



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

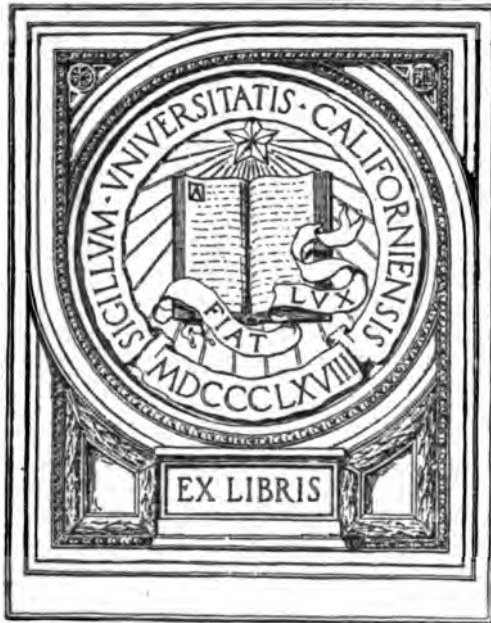
We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

GIFT OF



EX LIBRIS

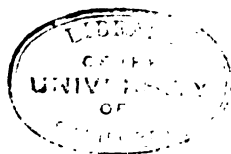
SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM

PROCEEDINGS

OF THE

UNITED STATES NATIONAL MUSEUM

VOLUME 46



WASHINGTON
GOVERNMENT PRINTING OFFICE

1914

ADVERTISEMENT.

The scientific publications of the National Museum consist of two series—Proceedings and Bulletins.

The Proceedings, the first volume of which was issued in 1878, are intended primarily as a medium for the publication of original papers based on the collections of the National Museum, setting forth newly acquired facts in biology, anthropology, and geology derived therefrom, or containing descriptions of new forms and revisions of limited groups. A volume is issued annually or oftener for distribution to libraries and scientific establishments, and, in view of the importance of the more prompt dissemination of new facts, a limited edition of each paper is printed in pamphlet form in advance. The dates at which these separate papers are published are recorded in the table of contents of the volume.

The present volume is the forty-sixth of this series.

The Bulletin, publication of which was begun in 1875, is a series of more elaborate papers, issued separately, and, like the Proceedings, based chiefly on the collections of the National Museum.

A quarto form of the Bulletin, known as the "Special Bulletin," has been adopted in a few instances in which a larger page was deemed indispensable.

Since 1902 the volumes of the series known as "Contributions from the National Herbarium," and containing papers relating to the botanical collections of the Museum, have been published as Bulletins.

RICHARD RATHBUN,
*Assistant Secretary, Smithsonian Institution, in
charge of the United States National Museum.*

APRIL 4, 1914.

TABLE OF CONTENTS.

	Page.
BARTSCH, PAUL. New mollusks from the Bahama Islands— No. 2016. November 29, 1913 ¹	107-109
New species: <i>Cerion (Strophiope) pepperi</i> , <i>Leptinaria bahamensis</i> . New subspecies: <i>Cepolis maynardi elevata</i> , <i>Varicella gracillima baha-</i> <i>mensis</i> .	
BASSLER, R. S. Notes on an unusually fine slab of fossil crinoids—No. 2009. November 29, 1913 ¹	57-59
BUSHNELL, DAVID I., jr. Archeological investigations in Ste. Genevieve County, Missouri—No. 2042. March 4, 1914 ¹	641-668
CLARK, AUSTIN HOBART. Revision of the crinoid genus <i>Himerometra</i> —No. 2026. November 25, 1913 ¹	279-289
COCKERELL, T. D. A. New parasitic hymenoptera of the genus <i>Eiphosma</i> —No. 2010. August 23, 1913 ¹	61-64
New species: <i>Eiphosma schwarzi</i> , <i>E. lacteum</i> , <i>E. montaguense</i> , <i>E.</i> <i>forte</i> .	
CRAWFORD, DAVID L. A contribution toward a monograph of the homopterous insects of the family Delphacidae of North and South America—No. 2041. March 4, 1914 ¹ ..	557-640
New genera: <i>Lepticus</i> (?), <i>Eucanyra</i> , <i>Liburniella</i> , <i>Bakerella</i> . New species: <i>Pentagramma bivittata</i> , <i>P. minore</i> , <i>Lepticus oculatus</i> , <i>Eucanyra stigmata</i> , <i>Stobaera nigripennis</i> , <i>Laccocera bicornata</i> , <i>Kormus californicus</i> , <i>Stenocranus angustus</i> , <i>S. rostrifrons</i> , <i>S.</i> <i>similis</i> , <i>Megamelanus frontalis</i> , <i>Dicranotropis cubanus</i> , <i>D. frontalis</i> , <i>D. bakeri</i> , <i>Bakerella maculata</i> , <i>Megamelus constrictus</i> , <i>M. metzaria</i> , <i>M. bifurcatus</i> , <i>M. rectangularis</i> , <i>M. cayamensis</i> , <i>M. kormusi</i> , <i>M.</i> <i>magnifrons</i> , <i>M. rotundatus</i> , <i>M. indistinctus</i> , <i>M. analis</i> , <i>M. nigri-</i> <i>dorsum</i> , <i>M. nigrigaster</i> , <i>M. albidens</i> , <i>M. approximatus</i> , <i>M. vanduzeei</i> , <i>M. erectus</i> , <i>M. pacificus</i> , <i>M. magnus</i> , <i>M. magnistylus</i> , <i>M.</i> <i>aurantii</i> . New varieties: <i>Laccocera zonata flava</i> , <i>Dicranotropis bakeri abdomi-</i> <i>nalis</i> , <i>Megamelus notulus flavus</i> , <i>M. constrictus minutus</i> , <i>M. teape</i> , <i>albinotatus</i> , <i>M. albidens havanensis</i> , <i>M. erectus niger</i> , <i>M. e. nigripen-</i> <i>nis</i> , <i>M. puellis mexicanus</i> .	
CRAWFORD, J. C. Descriptions of new hymenoptera, No. 8—No. 2029. December 23, 1913 ¹	343-352
New genera: <i>Perilampidea</i> , <i>Xenomymar</i> , <i>Neomymar</i> . New species: <i>Triasolcus urichi</i> , <i>T. trinidadensis</i> , <i>Telenomus tabano-</i> <i>cida</i> , <i>Neorileya ashmeadi</i> , <i>Perilampidea syrphi</i> , <i>Ooencyrtus trinidad-</i> <i>ensis</i> , <i>O. chrysopa</i> , <i>Signiphora giraulti</i> , <i>Derostenus fullowayi</i> , <i>Xeno-</i> <i>mymar urichi</i> , <i>Gonatocerus anomocerus</i> , <i>Anaphoidea latipennis</i> , <i>Neomymar vierecki</i> .	

¹ Date of publication.

DALL, WILLIAM HEALEY. On a brackish water Pliocene fauna of the southern coastal plain—No. 2023. December 6, 1913 ¹	225-237
New species: <i>Heterodonax alexandra</i> , <i>Unio</i> (<i>Lampetis</i>)? <i>sandrius</i> , <i>U.</i> (<i>Pleurobema</i>)? <i>alixus</i> , <i>U.</i> (<i>Unio</i>) <i>musius</i> , <i>Potamides matsoni</i> , <i>Cerithiopsis burkevillensis</i> , <i>Pachycheilus anagrammatus</i> , <i>P. suavis</i> , <i>Turritella satilla</i> , <i>Isapis obsoleta</i> , <i>Syrnola thelma</i> , <i>Paludestrina aldrichi</i> , <i>P. curva</i> , <i>P. cingulata</i> , <i>P. turricula</i> , <i>P. milium</i> , <i>Pyrgulopsis</i> ? <i>satilla</i> , <i>Planorbis ophis</i> .	
New varieties: <i>Rangia cuneata</i> var. <i>solida</i> , <i>Potamides matsoni</i> var. <i>gracilior</i> .	
FISHER, WALTER K. New starfishes from the Philippine Islands, Celebes, and the Moluccas—No. 2022. September 30, 1913 ¹	201-224
New genera: <i>Halityle</i> , <i>Dissogenes</i> , <i>Tarachaster</i> .	
New subgenus: <i>Xenorias</i> .	
New species: <i>Luidia prionota</i> , <i>L. orientalis</i> , <i>L. avicularia</i> , <i>L. gymnochora</i> , <i>Pectinaster hylacanthus</i> , <i>Cheiraster ludwigi</i> , <i>C. triplacanthus</i> , <i>Benthopecten moluccanus</i> , <i>B. polycetenius</i> , <i>B. styracius</i> , <i>Pentacerosia tyloderma</i> , <i>Asterodiscus helonotus</i> , <i>Halityle regularis</i> , <i>Dissogenes styracia</i> , <i>Ferdina glyptodisca</i> , <i>Fromia eusticha</i> , <i>F. hemiopia</i> , <i>Ophidiaster trychnus</i> , <i>Leiaster analogus</i> , <i>Marginaster paucispinus</i> , <i>Tarachaster tenuis</i> , <i>Nepanthia pedicellaris</i> , <i>N. platydisca</i> , <i>Anseropoda macropora</i> , <i>Lophaster suluiensis</i> , <i>Solaster tropicus</i> , <i>S. scotophilus</i> , <i>Rhipidaster</i> (<i>Xenorias</i>) <i>polycetenius</i> , <i>Asthenactis medusa</i> .	
FISK, MARY. A review of the fishes of the genus <i>Osmerus</i> of the California coast—No. 2027. November 25, 1913 ¹	291-297
New species: <i>Osmerus starksi</i> .	
FOLSOM, JUSTUS W. North American spring-tails of the subfamily Tomocerinae—No. 2037. December 30, 1913 ¹	451-472
New species: <i>Tomocerus bidentatus</i> , <i>Tritomurus californicus</i> .	
New variety: <i>Tomocerus flavescens</i> , var. <i>separatus</i> .	
GAHAN, A. B. New hymenoptera from North America—No. 2035. December 30, 1913 ¹	431-443
New genera: <i>Euphoriana</i> , <i>Eumicrosoma</i> .	
New species: <i>Elis atriventris</i> , <i>Bracon</i> (<i>Tropidobracon</i>) <i>meromyza</i> , <i>Euphoriana uniformis</i> , <i>Cælinidea ferruginea</i> , <i>Pteromalus eurymi</i> , <i>Dibrachys meteori</i> , <i>Eupelminus meteori</i> , <i>Elasmus apanteli</i> , <i>Tetrastichus brucophagi</i> , <i>T.</i> (<i>Tetrastichodes</i>) <i>detrimentosus</i> , <i>Sympiesis agromyza</i> , <i>Gonatocerus eximius</i> , <i>Eumicrosoma benefica</i> .	
GIDLEY, JAMES WILLIAMS. Preliminary report on a recently discovered Pleistocene cave deposit near Cumberland, Maryland—No. 2014. August 23, 1913 ¹	93-102
New species: <i>Ursus</i> (<i>Euarctos</i>) <i>vitabilis</i> , <i>Canis armbrusteri</i> .	

¹ Date of publication.

TABLE OF CONTENTS.

v

	Page.
GIDLEY, JAMES WILLIAMS. Some new American Pycnodont fishes—No. 2036. December 31, 1913 ¹	445-449
New species: <i>Microdon texanus</i> , <i>Calodus decaturensis</i> , <i>Anomazodus latidens</i> , <i>A. mississippiensis</i> .	
HALL, MAURICE C. A new nematode, <i>Rictularia splendida</i> , from the coyote, with notes on other coyote parasites—No. 2012. August 23, 1913 ¹	73-84
New species: <i>Rictularia splendida</i> .	
HARRING, HARRY K. A list of the rotatoria of Washington and vicinity, with descriptions of a new genus and ten new species—No. 2032. December 31, 1913 ¹	387-405
New genus: <i>Rousseletia</i> .	
New species: <i>Rousseletia corniculata</i> , <i>Encentrum aper</i> , <i>E. myriophylli</i> , <i>E. ricciae</i> , <i>Lecane stichæa</i> , <i>Monostyla acus</i> , <i>M. crenata</i> , <i>M. sylvatica</i> , <i>Trichotria brevidactyla</i> , <i>Asplanchnopus hyalinus</i> .	
HAY, OLIVER P. Camels of the fossil genus <i>Camelops</i> —No. 2025. December 6, 1913 ¹	267-277
———. Extinct bisons of North America; with description of one new species, <i>Bison regius</i> —No. 2021. December 6, 1913 ¹	161-200
New species: <i>Bison regius</i> .	
HOLLISTER, N. A review of the Philippine land mammals in the United States National Museum—No. 2028. December 31, 1913 ¹	299-341
New species: <i>Pachyura occultidens</i> , <i>Taphonycteris capito</i> , <i>Miniopterus paululus</i> , <i>Cherephon luzonius</i> , <i>Nannosciurus surrutilus</i> , <i>Epimys coloratus</i> , <i>E. robiginosus</i> , <i>E. mayonicus</i> , <i>E. leucophæatus</i> , <i>E. vigoratus</i> , <i>E. basilanus</i> , <i>E. ornatulus</i> , <i>E. benguetensis</i> , <i>Limnomys mearnsi</i> , <i>L. picinus</i> , <i>Apomys microdon</i> , <i>Pithecius mindorus</i> , <i>Rusa nigellus</i> .	
JORDAN, DAVID STARR, and WILLIAM FRANCIS THOMPSON. Notes on a collection of fishes from the Island of Shikoku in Japan, with a description of a new species, <i>Gnathypops iyonis</i> —No. 2011. August 23, 1913 ¹	65-72
New genus: <i>Onigocia</i> .	
New species: <i>Gnathypops iyonis</i> .	
KENNEDY, CLARENCE HAMILTON. Notes on the Odonata, or dragonflies, of Bumping Lake, Washington—No. 2017. September 30, 1913 ¹	111-126
KIRK, EDWIN. Notes on the fossil crinoid genus <i>Homocrinus</i> Hall—No. 2038. February 14, 1914 ¹	473-483
New family: <i>Homocrinidae</i> .	
New genus: <i>Lasiocrinus</i> .	

¹ Date of publication.

	Page.
KNAB, FREDERICK. Gad-flies (Tabanidæ) of the genus <i>Stibasoma</i> —No. 2033. December 23, 1913 ¹	407-412
New species: <i>Stibasoma dyridophorum</i> .	
———. New moth-flies (Psychodidæ) bred from Bromeliaceæ and other plants—No. 2015. August 23, 1913 ¹ ..	103-106
New species: <i>Psychoda amplipenna</i> , <i>P. fumata</i> , <i>P. tricolor</i> , <i>P. incompleta</i> .	
LINTON, EDWIN. Notes on a viviparous distome—No. 2040. February 24, 1914 ¹	551-555
New species: <i>Parorchis avitus</i> .	
MALLOCH, J. R. A synopsis of the genera of Agromyzidæ, with descriptions of new genera and species—No. 2018. December 6, 1913 ¹	127-154
New genera: <i>Paramilichia</i> , <i>Euchlorops</i> , <i>Paraleucopsis</i> .	
New name: <i>Paramackiza</i> .	
New species: <i>Milichia aethiops</i> , <i>Phyllomyza hirtipalpis</i> , <i>P. approximata</i> , <i>Euchlorops vittata</i> , <i>E. similis</i> , <i>Hemeromyia nitida</i> , <i>Rhincnessa texana</i> , <i>Paraleucopsis corvina</i> , <i>Phytomyza major</i> , <i>P. nitidula</i> , <i>P. lacteipennis</i> .	
———. The genera of flies in the subfamily Botanobiinæ with hind tibial spur—No. 2024. December 6, 1913 ¹ ..	239-266
New genera: <i>Prohippelates</i> , <i>Pseudohippelates</i> .	
New species: <i>Hippelates nudifrons</i> , <i>H. nitidifrons</i> , <i>H. truncata</i> , <i>H. apicata</i> , <i>H. nigricoxa</i> , <i>H. subvittata</i> , <i>H. texana</i> , <i>H. flavidula</i> , <i>H. subæqualis</i> , <i>Pseudohippelates gracilis</i> .	
MILLER, GERRIT S., Jr. Notes on the bats of the genus <i>Molossus</i> —No. 2013. August 23, 1913 ¹	85-92
New species: <i>Molossus fortis</i> , <i>M. debilis</i> .	
———. Revision of the bats of the genus <i>Glossophaga</i> —No. 2034. December 31, 1913 ¹	413-429
New subspecies: <i>Glossophaga soricina microtis</i> , <i>G. s. valens</i> .	
MORGAN, A. C. New genera and species of Thysanoptera, with notes on distribution and food plants—No. 2008. August 23, 1913 ¹	1-55
New genera: <i>Rhipiphorothrips</i> , <i>Microthrips</i> , <i>Horistothrips</i> .	
New species: <i>Euthrips hawaiiensis</i> , <i>E. floridensis</i> , <i>E. runneri</i> , <i>E. gossypii</i> , <i>Anaphothrips arizonensis</i> , <i>Echinothrips americanus</i> , <i>Rhipiphorothrips pulchellus</i> , <i>Microthrips piercei</i> , <i>Thrips quinciensis</i> , <i>T. helianthi</i> , <i>T. spinosus</i> , <i>Eurythrips hindsii</i> , <i>Trichothrips flavicauda</i> , <i>T. fuscus</i> , <i>T. hoodi</i> , <i>T. amplipennis</i> , <i>Horistothrips australis</i> , <i>Leptothrips russelli</i> , <i>Zygothrips femoralis</i> .	
New variety: <i>Euthrips tritici</i> , var. <i>bispinosus</i> .	

¹ Date of publication.

	Page.
POWERS, SIDNEY, and HERVEY W. SHIMER. See under Shimer, Hervey W.	155-156
RATHBUN, MARY J. Descriptions of new species of crabs of the families Grapsidæ and Ocypodidæ—No. 2030. December 31, 1913 ¹	353-358
New species: <i>Eriocheir leptognathus</i> , <i>Ptychognathus johannæ</i> , <i>Sesarma</i> (<i>Sesarma</i>) <i>tiomanense</i> , <i>Tympanomerus deschampsii</i> .	
SCHAUS, WILLIAM. New species of Noctuid moths from tropical America—No. 2039. January 29, 1914 ¹	485-549
New genera: <i>Chytonidia</i> , <i>Colodes</i> , <i>Encrusion</i> , <i>Anorena</i> , <i>Ateneria</i> , <i>Sinosia</i> , <i>Neoptodes</i> , <i>Eromidia</i> , <i>Polygnamptia</i> .	
New species: <i>Eriopyga dromas</i> , <i>Argyrostromis euryaces</i> , <i>Eriopus orses</i> , <i>Phuphena subvenata</i> , <i>P. costata</i> , <i>Chytonix commixta</i> , <i>C. chloe</i> , <i>C. pyrrha</i> , <i>Chytonidia chloristis</i> , <i>Spodoptera evanida</i> , <i>Gonodes echion</i> , <i>Monodes ixion</i> , <i>M. phlegyas</i> , <i>M. isse</i> , <i>Perigea drusilla</i> , <i>Colodes selecta</i> , <i>Nanamonodes trilineata</i> , <i>Micromonodes leucosticta</i> , <i>M. excellens</i> , <i>Neolita epicaste</i> , <i>Erocha albifera</i> , <i>E. dipsas</i> , <i>Trogoblema sericata</i> , <i>T. lucens</i> , <i>Phobolusia atrifrons</i> , <i>P. admirabilis</i> , <i>Oruza doto</i> , <i>Oenoptera leda</i> , <i>O. rhea</i> , <i>Pseudocraspedia ormenis</i> , <i>Parangitia atys</i> , <i>P. chlorosticta</i> , <i>P. japyx</i> , <i>Angitia thacia</i> , <i>A. orestes</i> , <i>A. onerosa</i> , <i>A. hermione</i> , <i>Ozarba angulilinea</i> , <i>O. onytes</i> , <i>Lithacodia folium</i> , <i>Neostrotia albescent</i> , <i>Eustrotia olenos</i> , <i>Heliocontia basipuncta</i> , <i>Ypsia glycon</i> , <i>Y. exaggerata</i> , <i>Encrusion porrima</i> , <i>E. phalereus</i> , <i>Hermionodes albistriga</i> , <i>H. umbrata</i> , <i>H. hebes</i> , <i>H. parca</i> , <i>H. regia</i> , <i>H. longistriata</i> , <i>H. inculta</i> , <i>H. pilosa</i> , <i>Leptoctenista grandimacula</i> , <i>L. hadenoides</i> , <i>L. oreas</i> , <i>L. funebris</i> , <i>L. malonia</i> , <i>L. lignea</i> , <i>L. crinipes</i> , <i>Anorena hyrtacides</i> , <i>Ateneria crinipuncta</i> , <i>Sinosia inornata</i> , <i>Neoptodes caicus</i> , <i>Ostha oenopion</i> , <i>O. ofella</i> , <i>Of. cybele</i> , <i>Azatha? pulchra</i> , <i>Orthogramma modesta</i> , <i>Pangrapt? subgeminata</i> , <i>Pf. dilucida</i> , <i>Thermesia ocrea</i> , <i>T. glycera</i> , <i>Apistis onerosa</i> , <i>Eromidia clotho</i> , <i>Bendis? nigrilunata</i> , <i>Glympis parvipuncta</i> , <i>Dagassa deucalion</i> , <i>Df. pyrrha</i> , <i>Orsa oculata</i> , <i>Oroscopta belus</i> , <i>Erebostrotia albipicta</i> , <i>Triomatodes agenor</i> , <i>T. canidia</i> , <i>T. pygmalion</i> , <i>T. aberrans</i> , <i>T. pylades</i> , <i>T. belus</i> , <i>Mulelocha albibasalis</i> , <i>M. erebea</i> , <i>Capnodes baccata</i> , <i>C. calais</i> , <i>C. barine</i> , <i>C. phaedra</i> , <i>C. partita</i> , <i>C. pelops</i> , <i>C. hannibal</i> , <i>C. æson</i> , <i>C. abas</i> , <i>C. deois</i> , <i>C. acron</i> , <i>C. hamulcar</i> , <i>C. barcas</i> , <i>C. cerea</i> , <i>C. accumulata</i> , <i>C. tyroe</i> , <i>C. gladysia</i> , <i>C. anthea</i> , <i>Ceromacra cebrenis</i> , <i>Antarchaea polla</i> , <i>Metalectra alcis</i> , <i>M. ceyx</i> , <i>M. astylos</i> , <i>M. agriodos</i> , <i>M. furva</i> , <i>M. variata</i> , <i>Corna oenone</i> , <i>Polygnamptia chloristicta</i> , <i>Baniana gulussa</i> , <i>B. athamas</i> , <i>B. helle</i> , <i>B. crucilla</i> , <i>B. gyas</i> , <i>B. herceus</i> , <i>B. serpens</i> , <i>B. phruzus</i> , <i>B. nephele</i> , <i>Focilla gradivus</i> , <i>F.? masgava</i> , <i>Elocussa fuscata</i> , <i>Gonuris leonnatus</i> , <i>Ensipia trilineata</i> , <i>Sanys pyrene</i> , <i>S. bebryx</i> .	
SHIMER, HERVEY W., and SIDNEY POWERS. A new sponge from the New Jersey Cretaceous—No. 2019. December 6, 1913 ¹	155-156
New species: <i>Caloptychium? jerseyense</i> .	

¹ Date of publication.

	Page.
THOMPSON, J. C. The variation exhibited by mainland and island specimens of the Hibakari snake, <i>Natrix vibakari</i> (Boie)—No. 2020. September 30, 1913 ¹	157-160
THOMPSON, WILLIAM FRANCIS, and DAVID STARR JORDAN. See under Jordan, David Starr.....	65-72
VIERECK, HENRY L. Descriptions of twenty-three new genera and thirty-one new species of Ichneumon-flies—No. 2031. December 31, 1913 ¹	359-386
<p>New genera: <i>Eristernaulax</i>, <i>Macroneuroides</i>, <i>Trachagathis</i>, <i>Zadiolcogaster</i>, <i>Aglaojoppidea</i>, <i>Cryptanuridimorpha</i>, <i>Cryptophion</i>, <i>Cryptopterigimorpha</i>, <i>Diaglyptidea</i>, <i>Digonocryptus</i>, <i>Epiopelmidea</i>, <i>Joppocryptus</i>, <i>Lamprocryptidea</i>, <i>Monogonocryptus</i>, <i>Phaenolabrorychus</i>, <i>Photocryptus</i>, <i>Photoptera</i>, <i>Polyaenidea</i>, <i>Polycyrtidea</i>, <i>Polycyrtimorpha</i>, <i>Thymarimorpha</i>, <i>Zaglyptomorpha</i>, <i>Zamastrus</i>.</p> <p>New species: <i>Aspigonus stramineicolor</i>, <i>Chelonus</i> (<i>Chelonella</i>) <i>szepligetii</i>, <i>Cyanopterus diversus</i>, <i>Eristernaulax leucotænia</i>, <i>Macroneura rufobalteata</i>, <i>Macroneuroides erythropleura</i>, <i>Meteorus mamestræ</i>, <i>Phanerotoma straminea</i>, <i>Apanteles</i> (<i>Protapanteles</i>) <i>iglesiæi</i>, <i>Trachagathis tæniogaster</i>, <i>Zadiolcogaster anomus</i>, <i>Aglaojoppidea pictipennis</i>, <i>Cryptanuridimorpha elegans</i>, <i>Cryptophion strandi</i>, <i>Cryptopterigimorpha tubulifera</i>, <i>Diaglyptidea roepkei</i>, <i>Digonocryptus bidens</i>, <i>Epiopelmidea erythrogastra</i>, <i>Joppocryptus egregius</i>, <i>Lamprocryptidea magnifica</i>, <i>Monogonocryptus diversicolor</i>, <i>Pezomachus</i> (<i>Pezomachus</i>) <i>apantelicida</i>, <i>Phaenolabrorychus anisitsi</i>, <i>Photocryptus photomorphus</i>, <i>Photoptera erythronota</i>, <i>Polyaenidea pretiosa</i>, <i>Polycyrtidea gracilis</i>, <i>Polycyrtimorpha amoenus</i>, <i>Thymarimorpha platygastera</i>, <i>Zaglyptomorpha attenuata</i>, <i>Zamastrus photopsis</i>.</p> <p>New subspecies: <i>Calobracon bicolor pæneunicolor</i>.</p>	

¹ Date of publication.

LIST OF ILLUSTRATIONS.

	PLATES.	Facing page.
1. Slab of <i>Scyphocrinus</i>		60
2. Two complete calices of <i>Scyphocrinus</i>		60
3. New mollusks from the Bahama Islands.....		110
4. Wings of species of <i>Agromyzidæ</i>		154
5. Heads of species of <i>Agromyzidæ</i>		154
6. Parts of species of <i>Agromyzidæ</i>		154
7. A fossil sponge from New Jersey.....		155
8. Skulls of Old World bisons, known as <i>Bison priscus</i>		200
9. Skulls of <i>Bison priscus</i> and <i>Bison occidentalis</i>		200
10. Skulls of <i>Bison occidentalis</i>		200
11. Skulls of <i>Bison occidentalis</i>		200
12. Skulls of <i>Bison occidentalis</i>		200
13. Skulls of <i>Bison occidentalis</i>		200
14. Skulls of <i>Bison crassicornis</i>		200
15. Skulls of <i>Bison priscus</i> ? and <i>Bison alleni</i>		200
16. Skull of <i>Bison alleni</i>		200
17. Skull and cervical vertebrae of <i>Bison alleni</i>		200
18. Skull of <i>Bison regius</i>		200
19. Skull, horn cores, and tooth referred to <i>Bison latifrons</i>		200
20. Pliocene mollusks of the coastal plain.....		238
21. Pliocene mollusks of the coastal plain		238
22. Pliocene mollusks of the coastal plain		238
23. Details of flies in subfamily <i>Botanobiinæ</i>		266
24. Details of flies in subfamily <i>Botanobiinæ</i>		266
25. Skull and premaxilla of <i>Camelops huerfanensis</i>		278
26. Details of teeth and jaw of <i>Camelops huerfanensis</i>		278
27. Skull of <i>Pithecius mindorus</i> from Mindoro.....		342
28. Skull of <i>Pithecius mindorus</i> from Mindoro.....		342
29. Skull and teeth of <i>Rusa nigellus</i> from Mindanao		342
30. New crabs of families <i>Grapsidæ</i> and <i>Ocypodidæ</i>		358
31. New crabs of families <i>Grapsidæ</i> and <i>Ocypodidæ</i>		358
32. New crabs of families <i>Grapsidæ</i> and <i>Ocypodidæ</i>		358
33. New crabs of families <i>Grapsidæ</i> and <i>Ocypodidæ</i>		358
34. Rotatoria of Washington and vicinity.....		406
35. Rotatoria of Washington and vicinity.....		406
36. Rotatoria of Washington and vicinity.....		406
37. Rotatoria of Washington and vicinity.....		406
38. Rotatoria of Washington and vicinity.....		406
39. Some new hymenoptera.....		444
40. North American spring-tails of the subfamily <i>Tomocerinæ</i>		472
41. North American spring-tails of the subfamily <i>Tomocerinæ</i>		472
42. Crinoids of the fossil genera <i>Homocrinus</i> and <i>Lasiocrinus</i>		484
43. <i>Parorchis avitus</i> , new species.....		556
44. Details of <i>Delpbacidæ</i>		640

	Facing page.
45. Details of Delphacidae	640
46. Details of Delphacidae	640
47. Details of genitalia and head of Delphacidae	640
48. Details of male genitalia of Delphacidae	640
49. Details of Delphacidae	640
50. Northern section of the Ross map, 1765. Ste. Genevieve is designated by the name "Misere"	668
51. Cache exposed on the side of the road near the spring	668
52. Objects associated with burial in mounds near the mouth of the Saline	668
53. A. Scapula of an elk used as a hoe. B. Side. C. Front. Small figure in limestone	668
54. Grave 1. Group on high point south of village site	668
55. Casts of fragments of pottery	668
56. A. Detail of a buffalo hair bag. B. Cast of a fragment of pottery. C. Cast of a fragment of pottery	668
57. Casts of fragments of pottery	668

TEXT FIGURES.

	Page.
Figs. 1-4.— <i>Euthrips phalerata</i> . 1, head, prothorax, and foreleg of female, dorsal view; 2, right antenna of female, dorsal view; 3, tip of abdomen of female, dorsal view; 4, left fore wing of female. Figs. 5-8.— <i>Euthrips hawaiiensis</i> . 5, head, prothorax, and foreleg of female, dorsal view; 6, left antenna of female, dorsal view; 7, tip of abdomen of female, dorsal view; 8, right fore wing of female. Figs. 9-10.— <i>Euthrips floridensis</i> . 9, head, prothorax, and forelegs of female, dorsal view; 10, right antenna of female, dorsal view	47
Figs. 11-12.— <i>Euthrips floridensis</i> . 11, tip of abdomen of female, dorsal view; 12, left fore wing of female. Figs. 13-16.— <i>Euthrips runneri</i> . 13, head, prothorax, and forelegs of female, dorsal view; 14, right antenna of female, 15, tip of abdomen of female, dorsal view; 16, right fore wing of female. Figs. 17-18.— <i>Euthrips tritici</i> , var. <i>bispinosus</i> . 17, right antenna of female, dorsal view; 18, second antenna segment of female, lateral view. Figs. 19-20.— <i>Euthrips gossypii</i> . 19, tip of abdomen of female, dorsal view; 20, left fore wing of female	48
Figs. 21-22.— <i>Euthrips gossypii</i> . 21, head, prothorax, and foreleg of female, dorsal view; 22, left antenna of female, dorsal view. Figs. 23-26.— <i>Anaphothrips arizonensis</i> . 23, head, prothorax, and foreleg of female, dorsal view; 24, left antenna of female, dorsal view; 25, tip of abdomen of female, dorsal view; 26, left forewing of female. Figs. 27-30.— <i>Microthrips piercei</i> . 27, head, thorax, and foreleg of female, dorsal view; 28, right antenna of female, dorsal view; 29, tip of abdomen of female, dorsal view; 30, right fore wing of female. Fig. 31.— <i>Echinothrips americanus</i> . Seventh to tenth segments of abdomen of male, ventral view	49
Fig. 32.— <i>Echinothrips americanus</i> . Right fore wing of female. Figs. 33-37.— <i>Rhipiphorothrips pulchellus</i> . 33, head, thorax, and forelegs of female, dorsal view; 34, tip of abdomen of female, dorsal view; 35, left antenna of male, dorsal view; 36, tip of abdomen of male, ventral view; 37, left fore wing of female	50
Figs. 38-41.— <i>Thrips quinciensis</i> . 38, head, prothorax, and foreleg of female, dorsal view; 39, right antenna of female, dorsal view; 40, tip of abdomen of female, dorsal view; 41, right fore wing of female. Figs. 42-43.— <i>Thrips spinosus</i> . 42, tip of abdomen of female, dorsal view; 43, left fore wing of female. Fig. 44.— <i>Thrips helianthi</i> . Left fore wing of female	51

	Page.
Figs. 45-46.— <i>Thrips spinosus</i> . 45, head and prothorax of female, dorsal view; 46, left antenna of male, dorsal view. Figs. 47-49.— <i>Thrips helianthi</i> . 47, head and prothorax of female, dorsal view; 48, left antenna of female, dorsal view; 49, tip of abdomen of female, dorsal view. Figs. 50-54.— <i>Trichothrips javicauda</i> . 50, head, prothorax, and forelegs of female, dorsal view; 51, tip of abdomen of female, dorsal view; 52, head, prothorax, and foreleg of male, dorsal view; 53, left antenna of male, dorsal view; 54, tip of abdomen of male, dorsal view.....	52
Figs. 55-57. <i>Trichothrips fuscus</i> . 55, head, prothorax, and foreleg of female, dorsal view; 56, right antenna of female, dorsal view; 57, tip of abdomen of female, dorsal view. Figs. 58-60.— <i>Trichothrips hoodi</i> . 58, head, prothorax, and foreleg of female, dorsal view; 59, left antenna of female, dorsal view; 60, tip of abdomen of female, dorsal view. Figs. 61-63.— <i>Eurythrips hindst.</i> 61, head, prothorax, and foreleg of female, dorsal view; 62, left antenna of female, dorsal view; 63, tip of abdomen of female, dorsal view.....	53
Figs. 64-67.— <i>Trichothrips amphipennis</i> . 64, head, prothorax, and foreleg of female, dorsal view; 65, right antenna of female, dorsal view; 66, tip of abdomen of female, dorsal view; 67, left fore wing of female. Figs. 68-71.— <i>Hortothrips australis</i> . 68, head, prothorax, and foreleg of female, dorsal view; 69, right antenna of female, dorsal view; 70, tip of abdomen of female, dorsal view; 71, right fore wing of female.....	54
Figs. 72-75.— <i>Leptothrips russelli</i> . 72, head, prothorax, and foreleg of female, dorsal view; 73, right antenna of female, dorsal view; 74, tip of abdomen of female, dorsal view; 75, right fore wing of female. Figs. 76-79.— <i>Zygothrips femoralis</i> . 76, head, prothorax, and foreleg of female, dorsal view; 77, right antenna of female, dorsal view; 78, tip of abdomen of female, dorsal view; 79, right fore wing of female.....	55
Fig. 1.— <i>Gnathypops iyonis</i> Jordan and Thompson.....	66
Fig. 2.— <i>Hoplichthys regant</i> Jordan.....	67
Fig. 3.— <i>Hoplichthys gilberti</i>	68
Fig. 4.— <i>Hoplichthys langsdorffii</i>	68
Fig. 5.— <i>Hoplichthys langsdorffii</i> Temminck and Schlegel.....	69
Fig. 1.— <i>Rictularia splendida</i> . Tail of male. c., latero-ventral combs; f., ventral fans; pap., papillae; spic., spicules.....	78
Fig. 2.— <i>Rictularia splendida</i> . Cross section, semidiagrammatic, in tail region of male. c., latero-ventral combs; f., mid-ventral fans; int., intestine; l. l., lateral lines; v. s., vesicula seminalis.....	78
Fig. 3.— <i>Rictularia splendida</i> . Anterior end of female showing vulva.....	79
Fig. 4.— <i>Rictularia splendida</i> . Tail of female.....	80
Fig. 5.— <i>Rictularia splendida</i> . Head of female.....	80
Fig. 6.— <i>Rictularia splendida</i> . Head of female.....	80
Fig. 1.— <i>Ursus (Euarctos) vitabilis</i> . Type specimen. Outer view of right lower jaw, $\frac{2}{3}$ nat. size. a. Superior view, nat. size.....	97
Fig. 2.— <i>Canis armbrusteri</i> , type specimen, portion of left lower jaw. 2. Outer view, $\frac{2}{3}$ nat. size. a. Superior view, nat. size.....	98
Fig. 3.— <i>Canis armbrusteri</i> . Cat. No. 7661, portion of right lower jaw. Outer view, $\frac{2}{3}$ nat. size. a. Superior view, nat. size.....	99
Figs. 4-8.—Lower fourth premolars and carnassials of <i>Canids</i> . All natural size. 4, 4a, <i>Canis occidentalis</i> , Cat. No. 1006, U.S.N.M. 5, 5a, <i>Canis armbrusteri</i> , Cat. No. 7482, U.S.N.M. 6, 6a, <i>Canis (Hyscins latrans)</i> , Cat. No. 3618, U.S.N.M. 7, 7a, <i>Canis aureas</i> , Cat. No. 181500, U.S.N.M. 8, 8a, <i>Vulpis</i> , Cat. No. 7183, U.S.N.M.....	100

	Page.
<i>Somatochlora semicircularis</i> .—Abdomen of female showing markings and terms used in describing them.....	114
Figs. 1-2.— <i>Somatochlora semicircularis</i> , male. 1, dorsal view. 2, lateral view.	119
Figs. 3-4.— <i>Somatochlora semicircularis</i> , female. 3, dorsal view. 4, lateral view.....	120
Figs. 5-13.— <i>Somatochlora semicircularis</i> . 5, lateral view of segments 9 and 10 of abdomen of female, field No. 7. 6, dorsal view of segments 9 and 10 of abdomen of female, field No. 12. 7, ventral view of segments 9 and 10 of abdomen of female, field No. 12. 8, lateral view of segment 2 of male, showing genital lobe and anterior hamule. 9, ventral view of segment 2 of same male as fig. 8. 10, lateral view of segment 2 of male, showing genital lobe and anterior hamule. 11, lateral view of segment 10 and appendages of male. 12, dorsal view of segment 10 and appendages of male. 13, ventral view of segment 10 and appendages of male.....	121
Figs. 14-25.— <i>Somatochlora semicircularis</i> . Vulvar lamina of 12 females, showing slight variations due largely to distortion in drying.....	122
Figs. 26-29.— <i>Somatochlora semicircularis</i> . Lateral views of segment 10 and appendages of 4 males, showing variations in tip due to distortion in drying..	122
Figs. 30-36.— <i>Somatochlora semicircularis</i> . Lateral views of abdomen in 7 males, showing differences in color pattern.....	123
Figs. 37-43.— <i>Somatochlora semicircularis</i> . Lateral views of abdomen in 7 males, showing differences in color pattern.....	124
Figs. 44-50.— <i>Somatochlora semicircularis</i> . Lateral views of abdomen in 7 females, showing variations in color pattern and length.....	125
Figs. 51-57.— <i>Somatochlora semicircularis</i> . Lateral views of abdomen in 7 females, showing variations in color pattern and length.....	126
Fig. 1.— <i>Bison antiquus</i> . Type. Part of skull. Horn-core restored to show form.....	165
Fig. 2.— <i>Bison antiquus</i> . Skull at Earlham College. Frontal view.....	166
Fig. 3.— <i>Bison antiquus</i> . Skull at Earlham College. View from the rear.....	166
Fig. 4.— <i>Bison occidentalis</i> . Skull at Kansas University. Frontal view.....	170
Fig. 5.— <i>Bison occidentalis</i> . Skull at Kansas University. Lateral view.....	171
Fig. 6.— <i>Bison occidentalis</i> . Skeleton at Kansas University.....	172
Fig. 7.— <i>Bison alleni</i> . Skull in U. S. National Museum. View from the rear.	184
Fig. 8.— <i>Bison alleni</i> . Left upper molars of No. 7706, U. S. National Museum. M ³ at right, $\times \frac{1}{2}$	186
Fig. 9.— <i>Bison alleni</i> . Left lower premolars and molars of No. 7706, U. S. National Museum. $\times \frac{1}{2}$	187
Fig. 10.— <i>Bison regius</i> . Right upper molars of type. M ³ at left. $\times \frac{1}{2}$	195
Fig. 1.—Molars (<i>m</i> ¹) and premolars (<i>pm</i> ⁴) of lower jaws of the type of <i>Camelops huerfanensis</i> . $\times \frac{1}{2}$	274
<i>Osmerus starksi</i> , new species.....	293
Fig. 1.— <i>Ooencyrtus chrysops</i> . Outline of antenna of female.....	347
Fig. 2.— <i>Signiphora giraulti</i> . Front wing of female.....	348
Fig. 3.— <i>Signiphora giraulti</i> . Middle leg of female.....	348
Fig. 4.— <i>Xenomymar urichi</i> . Antenna of female.....	349
Fig. 5.— <i>Xenomymar urichi</i> . Front wing of female.....	349
Fig. 6.— <i>Gonatocerus anomocerus</i> . Antenna of female.....	350
Fig. 7.— <i>Anaphoidea latipennis</i> . Outline of forewing of female.....	350
Fig. 8.— <i>Neomymar vierecki</i> . Antenna of female.....	351
Fig. 1.—Dorsal and lateral views of skull: <i>Glossophaga soricina</i> (a), <i>G. longirostris</i> (b), and <i>G. elongata</i> (c).....	416
Fig. 1.— <i>Microdon texanus</i> . Type. Vomerine plate, nat. size. 1. Palatine view. 1a. Section about middle point taken from posterior view.....	445

	Page.
Fig. 2.— <i>Microdon texanus</i> . Paratype. Portion of left splenial, nat. size. 2. Superior view. 2a. Posterior end view, outline.....	446
Fig. 3.— <i>Calodus fabadens</i> . Type. A nearly complete left splenial. 3. Superior view. 3a. Section taken from another view.....	446
Fig. 4.— <i>Calodus decaturensis</i> . Type. Portion of left splenial, nat. size. 4. Superior view. 4a. Posterior end view, outline.....	447
Fig. 5.— <i>Anomæodus latidens</i> . Type. Portion of left splenial, nat. size.....	448
Fig. 6.— <i>Anomæodus mississippiensis</i> . Type. Portion of right splenial, nat size..	449
Fig. 1.— <i>Tomocerus flavescens</i> , var. <i>arcticus</i> . Eyes of right side. $\times 320$	452
Fig. 2.— <i>Tomocerus flavescens</i> , var. <i>americanus</i> . The abdominal segments are numbered. $\times 20$	453
Fig. 3.— <i>Tomocerus flavescens</i> , var. <i>americanus</i> . Tibiotarsus showing an abnormal third segment. $\times 57$	453
Fig. 4.— <i>Tomocerus flavescens</i> , var. <i>americanus</i> . Concave aspect of unguis to show the form of the teeth. $\times 644$	453
Fig. 5.— <i>Tomocerus flavescens</i> , var. <i>americanus</i> . Left side of tenaculum. $\times 238$.	454
Fig. 6.— <i>Tomocerus flavescens</i> , var. <i>americanus</i> . Posterior segments of abdomen, numbered to show relative positions of terga and sterna. <i>f</i> , fold. $\times 39$	454
Fig. 7.— <i>Tomocerus flavescens</i> , var. <i>americanus</i> . Posterior segments of abdomen of male, showing protruded genital segment. <i>f</i> , fold. $\times 30$	455
Fig. 8.— <i>Tomocerus flavescens</i> , var. <i>americanus</i> . Anal segment of male, showing cerci. $\times 102$	455
Fig. 9.— <i>Tothocerus flavescens</i> , var. <i>separatus</i> . Bases of dentes to show segmentation and spines. $\times 124$	456
Fig. 10.— <i>Tomocerus flavescens</i> , var. <i>separatus</i> . Right mucro. $\times 275$	456
Fig. 1.—Map showing the position of the salt spring A and the mouth of the Saline.....	645
Fig. 2.—The salt spring A on fig. 1. The stippled area represents the ground impregnated with salt and barren of vegetation.....	646
Fig. 3.—Section through A-B on fig. 2. The dotted line indicates approximately the original surface. Above this line is the accumulation of ashes, charcoal, fragments of pottery, etc.....	647
Fig. 4.—Graves south of village site. D on fig. 1. Grave I is shown on plate 54 and fig. 5.....	653
Fig. 5.—Grave I on high point south of village site.....	654
Fig. 6.—Thirteen petroglyphs on the floor of the cave. Their relative positions are indicated on the plan of the cave, fig. 7.....	658
Fig. 7.—Plan of the cave showing the petroglyphs. The dotted lines indicate the channel worn in the floor of the cave. This channel continues outside the cave and connects with a narrow chasm extending east and west.....	659
Fig. 8.—Imprint on a fragment of pottery.....	663



NEW GENERA AND SPECIES OF THYSANOPTERA, WITH NOTES ON DISTRIBUTION AND FOOD PLANTS.

By A. C. MORGAN,

Of the Bureau of Entomology, United States Department of Agriculture.

INTRODUCTION.

The facts upon which this paper is based are the outgrowth of occasional work, during the past four years, upon the food plants and distribution of the tobacco thrips, *Euthrips fuscus* Hinds. During this work several new forms were either collected or received from other collectors, and information was obtained which greatly extends the range of several of our already described species. Because of the increasing economic importance of the order it is thought advisable to place the accumulated facts on record for the use of other workers. In all, 3 new genera, 19 new species, 1 European form now first recorded for America, and 1 new variety, are added to our fauna. One species is placed in synonymy, and the males of 2 other species are here recorded for the first time. New locality records are given for 38 species, and new food plants recorded for many of them.

Although there is considerable doubt of the validity of the use of the genus *Euthrips* to contain such widely different forms as *Euthrips ulicis californicus* Moulton, *E. phalerata* Haliday, *E. pyri* Daniel, and *E. tritici* Fitch, the writer has refrained for the present from a revision of the genus, and has used it in the broad sense ascribed to it by Hinds. An examination of certain European species should be made the basis for the revision, and it is my hope that Mr. Richard S. Bagnall will do this in his treatise upon Thysanoptera, which he is preparing for the Genera Insectorum.

EUTHRIPS PHALERATA Haliday (Redescription).

Figs. 1-4.

Female.—Length about 1.3 mm. Width 0.16 to 0.17 mm. General color yellowish brown.

Head about one and one-half times as broad as long, slightly retracted within the prothorax; diverging slightly posteriorly, cheeks slightly roughened; dorsum very distinctly transversely striated

behind the eyes. Anterior margin slightly produced between the antennæ. Eyes large, black, not protruding, very sparsely and minutely pilose, occupying about three-fifths the width of the head. Ocelli light reddish, large, fairly well separated, the posterior ones just behind the center of the eyes and near their inner margins; anterior ocellus somewhat directed forward; margined inwardly with dark-reddish-brown crescents; a long, slender, yellowish-brown spine in front of each posterior ocellus, other spines upon head few and minute. Mouth cone long, narrowing abruptly to the middle, thence very slender to the tip, reaching posterior margin of prosternum. Maxillary palpi long and slender, first and third segments of equal length, the second about three-fifths as long as first, light yellowish brown. Mouth cone darker brown than head, darkest at tip. Labial palpi very slender. Antennæ two and one-half times as long as the head, inserted below the front. Relative lengths of segments as follows:

$\frac{1}{9}$	$\frac{2}{13}$	$\frac{3}{16}$	$\frac{4}{15}$	$\frac{5}{10.5}$	$\frac{6}{15}$	$\frac{7}{3.4}$	$\frac{8}{5}$
---------------	----------------	----------------	----------------	------------------	----------------	-----------------	---------------

Segment one broadest, slightly broader than long, broadest at base; segments one, four, five, and six concolorous with head or only slightly lighter, seven and eight lighter brown, three light yellowish with a slight tinge of brown. Segment three is stalked and has a pseudo joint near the base. Long spines upon segments are slender and light yellowish. A branched sense cone stands upon the upper side of segment three near the tip and a similar one is borne on the under side of four near the tip. Segment one bears a transverse stria near the base.

Prothorax slightly broader than long, broadest behind, hind angles broadly rounded, and bearing two long spines. No long spines at front angles. A row of four small spines stands on hind margin between meson and spines at angles. Other spines upon prothorax few and inconspicuous. Mesothorax rounded at anterior angles; each of which is produced into a shoulderlike process; mesonotal plate transversely striate, bearing one long spine at each lateral angle, spines on posterior margin inconspicuous. Metathorax tapers but slightly posteriorly, metanotal plate longitudinally striate, with two pairs of spines on the front margin, the pair toward the middle being much the larger. Wings reaching nearly to tip of the abdomen; breadth at the middle about one-eleventh their length; with two broad white bands, the first beginning near base and extending to end of first third of wing, the second beginning at about two-thirds length of wing and extending nearly to the tip. Basal two-fifths of scale is light brown, the remainder being included in the white band, middle and tip of wing light brown. Veins in fore wing extend nearly to tip of wing. Spines on veins arranged at regular intervals except in

apical white band, costa bears 28 to 31; fore vein 17 to 18; hind vein 14 to 16; scale 6, interior of scale 1; a light sparse fringe on costa of each wing, posterior fringes heavy and wavy. The single median vein in the hind wing runs its entire length. Each wing rather thickly set with short spines. All femora brown; all tibiae brown except distal half of fore tibiae which shade to yellowish-brown; all tarsi pale yellowish-brown; base of bladder with a dark brown spot. Fore femora thickened. All legs clothed with numerous small, light brown spines. Hind and middle tibiae bear two rather stout spines at the tips within, also a row of four smaller spines along the inner margin. Fore tibia bears two conspicuous teeth at the tip within, the outer one being much the stronger and longer, the inner one is more blunt and bears a slender spine near the tip.

Abdomen rather stout to the eighth segment, thence narrowing abruptly to the tip; a dark brown narrow stripe across the dorsum of segments two to eight near their anterior edges; a row of six short slender spines on posterior margin of ventral segments two to seven; two or three spines on sides of segments two to seven only one of which is prominent; three prominent spines on each side of segment eight. Segment nine near its posterior margin bears a circlet of 10 spines of which the dorsal six are long and prominent. Tenth segment near the tip bears a circlet of six spines of which the dorsal four are long, slender, and conspicuous. The tenth segment also bears a few smaller spines at the tip. Tenth segment split open above for about half its length, truncated-cone shaped.

Described from two females; no males found.

Locality, Quincy, Florida.

On *Plantago virginica*.

H. F. Wilson, collector.

EUTHRIPS HAWAIIENSIS, new species.

Figs. 5-8.

Female.—Length about 1.2 mm., width of body about 0.35 mm. General color, head and thorax orange with slight brownish tinge, abdomen, normal color is apparently dark brown, although one specimen on type slide has the abdomen gray, shading to brown only on the last three segments. The latter specimen was probably recently matured when collected.

Head about 0.18 mm. wide, 0.12 long, diverging slightly behind the eyes; front almost straight, very slightly produced between the antennae; antennae inserted below the front, their bases separated by about half the width of the basal segment; back of head very noticeable transversely striated; sides scarcely roughened. Eyes large, occupying more than half the length of the head and two-thirds the width; very dark purplish, almost black by transmitted light, light

yellow by reflected light; pilose and rather finely faceted. Ocelli situated well back toward hind margins of eyes, the posterior ones contiguous with inner margins of eyes; the anterior ocellus is on a line with the middle of the eyes; color light yellow with reddish pigmentation; inner crescents large, reddish orange. One small brownish spine in front of each posterior ocellus and a similar one immediately behind the ocellus. Extending from the latter spine in a curved row behind each eye to the lateral margin of the head stands six smaller light-brown spines. Mouth cone reaches slightly past the middle of the prosternum, suddenly constricted at the basal third, thence to the tip the sides are very nearly parallel. Labrum constricted just before the tip, which is black. Labium sharply rounded. First and third segments of maxillary palpi of equal length, second shorter. Relative lengths of segments of antennæ as follows, each of which is an average of 4 antennæ:

$\frac{1}{8}$	$\frac{2}{9.9}$	$\frac{3}{13.5}$	$\frac{4}{13.8}$	$\frac{5}{10.2}$	$\frac{6}{13.5}$	$\frac{7}{2.2}$	$\frac{8}{2.8}$
---------------	-----------------	------------------	------------------	------------------	------------------	-----------------	-----------------

Color: Segments one and two yellowish brown to brown; six to eight brown; three yellow; basal fifth of four and extreme base of five pale gray, remainder of these two brown like the apical segments. Spines on segments light brown, of medium size, and rather sparse. A branched sense cone on the dorsal side of three near the tip and a similar one on the ventral side of four near the tip.

Prothorax about 0.22 mm. wide and 0.125 long. Sides nearly straight; anterior margin nearly straight; hind angles broadly rounded; posterior margin slightly convex. Two stout dark-brown spines at each posterior angle; between these spines and the meson on each side a row of three short spines, of which the inner is much the larger. A short anteriorly directed spine at each anterior angle. Dorsum of prothorax bears numerous short light-brown spines scattered over its surface. Whole dorsum rather finely and faintly transversely striate. Mesothorax with front angles broadly rounded. Sides of meso and metathorax straight, gradually diverging to the broadly rounded posterior angles of the metathorax. Metathorax about 0.3 mm. wide, scarcely narrower than the abdomen. Mesonotum broad and large, finely transversely striate, its lateral angles obtuse; a dark-brown incurved spine at each lateral angle and a smaller spine on each side the meson at about the second third of the length of the notum. Metanotum shield shaped, longitudinally striate, except near the central anterior portion, which is transversely striate. Metanotum bears a pair of dark-brown spines on each side on anterior margin, of which the inner spine is much the larger, being about two-thirds as large as the spines at the posterior angle of the prothorax. Anterior wings sharp pointed, uniformly gray brown, the brown due to numerous very small dark-

brown spines in longitudinal rows. Width of fore wings at the middle about one-twelfth the length, considerably broadened at the base. Veins not visible. Spines dark brown, rather stout and conspicuous. Costa bearing 27 to 28 regularly placed, though somewhat closer on basal than on outer half. Fore vein on basal two-fifths bears seven to eight spines, and scattered beyond the center three other spines, of which the last one stands near the tip. The other two spines may stand close together near the second third of the wing, or the second one may stand equidistant from the first spine and from the spine at the tip. Hind vein bears 11 to 15 spines regularly placed; scale bears five spines and interior of scale one. Front fringe long and a little thicker than the spines. Hind fringe rather thick, long and wavy, light brown. Front fringe intermediate in color between the spines and the hind fringe. Hind wing gray, with a single median vein disappearing just before the tip; front fringe slender, sparse, light brown; hind fringe rather thick, long, wavy, and light brown. Legs uniform pale yellow, tips of the tibiae and the tarsi lightest; of medium length, stout. Fore femora considerably thickened. Fore and middle tibiae stout. All tarsi with dark-brown spot at tip within. Two stout pale-yellow spines at tips of hind tibiae within; a row of eight to ten much smaller spines on inner side of hind tibia. Spines at tips of other tibiae small and inconspicuous. All femora and tibiae clothed with numerous short, slender, pale-yellow spines.

Abdomen cylindrical ovate, blunt at apex; a heavy dark-brown stripe across dorsum of segments 2 to 8 near their anterior edges. Sides of abdomen faintly striate. Each segment 2 to 8 laterally bears three to four small dark brown spines. Ninth segment bears a circlet of 10 medium-sized spines. Tenth segment bears a circlet of six similar spines. Tenth segment split open above for a little more than half its length. In the lighter specimens abdomen is dark brown at the tip.

Described from two females on type slide.

Locality, Honolulu, Hawaii, February 6, 1909.

On cotton.

D. T. Fulloway, collector.

Type.—Cat. No. 15720, U.S.N.M.

EUTHRIPS FLORIDENSIS, new species.

Figs. 9-12.

Female.—Length about 1.1 mm. (specimens slightly distended), width about 0.3 mm. General color, head pale lemon yellow, thorax orange yellow, body medium brown to dark brown.

Head about three-fourths as long as broad and seven-eighths as long as prothorax, not withdrawn into prothorax; cheeks slightly arched behind the eyes and slightly roughened posteriorly, diverging

very slightly behind; anterior margin straight; back of head indistinctly transversely striated. Eyes large, dark, and sparsely pilose, occupying about three-fifths the width of the head, not protruding, rather coarsely faceted; ocelli present, separated, pale yellow, margined inwardly with orange crescents; spines in front of each posterior ocellus long and dark brown, two inconspicuous spines stand behind each posterior ocellus. One prominent dark brown spine behind each eye, slightly shorter than spine in front of ocellus; two or three shorter light brown spines between this spine and lateral margin of head. First and third segments of maxillary palpi of equal length, the second slightly shorter. Antennæ nearly two and one-half times as long as the head; relative lengths of segments as follows:

$\frac{1}{7.6}$	$\frac{2}{10.2}$	$\frac{3}{14.4}$	$\frac{4}{13.5}$	$\frac{5}{10.5}$	$\frac{6}{13.8}$	$\frac{7}{2.9}$	$\frac{8}{4.6}$
-----------------	------------------	------------------	------------------	------------------	------------------	-----------------	-----------------

Color: One pale yellow, concolorous with head; two brown like the abdomen; three light brown, grayish in basal half; four and five light brown, slightly gray at bases; six, seven, and eight light brown. Spines upon segments two to five brown and conspicuous. A branched sense cone on the dorsal side of segment three near the tip and a similar one on the ventral side of four near the tip. Sixth segment bears one long, slender sense cone on the inner side about the middle, and a shorter one on the outer side. Last three segments bear numerous small spines. The last segment bears three small hairs at the tip which about equal the segment in length. Mouth cone is tipped with black and reaches three-fourths across the prosternum.

Prothorax rather rounded, two-thirds as long as broad; one pair of stout spines at each hind angle, one of similar length at each anterior angle; anterior margin also bears a spine of similar length half-way between meson and spine at anterior angle; one short, stout anteriorly directed spine stands near spine at anterior angle. Between the spines at the anterior angles and the meson there is a row of five spines of which only the fourth is long and stout. Mesothorax rounded at anterior angles with a distinct shoulder-like process; mesonotal plate bears one stout spine at each lateral angle and two pairs of smaller ones on posterior margin. Metathorax tapers slightly posteriorly, angles rounded behind; metanotal plate weakly reticulate and bears four spines on the anterior margin of which the middle pair is stout and conspicuous. Wings nearly reaching the tip of the abdomen, breadth at middle about one-twelfth the length; shaded decidedly with brown, a grayish spot between veins near origin of hind vein, basal fifth grayish. Spines on wings dark brown, stout and conspicuous. Each fore wing has two longitudinal veins extending to the tip. Spines arranged at regular intervals; costa bears 22 to 25; fore vein 17 to 20; hind vein 13 to 16; scale five, interior of

scale 1. Fringe on costa of fore wing long, stout, brown, and conspicuous. Fringe rather sparse on costa of hind wing. Posterior fringes brown, long, thick, and wavy. Hind wing shaded slightly with gray. Legs medium in size and length, yellow with a slight tinge of brown, quite thickly set with short brown spines. A pair of stout dark brown spines at the extremity of each tibia within; row of spines on inner side of hind tibia short but stout.

Abdomen elongate, ovate in outline, broadening to the fifth segment, narrowing from the sixth to the tip, last segment cone-shaped; a heavy dark brown stripe across dorsum of segments two to eight near anterior margin, and just back of this stripe a narrow dark brown line extends across each segment. Each ventral plate two to seven bears six small spines, on posterior margin. Each pleural plate bears three or four brown posteriorly directed spines. Also each dorsal plate bears three or four spines laterally just above spines on pleural plates. Dorsum of first abdominal segment weakly striate. Posterior edge of ninth segment bears a circlet of 10 spines of which the dorsal six are long, brown, and prominent. Tenth segment at the tip bears a circlet of six long slender spines, of which the dorsal four are the longest. Tenth segment split open above.

Described from many females, no males found.

Locality, Quincy, Florida. May 17, 1910.

Taken on *Asclepias variegata* Linnæus and in blossoms of *Catalpa catalpa*.

Collectors, G. A. Runner and A. C. Morgan.

Type.—Cat. No. 15721, U.S.N.M.

EUTHRIPS RUNNERI, new species.

Figs. 13-16.

Female.—Length 1.05 mm. (1 to 1.1 mm.); width about 0.25 mm. General color pale brownish yellow, thorax heavily tinged with brown.

Head four-fifths as long as broad and about four-fifths as long as the prothorax and but slightly withdrawn therein; cheeks slightly arched behind the eyes, almost parallel; anterior margin slightly produced between the antennæ; back of head very faintly transversely striate. Eyes large, pale yellow by reflected light, almost black by transmitted light, very sparsely and minutely pilose, together occupying about three-fifths the width of the head; ocelli present, subapproximate, yellow with a slight orange tinge, margined inwardly with deep orange crescents; spines between ocelli on each side long, slender, brown and conspicuous; post-ocular spines shorter, brown. Mouth cone reaching only about two-thirds across prosternum, blunt, black at tip. Antennæ two and one-fourth times as long as the head; relative length of segments as follows:

1	2	3	4	5	6	7	8
5.5	9	11.25	10.25	9.5	12.75	3	4.25

Color: One pale yellow; two light brownish yellow; three, four and five brown in apical half, bases light brownish yellow; six, seven and eight brown, except base of six which is light brown. Spines conspicuous upon segments two to five.

Prothorax broadened posteriorly, hind angles broadly rounded; one pair of stout spines at each posterior angle, a spine of similar length at each anterior angle, also one short anteriorly directed spine near the long spine; between each posterior pair and median line stands a row of five spines of which only number four is conspicuous; midway between anterior angle and median line stands a spine nearly equal in size to the large spine at the anterior angle. Mesothorax rounded at anterior angles which bear a shoulderlike process; mesonotal plate with a small spine at each lateral angle and with two pairs of inconspicuous spines upon posterior margin. Metathorax broader behind than at juncture with mesothorax; metanotal plate bears two pairs of spines on anterior margin of which the median pair is much the larger. Sides of meso and metathorax tinged with brown. Wings not reaching beyond seventh abdominal segment; breadth at middle about one-eleventh the length; very light brownish yellow; veins in fore wing extend from base to tip; spines on veins at regular intervals, brown and conspicuous; costa bears 15 to 19; fore vein 13 to 16; hind vein 9 to 10; scale 5; interior of scale 1; fringe on costa of both wings slender and sparse; fringe on hind margin of both wings heavy, light yellow and wavy. Legs concolorous with body, moderately stout, clothed with numerous short brown spines; a pair of stout spines at the extremity of each tibia within; rows of spines on inner side of hind tibiæ rather weak.

Abdomen broadens gradually to the fifth segment and narrows gradually from the seventh segment to the tip; the usual thickening across the dorsum of segments two to eight reduced to a very thin inconspicuous line; three to four dark brown conspicuous spines stand on each side of segments two to eight; a row of six small spines stands near posterior edge of ventral segments two to seven; posterior edge of dorsum of eighth segment bears a series of scalelike projections 12 to 16 in number, each of which bears a tiny transparent hair directed caudad. Posterior edge of ninth segment bears a circlet of 10 spines, 8 of which are long, dark brown and conspicuous, the ventral pair being smaller and lighter in color. The tenth segment bears six long spines, the four dorsal being much stronger than the two ventral ones and also darker brown. Tenth segment conical.

Described from 4 females; no males found.

Locality, Clarksville, Tennessee, February 2, 1910.

G. A. Runner, collector.

Food plant, *Aster* sp.; specimens were collected from the roots of this plant, undoubtedly in hibernation.

Named in honor of the collector.

Type.—Cat. No. 15722, U.S.N.M.

Note.—This species is closely related to *Euthrips tritici* Fitch from which it may be separated by the difference in coloration of the thorax, the absence of black at the tip of the abdomen, the different relative lengths of the segments of the antennæ, and by the smaller number of spines upon costa and veins.

EUTHRIPS GOSSYPIL, new species.

Figs. 19–22.

Female.—Length 1.1 mm. (1 to 1.3 mm.). General color yellowish gray—some specimens almost white.

Head nearly three-fourths as long as broad and four-fifths as long as prothorax, slightly retracted therein; slightly broadening behind; anterior margin very nearly straight; back of head indistinctly transversely striate. Eyes of medium size, occupying a little more than half the width of the head, yellowish to transparent gray, facets of medium size, sparsely and minutely pilose; ocelli present, well separated, the posterior ones very close to inner margins of eyes, transparent whitish, as large as facets of eye, not margined with crescents inwardly, the anterior ocellus slightly directed forward. A long slender brown spine near each posterior ocellus in front and toward the meson. Postocular spines brown and very nearly as large as those in front of the ocelli. A row of small very light brown spines extends across the dorsum of head back of eyes. Mouth cone reaches nearly to posterior edge of prosternum, its sides straight, tinged with brown and with a very dark brown spot at the tip. First and third segments of maxillary palpi of equal length, the second shorter. Labial palpi slender, the first segment very short. Antennæ slightly more than twice as long as head. Relative lengths of segments as follows:

$$\frac{1}{6} \quad \frac{2}{10} \quad \frac{3}{12} \quad \frac{4}{11.5} \quad \frac{5}{9} \quad \frac{6}{12} \quad \frac{7}{2} \quad \frac{8}{3}$$

Color: One gray; two yellowish gray, lightest at the base; three to five brownish yellow; six to eight light brown. Spines upon segments two to five, slender, light brown, those on segment two stoutest. Branched sense cones on upper side of three near the tip and on the under side of four near the tip.

Prothorax rounded, only about three-fifths as long as wide; one pair of stout spines at each posterior angle, a similar spine at each anterior angle, midway between meson and spine on anterior angle stands a spine of similar length to those at the angles, between spines on posterior angles and meson on each side stands a row of five spines, only the second one from the meson being large and conspicuous. Mesothorax very bluntly rounded; mesonotal plate with one stout

spine at each lateral angle and two pairs of smaller spines on posterior margin. Mesothorax tapers very slightly posteriorly; metanotal plate bears four spines very close together on front margin, of which the inner pair is much the stouter—nearly as stout as those upon angles of prothorax. Wings reaching seventh abdominal segment; breadth at the middle about one-tenth the length; shaded very slightly with yellow; veins in fore wing extend to the tip; spines on veins at regular intervals; costa 23 to 30; fore vein 17 to 22; hind vein 13 to 16; scale 5; interior of scale 1; all spines are long, prominent, and brownish; a sparse slender fringe on costa of each wing; posterior fringes rather heavy and wavy. Legs pale yellow, of medium length, strong, the fore femora considerably thickened; legs clothed with numerous slender, light brownish spines; all tibiae armed with two rather stout spines at the tip within; hind tibiae with a row of five spines along inner margin near the tip. Hind tarsi bear three rather conspicuous spines; a dark brown spot at tip of each tarsus within.

Abdomen almost cylindrical to the eighth segment, thence tapering evenly to the rounded tip; a narrow brownish indistinct line across dorsum of segments two to seven; three to four fairly stout brownish spines stand out prominently on sides of segments two to eight; six slender brownish spines stand in a row along posterior margin of each ventral plate two to eight; tip of ninth segment bears a circlet of 10 spines, of which the dorsal four pairs are strong and prominent; tenth segment bears a circlet of six long slender spines near the tip, of which the dorsal four are the stouter and much the browner; other spines on ninth and tenth segments small and inconspicuous; tenth segment conical, split open above.

Described from four females; no males found.

Locality, Yuma, Arizona, June, 1910.

Food plant, cotton—collected from tips of the leaves.

Argyle McLachlan, collector.

Type.—Cat. No. 15723, U.S.N.M.

NOTE.—This species lies very close to *Euthrips helianthi* Moulton, from which it may be distinguished by the greater relative width of the head, the difference in coloration of the antennæ, the different number of spines upon the scale, by the greater relative width and length of prothorax, and by having the tenth abdominal segment split open above.

EUTHRIPS TRITICI, var. *BISPINOSUS*, new variety.

Figs. 17-18.

Female.—Length about 1.28 mm. Relative measurements of head and prothorax as in *Euthrips tritici*. General color pale yellow, shading to gray on sides of head and abdomen. Anterior wings pale

yellow, posterior wings gray. Tip of abdomen not darker than remainder of body.

Relative lengths of segments of antennæ:

$\frac{1}{6}$	$\frac{2}{9}$	$\frac{3}{14.2}$	$\frac{4}{12}$	$\frac{5}{9}$	$\frac{6}{13}$	$\frac{7}{2.5}$	$\frac{8}{3}$
---------------	---------------	------------------	----------------	---------------	----------------	-----------------	---------------

Color of antennæ: Segment one gray; two brown, gray at extreme base; three very light brown on basal fourth, apical third brown, lighter at tip, middle of segment gray; four dark brown except at extreme base, which is lighter brown; five light brown, shaded darker at extreme tip and on sides; six to eight dark brown. Segments three and four relatively much more slender than in *Euthrips tritici*. Tip of second segment raised dorsally and bearing two exceptionally heavy dark brown spines. Spines on wing veins as in *Euthrips tritici*.

Described from four females, no males found.

Locality, Dade City, Florida, May 12, 1910.

Collected from blooms of Yucca.

A. C. Morgan, collector.

Type.—Cat. No. 15724, U.S.N.M.

EUTHRIPS FUSCUS Hinds.

On a slide in the collection of the United States Department of Agriculture were found five females and one male of this species. The data on the slide is as follows: "Thrips on timothy, from J. H. Comstock, July 6, /73." Since the male of this species has never been noted, a brief description and comparison with the female is here given.

Male.—Newly discovered. Length 0.75 mm. Antennæ shaded as in Hinds's description, though lighter throughout. Apterous. Color of body light yellowish brown. (The color of the abdomens of the females on the slide is deep brown.) Comparative measurements of the antennæ both of the females and the male on the Comstock slide are as follows:

Male.....	$\frac{1}{5}$	$\frac{2}{8}$	$\frac{3}{10}$	$\frac{4}{9}$	$\frac{5}{8}$	$\frac{6}{11}$	$\frac{7}{2.5}$	$\frac{8}{3}$
Female...	$\frac{1}{6}$	$\frac{2}{9}$	$\frac{3}{12}$	$\frac{4}{12}$	$\frac{5}{10}$	$\frac{6}{14}$	$\frac{7}{3}$	$\frac{8}{4}$

The ninth segment of abdomen apically bears a circlet of eight conspicuous spines. Of these the four that are borne ventrally are the smallest and lightest in color, and do not quite reach the tip of the tenth segment. Dorsally near each lateral margin stands a very long, strong, dark-brown spine, which is about twice the length of the ventral spines. The two remaining spines stand one on each side midway between the meson and the spines near the lateral margin,

and are very nearly as long as the lateral spines. This segment also bears two other very strong, dark-brown spines, one on each lateral margin about midway between the base and tip of the segment. This segment also bears a few smaller spines, one of which stands on each side the meson dorsally, in the apical row. The tenth segment bears four long, strong, brown spines, two on each side near the lateral margin, about two-thirds the distance from the base of the segment to the tip. Of these spines the two more dorso-cephalad are much the stouter and are strongly in-curved. Tenth segment large, lateral margins convex; tip is broadly rounded. A few small, almost transparent spines are borne on the segment.

ANAPHOTHRIPS ARIZONENSIS, new species.

Figs. 23-26.

Female.—Length 0.96 mm. (0.89 mm. — 1), width of mesothorax at front angles 0.2 (0.18 mm. — 0.22). General color very light yellow, almost white, with brownish shadings on head and prothorax, meso- and metathorax heavily tinged with orange.

Head about one-half wider than long, slightly rounded in front, diverging behind; cheeks roughened; dorsum faintly transversely striate back of eyes; very light yellow with a slight brownish tinge; no spines visible. Eyes of medium size, rather coarsely faceted; black by transmitted light, orange by reflected light; ocelli subapproximate, situated upon the sides of a slight hump, yellow, margined inwardly with brownish yellow crescents. Mouth cone reaching only slightly past the middle of the prothorax, somewhat narrowed at the middle, tipped with black; first and third segments of maxillary palpi of equal length, the second half as long as the first, third segment tipped with three hairs; first segment of labial palpi very short, the second long and slender. Antennæ subapproximate at the base, clearly only eight segmented; relative lengths of segments as follows (from the average measurements of eight antennæ):

$\frac{1}{4.4}$	$\frac{2}{7.6}$	$\frac{3}{9.7}$	$\frac{4}{8.6}$	$\frac{5}{8}$	$\frac{6}{9.5}$	$\frac{7}{1.7}$	$\frac{8}{2}$
-----------------	-----------------	-----------------	-----------------	---------------	-----------------	-----------------	---------------

Segment one rounded at the base; two nearly barrel-shaped, narrowed at the base; three to five stalked, three and five very noticeably, four weakly; three and five broaden to near the tips which are constricted; four nearly barrel-shaped; six fusiform. One is pale, almost white; two very light brownish yellow; three gray in basal half shading to yellow at tip; four brownish yellow except extreme base which is somewhat paler; five to eight light brown, six the darkest. Spines few, minute, pale and inconspicuous. A simple sense cone on outer margin of three near tip; a branched cone on

underside of four near tip; a short cone on outer margin of five near tip and a longer cone on inner margin of six near the tip.

Prothorax about one and one-half times as long as the head, and about one-half wider than long, sides and angles rounded; transversely striate; spines numerous and minute dorsally. Mesothorax considerably wider than prothorax, its front angles rounded and bearing a shoulder-like process. Mesoscutum faintly reticulate. Metathorax smoothly joined to mesothorax and tapering gradually to base of abdomen. Metascutum plainly reticulate. No spines visible on meso- or metathorax. Meso- and metathorax heavily tinged with orange. Wings well developed, reaching about to the ninth abdominal segment; at the middle about one-eleventh as broad as long; the fore longitudinal vein fades out near the tip of the wing, the hind vein fades out at the last fifth of the wing. Front fringe sparse but long, brownish; hind fringe on both wings rather sparse, long and straight, brownish. Spines upon costa and veins short, indistinct and nearly transparent upon most specimens, one specimen, however, has short, stout, dark brown spines. Costa bears about 22 spines, fore vein 15, hind vein 9. Tip of fore wing bears a stout dark brown spine which is about three times as long as other spines on wing; scale bears 5 spines. Two cross veins present, one extending obliquely from fore to hind vein, joining the hind vein just beyond the second spine, second cross vein is between fore vein and costa at about the middle of the wing. The second cross vein is lacking in some specimens. The single median vein of the hind wing reaches nearly to the tip. Fore wing is light yellowish, hind wing gray—nearly white—except for median brownish tinge. Legs concolorous with body, strong spines only at inner tip of hind tibiae. Other spines on hind tibiae weak. A dark spot at the tips of all tarsi within.

Abdomen rather stout, broadening to the fifth segment, thence narrowing to the tip, segments 7 to 10 sharply conical. First segment weakly reticulated upon the dorsum, 2 to 7 weakly transversely striate. Each dorsal plate 2 to 8 bears four spines, on plates 2 to 4 the median pair stands close together near anterior of segment and the lateral pair are only slightly removed from the margin; on segments 5 to 8 median spines diverge and the lateral spines are successively farther from the anterior edge until on the eighth segment they stand near the middle of the segment. Tip of ninth segment dorsally bears a transverse row of six spines of medium size and brownish in color, of these the median pair is the shortest and the second pair the longest. Tip of tenth segment dorsally bears four minute slender spines. Each pleural plate, segments 2 to 8 bears two short, stout, brownish spines directed caudally. Abdomen

very light yellow by transmitted light, nearly white by reflected light. Receptaculum seminis conspicuous, brownish red.

Described from 10 females.

Male unknown.

Locality, Yuma, Arizona, July 6, 1910.

Food plant, Snake weed.

Collector, Argyle McLachlan.

Type.—Cat. No. 15725, U.S.N.M.

ECHINOTHRIPS AMERICANUS, new species.

Figs. 31-32.

Female.—Length of distended specimens 1.3 mm. The normal length is very probably not more than 1 mm. General color light brown to dark brown with considerable red hypodermal pigmentation.

Head—Length 0.12 mm., width 0.16, almost rectangular, converging slightly toward prothorax; cheeks very slightly arched; slightly retracted within prothorax; front of head obtusely triangular. Eyes large, not protruding, pilose, occupying almost three-fifths the width of the head, black by transmitted light, yellow by reflected light, rather coarsely faceted. Ocelli large, subapproximate, the posterior ones situated back of center of eyes; orange yellow margined inwardly with dark red crescents. The anterior ocellus is situated in a depression in the front. A small spine stands in front of each posterior ocellus, and a row of four small spines extend in an arc in front of the anterior ocellus. Head transversely areolate behind the eyes. Mouth cone broad at the base, short, reaching only a little more than half-way across the prosternum, its sides straight. Maxillary palpi light gray, two segmented, of medium length, the first segment very much shorter than the second; second segment bears a slender hair at the tip. Labial palpi minute. Antennæ eight segmented, slender, about two and one-half times as long as the head. Relative lengths of segments as follows, taken from measurements from an average of five antennæ:

1	2	3	4	5	6	7	8
5.9	10	14.5	11.7	13.1	17.4	5	7.7

First two segments of antennæ stout; the first nearly cylindrical, one and one-third times as broad as long; the second barrel-shaped, four-fifths as long as broad; third segment distinctly stalked, the fourth and fifth very slightly so. All segments beyond the second slender. Color: First two segments concolorous with the head; three, four, and basal half of five gray; three and four sometimes with a yellowish brown tinge apically; remainder of antennæ light brown. Antennal segments with conspicuous spines on segments two to five, those on two and three being noticeably blunt. The eighth

segment at the tip bears a long hair which is slightly longer than the segment. A short, blunt, transparent sense cone is borne on the outside near the tip of segments three, five, and six.

Prothorax about 0.12 mm. in length and 0.21 in width, broadest across the middle, straight on the anterior margin, slightly convex on the posterior margin, hind angles bluntly rounded, yellowish brown tinged with red hypodermal pigmentation. Each hind angle bears a slender blunt spine, and a spine of similar size stands about two-fifths the distance from the spine at the angle to the meson. A smaller spine stands near the latter spine. Other spines on the prothorax small and inconspicuous. Surface of prothorax reticulated. Mesothorax about 0.28 mm. wide, its front angles broadly rounded, each bearing a shoulder-like process. Mesonotal plate broad and long bearing a transverse row of four spines half-way between front margin and lateral angles.

Mesonotal plate transversely areolate. Metanotal plate with a spine on each side the meson near the front margin, reticulated. Metanotal plate and sides of meso- and metathorax brown and without red hypodermal pigmentation. Sides of meso- and metathorax reticulate and areolate. Wings long and slender, attaining the tip of the abdomen, broadened at the base, at the middle only about one-eighteenth as broad as long, margins nearly straight except at the tip, basal fifth gray, and sometimes a broad band across middle of wings grayish, tip of wings gray usually, remainder of wings brown, darkest toward the base. Veins inconspicuous, the two longitudinal veins anastomose at first seventh of the wing and soon fade out. All spines on wings long, stout, and knobbed. Costa bears 15 to 19; fore vein 13 to 14; scale 2 interior of scale 1. Fringe present on both margins of both wings; the basal fifth on front margin and a shorter distance at the base of hind margin being without fringe. Fringe long and slender, that on both margins of fore wing being wavy, while only the posterior fringe of the hind wing is wavy. Hind wing with a very dark brown median longitudinal vein. Legs rather long and slender, tibiae unarmed except for a rather weak pair of spines at the tip of the hind tibia within. All femora brown except bases of middle femora and sometimes the bases of fore femora which are gray. Basal half of middle and hind tibiae and basal fourth of fore tibiae light yellowish, as are also the tarsi. A black spot at the tip of the tarsi within. Legs clothed with a few small spines.

Abdomen broadening to the fourth segment which is about 0.3 mm. wide, thence tapering gradually to the tenth segment, which is cylindrical. Sides of abdomen reticulate. Across the middle of the dorsum of each segment two to eight stands a row of 8 to 10 small

spines, those at the meson being nearest the anterior margin; these spines increase in size upon each succeeding segment caudally. The ninth segment bears two rows of spines, one transverse row of six long spines across the center of the dorsum; the second row at the tip of the segment consist of six long spines. Midway between these two rows on each side stands two spines similar in size to those composing the rows. Tip of tenth segment bears six long slender spines, and the pseudo or eleventh segment bears two small spines. All abdominal spines are sharp pointed and are much lighter in color than the abdomen.

Male.—Similar to the female, except smaller and more slender and lighter in color. The abdomen narrower and more nearly cylindrical. Segments two to eight of the abdomen ventrally are thickly peppered with small circular transparent spots. The ninth segment is only slightly narrowed caudally. The tenth segment is cylindrical and about half retracted within the ninth. Relative lengths of segments of antennæ taken from measurements upon the same scale as with the female:

$\frac{1}{5}$	$\frac{2}{8.5}$	$\frac{3}{12.5}$	$\frac{4}{9.7}$	$\frac{5}{11.5}$	$\frac{6}{14.7}$	$\frac{7}{3.9}$	$\frac{8}{6}$
---------------	-----------------	------------------	-----------------	------------------	------------------	-----------------	---------------

Described from many females. Type slide contains three females collected from Indian Poke, Quincy, Florida, May 18, 1910, by G. A. Runner and A. C. Morgan. Other specimens of females collected from *Magnolia grandiflorum*, Quincy, Florida, September 8 and 9, 1909, by A. C. Morgan, and from "Coffee bean" September 7, 1909, Quincy, Florida, by the writer.

Two males from "Touch-me-not," Clarksville, Tennessee, August 11, 1910, by S. E. Crumb. One of these is designated as the Allotype. One male in sweepings from grass Wittenberg, Missouri, July 12, 1909, by A. G. Vestal. This paratype is in the collection of Mr. J. D. Hood, from whom it was received for comparison.

One slide in the collection of the United States Department of Agriculture contains about 20 females, one male, and several larvæ. These were collected in the District of Columbia, August 14, 1900, from Adicea. Department note No. 9305.

This species may be distinguished from its congener *E. mexicanus* Moulton, by the following differences: Basal fifth of wing gray and a grayish band across the middle; the greater number of spines on the costa and the fore vein; and by the greater relative difference in the lengths of the first and second antennal segments. In *mexicanus* the second segment is more than three times as long as the first, while in *americanus* the second segment is only about twice as long as the first.

Type.—Cat. No. 15726, U.S.N.M.

RHIPIPHOROTHRIPS new genus.

Body, especially the head and prothorax, deeply sculptured. Head broader than long, uneven, somewhat narrowed behind, broadly rounded in front and with a hump between the eyes. Eyes prominent, slightly protruding. Ocelli present. Antennæ eight-segmented; second segment of the style much longer than the first and provided with a long slender hair at the tip; third and fourth segments each with a simple sense cone. Maxillary palpi two-segmented. Prothorax shorter than the head, without spines at the angles. Legs unarmed. Wings present; fore wings sculptured at the base, narrow, with two longitudinal veins which are very indistinct. Spines on veins very minute. Costa without fringe or spines. Anal spines weak. Mesothorax produced into prominent acute angles in front. Male with a curious fan-shaped scale on each lateral margin of the ninth segment, near the tip.

This genus is very near *Heliothrips*, but differs from it in being sculptured instead of reticulated, and in the fan-shaped scale on the ninth abdominal segment of the male.

Type of the genus.—*Rhipiphorothrips pulchellus*, new species.

RHIPIPHOROTHRIPS PULCHELLUS, new species.

Figs. 33-37.

Male.—Length 1.27 mm.; width of mesothorax 0.3 mm., greatest body width a little less than width of mesothorax. General color yellow, with heavy tinge of dark brown on head and thorax.

Head dorsally only about three-fifths as long as wide, ventrally about four-fifths as long as wide; deeply and coarsely sculptured; broadly rounded in front of eyes; a hump between the eyes which bears the ocelli; cheeks very rough, produced laterally behind the eyes; outline of the eyes more convex than outline of head at that point, so that there is a distinct notch both before and behind the eyes. Eyes prominent, slightly protruding, rather coarsely faceted, not pilose, black by transmitted light, yellowish-brown by reflected light. Back of head slightly narrowed. Ocelli about as large as facets of eyes and situated upon sides of hump between the eyes; approximate, pale yellow, the anterior ocellus being directed forward; inner crescents indistinct yellowish orange. Mouth cone not quite reaching across prosternum, black at the tip; labrum rather sharply pointed; labium rounded at tip; maxillary palpi short, the first segment shorter than the second; labial palpi short and blunt. Antennæ situated very low, just above ventral margin of the head, well separated, each in a depression next the eye and below the produced front; relative lengths of segments as follows:

1	2	3	4	5	6	7	8
9.5	12	18.7	15.5	12.5	11	2.8	15.3

Segment one barrel-shaped, longer than broad; two somewhat barrel-shaped, more constricted at base than at the tip; three and four fusiform; five clavate; six and seven similar in form to five only inverted; eight long and slender, tipped with a short hair. Segments one and two with a heavy yellow tinge medianly, the sides light gray; three and four gray, almost white; five and six with a broad median tinge of yellow; seven and eight light brownish gray. Segment two roughened. Segment three bears a long simple transparent sense cone on the outer margin near the tip, and segment four bears a similar cone similarly placed. Head without spines.

Prothorax shorter than the head, about two-thirds as long as broad, front angles rounded, broadest behind, posterior angles broadly rounded, posterior margin convex; coarsely sculptured, but not so deeply so as the head; spines few and minute; not so dark as the head and mesothorax, with an orange tinge in some specimens; constricted at articulation with mesothorax. Mesothorax broadest of all segments, about 0.3 mm. broad (one and one-half times as broad as the head and about one-eleventh broader than the abdomen), its anterior margin concave, its anterior angles acute and slightly overlapping the hind angles of the prothorax; mesothorax joined by about two-thirds its width to prothorax. Mesonotal plate concave on anterior margin, convex behind except a slight concavity at its juncture with metanotal plate; lateral angles acute; mesonotal plate bears a few small spines of which only the transparent insertions are visible; deeply sculptured. Metanotal plate triangular, with the base somewhat convex, the sides straight and meeting in an acute angle behind, deeply sculptured. Mesothorax broadest behind, the sides broadly rounded and roughened. Metathorax with sides convex and roughened, narrowing behind. Meso- and metanotal plates, and sides of both meso- and metathorax tinged with brown; remainder of meso- and metathorax yellow. Fore wings slightly broadened at the base, slender and long, reaching to the ninth abdominal segment; slightly sculptured at the base; the veins are indistinct and fade out at the middle of the wing; no spines or fringe upon the costa; spines on the veins few and minute, only the transparent insertions being visible. Hind wing with a single median vein. Fore wing at the extreme base brown, the brown area including nearly all of the scale, in some specimens all; remainder of wing gray with yellow longitudinal tinge on posterior margin. Hind wing gray with slight shading of yellow. Hind fringe on both wings of medium thickness, long, slender, brown, and for the most part straight, there being only an occasional wavy hair. Legs short, stout, roughened, unarmed, light yellow to lemon yellow; tarsi lighter with black spot at tip within.

Abdomen joined broadly to the thorax, broadening gradually to the fourth segment, thence tapering gradually to the tip, which is

rounded; greatest width only one and one-half times that of the head. Sides of abdomen noticeably sculptured. Each dorsal plate two to eight bears two pairs of spines placed in the form of a trapezoid, the anterior pair standing about the middle of the segment and quite near the median line. Spines on ninth segment short, comparatively stout though indistinct; the sides of the ninth segment almost inclose the tenth segment. Ninth segment long. Tenth segment short and almost retracted within the ninth segment. A curious fan-like ribbed scale or clasper on each lateral margin of the ninth segment near the tip.

Locality, Philippine Islands, 1910.

Collected by George Compere.

Food plant, Banyan tree.

Described from 3 males.

Female.—Similar to male in shape and coloration, length 1.4 mm.; the body does not narrow posteriorly as evenly as in the male, gradually narrowing from fourth to eighth segments, thence more rapidly to the tip; tenth segment cone-shaped, rounded at the tip; ovipositor not quite reaching the tip.

Described from 2 females.

Collected with the males.

Type.—Cat. No. 15727, U.S.N.M.

MICROTHRIPS, new genus.

Ocelli present. Antennæ seven-segmented (style one-segmented), seventh segment as long as or longer than the sixth. Eyes protruding. Maxillary palpi two-segmented. Head wider than long. Prothorax wider than long and as long as or slightly longer than the head; two spines upon the hind angles. Fore tibiae unarmed. Wings present, long, narrow, only slightly broadened at the base, pointed at the tip. Costal fringe of fore wings sparse but well developed. Hind fringe well developed and long. Costa and veins with spines. Fore wing with two veins which anastomose near base of the wing, thence running near the costa to the tip. Hind wing with a single median vein. Fore wings without bands.

This genus is very near *Baliothrips* Haliday, but differs in not having the wings banded, and in having the two veins of the fore wing joined together from near the base to the tip.

Type of the genus.—*Microthrips piercei*, new species.

MICROTHRIPS PIERCEI, new species.

Figs. 27-30.

Female.—Length 0.62 mm. (0.56 to 0.73 mm.). General color pale brownish yellow. The brownish tinge is quite pronounced in some specimens; legs transparent white.

Head five-ninths as long as broad; somewhat retracted within the prothorax; front produced between the antennæ; narrowed behind, broadest through the eyes; no hairs or spines visible upon the head; cheeks convex, eyes strongly protruding, coarsely granulated and together three-fifths the width of the head; ocelli approximate, not contiguous with inner margins of eyes, the posterior ones on a line with the hind margins of the eyes, the anterior one on line with the center of the eyes, yellowish by reflected light, black by transmitted light, margined inwardly with bright red crescents; maxillary palpi two segmented, transparent white, the first segment slightly longer than the second; labial palpi minute. Antennæ seven segmented, the relative lengths of the segments as follows:

1	2	3	4	5	6	7
$\frac{1}{3.25}$	$\frac{2}{6.25}$	$\frac{3}{7.3}$	$\frac{4}{6.2}$	$\frac{5}{6.3}$	$\frac{6}{6.3}$	$\frac{7}{6.9}$

Segment one short and cylindrical; two much the largest, globular viewed from above, cone shaped viewed from the side; three to five pedunculate—three and four conspicuously so, five slightly so—three ovoid; four and five barrel shaped; six nearly cylindrical with base and tip slightly narrowed; seven slender and the blunt apex bearing three short, slender, transparent hairs. The seventh segment bears four other hairs, one near the base, two at the middle, and one near the tip.

The other segments, except the first, bear a few minute colorless hairs which increase in length upon each succeeding segment. Color generally very light yellow—in some specimens almost white—except segment six which has a slight tinge of brown near the tip, and seven, which is very light brown with a tinge of yellow.

Prothorax trapezoidal, broadest behind, in front broader than the head and as long as or slightly longer than the head, width at hind angles nearly twice the length. Front angles noticeably rounded, high angles only slightly so. Pronotum behind very weakly cross striated. No spines upon pronotum except a pair of slender white ones upon each posterior angle. Prothorax somewhat constricted at its juncture with the mesothorax. Mesothorax about two-fifths wider than prothorax, widest in the middle, narrower than prothorax at juncture with prothorax but widening rapidly to the middle, slightly converging behind; a shoulderlike projection at each front angle. Metathorax narrower than mesothorax but about one-fourth wider than the prothorax, its sides nearly parallel. No spines on either the mesonotum or the metanotum. Wings very slender, reaching to end of the abdomen, broadest in first third, at the middle about one-twentieth as broad as long; nearly transparent whitish, costal fringe of fore wings composed of a few long, slender, colorless bristles intermixed with shorter almost colorless spines. Costa bears 20 to 22

spines. Fore vein runs very close to costa to tip of wing, hind vein nearer costal than anal margin of wing, and joins fore vein at end of first fifth of length of wing, thence running to tip of wing. Hind vein with one or two spines; the anastomosed veins bear three or four minute almost colorless spines; one spine on hind vein very near juncture of veins, one spine upon the anastomosed veins always near the tip of the wing. Hairs composing posterior fringes of both wings long, slender, straight and light colored. Legs lighter colored than body, quite long and slender; tarsi apparently only one-segmented; fore and middle tibiæ unarmed; each hind tibia bears two slender colorless spines at its inner extremity; other spines upon hind tibia few, and minute.

Abdomen scarcely wider than prothorax, almost cylindrical, widest at fifth segment, thence tapering very gradually to the ninth segment; ninth segment considerably narrowed behind; tenth segment longer than wide, widest at base, sides convex, tip broadly rounded. Tip of tenth segment dorsally bears four slender, colorless spines, and midway of segment on each side stands a spine similar to the apical ones. Ninth segment bears dorsally four slender colorless spines at the apex and two similar spines on the lateral margins apically.

Described from numerous females taken at Dallas, Texas, September 26, 1910, by W. D. Pierce, after whom the species is named. No males found.

Food plants, cotton, Dallas, Texas, September 26, and November 4, 1910; and *Vernonia*, Dallas, Texas, November 4, 1910, W. D. Pierce; *Papaw*, Clarksville, Tennessee, May 13, 1910, A. C. Morgan.

Type.—Cat. No. 15728, U.S.N.M.

THRIPS QUINCIENSIS, new species.

Figs. 38-41.

Female.—Length 1.1 mm. to 1.2 mm.; width about one-fourth the length. Color almost white with a slight tinge of yellow. Yellow tinge is pronounced on thorax and last two abdominal segments.

Head one and one-half times as wide as long; cheeks arched somewhat behind the eyes; front slightly produced between the antennæ; occiput indistinctly transversely striated; hairs upon head few, minute and almost transparent whitish; eyes not protruding, sparsely pilose, ocelli subapproximate, standing well back toward hind margins of eyes, posterior ones not contiguous with margins of eyes; color light yellow, margined inwardly with dark red crescents. Maxillary palpi three segmented. Antennæ seven segmented, relative lengths of segments as follows:

$$\frac{1}{5} \quad \frac{2}{8} \quad \frac{3}{10} \quad \frac{4}{9} \quad \frac{5}{8.5} \quad \frac{6}{12} \quad \frac{7}{6}$$

Segment one cylindrical; two barrel shaped; three to five pedunculate elongated ovoid; five joined by a moderately broad surface to base of six, which tapers somewhat from its middle to its apical end; seven tapering slightly, blunt at apex. Segments one, two, three, and four pale yellow, five light yellow with a tinge of brown which is more pronounced at apex; six and seven light brown.

Prothorax about one and one-half times as long as the head; one-fourth wider than long. Angles not distinct, broadly rounded. Each hind angle bears two slender, light yellowish spines of medium length, and between these pairs along the hind edge of the pronotum stands a row of three smaller spines on each side. Mesothorax one-third wider than prothorax. Wings at the middle about one-twelfth as broad as long; wings light gray, spines almost colorless, with a very slight tinge of yellow; costal fringe of fore wings composed of rather long bristles intermixed with a row of shorter, slender spines. Costa bears about 22 spines; fore vein bears 9 to 10 spines arranged as follows: A basal group of three or four spines, a group of three terminating at about two-fifths the length of the wing (these two groups are so close together that they might be considered as a single group), beyond the second group are three spines, the first stands beyond the center of the wing, the second at about two-thirds the distance between the first and the third, the latter being near the tip of the vein. Hind vein bears 9 to 11 spines. Spines upon wings quite long and slender. Origin of hind vein indistinct, near the second group of three spines upon the fore vein. Hairs composing hind fringe upon both wings long, slender, wavy, and light colored. Legs concolorous with body, rather slender; second segment of tarsus much longer than the first; spines upon inner side of hind tibia weak, except the almost colorless pair at its inner extremity.

Abdomen slightly wider than mesothorax, nearly three times as long as wide; posterior edge of ninth abdominal segment bears a circlet of twelve spines, all long and slender except the second spine on each side of the dorso-median line, which is short and indistinct; the dorsum of this segment bears two other spines of medium length, each standing near the middle of the segment cephalad of the third spine in the apical circlet. Tenth segment bears six long slender spines and a number of smaller ones. Tenth segment broad at base, cone shaped and rounded at the tip. Spines upon sides of abdomen short and slender.

Described from four specimens.

Locality, Quincy, Florida.

Food plant, *Pinckneya pubens* Michaux.

Collected by the writer and G. A. Runner.

No males found.

Type.—Cat. No. 15729, U.S.N.M.

THRIPS HELIANTHI, new species.

Figs. 44; 47-49.

Female.—Length, 1.05 mm. (1.07 to 1.02); width, about one-fourth the length. Color: thorax, yellowish brown, rest of body dark brown varying to light brown in some specimens.

Head one and one-half times as wide as long; cheeks slightly arched behind the eyes; front produced between the antennæ; occiput very distinctly cross striated; a small spine in front and a similar one behind each posterior ocellus, a row of six small spines extending in a curved line from the spine behind the posterior ocellus behind the compound eye to the lateral margin of the head; eyes not protruding, coarsely granulated, black by reflected light, dark purplish by transmitted light, sparsely pilose; ocelli well separated, the posterior ones cephalad of the hind margins of the eyes, not contiguous with the borders of the eyes, larger than the facets of the eye, color light yellow, margined inwardly with dark reddish crescents; maxillary palpi three-segmented; first and third segments of equal length, the second shorter. Mouth cone reaching nearly to hind edge of prosternum. Antennæ seven-segmented, two and one-half times as long as the head; relative lengths of the segments as follows:

$\frac{1}{6}$	$\frac{2}{9.1}$	$\frac{3}{12}$	$\frac{4}{11.6}$	$\frac{5}{10}$	$\frac{6}{14.4}$	$\frac{7}{5.4}$
---------------	-----------------	----------------	------------------	----------------	------------------	-----------------

Segment one cylindrical; two barrel-shaped; three to five pedunculate—three and four strongly, five weakly so—elongate ovoid; five joined by a moderately broad surface to base of six which tapers considerably from its middle to the apical end; seven tapers somewhat, blunt at the apex. Segments one, two, six, and seven dark brown; three and four pale brown; five dark brown, except the base which is somewhat lighter. Spines upon antennæ conspicuous, particularly so upon segment two. All spines brown, but shading from dark brown upon basal segments to light brown upon apical segments. Segments three and four each bear a branched sense cone near the tip, on upper side of three and on under side of four.

Prothorax rectangular, as long as the head and about three-fifths as long as wide; posterior portion of pronotum distinctly transversely striated; pronotum clothed with a number of small spines; each hind angle bears a pair of stout conspicuous spines; between these pairs along the hind margin of the pronotum stands a row of three smaller spines on each side, the inner spine being the strongest. A row of three spines on each side parallels the row upon the hind margin, the outer spine of which is cephalad of the two spines upon the hind angle, the inner cephalad of the last spine in the marginal row. Three short spines stand upon the front angles of the prothorax. Mesoscutum distinctly and finely transversely striated, bearing a

small dark spine at each lateral angle and a similar spine on each side equidistant from the meson and the hind margin. Metathorax about one-third wider than the prothorax; metanotal plate indistinctly longitudinally striate, bearing a row of four small spines upon front margin of which the inner two are the larger. Wings reach nearly to the tip of the abdomen, at the middle about one-fourteenth as broad as long, light brown, except basal fifth and apical fourth, which are light gray. Spines upon basal fifth almost colorless, remainder of spines dark brown. Costal fringe of fore wings composed of slender bristles intermixed with a row of shorter spines. Costa bears 21 to 23 spines; fore vein 9 to 10 placed as follows: A group of three or four in transparent basal fifth, a group of three in second fourth, beyond center of wing are two to four spines; if four, they stand equidistant from second group of spines and from each other; if three, the first stands alone near the center of the wing, the other two near the tip; if only two spines are present, they stand near the tip; hind vein bears 14 to 20 spines regularly placed. Origin of the hind vein indistinct, near middle of the second group of spines on the fore vein. Hairs composing hind fringe long, wavy, and dark colored. Legs rather slender; fore femora very slightly thickened; all femora dark brown; basal third of fore tibiae, basal half of middle tibiae and basal two-thirds of hind tibiae brown; remainder of tibiae and all tarsi yellowish brown. Second segment of tarsi much longer than the first; spines on inner side of hind tibiae medium in size, light colored. All femora and tibiae clothed with fine hairs. All femora striate.

Abdomen as wide as mesothorax, about two and one-half times as long as wide; each dorsal plate of segments two to eight marked near its anterior edge with a narrow transverse line of black which disappears about the middle of the pleural plates. Normally the segments of the abdomen overlap a little. Posterior edge of ninth segment bears a circlet of ten spines, the dorsal three pairs being long, rather dark brown, and conspicuous. Two smaller spines are found upon the dorsum of this segment about midway between front and hind margin, on each side somewhat nearer the lateral margin than the meson. Tenth segment bears a circlet of six spines at the tip, the four upon the dorsum being rather stout and conspicuous. Tenth segment split open above. Dorsum of first abdominal segment cross striate. Sides of abdomen striate. Posterior margin of each ventral segment two to seven bears a row of four small spines directed caudad. On each pleural plate of segments two to eight are 4 to 5 spines directed caudad, and increasing in strength caudally.

Described from nine specimens.

Food plant, *Helianthus* sp.

Locality, Clarksville, Tennessee.

Collected August 1, 1910, by the writer and S. E. Crumb.

Life history unknown, except that the specimens were feeding upon the under sides of the leaves of the host plant.

Type.—Cat. No. 15730, U.S.N.M.

THRIPS SPINOSUS, new species.

Figs. 42-43; 45-46.

Female.—Length 1.26 mm. (1.16 mm. to 1.35 mm.). (Specimens somewhat distended.) Width about one-fourth the length. Color quite uniformly light brown, with a tinge of yellow, except the ninth abdominal segment which shades to dark brown at the tip, and the tenth which is dark brown.

Head one-third wider than long, widest behind; cheeks slightly arched behind the eyes; occiput distinctly transversely striated; front slightly produced between the eyes; a prominent spine in front of each posterior ocellus, a smaller spine behind each posterior ocellus and two similar spines behind each eye distinctly noticeable, other spines upon head small and inconspicuous; eyes not protruding, rather coarsely granulated, dark purplish by reflected light, black by transmitted light, pilose; ocelli subapproximate, the posterior ones standing back of the center of the eyes, and not contiguous with their margins; color light yellow margined inwardly with dark red crescents. Mouth cone distinctly narrowed in the middle, slender, reaching three-fourths across prothorax; maxillary palpi slender, three segmented, the first segment slightly longer than either of the other two which are about of equal length. Antennæ seven segmented; relative lengths of segments as follows:

$\frac{1}{8}$	$\frac{2}{11}$	$\frac{3}{16.5}$	$\frac{4}{17}$	$\frac{5}{12.7}$	$\frac{6}{15.5}$	$\frac{7}{6}$
---------------	----------------	------------------	----------------	------------------	------------------	---------------

Segment one short, semiglobose; two cup shaped; three and four pedunculate elongated ovoid; five slightly pedunculate elongate, joined by a moderately broad surface to base of six, which tapers from its middle to its apical end; seven tapering, slightly rounded at apex. Segment three bears a transparent branched sense cone on the upper surface near the tip, and segment four bears a similar cone upon the under surface near the tip. Spines upon antennal segments two to five rather slender but distinct. Spines upon other segments rather minute. Segment one light yellowish brown; two light brown; three light yellowish brown, the brown tinge more pronounced toward the apex; four with peduncle almost transparent whitish, remainder light yellowish darkening toward the apex; five, six, and seven light brown except base of five, yellowish brown.

Prothorax rectangular, angles more rounded behind than in front, as long as head and one-half wider than long; pronotum indistinctly

transversely striated and sparsely clothed with small spines; each hind angle bears a pair of stout dark conspicuous spines, and between these pairs, along hind edge of pronotum, stands a row of three smaller spines on each side (on one specimen this row is composed of four spines). Front angle of prothorax bears a group of three or four short spines directed cephalad. Metathorax about one-third wider than prothorax; meso- and metathorax striated; metanotal plate bears a few small spines. Wings at middle about one-fifteenth as broad as long, very light brown. Costal fringe well developed, composed of light brown hairs, which are more than twice as long as the rather long dark brown spines with which they are intermixed. Costa bears 26 to 31 spines regularly placed. Fore vein bears a basal group of 7 to 8 spines and three scattered spines the first of which stands slightly beyond the center of the vein, the second stands at about two-thirds the distance from the first to the third, the third stands near the tip of the wing. Hind vein bears from 14 to 20 spines quite regularly placed. Origin of hind vein indistinct; it arises at about the sixth spine of the group upon base of fore vein. Spines upon wing long, dark colored and prominent. Hairs composing posterior fringe upon both wings long, slender, wavy, and light brown. All femora somewhat darker than body, tarsi pale yellow, tibiae intermediate in color between femora and tarsi. Legs rather slender, fore femora indistinctly striate, second segment of tarsi much longer than the first; spines on inner side of hind tibiae weak, except pair at the extremity; legs sparsely clothed with fine hairs.

Abdomen as wide or slightly wider than the mesothorax, a little more than twice as long as wide; each dorsal plate of segments two to eight marked near its anterior edge with a narrow transverse, indistinct brownish line, which disappears near the pleural plates. Posterior edge of ninth segment bears ten brownish spines of which the dorsal six are the longest; tenth segment bears a circle of six spines, the dorsal four being the longest. Tenth segment conical, truncate at the tip. Ninth and tenth segments bear a few smaller spines. Posterior edges of ventral segments two to seven bear a row of six slender spines. Each pleural plate bears three to four slender spines directed posteriorly. Tenth segment split open above. The spines upon the last two segments are long, slender, light brown.

Described from several specimens of both sexes.

Locality, Quincy, Florida, May 21, 1910.

In flowers of *Magnolia grandiflora*.

Collectors, G. A. Runner and A. C. Morgan.

Male.—Similar to the female but slightly smaller. Ventral abdominal segments two to seven each show an elongated gray area, which is about four times as long as broad.

This species may be distinguished from its nearest congener, *Thrips tabaci*, by the red ocellar crescents, by the general color, which is brown, and by the *stouter* spines.

Type.—Cat. No. 15731, U.S.N.M.

EURYTHRIPS HINDSI, new species.

Figs. 61-63.

Female.—Measurements, length, excluding connective tissue, about 1.4 mm.; width of body 0.35, which is about two-fifths its length. Head, length 0.16, width 0.15. Prothorax, length 0.12, width through coxæ 0.27. Mesothorax at front angles 0.27 wide; metathorax 0.3 wide. General color: head, legs, and first to fifth antennal segments yellow; thorax yellowish brown; remainder of body light brown.

Head about as wide as long, narrowed in front, sides nearly parallel, cheeks very slightly roughened, front produced; basal segments of antennæ large, approximate. Eyes small, rather coarsely faceted, very dark purplish, almost black by transmitted light, very light gray by reflected light. Ocelli wanting. Post-ocular bristles long, slender, light yellow, and sharp pointed. Mouth cone short and broad, reaching only half across prosternum. Labrum constricted near the tip, sharply pointed and tipped with black. Labium with sides nearly straight, tip broad, truncated and edged with black. Maxillary palpi short, the first segment very short, the second much longer and tipped with three or four bristles, which are about as long as both segments of the palpi. Labial palpi short and indistinct. Head yellow with a very light shading of brown at the sides.

Relative lengths of segments of antennæ as follows:

$\frac{1}{12}$	$\frac{2}{12}$	$\frac{3}{13}$	$\frac{4}{13}$	$\frac{5}{12}$	$\frac{6}{12}$	$\frac{7}{10}$	$\frac{8}{9}$
----------------	----------------	----------------	----------------	----------------	----------------	----------------	---------------

Color: one to four yellow; three and four with a very slight brownish tinge; five brownish yellow; six light brown; eight dark brown; seven intermediate in color between six and eight. Two curved transparent sense cones on each of segments three to eight near the tip, one within, one without.

Prothorax trapezoidal, hind angles broadly rounding, sides nearly straight. All spines on prothorax yellow and sharp pointed. One long spine at each posterior angle, a similar one on each side on the posterior margin about one-third the distance from the hind angle to the meson, a midlateral spine of similar length to the one at the posterior angle. The spine at the anterior angle is much shorter than the foregoing spines. Anterior marginals wanting. Mesothorax with front angles rather abrupt, broadest at juncture with metathorax. Metathorax converging behind. Wings wanting. Legs of medium length, stout; fore femora somewhat thickened. All femora and tibiæ bear

several slender erect spines. Those at the tip of the tibiae being more conspicuous than the others upon the segment. The fore coxae also bear an erect spine on the outer side. All tarsi with a black spot at the tip within.

Abdomen broadly joined to the thorax, sides nearly parallel to the eighth segment. Eighth and ninth segments converging abruptly to the tube. On posterior margin of each dorsal segment one to eight stands two spines, the outer one of which stands very near the lateral margin. On the first two segments only the inner spine is long and conspicuous, on the other segments both the spines are conspicuous. The ninth segment on its posterior margin bears a circlet of six long spines. The tip of the tube bears a circlet of six long spines and a similar number of shorter ones. All spines on the body are yellow and sharp pointed. A narrow dark brown line crosses the dorsum of segments three to eight. Tube as long as the head, and twice as broad at the base as at the tip, its sides straight. Thorax and abdomen suffused with dark purplish pigmentation.

Described from one female taken in a stool of broom sedge.

Named for Dr. W. E. Hinds in recognition of his valuable work upon this order.

Locality, Clarksville, Tennessee, October 17, 1910.

A. C. Morgan, collector.

Type.—Cat. No. 15732, U.S.N.M.

This species differs from its congeners in having the prominent spines upon the prothorax and body acute instead of blunt, in having a narrower body in proportion to its length, and in having the segments of the antennae roughened.

TRICHOTERIPS FLAVICAUDA, new species.

Figs. 50-54.

Female.—Apterous: Length 1.1 mm. General color brown, with basal joints of antennae, ninth and tenth abdominal segments and all tarsi yellow. Thorax and abdomen with considerable very dark reddish brown hypodermal pigmentation.

Head: Length about 0.18 mm., width about 0.17, general shape rectangular, front slightly produced both above and between the antennae, sides nearly straight and parallel; the dorsal and lateral surfaces bear a few minute spines; dorsal surface faintly transversely striate-reticulate; postocular bristles long, slender, and sharply pointed. Eyes small. Ocelli wanting. Antennae eight-segmented, all segments free, twice as long as the head; segments gradually decreasing in width from the base to the tip. Relative lengths of segments as follows:

1	2	3	4	5	6	7	8
9	10	12	11	12	12	10	11

Segments three to eight stalked; segments one and two yellow with a slight tinge of brown; segments three to six slightly more heavily tinged with brown than the preceding; seven and eight light brown. Sense cones of medium size, transparent, located as follows: Segments three to six with two each, one on the outer side, one on the inner side near the tip; segment seven with a small cone on the outer side. The inner cone on six is also small. Mouth cone short, not attaining the base of the prosternum, labrum pointed and just attaining the end of the labium, which is broadly rounded.

Prothorax large, length about 0.17 mm., width 0.34 through the coxæ; front margin concave, hind margin convex, the curves of the two margins being nearly concentric. Anterior marginal spines minute, other spines present, of medium size, blunt. Anterior coxal spines present, equaling in size those at the posterior margin of the prothorax, blunt. Pterothorax greatly reduced in length, as broad as prothorax but only slightly more than half as long. General color of legs slightly lighter brown than the body; all tarsi, tips of hind femora, apical third of fore femora, bases of fore and hind tibiæ, yellow. A dark spot at the tips of all tarsi within. Fore femora scarcely enlarged.

Abdomen very large and heavy, 1.4 times as broad as pterothorax, deep brown; eighth and ninth segments narrow abruptly; ninth segment and the tube, yellow. Tube short, only very slightly more than half as long as the head, its sides straight, very slightly infusate at the tip; twice as wide at the base as at the apex. Terminal bristles slender, about as long as the tube.

Described from two specimens, taken under bark at Corbin, Kentucky, September 26, 1911, by the writer.

Male.—Allotype. Extended specimen 1.3 mm. in length. A contracted specimen would probably be shorter than the female. Color similar to that of the female except the antennal joints, which are slightly browner.

Head 0.2 mm. in length, width 0.13. Lateral margins of the head with an angular protuberance just behind the eyes.

Prothorax, length 0.2 mm., width through coxæ 0.31. Fore femora much enlarged, as broad as the head; fore tarsus armed with a stout tooth; a blunt tooth-like projection on inner side of fore tibiæ. Pterothorax, width 0.3 mm.

Abdomen much more slender than in the female, greatest width 0.31 mm.

One specimen, Corbin, Kentucky. Taken with the females under bark by the writer.

Type.—Cat. No. 15733, U.S.N.M.

TRICHTHIPS FUSCUS, new species.

Figs. 55-57.

Female.—Measurements, length 1.75 mm.; head, length 0.33, width 0.25; prothorax, length 0.21, width 0.4 through coxæ; mesothorax at front angles of same width as the prothorax, slightly broader at juncture with metathorax. Metathorax posteriorly of same width as prothorax. Width of abdomen 0.5 mm.; tube, length 0.18, width at base 0.09, at the tip one-half as wide as at the base. General color, dark brown. Relative lengths of segments of antennæ:

1	2	3	4	5	6	7	8
10	17	22	21	17	17	14	9

General color of antennæ very dark brown.

Head broadly rounded in front, the rounding beginning just back of eyes; broadest just behind the eyes, converging slightly to articulation with prothorax. Cheeks with a few small spines. Whole dorsum of head finely transversely striated. Post ocular spines stout and prominent, blunt. Other spines upon head minute. Eyes large, occupying about three-fifths of width of head, very dark purplish, almost black by transmitted light, light yellow by reflected light, finely faceted. Ocelli larger than facets of eyes, with orange pigmentation, well separated, the posterior ones on a line with center of eyes and near their margins, the anterior ocellus is on the tip of the raised and produced front, and is directed forward. Mouth cone about as long as broad, the labrum triangular and sharp at the tip; the labium broadly rounded and overreaching the labrum, reaching nearly across the prosternum. Antennæ inserted below the front, the basal segments separated by about half their width. Color of antennal segments: One, dark brown; two, dark brown, except the tip, which is lighter brown; three, yellow; four and five, yellow, very slightly infusate at the sides near the tips; six, yellow in basal half, infusate in apical half; seven, dark brown, except basal fourth, which is yellowish; eight, dark brown. Segments 4 to 6 each bear near the tip two short transparent sense cones, one on the outer margin and one on the inner. Segment three on the outer side near the tip bears a single sense cone. Segments bear numerous light brown spines.

Prothorax trapezoidal, only about four-sevenths as broad on anterior margin as through coxæ, slightly lighter brown than head. One short spine at each posterior angle and one shorter one on each coxa, a short spine on each anterior angle and two similar ones on anterior margin somewhat nearer the meson than to the angles. All these spines are only very slightly dilated. Posterior marginals and midlaterals wanting. Dorsum faintly transversely striate, and

bearing a few minute spines scattered over the surface. Mesothorax dark brown at the sides, remainder light brown. Mesonotum finely transversely striate, spines minute. Metanotum very finely longitudinally striate. Anterior angles of mesothorax abrupt. Width of mesothorax at anterior margin only very slightly greater than width of metathorax at its juncture with abdomen. The sides of these two segments are slightly convex and areolate. Wings of medium size. Fringes straight and simple. Extreme base of anterior wing yellow, and bearing on anterior margin, basally, three very light-colored spines with dilated tips. Legs of medium length, stout, fore femora somewhat enlarged; fore tarsi unarmed; color dark brown, fore tarsi a lighter brown. A stout, light brown spine at tip of each posterior tibia without. Femora and tibiae transversely striate, and clothed with numerous short, stout, dark brown spines.

Abdomen broad, nearly one-half as wide as long (the specimen is, however, considerably contracted abdominally, which accounts largely for the apparent great width of the abdomen); sides nearly parallel from second to fourth segments, inclusive, tapering gradually thence to the seventh segment; the eighth and ninth converge very abruptly to the base of the tube. Segments overlap for almost half their length. Prominent spines on segments 2 to 8 rather stout, with tips slightly dilated. Spines at tip of ninth segment blunt, those at tip of tenth segment long, slender, light brown, and sharply pointed. The tube at the tip bears six long spines and six shorter ones. Dorsum of first abdominal segment areolate; second segment areolate on anterior portion, transversely striate on remainder. Remaining segments striate at the sides.

Described from one specimen.

Locality, Quincy, Florida. May 21, 1910.

Swept from Spice bush.

A. C. Morgan, collector.

Type.—Cat. No. 15734, U. S. N. M.

TRICHOTRIPS HOODI, new species.

Figs. 58-60.

Female.—Length, 1.6 mm.; length of head, 0.21; width of head, 0.21; meso thorax, width, 0.36. General color, very dark brown.

Head, broadly rounding in front, nearly black, converging behind, widest just behind the eyes; cheeks very nearly straight, slightly roughened, very sparsely and weakly spinose, front slightly raised and produced between the eyes, the anterior ocellus at the extremity of the projection, other ocelli situated well forward and close to margins of the eyes. Eyes of medium size, black, rather finely faceted, not protruding. Postocular spines of medium length, stout, blunt,

black. Dorsum of head behind the eyes transversely striated. Mouth cone broad at the base, triangular, reaching nearly across the prosternum. Antennæ approximate at the base, situated below the front, twice as long as the head; relative lengths of segments as follows:

1	2	3	4	5	6	7	8
$\frac{1}{10}$	$\frac{2}{15}$	$\frac{3}{20}$	$\frac{4}{19}$	$\frac{5}{17}$	$\frac{6}{16}$	$\frac{7}{16}$	$\frac{8}{9}$

Segment one cylindrical, as wide as long; two barrel-shaped; three to six clavate; three to seven slightly stalked; seven and eight taper evenly from the middle of seven to the slightly rounded tip of eight; tip of eight bears a slender hair which is about as long as the segment. Sense cones located as follows: One weak cone on the outer margin of three near the tip; segment four with three cones similar in size to the one on segment three; five and six with two each, one on the outer margin near the tip and the other on the inner margin near the tip. Spines on antennal segments brown, of medium length. Color of segments: One light yellow; two light yellow with brown shading at the sides; three is light brown with distinct dark brown shading at the sides; four, light brown with dark brown shading on stalk; five to eight increasing in intensity of dark brown toward the tip.

Prothorax a little more than three-fifths as long as the head, its length on the meson only about three-eighths the width through coxæ, in front about three-fourths as broad as through coxæ; trapezoidal in shape, sides slightly rounding; one short, stout, blunt dark-brown spine at each posterior angle; one about two-thirds as stout and long as the preceding, midway on each lateral margin; a small blunt spine on each anterior angle; the projections of the fore coxæ each bear a short blunt spine; posterior marginals are stout and blunt; anterior marginals are of medium size and blunt.

Mesothorax noticeably wider than the prothorax, its front angles abrupt. Mesonotum transverse, finely longitudinally striate. Sides of meso- and metathorax nearly straight, the sides of the latter converging to the articulation with the abdomen. Connective tissue between head and prothorax finely pigmented with red. Wings well developed and reaching about to eighth abdominal segment. The single median vein of the fore wing fades out at the first third of the wing. Three short, stout, blunt, dark brown spines stand near the base of the wing. Both fringes of fore wing well developed, composed of long, slender, dark brown hairs. Hind fringe near the tip double for eight hairs. Wings of even width throughout. (The hind wings are folded on the abdomen and are invisible.) Legs well developed, the fore femora are somewhat thickened and about half as wide as the head. All femora and tibiæ dark brown, except a gray, almost white, area at the tip of the femora within which extends about one-

third the length of the segment. Tarsi lighter brown than other segments of the leg and tipped with black within. Hind and middle tibiae each bear a long gray spine near the tip without.

Abdomen twice as broad as the head, almost as broad at the base as at the middle; sixth and seventh segments tapering very slightly, eighth narrowing suddenly; ninth segment only three-fourths as broad as the head. Tube four-fifths as long as the head and at its middle one-third as broad as long. Dorsal posterior margin of first abdominal segment strongly convex, straight only on each lateral fifth. Each dorsal segment two to eight bears a strong, black, blunt spine on the posterior margin near the side. The lateral spines are blunt and short on segments two to five, thence lengthening and strengthening strongly to segment eight. Six strong, dark brown, blunt spines stand in a circlet upon the posterior edge of segment nine, and six long, slender, sharp-pointed spines stand in a circlet on the tip of the tube. The tube also bears about eight shorter, light brown spines intermixed with the longer ones. The wing retaining bristles are strong and black.

Described from one female taken upon the underside of a leaf of *Paulonia imperialis*.

Locality, Clarksville, Tennessee, June 21, 1911.

A. C. Morgan, collector.

I take pleasure in naming this species *hoodi*, as a compliment to Mr. J. D. Hood, who has done a great deal of valuable work in this order.

Type.—Cat. No. 15735, U.S.N.M.

TRICHOTHRIPS AMPLIPENNIS, new species.

Figs. 64-67.

Female.—Measurements: Length 2.15 mm. (2 to 2.2 mm.)—specimens slightly extended; head, length 0.25 mm., width 0.23; prothorax, length 0.14, width 0.35 (the specimen is slightly mashed and the width of the prothorax may be slightly less than given); mesothorax, width 0.43 mm.; abdomen, width 0.5 mm. General color dark brown. Relative lengths of segments of antennæ:

$\frac{1}{10}$	$\frac{2}{15}$	$\frac{3}{19}$	$\frac{4}{16}$	$\frac{5}{18}$	$\frac{6}{14}$	$\frac{7}{14}$	$\frac{8}{13}$
----------------	----------------	----------------	----------------	----------------	----------------	----------------	----------------

Head nearly as broad as long, broadest just behind the eyes, converging behind. The cheeks bear several small spines. Postocular bristles somewhat remote from the eyes, pale yellow, conspicuous and sharp pointed. Eyes large, oval in outline viewed dorsally, very minutely pilose, pale yellow, finely faceted. Ocelli large with purplish pigmentation, posterior ones contiguous to margins of eyes and on a line with their middle. Anterior ocellus situated at the extrem-

ity of the produced front. Ocelli margined inwardly with black crescents. Dorsum finely transversely striated. Mouth cone as broad as long. Labrum sharply pointed, black at the tip. Labium broad at the tip and broadly rounded, slightly overreaching the labrum. Maxillary palpi stout, the first segment very short. Antennæ uniformly dark brown. Sense cones simple, situated as follows: Segment three bears three cones, one on the inner margin, one on the outer margin, and one below, near the tip; segment four bears three cones, which are situated as those on segment three; segments five and six each bear two cones, one on the inner margin near the tip and one on the outer margin near the tip, the outer cone on segment six being only about half as large as the inner. Seven and eight each bear a small cone on the underside near the tip. Segments rather thickly clothed with small gray hairs.

Prothorax transverse, broadest behind, trapezoidal, anterior margin slightly concave in outline, posterior margin convex. Spines present as follows: Posterior angular, posterior marginal, midlateral, anterior marginal, and anterior angular. Posterior angular and posterior marginal alone stout. All spines light yellow and blunt. One small stout spine stands on outer angles of fore coxæ. Mesothorax slopes gradually to the angles, which are abrupt and slightly shouldered. Sides of mesothorax parallel. Metathorax broadest at the middle, at which point it is broader than the mesothorax, converging from the middle to the articulation with the abdomen. Mesonotum transversely striate and bearing only a few small spines. Metanotum reticulate. Wings stout, reaching about to seventh abdominal segment, the apical two-fifths broadened, color light gray, almost white. Scale brown and a small area at base of fore wing brown, and bearing three long, blunt, hyaline spines. Hind wing similar in shape to the fore wing, and similarly colored, bearing two sharp spines in the basal brown area, the proximal one being very small. Fringe on borders of both wings thick, brown and long. Hind fringe on fore wings double, subapically, for about 24 hairs. All legs dark brown, only the tarsi being slightly lighter. Middle and hind legs of medium size, fore legs heavy, the femora three-sevenths as broad as the head. Fore tarsus with a strong sharp tooth which bears two setæ, on its inner side at the base. All legs clothed with a few small spines, and each tibia near the tip bears several conspicuous, blunt, hyaline spines.

Abdomen stout. Dorsum of first segment reticulate, and reduced to a shield-shaped piece which is not more than one-third as broad as segment two. Segments two to eight have a transverse thickening near the anterior margin. Spines on sides of segments few, only one small, transparent, blunt spine noticeable on sides of segments six to eight. Segment nine bears the usual circlet of six spines, which are light yellow, long, and blunt. Ninth segment also bears several

smaller, shorter spines. Tip of tube bears six spines, which are not so conspicuously blunt as the preceding. Tube two-thirds as long as the head, its sides straight; at the tip about three-fifths as broad as at the base. Hairs at the tip very nearly as long as the tube.

Described from six females, 1 type, 5 paratypes.

Locality, Quincy, Florida, May 15, 1910.

On *Hypericum dolabriforme*.

G. A. Runner and A. C. Morgan, collectors.

This species is provisionally placed in *Trichothrips*, since the wings are rather broader apically than is typical of the genus.

Type.—Cat. No. 15736, U.S.N.M.

GASTROTHRIPS Hood.¹

In my collection are a male and female of *Gastrothrips ruficauda* Hood, the type-species of this genus. An examination of the male suggests the following emendation of the generic description: Male with the fore femora considerably thickened, the fore tarsi armed with a stout tooth, a scale at the base of the tube.

GASTROTHRIPS RUFICAUDA Hood.

Male.—Newly discovered. Agrees very closely in coloration with the type, somewhat more slender, and is slightly smaller than the female in my collection. Measurements: Length 1.35 mm.; head, length 0.183, width 0.183; prothorax, length 0.175, width (including coxæ) 0.35; pterothorax, width 0.35; abdomen, width 0.375; tube, length 0.15, width at base 0.075, width at tip 0.033; greatest width of fore femur 0.125; length of antennal segments in microns: 1-36; 2-52; 3-60; 4-52; 5-52; 6-48; 7-40; 8-36. The fore femur is about one and one-half times as broad as that of the female, the fore tarsus is armed with a stout tooth the length of which is about half the width of the fore femur, a conspicuous scale at the base of the tube. The fore angles of the mesothorax are produced laterally into a sharp tooth-like process.

The measurements of the female in my collection are as follows: Length 1.46 mm.; head, length 0.183, width 0.208; prothorax, length 0.142, width (inclusive of coxæ) 0.40; pterothorax, width 0.333; abdomen, width 0.467; tube, length 0.168, width at base 0.080, width at tip 0.40. Length of antennal segments in microns as follows: 1-40; 2-54; 3-64; 4-58; 5-56; 6-56; 7-40; 8-40.

HORISTOTHRIPS, new genus.

Head longer than wide, rectangular viewed from above, front truncate, not produced in front of eyes; cheeks slightly roughened and bearing small spines not on warts; eyes large, finely faceted;

¹Proc. Ent. Soc. Wash., vol. 14, No. 3, pp. 186.

ocelli present, the anterior one directed forward; antennæ inserted below the eyes, twice as long as the head, eight-segmented, style two-segmented, intermediate segments scarcely elongated; mouth cone reaching past base of prosternum, narrowing sharply just below maxillary palpi, very sharply pointed; maxillary palpi of medium size, the first segment very short, the second segment tipped with two long, slender hairs; labial palpi nearly or quite as long as the maxillary, the first segment being about four times as long as the first segment of the maxillary palpi. Prothorax stout, trapezoidal, slightly longer than the head, through the coxæ more than one and one-half times as broad as long, all of the usual spines present. Mesothorax broadest of thoracic segments, sides of meso- and metathorax nearly straight, converging slightly to juncture with abdomen. Wings of medium size, not constricted in the middle, margins nearly parallel to the apical third whence the hind margin curves forward broadly. Middle and hind legs of medium size and length, fore femora greatly thickened, nearly as broad as the head, fore tarsus armed with a long, stout tooth. Abdomen stout, slightly wider than the mesothorax; tube stout, about twice as long as the preceding segment.

Generic description drawn up from three females, one winged and two wingless.

This genus is apparently closely related to *Cryptothrips*, but differs from it in having the femora of the females greatly enlarged and armed, in having the labial palpi as long as the maxillary palpi, in having the wings not narrowed in their first half, and in having the mouth cone long and sharply pointed.

Type of the genus.—*Horistothrips australiæ*.

HORISTOTHRIPS AUSTRALIÆ, new species.

Figs. 68-71.

Female.—Length of winged form 2.75 mm., length of wingless form 2.41. General color dark brown.

Head, length 0.28 mm., width 0.21; sides almost straight—very slightly convex—and very slightly constricted posteriorly. Entire dorsum finely areolate—very nearly reticulate; cheeks bear a few tiny spines similar in size to those scattered upon the dorsum. Post ocular bristles prominent and with dilated tips. Eyes finely faceted, occupying slightly more than half the width of the head and nearly one-third the length, pale yellow, almost white. Front truncate across the eyes, antennæ inserted below the front which is slightly produced at that point between the basal joints. Ocelli present, posterior pair situated on a line with center of eyes and contiguous to them. Anterior ocellus at extremity of front and directed forward.

Ocelli larger than facets of eyes, clouded with dark purplish pigmentation; margined inwardly with very dark purplish crescents. Mouth cone long and sharply pointed, constricted suddenly just beyond maxillary palpi thence very slender to the tip, in undistended specimens would surpass the posterior margin of prothorax; maxillary palpi of medium size, the first segment very short; labial palpi slender, very nearly as long as the maxillary palpi; first segment of labial palpi fully four times as long as first segment of maxillary palpi; second segment of maxillary palpi tipped with two long yellowish hairs. Color of head dark brown, almost black at the sides. Relative lengths of segments of antennæ as follows:

1	2	3	4	5	6	7	8
11	16	21.5	22	20	17	15	8.5

Segment one truncated cone-shaped; two urn-shaped; three to six clavate; seven elliptical; seven and eight taper evenly from the middle of seven to the tip of eight which is cone-shaped. Color: One dark brown; two yellowish brown clouded with dark brown on sides near the base; three light yellowish brown clouded with dark brown on the apical third; four light brown at the base shading to dark brown at the tip; five dark brown, the basal half slightly lighter; six, seven, and eight dark brown. Spines on segments pale and inconspicuous. Sense cones located as follows: One on inner and one on outer sides on segments three to six.

Prothorax slightly longer than the head; width anteriorly five-sixths the length, width through coxæ one and two-thirds the length. All conspicuous spines on prothorax knobbed, arranged as follows: One at each hind angle, one on the projection of the coxæ, one mid-lateral, one on each side on posterior margin halfway between spine at hind angle and the meson, four spines on anterior margin arranged in two pairs, the lateral ones at the angles, the other pair standing near the meson, one on each side. Dorsum of prothorax finely areolate, hind margin broadly rounded. Mesothorax very nearly as broad as prothorax through the coxæ, its front angle abrupt—almost a right angle, sides slightly convex. Metathorax with sides gradually converging to the abdomen to which it is broadly joined. Mesonotum strongly transverse, transversely striate, bearing one conspicuous knobbed spine at each lateral angle. Two pairs of very small spines are also found, one spine of each pair stands near the anterior margin at about one-third the distance from the lateral margin to the meson, the spine of the second pair stands caudo-laterad of the spines of the first pair. Metanotal plate large, broader than long, finely areolate—almost reticulate. Legs of moderate length, middle and hind femora scarcely thickened, fore femora greatly enlarged, their

greatest width very nearly equal that of the head. Fore tarsus with a very stout tooth. All femora dark brown, except extreme bases and tips of middle femora and extreme tips of hind femora which are yellowish brown. Hind and middle tibiae dark brown along sides, light brown at tips, infusate along center. Fore tibiae yellowish brown. All tarsi light yellowish brown with a black spot at the tip within. All femora and tibiae clothed with numerous minute spines. In winged specimens the wings are short and broad, reaching only about to the sixth abdominal segment. Wings gray. Three almost transparent stout spines with dilated tips on vestigial basal portion of vein in fore wing. Hind wing gray with a slight median thickening visible for about one-third the length of the wing. Both fringes of both wings thick, slender, and long. Hind fringe of fore wing near tip double for about 17 hairs.

Abdomen broad and heavy, second to seventh segments of about equal widths, eighth and ninth segments tapering suddenly to the tube. Tube about two-thirds as long as the head. Dorsum of first segment and a band across anterior margin of second segment finely areolate. Third segment weakly cross striate on anterior portion. All prominent spines on body pale and with dilated tips, except the two ventral spines at the tip of the ninth segment which are blunt, and the six slender spines at the tip of the tube which are sharp pointed and brown. Spines at tip of tube slightly longer than the tube.

Type slide contains two females, one wingless and one winged, and three pupae and one larva.

Swan River, Australia, received at the U. S. Department of Agriculture, March 1, 1902.

Collected under dead scales of *Eriococcus* on *Eucalyptus*.

Collector, George Compere.

Type.—Cat. No. 15737, U.S.N.M.

LEPTOTHRIPS ASPERSUS Hinds.

I have in my collection one slide of this species initialed by Moulton—therefore, presumably determined by him—and one slide of *Cryptothrips californicus* Daniel, also initialed by Moulton. A careful comparison of these slides with my slides of *Leptothrips aspersus* Hinds, which have been compared with Hinds' cotypes in the collection of the U. S. National Museum, show no specific differences. Therefore, *Cryptothrips californicus* Daniel becomes a synonym of *Leptothrips aspersus* Hinds. Mr. J. D. Hood¹ has already placed *Cryptothrips californicus* in *Leptothrips*, and has called attention to the identity of *Liothrips mcconnelli* Crawford with *Leptothrips aspersus*. The distribution of *L. aspersus* is extended, therefore, to Mexico.

¹ Proc. Biol. Soc. Wash., vol. 25, April 13, 1913, pp. 61-62.

LEPTOTHIRIPS RUSSELLI, new species.

Figs. 72-75.

Female.—Measurements: total body length about 1.9 mm. (specimen slightly distended); head, length 0.24 mm., width 0.17 mm.; prothorax, length 0.14 mm., width through coxæ 0.28 mm.; mesothorax, width at front angles 0.30 mm.; metathorax, width at articulation with mesothorax 0.31 mm.; abdomen, width at second segment 0.30 mm.; tube, length 0.125, width at base 0.06, width at tip four-sevenths of width at base. General color fuscous, shading to brown on body in best cleared specimens. Abdomen with indistinct purplish pigmentation in the last segments. Relative lengths of segments of antennæ:

$\frac{1}{7}$	$\frac{2}{12}$	$\frac{3}{11.5}$	$\frac{4}{13.5}$	$\frac{5}{13}$	$\frac{6}{13}$	$\frac{7}{11.5}$	$\frac{8}{8}$
---------------	----------------	------------------	------------------	----------------	----------------	------------------	---------------

Head, broadest just behind the eyes, converging slightly to articulation with prothorax, sides very nearly straight, very indistinctly roughened, bearing a few minute spines; a hump between the eyes in front extending beyond and above the insertion of the antennæ; the posterior ocelli at the sides and on base of the hump cephalad of the middle of the eyes, the anterior ocellus at the extremity of the hump and directed forward. Dorsum faintly transversely striated. Eyes large, occupying about two-thirds the width of the head, finely faceted; sparsely and minutely pilose, gray. Ocelli much larger than facets of eye, posterior ones contiguous to eyes, gray. Post-ocular spines long, stout, and blunt. Mouth cone broad at the base, reaching slightly past the middle of prosternum. Sides of labrum nearly straight, labrum slightly constricted at the tip; labium broadly rounded at the tip and overreaching the labrum. Color of head, dark brown to fuscous. Antennæ dark brown, segments one and two slightly the darkest, basal half of three somewhat lighter than the remainder of the antennæ. Spines on antennal segments small, sparse and light colored. Sense cones nearly straight, transparent, located near tips of following segments: one on outer surface of three; two on each of segments four to six, one on the outer and one on the inner side, the outer one on segment six only about half as large as the other cones.

Prothorax trapezoidal, sides nearly straight to hind angles, which are abrupt. Spines at hind angles stout, prominent, and blunt; spines at front angles distinct, short, stout, and blunt. Posterior marginals intermediate in size between spines at fore and hind angles, blunt. Midlaterals wanting. Anterior marginals very short, blunt, visible only on lighter specimens. Mesothorax with front margin slightly convex, its front angles abrupt; a notch at each side just caudad of front angle. Mesonotum broad, transverse, transversely striate behind, its spines minute. Metathorax broad, very slightly

constricted at articulation with mesothorax, converging behind to articulation with abdomen. Metanotum longitudinally striate. Wings of medium size, transparent, a brownish tinge at extreme base, constricted in the middle. Fore wing without double fringe on hind margin subapically. Near base of anterior wing, where fore longitudinal vein should be stands three light-brown spines, the first two being stout and blunt, the third or distal one longer, more slender, and sharp pointed. Fringe of both wings rather heavy, stout, brown, and straight. Legs concolorous with body, the femora a little darker than the tibiae and tarsi, of medium length, fore and hind femora slightly thickened, fore coxæ projecting strongly and bearing a few very small spines. Fore tarsi with a tiny tooth within. Legs clothed with numerous short spines, a slender spine on each fore tibia above near the tip alone conspicuous.

Abdomen long and slender, tapering gradually from the second segment, the eighth and ninth converging more sharply to the tube. Sides of tube nearly straight. Terminal hairs at tip of tube, slender and pale. Spines at sides of abdomen, slender, pale and not very prominent.

Described from five females; no males found.

Locality, Laurel Canon, California.

Food plant unknown.

H. M. Russell, collector.

I take pleasure in naming this species after Mr. H. M. Russell in recognition of his economic work upon certain species of the order.

Type.—Cat. No. 15738 U.S.N.M.

ZYGOTHRIPS FEMORALIS, new species.

Figs. 76-79.

Female.—Normal length about 1.1 mm. (the second, third, and fourth body segments are distended and the specimen as mounted measures 1.35 mm.). Width of prothorax 0.2 mm., width of mesothorax 0.27. General color of head and thorax dark brown, abdomen lighter brown on first three segments. Considerable red and orange hypodermal pigmentation in thorax and abdomen.

Head about one-ninth longer than broad, diverging very slightly behind the eyes, sides straight, broadest behind; almost straight across the front except for a slight projection between the antennæ; back of head transversely striate; post-ocular bristles long, slender, and blunt; cheeks very faintly roughened. Eyes of medium size occupying a little more than four-sevenths the width of the head through them, finely faceted, not pilose, very dark red by transmitted light, light yellowish by reflected light. Ocelli large, situated well forward, the posterior ones in front of center of eyes, anterior one stands upon a prominence of the front; reddish yellow with purplish inner margins. Mouth cone short and blunt reaching a little more than half-way across prosternum, labrum sharply pointed, tipped with black,

the labium broadly rounded. Maxillary palpi of medium size, the first segment very short. Antennæ about one and three-fourths times as long as the head, slightly separated at the base by a slight projection of the head. Relative lengths of segments as follows:

$\frac{1}{5+}$	$\frac{2}{10}$	$\frac{3}{11}$	$\frac{4}{10}$	$\frac{5}{10.5}$	$\frac{6}{11}$	$\frac{7}{10}$	$\frac{8}{8}$
----------------	----------------	----------------	----------------	------------------	----------------	----------------	---------------

Segment one truncated cone-shaped; two urn-shaped; three to five similar in shape. One and two dark brown; four to eight somewhat lighter brown than the first two segments; segment three lightest of all. Spines light colored and inconspicuous. Segments three to six each bear two small curved sense cones near the tip, one on the inner side and one on the outer.

Prothorax three-fourths as long as the head, and across outer angles of the coxæ one and one-half times as wide as the head. Anterior marginal and midlateral spines wanting, those at the angles present, but small, transparent and inconspicuous. Mesothorax about one-seventh broader than the prothorax, its front angles sloping abruptly, it converges posteriorly to its juncture with the metathorax. Mesothorax with a small spine near each lateral angle, also a similar spine on anterior margin on each side halfway from lateral angle to meson. Metanotum weakly longitudinally striate. Metathorax only slightly narrower than mesothorax, converging posteriorly and broadly joined to the abdomen. Wings slender, weak, and transparent, scarcely reaching past seventh abdominal segment; and very slightly narrowed in the middle. Legs rather short and stout, all femora somewhat thickened, the fore femora noticeably so. All femora and tibiæ brown; all tarsi pale yellow with a black spot at the tip within. Tooth upon inner side of fore tarsi reduced to a slight swelling.

Abdomen slightly wider than mesothorax, almost cylindrical to the eighth segment, eighth and ninth segments converging rather abruptly to the tube. Spines upon abdomen rather weak except on last three segments where they are slightly stouter, longer, and more conspicuous. Ninth segment bears a circlet of six long slender spines which are light yellowish, and a few smaller spines. Of the long spines at tip of ninth segment the two most dorsal ones are blunt; tube at the tip also bears six long slender sharp-pointed spines of which the longest are nearly twice the length of the tube; the tube also bears a few smaller spines. A narrow dark line extends across the dorsum of segments three to eight near the anterior margin. Sides of tube nearly straight. Tube at the middle two-fifths as wide as long; nearly three-fifths as long as head.

Described from one specimen taken in sweepings.

Locality, Clarksville, Tennessee, June 20, 1911.

A. C. Morgan, collector.

Type.—Cat. No. 15739, U.S.N.M.

NEW LOCALITY AND FOOD PLANT RECORDS FOR CERTAIN
THYSANOPTERA.

Since the locality records in the writer's collection greatly extend the distribution of certain species, also since new food plants have been recorded for some of the species, it is thought advisable to place this information on record. This information is given below under an alphabetical arrangement of the genera within each family.

Suborder TEREBRANTIA.

Family AEOLOTHRIPIDÆ.

ÆOLOTHRIPS BICOLOR Hinds.

Quincy, Florida, March 17, 1909, *Plantago virginica*, H. F. Wilson.

Quincy, Florida, March 13, 1909, on corn, H. F. Wilson.

Quincy, Florida, March 20, 1909, on onions, H. F. Wilson.

Quincy, Florida, May 14, 1909, on Rutabaga, A. C. Morgan.

Clarksville, Tennessee, April 2, 1910, in sod, A. C. Morgan.

This species was also collected by the writer in May, 1910, at Quincy, Florida, while sweeping oats.

ÆOLOTHRIPS FASCIATUS (Linnaeus).

Flagstaff, Arizona, July 2, 1907, in miscellaneous collection of insects, Schwarz and Barber.

Avalon, Catalina Islands, California, October 29, 1908, in blossoms of wild tobacco, H. O. Marsh.

Family THRIPIDÆ.

ANAPHOTHRIPS STRIATUS Osborn.

Clarksville, Tennessee, April 14, 1910, on rye, A. C. Morgan.

BREGMATOTHRIPS VENUSTUS Hood.

Pearly, Tennessee, July 30, 1912, both short and long winged forms in sweeping grass along roadside, A. C. Morgan.

CHIROTHERIPS CRASSUS Hinds.

Clarksville, Tennessee, April 9, 1909, on *Allium*, Morgan and Crumb.

CHIROTHERIPS MANICATUS Haliday.

Quincy, Florida, March 20, 1909, on oats, H. F. Wilson.

Pearly, Tennessee, July 30, 1912, sweeping in grass along road, A. C. Morgan.

I have also in my collection a slide loaned from the collection of the United States Department of Agriculture bearing the following data: NW. Territory, British Columbia, September 12, 1901, on wheat, J. Fletcher.

CTENOTHRIPS BRIDWELLI Franklin.

Clarksville, Tennessee, April and May, 1910, breeding on the under side of the leaves of several species of *Trillium*, Morgan and Crumb.

Clarksville, Tennessee, July 8, 31, 1910, breeding on the under side of leaves of Mandrake, Crumb and Morgan.

EUTHRIPS FUSCUS Hinds.

Quincy, Florida, March 17, 1909, on *Plantago virginica*, H. F. Wilson.

Quincy, Florida, March 3, 1909, on life everlasting, H. F. Wilson.

Quincy, Florida, May 22, 1909, on peanuts, A. C. Morgan.

Quincy, Florida, May 22, 1909, on sorrel, A. C. Morgan.

Quincy, Florida, this species was also taken upon tobacco on all the above dates.

Clarksville, Tennessee, April 9, 1909, on dandelion, A. C. Morgan.

Clarksville, Tennessee, April 12, 1909, on *Cercis canadensis*, S. E. Crumb.

Clarksville, Tennessee, April 28, 1909, on *Quamasia*, S. E. Crumb.

Clarksville, Tennessee, April 23, 1910, on plantain, A. C. Morgan.

Clarksville, Tennessee, January 14, 1911, in stools broom sedge, Runner and Morgan.

Clarksville, Tennessee, January 21, 25, 1911, hibernating in sod, G. A. Runner.

Clarksville, Tennessee, June 16, 1909, on tobacco, S. E. Crumb and A. C. Morgan.

Appomattox, Virginia, April 16, 1909, on *Allium*, A. C. Morgan.

Washington, District of Columbia, March 23, 1910, on plantain, G. A. Runner.

Dallas, Texas, May, 1910, on cotton, Hunter No. 1895.

Robertsdale, Alabama, May 23, 1910, on oats and tobacco, A. C. Morgan.

Durham, North Carolina, August 8, 1910, injuring tobacco, G. A. Runner.

EUTHRIPS OCCIDENTALIS Pergande.

Dade City, Florida, May 12, 1910, on snap beans, Hunter and Morgan.

Manatee, Florida, March, 1911, on mango, H. F. Schultz.

EUTHRIPS TRITICI Fitch.

Dallas, Texas, May, 1910, on cotton, Hunter No. 1895.

I have specimens of this species from many localities and from many food plants. It is so cosmopolitan that I will not attempt to list its localities and food plants further.

EUTHRIPS NERVOSUS Hinds.

Clarksville, Tennessee, July 10, 11, 1912, on cattails in Aphid colonies, Crumb and Morgan.

HELIOTHRIPS FASCIATUS Pergande.

Clarksville, Tennessee, October 10, 1910, on under side of leaves of poplar, A. C. Morgan.

Davis, California, October 13, 1911, injuring cotton in tips of leaves, A. McLachlan.

HELIOTHRIPS FASCIAPENNIS Hinds.

Tlahualilo, Mexico, September 12, 1910, injuring cotton leaves, J. P. Conduit.

Davis, California, October 13, 1910, injuring cotton, A. McLachlan.

Chico, California, September, 1910, injuring cotton, T. H. Kearney.

HELIOTHRIPS HAEMORRHODALIS Bouche.

Haifa, Palestine, Jewish Agriculture Experiment Station, July 17, 1912. Injuring blossoms and young leaves of orange. Specimens sent by Aaron Aaronsohn.

HETEROTHRIPS ARISAEMAE Hood.

Quincy, Florida, March 20, 1909, on honeysuckle, H. F. Wilson.

Quincy, Florida, March 17, 1909, on *Rhododendron ulmiflorum*, H. F. Wilson.

Clarksville, Tennessee, April 8, 1910, on *Arisaemae*, S. E. Crumb.

Appomattox, Virginia, July 21, 1910, on wild grape, G. A. Runner.

LIMOTHRIPS CEREALIMUM Haliday.

Clarksville, Tennessee, April, 1910, on rye, A. C. Morgan.

Quincy, Florida, May, 1910, on oats, A. C. Morgan.

Knoxville, Tennessee, June, 1911, on oats, E. C. Cotton.

PSEUDOTHRIPS INEQUALIS Beach.

Quincy, Florida, May 17, 1910, on *Senecio* sp., A. C. Morgan.

Clarksville, Tennessee, January, 1911, hibernating at base of *Aster*, G. A. Runner.

THRIPS ABDOMINALIS Crawford.

Lawton, Oklahoma, June 28, 1909, on *Rudbeckia*, W. D. Pierce.

Quincy, Florida, March, 1909, from tobacco plant bed, H. F. Wilson.

Quincy, Florida, May 17, 1910, *Senecio* sp., Runner and Morgan.

Appomattox, Virginia, March 16, 1909, on *Allium*, A. C. Morgan.

Key West, Florida, April 23, 1912, miscellaneous collecting, Runner and Morgan.

THRIPS MADRONII Moulton.

Corbin, Kentucky, September 26, 1911, in sweepings, A. C. Morgan.

THRIPS PERPLEXUS Beach.

Clarksville, Tennessee, April 2, 1910, in sod and on cedar, Crumb and Morgan.

Clarksville, Tennessee, August 19, 1910, on *Paspalum* and Sorghum, Crumb and Morgan.

Clarksville, Tennessee, October 15, 1910, in stools of broom sedge, A. C. Morgan.

Quincy, Florida, September 8, 1909, on grass, A. C. Morgan.

THRIPS TABACI Lindeman.

I have specimens of this cosmopolitan species from various food plants, from Quincy, Florida, Clarksville, Tennessee, and from Cranmoor, Wisconsin. Haifa, Palestine, Jewish Agriculture Experiment Station, July 16, 1912, on *Sesamum indicum*, specimens sent by Aaron Aaronsohn.

SERICOTHRIPS CINGULATUS Hinds.

Clarksville, Tennessee, June 4, 1910, on broad leaved plantain, A. C. Morgan.

Clarksville, Tennessee, October 15, 1910, hibernating in stools of broom sedge, A. C. Morgan.

Clarksville, Tennessee, January 14, 1911, hibernating in stools of broom sedge, Runner and Morgan.

SERICOTHRIPS VARIABILIS Beach.

Dallas, Texas, May, 1910, on cotton, Hunter No. 1895.

Clarksville, Tennessee, June 6, 1910, sweeping in woods, Crumb and Morgan.

Suborder TUBULIFERA.

Family PHLOEOTHRIPIDÆ.

ACANTHOTHRIPS MAGNAFEMORALIS Hinds.

Clarksville, Tennessee, April, 1910, miscellaneous collecting, S. E. Crumb.

Clarksville, Tennessee, July, 1912, miscellaneous collecting, A. C. Morgan.

ANTHOTHRIPS NIGER Osborn.

Quincy, Florida, March 17, 1909, *Plantago virginica*, H. F. Wilson.

Quincy, Florida, March 17, 1909, on rye, H. F. Wilson.

Quincy, Florida, May 12, 1909, on corn, A. C. Morgan.

Quincy, Florida, May 14, 1909, on rutabaga, A. C. Morgan.

Quincy, Florida, May 12, 1909, on oats, A. C. Morgan.

Quincy, Florida, May 14, 1909, on tomato, A. C. Morgan.

Quincy, Florida, May 13, 1909, on cocoa grass, A. C. Morgan.

ANTHOTHRIPS VERBASI Osborn.

Clarksville, Tennessee, March 2, 5, 1909, on *Verbascum*, H. F. Wilson.

Clarksville, Tennessee, June 16, 1909, on *Verbascum*, A. C. Morgan.

Quincy, Florida, May 12, 1909, on corn, A. C. Morgan.

Knoxville, Tennessee, May 17, 1912, on *Verbascum*, G. M. Bentley.

CEPHALOTHRIPS YUCCÆ Hinds.

Quincy, Florida, May, 1910, on *Yucca*, A. C. Morgan.

Clarksville, Tennessee, May 6, 1910, on *Yucca*, A. C. Morgan.

CRYPTOTHRIPS RECTANGULARIS Hood.

Bridgeville, Delaware, December 23, 1911, under peach bark, A. C. Morgan.

EURYTHRIPS AMPLIVENTRIS Hinds.

Clarksville, Tennessee, January 12, 1911, hibernating in stools of broom sedge, G. A. Runner.

GASTROTHRIPS RUFICAUDA Hood.

Vienna, Virginia, August 22, 1912, under bark of grape, R. A. Cushman.

IDOLOTHRIPS CONIFERARUM Pergande.

Norfolk, Virginia, June, 1909, on pine, H. F. Wilson.

IDOLOTHRIPS FLAVIPES Hood.

Clarksville, Tennessee, April 16, 1909, from dead leaves, S. E. Crumb

LEPTOTHRIPS ASPERSUS Hinds.

Quincy, Florida, May, 1909, miscellaneous collecting, H. F. Wilson.

Quincy, Florida, May, 1909, on Indian poke, *Magnolia grandiflora*, beans, coffee bean, sweeping in woods, A. C. Morgan.

Dallas, Texas, May, 1910, on cotton, Hunter No. 1895.

Clarksville, Tennessee, April 4, 1909, *Cercis canadensis*, S. E. Crumb.

Clarksville, Tennessee, August 1, 1909, on sycamore, Crumb and Morgan.

Clarksville, Tennessee, August 21, 1909, on grape leaves, Crumb and Morgan.

Clarksville, Tennessee, August 21, 1909, on *Ambrosia*, Parman and Morgan.

Clarksville, Tennessee, August 28, 1909, on ash, S. E. Crumb.

Key West, Florida, April 23, 1912, miscellaneous collecting, Runner and Morgan.

LIOTHRIPS CITRICORNIS Hood.

Clarksville, Tennessee, April 21-26, 1909, emerged from leaves, Crumb and Morgan.

Clarksville, Tennessee, August 21, 1909, on grape, Crumb and Morgan.

Clarksville, Tennessee, July 18, 1910, on hickory leaves, A. C. Morgan.

LIOTHRIPS OCELLATUS Hood.

Vienna, Virginia, May 25, 1911, in galls of *Pemphigus caryæcollis* on black walnut, R. A. Cushman.

PHLOEOTHRIPS PERGANDEI Hinds.

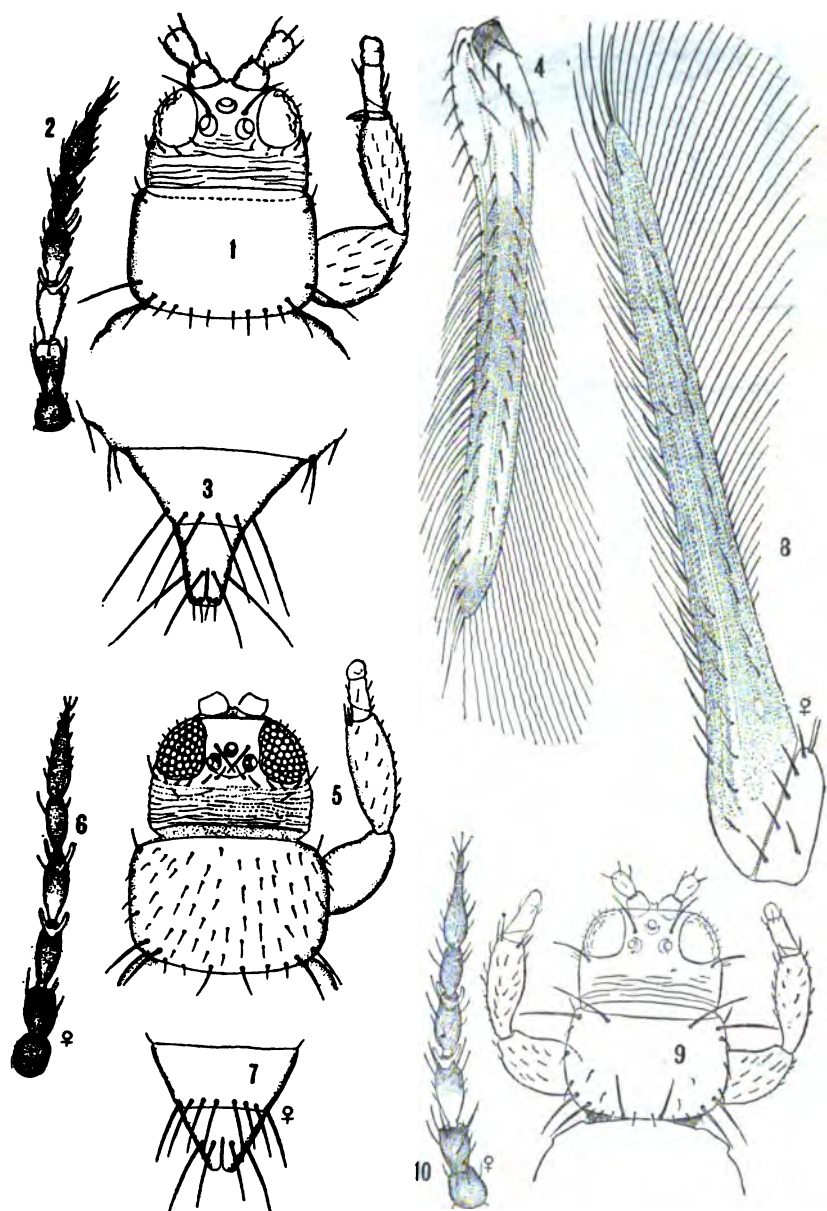
Clarksville, Tennessee, June 6, 1910, sweeping in woods, A. C. Morgan.

PHLOEOTHRIPS RAPTOR Crawford.

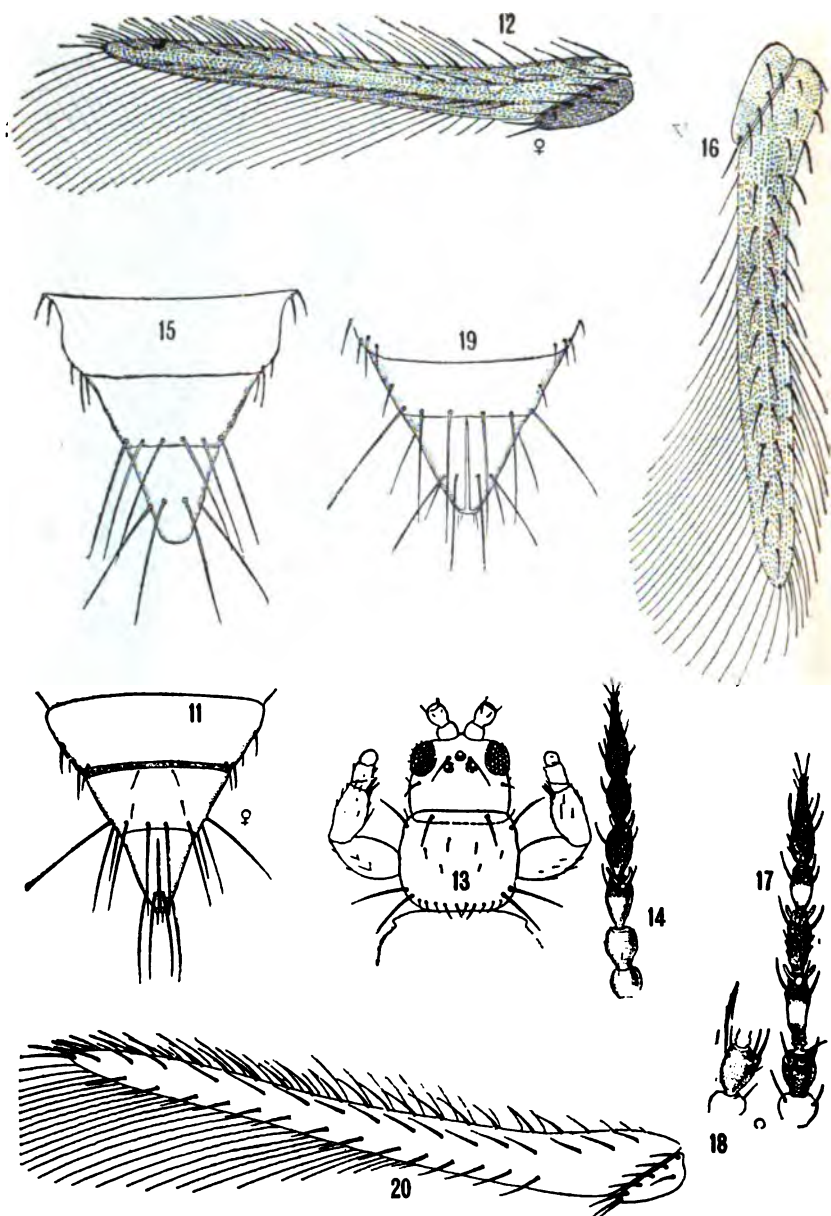
Quincy, Florida, May 14, 1909, miscellaneous collecting, A. C. Morgan.

PHLOEOTHRIPS UZELI Hinds.

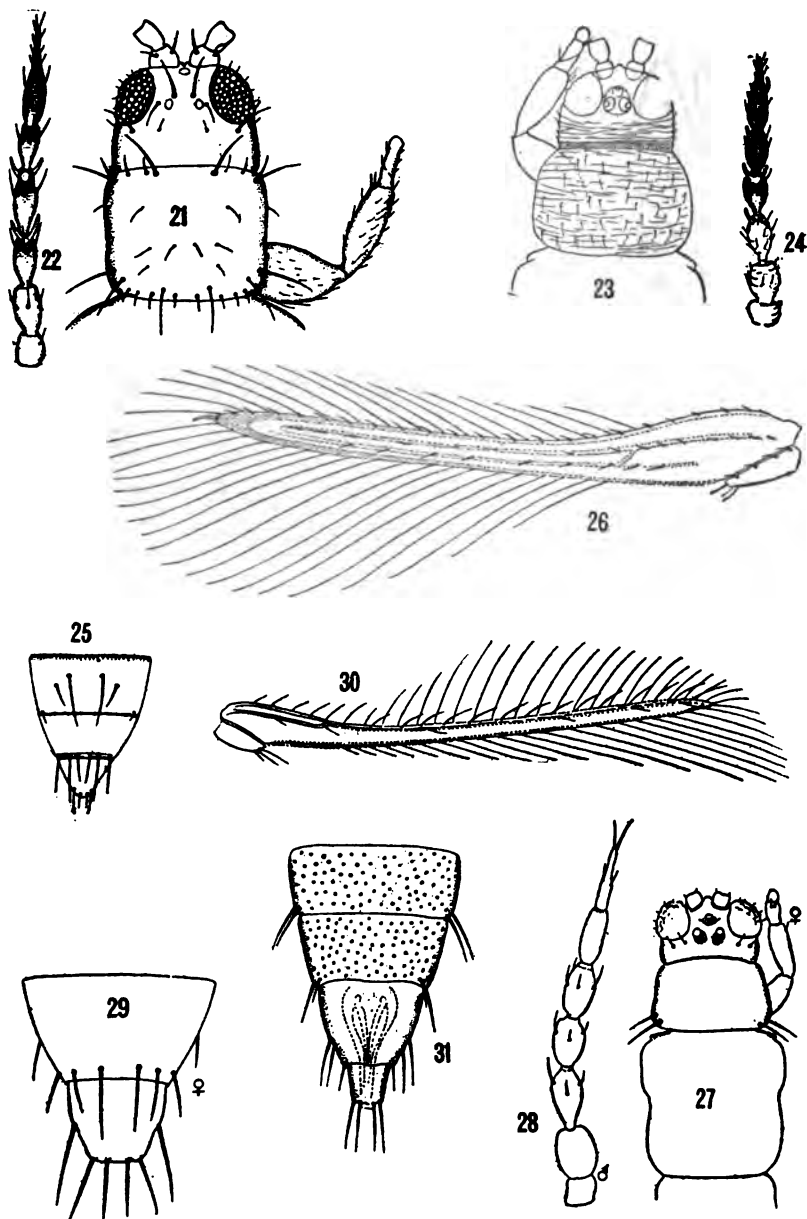
Clarksville, Tennessee, May 10, 1910, on *Yucca*, A. C. Morgan.



FIGS. 1-4.—*EUTHRIPS PHALERATA*. 1, HEAD, PROTHORAX, AND FORE LEG OF FEMALE, DORSAL VIEW; 2, RIGHT ANTENNA OF FEMALE, DORSAL VIEW; 3, TIP OF ABDOMEN OF FEMALE, DORSAL VIEW; 4, LEFT FORE WING OF FEMALE. FIGS. 5-8.—*EUTHRIPS HAWAIIENSIS*. 5, HEAD, PROTHORAX, AND FORE LEG OF FEMALE, DORSAL VIEW; 6, LEFT ANTENNA OF FEMALE, DORSAL VIEW; 7, TIP OF ABDOMEN OF FEMALE, DORSAL VIEW; 8, RIGHT FORE WING OF FEMALE. FIGS. 9-10.—*EUTHRIPS FLORIDENSIS*. 9, HEAD, PROTHORAX, AND FORE LEGS OF FEMALE, DORSAL VIEW; 10, RIGHT ANTENNA OF FEMALE, DORSAL VIEW.



FIGS. 11-12.—*EUTHRIPS FLORIDENSIS*. 11, TIP OF ABDOMEN OF FEMALE, DORSAL VIEW; 12, LEFT FORE WING OF FEMALE. FIGS. 13-16.—*EUTHRIPS RUNNERI*. 13, HEAD, PROTHORAX, AND FORE LEGS OF FEMALE, DORSAL VIEW; 14, RIGHT ANTENNA OF FEMALE; 15, TIP OF ABDOMEN OF FEMALE, DORSAL VIEW; 16, RIGHT FORE WING OF FEMALE. FIGS. 17-18.—*EUTHRIPS TESTICI*, VAR. *BISPINOSUS*. 17, RIGHT ANTENNA OF FEMALE, DORSAL VIEW; 18, SECOND ANTENNA SEGMENT OF FEMALE, LATERAL VIEW. FIGS. 19-20.—*EUTHRIPS GOSSYTHI*. 19, TIP OF ABDOMEN OF FEMALE, DORSAL VIEW; 20, LEFT FORE WING OF FEMALE.



FIGS. 21-22.—*EUTHRIPS GOSSTPHI*. 21, HEAD, PROTHORAX, AND FORE LEG OF FEMALE, DORSAL VIEW; 22, LEFT ANTENNA OF FEMALE, DORSAL VIEW. FIGS. 23-26.—*ANAPHOTHRIPS ARIZONENSIS*. 23, HEAD, PROTHORAX, AND FORE LEG OF FEMALE, DORSAL VIEW; 24, LEFT ANTENNA OF FEMALE, DORSAL VIEW; 25, TIP OF ABDOMEN OF FEMALE, DORSAL VIEW; 26, LEFT FORE WING OF FEMALE. FIGS. 27-30.—*MICROTHRIPS PIERCEI*. 27, HEAD, THORAX, AND FORE LEG OF FEMALE, DORSAL VIEW; 28, RIGHT ANTENNA OF FEMALE, DORSAL VIEW; 29, TIP OF ABDOMEN OF FEMALE, DORSAL VIEW; 30, RIGHT FORE WING OF FEMALE. FIG. 31.—*ECHINOTHRIPS AMERICANUS*. SEVENTH TO TENTH SEGMENTS OF ABDOMEN OF MALE, VENTRAL VIEW.

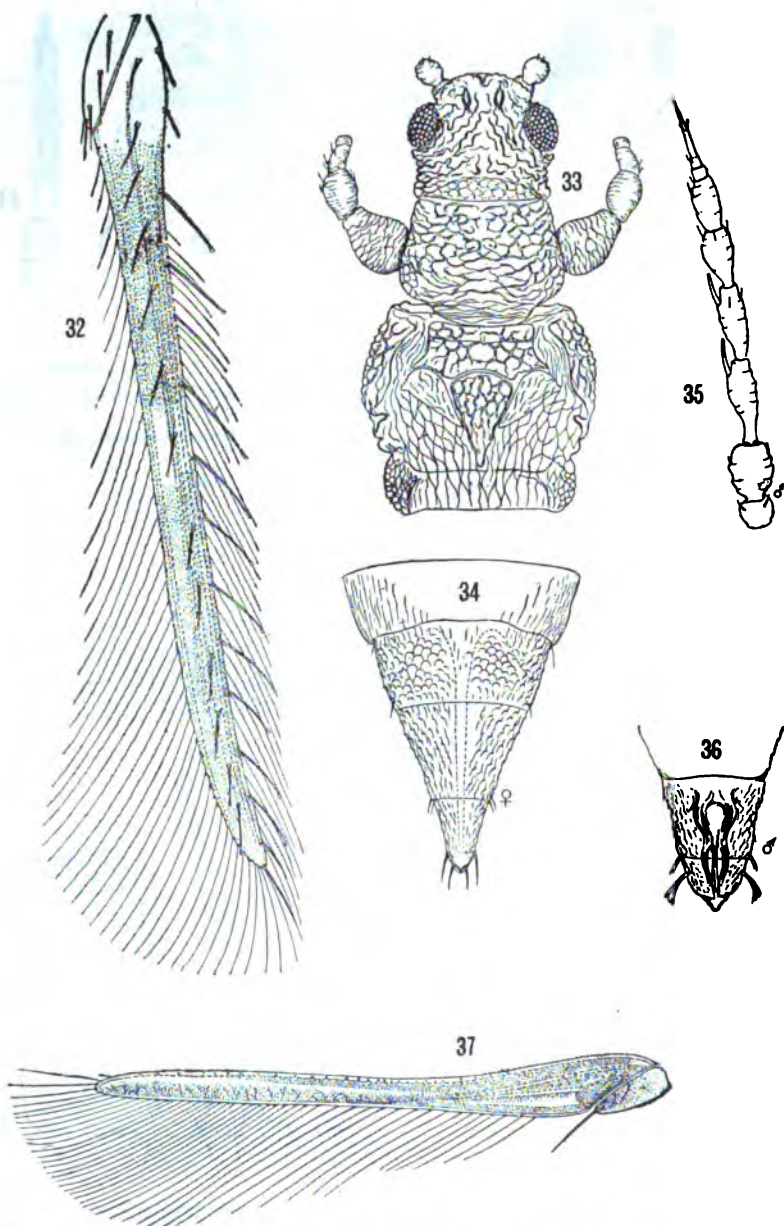
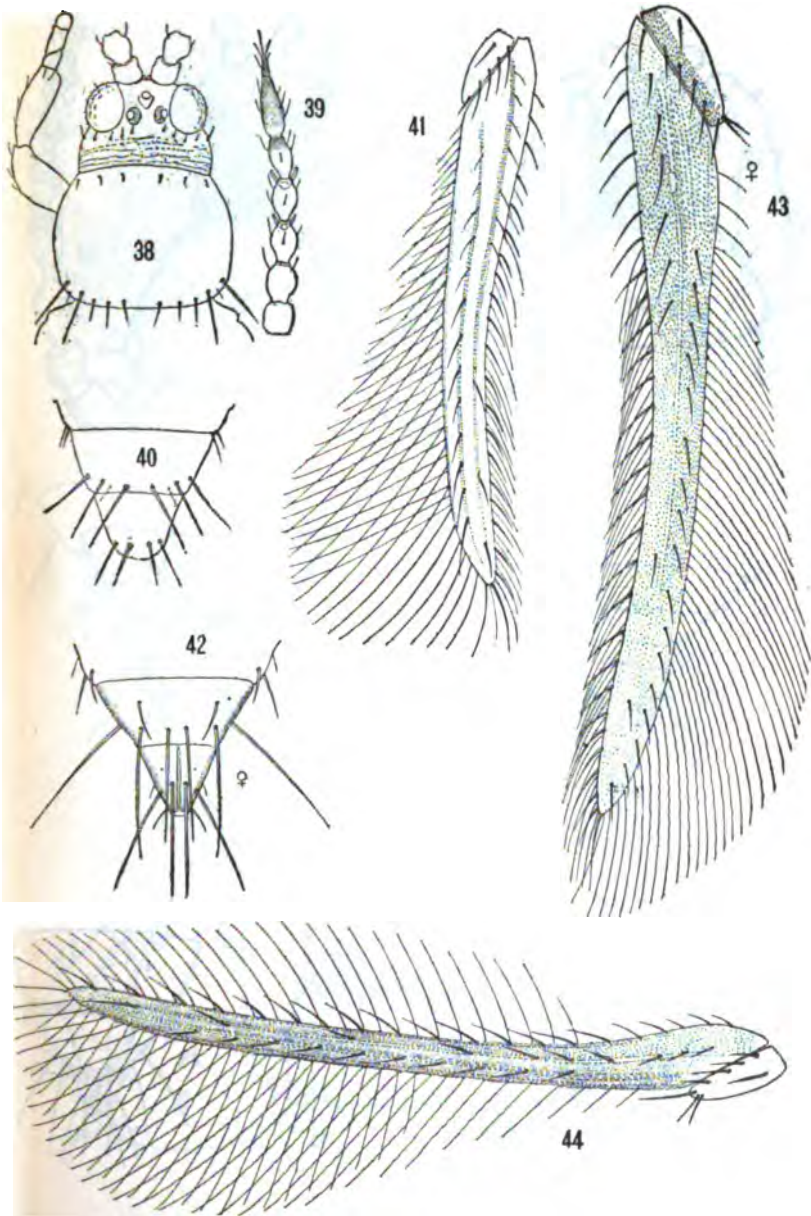
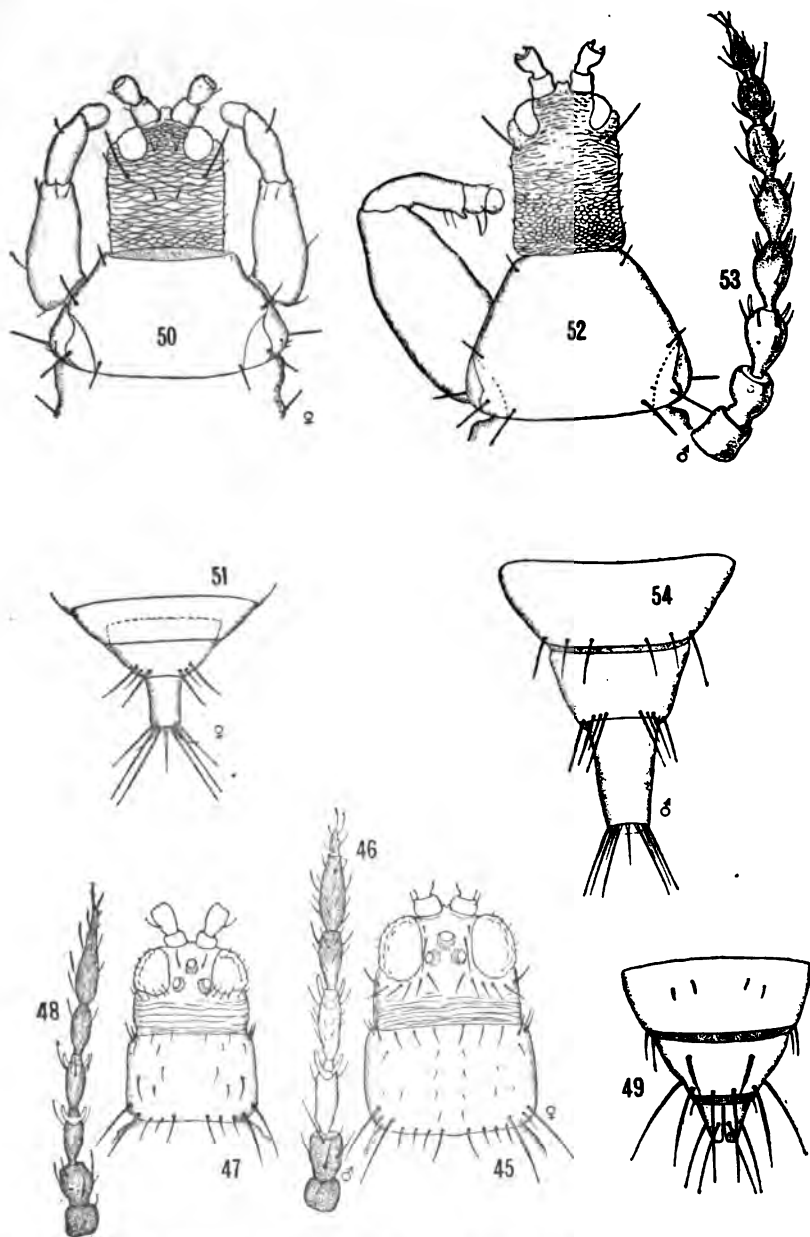


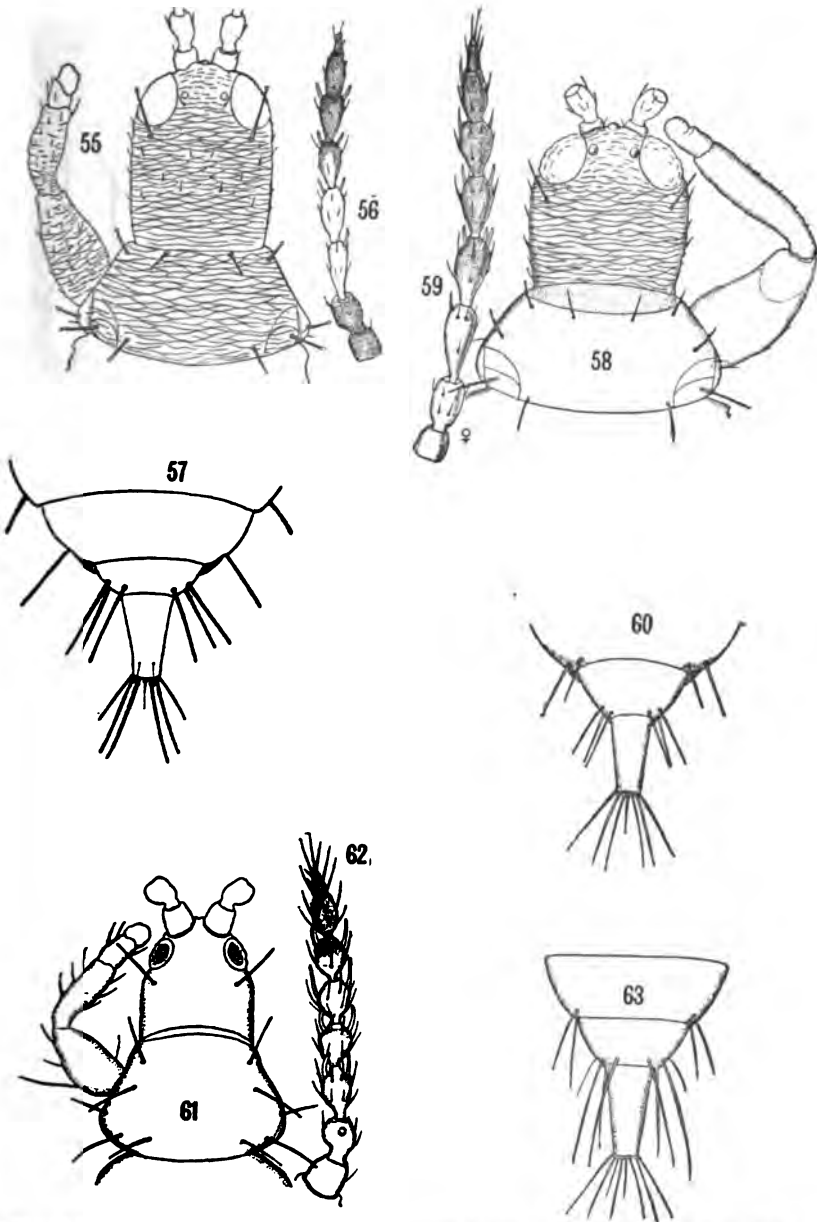
FIG. 32.—*ECHINOTHRIPS AMERICANUS*. RIGHT FORE WING OF FEMALE. FIGS. 33-37.—*RHIPIPHOROTHRIPS PUICELLUS*. 33, HEAD, THORAX, AND FORE LEGS OF FEMALE, DORSAL VIEW; 34, TIP OF ABDOMEN OF FEMALE, DORSAL VIEW; 35, LEFT ANTENNA OF MALE, DORSAL VIEW; 36, TIP OF ABDOMEN OF MALE, VENTRAL VIEW; 37, LEFT FORE WING OF FEMALE.



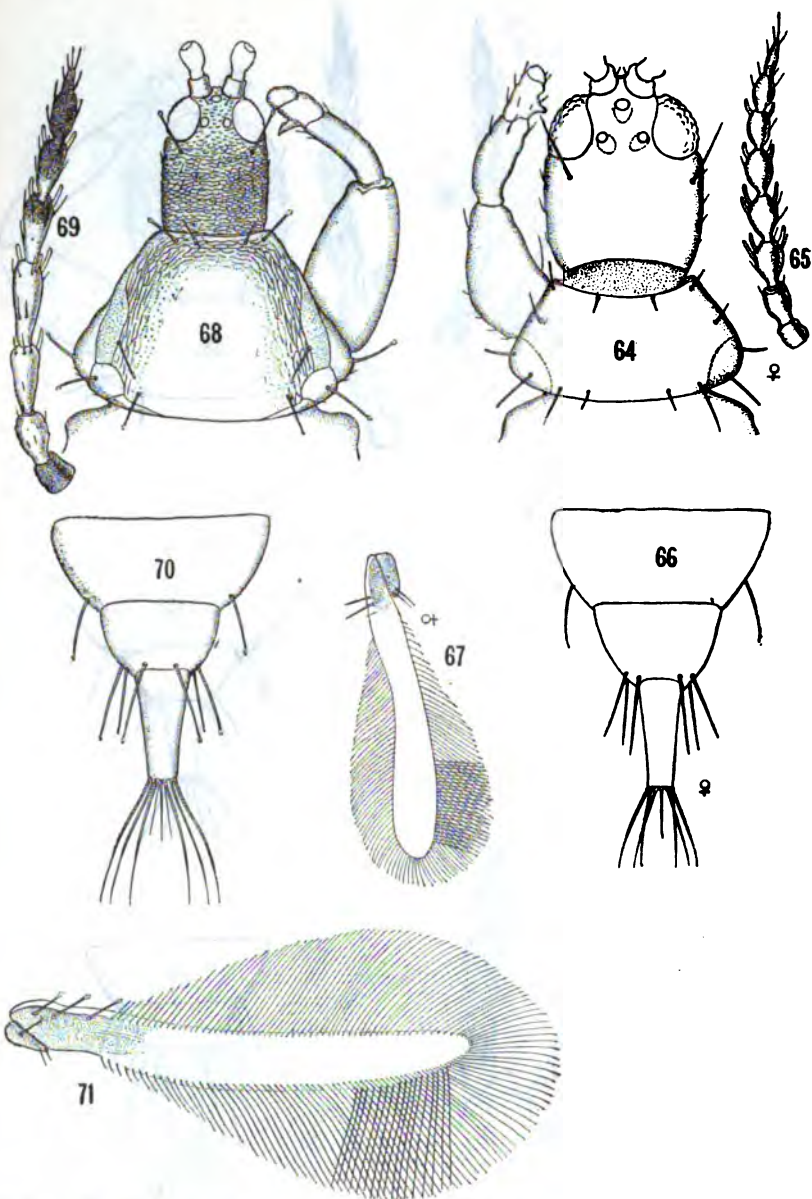
FIGS. 38-41.—*THRIPS QUINCIENSIS*. 38, HEAD, PROTHORAX, AND FORE LEG OF FEMALE, DORSAL VIEW; 39, RIGHT ANTENNA OF FEMALE, DORSAL VIEW; 40, TIP OF ABDOMEN OF FEMALE, DORSAL VIEW; 41, RIGHT FORE WING OF FEMALE. FIGS. 42-43.—*THRIPS SPINOSUS*. 42, TIP OF ABDOMEN OF FEMALE, DORSAL VIEW; 43, LEFT FORE WING OF FEMALE. FIG. 44.—*THRIPS HELIANTHEL*. LEFT FORE WING OF FEMALE.



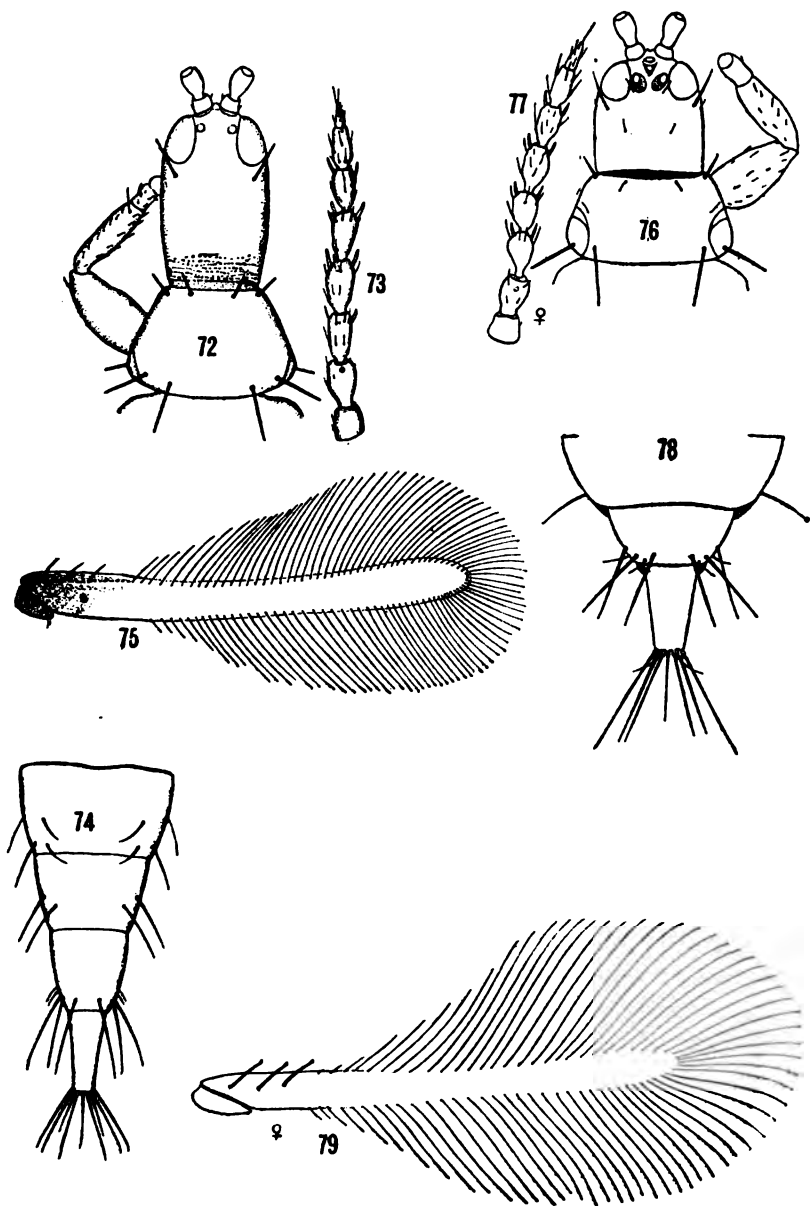
FIGS. 45-46.—*THRIPS SPINOSUS*. 45, HEAD AND PROTHORAX OF FEMALE, DORSAL VIEW; 46, LEFT ANTENNA OF FEMALE, DORSAL VIEW. FIGS. 47-49.—*THRIPS HELIANTHI*. 47, HEAD AND PROTHORAX OF FEMALE, DORSAL VIEW; 48, LEFT ANTENNA OF FEMALE, DORSAL VIEW; 49, TIP OF ABDOMEN OF FEMALE, DORSAL VIEW. FIGS. 50-54.—*TRICHTOTHRIPS FLAVICAUDA*. 50, HEAD, PROTHORAX, AND FORE LEGS OF FEMALE, DORSAL VIEW; 51, TIP OF ABDOMEN OF FEMALE, DORSAL VIEW; 52, HEAD, PROTHORAX, AND FORE LEG OF MALE, DORSAL VIEW; 53, LEFT ANTENNA OF MALE, DORSAL VIEW; 54, TIP OF ABDOMEN OF MALE, DORSAL VIEW.



FIGS. 55-57.—*TRICHOPTERIS FUSCUS*. 55, HEAD, PROTHORAX, AND FORE LEG OF FEMALE, DORSAL VIEW; 56, RIGHT ANTENNA OF FEMALE, DORSAL VIEW; 57, TIP OF ABDOMEN OF FEMALE, DORSAL VIEW. FIGS. 58-60.—*TRICHOPTERIS HOODI*. 58, HEAD, PROTHORAX AND FORE LEG OF FEMALE, DORSAL VIEW; 59, LEFT ANTENNA OF FEMALE, DORSAL VIEW; 60, TIP OF ABDOMEN OF FEMALE, DORSAL VIEW. FIGS. 61-63.—*EURYPTERIS HINDSI*. 61, HEAD, PROTHORAX, AND FORE LEG OF FEMALE, DORSAL VIEW; 62, LEFT ANTENNA OF FEMALE, DORSAL VIEW; 63, TIP OF ABDOMEN OF FEMALE, DORSAL VIEW.



FIGS. 64-67.—*TRICHTHIPS AMPLIPENNIS*. 64, HEAD, PROTHORAX, AND FORE LEG OF FEMALE, DORSAL VIEW; 65, RIGHT ANTENNA OF FEMALE, DORSAL VIEW; 66, TIP OF ABDOMEN OF FEMALE, DORSAL VIEW; 67, LEFT FORE WING OF FEMALE. FIGS. 68-71.—*HORISTOTHRIPS AUSTRALIS*. 68, HEAD, PROTHORAX, AND FORE LEG OF FEMALE, DORSAL VIEW; 69, RIGHT ANTENNA OF FEMALE, DORSAL VIEW; 70, TIP OF ABDOMEN OF FEMALE, DORSAL VIEW; 71, RIGHT FORE WING OF FEMALE.



FIGS. 72-75.—*LEPTOTHRIPS RUSSELLI*. 72, HEAD, PROTHORAX, AND FORE LEG OF FEMALE, DORSAL VIEW; 73, RIGHT ANTENNA OF FEMALE, DORSAL VIEW; 74, TIP OF ABDOMEN OF FEMALE, DORSAL VIEW; 75, RIGHT FORE WING OF FEMALE. FIGS. 76-79.—*ZYGOTHRIPS FEMORALIS*. 76, HEAD, PROTHORAX, AND FORE LEG OF FEMALE, DORSAL VIEW; 77, RIGHT ANTENNA OF FEMALE, DORSAL VIEW; 78, TIP OF ABDOMEN OF FEMALE, DORSAL VIEW; 79, RIGHT FORE WING OF FEMALE.

NOTES ON AN UNUSUALLY FINE SLAB OF FOSSIL CRINOIDS.

By R. S. BASSLER.

Curator, Division of Paleontology, United States National Museum.

A large slab of fossil crinoids just prepared for the exhibition collections in the Division of Paleontology of the United States National Museum is so unique and of such interest that it seemed to the writer worthy of some special notice. This slab belongs to the unrivaled collection of fossil echinoderms deposited in the National collections by Mr. Frank Springer, who is preparing a monograph upon *Scyphocrinus*, the genus to which the crinoids represented on the slab belong. Mr. Springer has very kindly allowed the writer free use of his notes upon this genus in preparation of the present article.

For over 50 years paleontologists have known of certain bulblike crinoidal or cystoidal bodies in late Silurian and early Devonian rocks. American specimens were described by Hall in 1879 as *Camarocrinus*, but some years before Barrande applied the name *Lobolithus* to similar objects in the Silurian rocks of Bohemia. A large number of these bodies having been accumulated in the collections of the United States National Museum, Prof. Charles Schuchert in 1904 published a full account of them in his paper on "Siluric and Devonian Cystoidea and Camarocrinus."¹ Hall regarded *Camarocrinus* as a large chambered bulb to which was attached a column bearing at its distal extremity a large crinoidal calyx with unknown characters. Schuchert arrived at substantially the same conclusion, believing that "*Camarocrinus* thus appears to be the float of an unknown crinoid that was held together after the death of the individual by the firmly interlocked double walls of the exterior and interior while the crown and stalk dropped away. Under this hypothesis the float drifted with the sea currents, was finally filled with water, and the attenuated end being heavier sank in that position to the sea bottom." Although realizing that the last word had not been said in regard to *Camarocrinus*, this author believed that the supposition that these bodies were anchored in the mud with the stalk directed upward was not in accord with the facts. In Bohemia

¹Smiths. Misc. Coll., vol. 47, 1904, pt. 2, pp. 201-272, 11 pls., 24 figs. No. 1482.

Camarocrinus (*Lobolithus*) is found associated with calices of the crinoid *Scyphocrinus*, and in 1900, Dr. F. A. Bather definitely associated these two genera as parts of one and the same organism.

No association of *Camarocrinus* and *Scyphocrinus* in America had ever been noted, although the *Camarocrinus* occurred frequently in such large numbers as to make up entire limestone layers. In Oklahoma, where these layers sometimes outcrop at the surface, cobblestone-like masses frequently strew the ground in great profusion. Since 1904 Mr. Springer has directed his efforts toward the discovery of new evidence upon *Camarocrinus*, with the result, as announced at the 1912 meeting of the Paleontological Society in New Haven, Connecticut, that he is now able to show, first, that the genus *Scyphocrinus* occurs at several horizons in the late Silurian and early Devonian of America; second, that the *Camarocrinus* bulbs are frequently connected at the distal end of the stem with crinoids belonging to the genus *Scyphocrinus*; and third, that these bulbs usually occur with the stalk end upward and not downward as before supposed. Mr. Springer will publish the evidence for these conclusions later, but a few notes regarding the slab which is the subject of the present article are in order.

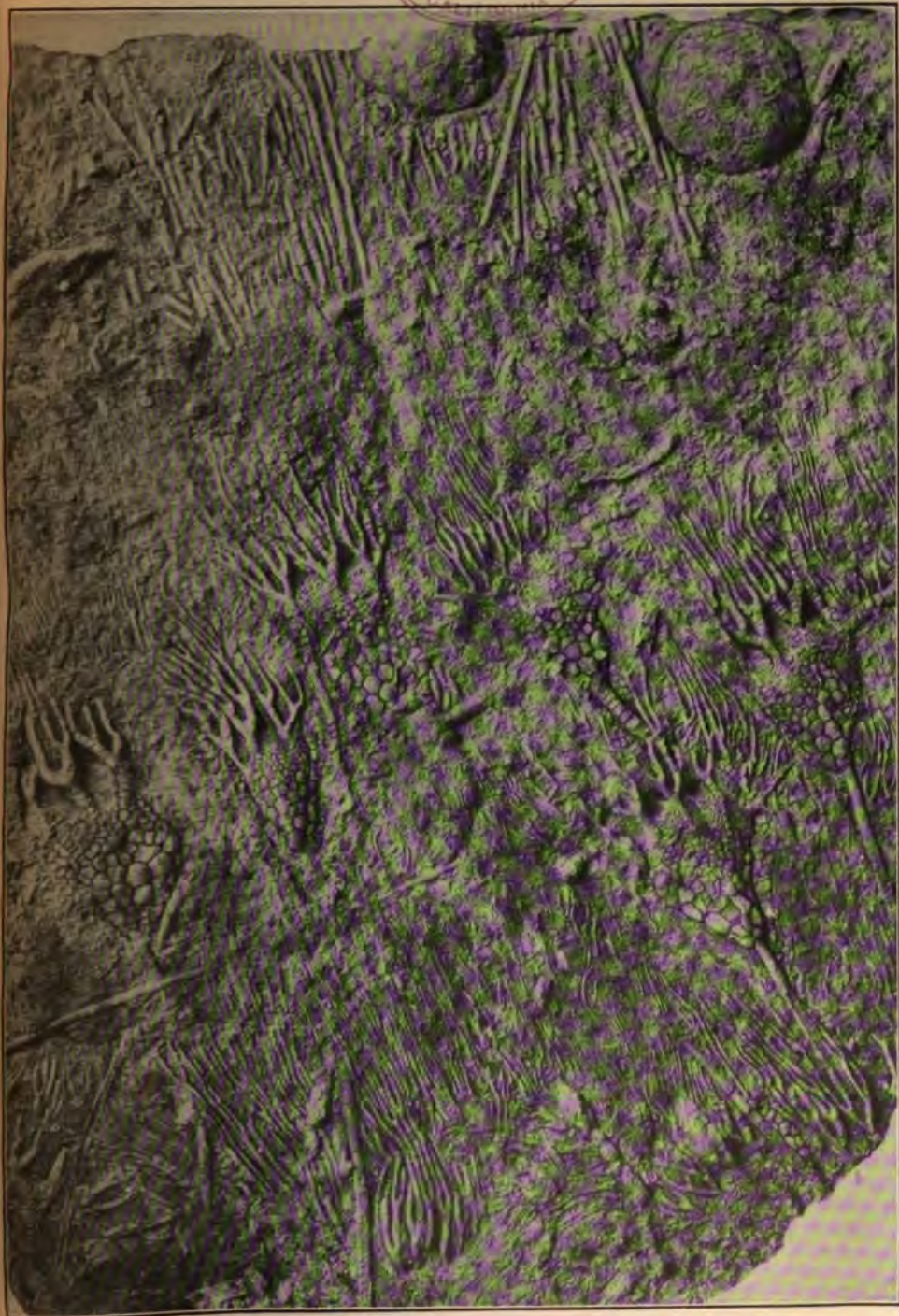
During the summer of 1904, as recorded in Schuchert's paper, the present writer observed *Camarocrinus* in the bluffs along the Mississippi River a few miles north of Cape Girardeau, Missouri, in the outcropping edge of a layer with numerous large crinoid stems. In 1911 Dr. E. O. Ulrich found a detached mass of crinoidal limestone from the same layer in which was embedded the well-preserved calyx of a large *Scyphocrinus*. These discoveries were so promising of favorable results that Mr. Springer asked his private collector, Mr. Frederick Braun, to carefully examine this general area in the hope of finding the fossiliferous bed at some place sufficiently exposed for careful collecting. After a protracted search along the bluffs facing the Mississippi River, Mr. Braun finally succeeded in locating the crinoidal layer at a point where he could carry on quarrying operations. Here several weeks' work resulted not only in some most remarkable specimens of crinoid, but in settling finally the facts upon which the interpretation of *Camarocrinus* must depend. The work was of no small difficulty, as the physical obstacles were formidable. The layer could be readily traced but it was not everywhere fossiliferous, and as the crinoids occurred only on the lower side a place had to be found where there was a soft seam underneath along which the fossiliferous stratum would readily separate from the one next below. The fossiliferous part of the layer proved to be limited to a small area which contained the remains of a thickly crowded crinoid colony suddenly killed by some change in the water and embedded in the soft muddy sea bottom without material disturbance by currents.

Four large slabs ranging from 500 to 1,500 pounds weight each and a number of smaller pieces were selected, the whole weighing 4,500 pounds. Two of the slabs fit together, forming a single one of about 4 by 7 feet, containing the most important specimens. This is the slab now on exhibition in the United States National Museum. The remaining specimens have been prepared and form a part of the study series.

The locality was a number of miles distant from any station or landing, and it was necessary to transport lumber to make strong packing cases for the slabs, embedding them in plaster to insure the specimens from injury in handling. A chute was then constructed to slide the cases down with ropes and tackle from a rock levee to the water's edge, about 35 feet distant, where they were shipped on a passing river steamboat. Upon their arrival at the National Museum it was necessary to clear away the adherent clay with fine tools before the specimens could be seen or studied. In addition a large amount of time was consumed in removing the more or less hard calcareous matrix composed of innumerable arm and pinnule joints forced down between the arms of the specimens and firmly cemented by pressure.

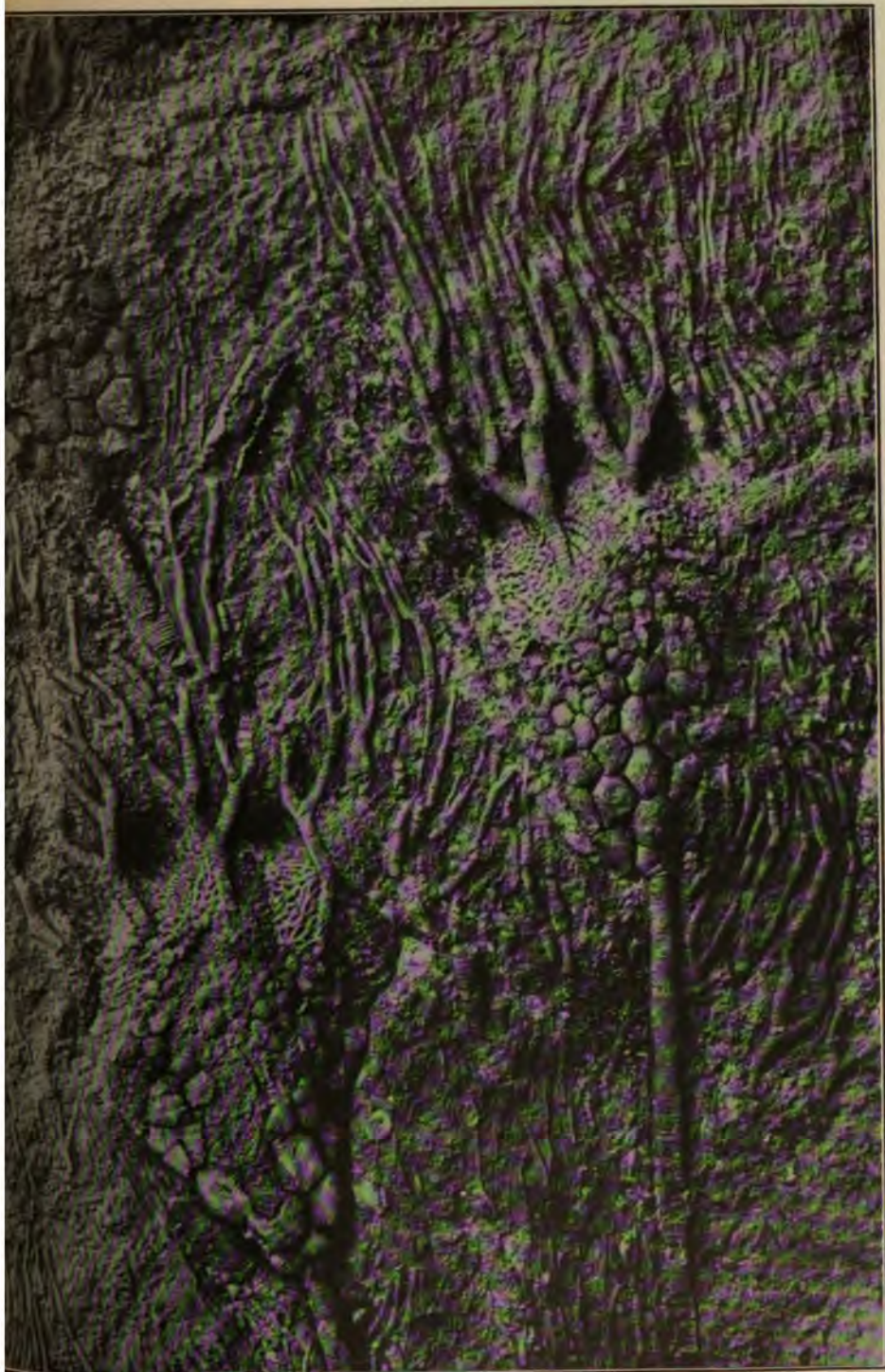
The principal slab, of which a portion, one-sixth natural size, is shown on plate 1, contains 18 complete crowns, several of them with the stem attached for part of its length. Some have the calyx fairly rotund, but most of them are considerably flattened and often much distorted by contact with the *Camarocrinus* bulbs noted below. All have the strong, many-branched arms intact and often upward of 12 inches long. Two of the smaller but more complete calices, one-half natural size, are shown on plate 2. Besides these crowns several sets of arms are partly visible, belonging to calices which are entirely buried, either under other individuals or in the limestone matrix, which becomes firm and hard a short distance inward. Some parts of the slab are covered with a dense mass of stems lying parallel like stalks of grain in a sheaf, and many of the crowns lie with their arms pointing in the same direction, as if they had fallen over in the mud at the same time under the common impulse of a gentle current. Intermingled with the crowns and stems forming the chief remaining portion of the crowded surface are numerous *Camarocrinus* bulbs; some of them are well exposed and appear of good size, while in many cases only a part can be seen protruding among the other objects. All of them are considerably flattened and some much fractured from the pressure of the overlying mass of arms of the compact limestone deposit forming the main thickness of the heavy layer.

This slab has been mounted on a flat-topped glass-covered base and has been installed at the west end of the hall of Invertebrate Paleontology. Here the specimen serves a twofold purpose—first, in showing one method of fossilization, and, second, as an introduction to the biologic exhibit of fossil crinoids.



SLAB OF SCAPHOCRINUS. (ONE-SIXTH NATURAL SIZE.)

FOR EXPLANATION OF PLATE SEE PAGE 59.



TWO COMPLETE CALICES OF SCAPHOCRINUS. (ONE-HALF NATURAL SIZE.)

FOR EXPLANATION OF PLATE SEE PAGE 59.

NEW PARASITIC HYMENOPTERA OF THE GENUS EIPHOSOMA.

By T. D. A. COCKERELL,
Of the University of Colorado, Boulder.

The genus *Eiphosoma* consists of Ophionine Ichneumonidæ in which the stigma is elongate, the abdomen long and slender, and the hind femora toothed. It is a characteristic member of the Neotropical fauna, but Brues has recorded *E. septentrionale* from as far north as Pennsylvania. A species collected last year by my wife in Guatemala is found on examination to be new, and when comparing it with the material in the United States National Museum I have found three other species to be described. Brues¹ has given a table of the species occurring in North and Central America; with the new species added, this table may be modified as follows. I omit *E. pyralidis* Ashmead, which is the type of a distinct genus *Brachiziphosoma* Viereck. This *B. pyralidis* is a characteristic member of the Nearctic fauna, having been described from Missouri, and being represented in the National Museum from Agricultural College, Michigan (A. J. Cook), Nyack, New York (Zabriskie), and Ithaca, New York.

Metathorax with only a median black line or band, ² the suture bounding it anteriorly often black, this black sometimes widened laterally, forming a claviform spot.....	1
Metathorax with lateral black markings, not connected with the anterior suture..	7
1. Mesopleura with a black spot or oblique line or band.....	2
Mesopleura entirely yellow, areolet present.....	6
2. Posterior tibiæ entirely honey yellow; areolet wanting.... <i>nigrovittatum</i> Cresson.	
Posterior tibiæ largely black.....	3
3. Wings broadly fuliginous at apex; areolet absent..... <i>schwarzi</i> , new species.	
Wings hyaline at apex, or with a faint cloud; areolet present.....	4
4. Wings milky; areolet very minute, not longer than its petiole. <i>lacteam</i> , new species.	
Wings not milky.....	5
5. Length about 12 mm.; wings somewhat dusky at tip; species of Pennsylvania.	
<i>septentrionale</i> Brues.	
Much larger; wings wholly clear; species of Mexico and Central America.	
<i>mexicanum</i> Cresson.	

¹ Psyche, vol. 18, p. 21.

² A ootype of *E. mexicanum* in the U. S. National Museum has minute black spots on extreme lateral margins, so I have placed this species under both categories. According to Cameron it is variable and widely distributed.

6. Abdomen with large black clouds on fourth and sixth segments; lateral pieces of male genitalia shaped like the end of a finger.....*vitticollis* Cresson
Abdomen without black clouds on fourth and sixth segments; lateral pieces of male genitalia spoonlike*motaguense*, new species.
7. Wings entirely hyaline..... 8
Wings tipped with dilute fuliginous..... 10
8. Metathorax black, with four yellow stripes.....*tezanum* Cresson.
Metathorax yellow, with the median excavated space and a line or spot on each side black..... 9
9. Small, anterior wing under 5 mm. long; Cuba; also collected by Busck at Bayamon, Porto Rico.....*annulatum* Cresson.
Much larger; anterior wing about 10 mm. long; Mexico and Central America
mexicanum Cresson.
10. Hind tarsi and tibiae yellow; metathorax with three black stripes.
atrovittatum Cresson.
Hind tarsi and tibiae with much black..... 11
11. Length about 17 mm.; wings hyaline except for apical cloud*aztecum* Cresson
Length over 25 mm.; wings conspicuously dusky.....*forte*, new species.

EPIPHOSOMA SCHWARZI, new species.

Female.—Length about 11 mm. Anterior wing about 5½ mm.; structure and general type of markings as usual in the genus; wings clear hyaline, broadly fuliginous at tip, the areolet entirely absent; first recurrent nervure with a strong double curve; antennæ black, yellow at base beneath; ground color of head and thorax light chrome yellow; face wholly yellow below antennæ; mandibles dark red at the sharply bidentate apex; ocellar region, middle of front and occiput black; mesothorax black with an elongated U in yellow, the lateral black lobes smooth and hardly punctured except in front; scutellum yellow; mesopleura with an oblique black band; metathorax yellow with a broad median band, which does not reach the base; anterior and middle legs light ferruginous; hind femora red with a blackish shade toward base, and a dark saddle-like mark before apex, the single tooth below this cloud; hind tibiae with more than the median third ferruginous, the rest black; hind tarsi black; abdomen nearly as in *E. mexicanum*, but first joint rather shorter in proportion, and joints beyond middle clouded with black.

Habitat.—Cacao, Trece Aguas, Alta Vera Paz, Guatemala, April 14, 1906 (Barber and Schwarz).

Type.—Cat. No. 15678, U.S.N.M.

EPIPHOSOMA LACTEUM, new species.

Female.—Length about 9.5 mm. Anterior wing a little over 5 mm.; structure and markings ordinary, but wings milky hyaline, very white, with the areolet long, petiolate and excessively minute; antennæ black, yellow beneath at base, and the first three flagellar joints narrowly ringed with pale at apex below; ground color of head and thorax rather pale yellow; mesothorax black with sublateral and

marginal yellow bands, the lateral black areas strongly punctured all over; scutellum yellow; mesopleura with a broad black band; metathorax with a broad median black band, in the middle of which is a deep narrow sulcus; at anterior corners of metathorax is a quadrate black patch; anterior and middle legs light ferruginous; hind legs peculiarly colored, their trochanters with femora having the basal half black, interrupted by a cream-colored annulus, which becomes an elongated stripe beneath its apical part on the femur; beyond the black the femora are swollen, with chestnut red, with a black subapical saddle and the apex cream color; the single tooth is below the beginning of the subapical black; hind tibiae black with a broad yellowish white annulus; hind tarsi black; abdomen ferruginous, strongly blackened dorsally; apex of second segment above broadly ferruginous.

Habitat.—Minatitlan, Mexico, February 1, 1892 (H. Osborn).

Type.—Cat. No. 15679, U.S.N.M.

EPHOSOMA MOTAGUENSE, new species.

Male.—Length about 17 mm. Anterior wing about 8 mm.; structure and markings ordinary, but mesopleura clear yellow without dark markings; head and antennae colored as in *E. lacteum*; ground color of head and thorax lemon yellow; mesothorax with three broad black bands, the lateral ones rather sparsely punctured and nearly reaching the anterior border; scutellum yellow; metathorax with a median black band, and the suture anteriorly bounding it black; areolet petioled, but rather large; apex of the anterior wings with a very faint dusky tint, hardly noticeable; anterior and middle legs pale ferruginous, yellow basally; hind legs with first trochanters ferruginous, second cream colored, each blackened or darkened above; hind femora rich chestnut red, broadly black above near base and with a large black subapical saddle, beyond which, on upper side, is a pallid patch; the single spine formed as usual, well developed; hind tibiae black with the middle broadly ferruginous, especially beneath, their tarsi black; abdomen deep ferruginous, segments 4 to 7 without black patches.

Habitat.—Quirigua, Motagua Valley, Guatemala, 1912 (Wilmatte P. Cockerell).

Type.—Cat. No. 15680, U.S.N.M.

EPHOSOMA FORTE, new species.

Male.—Length about 28 mm., anterior wing about 15 mm.; structure and markings ordinary, but size very large and black on thorax greatly developed; ground color of head and thorax reddish-yellow; teeth of the bidentate mandibles black; flagellum of antennae black; mesothorax black with yellow subdorsal and lateral stripes, the

subdorsal expanded anteriorly, the expanded part smooth, punctate only along its upper margin; the black areas of mesothorax coarsely but not very closely punctate; sides of thorax with a broad-margined black triangle, which would be open on the inferior posterior side but for a large black patch placed before the opening; scutellum honey-yellow; metathorax broadly black at base, with also a broad black median band, expanded apically, and the sides broadly black; wings strongly brownish, the apices dilute fuliginous, areolet large and transversely elongate, briefly petiolate; anterior and middle legs light ferruginous, yellow basally; hind legs with the first trochanters black, ferruginous at the pointed apex above, second trochanters ferruginous above and broadly yellow beneath; femora very black, except at apex and extreme base, but a dark red narrow stripe above and most of the under side broadly dark red, the single tooth very strong, placed as usual; hind tibiae reddish yellow, broadly black at base and apex, their tarsi black; abdomen with a black stripe above; basal half of first segment reddish-yellow; sixth and seventh segments with a large black or blackish saddle; lateral plates of genitalia large, elongated, parallel sided, the basal half red, the apical half black.

Female.—Similar to the male except in the usual generic characters; areolet smaller; subapical abdominal segments black above but without the broad saddle-like patches.

Habitat.—Mexico, one of each sex, the female labeled 384. The male is the type. No other data are available.

Type.—Cat. No. 15681, U.S.N.M.

Eiphosoma Cresson has been altered to *Xiphosoma* by certain authors,¹ but this is contrary to the rules, and also impossible on account of the long prior use of the name *Xiphosoma* by Spix for a reptile.

I am much indebted to Mr. S. A. Rohwer of United States Bureau of Entomology for references to literature and other assistance.

¹ See Krieger, *Zeitschr. Hym. Dipt.*, vol. 3, p. 201; Szépligeti, *Genera Insectorum, Hymenoptera, Ophionidae*, p. 4.

NOTES ON A COLLECTION OF FISHES FROM THE ISLAND
OF SHIKOKU IN JAPAN, WITH A DESCRIPTION OF A
NEW SPECIES, GNATHYPOPS IYONIS.

By DAVID STARR JORDAN and WILLIAM FRANCIS THOMPSON,
Of Stanford University, California.

The museum of Stanford University has received a small collection of fishes, made by Mr. Yoshiro Manabe, teacher of biology in the Kwansei Gakuin (College) at Kobe. The specimens were obtained from Yawatahama, a village on the coast of the Province of Iyo, which occupies the northwestern part of the large island of Shikoku. The collection has been sent to the United States National Museum.

Family EQUULIDÆ.

LEIOGNATHUS RIVULATUS (Temminck and Schlegel).

One young specimen.

Family OPISTHOGNATHIDÆ.

GNATHYPOPS IYONIS Jordan and Thompson, new species.

Description of the type No. 74763, United States National Museum, a female specimen 74 mm. in total length, from Yawatahama, Iyo, Japan, collected by Yoshiro Manabe, a former student of Stanford University.

Head $3\frac{2}{3}$ in body length to base of caudal; depth $4\frac{1}{2}$; eye 4 in head; snout $5\frac{1}{2}$; interorbital space 13; maxillary $1\frac{1}{2}$; dorsal rays XI, 13; anal rays II, 14; scales in lateral series 47; gill-rakers $10 + 21$; height of dorsal spine $4\frac{1}{2}$ in head; of longest dorsal ray $2\frac{1}{2}$; of pectoral 2; of ventrals $1\frac{1}{2}$; of caudal $1\frac{1}{2}$; depth of caudal peduncle $3\frac{1}{2}$.

Body compressed, with little slope in dorsal profile either anteriorly or posteriorly; maxillary extending to within a third of eye diameter from the preopercular angle, its tip not rounded, nor truncate, but broadest an eye diameter before tip, this condition caused by the large supplementary bone, the length of which is equal to the diameter of the eye and which does not extend to tip of maxillary proper; tip of latter very flexible; short snout, strongly curved downward from

between eyes; latter half length of post orbital part of head, looking upward and outward; interorbital space very narrow, concave. Tongue small, free, its tip rounded. Teeth all minute, the outer in jaws slightly enlarged; teeth present in pharynx; upper jaw with a pair of oval patches at symphysis, extended along anterior half as a single row; lower jaw similar; outer teeth very slightly enlarged. Vomer with a few small teeth. Roof of mouth with widely set, minute papillæ.

Scales absent on head, nape and above pectorals, and in gradually narrowing area to below first ray of soft dorsal, and thence in a narrow line along dorsal base to caudal; upper edge of caudal peduncle thus left naked; pectoral base, breast and caudal base also naked. Dorsal surface of head, suborbitals and snout thickly dotted with pores; especially large ones at upper angle of gill slit, on mandible and preopercular limbs; those of lateral line in double row anteriorly, frequently

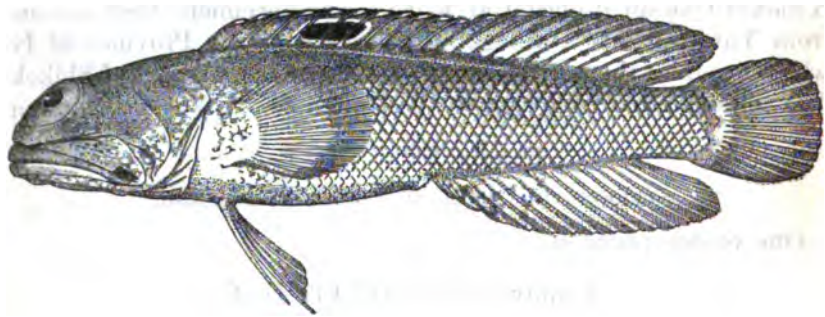


FIG. 1.—*GNATHYPOPS ITONIS* JORDAN AND THOMPSON; FROM THE TYPE.

single posteriorly. Lateral line extending along base of dorsal to eighth soft ray, discontinuous, however, on one side.

Dorsal fin continuous, last dorsal spine but slightly lower than first ray; spines subequal throughout; soft rays longest posteriorly. Anal similar to soft dorsal, inserted opposite its first ray. Caudal rounded, as is pectoral. Ventrals with two simple, somewhat elongate rays.

Color plain, olivaceous, save for a large oval black spot narrowly margined with white between fifth and eighth dorsal spines, and a deep black spot on inner side of maxillary tip on membrane connecting it with mandible. Spinous dorsal narrowly edged on rays with white, on membranes with dark. Scales with darkened margins, save on belly. Dorsal surface of head dusky. Pectorals, ventrals, caudal, and anal colorless.

This species is readily known from the other Japanese species, *Gnathypops hopkinsi* and *G. evermanni* by the naked area above the pectorals, by the much smaller outer teeth, by the peculiar coloration and the measurements.

The flexible, projected tip of the maxillary places it in the extreme of the genus, approaching *Opisthognathus*. From other species of the genus, it is distinguished by the minute teeth, the outer scarcely enlarged, not canine. Other characters are the very porous skin of the head and the naked breast and shoulders. These characters separate it from the fifteen other species of the genus *Gnathypops* in Asiatic, Australian, and East Indian waters as far as can be judged by descriptions and figures. All the American species have the teeth more enlarged.

Family CHAMPSODONTIDÆ.

CHAMPSODON VORAX Günther.

A specimen 94 mm. long differs from the plate given by Günther in the "Shore Fishes" of the *Challenger* Expedition, in having the anterior rays of the second dorsal elevated, the second ray being half the length of the head instead of a third. Other specimens in the Stanford University Collection from Wakanoura show intergradations, however, and we do not venture to separate the common Japanese species from the East Indian *Champsodon vorax*.

Family SCORPÆNIDÆ.

PTEROIS LUNULATA Temminck and Schlegel.

One small specimen, typical.

Family HOPLICHTHYIDÆ.

HOPLICHTHYS LANGSDORFII Cuvier and Valenciennes.

A specimen showing the typical two-spined body scutes as in the plate given by Cuvier and Valenciennes, beside numerous other char-

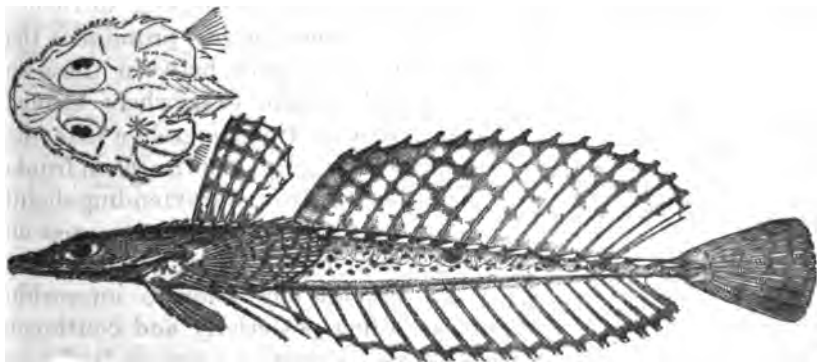


FIG. 2.—HOPLICHTHYS REGANI JORDAN.

acters separating it from the other Japanese species of *Hoplichthys*, *H. gilberti*, and *H. regani*.

It agrees entirely with specimens from Misaki, of which a description follows:

Head $3\frac{1}{2}$ in body length to base of caudal; breadth of head (including spines) $3\frac{1}{2}$; eye $4\frac{1}{2}$ in head; snout 3; maxillary $3\frac{1}{2}$; D. VI 15; A. 17; pectoral 15; lateral scutes, 27.

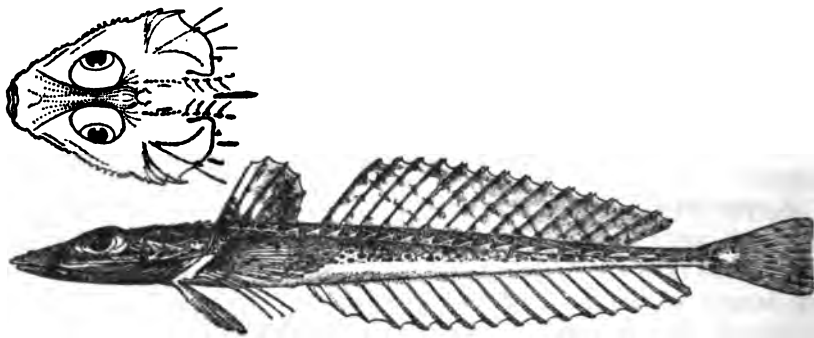


FIG. 3.—*HOPLICTHYS GILBERTI*.

Head armature well developed, all ridges serrated, spines long and prominent; facial margins strongly serrated, each side with four marginal divisions less prominent than in *H. regani*, separated by slightly invaginated short smooth areas, each division with antrorse anterior spines and posteriorly directed posterior spines, the last spine longest and strongest, save those on tip of snout; the sharp thin edge nowhere completely interrupted, its height

in posterior division $4\frac{1}{2}$ in longitudinal diameter of eye; distance between eye and preorbital margin contained two in length of eye; two serrate ridges on upper edge of preorbital well developed, serrations somewhat less prominent than in *H. gilberti*; space between these and preorbital margin everywhere strongly concave, a continuous groove extending along both ridges; smooth area in front of orbit $\frac{1}{3}$ length of eye, and extending slightly more than half way to snout; preocular ridges therefore diverging less than in any other species now known; interorbital

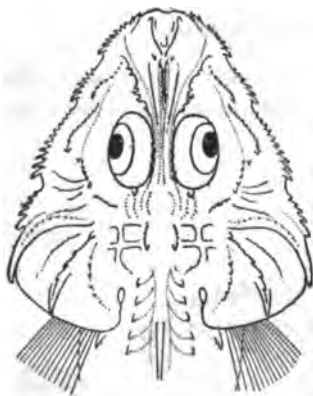


FIG. 4.—*HOPLICTHYS LANGSDORFFII*.

space deeply concave, groove spreading posteriorly and continuous with concave space between "nuchal" spines; a "postocular" spine comparatively well developed, as are the "nuchal"; spines at angle of mouth well developed; preopercle with two spines, outer short, less than one-third length of larger; opercle with two spines, smaller than inner preopercular one, and with but three main ridges. Dorsal

lateral scutes broader than length of eye, ventral lobe being half of same; two well-developed spines on each scute, the upper larger. Spinous dorsal low, longest spine equal to length of eye, not reaching insertion of second dorsal when supine; soft dorsal highest anteriorly, third ray $2\frac{1}{2}$ in head; soft dorsal inserted $\frac{3}{4}$ diameter of eye posterior to anal; latter's rays longest in center, $1\frac{1}{2}$ times eye diameter; longest free pectoral ray shorter than tip of pectoral by length of snout; in largest specimen four free pectoral rays present, in smaller three; tips of pectorals reaching seventh anal ray.

Color of spinous dorsal dusky on distal half, margin colorless; pectorals somewhat spotted; indistinct traces of spots on body and orbital area, but color of body nearly completely faded.

In the paper of Jordan and Richardson¹ the existence of two well-defined species of *Hoplichthys* in Japan was made evident. One of these was wrongly identified as the original *Hoplichthys langsdorffii* of Cuvier and Valenciennes. The other was named *Hoplichthys gilberti*. (Fig. 3.)

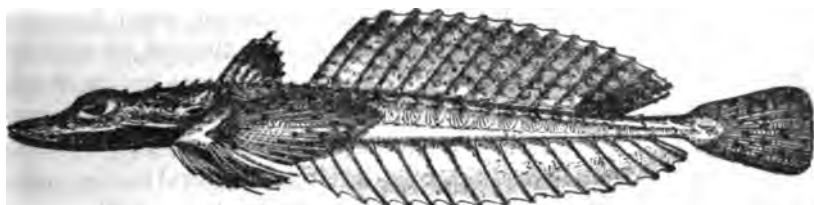


FIG. 5.—*HOPLICHTHYS LANGSDORFFII* TEMMINCK AND SCHLEGEL.

In a personal letter of the same year, Mr. Regan informed Doctor Jordan of the existence of a third species, not known to Jordan and Richardson, and that this third species is the original *Hoplichthys langsdorffii*. This opinion seems to be correct, and in this paper we describe and figure the true *H. langsdorffii*. (Figs. 4 and 5.) In the American Naturalist for December, 1908, Doctor Jordan renames the species described and figured by Jordan and Richardson under the erroneous name of *Hoplichthys langsdorffii*, calling it *Hoplichthys regani* Jordan. (Fig. 2.)

The following analysis will facilitate the discrimination of the species.

Key to Japanese species of Hoplichthys.

- a¹. Under side of head with a tuft of strong spines at the outer posterior angle of each mandible; lateral facial edges strongly lobed and with strong curved spines; lower spine of lateral scutes very obscure. Anal rays 16.....*regani*.
- a². Under side of head without spines; lateral facial edges scarcely lobed; rather weakly serrated, except posteriorly; anal rays 17 or 18.
 - b¹. Lateral scutes each with two well-developed spines.....*langsdorffii*.
 - b². Lateral scutes, each with the lower spine very minute or hidden...*gilberti*.

Family PLATYCEPHALIDÆ.

ONIGOCIA Jordan and Thompson, new genus.

Onigocia JORDAN and THOMPSON, new genus of Platycephalidæ; type, *Platycephalus macrolepis* Bleeker.

ONIGOCIA MACROLEPIS (Bleeker).

Two young examples.

The genus *Thysanophrys* Ogilby, as left by Jordan and Richardson,¹ should apparently be further subdivided. The present species is the type of a distinct group, characterized by the presence of large scales (about 40 in lateral line), three preopercular species and a small cirrus over the eye. This genus may be called *Onigocia* from the Japanese name *Onigochi* (devil flat-head) applied to *Onigocia spinosa*, the second Japanese species of the same genus.

Of the other generic types heretofore included under *Thysanophrys*, *Insiadiator* Jordan and Snyder (*meerdervoorti*—*rudis*) differs in the small scales and in the absence of cirri over the eye. *Thysanophrys* proper of Australia and the East Indies (*longiceps*, etc.) has small scales (about 75 to 90), a well-marked cirrus over the eye, an unarmed lateral line, and but two preopercular spines. *Grammoplites* Fowler (*scaber* and other East Indian species) has the lateral line armed throughout with spines. The remaining Japanese species (*japonicus*, *crocodilus*) differ from *Grammoplites* in having the lateral line unarmed. These may constitute the new genus, *Inegocia* Jordan and Thompson, of which the type is *Platycephalus japonicus* Krusenstern.

Inegochi means Rice-kochi or flat-head. Kochi is the general name in Japanese for all Platycephalidæ and Callionymidæ.

Family GOBIIDÆ.

PTEROGOBUS ELAPOIDES (Günther).

A single example of this species, partly intermediate in characters between *Pterogobius elapoides* Günther and *P. daimio* Jordan and Snyder. The body bands are rather those of *P. daimio*, the width of the black of the third body band being contained but two times and a half in the space intervening between it and the next. At the base of the caudal on one side is a band nearly as long as the caudal peduncle is deep, while on the other it is merely an oblong spot half that length. In this regard as in all other characters except the breadth of the lateral band this specimen is typical of *P. elapoides*. It is a female with large, ripe ova, and short dorsal fin.

The question as to the relations of the forms called *daimio* and *elapoides* is still unsettled. Jordan and Snyder regarded the two as different, the form called *daimio* being the southern representative

¹ Proc. U. S. Nat. Mus., vol. 33, 1906, p. 631.

of the other. Their material seems to bear out this conclusion, for both sexes are represented in both forms. Mr. Regan and later Snyder have concluded that *daimio* is the male and *elapoides* the female. This seems, however, not to be the fact. Of 18 specimens before us, typical of *Pterogobius daimio*, 11 are females, and 7 are males. In these portions only of the gonads remain, corroborating the fin characters, given below, in each case. Microscopic examination was necessary to decide the sex. None of these have a bar across the base of the caudal, as is typical of *P. elapoides* Günther. The male has a much more elongated spinous dorsal than the female, and longer soft dorsal rays, as well as darker vertical and ventral fins. The anal is narrowly edged with white. The differences between the nominal species *P. daimio* and *P. elapoides* seem to be the presence in the latter of an additional bar across the caudal base, vertical body bands, broader in specimens of the same size. The last-named characters intergrade.

Since the original description of *Pterogobius daimio* by Jordan and Snyder, Regan¹ has expressed the opinion that the brightly colored *P. daimio* is the male of *P. elapoides*, the other alleged characters entirely intergrading. Snyder² admits that the two species represent each a distinct sex but fails to find that the characters intergrade, and says further that "in our collecting the sexes were not found together, and the male specimens (*daimio*) far outnumber the females (*elapoides*)." Among the cotypes of *P. daimio* Jordan and Snyder, 7 are females with unripe ovaries, 1 a male, while 1 eviscerated is apparently a female, judging by the height of the dorsal fin. It is evident, however, that the sexes are both present in each form, and that they are apparently not of like distribution, *P. elapoides* ranging farther north. At the same time some characters intergrade, as is evident in the specimen from Yawatahama, and for the present we may regard the question as to whether *Pterogobius daimio* is a distinct species as still unsettled. The probabilities are that it is the northern type or subspecies, although the two meet at Misaki.

The table of measurements show that the dorsals of *P. daimio* are much higher than in *P. elapoides*, the dorsals in the female being higher than those in the male in the latter form.

The head in both forms forms 0.27 to 0.29 of body length. The spinous dorsal in the male *daimio* is 0.37 and 0.42 in two examples; in the female of *daimio* 0.25, 0.26, 0.26, 0.28, 0.29 in five examples. In the male of *elapoides* it is 0.25, 0.25, 0.25 in three examples; in the female 0.18, 0.21, 0.22 in three. The soft dorsal in the male *daimio* averages 0.18; in the female 12; in male *elapoides* 0.13; in the female 0.115. The fin rays and body measurements do not differ. The

¹ Annals and Magazine of Natural History, ser. 7, vol. 15, January, 1905, p. 22.

² Proc. U. S. Nat. Mus., vol. 42, 1912, p. 443.

scales average larger in *daimio*, 0.82, 0.84, 0.85, 0.87, 0.90, 0.90, 0.90, 0.92, while in *elapoides* we count 0.85, 0.85, 0.92, 0.94, 0.95, 0.95.

In Southern Japan, *P. elapoides* is rare, being recorded only from Misaki and Iyo.

DORYPTENA TANEGASHIMAE (Snyder).

A specimen 90 mm. long, the color poorly preserved, showing but slight traces of the typical cross bands. The caudal fin is black; the pectorals very dark, with their pattern distinct, however; the dorsal spines slightly filiform and long ($1\frac{1}{2}$ in head), dorsal rays VI-14; anal rays 12. These are all very slight differences, and a direct comparison with the cotypes shows no specific distinctions.

A NEW NEMATODE, *RICTULARIA SPLENDIDA*, FROM THE COYOTE, WITH NOTES ON OTHER COYOTE PARASITES.

By MAURICE C. HALL,

Of the Bureau of Animal Industry United States Department of Agriculture.

The coyote, as a carrier of parasites, may be looked upon, for most purposes, as a common dog running wild. All the available evidence indicates that parasites of either the coyote or the dog could certainly be transmitted, under favorable conditions, to the other animal. The parasites of the coyote have, therefore, practically the same considerable economic importance that those of the dog have. If they are detrimental to the coyote, it would be to our interest to see that they are permitted to thrive, provided it were feasible to do so. It is not always feasible or desirable, for the reason that the coyote may transmit such parasites, directly or indirectly, to dogs, to the injury of the dogs and of other animals in which some of these parasites may pass intermediate stages of their life-history.

Whether the parasite described below has any pathological, and hence economic, significance is not known. Its remarkable armature and mouth structure, and the fact that other species of the same genus have been reported as red when collected, a thing suggestive of a blood-sucking habit, indicate that the worm may be quite injurious to its host. On the other hand, species and specimens of the genus involved are comparatively rare, so that there is little evidence at present to show that the worm has any particular economic significance.

Superfamily **STRONGYLOIDEA** Weinland, 1858.

Superfamily diagnosis.—Meromyarian or polymyarian. Males with a caudal bursa supported by rays; in forms near the outer limit of the superfamily the bursa is occasionally very small and the rays atypical, or the bursa may be lacking altogether, the species in question being only referable to this superfamily on the ground that transitional, but recognizably strongyle forms, found at times in the same locations and with the same habits, relate them to it. Esophagus without posterior bulb. Mouth naked or with a buccal capsule and six papillæ

distinct or indistinct. Male usually with two spicules and female usually with two ovaries. Oviparous, viviparous, or ovoviviparous.

Type family.—Strongylidæ Cobbold, 1864.

Weinland proposed the Strongyloidea as a family, but the name is in the form now used for the superfamily and it is erected as a superfamily in this paper.

Family STRONGYLIDÆ Cobbold, 1864.

Family diagnosis.—Strongyloidea: Meromyarian. Caudal bursa well developed and with each lateral lobe supported by six rays. Buccal capsule present or absent; when present, slightly or well developed. Oviparous; eggs segmenting when laid. Embryo usually rhabditiform. In digestive, rarely in respiratory system.

Type genus.—*Strongylus* Mueller, 1780.

Subfamily STRONGYLINÆ Railliet, 1903.

Subfamily diagnosis.—Strongylidæ: Buccal capsule well developed. Parasites of the digestive, rarely of the respiratory tract.

Type genus.—*Strongylus* Mueller, 1780.

Subfamily TRICHOSTRONGYLINÆ Leiper, 1908.

Subfamily diagnosis.—Strongylidæ: Buccal capsule lacking or only slightly developed. Parasites of the digestive tract.

Type genus.—*Trichostrongylus* Looss, 1905.

Family METASTRONGYLIDÆ Railliet and Henry, 1910.

Family diagnosis.—Strongyloidea: Polymyarian. Buccal capsule present or lacking. Caudal bursa present or absent; when present, frequently atypical in structure and number of rays. Oviparous, with eggs in variable stages when laid, ovoviviparous or viviparous. Embryo not rhabditiform (not known for Rictulariinae). In respiratory and circulatory systems, rarely in digestive.

Type genus.—*Metastrongylus* Molin, 1861.

Subfamily METASTRONGYLINÆ Leiper, 1908.

Subfamily diagnosis.—Metastrongylidæ: Bursa well developed and conforming in general to the strongyle type. Eggs in varying stages of development when laid. In respiratory and circulatory systems.

Type genus.—*Metastrongylus* Molin, 1861.

Subfamily PSEUDALINÆ Railliet and Henry, 1909.

Pseudalins RAILLIET AND HENRY, 1910.

Subfamily diagnosis.—Metastrongylidæ: Bursa much reduced or lacking; when present, with few and atypical rays. Mouth with or without buccal capsule. Viviparous. Parasites of the respiratory and circulatory apparatus.

Type genus.—*Pseudalius* Dujardin, 1845.

I have followed Railliet and Henry (1910) in grouping the two subfamilies just given under the *Metastrongylidæ*, the family created by them for these subfamilies on the ground that they have the same musculature. It should be noted, however, that Schneider (1866) puts *Pseudalius* in the *Holomyaria*, which are related to the *Mero-myaria*, and Railliet (1895) has listed *Pseudalius* as a meromyarian of holomyarian form. Not being in a position to pass on the question, I have followed Railliet and Henry.

Subfamily RICTULARIINÆ Hall, 1913

Subfamily diagnosis.—*Metastrongylidæ*: Bursa much reduced or lacking; when present, with few and atypical rays. Mouth with well developed buccal capsule. Prominent cuticular ornamentation along entire body. Ovoviviparous. Parasites of the digestive tract.

Type genus.—*Rictularia* Frölich, 1802.

This subfamily is proposed here for the reason that *Rictularia* can not be referred to any subfamily at present established. The structure of the mouth parts, the esophagus, the spicules and the ovaries relates it to the strongyles, although it does not have the normal strongyle bursa. The elaborate cuticular ornamentation and the fact that it is ovoviviparous are atypical conditions in the group to which it is referred. On the other hand, the buccal capsule which relates *Rictularia* to the Strongyloidea excludes it from any other group.

Genus RICTULARIA Frölich, 1802.

Generic diagnosis.—*Rictulariinae*. There is a well-developed, narrow, chitinous buccal capsule, with its aperture more or less distinctly dorsal and probably always surrounded by a circle of denticles, and with its base armed with teeth and spines. Esophagus without posterior bulb. Along practically the entire ventral surface on each side there are two rows of cuticular combs or spines. The vulva is near the posterior end of the esophagus. Male with or without a bursa, which when present is always small and always remains open, and with two small, equal or unequal spicules. Egg containing an embryo when laid. In the small intestine of bats, rodents, insectivores, and carnivores.

Type species.—*Rictularia cristata* Frölich, 1802.

The above generic diagnosis is a modification of that given by Jägerskiöld (1909) in his monographic paper on this genus. As Jägerskiöld points out, the description and figures of the type-species, *R. cristata*, do not agree with the generic diagnosis here given, in that *R. cristata* is described and figured by Frölich (1802), and the description confirmed by Dujardin (1845), as having only one row of ventral combs or spines. Jägerskiöld states that he would doubt Frölich's accuracy if Dujardin had not verified this description, and

that in case their descriptions are confirmed the generic diagnosis above given will need revision.

It seems that Jägerskiöld might have even gone further and said that if *R. cristata* were found to have only one row of ventral spines extending, as Frölich describes and figures it, from the head to the vulva, then it would be necessary to leave it as the type and only species of its genus and create a new genus for the several other species at present assigned to this genus and which have two rows of ventral spines or combs extending from the head practically the entire length of the body. There is, however, some little evidence for believing that Frölich and Dujardin were both in error in stating that *R. cristata* has only a single row of spines.

In the first place, it is a very easy matter to get the impression that a species of *Rictularia* has only a single row of spines. It was my own impression of *R. splendida* when I first looked at it. No other species of *Rictularia* was known to either Frölich or Dujardin, so they had no contradictory statements or material for comparison to make them particularly careful in regard to this point. Moreover, they worked at a time when nematodes were none too carefully described, and their descriptions of this species are in error in some other respects. More important yet is the fact that both of them have evidence in their papers that their statements in regard to the number and extent of the rows of spines is not correct. Thus Frölich states that there is but one row of spines, but his figure 3 of plate 1 shows the row of spines to be distinctly latero-ventral in its relation to the buccal capsule, and his statement in the label that the spines are turned sideways leaves it still likely that a corresponding row on the opposite side of the body was not seen. Dujardin offers confirmation of this idea when he states that the cuticle bears from the head to the vulva an asymmetrical rank of hooks. The suggestion of asymmetry probably arose from seeing both rows of hooks in the head region, where they were close together and yet evidently not in the same focal plane. Probably influenced by Frölich's statement and by his own first observation, he held to the idea that there was only one row, qualifying it to conform to other observations by the statement that the row was asymmetrical. Frölich apparently only saw one row and did not mention or figure any asymmetry. Dujardin also states that the vulva is located laterally toward the dorsal face (taking the position of the buccal aperture, which is dorsal, as determining the ventral surface), and it seems evident that he considered the ventral (to him dorsal) line as determined by the row of spines and the vulva at its side as located laterally or asymmetrically. The actual fact must have been that the vulva was in its usual approximate ventral location (it is a little lateral in *R. calharensis* and

R. splendida) between the two latero-ventral rows of spines, of which he saw only the upper and nearer row.

In the second place, Frölich and Dujardin state that the row of spines extends from the head to the vulva, but Frölich adds that rarely one notices one or more teeth behind the vulva. In this connection it may be noted that the species of the genus *Rictularia* break rather naturally into two groups, (1) those parasitic in carnivores and in which the comblike cuticular structures of the anterior portion of the body of the female change very gradually into the spinelike structures of the posterior portion of the body, with no noticeable alteration taking place in the immediate vicinity of the vulva, and (2) those parasitic in rodents, insectivores, and bats, and in which the comblike structures anterior of the vulva become spinelike posterior of it, the transition being more or less marked in the vicinity of the vulva. The comblike structures are larger, continuous, and much more conspicuous; the spinelike are smaller, separated, often widely so, and in some cases very inconspicuous. The species which Frölich and Dujardin had, *R. cristata*, was collected from rodents, *Mus sylvaticus*, *Myoxus glis*, *M. nitedula*, and *M. ocellarius*, and probably followed the rule for rodent species that the prominent combs anterior of the vulva were followed by inconspicuous spines posterior of it. Frölich's reference to the rare occurrence of teeth behind the vulva bears out this assumption. The writer feels safe, therefore, in adhering to a generic diagnosis of *Rictularia* in which two rows of ventral combs or spines is specified, even with a type-species described as having only one, on the ground that there is ample reason and evidence for believing that the type-species must have had two. I venture to think that a reexamination of the type or other adequate material will confirm this opinion.

So far species of this genus have been recorded only from the small intestine, and this is the only habitat mentioned in the generic diagnosis. However, I have collected a female *Rictularia* from the stomach of a rodent on one occasion.

RICTULARIA SPLENDIDA Hall, 1913.

Specific diagnosis.—*Rictularia*: Close to *R. cahirensis* Jägerskiöld from *Felis domestica* (Egypt), and to *R. affinis* Jägerskiöld from *Felis domestica* and *Vulpes vulpes niloticus* (Egypt). As there seems to be little of specific value that is common to both males and females, the two will be considered separately.

Male.—Length, 4.83 mm.; the maximum width, exclusive of spines, in posterior part of body, 280 μ . Dorso-ventral head diameter at the base of the buccal capsule, 72 μ . Length of esophagus, 1.75 mm. Nerve ring not discernable; 108 or 109 combs, attaining a height of

47 μ and a length of 100 μ along the distal margin in the esophageal region of body, the maximum height being attained in the next to the last comb, which has an apparent height of 70 μ . In the ventral line of the posterior portion of the body, anterior of the cloaca and between the two latero-ventral

lines of combs is a row of 8 fan-shaped, almost semicircular, cuticular structures. (See fig. 1.) These fans are beautifully fluted. The last fan measures 53 μ from its base to its tip and 110 μ along the base. They are set obliquely, the anterior end being to the left of the ventral line and the posterior end being to the right and overlapping the anterior end of the succeeding fan. I find no such relation between the fluting of the fans and the cuticular annulation as Jägerskiöld suspects of being present. The fluting seems to

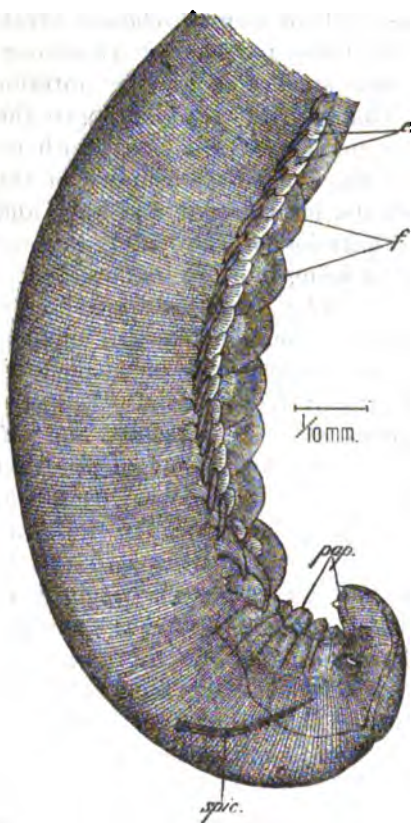


FIG. 1.—*RICTULARIA SPLENDIDA*. TAIL OF MALE. *c.*, LATERO-VENTRAL COMBS; *f.*, VENTRAL FANS; *pap.*, PAPILLÆ; *spic.*, SPICULES.

be of the same nature as that of the combs. In this region the body of the male is flattened on that portion of the ventral surface included between the latero-ventral combs. (See fig. 2.) The last two or three of these combs are larger than the others and somewhat different in form, a modification which Jägerskiöld thinks is of service in clasping the female. There is a slight bursa membrane, scarcely worthy the name of bursa, and resembling slightly developed anal alæ. There is only one pair of postanal papillæ visible,

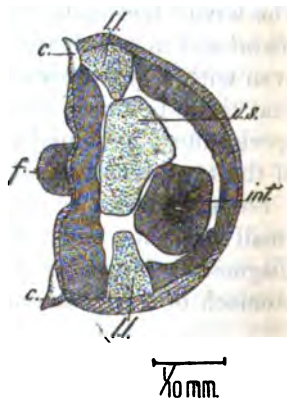


FIG. 2.—*RICTULARIA SPLENDIDA*. CROSS SECTION, SEMIDIAGRAMMATIC, IN TAIL REGION OF MALE. *c.*, LATERO-VENTRAL COMBS; *f.*, MID VENTRAL FANS; *int.*, INTESTINE; *l. l.*, LATERAL LINES; *v. s.*, VESICULA SEMINALIS.

situated near the tip of the tail. Of pre-anal papillæ there are three pairs that show a true papillar structure. These are large conoidal affairs. A pair of somewhat similar cuticular elevations is situated anterior of these and nearer the ventral line, just back of the last ventral fan, but no papillar structure is evident here. The slightly curved, light-colored spicules are equal, $207\ \mu$ long and 9 or $10\ \mu$ wide. The width of the cuticular annulations is from 5 to $7\ \mu$ over most of the body. The mouth has the structure characteristic of the genus: The buccal capsule is bounded on its antero-ventral surface by a lip which overhangs the buccal aperture somewhat; this lip seems to be supported by two chitinous trabeculæ; around the buccal aperture is a row of denticles, not easily counted, but apparently between 15 and 20 in number; at the base of the buccal capsule just

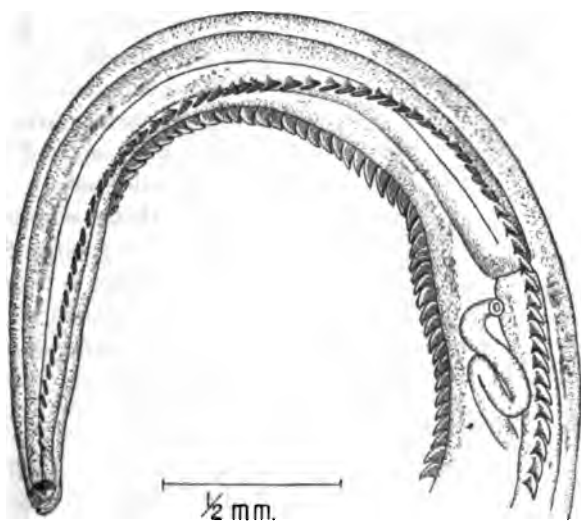


FIG. 3.—*RICTULARIA SPLENDIDA*. ANTERIOR END OF FEMALE SHOWING VULVA.

dorsal of the esophageal aperture is a tooth about $11\ \mu$ long, curved dorsally at its tip. (Other details of the capsular armature not determined for male. See description of female.) The head papillæ, while doubtless present, are not evident in the male. The anterior end of the first latero-ventral comb is about $30\ \mu$ back of the base of the buccal capsule.

Female.—Length, 8.37 to 10.55 mm.; maximum diameter, $440\ \mu$. Dorso-ventral head diameter at base of the buccal capsule, $80\ \mu$. Length of esophagus, 2.53 to 2.91 mm. Distance of nerve ring from anterior end of body, $312\ \mu$. Vulva just posterior of the posterior end of the esophagus, 2.33 to 2.49 mm. back of the anterior end of body, and opposite the fifty-fifth comb. (See fig. 3.) Vulva may be situated to right or left of the median ventral line. The transition

from combs to spines is very gradual. I have divided the 136 combs and spines into 120 combs and 16 spines, though this might be shifted one or two either way. In one specimen the apparent total of combs and spines is 138. The combs attain a maximum height of $72\ \mu$ in the neck region. The last spine is about 1.7 mm. from the posterior end of the body. The anus is 180 to $315\ \mu$ from the tip of the tail. In the specimen noted as having 138 combs and spines, there appears

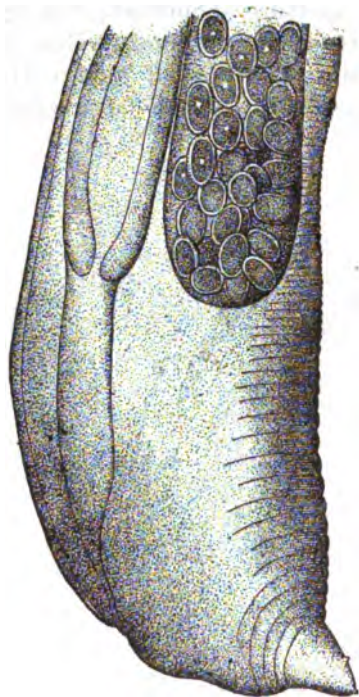


FIG. 4.—*RICTULARIA SPLENDIDA*. TAIL OF FEMALE.

to be a row of 4 very small, anteriorly directed spines close together and just anterior of the anus. While these structures seem unmistakable and hardly apt to be artifacts occurring in orderly, duplicating sequence, it would be interesting to learn whether anything similar occurs on related forms before assuming anything in regard to these. The posterior branch of the uterus may terminate anterior or posterior of the anus. The tail ends in a blunt, rounded end, bearing a short spine. (See fig. 4.) What appears to be a papilla occurs near the end of the tail. In the posterior portion of the body the cuticular annulations are about $5\ \mu$ wide; more anterior they are $7\ \mu$; in some places in the neck region they are about $16\ \mu$. The eggs have shells averaging about 38 to $42\ \mu$ long by 32 to $34\ \mu$ wide and about 3 or 4 μ thick. The eggs contain a well-developed embryo while in utero. The mouth structure is for the most part similar to that of the male. (See figs. 5 and 6.) It is a little larger, the prominent tooth at the base is 16 to $20\ \mu$ long and has on each side of it a pair



FIG. 5.—*RICTULARIA SPLENDIDA*. HEAD OF FEMALE.



FIG. 6.—*RICTULARIA SPLENDIDA*. HEAD OF FEMALE.

of smaller teeth very likely represented in the male, but not evident in my material. The large tooth seems to be borne on a chitinous projection originating on the dorsal side of the capsule, a condition somewhat similar to that figured by Jägerskiöld for *R. affinis*. There is also another tooth evident toward the ventral side of the base of the capsule from the tooth already noted. The head papillæ are not well defined, and are not represented in the figure. The anterior end of the first latero-ventral comb is about $55\ \mu$ back of the base of the buccal capsule.

Host.—*Canis nebracensis*.

Location.—Small intestine.

Locality.—Amo, Colorado, 18 miles east of Colorado Springs.

Type-specimen.—Cat. No. 16218, U.S.N.M. (Bureau of Animal Industry helminthological collection); collected by M. C. Hall, October 3, 1911.

The following key is intended only to show the position of *R. splendida* with relation to the other species of the genus, and hence the majority of the species are covered simply as a group. Part of the characteristics of some species are derived from Jägerskiöld's figures unsupported by any statement in the text, but his excellent figures seem to warrant this.

Key for distinguishing Rictularia splendida from other species.

1. *Females* with cuticular formations anterior of vulva comb-shaped; posterior of vulva they become spine-shaped, the transition being in the region of the vulva and fairly distinct. *Males* with latero-ventral combs not extending posteriorly to the cloacal aperture. *Rictularia* spp. parasitic in bats, insectivores, and rodents.
Females in which the transition from combs to spines is very gradual and remote from the vulva. *Males* with latero-ventral combs extending posteriorly practically to the cloacal aperture. *Rictularia* spp. parasitic in carnivores 2.
2. *Females* with 136 to 188 combs and spines; vulva posterior of esophagus; anterior end of first comb its own length, or farther, from the base of the buccal capsule. *Males* with 8 large midventral fans, almost semicircular in outline, just anterior of cloaca; 108 or 109 latero-ventral combs; 3 pair of large conoidal pre-anal papillæ, spicules $207\ \mu$ long. *Rictularia splendida*.
Females with fewer combs and spines or with vulva usually anterior of the posterior end of esophagus; the first comb distinctly less than its own length from the base of the buccal capsule. *Males* with fewer and flatter fans, more or else fewer latero-ventral combs, no large conoidal pre-anal papillæ, spicules distinctly shorter or longer. 3.
3. *Females* with 126 to 135 combs and spines and with vulva always posterior of esophagus. *Males* 4.8 mm. long, with 7 midventral fans, 96 latero-ventral combs, spicules $170\ \mu$ long. *Rictularia cahirensis*.
Females with 127 to 137 combs and with vulva usually anterior of posterior end of esophagus. *Males* 7 to 8.5 mm. long, with 6 midventral fans, 111 latero-ventral combs, spicules 220 to $230\ \mu$ long. *Rictularia affinis*.

The extent of the latero-ventral combs in the male is hard to judge from descriptions and figures given. It may be that it will not serve to separate the males parasitic in carnivores from those in other host groups.

The females of the three species of *Rictularia* known from carnivores are so very much alike that it is difficult to compile a key for their differentiation, which is the more unfortunate in that the female, as is the rule among nematodes, is the one most likely to be collected and collected in larger numbers.

The following notations will add something of use in differentiation: The female of *R. splendida* is the smallest and that of *R. affinis* the largest, the three species making a series in which the maximum of a smaller species is the minimum of the next larger, as follows: *R. splendida* 8.37 to 10.55 mm., *R. cahirensis* 10.5 to 13.5 mm., *R. affinis* 13.5 to 20.5 mm. The last-named species has also a distinctly longer esophagus than the others, but has smaller eggs. The egg dimensions are as follows: *R. splendida* 38 to 42 μ by 32 to 34 μ , *R. cahirensis* 39 to 42 μ by 26 to 28 μ , *R. affinis* 36 to 38 μ by 24 to 26 μ . Jägerskiöld figures the first comb of both his species as closer to the base of the buccal capsule than is the case in *R. splendida*, and I have included this distinction in my key. He makes no statement in regard to this point in his text and the distinction may not be found to be a good one.

As regards the males, *R. splendida* and *R. cahirensis* are about the same size, while the male of *R. affinis* is about half as large again. The last-named male also has a longer esophagus, as would be expected, and wider annulations (10 to 14 μ).

Since the parasites of the coyotes, as pointed out in my introductory paragraph, are of considerable economic importance, I have summarized here the records of parasites from coyotes so far as they are known to me.

Protozoa.—*Opalinopsis nucleolata* was described as a new species from the liver of *Canis latrans* by Smith and Fox (1908). The parasite had set up pathological alterations in the liver of the coyote, which was an inbred specimen from the Philadelphia Zoological Gardens.

Trematoda.—*Amphimerus pseudofelineus* was recorded from the gall ducts of *Canis latrans* at Lincoln, Nebraska, by Ward (1895) under the name of *Distoma felineum*. Later, Ward (1901) transferred this to the genus *Opisthorchis*, making it a new species, *O. pseudofelineus*. Subsequently Barker (1911) transferred it to his new genus, *Amphimerus*.

Cestoda.—*Multiceps multiceps* was reported from the intestine of *Canis nebracensis* at Washington, District of Columbia, by Hall (1911), the infection being experimentally developed by feeding scolices from the gid bladder worm, or *cœnurus*, of sheep. A second similar case was also reported by Hall (1912b).

Tænia pisiformis is here reported for the first time from the intestine of *Canis nebracensis* on the basis of specimens from Montana and

Colorado. The Colorado specimens were reported by Hall (1912a) as *Tænia* sp., owing to the remarkable structure of the hooks on the first specimen examined. Further study has shown that these hooks were anomalies. Other material from the coyote in Montana can not be placed more definitely at this time than as *Tænia* sp. It is practically certain that coyotes are infested by *Tænia hydatigena*, *Multiceps serialis*, and the adult stage of *Cysticercus ovis*, but there are no records of these parasites from the coyote.

Nematoda.—*Ancylostoma caninum* was reported from the intestine of *Canis latrans* at Washington, District of Columbia, by Stiles and Hassall (1894) under the name of *Uncinaria trigonocephala*.

Belascaris sp. was reported from the intestine of *Canis nebracensis* at Amo, Colorado, by Hall (1912a).

Rictularia splendida, described as a new species in this paper, was reported by Hall (1912a) under the name of *Rictularia* sp.

Arthropoda.—*Dermacentor venustus* has been reported from the skin of *Canis lestes* in Montana by Henshaw and Birdseye (1911).

Sarcoptes scabiei lupi has been collected from *Canis latrans* in South Dakota, there being specimens in the collection of the United States Bureau of Animal Industry, and this or a related variety has been spread by artificial means among the coyotes of Montana under the supervision of the State veterinarian, Dr. M. E. Knowles. Something similar is now being attempted in Wyoming. I have found a division of opinion among Montana sheepmen as regards the efficacy of sarcoptic mange as a means of eradicating coyotes, some claiming that it was doing good and others claiming that it was doing no good, or even doing some damage in cases where it was transmitted to sheep dogs.

BIBLIOGRAPHY.

BARKER, FRANKLIN D.

1911. The trematode genus *Opisthorchis* R. Blanchard, 1895. Arch. de Parasitol., Par., vol. 14 (4), pp. 513-561, pls. 17-20.

1911. Idem. Reprint. Studies Zool. Lab. Univ. Nebr., Par. (103), pp. [513]-561, 3 tables, pls. 17-20.

DUJARDIN, FELIX.

1845. Histoire naturelle des helminthes ou vers intestinaux. xvi+654+15 pp., 12 pls. Paris.

FRÖLICH, JOSEPH ALOYSIUS.

1802. Beiträge zur Naturgeschichte der Eingeweidewürmer. Naturforscher, Halle, vol. 29, pp. 5-96, pl. 1, figs. 1-21; pl. 2, figs. 1-25.

HALL, MAURICE C.

1911. The coyote as a host of *Multiceps multiceps*. [Read before 6. Meet. Helm. Soc., Wash., D. C.] Science, N. Y., n. s., vol. 33, June 23, p. 975.

1912a. The parasite fauna of Colorado. Colorado College Publication, Colorado Springs, sc. s., vol. 12 (10), Jan.-Mar., pp. 329-383, 1 map.

1912b. A second case of *Multiceps multiceps* in the coyote. [Read before 9. Meet. Helm. Soc., Wash. D. C.] Science, N. Y., n. s., vol. 35, Apr. 5, p. 556.

HENSHAW, HENRY W., and BIRDSEYE, CLARENCE.

1911. The mammals of Bitterroot Valley, Mont., in their relation to spotted fever. Circ. 82, Bureau Biol. Survey, U. S. Dept. Agric., Wash., Aug. 3, pp. 1-24, figs. 1-12.

JÄGERSKILD, L. A.

1909. Nematoden aus Ägypten und dem Sudan (eingesammelt von der Schwedischen Zoologischen Expedition). 66+v pp., 23 figs., 4 pls. Upsala. (Results of the Swedish Zoological Expedition to Egypt and the White Nile, 1901, under the direction of L. A. Jägerskiöld, pt. 3 (25).)

RAILLIET, ALCEDE.

1895. Traité de zoologie médicale et agricole. 2. éd. [fasc. 2], xv+737-1303 pp., figs. 495-892. Paris. [Published in May.]

RAILLIET, A., and HENRY, A.

1910. Quelques helminthes nouveaux ou peu connus du groupe des Bunceotomiens. Bull. Soc. path. exot., Par., vol. 3 (5), 11 May, pp. 311-315.

SCHNEIDER, ANTON.

1866. Monographie der Nematoden. viii+357 pp., 122 figs., 28 pls., 343 figs. Berlin.

SMITH, ALLEN J., and FOX, HERBERT [M. D.]

1908. Note on the occurrence of a ciliate (*Opalinopsis nucleolata*, n. s.) in the liver of a mammal (*Canis latrans*). Proc. Path. Soc. Phila., n. s., vol. 11, pp. 282-287.

STILES, CHARLES WARDELL, and HASSALL, ALBERT.

1894. A preliminary catalogue of the parasites contained in the collections of the United States Bureau of Animal Industry, United States Army Medical Museum, Biological Department of the University of Pennsylvania (Coll. Leidy) and in Coll. Stiles and Coll. Hassall. Vet. Mag., Phila., vol. 1 (4), Apr., pp. 245-253; (5), May, pp. 331-354.

WARD, HENRY BALDWIN.

1895. The parasitic worms of man and the domestic animals. Ann. Rep. Nebraska Bd. Agr., Lincoln (1894), pp. 225-348, figs. 1-82, 2 pls., figs. 1-16.
1901. Notes on the parasites of the lake fish. 3. On the structure of the copulatory organs in *Microphallus* nov. gen. Trans. Amer. Micr. Soc., Lincoln (23 Ann. Meet., New York, June 28-30, 1900), vol. 22, pp. 175-187, pl. 26, figs. 1-5.

NOTES ON THE BATS OF THE GENUS MOLOSSUS.

By GERRIT S. MILLER, JR.,

Curator, Division of Mammals, United States National Museum.

Having recently examined the entire series of bats of the genus *Molossus* in the United States National Museum,¹ I find that the number of recognized forms must be increased from 13 to at least 18. Such large areas of South America are still unrepresented, however, that no definitely monographic treatment of the genus is now possible. The following key and brief diagnoses are intended merely to place on record such results as have been reached.

The systematic history of the genus *Molossus* begins with a specimen from Martinique described by Daubenton under the name "*mulot-volant*" in the Memoires of the Royal Academy of Sciences, Paris, for the year 1759.² The same animal appears as an "*autre chauve-souris*" in Buffon's Natural History, volume 10, pages 84-87, plate 19, figure 1. Here it is accompanied by a smaller individual also called an "*autre chauve-souris*,"³ but concerning whose history nothing is said. The length of forearm of the larger specimen as represented on the plate exactly agrees with that recorded in the text (p. 86). Assuming that the smaller animal, the dimensions of which were not published, was as carefully treated by the artist De Seve, there is no reason to suppose that it belonged to another species or that it originated elsewhere than in Martinique, since the lengths of the two forearms, 38 mm. and 36 mm., respectively, are within the known extremes of individual variation in the local race occurring on the islands of Dominica and Trinidad, and at Macuto, Venezuela. Therefore until the Martinican animal can be shown to differ from this race such technical names as were based on the two

¹ Dr. J. A. Allen has kindly lent me some important material from the American Museum of Natural History, including the types of *Molossus verrilli* and *M. sinaloa*. I have also had the opportunity to study, through the courtesy of Mr. Samuel Henshaw, the specimens in the Museum of Comparative Zoology, whose measurements have been recorded by Dr. Glover M. Allen (Notes on Chiroptera: Bull. Mus. Comp. Zool., vol. 52, pp. 59 and 60, July, 1908).

² Page 287. Volume published in 1765.

³ Pages 57-58, pl. 10, fig. 2.

"*autre chauve-souris*" of plate 19 should be regarded as applying to the somewhat wide ranging form in question.¹ These names are four: On the larger specimen, *Vespertilio molossus major* Kerr, 1792, and *Molossus fusciventer* Geoffroy, 1805; on the smaller specimen, *V. molossus minor* Kerr, 1792, and *Molossus longicaudatus* Geoffroy, 1805.

Buffon's plate 19 is an important element in the history of another name, the *Vespertilio molossus* of Pallas. This was first published in 1766,² while additional data, including a figure of the skull, appeared during the subsequent year.³ The name was based on a specimen in the possession of Pallas, not improbably from Surinam, though no direct information is given concerning its origin. The figure shows conclusively that the animal was a *Nyctinomus* of the "*macrotis*" group. Pallas, however, supposed that his bat was the same as the one figured by Buffon, to whose plate he refers as a good representation of those characters of head and lips that suggested to him the specific name *molossus*.⁴

This confusion of two distinct animals under the specific name *molossus* continued through the rest of the eighteenth century. In 1805 Geoffroy increased it by proposing a generic name *Molossus* for the bats to which the specific name had previously been applied,⁵ and then basing his account of the technical characters of the group on one of the specimens (the smaller) figured by Buffon. Although Geoffroy evidently regarded the *Vespertilio molossus* of Pallas as identical with one or the other of Buffon's specimens, he applied a new name to each: *fusciventer* to the larger and *longicaudatus* to the smaller, probably because he believed that this was made necessary by the transfer of the old specific name from a species to a genus. In the same paper Geoffroy described seven other members of the genus, all technically named for the first time. The group therefore contained nine supposedly distinct forms. By tautonymy its type must be *Vespertilio molossus*. Since Geoffroy makes no direct reference to Pallas in connection with this name, the type-species should be construed in the wider sense of "*molossus* Auct." As first reviser I now restrict the name, under the provisions of the International Code, art. 30 *g*, to that portion of the composite species

¹ On St. Lucia and Barbados a slightly larger form occurs. This appears to be identical with *Molossus obscurus* of British Guiana. It is not impossible that true *major* may prove to be this larger animal, in which event a readjustment of names will be required.

² *Miscellanea Zoologica*, p. 49.

³ *Spicilegia Zoologica*, fasc. 3, p. 8, pl. 4, fig. 11.

⁴ The name *Nyctinomus molossus* (Pallas) should be applied to the "*macrotis*" of northern South America, reserving Gray's name for the local Jamaican form.

⁵ *Ann. Mus. Hist. Nat. Paris*, vol. 6, pp. 151-154. "Reservant au *vesp. leporinus* le nom de *Noctilio*. . . j'ai érigé en nom générique celui de *molossus* qui n'a désigné jusqu'ici qu'une espèce, et qui m'a paru propre à faire connoître toutes celles qu'on a souvent été dans le cas de confondre sous la même dénomination."

which Geoffroy knew at first hand and from which he derived his technical characters. The generic name *Molossus* therefore continues to be applied to the group for which it is in current use, though with *M. major* (Kerr) = *Vespertilio molossus* of authors (part) from Martinique as the type.

KEY TO THE RACE OF THE GENUS MOLOCHUS.

Greatest breadth across upper canines 5 mm. or more (*rufus*-group).

Forearm 47-51 mm.; greatest length of skull 21-23 mm.

Color brownish (French Guiana to Peru and Paraguay).....*rufus* (p. 88).

Color blackish (Mexico).....*nigricans* (p. 88).

Forearm 43-47.5; greatest length of skull 19-21.3 mm.

Color light and dull (Mexico to Panama)..... *sinaloa* (p. 89).

Color dark and rich (Venezuela)..... *pretiosus* (p. 88).

Greatest breadth across upper canines less than 5 mm.

Greatest length of skull 18-18.6 mm. (*currentium*-group).

Color with a decided tendency toward broccoli-brown and drab (Argentina).
currentium (p. 89).

Color a rich dark brown (Central America and northern South America)
bonae (p. 89).

Greatest length of skull 14.8–17.4 mm.

Forearm 33-37 mm. (*pygmaeus*-group).

Braincase unusually inflated, its greatest width about 9 mm. (British Guiana).....*burnesi* (p. 91).

Braincase normal, its greatest width about 8 mm.

General color a light brown usually much tinged with drab, especially on underparts (Curaçao, Peru, and Ecuador) *pygmaeus* (p. 92).

General color a clear brown rarely if ever distinctly tinged with drab.

Upper parts very dark, usually something between burnt-umber
and seal-brown (Panama).....*coibensis* (p. 92.)

Upper parts not very dark, usually something between raw-umber and wood-brown (Cuba).....*tropidorhynchus* (p. 92).

Forearm 36-41 mm. (*obscurus*-group).

Lower leg 19-21.6 mm.; greatest length of skull 15-16.4 mm.

Molars averaging larger (Dominica, [Martinique], Trinidad, Venezuela).....*major* (p. 90).

Molars averaging smaller (St. Kitts, Nevis, Antigua, Montserrat).
debilis (p. 90).

Lower leg 20-23.8 mm.; greatest length of skull 16-17.4 mm.

Lower leg usually more than 22.6 mm. (22-23.8 mm.)

Rostrum normal (Porto Rico).....*fortis* (p. 89).

Rostrum short and heavy.

Molars large (Jamaica).....*fuliginosus* (p. 90).

Molars small (Santo Domingo).....verrilli (p. 90).

Lower leg usually less than 22.6 mm. (21-22.6 mm.)

Underparts with a decided tinge of drab (Mexico). *aztecus* (p. 91).

Underparts without decided tinge of drab.

General color moderately dark, approaching raw-umber (Paraguay).....*crassicaudatus* (p. 91).

General color very dark, burnt-umber or darker (Brazil, British Guiana, Barbados, St. Lucia)...*obscurus* (p. 91).

First or rufus-group.—Largest members of the genus, with length of forearm ranging from 43 to 51 mm, greatest length of skull from 19 to 23 mm; skull with highly developed sagittal crest, and with rostral breadth across canines 5 mm or more.

MOLOSSUS RUFUS Geoffroy.

1805. *Molossus rufus* GEOFFROY, Ann. Mus. Hist. Nat., Paris, vol. 6, p. 155. (Cayenne.)¹
 1805. *Molossus castaneus* GEOFFROY, Ann. Mus. Hist. Nat., Paris, vol. 6, p. 155. (Paraguay.)
 1823. *Molossus ursinus* SPIX, Sim. et Vespert. Brasil Sp. Nov., p. 59. (Vicinity of Para, Brazil.)
 1827. *Dysopes alecto* TEMMINCK, Monogr. de Mamm., vol. 1, p. 231. (Interior of Brazil.)
 1844-46. *Molossus myosuroides* TSCHUDI, Fauna Peruana, Mamm, p. 83. (Peru.)
 1891. *Molossus fluminensis* LATASTE, Ann. Mus. Civ. Stor. Nat., Genova, ser. 2, vol. 10, p. 658. (Rio Janeiro, Brazil.) Name based on a normal specimen of *Molossus rufus* whose characters differ in important details from those in Dobson's faulty description.

Size maximum for the genus; forearm in males 48.5-51 mm, in females 47-51; greatest length of skull in males 21.4-23, in females 20.4-22; general color a reddish brown varying in different individuals from russet to mummy-brown, the blackish phase apparently unusual. Specimens examined from Cayenne, Peru (type of *M. myosuroides*; forearm 48 mm), southern Brazil (São Paulo), and Paraguay (Sapucay and Villa Rica).

MOLOSSUS NIGRICANS MILLER.

1902. *Molossus nigricans* MILLER, Proc. Acad. Nat. Sci. Philadelphia, p. 395. September 12, 1902. (Acaponeta, Tepic, Mexico.)

Like *Molossus rufus* but color usually a deep, blackish brown. Specimens examined from Tepic (Acaponeta), Vera Cruz (Catemaco and San Andres Tuxtla), and Yucatan (Chichen Itza and Yaxcash).

MOLOSSUS PRETIOSUS MILLER.

1902. *Molossus pretiosus* MILLER, Proc. Acad. Nat. Sci. Philadelphia, p. 396. September 12, 1902. (La Guaira, Venezuela.)

Size not so great as in *Molossus rufus*; forearm in males 44.5-47.5 mm, in females 43.5-46; greatest length of skull in males 20.5-21.5, in females 19-20.7; general color a rich dark brown varying from a reddish seal-brown almost to chestnut, the blackish phase not unusual. Specimens examined from La Guaira, Venezuela, and vicinity.

¹ Thomas (Ann. and Mag. Nat. Hist., ser. 7, vol. 8, p. 437, November, 1901) assumes that the animal originally came from Brazil, but Geoffroy expressly states (p. 154) that his species of *Molossus*, other than those known to Azara, were sent from "North America, Surinam, and chiefly from Cayenne." A male from Cayenne and two males from "America," which I examined in the Paris Museum in 1904 (the two without exact locality marked "type," but the authenticity of this indication open to question) represent a large form like *rufus* (forearm in the two "types" 49 and 50 mm). Further material from French Guiana is needed to show whether *Molossus rufus* and the Paraguayan *M. castaneus* are distinct.

MOLOSSUS SINALOÆ Allen.

1906. *Molossus sinaloæ* ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 22, p. 236. July 25, 1906. (Escuinapa, Sinaloa, Mexico.)

Like *Molossus pretiosus* but color a dark brownish drab. Specimens examined from Sinaloa (Escuinapa), Yucatan (Yaxcash), Honduras (Chamalicon), Nicaragua (Graytown), and Panama (Punta de Peña).

Second or currentium-group.—Size less than in the rufus-group; forearm ranging from 39 to 42 mm, greatest length of skull from 18 to 18.6 mm; rostral breadth across canines slightly less than 5 mm.

MOLOSSUS CURRENTIUM (Thomas).

1901. *Molossus obscurus currentium* THOMAS, Ann. and Mag. Nat. Hist., ser. 7, vol. 8, p. 438. November, 1901. (Goya, Corrientes, Argentina.)

Size less than in the members of the rufus-group; greatest length of skull, 18–18.6 mm.; greatest breadth across upper canines less than 5 mm.; general color a dark brownish drab. Specimens examined from Argentina (Goya) and Brazil (Manaos and Obydos).

MOLOSSUS BONDÆ Allen.

1904. *Molossus bondæ* ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 20, p. 228. June 29, 1904. (Bonda, Santa Marta, Colombia.)

Like *Molossus currentium* but color very dark, approaching the seal-brown of Ridgway. Specimens examined from Nicaragua (Greytown) and Panama (Chorrera, Am. Mus. Nat. Hist.).

Third or obscurus-group.—Length of forearm usually less than in the members of the currentium-group but seldom falling below 37 mm. (36–41 mm.); skull constantly smaller (greatest length, 15–17.4 mm.).

MOLOSSUS FORTIS, new species.

Type.—Adult male (in alcohol). Cat. No. 102319, U. S. National Museum. Collected at Luquillo, Porto Rico, March 5, 1900, by L. Stejneger and C. W. Richmond.

Size maximum for members of the obscurus-group; lower leg and foot usually more than 22.6 mm. (22–23.8 mm.); skull and teeth normal. Measurements of type: head and body, 66 mm.; tail, 37.5; tibia and foot, 23; forearm, 40; third digit, 81; fifth digit, 43; greatest length of skull, 17.5; condylobasal length, 16.0; breadth of braincase, 8.9; mandible, 12.2; maxillary tooththrow exclusive of incisors, 6.6; mandibular tooththrow exclusive of incisors, 7.2. Confined to Porto Rico.

MOLOSSUS FULIGINOSUS Gray.

1838. *Molossus fuliginosus* GRAY, Mag. Zool. and Bot., vol. 2, p. 501. February, 1838. (Jamaica. See Dobson, Catal. Chiropt. Brit. Mus., p. 413, 1878.)

Like *Molossus fortis* from Porto Rico, but rostral portion of skull obviously shortened; teeth normal. Confined to Jamaica.

MOLOSSUS VERRILLI Allen.

1908. *Molossus verrilli* ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 24, p. 581. September 11, 1908. (Samana, Santo Domingo.)

Agreeing with *Molossus fuliginosus* in general characters and in form of rostrum, but molars decidedly reduced in size. Confined to Santo Domingo; type specimen examined.

MOLOSSUS MAJOR (Kerr).

1792. *V[espertilio] mol[ossus] major* KERR, Anim. Kingd., p. 97. Based on Schreber's plate 59, lower figure (=Buffon, vol. 10, pl. 19, fig. 2). Martinique.
1792. *V[espertilio] mol[ossus] minor* KERR, Anim. Kingd., p. 97. Based on Schreber's plate 59, upper figure (=Buffon, vol. 10, pl. 19, fig. 1). Probably from Martinique.
1805. *Molossus longicaudatus* GEOFFROY, Ann. Mus. Hist. Nat., Paris, vol. 6, p. 155. Based on the specimen represented by Buffon, vol. 10, pl. 19, fig. 2. (Martinique.)
1805. *Molossus fusciventer* GEOFFROY, Ann. Mus. Hist. Nat., Paris, vol. 6, p. 155. Based on Buffon, vol. 10, pl. 19, fig. 1. (Probably from Martinique).

Smaller than *Molossus obscurus* and its immediate allies *crassicaudatus* and *aztecus*, lower leg and foot usually less than 21 mm. (19–21.6 mm.); teeth normal. Specimens examined from Dominica, Trinidad, and Venezuela (Macuto).

MOLOSSUS DEBILIS, new species.

Type.—Adult female (in alcohol) Cat. No. 110935, U. S. National Museum. Collected on St. Kitts, Lesser Antilles, in 1901, by W. H. Alexander.

Like *Molossus major* but crown area of molars decidedly reduced. Measurements of type: head and body, 56.6 mm.; tail, 36; tibia and foot, 20.4; forearm, 38; third digit, 74; fifth digit, 42; greatest length of skull, 15.4; condylobasal length, 14.0; breadth of braincase, 8.2; mandible, 10.6; maxillary tooththrow exclusive of incisors, 5.4; mandibular tooththrow exclusive of incisors, 5.0. Specimens examined from St. Kitts, Nevis, Antigua, and Montserrat.

MOLOSSUS OBSCURUS Geoffroy.

1805. *Molossus obscurus* GEOFFROY, Ann. Mus. Hist. Nat., Paris, vol. 6, p. 155. Surinam (name definitely applied to specimens from Surinam, one of the localities mentioned by Geoffroy, by Temminck, Monogr. de Mamm., vol. 1, 1826, p. 236-237).
1820. *Molossus acuticaudatus* DESMAREST, Mammalogie, p. 116. (Brazil.)
1826. *Dysopes velox* TEMMINCK, Monogr. de Mamm., vol. 1, p. 234. (Brazil.)
1850. *Dysopes olivaceofuscus* WAGNER, Abh. Math.-Phys. Classe, k. bayer. Akad. Wissensch., München, vol. 5, p. 202. (Cuyaba, Matto Grosso, Brazil.)
1850. *D[ysopes] amplexicaudus* WAGNER, Abh. Math.-Phys. Classe, k. bayer. Akad. Wissensch., München, vol. 5, p. 202. (Caicara, Matto Grosso, Brazil.)

Size less than in the large Antillean species; lower leg and foot usually less than 22.6 mm. (21-22.6 mm.); general color a rich brown at least as dark as the burnt-umber of Ridgway. Specimens examined from eastern Peru (Perené, Dept. of Junin), Brazil (Bahia, Marajo, Para?, San Paulo, Santarem), British Guiana (Berbice), and the islands of Barbados and St. Lucia.

MOLOSSUS CRASSICAUDATUS Geoffroy

1805. *Molossus crassicaudatus* GEOFFROY, Ann. Mus. Hist. Nat., Paris, vol. 6, p. 156. (Paraguay).

Like *Molossus obscurus* but color not so dark (usually approaching the raw-umber of Ridgway). Specimens examined from Paraguay (Tacuaral and Villa Rica).

MOLOSSUS AZTECUS Saussure.

1860. *M[olossus] aztecus* SAUSSURE, Revue et magasin de zoologie, ser. 2, vol. 12, p. 283, July, 1860. (Amecameca, Mexico.)

Like *Molossus crassicaudatus* but underparts with a decided tinge of drab. Specimens examined from Chiapas (Huehuetan).

Fourth or pygmæus-group.—Smallest members of the genus, with length of forearm ranging from 33 to 37 mm.

MOLOSSUS BURNESI Thomas.

1905. *Molossus burnesi* THOMAS, Ann. and Mag. Nat. Hist., ser. 7, vol. 15, p. 584. June, 1905. (Cayenne, French Guiana.)

According to the description this species differs from all other known members of the genus in the unusual inflation of the braincase; greatest length of skull 16.2 mm., breadth of braincase 8.9. (In other forms with skull of same length the breadth of braincase is about 8 mm.) Known from the type only; no specimens seen.

MOLOSSUS PYGMÆUS Miller.

1900. *Molossus pygmæus* MILLER, Proc. Biol. Soc. Washington, vol. 13, p. 162. October 31, 1900. (Willemstad, Curaçao.)

Color a light brown, the general effect usually ranging between the drab and hair-brown of Ridgway, some trace of drab always present, at least on underparts. Skull normal. Specimens examined from Curaçao, Ecuador (Guayaquil, Santa Rosa), and northwestern Peru (Piura).

MOLOSSUS COIBENSIS Allen.

1904. *Molossus coibensis* ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 20, p. 227. June 29, 1904. (Coiba Island, Panama.)

Like *Molossus pygmæus* Miller, but color very dark, usually ranging between the burnt-umber and seal-brown of Ridgway. Specimens examined from the following localities in Panama: Ancon, Chorrera, Culebra, Paraiso, San Pablo, and Tabernilla.

MOLOSSUS TROPIDORHYNCHUS Gray.

1839. *Molossus tropidorhynchus* GRAY, Ann. Nat. Hist., vol. 4, p. 6. September, 1839. (Cuba.)

Like *Molossus pygmæus* and *M. coibensis*, but color a light brown usually ranging between the raw-umber and wood-brown of Ridgway, and with no evident trace of drab. Confined to Cuba.

PRELIMINARY REPORT ON A RECENTLY DISCOVERED PLEISTOCENE CAVE DEPOSIT NEAR CUMBERLAND, MARYLAND.

BY JAMES WILLIAMS GIDLEY,

Assistant Curator of Fossil Mammals, United States National Museum.

INTRODUCTION.

The recent fortunate discovery of Pleistocene mammal remains in cave deposits near Cumberland, Maryland, adds one more to the rather limited number of such occurrences and promises to be of great importance in working out the comparatively little known Pleistocene mammalian life of the eastern United States. It may also aid in the proper correlation of these and similar deposits of the East with the better known Pleistocene beds of other parts of the country.

The preliminary investigation of the Cumberland Cave deposit made last October produced most encouraging results. Over 100 specimens were secured, consisting principally of jaws and jaw fragments, which represent 22 recognizable genera, including one genus now exclusively African, and at least 29 species, most of which are apparently extinct, or are now living in remote localities. The work of exploration again taken up by the writer in May of the present year has already added several other forms to the list, and is yielding better material of many of the forms represented in the collection of last autumn. This material will be published with the final results and conclusions at a later date when the exploration is completed.

The location of this important find is at the bottom of a deep cut of the Western Maryland Railway where it passes through the north end of a spur or ridge of limestone near the little village of Corriganville, at the mouth of Cash Valley, about 4 miles northwest of Cumberland. The ledge is here upturned at an angle of about 90°, the roadway cutting it nearly at right angles, and the excavation is about 100 feet deep at the point where the fossil-bearing deposits were exposed. When first observed the workmen naturally regarded the bones as those of animals now living in the neighborhood, and beyond exciting their curiosity at finding them buried in the rocks and débris of a small cavern at so great a depth, no particular interest

was aroused. I was told that quantities of the material were destroyed by the steam shovel and dynamite in making the excavation, while many specimens were picked up by the workmen and others and carried away as curiosities. After the cut had been completed the locality was visited by Mr. Raymond Armbruster, of Cumberland, Maryland, and Mr. George Roeder, of Swetnan, Virginia, who, obtaining a few specimens from the still undisturbed deposits outcropping at the side of the excavation, recognized the possible scientific value of the material and reported it to the United States National Museum. The credit of the discovery therefore belongs entirely to these gentlemen, and especial praise is due to Mr. Armbruster for the subsequent interest and for the assistance he has given in securing this material for science. It seems appropriate in this connection to express my obligation to these gentlemen and also to Mr. G. H. Friend, principal assistant engineer in charge of the Cumberland division of the Western Maryland Railway, and Mr. Martin Gallagher, industrial commissioner, for their interest in the work and their assurance of hearty cooperation in continuing the investigation of the still unexplored deposits. Thanks are also due Mr. G. C. Hendrickson, of Cumberland, for placing at my disposal a portion of a skull taken from the railroad cut, representing an extinct species of the dog family.

GEOLOGIC HISTORY AND AGE OF DEPOSITS.

The upturned ledge of rock in which the cave deposits occur represents the lower Helderbergian division of the Devonian. It forms a segment of the much eroded west wing of a great anteclineal fold having a nearly north and south axis. The total thickness of the formation at this place is about 900 feet, but the cave chamber containing the fossil bones and other caverns in the immediate vicinity seem to be confined to a single stratum not more than 20 feet thick. The small size and peculiar disposition of the caverns in a single plane suggest a true fissure cave, although it can not properly be so called. The cause for this resemblance is probably due to the upturned condition of the strata which brings the bedding plane and hence the line of cleavage to a nearly perpendicular position. This has for ages given free access to the corrosive action of the surface waters along the line of strike which easily following the lines of cleavage of the rocks, would spread downward to great depths and laterally only along the line of outcrop, without forming caverns of any great size.

PROBABLE MANNER OF ENTOMBMENT.

In making the railway cut, several small chambers at higher levels than the one containing the bones were encountered, and before the work of excavation began there was said to have been an opening to the surface on the crest of the hill directly above the middle of the

present roadbed. This opening so nearly overhead probably at one time served as a trap through which were introduced the animals whose remains are now in the deposits of the bone cavern. There are other openings along the line of outcrop of the ledge, one of them at about the same level with the bone-bearing deposits, appearing at the north end of the ridge where it slopes abruptly down into the Wills Creek Valley. These openings may or may not have communicated at one time with the caverns intersected by the railroad cut, but probably had nothing to do with the accumulation of material in the latter.

From Brown's¹ account of the Conard Fissure, it would seem that the conditions governing the accumulation of material in the Cumberland Cave were quite similar. The bones for the most part are much broken, yet show no signs of being water worn. They are found scattered fairly uniformly throughout the entire mass of unstratified accumulations which consist entirely of cave clays and breccias, unevenly hardened and more or less cemented together by stalactitic materials. There is an almost entire absence of admixture of sand or gravel, or in fact anything that would suggest the possible aid of stream currents in sorting or placing the material during the process of accumulation. It seems probable therefore that this little fossil-bearing pocket represents the accumulation of a great number of years in which the conditions were such that animals, both large and small, sometimes by accident, sometimes by being dragged there by carnivores, occasionally became entrapped in the upper chambers of the cave. Thus carcasses of the larger animals were probably caught and held in crevices not far beneath the surface of the ground and remained there until the bones were sufficiently macerated to allow them to fall apart by their own weight, when the separated bones would work their way by gravity to lower and lower levels until they finally came to rest at the bottom of the cavern then a hundred feet or more below the surface of the ground. The broken and scattered condition of the bones found in the deposits would be accounted for in this way.

The mammals represented in the collection are undoubtedly Pleistocene and probably pre-Wisconsin in age; a more exact geological horizon of the deposits, however, can not at present be determined. From this preliminary study they appear to be about the equivalent of the Port Kennedy cave deposits, the fauna of which was described by Cope² and is now regarded as early Pleistocene. The Cumberland Cave fauna may represent a somewhat later phase. But this supposition can be verified or disproven only by a careful comparison of the material with that from Port Kennedy and other localities.

¹ *Memoirs Amer. Mus. Nat. Hist.*, vol. 9, pt. 4, 1907, pp. 163.

² *Journ. Acad. Nat. Sci. Phila.*, vol. 11, 1869, pp. 194-267.

LIST OF FAUNA REPRESENTED.

Equus sp.
Tapirus cf. *haysii* (?) Leidy.
Taurotragus americanus Gidley.
Platygonus cf. *vetus* ? Leidy.
Ursus (*Euarctos*) cf. *americanus* ? Pallas.
Ursus (*Euarctos*) *vitabilis*, new species.
Canis armbrusteri, new species.
Canis sp.
Vulpes (?) sp.
Mustela cf. *vison* Schreber.
Lepus americanus ? Erxleben.
Lepus sp.
Ochotona cf. *princeps*.
Synaptomys sp.
S. (*Myctomys*) cf. *borealis* (Richardson).
Microtus cf. *chrotorrhinus* Miller.
Microtus sp.
Neotoma sp.
Napæozapus sp. probably new.
Peromyscus cf. *leucopus* (Rafinesque).
Erethizon, two new species.
Marmota cf. *monax* Linnæus.
Sciuropterus cf. *alpinus* Richardson.
Sciurus hudsonicus Erxleben.
Myotis, new species (?).
Vespertilio grandis Brown.
Vespertilio sp.
Blarina cf. *brevicauda* (Say).

DESCRIPTION OF NEW SPECIES AND NOTES ON CANIDS.

CARNIVORA.

Genus *URSUS* (*EUARCTOS*) Gray.

This subgenus is represented by at least two species, as shown by many specimens consisting of foot and limb bones, and a few upper and lower jaw portions containing teeth. At least one of these forms is new and is described below.

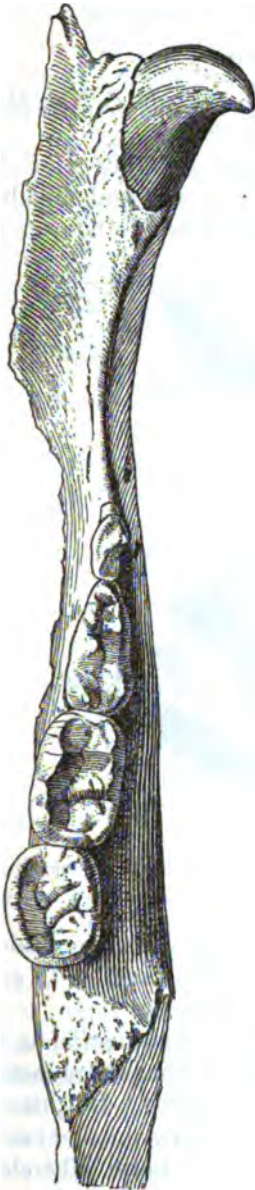
URSUS (*EUARCTOS*) *VITABILIS*, new species.

Type.—Lower jaws, nearly complete, lacking incisors (Cat. No. 7665, U. S. Nat. Mus.), see figs. 1, 1a, p. 97.

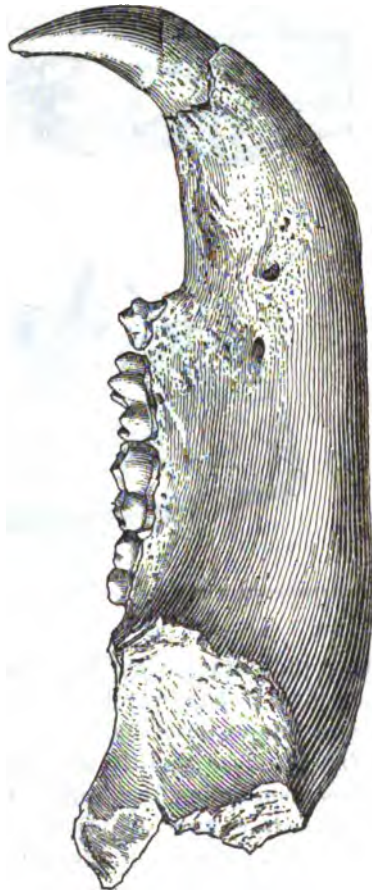
Description.—About the size of *U. (Euarctos) americanus*, but differs from that species in (1) comparatively larger canines; (2) wider space

between the anterior cheek-teeth, combined with a less wide branching of the horizontal rami in general; (3) a relatively larger symphysis, which is more sharply constricted and more flattened laterally behind the canines; and (4) longer diastema between canines and cheek-teeth.

A second specimen, a portion of the right maxillary (Cat. No. 7664, U. S. Nat. Mus.), is probably referable to this species. It contains the two molars, which do not differ materially, except in their somewhat smaller size, from the corresponding ones of *U. americanus*.



1a



1

FIG. 1.—*URSUS (EUARCTOS) VITABILIS*. TYPE-SPECIMEN. OUTER VIEW OF RIGHT LOWER JAW, 2-3 NAT. SIZE. a. SUPERIOR VIEW, NAT. SIZE.

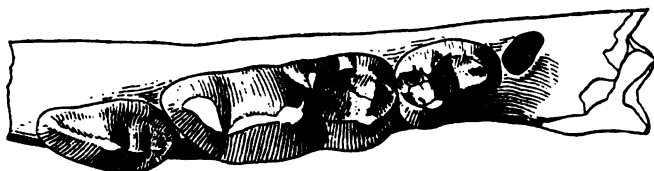
Genus CANIS.

There are at least two carnivores represented in the collections which are referable to *Canis* as that genus is at present understood. One species is here described.

CANIS ARMBRUSTERI,¹ new species.

Type.—Portion of a left lower jaw (Cat. No. 7662, U. S. Nat. Mus.), containing three teeth, p_4 to m_2 . (See figs. 2, 2a.)

Paratypes.—Portion of a right lower jaw (Cat. No. 7661, U. S. Nat. Mus.) containing four teeth, p_2 to m_1 (see figs. 3, 3a), and the alveoli for p_1 , and the canine; and portions of the right and left lower jaws



2a



2

FIG. 2.—CANIS ARMBRUSTERI, TYPE-SPECIMEN, PORTION OF LEFT LOWER JAW. 2. OUTER VIEW, 2-3 NAT. SIZE. a. SUPERIOR VIEW, NAT. SIZE.

of another individual (Cat. No. 7482, U. S. Nat. Mus.), containing teeth (see figs. 5, 5a), which include the carnassials of both sides, and m_2 and the posterior half of p_4 of the left side.

Description.—Size slightly less than that of *C. occidentalis*, as that species has been defined by Miller,² but the tooth characters indicate an animal quite distinct from any of the true wolves. Its principal differences are seen in the greater relative depth of jaw, smaller canine, more simple p_2 and p_3 , the presence of a posterior basal tubercle on p_4 , and in the relatively larger heel of the carnassial. The paraconid

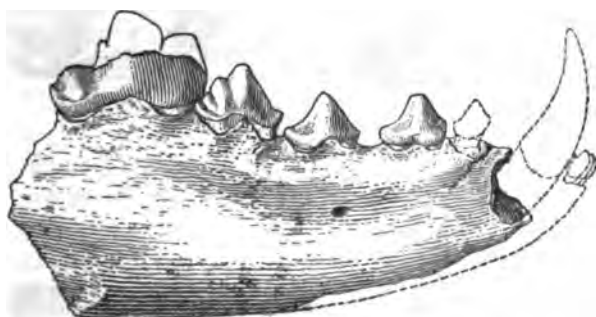
¹ This species is named in honor of Mr. Raymond Armbruster, through whose efforts the Cumberland Cave deposits were first brought to scientific notice.

² Smiths. Misc. Coll., vol. 59, No. 15, 1912, p. 2.

also is less expanded at base, with more perpendicular anterior face. The metaconid is larger and higher placed, while the protoconid is less broad and full, as seen from the inner side. The carnassials as a whole suggest those of the jackal, fox, or coyote rather than those of the wolf. The anterior functional premolars are relatively small and have no accessory tubercles, while p_4 is fully as heavy and robust as in the wolves and carries, besides the usual secondary cusp, an extra posterior basal cusp in addition to the cingulum, as in the jackals and coyotes. In the wolves and dogs (see figs. 4, 4a) p_4 has but one secondary cusp and a cingulum heel, but p_2 and p_3 usually have a well-developed posterior secondary cusp.



3a

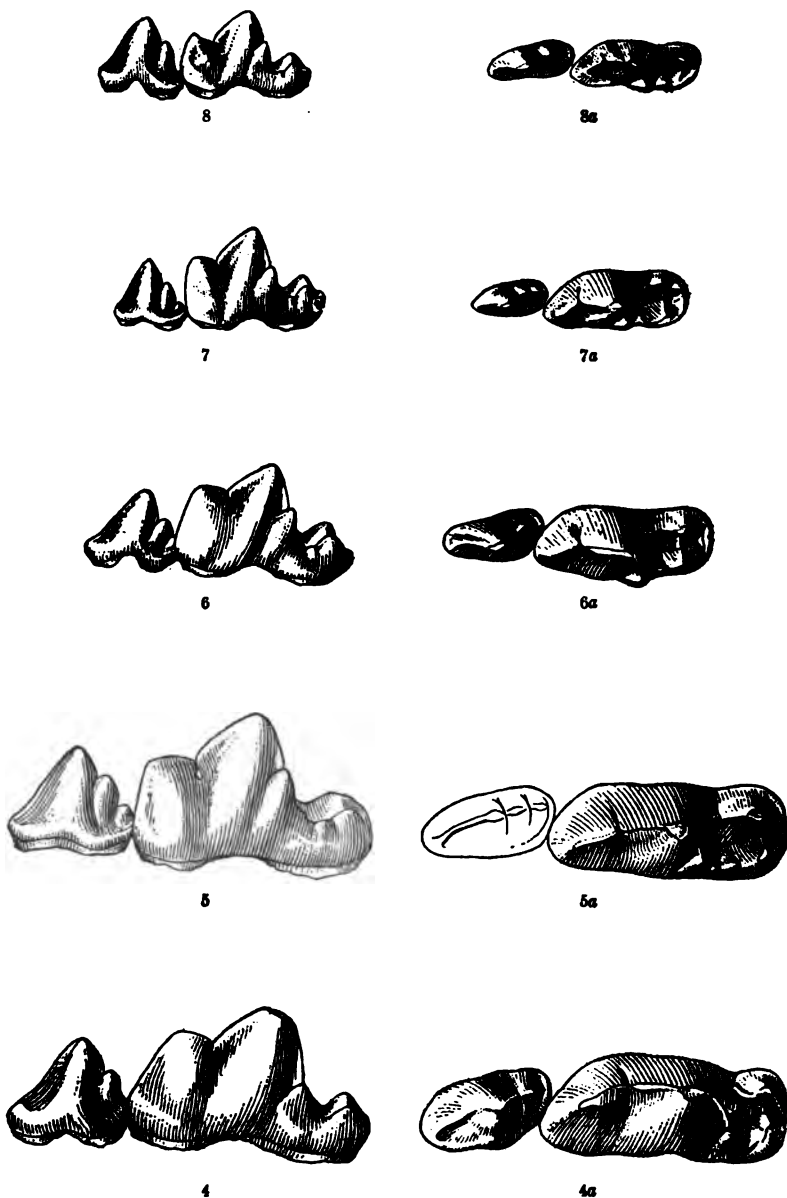


3

FIG. 3.—*CANIS ARMBRUSTERI*. CAT. NO. 7661, PORTION OF RIGHT LOWER JAW. OUTER VIEW, 2-3 NAT. SIZE. a. SUPERIOR VIEW, NAT. SIZE.

ADDITIONAL NOTES ON THE LOWER TEETH OF THE CANIDS.

The carnassials in the canids, except within the narrow limits of individual variation, are very constant in character and present certain modifications which for the most part readily determine the group to which they belong. These, taken together with the combined characters of the other teeth, are clearly diagnostic, not only of the various larger groups of the family, but even of groups now included in the genus *Canis*. Thus in the true wolves and domestic dogs the heel of the lower carnassial is short (being less than one-fourth the total length of the crown) and is narrower than the talonid; the paracoid is relatively large, with antero-posteriorly lengthened base, so that the anterior face slopes backward at a con-



FIGS. 4-8.—LOWER FOURTH PREMOLARS AND CARNASSIALS OF CANIDS. ALL NATURAL SIZE. 4, 4a, *CANIS OCCIDENTALIS*, CAT. NO. 1006, U.S.N.M. 5, 5a, *CANIS ARMBRUSTERI*, CAT. NO. 7482, U.S.N.M. 6, 6a, *CANIS (LYSCISCUS) LATRANS*, CAT. NO. 3618, U.S.N.M. 7, 7a, *CANIS AUREUS*, CAT. NO. 181500, U.S.N.M. 8, 8a, *VULPES*, CAT. NO. 7183, U.S.N.M.

siderable angle; the body, or column, of the protocoid is full and rounded, and the metacoid is greatly reduced, appearing in the living species as a small tubercle on the inner posterior angle of the protocoid near its base (see fig. 4). Similar and fully as important differences are observed in the upper carnassial. The character of the premolars have been stated above, page 98.

The constancy of these characters seems to mark the wolves and dogs as closely related members of a natural group, and tends to support the belief held by many, and recently especially expressed by Miller,¹ that all the domestic breeds of dogs were originally derived from some species of true wolf, and not from the jackal as has been held by some other authorities.

The subgeneric distinction of the coyotes (*Lyciscus*) is well substantiated by their tooth characters (see figs. 6, 6a). The teeth in this group are all relatively narrower and less robust than in the wolves, while the carnassial has more the general proportions of those of the jackal or fox (see figs. 7, 8). Thus the heel is less reduced, with the two principal cusps more trenchant and more nearly subequal; the metaconid is more prominent; the paraconid shorter; and the bodies or columns of the paraconid and protoconid are less full and rounded, leaving the cutting blades of the trigonid much sharper. The p_4 has two posterior tubercles and a posterior basal cingulum, and p_2 is usually simple.

Both p_4 and p_2 are usually simple in the jackals while the crowns of all the premolars are relatively higher and shorter than are those of the coyotes.

The foxes differ from the other canids in having relatively lower crowned, smaller carnassials as well as in the greater relative length of the canine, as pointed out by Miller.²

In *Cuon* and *Lycan* the lower carnassials have a completely single-cusped, trenchant heel, which distinguishes them from all the other living canids. There are differences likewise in the upper carnassials and other teeth, especially the molars, which separate this group from *Canis* and seem to ally it to some of the extinct forms of the late Oligocene, of the *Temnocyon*, or *Hyenocyon* type.

Some of the characters mentioned above have been recognized and used by various investigators, but others of seemingly equal importance seem to have been overlooked.

Herewith is a list of the principal characters of the lower teeth which seem to be diagnostic for some of the groups of living canids.³ *Canis armbrusteri* is also included.

¹ Catalogue of Mammals of Western Europe, 1912, p. 313.

² *Idem*, p. 326.

³ This is not a complete classification and is only given to show some of the more important tooth characters, especially of the carnassials. The South American fox-like dogs are not included here.

- a¹. Lower carnassials with trenchant heel. *Cuon, Lycaon.*
- a². Lower carnassial with heel more or less basin-shaped with two prominent cusps.
- b¹. Heel of carnassial reduced, narrower than trigonid, length contained in total length of tooth about four times; main cusps of carnassial heel, and anterior pair of m_2 as well, very unequal in size.
- c¹. Protoconid and paraconid of carnassial very large and full, subconic to summit. Premolars robust, with but one posterior tubercle each on p_3 , p_4 , and usually on p_2 . Each premolar has besides a posterior basal shelf formed by the cingulum. *Canis* (wolves and domestic dogs).
- c². Anterior premolars greatly reduced. *Epiyon* (extinct).
- b². Heel of carnassial less reduced, about equaling trigonid in width, length of heel contained in total length of tooth three and one-half times or less. Protoconid and paraconid of carnassial less full and more bladelike. Innercusps of carnassial heel and anterior pair of m_2 relatively larger, sometimes almost subequal with the opposing outer cusps.
- c³. Molars and premolars relatively narrow or compressed, p_4 with two posterior tubercles and basal cingulum, p_2 and usually p_3 with a single posterior tubercle. Canines large, but relatively longer than in the wolves. *Canis* (*Lyciscus*) (coyotes).
- c⁴. Premolars relatively shorter as in the wolves but with higher more pointed cusps. P_4 with two posterior tubercles and a cingulum as in the coyotes, but with no posterior tubercles on the other premolars. *Canis aureus*, etc. (jackals).
- c⁵. Carnassials proportionally small with relatively lower crowns, p_4 with one posterior tubercle and a posterior basal cingulum cusp, p_2 and p_3 with posterior tubercles obsolete or wanting.
- d¹. Tooth cusps prominent, trenchant; heels of premolars short. *Vulpes* (red fox).
- d². Tooth cusps less prominent; heel of carnassial broad with posterior inner tubercle (entoconid) small; heels of premolars long. *Alopec* (Arctic fox).
- c⁶. Carnassial moderately robust with short paraconid, and long, broad heel; premolars relatively long, low and simple, except p_4 , which has two well-defined posterior tubercles and a posterior basal cingulum; canine and anterior premolars relatively small, jaw of great relative depth in region of carnassial. *Canis armbrusteri* (extinct).

In the new species from the Cumberland Cave, *C. armbrusteri*, the general form of the carnassial is more like that of the coyote and jackal, and in the heavy three-cusped p_4 combined with the relatively small, simple, single-cusped p_2 and p_3 and small canine it resembles the jackal despite its much greater size. The relatively deeper jaw and broader more basinlike heel of the carnassial would, however, scarcely warrant considering it a member of that group. It probably represents an extinct group of dogs which when better known may be referred to a new genus.

NEW MOTH-FLIES (PSYCHODIDÆ) BRED FROM BROMELIACEÆ AND OTHER PLANTS.

By FREDERICK KNAB,

Custodian of Diptera, United States National Museum.

While on an entomological investigation in southern Mexico the writer gave some attention to the inhabitants of the epiphytic Bromeliaceæ, which are so characteristic a feature of our American tropics. Dipterous larvæ were present in the water at the leaf bases of the plants in considerable numbers and variety, and among them those of Psychodidæ. These psychodid larvæ were dark in color and had a rather long breathing tube, by which they suspended themselves from the surface film in the manner of culicid larvæ. Their movements were slow, and when disturbed they sank to the bottom. The pupæ are free swimming, like those of Culicidæ, but not very active. The larvæ proved difficult to rear, but several were brought through to imago. Correspondence with Dr. J. H. Pazos, of Cuba, and Mr. A. H. Jennings, then in Panama, brought about the rearing of additional species by these gentlemen. The species all proved to be unknown, as was to be expected, and are described herewith. No doubt other species peculiar to the water of Bromeliaceæ exist, and still others in similar habitats; in fact, one from a plant of another family is included in the following.

In the descriptions I have used the generic name *Psychoda* in the broadest sense, fully realizing that the species are not typical. It would have been easy to create new genera for them, but I prefer to await a more complete elucidation of the group. I can only indorse the remarks of Mr. Brunetti on this subject.¹ In the terminology of the wing venation I have adopted that of this author as logical and the most convenient. The scale vestiture of the body and wings, in the forms here described, is long and hairlike, and by most authors would be termed hairs.

PSYCHODA AMPLIPENNA, new species.

Male.—Dark, densely clothed with long black vestiture; antennæ pale; wings marked with white. Antennæ long, nearly as long as the body, pale, the nodes globose, brownish luteous, with dense whorls

¹ Fauna of British India, Diptera Nematocera, 1912, p. 198.

of short coarse silky white hairs. Palpi rather long, about half as long as the antennæ, clothed with outstanding black scales. Occiput, thorax, and abdomen densely clothed with long, erect, hairlike black scales with white apices, giving the insect a moldy appearance. Wings grayish hyaline, ovate-lanceolate, less than twice as long as broad, the tip at third vein bluntly rounded; upper branch of second vein forked well toward base of wing; vestiture black, very heavy on the costa, the fringe at apex, from uppermost branch of second to fourth vein, pale fuscous; an ill-defined broad crescentic fascia, formed of white scales, extending nearly across disk just beyond middle of wing, the black vestiture before and beyond it slightly heavier; some erect white scales along the veins on basal half of wing; apices of marginal, submarginal, posterior, and anal cells each with a broad white spot formed by the shorter and sparser scaling at these points and not by white scales; fringe ample, unicolorous. Halteres with white stem and dark knob. Legs black scaled, the tips of last tarsal joints yellowish white.

Length.—Body about 1.5 mm.; wing 2 mm.

Locality.—San Antonio de los Baños, Cuba (J. H. Pazos); three specimens bred from larvæ in water at leaf bases of epiphytic bromeliads.

Type.—Cat. No. 15933, U.S.N.M.

PSYCHODA FUMATA, new species.

Male.—Thoracic integument pale yellowish, the body and legs more or less darkened; vestiture of thorax dirty whitish, that of body wings, and legs dark with silky luster. Antennæ long, blackish, the shaft very slender, the nodes large, well separated, bearing dense but short whorls of coarse whitish hairs. Palpi long, about half as long as the antennæ, clothed with grayish scales. Mesonotum clothed with dull whitish hair like scales, erect and very long and forming irregular tufts along lateral margins, behind and along median line; posteriorly some of the long scales show infuscation toward their apices. Abdomen clothed with dusky scales. Wings grayish hyaline, broadly lanceolate, about twice as long as broad, coming to a point at third vein; auxiliary vein well developed, reaching to apical third of wing; upper branch of second vein forked beyond middle of wing; seventh vein well developed; vestiture dull brown and black, unspotted; costa densely clothed with long hairlike black scales; scales of veins dusky brown, uniformly distributed; fringe ample, dusky with fuscous luster, at apex becoming black like the costa. Halteres pale, with black knobs. Legs blackish, unmarked, the scales with gray luster.

Length.—Body about 2 mm.; wing 2.5 mm.

Locality.—Córdoba, Mexico, March, 1908 (F. Knab).

Type.—Cat. No. 15934, U.S.N.M.

Three specimens bred from larvæ in the water at the leafbases of epiphytic bromeliads. Larvæ were found in different plants on different occasions, but proved difficult to rear. The forking of the upper branch of the second vein beyond the middle of the wing, as it occurs in this species, has been supposed to be a characteristic peculiar to the subfamily Phlebotominae; but the presence of a well-developed long seventh vein clearly places it in the Psychodinae.

PSYCHODA TRICOLOR, new species.

Female.—Black, variegated with white and ochereous yellow. Antennæ long, slender, pale, the nodes elongate and rather small, with dense whorls of coarse silky white hairs. Palpi stout, rather long, less than half as long as the antennæ, densely clothed with shaggy black scales. Thorax brownish luteous; dorsum clothed in front with erect brownish white scales, posteriorly with black ones, the two intermingling toward the middle, a few white-tipped scales posteriorly. Abdomen densely clothed with long erect black scales, some yellow scales forming tufts on anal appendages. Wings pale grayish hyaline, broadly lanceolate, over twice as long as wide, coming to a rather sharp point at apex of third vein; upper branch of second vein forked before middle of wing; vestiture black with white marginal spots; fringe broadly golden before apex on both outer and inner margins, the extreme tip black; costal vestiture dense, black from base to uppermost branch of second vein and involving two small white patches; fringe on inner margin very long, black from base to fourth vein; longitudinal veins with the black scales denser at extreme apices, producing the effect of black spots, just before them some long white scales which project in such a way as to give the effect of white marginal spots on the cells. Legs with shaggy black scales; knees silvery white scaled; some of the tarsal joints with narrow white rings.

Length.—Body about 2.5 mm.; wing 2.7 mm.

Locality.—Coscajar River, Panama, February, 1909 (A. H. Jennings). Three specimens bred from larvæ in water at leaf bases of epiphytic bromeliads.

Type.—Cat. No. 15935, U.S.N.M.

A very similar species has been bred from larvæ in the liquid held by the flower bracts of *Calathea discolor*. On account of the similarity of appearance and of habits it is best described here.

PSYCHODA INCOMPLETA, new species.

Male.—Black, variegated with white, similarly marked to *P. tricolor*. Antennæ long, dark, the nodes globose, piceous, the stems slender, brownish; hairs of whorls long and rather dense, blackish. Occiput, thorax, and abdomen densely clothed with long erect sooty scales. Wings pale grayish hyaline, broadly lanceolate, over twice

as long as wide, coming to a rather sharp point at apex of third vein; upper branch of second vein forked before middle of wing; vestiture black, with white marginal spots; fringe black, with two white patches near apex of wing, one on outer margin between upper forks of second, the other on inner margin between forks of fourth vein; a series of marginal whitish spots between the veins, produced by white scales projecting from the veins, absent on the cells between second and fifth veins. Legs with shaggy black scales, without white knee-spots, but with white rings on some of the tarsal joints.

Length.—Body about 2 mm.; wing 2.5 mm.

Locality.—Tabernilla, Canal Zone, Panama, April, 1909 (A. H. Jennings). Three specimens.

Type.—Cat. No. 15936, U.S.N.M.

Bred from larvæ found in fluid held by the flower bracts of *Calathea discolor* Meyer. The liquid in these flower bracts is dark and thick, produced partly by a mucilaginous secretion of the plant itself.

NEW MOLLUSKS FROM THE BAHAMA ISLANDS.

By PAUL BARTSCH

Assistant Curator, Division of Mollusks, United States National Museum.

Some time ago the United States National Museum received from Mr. G. W. Pepper, of Providence, Rhode Island, a collection of Bahama land mollusks for determination. Among these shells are several forms which are sufficiently distinct from those heretofore known from these islands to merit recognition. I have therefore prepared the following descriptions and figures.

Shortly after describing these shells, I had the pleasure of visiting the Bahamas myself, and was able to make large collections there, particularly on Andros Island, which is a collective term applied to a number of minor keys separated by tortuous channels of varying width and depth. Practically each key examined, no matter how small, providing it bears vegetation, excepting those in the Tongue of the Ocean, which are at times dashed over by waves, is inhabited by *Cerions* of the *glans* group. Sufficient differentiation has taken place on each key to enable one to distinguish the shells from the different keys. On some of the keys a series of swales separate an equal number of wooded elevations, each of which is occupied by a different race of these shells. The question naturally presents itself, to what extent are these forms constant? Do they represent stable races with fixed characters, or are they continually changing in form? It seems to me that our systematic treatment of this group will have to depend upon the answer to these questions, for it would be folly to waste time and paper in describing thousands of forms if they are not constant. If they are changing, the question still presents itself, do they pass through a definite cycle of changes? Then the further question arises, are we dealing with a complex Mendelian problem? At all events it seems desirable to study the underlying factors responsible for the phenomena as they are represented, and until such studies have been completed it would be more desirable to stop indiscriminate description of new species of *Cerion*.

I have probably a hundred so-called species which I might describe, of recent years' collecting, as distinct as any that have received names in the past, which will wait for their designation until the

breeding experiments ¹ I am now conducting on the Florida keys, under the auspices of the Department of Marine Biology of the Carnegie Institution of Washington, D. C., have been completed.

The *Cerion* described in the present paper is as distinct as any of the described species. Were it part of my collecting I would retain the description until the breeding experiments have given a decision upon the desirability, yes, the necessity, of describing the thousands of races which will be found when exhaustive collecting will have been done in the Bahamas. However, since the present species has been distributed under the above name, it is best that it should have a definite status. For the other forms described, no apologies are necessary.

CERION (STROPHIOPS) PEPPERI, new species.

Plate 3, figs. 1, 3, 7-12.

Shell cylindro-conic, moderately tapering at the apex, chocolate brown, crossed with slender, very retractive, somewhat irregular, whitish, axial riblets, between which appear finer lines of growth. Base rimate, crossed by the continuation of the axial ribs. Aperture small, with a white reflected peristome. Parietal wall provided with a strong fold, which is a little to the right of the middle; the second fold is at the junction of the inner lip and parietal wall.

This species was found common by Mr. G. W. Pepper, 2 miles south of Mastic Point, Andros Islands, Bahamas. The type, Cat. No. 250217, U.S.N.M., figure 10, has 12 whorls and measures: length, 31.0 mm., diameter, 9.0 mm.

With the type lot are a number of smaller specimens which have a completed aperture, but a much lesser number of whorls, figures 9 and 12. They agree in all characters with the species excepting size and number of whorls. One of these has nine whorls and measures: length, 19.9 mm., diameter, 8.2 mm. Another having nine whorls measures: length, 19.0 mm., diameter 9.5 mm.

Still another lot of specimens, of which I have seen three, figures 1, 3, and 11, are intermediate in size between these two. These three have a second lip, starting from within the first peristome, building out a new growth and leaving the original reflected peristome as a broad varix. One of these has ten and one eight turns and measures; length 22.9 mm.; diameter 10.0 mm. It would seem as if these smaller specimens indicated a forced maturity owing probably to the effects of a dry season and that with the return of favorable conditions these three have started a new growth.

Still two other specimens of this species have, probably owing to some injury, assumed a scalariform spire in the later whorls. These two, figures 7 and 8, were collected on a small unnamed key south of Mastic Point, Andros Islands, Bahamas.

¹ See Yearbook, Carnegie Institution, No. 11, pp. 129-131, and the second report in the next yearbook, not yet issued.

CEPOLIS MAYNARDI ELEVATA, new subspecies.

Plate 3, figs. 4-6.

Shell similar to *C. maynardi*, but much more elevated, with the axial sculpture a little more strongly emphasized, the individual whorls are more inflated, the aperture is considerably shorter and tends toward a subcircular rather than an oval outline. Lip edged with pink internally. Color bands absent.

Eight specimens of this species were collected by Mr. Pepper at Mastic Point, Andros Islands, Bahamas. Two of these, cotypes, are in the U. S. National Museum, Cat. No. 250221. These have five whorls and measure: Altitude, 9.8 mm., and 10.2 mm.; greatest diameter, 12.5 mm. and 13.1 mm., respectively.

LEPTINARIA BAHAMENSIS, new species.

Plate 3, fig. 2.

Shell elongate-conic, yellowish white. Whorls seven, well rounded but not inflated, marked by very fine, slender, sinuous, axial threads. Sutures strongly constricted. Periphery of the last whorl well rounded. Base narrowly umbilicated. Aperture oval; posterior angle obtuse; half the outer lip, immediately below the summit, inbent and at the same time slightly protracted into a faint claw-like element; inner lip revolute, provided with a fold a little anterior to its middle. Parietal wall glazed with a thin callus.

The type, Cat. No. 250220 U.S.N.M., was collected by Mr. G. W. Pepper at Mastic Point, Andros Islands, Bahamas. It measures: Length 7.1 mm.; diameter 3.7 mm.

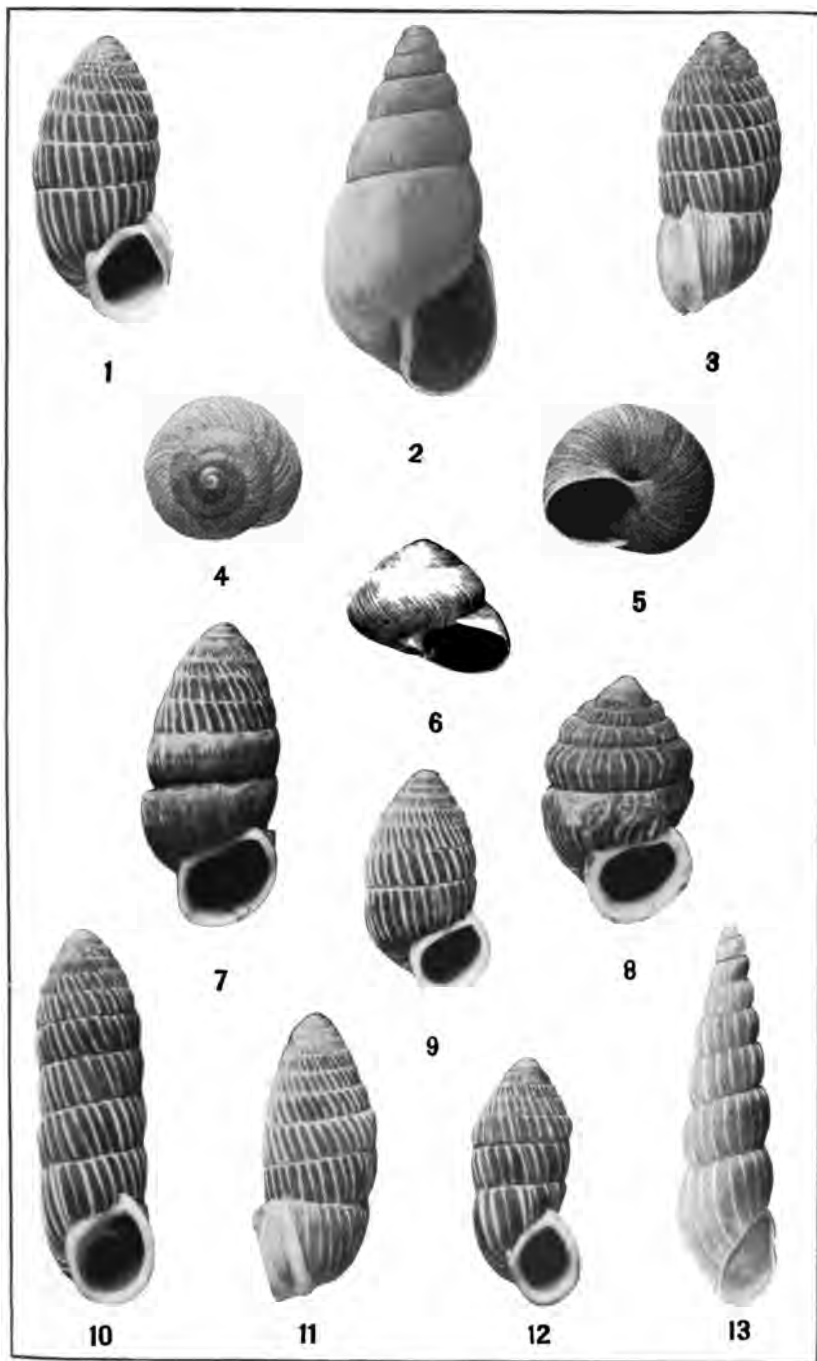
VARICELLA GRACILLIMA BAHAMENSIS, new subspecies.

Plate 3, fig. 13.

Shell similar to *V. gracillima*, but having the whorls less inflated, and scarcely at all shouldered at the summit, and the sutures much less constricted. The ribs also in the present form are very poorly developed and much more distantly spaced than in *V. gracillima*.

The type, which has nine whorls, measures: Length 7.5 mm.; diameter 2.0 mm.; it and three specimens, Cat. No. 180661, U.S.N.M., were collected by Owen Bryant on Mangrove Cay, Andros Islands, Bahamas. Cat. No. 180660, U.S.N.M., contains six specimens, which are a little smaller in every way than the type lot, collected by the same gentleman under leaves and bushes on a hillside near Fort Charlotte, Nassau, New Providence. Still another specimen was determined for Mr. G. W. Pepper, collected on Andros Islands.

EXPLANATION OF PLATE 3.FIGS. 1, 3, 7-12. *Cerion (Strophiope) pepperi*.4-6. *Cepolis maynardi elevata*.2. *Leptinaria bahamensis*.13. *Varicella gracillima bahamensis*.



NEW MOLLUSKS FROM THE BAHAMA ISLANDS.

FOR EXPLANATION OF PLATE SEE PAGE 109.

NOTES ON THE ODONATA, OR DRAGONFLIES, OF BUMPING LAKE, WASHINGTON.

By CLARENCE HAMILTON KENNEDY.

Of Sunnyside, Washington.

The following paper is based on material obtained by the writer, on July 10 and 11, 1911, while collecting mussels for the United States Bureau of Fisheries. The specimens on which this paper is based are deposited in the United States National Museum.

Bumping Lake of the Cascades, which is called Lake Tannum on the older maps, is in the west end of Yakima County, Washington, at an elevation of 3,300 feet. It is roughly L-shaped, about 5 miles long and one-half mile wide. Its outlet, Bumping River, empties into the American River, which in turn empties into Naches River. The Naches River is the main tributary of the Yakima River.

Bumping Lake is a dark sheet of water hemmed in on all sides by great somber firs. To one who sees it for the first time it is a striking lake, for, while gazing across its quiet surface, with the fir-covered slopes rising for a thousand feet from the water's edge, and above these towering another thousand feet the rocky crags and snow-drifted slopes of the higher ridges, a distant tanager's call echoing through the firs breaks the silence, and one's impression is that of solitude. This impression is further carried out in a study of the fauna of the region, in most groups of which comparatively few species occur, and these few occur in small numbers.

The lake lies near the upper border of the Canadian zone. The coney, great northern shrike, varied thrush, and white-winged crossbill of the Hudsonian zone are associated here with the coyote, pine squirrel, and Louisiana tanager of the Canadian. As in other groups but few species of dragonflies are found here, and but one of the four found, a mountain or northern species, appears to be at home and flourishing. Possibly this scarcity in the case of the dragonflies is due to some extent to the recent damming of the lake's outlet by the Reclamation Service to hold back water for late summer irrigation, for the lake surface is now raised each summer 40 feet above its

former level. This fluctuation of the surface level is especially disastrous to lake species of dragonflies, as it entirely prevents the formation of a shore vegetation of aquatic plants, or beaches, such as dragonflies usually frequent.

The water of the lake is very cold, as the lake is fed entirely by the torrents which rush down from the snow fields covering the surrounding heights. It is not clear for a mountain lake, but has a slight turbidity of a dark swampy nature, possibly due to the recent flooding of the burnt-over margins.

Of the four species of dragonflies found about the lake, only two occurred along the lake shore. Of these two, *Aeshna multicolor* patrolled the surface of the water, while *Sympetrum corruptum* caught Diptera among the bushes or rested in the sunshine, perched on some dead twig. Not more than 20 individuals of these two species were seen, and neither species was observed pairing or ovipositing. The other two species were found in a bordering swamp, several of which occur here. All except one were cedar swamps, which were dark and gloomy places, with the water completely shaded by the great trunks and pendulous limbs of the cedar trees, and were seemingly avoided by the light-loving dragonflies.

The single open swamp was known at the lake as "Cabin Swamp," because on its bank stood a log cabin used by the forest rangers, by whom the swamp itself had been fenced for a horse pasture. This "Cabin Swamp" was on the south shore and about 2 miles above its outlet. It was about 2 acres in extent, was covered with sedges and swamp grasses, and contained but two or three shallow pools. Toward the lake the swamp was bordered by a dense forest of black pines, while over its opposite border towered the snow-capped ridge, down the gullies of which roared the snow water which fed it. Numerous clumps of various species of mountain willows, one species only 12 inches high, dotted the grass, while everywhere over its surface were bright yellow splotches of senecio, clumps of a low purple flower, and many spikes of a white orchid.

Three species of dragonflies were found in this swamp, *Aeshna multicolor*, *Amphiagrion saucium*, and *Somatochlora semicircularis*.

Aeshna multicolor strayed in from the lake shore occasionally. Two or three individuals were seen here, though none were taken.

Amphiagrion saucium occurred here, though only three individuals were seen—a single male and a pair in copulation, the female of which was taken. This species hovered in the grass.

Somatochlora semicircularis was the species of dragonfly thoroughly at home in this high cold swamp. The metallic luster of its green body seemed in harmony with the icy water and cool bracing air, spicy with the delicate perfume of the mountain orchids. As compared with the other three species, *Somatochloras* were abundant, as

six or eight individuals were seen on the wing at times and one or two pairs in copulation, though occasionally none would be in sight. Being active on the wing, it seemed that the open swamp was merely the favorite spot of a wider range, though I did not succeed in checking this conclusion by finding *Somatochlora*s flying elsewhere. Of the two sexes the males were the more active and the higher fliers. They usually flew about 2 feet above the sedges, but occasionally they would take high flights among the black pines growing about the swamp. The males were never at rest except when copulating, but the females, while usually flying low, frequently rested on the sedges and other plants. In mating the males captured the females while these rested. After capture followed a long nuptial flight in copulation, which usually lasted several minutes, following which the pair, while yet in copulation, settled on some tree or shrub, where they remained for a long time. One pair was timed 25 minutes for this resting period. The eggs were laid in masses on the surface of the water in the more open pools, whereupon the egg masses would immediately disintegrate and fall to the bottom. The females were unaccompanied by the males while ovipositing. A careful search for both larvæ and exuviae was made, but neither were found.

The following list gives the specimens collected. The dates of collection were July 10 and 11, 1911.

AMPHIAGRION SAUCIUM (Burmeister).

One female of this species was taken in "Cabin Swamp," and two males were seen.

ÆSHNA MULTICOLOR (Hagen).

One male of this species was captured on the north side of the lake near the spillway. Perhaps a dozen individuals were seen along shore, and three were seen in "Cabin Swamp."

SOMATOCHLORA SEMICIRCULARIS (Selys).

Nine pairs, 32 single males, and 6 single females of this species were taken in "Cabin Swamp." This number probably comprised a majority of the individuals living there, as they were much less numerous at the end of the second day's collecting than in the beginning. None were seen elsewhere. Because the females were more easily caught than the males, I believe that the foregoing numbers show the natural proportion of the sexes, especially as I found no frogs or toads in the swamp, and the water was not deep enough for fish; neither did I observe any birds capturing dragonflies.

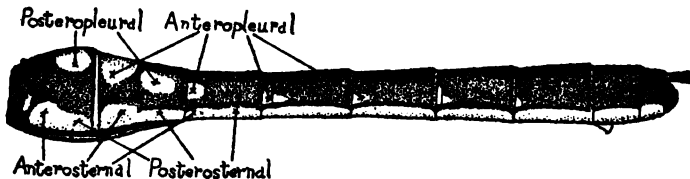
As *Somatochlora semicircularis* is a species not common in collections, especially in such large series, it seemed opportune to make careful descriptions and to publish notes and drawings based on the variations among the individuals.

Color of *Somatochlora semicircularis*, male, field No. 4.

Vertex metallic blue, finely and evenly punctate, evenly covered with yellow pile. Lateral ocelli yellow, central ocellus brown. Frons metallic blue, but with slightly more greenish tinge than vertex; each lateral face of frons with yellow triangle.¹ Antennæ black. Clypeus with center very pale yellow; wings of clypeus black; pile on lower edge yellow. Labrum black. Labium very pale yellow, coarsely punctate; pile white. Eyes brown above and gray below. Rear of head black, with submarginal row of white hairs.

Prothorax black, with anterior edge of dorsum white, and a diamond-shaped white "cushion" at posterior edge; this "cushion" covered with long white pile. Coxæ white on external surface, black on internal surface; legs black.

General color of mesothorax and metathorax metallic blue, with greenish reflections, thickly covered with long yellow pile, which is longer toward the ventral and posterior surfaces. Mid-dorsal carina



SOMATOCHLORA SEMICIRCULARIS.—ABDOMEN OF FEMALE SHOWING MARKINGS AND TERMS USED IN DESCRIBING THEM.

black. Ventral and antero-dorsal edges of mesepisternum and the antealar sinus yellowish. Mesepimeron with vertical, lenticular yellow spot. Metepimeron with much smaller elliptic yellow spot. Wings hyaline, except brown stigma, yellow anal triangle in hind wings, and white membranules, which are dusky on distal two-thirds in hind wing.

General color of abdomen black, with bluish reflections on segments 1-3.

The markings on the abdomen fall into two distinct series, viz, a pleural or lateral series, and a sternal or ventral series. The relationship of these series is well shown on figure 47; also it is shown, but not so well, in figures 46, 48, and 52. It appears, from a study of the drawings, that in the highest development in these series there would be on each segment both an anterior and a posterior spot in each series. This occurs in the sternal or ventral series in both sexes. (It must be remembered that in the ventral series these two spots on each segment are confluent and so form a solid stripe

¹ The yellow or orange on either side of the frons in *Somatochlora semicircularis* is variable in extent, generally not tending to meet from either side to form a transverse band separating the dark-colored frons from the dark-colored nasus. In one female specimen, however, this band is completely present, and in five males and two females it is nearly complete, being interrupted a short distance only at the middle. Dr. Philip P. Calvert states that in some male specimens of this species from Maine the band is complete in every case. In the material upon which the present paper is based the tendency is in the opposite direction; i. e., toward the obliteration of the band.

along the sterna from segment 2 to segment 9. This stripe does not show in the drawings, because of the shape of the abdomen. The pleural or upper series is much more interrupted. The spot on segment 1 probably belongs to the sternal series. The accompanying text figure shows the application of the terms used in describing these series of spots. I might note here that figures 30-57 were drawn from dried material 14 months old, but excellently preserved. I believe that the coloration is substantially the same as in life, but I have noticed, particularly in two steamed specimens, some slight changes in coloration.

The segments of the abdomen in the male (see figs. 30-43) show always the following yellow markings:

Segment 1. A lateral, vertical, elliptical spot.

Segment 2. A large, round, posteropleural spot; a large, pear-shaped, anterosternal spot; a large, L-shaped, posterosternal spot, the angle of which runs down onto the genital lobe; a narrow band around posterior end of segment.

Segment 3. Anterosternal spot large, triangular, confluent with the long, narrow, posterosternal spot.

Segment 4. No pleural spots. Sternal spots narrow and confluent.

Segments 5-8. A small, round, anteropleural spot next spiracle. Sternal spots confluent, forming a streak along ventral edge.

Segments 9 and 10. Sternum yellow. Appendages black.

Figures 30-43 show the variations in the abdominal markings of 14 males. Because of the shape of the abdomen, the sternal marking of segments 4-8 does not show, but except for slight variations in width of this sternal stripe, it is for all specimens, both male and female, as described above.

Pile on abdomen short, scanty, and yellow.

Figures 26-29 show the variations in the abdominal appendages in the male. This variation is slight as compared with the other variations in the male. The tips of the superior appendages in life are elastic, and so they frequently vary in their position and direction of curve from having dried while forced out of shape. The differences shown in the tips of the four figures are due to this distortion in drying.

The following condensed table gives the measurements in the males:

Number of males.	Length of abdomen.	Number of males.	Length of hind wing.
	mm.		mm.
4	34	2	28
11	35	7	29
17	36	19	30
6	37	9	31
3	38	4	32

The following tables give the variations in the venation of the wings of the males:

Number of males.	Number of antecubitals in fore wing.	Number of males.	Number of antecubitals in hind wing.	Number of males.	Number of postcubitals in fore wing.	Number of males.	Number of postcubitals in hind wing.
17	7	2	4	6	5	5	6
17	8	38	5	20	6	20	7
6	9	1	6	12	7	14	8
1	10			3	8	2	9

Number of males.	Number of veins in triangle of fore wing.	Number of males.	Number of veins in triangle of hind wing.	Number of males.	Number of veins in internal triangle of fore wing.
3	0	21	0	3	1
36	1	20	1	2	2
2	2			36	3

By selecting from each column of the foregoing tables the character held by the greatest number of individuals, the following general description is made up: Male, abdomen 36 mm., hind wing 30 mm., eight antecubitals and six postcubitals in fore wing, five antecubitals and seven postcubitals in hind wing, one vein in triangle of fore wing, no veins in triangle of hind wing, and three veins in internal triangle of fore wing. It is interesting to note that among the 41 males none had this particular combination.

Color of *Somatochlora semicircularis*, female, field No. 12.

Vertex metallic blackish green, finely and evenly punctate and covered with dark pile. Ocelli tan-colored. Antennæ black. Frons metallic green, slightly lighter in color and more brilliant than vertex, evenly but more coarsely punctate than vertex; each lateral face with a yellow triangle.¹ Clypeus with center yellow, its wings metallic green, covered with yellow pile. Labrum black. Labium yellow, coarsely punctate, and covered with yellow pile. Eyes gray. Base of head black, with submarginal row of white hairs.

Prothorax black, with anterior edge of dorsum yellow, and a diamond-shaped, yellowish, cushion-like marking at posterior edge. Coxæ yellow on external and posterior surfaces, black on internal surface. Legs black.

General color of mesothorax and metathorax metallic green, with faint yellowish reflections, thickly and evenly covered with long yellow pile. Middorsal carina dark brown. Antealar sinus and ridges yellowish. Mesepimeron with vertical, yellow, oval spot. Metepimeron with faint yellow, oval spot. (Some females do not show this second yellow spot.) Wings hyaline, except brown stigma, a yellow tinge at base of wings, and opaque membranules.

Abdomen black, with a faint greenish luster, except as follows:

Segment 1. Side with a vertical, elliptical spot of buff-yellow.

¹ See footnote, p. 114.

Segment 2. A circular posteropleural spot. The two sternal spots confluent in a large semicircular spot. A narrow band around posterior end of segment.

Segment 3. Anteropleural spot large and elliptical. The two sternal spots confluent in a large blotch covering the lower sides and sternum of this segment.

Segments 4 and 5. Pleural spots absent. Sternal spots confluent, but much more restricted than in segment 3.

Segments 6 and 7. A small, round, anteropleural spot present. Sternal marking a narrow ventral stripe, as in segments 4 and 5.

Segment 8. No pleural spots. Sternal marking as in segments 4-7.

Segments 9 and 10. Entire sternal area yellow. Vulvar lamina yellow. Appendages black.

Pile on abdomen short, scanty, and yellow.

Figures 44-57 show the abdominal markings of 14 females. Because of the shape of the abdomen, the sternal stripe of segments 4-8 does not show. It is in all specimens as described above.

Figures 14-25 show the variations in the vulvar lamina in 12 females. On the base of the lamina there is a black spot, which varies in size in the different specimens. Figure 20 is a ventral view of the same lamina as is shown in figure 5.

The following table gives the measurements of the 14 females:

Number of females.	Length of abdomen.	Number of females.	Length of hind wing.
	mm.		mm.
1	32	1	29
3	35	5	30
4	36	3	31
3	37	2	32
2	38	3	33
1	39		

The following tables give variations in certain characters of wing venation in the females:

Number of females.	Number of antecubital veins in front wing.	Number of females.	Number of antecubital veins in hind wing.	Number of females.	Number of postcubital veins in front wing.	Number of females.	Number of postcubital veins in hind wing.
4	7	1	4	1	5	1	6
6	8	12	5	5	6	8	7
4	9	1	6	8	7	4	8
						1	10

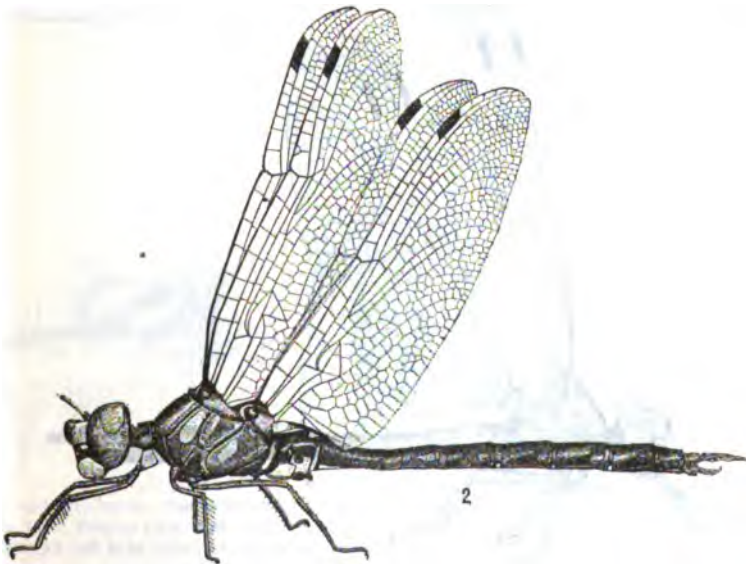
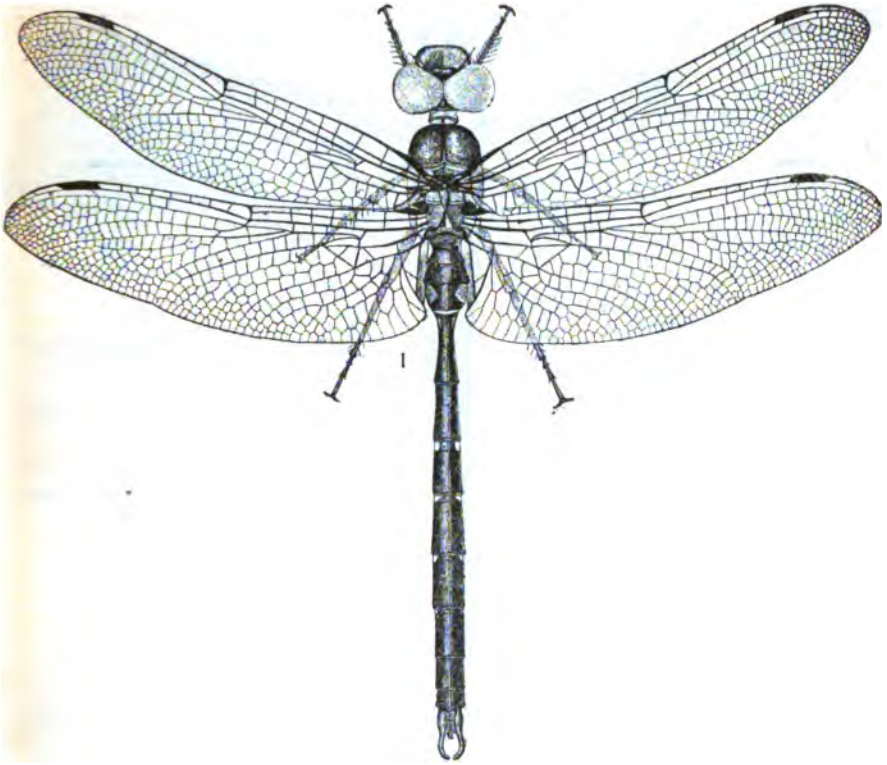
Number of females.	Number of veins in triangle of fore wing.	Number of females.	Number of veins in triangle of hind wing.	Number of females.	Number of veins in internal triangle of fore wing.
14	1	8	0	14	3
		6	1		

By selecting from each column of the foregoing tables the character held by the greatest number of individuals the following general description is made up: Female, abdomen 36 mm., hind wing 30 mm., eight antecubitals and seven postcubitals in fore wing, five antecubitals and seven postcubitals in hind wing, one vein in triangle of fore wing, no veins in triangle of hind wing, three veins in internal triangle of fore wing. No female had this combination of characters.

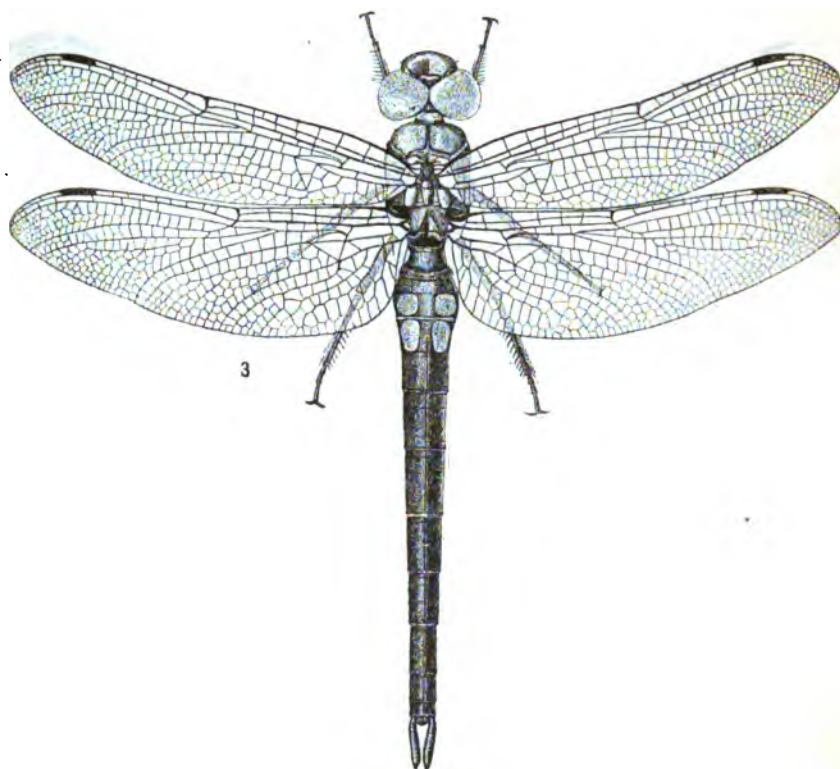
SYMPETRUM CORRUPTUM (Hagen).

One female belonging to this species was taken 1 mile above the outlet, on the south shore, and 8 or 10 individuals were seen along the lake shore.

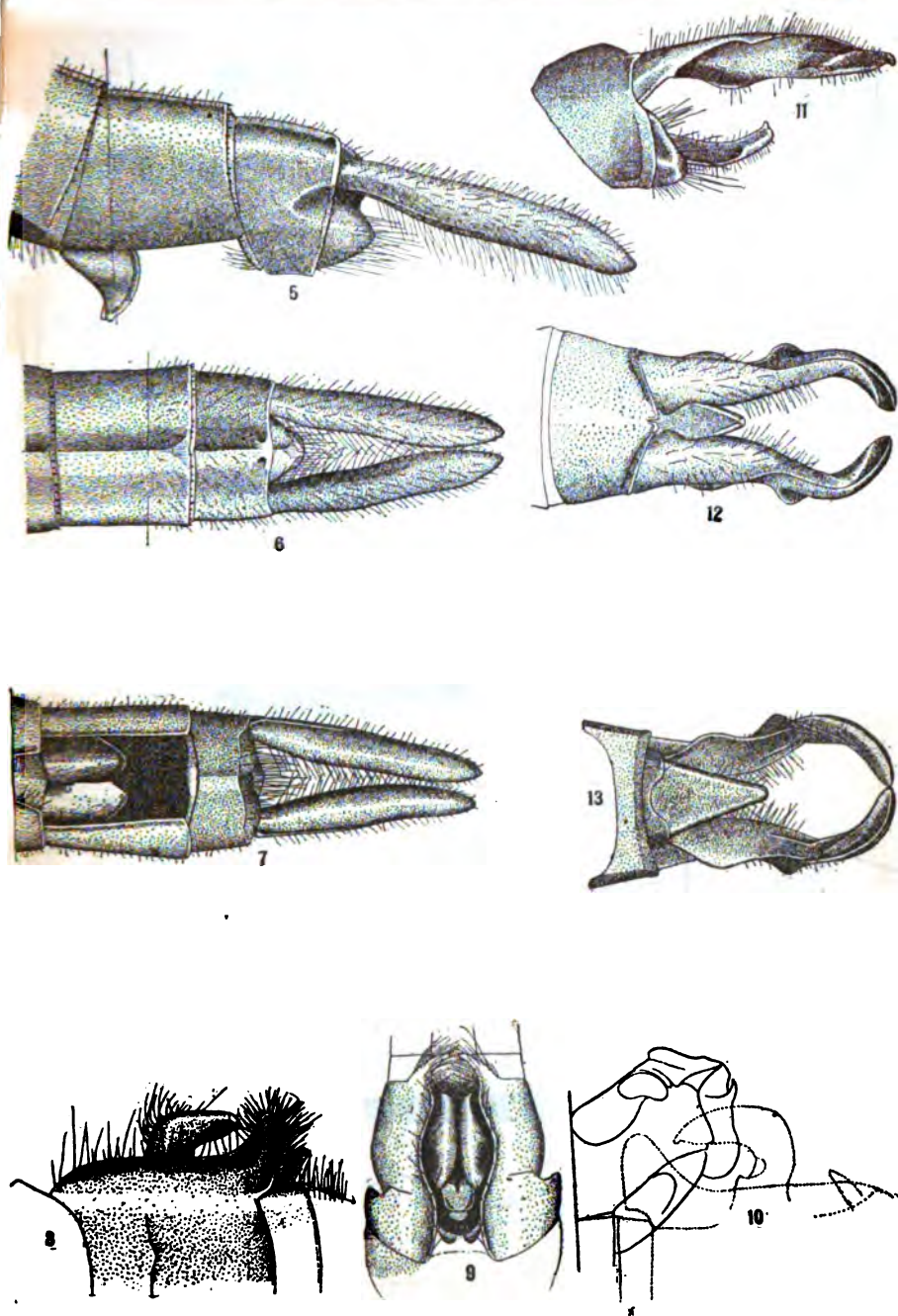
These species are widely distributed over North America, and of the last three, each in its own genus is an exceptionally vigorous and wide flier.



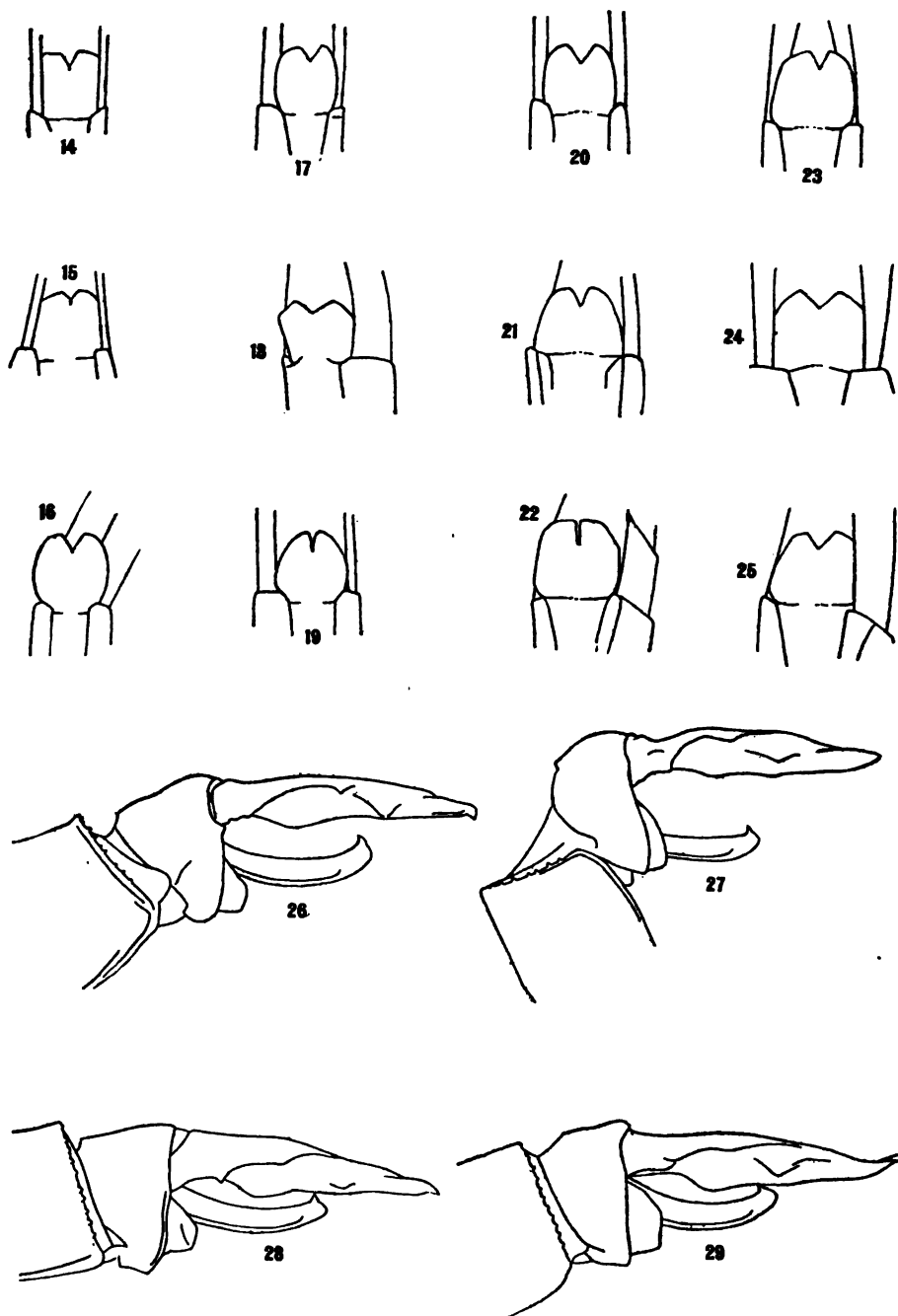
FIGS. 1-2.—*SOMATOCHLORA SEMICIRCULARIS*, MALE. 1. DORSAL VIEW. 2. LATERAL VIEW.



FIGS. 3-4.—*SOMATOCHLORA SEMICIRCULARIS*, FEMALE. 3. DORSAL VIEW. 4. LATERAL VIEW.

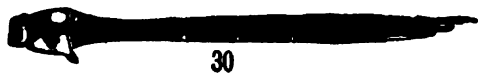


FIGS. 5-13.—*SOMATOCHLORA SEMICIRCULARIS*. 5. LATERAL VIEW OF SEGMENTS 9 AND 10 OF ABDOMEN OF FEMALE, FIELD NO. 7. 6. DORSAL VIEW OF SEGMENTS 9 AND 10 OF ABDOMEN OF FEMALE, FIELD NO. 12. 7. VENTRAL VIEW OF SEGMENTS 9 AND 10 OF ABDOMEN OF FEMALE, FIELD NO. 12. 8. LATERAL VIEW OF SEGMENT 2 OF MALE, SHOWING GENITAL LOBE AND ANTERIOR HAMULE. 9. VENTRAL VIEW OF SEGMENT 2 OF SAME MALE AS FIGURE 8. 10. LATERAL VIEW OF SEGMENT 2 OF MALE, SHOWING GENITAL LOBE AND ANTERIOR HAMULE. 11. LATERAL VIEW OF SEGMENT 10 AND APPENDAGES OF MALE. 12. DORSAL VIEW OF SEGMENT 10 AND APPENDAGES OF MALE. 13. VENTRAL VIEW OF SEGMENT 10 AND APPENDAGES OF MALE.



FIGS. 14-25.—*SOMATOCELORA SEMICIRCULARIS*. VULVAR LAMINA OF 12 FEMALES, SHOWING SLIGHT VARIATIONS DUE LARGELY TO DISTORTION IN DRYING.

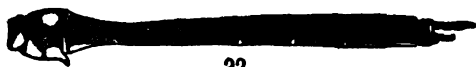
FIGS. 26-29.—*SOMATOCELORA SEMICIRCULARIS*. LATERAL VIEWS OF SEGMENT 10 AND APPENDAGES OF 4 MALES, SHOWING VARIATIONS IN TIP DUE TO DISTORTION IN DRYING.



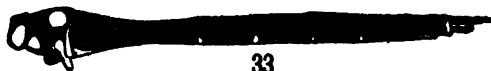
30



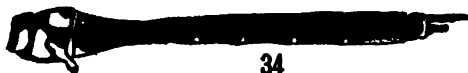
31



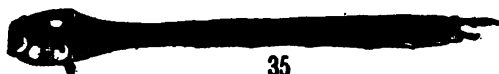
32



33



34

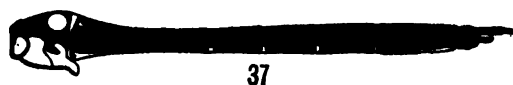


35



36

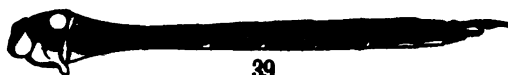
FIGS. 30-36.—*SOMATOCHLORA SEMICIRCULARIS*. LATERAL VIEWS OF ABDOMEN IN 7 MALES, SHOWING DIFFERENCES IN COLOR PATTERN.



37



38



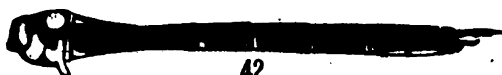
39



40



41



42



43

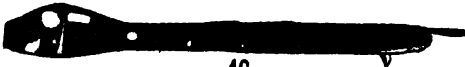
FIGS. 37-43.—*SOMATOCHELORA SEMICIRCULARIS*. LATERAL VIEWS OF ABDOMEN IN 7 MALES, SHOWING DIFFERENCES IN COLOR PATTERN.



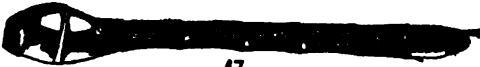
44



45



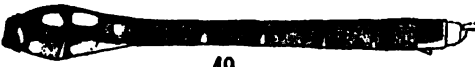
46



47



48



49



50

FIGS. 44-50.—*SOMATOCHLORA SEMICIRCULARIS*. LATERAL VIEWS OF ABDOMEN IN 7 FEMALES, SHOWING VARIATION IN COLOR PATTERN AND LENGTH.



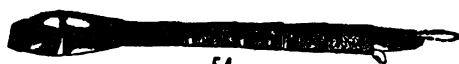
51



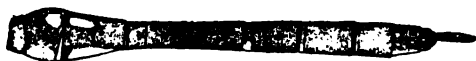
52



53



54



55



56



57

FIGS. 51-57.—*SOMATOCHIRONA SEMICIRCULARIS*. LATERAL VIEWS OF ABDOMEN IN 7 FEMALES, SHOWING VARIATION IN COLOR PATTERN AND LENGTH.

A SYNOPSIS OF THE GENERA OF AGROMYZIDÆ, WITH DESCRIPTIONS OF NEW GENERA AND SPECIES.

By J. R. MALLOCH,

Of the Bureau of Entomology, United States Department of Agriculture.

INTRODUCTION.

My original intention was to give a revision of the genera and species in this family, but I have found it impossible to accomplish this in the time at my disposal, so I have confined my work to that presented in this paper and to a revision of the species of the genus *Agromyza*, which is to appear in the *Annals of the Entomological Society of America*.

I have revised the nomenclature so as to bring it into conformity with that used by the most recent writers who have dealt with the family.

Where new species are described in old genera the species previously known from this country are tabulated, except in *Phytomyza*, and this is also done where the generic relations are different from those used in Aldrich's Catalogue of North American Diptera.

The species of this family may be known from the other Acalyptrate Muscidæ by the following characters: Eyes separated in both sexes, bare, or pilose; arista bare, or pubescent, never combed; vibrissæ differentiated, except in Ochthiphilinae; palpi and proboscis often enlarged; post-vertical bristles generally present; thorax with always at least one pair, generally two, of dorso-central macrochaetæ; at least the sternopleura with one bristle; legs without any preapical bristle. In *Agromyza* there are generally two postero-dorsal setulæ on mid tibia but the dorsal surface is without bristles; wings with subcostal vein indistinct, incomplete, or joining first vein; costa reaching to vein three or four; outer cross vein rarely much beyond wing middle, sometimes absent (*Phytomyza* and *Paramyia*); basal cells always distinct.

In the Ephydridæ and Drosophilidæ the basal cells are generally indistinct, or absent; and the arista is often combed. The genera in Geomyzidæ have often the dorsal preapical tibial bristle distinct and

costal wing vein spinose, as well as the arista plumose or sub-plumose. The Chloropidæ have the frons bare or at least without bristles; the basal cells of wings absent and generally a peculiar curve at the middle of penultimate section of fifth vein; the pleuræ are bare.

HABITS OF THE SPECIES.

Most of the species in the larval stage in Agromyzinæ are phytophagous, making mines in leaves and stems of plants, and a few species of the genus *Agromyza* make galls on twigs of trees. The Phytomyzinæ are, so far as is known, miners in leaves. The larvæ of *Ochthiphila* have been found in galls of *Triticum repens*. The species of the genus *Leucopis*, so far as they are known, feed upon aphides and scale insects. The single American species of the genus *Cerodontha* mines the stems of wheat and does considerable damage. The peculiar genus *Cryptochaetum* is predaceous in the larval state on coccids.

The perfect insects are generally found on flowers, some of them being especially abundant on the flowers of umbelliferous plants in late summer.

TERMINOLOGY.

Center stripe.—An usually opaque stripe inclosed between the orbits and generally differentiated from them by being less shining and rather more depressed. Bare in Agromyzinæ; in the Milichinæ and in some of the Ochthiphilinæ, with short bristles.

Frons.—This term I have used to designate the space bounded by the eyes laterally, the frontal lunule anteriorly, and the vertex posteriorly. It includes the orbits, center stripe, and ocellar triangle.

Lunule.—A small lunulate portion in front of frons and immediately over antennæ.

Occiput.—That part of head behind eye, viewed from the side.

Ocellar region.—This term I have used instead of the "ocellar spot" used by some writers. It is the slightly raised triangular portion occupied by the ocelli.

Ocellar triangle.—This is a large subtriangular, generally glossy, portion with its base at vertex and its apex intersecting the center stripe, on which are situated the ocellar region and ocelli. In most of the species in *Agromyza* and some other genera it is not distinguishable, but in some of the Milichinæ it is much more evident, approaching more nearly to the Chloropidae, in which family it is very distinct.

Orbit.—The narrow, more or less shining lateral stripe upon which are situated the *orbital bristles*.

Post-vertical bristles.—The pair situated immediately behind the ocelli on the vertex.

Vibrissa.—The usually differentiated bristle at anterior margin of cheek on a level with upper mouth margin.

The other terms used in descriptions are such as are used in most works dealing with Diptera and require no further explanation.

SYNOPTIC TABLE OF SUBFAMILIES IN AGROMYZIDÆ.

1. Postvertical bristles distinctly divergent, always distinct ¹..... 2
Post vertical bristles not divergent, either directed straight backward, or cruciate, or indistinguishable..... 3.
2. Outer cross vein always present and situated beyond inner cross vein.

AGROMYZINÆ.

Outer cross vein absent, or situated anterior to, or directly under inner.

PHYTOMYZINÆ.

3. Central stripe of frons with generally two rows of setulæ, or if these are absent the anterior margin has several distinct setulæ in a transverse row; vibrissa generally differentiated from marginal mouth bristles..... *MILICHINÆ*.
- Central stripe of frons bare except for sometimes scattered short hairs, which are not regularly arranged in two stripes, anterior margin without distinct setulæ; ocellar triangle seldom distinct (*Cryptochætum*); vibrissa absent or rarely differentiated from marginal mouth bristles..... *OCETHRIPILINÆ*.

SYNOPTIC TABLE OF GENERA IN AGROMYZINÆ.

1. Mesopleura bare..... 2.
Mesopleura with at least one strong bristle..... 3.
2. Frons buccate, the ocelli situated on a humplike protuberance in vertical line above the antennæ (pl. 5, fig. 13)..... *Traginops* Coquillett.
Frons normal in shape; ocelli situated well back toward vertex (pl. 5, fig. 15).
Odinia Robineau-Desvoidy.
3. Third antennal joint terminating in a thornlike point on upper side.
Cerodontha Rondani.
Third antennal joint not terminating in a sharp point on upper side.

Agromyza Fallen.

These four genera are all that I consider belong to this subfamily. The species which stand in the collection as *Cacoxenus* have cruciate postvertical bristles, which excludes them from this subfamily.

SYNOPTIC TABLE OF GENERA IN PHYTOMYZINÆ.

1. Outer cross vein absent..... *Phytomyza* Fallen.
Outer cross vein present, but situated anterior to, or directly below, the inner cross vein (pl. 4, fig. 4)..... *Napomyza* v. d. Wulp.

Some writers do not recognize the validity of *Napomyza*, but in most cases it is ranked as distinct from *Phytomyza*. *Paramyza* Williston belongs to the *Milichinæ*.

SYNOPTIC TABLE OF GENERA IN OCETHRIPILINÆ.

1. Orbital bristles present..... 4.
Orbital bristles absent..... 3.
2. Arista absent (pl. 4, fig. 5; pl. 6, fig. 29)..... *Cryptochætum* Rondani.
Arista present..... 3.

¹ *Hemeromyia* has the postvertical bristles slightly divergent in type, but they are very small, there are two bristles on anterior margin of frons, and in other respects it has so much the habitus of the *Milichinæ* that I consider it really belongs to that subfamily.

3. Costa with short black thorns; mesonotum with one pair of dorso-central bristles.
Paraleucopis, new genus.
 Costa without such thorns; mesonotum with two pairs of dorso-central bristles.
Leucopis Meigen.
4. Head produced in front, the face receding almost horizontally (pl. 5, fig. 16).
Acrometopia Schiner.
 Head only slightly produced in front, the face, if receding, only slightly so, not nearly horizontally..... 5.
 5. Mesopleura bare..... *Ochthiphila* Fallen.
 Mesopleura with 1-2 strong bristles..... 6.
 6. Mesonotum with only one pair of dorso-central bristles..... *Cacoxenus* Loew.
 Mesonotum with at least two pairs of dorso-centrals. (Head, pl. 6, fig. 23).
Pseudodinia Coquillett.

The genus *Parodinia* belongs to the Geomyzidæ.

SYNOPTIC TABLE OF GENERA IN MILICHINÆ.

1. Wing with a distinct, wedge-shaped incision at that portion where the subcostal vein should join costa (pl. 4, fig. 1)..... 2.
 Wing without a deep incision at this part, costa sometimes interrupted..... 5.
 2. Hind margin of eyes vertical, without an incision at about their middle (pl. 5, fig. 14)..... 3.
 Hind margin of eye with a more or less triangular incision at about the middle (pl. 5, fig. 12)..... *Milichiella* Giglio Tos.
 3. Mesopleura bare..... *Milichia* Meigen.
 Mesopleura with 3-4 strong bristles..... 4.
 4. Proboscis long, geniculate (pl. 5, fig. 14)..... *Pholeomyia* Bilimek.
 Proboscis not long and geniculate..... *Paramilichia* new genus.
 5. Eyes long haired; frons, thorax, including pleuræ, and abdomen long haired, the normal bristles almost indistinguishable from the hairs... *Arctobiella* Coquillett.
 Eyes much shorter haired, or bare; the frontal and thoracic bristles distinguishable from the much shorter setulæ..... 6.
 6. Fourth vein upwardly directed, at its apex very close to third; proboscis very long and slender, geniculate (pl. 5, fig. 20; pl. 4, fig. 6)..... *Eusiphona* Coquillett.
 Fourth vein only slightly or not at all approaching third; proboscis, if geniculated, not conspicuously long and thin..... 7.
 7. Outer cross vein absent (pl. 4, fig. 7)..... *Paramyia* Williston.
 Outer cross vein present..... 8.
 8. Palpi exceptionally large, projecting much beyond mouth margin (pl. 5, figs. 17-19).
Phylomyza Fallen.
 Palpi not projecting much beyond the mouth margin..... 9.
 9. Proboscis geniculate and elongated, but not very slender (pl. 5, fig. 9)..... 10.
 Proboscis not geniculate and elongated..... 14.
 10. Costa reaching to third vein (pl. 6, fig. 30)..... *Aldrichiella* Hendel.
 Costa reaching to fourth vein..... 11.
 11. Mesopleura bare..... 12.
 Mesopleura with 2-3 strong bristles..... 13.
 12. First costal division bristled; the entire body, including frons, not glossy; post-vertical bristles strong; the two upper orbital bristles directed outward, over the eye..... *Desmometopa* Loew.
 First costal division bare; the entire body, including frons, polished; post-vertical bristles short; upper orbital bristle backwardly directed, the one below it directed forward..... *Paramadisa*, new name.

13. Frons with two rows of short bristles on the central stripe.....¹ *Rhincassa* Loew.
Frons bare except for the orbital bristles.....¹ *Tethina* Haliday.
14. Costa reaching to third vein, fourth vein indistinct (pl. 4, figs. 2, 3, 8)..... 15.
Costa reaching to fourth vein, fourth vein distinct.....¹ *Hemeromyia* Coquillett.
15. Mesopleura bare.....*Euchlorops*, new genus.
Mesopleura with 2-3 bristles.....*Meoneura* Rondani.

I have retained *Hemeromyia* Coquillett in the Milichinæ because it has more affinities with this family than with the Geomyzidæ, to which group it bears some resemblance in its possession of the short costal thorns. *Parodinia*, while possessing these spines also, has in addition preapical tibial bristles.

Genus MILICHIELLA Giglio-Tos.

Milichiella GIGLIO-TOS, Ann. Soc. Ent. France, 1895, p. 367.

Ophthalmomyia WILLISTON, Trans. Ent. Soc. Lond., 1896, p. 426.

Stenoporomyia HENDEL, Wien. Ent. Zeitg., vol. 22, 1903, p. 250.

The characters given in the synoptic table of genera should serve to separate this from the other genera in Milichinæ. Becker in his paper on this group² gives 17 species as belonging to this genus from various parts of the world. I have only found four of these in the U. S. National Museum collection, one of which, *lucidula*, has not been recorded, under that name, from America.

SYNOPSIS OF SPECIES IN MILICHIELLA.

Males.

1. Abdomen almost entirely silvery white pollinose..... 2.
Abdomen black, or with only two white spots..... 3.
2. Mesonotum shining black; third and fourth veins strongly convergent.
arcuata Loew.
Mesonotum dull gray, generally with brownish longitudinal vittæ; third and fourth veins only slightly convergent.....*cinerea* Coquillett.
3. Second abdominal segment with two white side spots.....*lucidula* Becker.
No white spots on second segment.....*lacteipennis* Loew.

Females.

1. Mesonotum glossy black..... 2.
Mesonotum dull gray, with brown vittæ.....*cinerea* Coquillett.
2. Incision on posterior margin of eye large; disk of abdomen, except that of last segment, subopaque; last section of fourth wing vein one and one-third times as long as penultimate; outer cross vein at about its own length from end of fifth.
lacteipennis Loew.
Incision on posterior margin of eye small; disk of abdomen entirely glossy; last section of fourth vein twice as long as penultimate; outer cross vein about twice its own length from end of fifth.....*arcuata* Loew.

¹ Some species of *Rhincassa* and *Tethina* will run to 14, in which case *Tethina* may be separated from *Hemeromyia* by the absence of costal thorns, and *Rhincassa* by the character which separates it from *Tethina*.

² Ann. Mus. Nat. Hung., vol. 5, 1907, p. 507.

MILICHIELLA ARCUATA Loew.

Lobioptera arcuata LOEW, Zeit. Ges. Naturw., 1876, p. 339.

Milichia arcuata (Loew), ALDRICH, Cat. N. A. Dipt., 1905, p. 651.

Represented in U. S. National Museum collection by one male specimen from each of the following localities: District of Columbia (collection Coquillett); Bladensburg, Maryland (H. S. Barber); and Toronto, Canada (Brodie collection). I have also seen four specimens, two males and two females, from Natchez, Mississippi, May 20, 1909 (E. S. Tucker). The female has not been previously recorded, and should be readily distinguished by the characters given in the above table, as also its smaller size (1.5 mm.).

MILICHIELLA CINEREA Coquillett.

Ophthalmomyia cinerea COQUILLETT, Proc. U. S. Nat. Mus., vol. 22, 1899, p. 268.

This species was described from a single female. The two males in collection U. S. National Museum differ in having the abdomen silvery white, except the hypopygium, which is black. The second abdominal segment in the male is about twice as long as the third, which is subequal in length with the fourth and fifth. In other respects the male is similar to the female.

This species must be very close to *M. parva* Macquart from the Isle de Bourbon, but the third and fourth veins are parallel in *parva*, whereas in *cinerea* they are slightly, but appreciably, convergent at their apices, and *parva* is described as black and not gray.

Localities.—Type, Bayamon, Porto Rico, January, 1899 (A. Busck); males, Santo Domingo, West Indies, June 8, 1905 (A. Busck); Philadelphia, Pennsylvania (C. W. Johnson).

MILICHIELLA LUCIDULA Becker.

Milichiella lucidula BECKER, Ann. Mus. Nat. Hung., vol. 5, 1907, p. 537.

I find two males of this species in U. S. National Museum collection that agree with Becker's description. The type came from Peru; but in spite of the fact that the museum specimens came from Carlinville, Illinois (Robertson), I am convinced they are the same as Becker's species. In the male this species may be distinguished from *lacteipennis* by the presence of a silvery white spot on each side of the second segment of the abdomen. In other respects it agrees closely with that species. The female is undescribed, and will be very difficult to separate from the female of *lacteipennis*, as the silvery abdominal spots will presumably be absent. I took one male of this species in Virginia close to the Highway Bridge over the Potomac May 25, 1913.

The species recorded as *M. bisignata* Coquillett in Smith's list of New Jersey Diptera is, I have found upon examination, identical with the Carlinville specimens. I can find neither the type of *bisignata* in the collection here, nor any published description, and conclude that

the species must rank as *nomen nudum*. In the edition of Smith's list, which appeared prior to that of 1909, this species is included amongst the *Sepsidæ*.

MILICHIELLA LACTEIPENNIS Loew.

Plate 5, fig. 12.

Lobioptera lacteipennis LOEW, Dipt. Amer. Sept. Ind. Cent., 6, species 97.

This appears to be a fairly common species, and is very widely distributed. It was originally described from Cuba; there are specimens in collection from Biscayne Bay, Florida (Mrs. A. T. Slosson); District of Columbia (collection Coquillett); Holly Springs, Mississippi (F. W. Mally); Texas (Belfrage); Mesilla, New Mexico (T. D. A. Cockerell); Selma, Alabama, one female taken among aphides on cotton, October (W. H. Patten); Santa Clara County, California (Baker); Brownsville, Texas (C. H. T. Townsend); Dallas, Texas (C. R. Jones); Plano, Texas (E. S. Tucker); Victoria, Texas (W. E. Hinds); Whittier, California (P. H. Timberlake); Boerne, Texas (F. C. Pratt); Waco, Texas (Belfrage); Bayamon, Porto Rico, January, 1899 (A. Busck); and Santo Domingo, West Indies (A. Busck). There are also specimens in collection Ceara, Brazil (F. D. da Rocha); the island of Guam (D. T. Fulloway); and several specimens taken in Oahu, Hawaiian Islands, by W. H. Ashmead.

Genus MILICHIA Meigen.

Milichia MEIGEN, Syst. Besch., vol. 6, 1830, p. 131.

Lobioptera WAHLBERG, Kgl. Vetensk. Akad. Forh., 1847, p. 259.

This genus may be distinguished by the posterior margin of the eye having no triangular excision, and the mesopleura being bare. The proboscis is not geniculated, though rather over the normal size, and, except at apex, chitinized.

The species described herewith is the only American representative of the genus which I have seen, and, with this exception, nothing is known of their larval habits.

MILICHIA ÆTHIOPS, new species.

Male.—Entirely black, only the halteres brownish.

Frons glossy black, sides divergent posteriorly, at upper margin distinctly short of one-third the width of head, at lower margin slightly over one-half as wide as at upper; surface with longitudinal furrows; orbits very narrow; three orbital bristles present, and a few scattered additional short orbital hairs; the two rows of setulæ on center stripe distinct; antennæ black, of normal size, third joint rounded, its surface covered with very short, pale, pilosity; arista with basal joints distinct, and swollen; cheeks linear, marginal bristles strong and closely placed, the vibrissæ differentiated slightly and incurved; proboscis yellow at apex; palpi black. Mesonotum glossy; two pairs of dorso-centrals present, the anterior pair weak; the pair of bristles between the posterior pair distinct; squamæ white,

fringe yellowish. Abdomen shining, the surfaces of segments 2-4 granulose and less glossy than fifth; second and fifth segments elongated. Legs black; covered with short hairs, the ventral surfaces of femora bristled. Wings whitish, veins yellowish, costal setulæ black, carried, as usual, to end of second vein; venation almost identical with that of *Milicheilla lacteipennis*, the third and fourth veins being distinctly convergent at their apices.

Length.—2 mm.

Type.—Cat. No. 15745, U.S.N.M.

Locality.—Harlingen, Texas, "reared from wild tuber," April, 1909 (McMillan and Marsh).

The female is similar in most respects to the male, but the frons is distinctly broader and the halteres are generally pale yellow. In all there are eight specimens before me which were labeled *Agromyza aeneiventris* Fallen, and may have been recorded under that name.

Genus PHOLEOMYIA Bilimek.

Pholeomyia BILIMEK, Verh. zool.-bot. Ges. Wien, 1867, p. 903.

Rynchomilichia HENDEL, Wien. Ent. Zeitg., vol. 22, 1903, p. 250.

The species of this genus, which number 12 in Becker's paper already mentioned, are recognizable from those in the genus *Milichia* by the presence of bristles on the mesopleura, from *Paramilichia* by the geniculated and elongated proboscis, and from *Milichiella* by the absence of the incision in the posterior margin of the eye.

I have seen three species belonging to this genus from North America. Only one American species that I have seen can be correctly referred to *Milichia*, though the genus has generally appeared in out lists as including most of those in *Pholeomyia* and *Milichiella*.

SYNOPSIS OF SPECIES IN PHOLEOMYIA.


1. Mesonotum with three distinct dorso-centrals.....*indecora* Loew.
Mesonotum with two distinct pairs only..... 2.
2. All abdominal segments, except first, covered with silvery pollinosity.
leucogastra Loew.
All segments not silvery dusted..... 3.
3. The entire abdomen opaque black, only a silvery spot on lateral margin of fifth segment.....*pseudodecora* Becker.
Abdomen otherwise marked..... 4.
4. First and second abdominal segments black, third to fifth with fore marginal bands, the one on third segment interrupted.....*robertsoni* Coquillett.
Third and fourth segments entirely silvery white, second concolorous, but with a large, black-brown central spot.....*leucozona* Bilimek.

PHOLEOMYIA INDECORA Loew.

Plate 4, fig. 1; plate 5, fig. 14.

Lobioplera indecora LOEW, Dipt. Amer. Sept. Ind. Cent., 8, species 94.

Milichia indecora (Loew), ALDRICH, Cat. N. A. Dipt., 1906, p. 651.

This is the largest and probably the most common species of the  with the costal incision. It may be known from any other

American species by the uniform black-brown color in both sexes and by its possession of three pairs of dorso-central bristles.

The specimens I have examined are from the following localities: Beverly, Massachusetts (Burgess); Franconia, New Hampshire (Mrs. A. T. Slosson); District of Columbia (collection Coquillett); Georgia and North Carolina (no other data); New York (E. B. Southwick); White Mountains, New Hampshire (Morrison); Texas (C. H. T. Townsend); Vieques Island, Porto Rico (A. Busck); and Frontera, Tabasco, Mexico (C. H. T. Townsend).

PHOLEOMYTIA LEUCOGASTRA Loew.

Milichia leucogastra LOEW, Wien. Ent. Monatsch., vol. 5, 1861, p. 43.

Lobioptera leucogastra LOEW, Dipt. Amer. Sept. Ind. Cent., 8, species 95.

This species, which was originally described from Cuba, is represented by two specimens in the U. S. National Museum collection from Georgia (no other data). The male may be easily separated from *indecora* by the silvery white abdomen, and its larger size (2 mm.) readily separates it from *robertsoni*, which is the only other species with pollinose abdomen recorded from this country. I have seen one specimen of this species from Rosser, Texas, August 23, 1905 (F. C. Bishopp), and one from Victoria, Texas, April 1, 1907 (J. D. Mitchell).

PHOLEOMYTIA ROBERTSONI Coquillett.

Milichia robertsoni COQUILLETT, Journ. N. Y. Ent. Soc., vol. 10, 1902, p. 187.

Represented in U. S. National Museum collection by the type specimen only. Length barely 1.5 mm. Locality: Inverness, Florida (Robertson).

PHOLEOMYTIA LEUCOZONA Billek.

Plate 6, fig. 31.

Pholeomyia leucozona BILLEK, Verh. zool.-bot. Ges. Wien, 1867, p. 903.

Rhynchomilichia prasecta BECKER, Ann. Mus. Nat. Hung., vol. 5, 1907, p. 525.

I have not seen this species which was described from caves at Cacahuamilpa, Mexico. The above synonymy is according to Hendel,¹ who has examined the type-specimen.

PHOLEOMYTIA PSEUDODECORÆ Becker.

Rhynchomilichia pseudodecora BECKER, Ann. Mus. Nat. Hung., vol. 5, 1907, p. 524.

This species was described from specimens of both sexes, one male and three females, taken at Tifton, Georgia. The female lacks the silvery spot on fifth segment of abdomen. I have not seen the species.

PARAMILICHIA, new genus.

This genus is erected for the reception of *Milichia longiseta* Becker,² which was described from South America. The characters given in

¹ Wien. Ent. Zeft., vol. 30, 1911, p. 40.

² Ann. Mus. Nat. Hung., vol. 5, 1907, p. 530.

the table should serve to distinguish the genus from *Pholeomyia*. Represented in the U. S. National Museum collection by one specimen from Nicaragua.

Genus ALDRICHIELLA Hendel.

Plate 6, figs. 25, 30.

Aldrichiella HENDEL, Wien. Ent. Zeitg., vol. 30, 1911, p. 35.

A single species belonging to this genus is known from America, namely, *A. agromyzina* Hendel. Locality: Brookings, South Dakota. According to Becker's description the species bears a superficial resemblance to *Agromyza scutellata* Fallen.

PARAMADIZA, new name.

The species *halteralis* Coquillett (*Desmometopa*) belongs to *Madiza* according to Hendel in the paper already cited under *Aldrichiella*. *Madiza* Fallen has as type *oscinina* Fallen, which is a chloropid. The European species *glabra* is congeneric with *halteralis*. Owing to the fact that no name is available for this genus I have to propose a new one. The type of this genus is *Paramadiza halteralis*, as indicated.

Genus PHYLLOMYZA Fallen.

Phyllomyza FALLEN, Dipt. Suec. Ochthid., 1823, 8, species 1.

Generic characters.—This genus may be distinguished from other Milichinæ by the very large third antennal joint in the male and by the exceptionally developed palpi in both sexes. *Paramyza*, which bears a rather close resemblance to this genus, has the outer cross vein absent, and *Agromyza laterella* Zetterstedt, which has the third joint enlarged, has the palpi normal and the postvertical bristles divergent. There is but one European species described so far, *P. securicornis* Fallen.

SYNOPSIS OF MALES KNOWN IN PHYLLOMYZA FALLEN.

1. Mesonotum with four pairs of distinct dorso-central bristles; male palpi not longer than height of head, moderately hairy; cheeks distinct. . . . *securicornis* Fallen.
- Mesonotum with two pairs of distinct dorso-central bristles; male palpi distinctly longer than height of head, densely hairy; cheeks linear, almost absent.
hirtipalpis, new species.

PHYLLOMYZA SECURICORNIS Fallen.

Plate 5, fig. 17.

Phyllomyza securicornis FALLEN, Dipt. Suec. Ochthid., 1823, 8, species 1.

Agromyza securicornis MEIGEN, Syst. Besch., vol. 6, 1830, p. 171, species 13.

Agromyza flavitarsis MEIGEN, Syst. Besch., vol. 6, 1830, p. 107, species 13.

Agromyza morosa MEIGEN, Syst. Besch., vol. 6, 1830, p. 170, species 8.

Male and female.—Entirely shining black or black-brown, only the apices of femora, entire fore tibiae, mid and hind tibiae at bases and apices, entire tarsi on all legs, and halteres yellow.

Frons in both sexes distinctly broader than one-third the width of head; each orbit about one-fourth as broad as center stripe; orbits shining, center stripe opaque; five distinct orbital bristles present, the lower two directed slightly inward and backward, the upper three directed outward and backward; besides the bristles there is an irregular row of hairs on orbits nearer to eye margin; center stripe with two rows of incurved hairs which converge slightly toward anterior margin; the pair of bristles on anterior margins weak, divergent; antennæ in male very large, the third joint subquadrate and very densely pilose; in female the third joint much smaller and rounded at apex; arista with the basal two joints distinctly thickened, their junction with the terminal part slightly geniculated; pubescence on arista distinct; length of arista twice as long as breadth of third antennal joint in male, and about three times as long as breadth of third joint in female; face black, concave in profile, in both sexes somewhat produced at mouth margin; cheeks brownish, marginal bristles distinct, vibrissa not much differentiated; palpi black, as long as proboscis in male, slightly shorter in female, the surface bristles sparse; proboscis brown, chitinated. Mesonotum with four distinct pairs of dorso-central bristles, the front pair very close to anterior margin; the pair of bristles between the posterior pair of dorso-centrals distinctly differentiated from discal setulæ; basal pair of bristles on scutellum much weaker than apical pair. Abdomen with numerous surface setulæ, which are longer on the apices of segments. Legs covered with short hairs; mid tibia with distinct apical spurs, the other pairs without any distinct spurs. Wings clear; veins yellowish or brownish; subcostal vein very indistinct; first costal division about one-fifth as long as second; second and third veins slightly convergent, third and fourth slightly divergent at apices; outer cross vein at slightly beyond wing middle, at little more than its own length from margin of wing, and at distinctly more than its own length from inner cross vein. Halteres yellow.

Length.—2–2.5 mm.

The only specimens of this species that I have seen from America are one female from the Burgess collection, taken at Beverly, Massachusetts, October 9, 1871, and one in C. W. Johnson's collection from Orrs Island, Maine. There are two males and one female in the collection from Italy (Prof. M. Bezzi) with which the American specimens agree so closely as to leave no doubt as to their identity.

PHYLLOMYZA HIRTIPALPIS, new species.

Plate 5, fig. 18.

Male.—Frons black; center stripe opaque, the bristles on it very weak, the stripes on which they are situated not shining; orbits and ocellar triangle shining; upper three orbital bristles outward curved,

the lower two curved inward; orbits and anterior margin of center stripe with numerous rather long hairs; head in profile as figure 18, Plate 5; antennæ, arista, proboscis, and palpi black, apex of proboscis yellowish; the pilosity on antennæ very distinct, arista distinctly hairy, palpi hairy; eye facets exceptionally large; occiput very narrow above. Mesonotum shining, two pairs of dorso-centrals present, the pair of bristles between the posterior pair hardly distinguishable from the discal setulæ; pleuræ glossy black-brown; scutellum colored as disk of mesonotum, the basal pair of bristles half as large as the apical pair. Abdomen shining black; surface of segments with numerous hairs. Legs yellow, all coxæ, femora except extreme bases and apices, and the mid and hind tibiæ on middle broadly blackened; all legs with rather distinct hairs. Wings vitreous; costa distinctly haired; veins 2-3 convergent on outer portions, 3-4 divergent; third vein ending in wing tip; outer cross vein at about its own length from end of fifth vein; penultimate section of fourth vein two-fifths as long as last section. Halteres yellow.

Length.—1 mm.

Type.—Cat. No. 15746, U.S.N.M.

Locality.—Plummers Island, Maryland, August 10, 1912 (W. L. McAtee).

PHYLLOMYZA APPROXIMATA, new species.

Plate 5, fig. 19.

Two females, one taken in Washington, District of Columbia, June 4, 1912, by the same collector, and another, "D. C.," coll. Coquillett? May, which I consider belong to a different species, differ in having the profile of head as in figure 19, Plate 5; in having the outer cross vein at nearly three times its own length from end of fifth vein, the inner and outer cross veins of nearly equal length; and the last section of fourth vein about five times as long as the penultimate section.

It is very seldom that such differences as are here noted are found in the sexes of the same species, and though in this genus the tendency to sexual difference is considerable I consider it the better course to adopt the male as the type of *hirtipalpis*, and give to the females the species name *approximata*.

Type.—Cat. No. 15751, U.S.N.M.

I have, since writing the above, seen two females of this species taken at Plummers Island, Maryland, by W. L. McAtee.

Williston's¹ description of *Phyllomyza magnipalpis* is as follows:

Phyllomyza magnipalpis, n. sp.

Female.—Head deep black. Front broad, large, the narrow orbits, on which are placed the lateral rows of bristles, subshining. Third antennal joint very large,

¹ Trans. Ent. Soc. Lond., 1896, p. 443.

the arista, which springs from its superior angle, finely pubescent. Face excavated, retreating in profile. Palpi very large, projecting; proboscis small, rather slender. Thorax deep black; mesonotum shining, with black hair. Scutellum large, trapezoidal, with a stout bristle on each apical angle. Abdomen black, with black hair, not shining; in shape, short ovate, the five segments of nearly equal length. Legs black, the immediate tip of femora, the front tibiæ, the middle tibiæ in part and all the tarsi yellow. Wings nearly hyaline; basal cells small but complete; submarginal cell narrowed at the extremity, its costal margin only about half the length of that of the first posterior tip of the wing; penultimate section of the fourth vein less than one third the length of the ultimate section.

Length $1\frac{1}{2}$ mm.

One specimen.

St. Vincent, West Indies.

There is nothing in the foregoing description to distinguish this species from either of the other two, except in its possession of only two scutellar bristles, which I am certain is inaccurate.

EUCHLOROPS, new genus.

Generic characters.—Frons flattened, slightly produced in front; ocellar triangle distinct; central rows of bristles distinct, but sometimes consisting of only two pairs near to anterior margin; post-vertical bristles slightly incurved; antennæ normal in shape, arista bare; vibrissæ weak, but distinct; proboscis and palpi normal; humerus with two bristles; dorso-centrals on mesonotum strong; four scutellar bristles; meopleura bare; no strong bristles on sternopleura, those that are present weak, and hair-like; abdomen five segmented, the first indistinct; legs normal in shape and length; the preapical bristles absent.

Type of genus.—*Euchlorops vittata*, new species.

EUCHLOROPS VITTATA, new species.

Plate 4, fig. 8; plate 6, figs. 24, 32.

Female.—Frons yellow, viewed from above as in figure 24, Plate 6, the strong orbital bristles black, the hairs, confined to anterior half, pale yellow; outline of ocellar triangle, and ocellar region black, or black-brown; antennæ yellow, third joint black; arista black, pale at base; face and cheeks entirely yellow, hairs and vibrissæ yellowish white; head in profile as figure 32, Plate 6; proboscis and palpi black. Mesonotum yellow, with three longitudinal stripes, the center one commencing on anterior margin and finishing rather wedge-shaped before reaching posterior margin; the side stripes beginning at behind humeri and of almost equal width on their entire length, finishing at just in front of posterior pair of dorso-centrals; the four pairs of dorso-centrals black, and of almost equal strength; no bristles between the posterior pair; the short discal setulæ yellow; humeral and other marginal bristles black, and of moderate length;

pleuræ yellow, a spot below humeri, another on lower anterior half of mesopleura, the lower portion of sternopleura, a spot between mid and hind coxæ, and a vertical streak below wing base black; no black pleural bristles present; scutellum yellow, darkened laterally at base; the bristles and several short discal setulæ black, some other weaker discal setulæ yellow. Abdomen brownish yellow, glossy; surfaces of segments with scattered, short, pale setulæ; posterior margin of last segment and postero-lateral margins of other segments with a few black bristles. Legs yellow, all femora and tibiæ browned on the middle; tarsi brown; surfaces of all legs with numerous short yellow hairs, intermixed with which, on the dorsal surfaces, are regular longitudinal rows of short black setulæ; no distinct tibial bristles present, and those on the ventral surfaces of femora weak. Wings clear, basal portions of veins yellowish; costa from end of first vein, third vein from before cross vein, and fifth vein almost from its base, brown; costa slightly interrupted at a little before end of first vein; fourth vein indistinct beyond outer cross vein; for venation see figure 8, Plate 4. Halteres yellow, knobs white.

Length.—1.5 mm.

Type.—Cat. No. 15747, U.S.N.M.

One female: Wellington, Kansas, hibernating in clump of *Andropogon scoparius* January, 1913 (H. E. Smith).

EUCHLOROPS SIMILIS, new species.

Female.—Frons reddish yellow, ocellar triangle subshining, ocellar region and margins of triangle black-brown; head viewed from above almost as in *vittata*, but slightly more elongate, the hairlike surface bristles rather sparse, black, no pale hairs present; antennæ brown, basal two joints and base of third yellowish, size and shape as in *vittata*; clypeus black; face and cheeks yellow, profile almost as in previous species, but upper mouth margin slightly more produced; palpi yellow; proboscis yellow, normal in shape. Mesonotum yellow, subshining, three broad longitudinal vittæ present; only one pair of strong, widely placed, dorso-centrals present, disk with numerous irregularly arranged, black, setulose hairs; lateral bristles strong; pleuræ yellow, marked with black as in *vittata*, but the markings larger and not so well defined; scutellum yellow, with a black mark on either side; marginal bristles subequal, discal hairs black, setulose. Abdomen shining black-brown; segments subequal, except first, which is shortened; disk of all segments with pale, scattered hairs, lateral margins, and apex of fifth (last) segment with black bristles. Legs reddish yellow, femora slightly darkened on middle; tibiæ darkened from near base, becoming black at apices, tarsi black; fore femora with two black bristles on about middle of postero-dorsal surface; surfaces of all legs with short black hairs, with which are intermixed

numerous pale hairs. Wings smoky gray; ventation similar to that of *vittata*, except that the penultimate section of fourth vein is slightly longer than the penultimate section of third. Halteres yellow.

Length.—1.5 mm.

Type.—Cat. No. 15748, U.S.N.M.

Locality.—Springer, New Mexico (C. N. Ainslie), Webster No. 5554. One female.

The two species described herewith are very close in general appearance, but may be separated readily by the number of dorso-central bristles.

Genus PARAMYIA Williston.

Paramyia WILLISTON, Kans. Univ. Quart., vol. 6, 1897, p. 1.

This genus was erected by Williston for the reception of *P. nigra*, new species. In most respects it is very close to *Phyllomyza*, although Williston compared it with *Phytomyza*. The genus belongs without doubt to the *Milichinæ* and Loew's species *Phyllomyza nitens* is congeneric with *nigra* Williston. This is the only genus so far described in *Milichinæ* that has the posterior cross vein absent. I give a copy of Williston's description of *nigra* and describe *nitens* from specimens in the U. S. National Museum collection.

PARAMYIA NIGRA Williston.

Paramyia nigra WILLISTON, Kans. Univ. Quart., vol. 6, 1897, p. 2.

Female.—Black. Front opaque, with a long shining triangle, reaching nearly to the front border. Face more yellowish; in some reflections silvery on the sides. Proximal portion of the proboscis piceous; distal portion yellowish. Thorax shining; mesonotum with rather abundant, short, black hair. Abdomen less shining than the mesonotum. The knees narrowly, the front and middle tibiae and tips of the hind tibiae, and all the tarsi yellow. Wings tinged with brownish. Length 2½ mm.

One specimen, Grenada, H. H. Smith.

In most respects Williston's description of his genus fits *nitens* but he used some characters in defining the genus which are of only specific value as for instance the number of scutellar bristles, and their position, as well as the course of the wing veins. These characters might have been used to better advantage in his description of the species.

PARAMYIA NITENS Loew.

Plate 4, fig. 7.

Phyllomyza nitens LOEW, Dipt. Amer. Sept. Ind. Cent., 8, 1861, species 82.

Male and female.—Black, legs brown, knees and tarsi yellowish.

Frons slightly over one-half as wide as head in male, distinctly wider in female, posteriorly the sides are divergent; orbits narrow, glossy black, generally four orbital bristles present, the lower two pairs incurved, the upper pairs curved outward; ocellar region slightly raised, glossy black; ocellar triangle glossy black, narrow,

extending to anterior margin of center stripe, center stripe dull black; the hairlike bristles along the sides of the ocellar triangle, and on anterior margin of frons distinct; postvertical bristles incurved; antennæ of male shaped much as in the male of *Phyllomyza securicornis*, the third joint truncate at apex, its length distinctly greater than its breadth; in the female the third joint is rounded and the antennæ are of normal size; arista pubescent, in male its length does not exceed $1\frac{1}{2}$ times that of the third antennal joint, in female its length is about equal to from its base to second uppermost orbital bristle; cheeks narrow, marginal bristles weak, anterior margins of cheek produced, vibrissa slightly differentiated; proboscis chitinised, its entire length equal to about three times the height of head, geniculated; palpi large, spatulate, sparsely bristled; occiput almost invisible on upper half. Mesonotum glossy black; two pairs of dorso-centrals present, the pair of bristles between the posterior pair distinct; pleuræ glossy black; squamæ brown; scutellum glossy black; the basal pair of bristles much weaker than the apical pair. Abdomen glossy and like mesonotum covered with short black setulæ. Legs thickly covered with short setulose hairs. Wings clear, costa, basal part of veins, and veins 1-3 brown, the others indistinct, venation as figure 7, Plate 4. Halteres black.

Length.—1-1.5 mm.

Originally described from Pennsylvania (Osten Sacken). Specimens in U. S. National Museum collection are from District of Columbia (collection Coquillett); Peaks of Otter, Virginia, July 26, 1906, (W. Paine); White Mountains, New Hampshire, July, (S. H. Scudder); Southern Illinois, (Robertson); and Kaslo, British Columbia, (R. P. Currie).

Genus MEONEURA Rondani.

Meoneura RONDANI, Prodr., vol. 1, 1856, p. 128.

Anisoneura LIOTY, Atti Inst. Veneto, ser. 3, vol. 10, 1864, p. 1314.

Psilidotus primus BECKER, Mitth. Zool. Mus. Berlin, vol. 2, pt. 3, 1903, p. 192.

This genus may be distinguished from *Agromyza* by possession of the following characters: Frontal triangle distinct; frons with two anterior marginal bristles at center; lower two pairs of fronto-orbital bristles incurved, upper two pairs curved outward (pl. 5, fig. 11); vibrissæ strong, the anterior pair consisting of an upper and lower incurved bristle on facial ridge, the others carried backward in a diagonal line from lower anterior angle to posterior upper angle at near to edge of eye (pl. 5, fig. 10). There is also an additional bristle on lower part posteriorly; antennæ as in *Agromyza*, arista slightly pubescent; wings with costa to end of third vein; fourth vein indistinct beyond cross vein; costa ciliated with short, but distinct bristles to end of first vein (pl. 4, figs. 2, 3).

TABLE OF SPECIES.

1. Larger species 1½–2 mm.; fore femora with a long, curved bristle at about apical third on the postero-ventral surface (pl. 6, fig. 27).....*vagans* Fallen.
 Smaller species barely 1 mm.; fore femora without a clearly differentiated bristle as above, the row on this surface graduated in length (pl. 6, fig. 26)*lactispennis* Fallen.

MEONEURA VAGANS Fallen.

Plate 5, figs. 10, 11; plate 6, fig. 27.

Agromyza vagans FALLÉN, Dipt. Suec. *Agromyza*, 1823, 5.7

? *Agromyza obscurella* FALLÉN, Dipt. Suec., *Agromyza*, 1823, 5.7.

? *Agromyza pectinata* MEIGEN, Syst. Besch., vol. 6, 1830, p. 179, species 4.1.

? *Agromyza infusca* MEIGEN, Syst. Besch., vol. 6, 1830, p. 184, 56.

Agromyza tritici FITCH, 2nd Rept. Nox. Ins. N. Y. State, 1856, p. 303.

Meoneura obscurella (Fallén) RONDANI, Prodr., vol. 1, 1856, p. 128, pls. 4, 5, 6, figs. 3, 10, 11, 27.

Male and Female.—Black, distinctly shining. Frontal triangle glossy, the anterior margin of frons distinctly reddish-yellow; sometimes this color is confined to anterior margin, at others the anterior half of frons is reddish, and more rarely the pale color extends almost to vertex, but the ocellar triangle is always black. Face brownish-yellow, excavated, with a slight central keel and the mouth margin slightly produced, antennæ brown, cheeks brown, paler anteriorly; besides the two anterior vibrissæ there are four to five bristles forming the diagonal row across the cheek; above this series of bristles the cheek is subopaque, below it glossy and slightly granulose; proboscis and palpi brown, normal in size. Mesonotum slightly gray dusted; three pairs of dorso-central bristles present, the anterior pairs reduced in size; surface with numerous short setulose hairs. Abdomen subshining; segments brownish toward bases; all segments with scattered surface hairs, the most distinct being the preapical row on each segment; female ovipositor not chitinized, papillalike; male hypopygium of moderate size, glossy brown. Legs brown, the tarsi paler; all legs with short, pale brown hairs; besides the long bristle on anterior femur there is one present on the apical third of the antero-ventral surface of the hind femur; tarsi rather thickly covered with pale, almost white, hairs on the ventral surface. Wings generally whitish, veins yellow or pale brown, costa interrupted at before tip of first vein, to this part furnished with a double row of setulæ, which are longer than the diameter of the costal vein; length from humeral vein to end of first about one-third as long as next costal division; inner cross vein at just beyond end of first vein, outer cross vein at about one and one-half times its own length from inner; fourth vein indistinct from outer cross vein. Halteres milk white.

Length.—1.5–2 mm.

I have no hesitation in placing *tritici* Fitch as a synonym of the specimens in collection, from Europe, standing as *obscurella* Fallén.

I have before me the type-specimens of Fitch's species and they agree in every particular with the European specimens. The species *lacteipennis* Fallen (*Agromyza*) is congeneric with *obscura* and as this species is the type of Liory's genus *Anisoneura* that genus becomes a synonym of *Meoneura*. Becker described the genus *Psalidotus* with *P. primus* as type¹ and in 1905 Becker and Bezzi² gave this species as a synonym of *obscura*, making the genera synonymous. Becker's figure gives only a single bristle on the mouth margin and he does not mention the diagonal row on the cheek so prominent in *obscura*, but his description fits otherwise and probably he overlooked this feature.

The specific synonyms cited are, I believe, correct, though I have not material at hand for comparison.

The localities for specimens in collection are New York (Fitch's types, four specimens and pupal cases), reared from wheat, and two specimens—Cambridge, Massachusetts (Burgess?). The European specimens are from Holland and were identified by de Meijere. I have seen one specimen from Boston, Massachusetts (C. W. Johnson).

MEONEURA LACTEIPENNIS Fallen.

Plate 4, fig. 2; plate 6, fig. 26.

Agromyza lacteipennis FALLEN, Dipt. Suec. *Agromyza*, 1823, 4.4.

Anisoneura lacteipennis (Fallen) LIOR, Atti. Inst. Veneto, ser. 3, vol. 10, 1864, p. 1314.

Male and female.—Similar in coloration to the foregoing, but considerably smaller. In the coloration of the frons I find that the females have it more distinctly yellow than the males, though my series is not large enough to allow one to form a definite opinion as to whether this is the rule or not. The fore femur has a row of distinct hair-like bristles on the postero-ventral surface, but the very long bristle present in *vagans* is not noticeable in this species. The other characters of the species are almost identical. Costa less distinctly spinose at base than in *obscura*.

Localities of specimens examined: One specimen, Saldovia, Alaska (Harriman Alaska Expedition, Kincaid); two specimens, Kaslo, and two specimens, London Hill Mine, Bear Lake, British Columbia (R. P. Currie).

Genus HEMEROMYIA Coquillett.

Hemeromyia COQUILLETT, Journ. N. Y. Ent. Soc., vol. 10, 1902, p. 190.

This genus was erected for the reception of a single species, *obscura* Coquillett. The postvertical bristles in the type are very small and slightly divergent, but, owing to the presence of a pair of bristles on the anterior margin of frons and the strong mouth-marginal bristles,

¹ Mitth. Zool. Mus. Berlin, vol. 2, pt. 3, 1903, p. 192.

² Kat. d. Palaar. Dipt., vol. 4, p. 239.

which extend above the level of the epistome, I consider its position in the Milichinæ more nearly the correct one than if it were retained in the Agromyzinæ.

HEMEROMYIA OBSCURA Coquillett.

Hemeromyia obscura COQUILLETT, Journ. N. Y. Ent. Soc., vol. 10, 1902, p. 190.

Female.—Shining black, anterior margin of frons narrowly, face and cheeks, third joint of antennæ on lower half and tarsi yellow. Halteres with milky-white knobs.

Frons one-third as wide as head at anterior margin, at posterior ocelli one-half as wide as head; surface of frons granulose; ocellar triangle glossy, distinct; center stripe opaque, bare except for the pair of bristles on anterior margin; orbits glossy on upper half, four bristles present; antennæ small, half hidden below the anterior margin of frons, which is slightly protuberant, third joint rounded, covered with very short, white pile; arista swollen at base, bare, its length short of the breadth of frons at anterior margin; face concave; cheeks higher posteriorly than anteriorly, the shape much as in *Meoneura*, but the bristles much weaker on the diagonal ridge, the upper bristle, in front, midway between the apex of antennæ and lower margin of cheek, and in line with lower margin of eye; proboscis fleshy (palpi retracted); occiput invisible on upper half. Mesonotum with surface finely granulose; four pairs of dorso-centrals, no other setulæ on center of disk; mesopleura and sternopleura with 2-3 bristles each; scutellum as disk of mesonotum, the basal pair of bristles weaker than the apical pair. Abdomen with dorsum bare, the setulæ confined to the lateral margins and the apex. Legs with femora slightly thickened, fore femur with 2-3 long bristles on apical half of postero-vertical surface, and a row of shorter ones from these to base; other femora with shorter bristles on ventral surfaces; no tibial bristles present; apical spurs weak. Wings clear, veins black-brown; inner cross vein at near to wing middle, at distinctly beyond end of first vein, and at about one-third from apex of discal cell; outer cross vein at slightly more than its own length from inner, and about same length from end of fifth vein; third and fourth veins subparallel on last sections; sixth vein very distinct, but not reaching wing margin.

Length.—1.5 mm.

Redescribed from type-specimens.

Locality.—Las Vegas, Hot Springs, New Mexico (H. S. Barber). I have also seen two specimens taken by Mitchell and Cushman on Chisos Mountains, Brewster County, Texas, June, 1908.

HEMEROMYIA NITIDA, new species.

Plate 6, fig. 21.

Female.—Glossy black; bases of tarsi and apices of tibiæ yellow; halteres yellow; wings whitish, veins yellow.

Head similar in shape to *H. obscura*, the frons slightly protruding and the face concave; the antennæ are half hidden under the frons. Frons almost twice as wide as either eye, sides slightly convergent anteriorly, lower two orbital bristles directed inward, upper two directed outward; antennæ rather larger than in *obscura*, arista similar to that of *obscura*; cheeks over one-third as high as eye, the diagonal line of bristles strong and running much closer to eye margin than in *obscura*; palpi very small. Mesonotum rather more strongly bristled than *obscura*, and between the dorso-centrals there are several irregular rows of short setulæ; scutellar bristles subequal. Abdomen as in *obscura*. Legs as in that species, but the ventral femoral bristles are stronger and there is one strong bristle on the hind femur at near apex on the antero-ventral surface. Wings with inner cross vein at little beyond end of first vein and at middle of discal cell; outer cross vein at its own length from apex of fifth and one and one-half times that length from inner; sixth vein less distinct than in *obscura*.

Length.—1.5 mm.

Type.—Cat. No. 15749, U.S.N.M.

Locality.—Florissant, Colorado (T. D. A. Cockerell).

The presence of discal setulæ on mesonotum, the hind femoral preapical bristle, and the different venation should readily separate this species from *obscura* Coquillett.

Genus TETHINA Haliday.

Tethina HALIDAY, Ann. Nat. Hist., vol. 2, 1839, p. 188.

This genus may be distinguished from *Rhcnassa* Loew by the character of frons as given in the table of genera, and by the absence, or partial absence, of the cross vein closing base of discal cell. I consider that the genus properly belongs to the Ephydridæ and not to the Agromyzidæ, though whether the species *rostrata* Hendel is really congeneric with the other two or not, I can not say for certain. I include *Tethina* in my paper only because it has been placed in Agromyzidæ by other authors. It can not belong here according to my definition of the family Mielidinæ, having no central frontal setulæ.

SYNOPSIS OF SPECIES.

- | | |
|--|-------------------------|
| 1. Face very distinctly produced in profile; proboscis elongated (fig. 28) | |
| | <i>rostrata</i> Hendel. |
| Face not much produced in profile; proboscis normal..... | 2. |

2. Legs except fore coxæ, knee joints and bases of tarsi black; outer cross vein of wing at less than its own length from end of fifth vein.....*coronata* Loew.
 Legs yellow, femora black gray, all tibiae brownish on middle, tarsi with apical joint blackened; outer cross vein at three times its own length from end of fifth vein.....*parvula* Loew.

TETHINA ROSTRATA Hendel.

Tethina rostrata HENDEL, Wien. Ent. Zeitg., vol. 30, 1911, p. 41.

This species was described by Hendel from specimens sent him by Professor Aldrich from Pender, Idaho, and Friday Harbor, Washington. I have not seen the species, which is unrepresented in the U. S. National Museum collection.

TETHINA CORONATA Loew.

Rhcnassa coronata LOEW, Dipt. Amer. Sept. Ind. Cent., 6, 1865, species 98.

This species was described from Georgia by Loew. I have seen specimens from Logansport, Louisiana (E. S. Tucker); Longview, Texas (E. S. Tucker); and Durango, Mexico (F. C. Bishopp). This species is very close to *T. cinerella* Haliday, differing in color of the fore coxæ and in venation, that of the European species being nearer to the venation of *parvula*.

TETHINA PARVULA Loew.

Rhcnassa parvula LOEW, Dipt. Amer. Sept. Ind. Cent., 8, 1869, species 81.

Originally described from Newport, Rhode Island. I have seen three specimens from Galveston, Texas (W. D. Pierce). Taken on *Tamarix gallica*.

Genus RHICNESSA Loew.

Rhcnassa LOEW, Wien. Ent. Monatsch., vol. 6, 1862, p. 175.

This genus though bearing a superficial resemblance to *Tethina* really belongs to the Milichinæ. The only described species occurring in North America which is referable to this genus is I consider *albula* Loew. I have seen several specimens of this from Galveston, Texas (E. S. Tucker). There is another species which occurs in Texas the description of which is given herewith. *Anthomyza cinerea* Williston, which Hendel suggests is a species of *Rhcnassa*, may belong here, but the name is preoccupied by *cinerea* Loew (1862), so that, even should it be distinct from *albula* Loew, or identical with the one now described, the name can not stand. Hendel states in his paper¹ "*Xanthopoda* Williston wahrscheinlich zu *Tethina*." I have not seen either of Williston's species, which were described from St. Vincent, West Indies.

RHICNESSA ALBULA Loew.

Plate 6, fig. 22.

Rhcnassa albula LOEW, Dipt. Amer. Sept. Ind. Cent., 8, 1869, species 80.

This species was originally recorded from Newport, Rhode Island. The series I have examined was taken at Galveston, Texas, March 17, 1908 (E. S. Tucker).

¹ Wien. Ent. Zeitg. vol. 30, 1911, p. 42.

RHICNESSA TEXANA, new species.

Female.—Black-gray, with pale gray dusting, opaque. Head with frontal stripe reddish yellow, orbits and triangle whitish, face, cheeks, and antennæ yellow, upper margin of third antennal joint brown; cheeks silvered on upper half; palpi yellow, proboscis brownish yellow. Mesonotum slightly brownish on disk, and at some angles with faint indications of two brown stripes. Second abdominal segment almost entirely yellow, other segments with apices narrowly pale. Legs yellow, fore femora distinctly blackened, posterior pairs browned on middle, last two tarsal joints blackened. All bristles black or brown.

Frontal triangle very short, ocellar bristles widely divergent; orbits narrow, the inner orbital row of setulæ regular, of moderate strength, incurved, the orbital bristles four in number; cruciate frontal setulæ consisting of about four pairs of moderate length; antennal arista hairlike, short, not longer than anterior width of frons, bare; eyes about one-third higher than long; cheeks about one-third as high as eye; marginal cheek bristles of moderate strength, upturned, in a single row, the vibrissa not differentiated. Mesonotum with four pairs of post-sutural, and two pairs of presutural dorso-centrals, between which are situated about four rows of short black setulæ. Legs with surfaces covered with numerous black setulæ, which are bristle like on the ventral surfaces of all femora towards apices. Wings clear, veins yellowish; veins 2-3 divergent, 3-4 slightly convergent apically; outer cross vein at nearly twice its own length from apex of fifth. Halteres yellow.

Length.—2 mm.

Male.—Similar to female though smaller, darker in color, particularly that of the femora, and wing veins. The outer cross vein is at more than twice its own length from end of fifth vein.

Type and allotype.—Cat. No. 15807, U. S. N. M.

Type-locality.—Corpus Christi, Texas, April 12, 1906 (F. C. Pratt). Locality of paratype: St. Augustine, Texas, March 22, 1908 (E. S. Tucker).

This species may be distinguished from *albula* Loew, by its darker coloration, and the fact that all the bristles are brown, or black, and not yellow, or white, as in *albula*. *Rhicnessa cinerea* Loew, of Europe, is closely related to this species, but has only two rows of setulæ between the dorso-centrals on the mesonotum. It has also some other minor differences from *texana*.

PARALEUCOPIS, new genus.

This genus comes very close to *Leucopis* Meigen, but may be distinguished from it by the eyes being distinctly longer than high; the third antennal joint disklike; the second joint of arista but slightly longer than its diameter; the mesonotum having only one

pair of dorso-centrals; the costal vein of wing having closely placed, short, black thorns from end of first vein to apex of second, where they become indistinct; first costal division with the normal fringe and only one black thorn at apex of subcostal vein; subcostal vein indistinct, but complete; anal cell complete and distinct, the sixth vein straight, reaching two-thirds to wing margin; costa reaching to fourth vein.

Type of genus.—*Paraleucopis corvina*, new species.

PARALEUCOPIS CORVINA, new species.

Male.—Metallic blue-black; antennæ yellow, sometimes slightly browned; legs yellow, coxæ except apices, femora except bases and apices narrowly, and sometimes middle of hind tibiæ browned or blackened. Wings whitish, veins yellow; halteres yellow.

Head in profile; frons flattened, descending toward front, face receding, slightly concave; frons, viewed from above, almost parallel-sided, glossy black, with a brownish tinge anteriorly, surface with sparse very short pale hairs, breadth barely more than equal to either eye; antennæ of rather small size; arista hairlike, bare; cheeks high, equal at posterior margin, where they are highest, to over one-half the height of eye at highest part, surface with hairs similar to frons; palpi brown; eyes bare. Mesonotum with very sparse dark setulæ on the disk besides the one pair of dorso-centrals; the one bristle present on the sternopleura is situated close to the upper posterior angle and is difficult to see owing to the fact that it is upturned and lies very close to the surface; squamæ white; scutellum arched, rounded, four equally strong marginal bristles present. Abdomen subopaque on basal two segments, highly glossy on apical segments, surface hairs pale. Legs stout; mid tibiæ with an apical, black, straight spur; all tarsal joints except last one with black bristles at apices on under surface; claws black. Inner cross vein of wing at slightly beyond end of first vein and at slightly beyond middle of discal cell; outer cross vein at about its own length from end of fifth vein; last section of fourth vein two and one-half times as long as penultimate section; third and fourth veins convergent, third ending in wing tip.

Length.—1–5 mm.

Type.—Cat. No. 15755, U.S.N.M.

Female.—Similar to male in coloration and chætotaxy.

Allotype and paratypes.—Same number as type.

Locality.—Kerr Ranch, New Mexico, on *Yucca* species, April 23, 1910 (J. D. Mitchell). One specimen marked "From Raven's nest," same locality, has date 5-4-'10, by the same collector. There are in all 14 specimens in the series.

A single specimen taken by H. Pinkus at Dallas, Texas, May 6, 1910, agrees with the type series.

Genus ACROMETOPIA Schiner.

Acrometopia SCHINER, Wien. Ent. Monatschr., vol. 6, 1862, p. 434.

Oxyrhina pp. ZETTERSTEDT (not Meigen), Dipt. Scand., vol. 5, 1846, p. 1963.

Acrometopa ALDRICH, Cat. N. A. Dipt., 1905, p. 653 (*lapsus*).

This genus was originally described from Europe, but two American species have been referred to it by Coquillett. The figure of the head (fig. 16, pl. 5) should serve to distinguish the members of this genus from other Ochthiphilinae.

ACROMETOPIA PUNCTATA Coquillett.

Plate 5, fig. 16.

Acrometopia punctata COQUILLETT, Journ. N. Y. Ent. Soc., vol. 10, 1902, p. 185.

The abdomen of this species has a distinct brown dot at base of all the discal setulae, and the cell between second and third veins from above outer cross vein to its base is clear. The type-specimen was taken by H. K. Morrison in southern Georgia.

ACROMETOPIA MACULATA Coquillett.

Acrometopia maculata COQUILLETT, Journ. N. Y. Ent. Soc., vol. 10, 1902, p. 185.

This species has the spots at bases of the abdominal discal setulae much less distinct, but there are two distinct, rounded spots on the anterior margin of each segment, and the cell referred to in foregoing species has three narrow brown cross bands between the outer cross vein and the base of cell. The type-specimen was taken by August Busck in Baracoa, Cuba.

Nothing is known of the early stages of either of our species, which are represented in the U. S. National Museum collection only by the type-specimens.

Genus PHYTOMYZA Fallen.

PHYTOMYZA MAJOR, new species.

Female.—Yellow, subshining. Ovipositor brownish or blackish. Wings clear, veins yellowish, all veins distinct, but 1–3 thicker than 4–6. Bristles black.

Frons about twice as wide as either eye; orbits broad, one-half as wide as frontal stripe; upper two orbital bristles situated on near to inner margin of orbit; lower three on about center; in addition to these bristles there is an irregular row of short hairs between them and the eye margin; face concave, center raised longitudinally, but not sharply keeled; antennae of moderate size, third joint rounded, not much longer than second, pilose; second joint with a series of black hairs on apical margin; arista with basal joints elongated and thickened; pubescence short, but thick; eye almost as long as high; cheek slightly over one-half as high as eye; marginal bristles of mod-

erate length, vibrissa well differentiated; occiput linear. Mesonotum with 4 pairs of dorso-centrals and in one specimen with slight indications of longitudinal vittæ; disk with sparse, short black setulæ; scutellum with four bristles. Abdomen: All segments with numerous short, black surface hairs, longer on lateral margins; ovipositor glossy, brownish or blackish, as long as, or slightly longer than, last abdominal segment. Legs with apical tarsal joint darkened, and all surfaces covered with short black setulæ; hind femur thickened slightly; hind tibia with apical half thickened somewhat. Wings with first costal division one-half the length of second; third about one-fifth as long as second, and one-half as long as fourth; costa extending slightly beyond end of third vein; second vein slightly waved; third straight; fourth straight, ending slightly behind wing tip; sixth vein not reaching wing margin.

Length.—4.5 mm.

Type.—Cat. No. 15809, U.S.N.M.

Locality.—Ungava Bay, Labrador (L. M. Turner), with the type in another female in rather poor condition.

PHYTOMYZA NITIDULA, new species.

Female.—Shining black. Squamæ and halteres whitish. Wings whitish, veins 1-3, and costa, black.

Frons parallel-sided, barely one-third wider than either eye; center stripe opaque; four orbital bristles present, the upper pair strongest; antennæ of moderate size, third joint with a short, thornlike production at upper angle of apex; arista threadlike, bare, slightly longer than breadth of frons; face in profile slightly concave, receding toward mouth; eyes distinctly higher than long; cheeks narrow at anterior margin, at posterior margin less than one-third as high as eye; occiput distinct; marginal cheek bristles distinct; vibrissa not much differentiated. Mesonotum (rather rubbed in type) with 3 pairs of dorso-centrals of moderate length, the posterior pair much the strongest; disk covered with short black setulæ; scutellum with four bristles. Abdomen broadly ovate; surface of segments finely granulose; all segments with short, scattered, black hairs, which are longest on lateral and posterior margins of apical two segments. Legs normal. Wings with costa falling almost as far short of apex of fourth vein as length of second costal division; first costal division one-fourth shorter than second; second twice as long as third; veins 2-3 divergent; almost straight; fourth vein ending in wing tip; veins 4-6 indistinct.

Length.—1.25 mm.

Type.—Cat. No. 15808, U.S.N.M.

Locality.—Holtville, California (V. L. Wildermuth), Webster No. 6149.

PHYTOMYZA LACTEIPENNIS, new species.

Female.—Entirely black, subshining; halteres yellow, knobs white; tarsi yellowish, darkened at apices. Wings milk white, costa and third vein brownish yellow, first and second veins yellow, the other veins indistinct.

Frons with center stripe opaque, the narrow orbital stripes, and ocellar region glossy; breadth of frons one-third the width of head, the sides slightly divergent posteriorly; orbits in type-specimen denuded of bristles, but evidently normally with three pairs present; face concave in profile, lower margin slightly produced; cheeks narrow anteriorly, much broadened posteriorly, at broadest part one-third as high as eye; antennæ small, third joint with an acute upper angle at apex, but not so distinctly produced as in *Cerodontha*; arista bare, distinctly swollen at base, the terminal section threadlike; palpi small, bare, black; proboscis brown, of normal shape. Mesonotum with slight whitish pollinosity; three pairs of dorso-centrals present, the anterior pair weak; disk with numerous short setulæ; no distinctly differentiated bristles between the posterior pair of dorso-centrals; pleuræ with the normal bristles; scutellum with four subequal marginal bristles, disk bare. Abdomen shining; lateral margins of all segments with bristles, the last segment with noticeably long post-marginal bristles; ovipositor glossy black. Legs short, their surfaces with very short black hairs. Wings with first and second costal division subequal, third distinctly, but not greatly, shorter than second, third vein ending well in front of wing tip.

Length.—1.5 mm.

Type.—Cat. No. 15750, U.S.N.M.

Locality.—Mesilla Park, New Mexico (C. N. Ainslie), Webster No. 5050.

EXPLANATION OF PLATES.

PLATE 4.

- Fig. 1. Wing of *Pholeomyia indecora*.
2. Wing of *Meoneura lacteipennis*.
3. Wing of *Meoneura vagans*.
4. Wing of *Napomyza lateralis*.
5. Wing of *Cryptochætum iceryæ*.
6. Wing of *Eusiphona mira*.
7. Wing of *Paramyia nitens*.
8. Wing of *Euchlorops vittata*.

PLATE 5.

- Fig. 9. Head of *Desmometopa m-nigrum*.
10. Head of *Meoneura vagans* (side view).
11. Head of *Meoneura vagans* (dorsal view).
12. Head of *Milichiella lacteipennis*.
13. Head of *Traginops irrorata*.
14. Head of *Pholeomyia indecora*.
15. Head of *Odinia maculata*.
16. Head of *Acrometopa punctata*.
17. Head of *Phyllomyza securicornis* (male).
18. Head of *Phyllomyza hirtipalpis* (male).
19. Head of *Phyllomyza approximata* (female).
20. Head of *Eusiphona mira*.

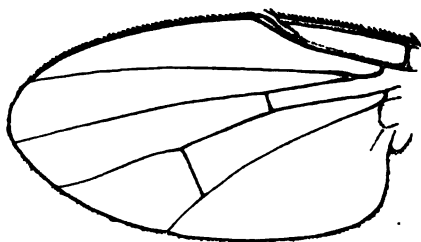
PLATE 6.

- Fig. 21. Head of *Hemeromyia nitida*.
22. Head of *Rhincassa albula*.
23. Head of *Pseudodinia varipes*.
24. Head of *Euchlorops vittata* (dorsal view).
25. Head of ¹*Aldrichiella agromyzina*.
26. Fore femur of *Meoneura lacteipennis*.
27. Fore femur of *Meoneura vagans*.
28. Head of ¹*Tethina rostrata*.
29. Head of *Cryptochætum iceryæ*.
30. Wing of ¹*Aldrichiella agromyzina*.
31. Head of *Pholeomyia leucozona*.
32. Head of *Euchlorops vittata* (side view).

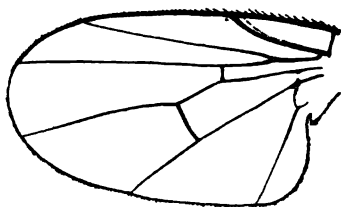
¹ These figures are after Becker.

INDEX TO SUBFAMILIES, GENERA, AND SPECIES.

	Page.		Page.
<i>Acrometopa</i>	150	<i>morosa</i> (<i>Phyllomyza</i>).....	136
<i>Acrometopia</i>	150	<i>Napomyza</i>	129
<i>seneciventris</i> (<i>Agromyza</i>).....	134	<i>nigra</i> (<i>Paramyza</i>).....	141
<i>æthiops</i> (<i>Milichia</i>).....	133	<i>nitens</i> (<i>Paramyza</i>).....	141
<i>Agromyza</i>	129	<i>nitida</i> (<i>Hemeromyia</i>).....	146
<i>agromyzina</i> (<i>Aldrichiella</i>).....	136	<i>nitidula</i> (<i>Phytomyza</i>).....	151
<i>albula</i> (<i>Rhincnessa</i>).....	147	<i>obscura</i> (<i>Hemeromyia</i>).....	145
<i>Aldrichiella</i>	136	<i>obscurella</i> (<i>Meoneura</i>).....	143
<i>Agromyzinæ</i>	129	<i>Ocithipha</i>	130
<i>Anisoneura</i>	144	<i>Ocithiphilinz</i>	129
<i>Anthomyza</i>	147	<i>Odinia</i>	129
<i>approximata</i> (<i>Phyllomyza</i>).....	138	<i>Ophthalmomyia</i>	132
<i>Arctobiella</i>	130	<i>Oxyrhina</i>	150
<i>arcuata</i> (<i>Milichiella</i>).....	132	<i>Paraleucopsis</i>	148
<i>Cacozenus</i>	130	<i>Paramadisa</i>	136
<i>Cerodontha</i>	129	<i>Paramilichia</i>	135
<i>cinerea</i> (<i>Milichiella</i>).....	132	<i>Paramyza</i>	141
<i>cinerea</i> (<i>Rhincnessa</i>).....	148	<i>Parodinia</i>	130
<i>cinerella</i> (<i>Tethina</i>).....	147	<i>parva</i> (<i>Milichiella</i>).....	132
<i>coronata</i> (<i>Tethina</i>).....	147	<i>parvula</i> (<i>Tethina</i>).....	147
<i>corvina</i> (<i>Paraleucopsis</i>).....	149	<i>pectinata</i> (<i>Meoneura</i>).....	143
<i>Cryptochaetum</i>	129	<i>Pholeomyia</i>	134
<i>Euchlorops</i>	139	<i>Phyllomyza</i>	136
<i>Eusiphona</i>	130	<i>Phytomyza</i>	150
<i>halteralis</i> (<i>Paramdiza</i>).....	136	<i>Phytomyzinæ</i>	129
<i>Hemeromyia</i>	144	<i>præsecta</i> (<i>Pholeomyia</i>).....	135
<i>hirtipalpis</i> (<i>Phyllomyza</i>).....	137	<i>prinus</i> (<i>Meoneura</i>).....	142
<i>indecora</i> (<i>Pholeomyia</i>).....	134	<i>Psolidotus</i>	142
<i>infusata</i> (<i>Meoneura</i>).....	143	<i>pseudodecora</i> (<i>Pholeomyia</i>).....	135
<i>lacteipennis</i> (<i>Meoneura</i>).....	144	<i>Pseudodinia</i>	130
<i>lacteipennis</i> (<i>Milichiella</i>).....	133	<i>punctata</i> (<i>Acrometopia</i>).....	150
<i>lacteipennis</i> (<i>Phytomyza</i>).....	152	<i>Rhincnessa</i>	147
<i>leucogastra</i> (<i>Pholeomyia</i>).....	135	<i>Rhynchomilichia</i>	135
<i>Leucopsis</i>	130	<i>robertsoni</i> (<i>Pholeomyia</i>).....	135
<i>leucozona</i> (<i>Pholeomyia</i>).....	135	<i>rostrata</i> (<i>Tethina</i>).....	147
<i>Lobioptera</i>	135	<i>scutellata</i> (<i>Agromyza</i>).....	136
<i>longiseta</i> (<i>Paramilichia</i>).....	134	<i>securicornis</i> (<i>Phyllomyza</i>).....	136
<i>lucidula</i> (<i>Milichiella</i>).....	132	<i>similis</i> (<i>Euchlorops</i>).....	140
<i>maculata</i> (<i>Acrometopia</i>).....	150	<i>Stenoporomyia</i>	131
<i>Madiza</i>	136	<i>Tethina</i>	146
<i>magnipalpis</i> (<i>Phyllomyza</i>).....	138	<i>texana</i> (<i>Rhincnessa</i>).....	148
<i>major</i> (<i>Phytomyza</i>).....	150	<i>Traginops</i>	129
<i>Meoneura</i>	142	<i>triticii</i> (<i>Meoneura</i>).....	143
<i>Milichia</i>	133	<i>vagans</i> (<i>Meoneura</i>).....	143
<i>Milichiella</i>	131	<i>vittata</i> (<i>Euchlorops</i>).....	139
<i>Milichinæ</i>	129	<i>xanthopoda</i> (<i>Tethina</i> ?).....	147



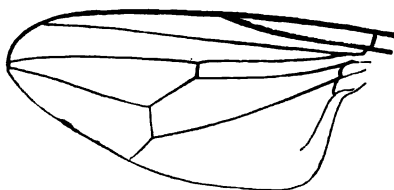
1



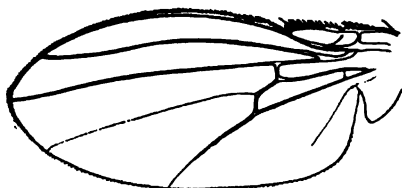
5



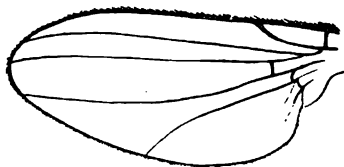
2



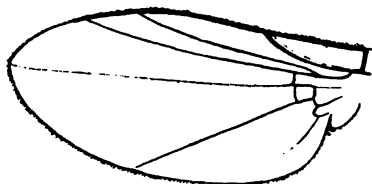
6



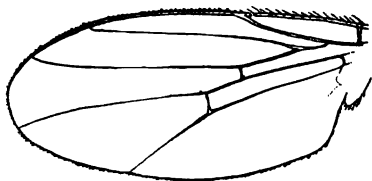
3



7



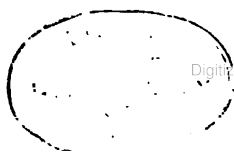
4

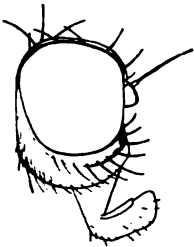


8

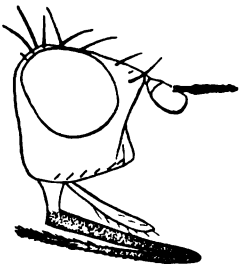
WINGS OF SPECIES OF AGROMYZIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 153.

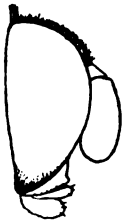




21



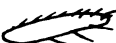
25



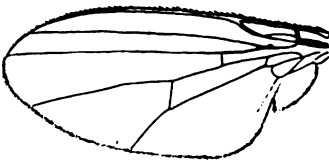
29



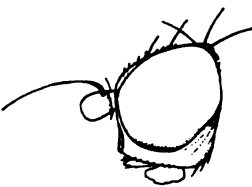
22



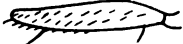
26



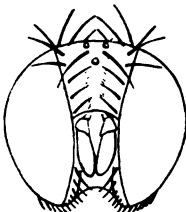
30



23



27



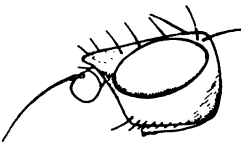
31



24



28



32

PARTS OF SPECIES OF AGROMYZIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 153.



A FOSSIL SPONGE FROM NEW JERSEY.

FOR EXPLANATION OF PLATE SEE PAGE 155.

A NEW SPONGE FROM THE NEW JERSEY CRETACEOUS.

By HERVEY W. SHIMER and SIDNEY POWERS,
Of the Massachusetts Institute of Technology, Boston.

Sponges have proved to be so rare in the Cretaceous rocks of America that any contribution to the subject, however slight, would be worth while. The fossil which forms the subject of the present paper is the only sponge which has been reported from the Cretaceous of New Jersey, where it was collected by H. W. Shimer in the Mount Laurel sandstone of Atlantic Highlands. This formation is composed almost entirely of moderately coarse sand grains (silicarenite) and glauconite. The age of the beds is Mount Laurel-Navesink of the upper part of the Cretaceous.

The genus *Cæloptychium*, to which it seems best to refer this specimen, has heretofore been found only in the Upper Cretaceous of Europe. Both Dr. T. W. Stanton and Prof. Stuart Weller, who have very kindly examined the specimen, have reported that they know of no sponge in North America with which it might be even generically associated. The following species were found associated with this sponge:

FORAMINIFERA.

Nodosaria levigata d'Orbigny.

PELECYPODA.

Arca rostellata Morton.

Cardium spillmani Conrad.

Cardium tenuistriatum Whitfield.

Crassatellites subplanus (Conrad)

Cucullæa neglecta Gabb.

Cucullæa tippana Conrad.

Cyprimeria densata (Conrad).

Inoceramus confertim-annulatus Roemer.

Ostrea mesenterica Morton.

Panopea decisa Conrad.

Trigonia thoracica Morton.

GASTROPODA.

Anchura pennata Morton.

Gastrochæna americana Gabb.

Lunatia halli Gabb.

Pyrifusus macfarlandi Whitfield?

Trachytriton atlanticum Whitfield.

Turbinopsis ? elevata Whitfield.

Turritella vertebroides Morton.

CEPHALOPODA.

Baculites ovatus Say.

Belemniteella americana Morton.

VERTEBRATA.

Fish vertebrae.

Reptilian bones.

Genus *CÆLOPTYCHIUM* Goldfuss.

CÆLOPTYCHIUM? JERSEYENSE, new species.

Plate 7.

Mushroomlike, contracting from a broad and depressed upper surface into a short stalk. Edge of umbel rounded. Entire surface

covered with low radiating folds, which increase in number toward margin of umbel, where about 35 are present. Umbel subcircular, with greatest diameter 33 mm. Entire height of sponge 20 mm. No ostia are apparent.

A vertical cross section near the edge of the umbel gives indication that although the arrangement of the folds upon one side of the specimen is so poorly preserved as to be indeterminate, yet the apparent connection of the folds on the opposite side in pairs seems to indicate that there was originally present the typical sigmoid arrangement characteristic of *Cæloptychium*, as seen in *C. agaricoides*, *C. decimum*, etc.

This specimen differs from the typical species of *Cæloptychium* in the rounded instead of flattened margin of umbel and in the less elevation of the folds, though this latter feature may be due to imperfect preservation. It approaches *C. seebachi* and *C. princeps* in the depressed upper surface of umbel and in the gradual contraction of its lower surface into the stalk.¹

Occurrence.—Cretaceous, Mount Laurel-Navesink beds at Atlantic Highlands, New Jersey.

Holotype.—Cat. No. 31176, U.S.N.M.

¹ Abh. k. bayer. Akad. Wiss., math.-physik. classe, vol. 12, pl. 2.

THE VARIATION EXHIBITED BY MAINLAND AND ISLAND SPECIMENS OF THE HIBAKARI SNAKE, *Natrix vibakari* (BOIE).

By J. C. THOMPSON,
Surgeon, United States Navy.

In a recent paper¹ attention was called to the fact, first made known by Wallace, that where a serpent inhabits both the mainland and adjoining islands individuals captured on the islands frequently possess the larger number of vertebræ. This has been examined into and found to hold true for a great many species, including members of the Colubridæ, Najidæ, and Crotalidæ. An endeavor is being made to ascertain exactly which portion of the vertebral column becomes involved in the process of lengthening. In the present species it is the caudal region alone.

The island specimens of *Natrix vibakari* (Boie) have been reported from Hondo, Shikoku, and Kiushu, three of the four principal islands of Japan. None have been reported from Hokkaido, the northern island. The mainland specimens have been captured at Khabarovka, Vladivostok, and Possiet Bay in the Ussuri Province of Siberia, and from Fusan in southeast Korea.

If the sum of the gastrosteges and the urosteges in each specimen be plotted in linear fashion, it may be seen at a glance that the examples from the islands have the larger number of vertebræ.

Diagram showing the variation in the sum of the ventrals and subcaudals.



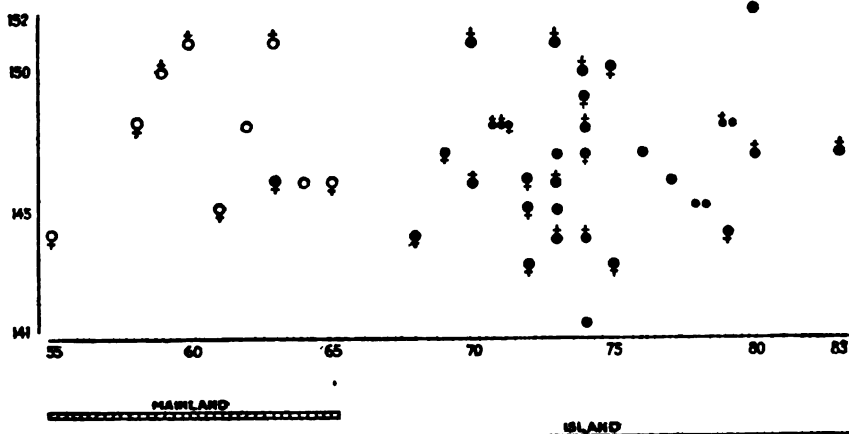
In the above diagram the circles represent mainland and the dots island specimens. Where the sex has been recorded, there is added the conventional sign.

¹ Herpetological Notices, No. 2, San Francisco.

Range of variation in 44 specimens.....	199-232
Range in 9 mainland specimens.....	199-214
Arithmetical mean.....	208
Range in 35 island specimens.....	208-232
Arithmetical mean.....	221
Overlapping of mainland and island specimens:	
In terms of shields.....	7
In percentage of the total range.....	21

A more instructive graphic scheme will result if the records of each specimen be plotted on squared paper, due regard being taken of the gastrostege and urostege count.

Diagram showing the variation in the subcaudals.



Range of variation in 43 specimens:	
Ventrols.....	141-152
Subcaudals.....	55- 83
Range in 9 mainland specimens:	
Ventrols.....	144-151
Subcaudals.....	55- 65
Range in 34 island specimens:	
Ventrols.....	141-152
Subcaudals.....	63- 83
Overlapping of mainland and island specimens:	
Ventrols (range 12, overlapping 8)..... per cent..	66.6
Subcaudals (range 29, overlapping 3)..... do.....	10.3

The variation in the number of dorsal vertebrae, as evidenced by the gastrostege count, is seemingly of no consequence. As to the caudal vertebrae, however, it is most apparent that the specimens from the two geographical regions are in this respect quite distinct. Furthermore, owing to the fact that a straightforward species is under consideration, occasional intermediates between the two groups exist.

The climate of continental islands is regularly milder than that of the adjoining mainland of the same latitude. Where the range of a species extends over regions that differ, in one having a more temperate climate, the animals inhabiting the warmer are prone to be the larger. The lengthening of the tail in this species is evidently an example of this phenomenon.

The increase in the length of the vertebral column has been confined strictly to the caudal region. There has been no change in the relative position of the internal organs. The gastrostege level at which the principal viscera are situated may be presented in a table.

Gastrostege level of the principal viscera.

	Mainland.				Island.							
Sex.....	♂	♀	♀	♀	♂	♂	♂	♂	♂	♀	♀	♀
Gastrosteges.....	151	144	145	146	144	144	145	146	148	143	143	147
Heart, apex.....	29	27	26	27	30	28	30	30	28	28	26	29
Liver:												
Anterior.....	41	36	35	35	37	37	37	38	36	36	35	36
Posterior.....	78	75	74	74	70	74	78	77	73	69	74	64
Gall bladder, middle.	85	82	85	84	83	80	82	83	84	.....	84	76
Kidneys, right:												
Anterior.....	115	115	.....	.....	110	112	114	112	.....	119	110	119
Posterior.....	127	125	.....	.....	125	125	127	124	.....	130	121	128
Kidneys, left:												
Anterior.....	128	120	.....	.....	119	122	123	117	.....	123	119	126
Posterior.....	137	132	.....	.....	134	136	137	131	.....	133	130	137
Ileo-caecal valve	131	128	.....	.....	123	128	127	.....	.....	128	123	128
Cal. Ac. Sci. Mus. No.	31487	31488	31486	31485	15854	16065	15860	15859	15856	15855	15858	15861

An inspection of this table brings to light the fact that where one specimen has a few more body vertebræ than another the increase has taken place in a definite part of the column. This region is between the gall bladder and the ileo-cæcal valve, and would correspond to the lumbar region in the higher animals.

The scales are in 19 rows anteriorly and 17 posteriorly; the IV row is the one that is suppressed, and it terminates at the upper half of an enlarged scale in the row below.

Gastrostege level at which the suppressed rows terminate.

	Mainland.				Island.							
Sex.....	♂	♀	♀	♀	♂	♂	♂	♂	♂	♀	♀	♀
Gastrosteges.....	181	144	145	146	144	144	145	146	148	143	143	147
19 rows anterior IV suppressed:												
Right.....	70	86	79	84	78	84	85	84	83	73	83	86
Left.....	66	88	79	84	79	82	86	83	84	75	82	80
17 rows posteriorly.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cal. Ac. Sci. Mus. No.	31487	31488	31486	31485	15854	16065	15860	15859	15856	15855	15858	15861

At present there are only a few records of mainland specimens but these are sufficient to show that there exists a marked tendency toward a reduction in the number of head shields. The island

specimens normally have three postoculars, whereas those from the mainland as a rule have two. The island examples normally have 7 supralabials, and where they vary it is in the direction of an increased number, or 8. Those from the mainland normally have 7 also, but when they vary it is in the direction of a reduced number, or 6.

The nearest ally of this serpent is *Natrix sauteri* (Boulenger), from Formosa. There are no records of either from the intervening Riu Kiu Islands.

The material upon which this study was based consists of 20 specimens in the United States National Museum, 8 in the British Museum of Natural History, 12 in the California Academy of Sciences, and 6 records from literature.

THE EXTINCT BISONS OF NORTH AMERICA; WITH DESCRIPTION OF ONE NEW SPECIES, BISON REGIUS.

By OLIVER P. HAY,

Research Associate of the Carnegie Institution of Washington.

Since Frederic A. Lucas¹ wrote, in 1899, his paper on The Fossil Bisons of North America, a considerable number of new specimens have found their way into the various collections; and some of these furnish more complete portions of the skull than were known at that time. It seems therefore proper that these new acquisitions should be described and illustrated; and this the writer proposes to do, having, through the courtesy of the officers of the United States National Museum, the American Museum of Natural History, the Field Museum of Natural History, Earlham College, Indiana, and the University of Kansas, had free access to the materials in their possession.

Inasmuch as many European writers have been disposed to refer the fossil bisons of North America, except perhaps *B. latifrons*, to the European species, *Bison prisus*, it seems to be necessary to consider that name and the forms which have been arranged under it.

Anyone who examines the various figures of skulls to which this name has been applied must be struck by the great differences which are presented by them in the length of the horn-cores, their direction, and the amount of their curvature. As examples of these may be taken two skulls figured by H. v. Meyer.² Figure 1, plate 8, represents the former, found near Pavia, Italy. Figure 2 of same plate shows the latter, supposed to have been brought from Hungary. Another example is represented by figures 1, 2 of plate 15, a specimen found in Siberia, in the case of which the horn-sheaths are yet present. Figure 3 of plate 8 is reproduced from the skull described by Pallas,³ and found on one of the tributaries of the Yenesei River, in Siberia. As will be observed the horn-sheaths had been preserved. Tscherski⁴ described this skull, comparing it with a number of others.

¹ Proc. U. S. Nat. Mus., vol. 21, pp. 755-771, pls. 65-84.

² Nova Acta, etc., vol. 17, 1835, pls. 10, 11.

³ Nova Comment. Acad. Petropol., vol. 13, 1769, p. 462, pl. 11, fig. 1.

⁴ Mém. Acad. Imp. Sci. St. Petersb., ser. 7, vol. 40, 1863, p. 76.

The attitude assumed by most European writers, especially the older ones, on the relationships of the fossil bisons of the northern parts of the eastern and the western hemispheres is well illustrated by the language of J. F. Brandt.¹ This author, having studied the rich materials in the St. Petersburg Academy, expressed himself unhesitatingly as regarding *Bison priscus* Bojanus and *Bos latifrons* Fischer as identical with *Bison bonasus* of Europe. He further affirmed that, notwithstanding the contradiction which he had to expect in America, he identified *Bison latifrons* (Harlan) and *Bison antiquus* Leidy, together with *Bos priscus* Bojanus, as mere races of one primitive form.

It is very probable that to-day few naturalists would deny that all these forms have descended from a common and not far removed ancestor. There is, however, in our time, hardly one who will affirm that the European bison is the same species as the North American animal; and there are few who will contend that our *Bison latifrons*, with its immense horns, was specifically identical with the short-horned *Bison bonasus* of Europe, or even with the forms that have been included under the name *Bison priscus*.

It is only recently that an effort has been made to establish distinct species and subspecies on the materials which have been found from the British Isles to Eastern Siberia in Pleistocene deposits. In 1909² La Baume, in an interesting paper on fossil and subfossil oxen of the Old World, discussed ten skulls of *Bison priscus*, and presented numerous measurements. Some of these skulls he figured. They had been collected in as nearly as many localities, scattered from the Rhine to eastern Siberia. He concluded that, as regards the measurements of the skulls themselves, there appeared to exist no great differences, but he appreciated the fact that there existed very great differences among the horn-cores of the different skulls which had been described by the various European writers. On pages 52-54 he gives a brief history of the several attempts which had been made to explain these differences; and he shows in a striking way the difficult position in which these writers had placed themselves in their resolution to regard all these forms of bisons as belonging to a single species. La Baume expresses this conclusion: "It is impossible to refer to geographical varieties all the variations in the form of the horn-cores of *Bison priscus*; since very different sorts of horn-cores are found within very narrowly restricted regions and, on the other hand, horn-cores from widely removed localities agree completely." The writer quoted did not attempt to establish any new species, regarding it as necessary to await the accumulation of additional and better materials.

¹ Verh. russ. mineral. Ges., ser. 2, vol. 2, pp. 137, 150.

² Schriften naturf. Ges. Dansig, n. s., vol. 12, Heft. 3, pp. 45-80.

It may be here remarked that La Baume, following Nathusius, made use, as a standard for comparison, of a measurement which is to be recommended; but which the present writer has not been able to use to any considerable extent. This measurement is the distance from the lower border of the foramen magnum to the base of the nasals. In but few fossil skulls can the basilar length be obtained; while in many the fronto-nasal suture remains. The measurement in question, called by La Baume "Schädeldurchmesser" might be called in English the basinasal length.

In the same year that La Baume published his paper Max Hilzheimer¹ described as a new species *Bison primitivus*. The type of this species had been found near Kisensk, on the Lena River, Siberia. This will be referred to again on page 177. In a second paper² Hilzheimer described *Bison uriformis*, basing it on part of a skull with complete horn-cores, found near Kottbus, in Prussia; also, *Bison europæus lenensis*,³ on a nearly complete skull, with horn-sheaths, which had been collected on the Vilui River, an affluent of the Lena; furthermore, he recognized⁴ a second specimen of his *B. primitivus*, brought from Vologda, in Eastern Russia. The two last-named skulls were among those studied by La Baume.

If the fossil bisons of Europe are to be subdivided into species, or, as some doubtless prefer to call them, subspecies or races, it will be first of all necessary to determine what is the form to which the term *priscus* is to be applied. This may not be a wholly easy matter; at least, so far as the writer knows, no one has yet attempted to place the name on a solid basis. It is generally credited to Bojanus⁵ who uses the combination *Urus priscus*. If this were the first use of the specific name, as applied to a fossil bison, the reviser might select as the type any one of the five specimens catalogued by Bojanus; and thus the further usefulness of the name would depend on the quality of the reviser's mercy. However, Bojanus himself indicates ("nomine aliis auctoribus iam recepto") that he was not the first to use the name. H. von Meyer's *Palæologica*, etc., in which he states that he has dealt with the literature, is not accessible to the present writer; but he finds, through the good offices of Dr. C. W. Richmond, that Schlotheim, in 1820,⁶ applied the title *Bos urus priscus* to three specimens which had been found somewhere in the neighborhood of Gotha, Germany. One of these was a complete horn-core, over 2 feet long; another, the lower half of a still thicker horn-core, together with a part of a skull. Schlotheim

¹ Jahreshefte Ver. vaterl. Naturk., Württemberg, 1900, pp. 241-260, pls. 6, 7.

² Sitz.-Ber. Ges. naturf. Freunde, Berlin, 1910, p. 138, figs. 3, 4.

³ Page 144, figs. 8, 9.

⁴ Page 142, figs. 6, 7.

⁵ Nova Acta, etc., vol. 13, 1827, p. 427.

⁶ Petrefactenkunde, p. 10.

stated that his specimens agreed wholly with figures which had been published by Faujas, of a skull which had been found in the Rhine near Bonn. The horn-cores of this skull had, however, lost their extremities. H. Bronn, author of the article on "Ochsen",¹ makes this disposition of Schlotheim's name: "1, *Bos taurus* Lin. var. *fossilis* Cuv. (*Bos urus priscus*, v. Schloth.)," J. F. Brandt² seems to refer Schlotheim's name to *Bos primigenius*. It seems probable, however, that the complete horn-core in Schlotheim's hands resembled those here figured, after v. Meyer (pl. 8, figs. 1, 2), or those of the skull represented by Owen.³ It is very probable that the specimens mentioned by Schlotheim are yet in existence; and if so, and if Schlotheim's use of the name *priscus* for a fossil bison of Europe is the earliest, one of the three specimens, preferably the most complete one, ought to be selected as the type of *Bison priscus*, and it ought, further, to be carefully figured and described. We would then have for our building a fixed corner stone, even though it might not be one that furnishes everything that could be desired.

The first of the American species of extinct bison to be considered is *Bison antiquus* Leidy.

BISON ANTIQUUS Leidy.

It is unfortunate that the types of so many species of fossil animals are very imperfect specimens. That of *Bison antiquus* consists of only a portion of the right side of the skull bearing a part of the horn-core. This fragment has likewise been eroded somewhat, so that the exact dimensions and form can not be determined. This results in somewhat different estimates.⁴ The writer has attempted here to restore in outline the missing part of the horn-core, so that one may form a judgment regarding its shape (fig. 1). At a later time Leidy referred to the same species a skull lacking all in front of the orbits, but with complete horn-cores, which had been discovered in California. This was figured by Leidy under the name *Bison latifrons*.⁵ Rhoads⁶ made this specimen the type of *Bison californicus*. The writer⁷ described and illustrated, under the name *B. antiquus*, a skull which is in Earlham College, Richmond, Indiana, and which was discovered some years ago near Vincennes, Indiana. The figures are here reprinted (figs. 2, 3). This skull differs from

¹ Ersch und Gruber's Encyclopädie der Wissenschaften und Künste, sec. 3, 1836, p. 278.

² Verh. russ. mineral. Ges., ser. 2, vol. 2, p. 186.

³ Brit. Foss. Mammals and Birds, p. 491.

⁴ Allen, American Bisons, p. 26; Lucas, Proc. U. S. Nat. Mus., vol. 21, 1899, p. 760; Hay, Geol. Surv. Indiana, vol. 35, 1912, p. 650.

⁵ Extinct Vert. Fauna, pl. 28, figs. 4, 5; Lucas, work previously cited, pls. 69, 70.

⁶ Proc. Acad. Nat. Sci. Phila., 1897, p. 501.

⁷ Work previously cited, p. 650. figs. 50, 51.

that found in California in having slenderer horns. This may be explained on the supposition of a difference of sex. There seem to be some differences in the proportions of the cranium likewise. In the Indiana specimen the distance from the occiput to a line joining the hinder borders of the orbits is about 73 per cent of the width at the rear of the orbits; in the California specimen the corresponding estimate is about 69 per cent. However, in four skulls of the American bison a range is found which is equally great. It seems to the writer that we must believe that the California specimen and that found in Indiana belong to the same species. The characters that distinguish this bison are found, as pointed out by Lucas, in the horns, which are about as long as the skull is wide, rapidly tapering, somewhat sagging, at the base, recurved at the tip, and directed outward in a plane at right angles with the midline of the skull. In all



FIG. 1.—BISON ANTIQUS. TYPE. PART OF SKULL. HORN-CORE RESTORED TO SHOW FORM.

the other species of North American and apparently also of European bisons the axis of the base of the horn-core is directed more or less toward the orbit of the opposite side.

In his work *The American Bisons, Living and Extinct*, page 21, published in 1876, J. A. Allen accepted this species as being distinct from the European *Bison priscus*; but, he included in it *Bison crassicornis*, of Alaska; as well as remains which have since been recognized by Lucas as *B. occidentalis*. He was therefore entirely consistent when he gave his judgment as follows:

The types here recognized as distinct forms under the names *B. priscus* and *B. antiquus*, it should be remarked, differ but slightly from each other—not more so, probably, than do *B. bonasus* and *B. americanus*, if indeed so much—and constitute, as it were, a common circumpolar form from which *B. bonasus* and *B. americanus* have probably been differentiated.

Richard Lydekker, in his *Wild Oxen, Sheep, and Goats, etc.*, published in 1898, on page 61, regarded *B. antiquus* and *B. crassicornis*

(as well as materials now called *B. occidentalis*) as synonyms of *B. priscus*, the extinct bison of Europe. He figured a skull, lacking the part in front of the orbits and bearing the horn-cores, which had been found at Ilford, Essex, England. There is a cast of this in the United States National Museum, and from this photographs have been made and reproduced (pl. 9, figs. 1, 2) for comparison with the

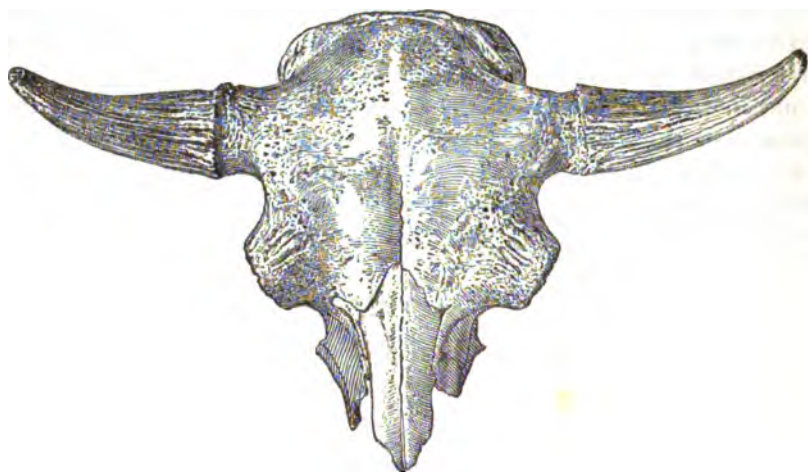


FIG. 2.—BISON ANTIQUUS. SKULL AT EARLHAM COLLEGE. FRONTAL VIEW.

figures here given of other species of extinct bisons. Mr. Lydekker regards this skull as that of a very large bull.¹ It appears to be the same specimen that Richard Owen² thought might be the skull of a female. Attention may likewise be called to another specimen which was dug up at Woolwich, England, and of which Owen published a figure on page 49 of the work just cited. The horn-cores have

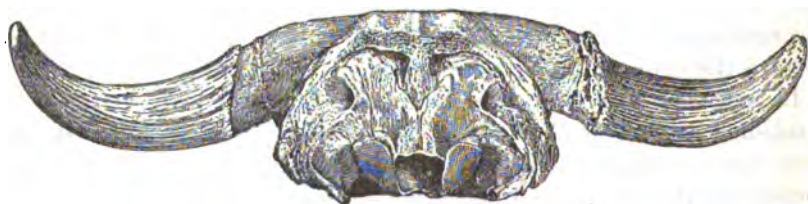


FIG. 3.—BISON ANTIQUUS. SKULL AT EARLHAM COLLEGE. VIEW FROM THE REAR.

an appearance quite different from that of the specimen found at Ilford, being much slenderer and apparently not so much curved. From the cast of the Ilford specimen the present writer has obtained the following results. For comparison the corresponding measurements are taken from the specimen of *B. antiquus* which is at Earlham College and of the California skull which has been called by Rhoads *B. californicus*.

¹ Cat. Foss. Mamm., pt. 2, p. 24.

² Brit. Foss. Mammals and Birds, p. 494.

Measurements of skulls.

Dimensions taken.	<i>B. priscus</i> , No. 45392, B. M.	<i>B. antiquus</i> , Earlham College.	<i>B. californicus</i> .
	mm.	mm.	mm.
Width between bases of horn-cores.....	840	400	400
Width at the rear of the temporal fossae.....	233	205	.....
Width across mastoids.....	330	310	330
Width at rear of orbits.....	395	360	.....
Width between orbits and horn-cores.....	340	310	330
Length from occipital crest to line joining the rear of the orbits.....	253	263	.....
Distance from lower border of foramen magnum to rear of nasale, basinial length.....	308	292	.....
Length along upper curve of horn-core.....	620	290	290
Length along the lower curve of horn-core.....	610	355	326
Distance between tips of horn-cores.....	1,020	880	880
From outside to outside of horn-cores, greatest.....	1,120	880	880
Greatest diameter of base of horn-core.....	138	103	115
Least diameter of base of horn-core.....	115	90	110

It ought to be stated here that the measurements of the specimen of *B. priscus* which were recorded by Mr. Lydekker in the catalogue, as cited, differ from the corresponding ones here given, not having been taken in the same way, the length of the horn-core, 375 mm., being taken evidently in a straight line. It is further to be noted that in the present paper the distance between the bases of the horn-cores is taken across the forehead where the rough bases approach each other most nearly. Some authors appear to take the measurement between other points.

The skull from California which has been regarded as *B. antiquus* has horn-cores of nearly the same length as those of the Earlham specimen, but they are of greater diameter at the base. We may therefore regard the California skull as being that of a bull; the other, that of a cow. Is it then possible that the English skull with a narrower forehead, greater width at the orbits, and immensely longer horns, besides other differences, belonged to a bull of the same species? The writer does not think so.

BISON OCCIDENTALIS Lucas.

The type of this species is in the United States National Museum and has the catalogue number 4157. It was discovered by Sir John Richardson, at Fort Yukon, Alaska, where the Porcupine River empties into the Yukon. The specimen consists of the rear of the skull bearing the two horn-cores. Of the left horn-core the distal extremity is missing. Inasmuch as a number of other specimens which are to be referred to the same species have come to light, it seems best to consider them. Figures are here presented of the type skull (pl. 9, figs. 3, 4).

The most nearly complete skull of this species known to the writer is one in the American Museum of Natural History. Through the liberality of the officers of the museum the writer has been furnished with photographs of this skull, and from these the figures here shown

have been prepared (pl. 10, figs. 1, 2, 3, a). The skull was found in the Fox Gulch mine, near Dawson, Yukon Territory, and was presented to the American Museum of Natural History by George T. Coffey, through L. S. Quackenbush. The catalogue number of the specimen is 13721. This skull lacks the lower jaws; likewise the maxillary, the premaxillary, and the lachrymal of the right side are missing. The true molars of the left side are present, but are somewhat shattered and consequently have not been figured. The measurements taken are found in the second column of the following table. In the first column are the corresponding measurements from the type-specimen, so far as they can be obtained:

Measurements of skulls.

Dimensions taken.	Type.	13721 A.M.N.H.	5514 U.S.N.M.	2643 U.S.N.M.	Univ. Kansas.
Length from the rear of the occipital condyles to front of premaxillae.....	mm.	mm.	mm.	mm.	mm.
Length from front of foramen magnum to front of premaxillae.....		573			600
Length from middle of occipital crest to front of premaxillae.....		537			560
Length from middle of occipital crest to front of nasals.....		600			615
Length from middle of occipital crest to rear of nasals.....		465			533
Distance from upper lip of foramen magnum to middle of occipital crest.....	266	285	280	260	271
Distance between bases of horn-cores.....	107	110	102	102	
Distance from lower border of foramen magnum to rear of nasals, basinasal length.....	297	335	320	312	370
Distance from lower border of foramen magnum to rear of nasals, basinasal length.....	290		370		
Width of skull at the auditory openings.....	273	280	290	298	305
Width of skull at the hinder ends of the temporal fossae.....	175	200	187	202	195
Width of skull at constriction between orbits and bases of horn-cores.....	297	295	298	300	350
Width of skull at the rear of the orbits.....	355	355	368		397
Width of skull at the maxillo-malar sutures.....		285			
Width of muzzle at middle of length of premaxillae.....		143 ±			
Width of palate between anterior premolars.....		90			
Width of palate between hinder molars.....		132			
Width across nasal bones, in straight line.....		97			
Diameter of orbit.....		72			
Diameter of base of horn-cores, fore-and-aft.....	102	118	105	115	107
Diameter of base of horn-cores, vertical.....	96	95	88	95	92
Circumference of horn-cores at base.....	300	320	310	336	325
Length of horn-cores on upper curve.....	298	355	330	352	310
Length of horn-cores on lower curve.....	365	420	415	415	375
Distance between tips of horn-cores.....	700	920	810	808	880
From middle of occipital crest to rear of orbit—straight line.....	290	288	295		

The following are the measurements of the molar teeth; and in the second column the corresponding measurements of the molars of two American bisons, the stage of wear being about the same:

Measurements of teeth.

Teeth measured.	13721 A.M.N.H.	22638 U.S.N.M.	22374 U.S.N.M.
Length of the molar series.....	mm.	mm.	mm.
M. { length.....	92	92	93
M. { width.....	25.5	26	26
M. { length.....	26	25	26.5
M. { width.....	31	33	33
M. { length.....	29	25	28.5
M. { width.....	33	33	34
M. { length.....	29	23	23

It will be observed that there is no considerable differences in the measurements of the teeth of the two species; and, had we more individuals, these differences might disappear. However, a difference is seen in the structure of the last molars of the two species. On the anterior half of the outer face there are, in *B. occidentalis*, three pillars which descend from the base of the tooth, instead of two, as in the existing bison. That is, the deep valley or groove just opposite the posterior horn of the anterior crescent of *Bison bison* is, in *B. occidentalis*, occupied by a pillar about equal in diameter to the pillar just behind it and belonging to the hinder half of the outer face of the tooth. This extra pillar is not present in the other two molars.

It will be seen that in various ways this specimen differs from the type. The skull has exactly the same width, 355 mm., at the rear of the orbits, and the cranial length (from the middle of occiput to line joining the rear of the orbits) is practically the same. Nevertheless, the distance between the bases of the horn-cores is greater by 38 mm.; the distance between the hinder ends of the temporal fossæ is 25 mm. greater; the circumference of the base of the horn-cores is somewhat greater; the horn-cores are longer by about 55 mm. and the distance between the tips of the horn-cores is greater by 220 mm., the latter greater dimension being partly due to the less abrupt curvature of the horn-cores. When the figures showing the rear of the skulls is examined (pl. 9, fig. 4; pl. 10, fig. 2) it is seen that the forehead of the American Museum specimen is more swollen than that of the type and that the horn-cores sag somewhat more than in the type. It may be observed that similar differences exist in the American bison and that the sagging of the horns seems to be associated with the inflation of the forehead.

In both the type and in the American Museum specimen the axis of the horn-cores is directed pretty nearly toward the orbit of the opposite side. Also in both a line joining the extremities of the horn-cores passes somewhat behind the occiput; slightly less in the type than in the other specimen.

It is proposed next to describe the skull and briefly the skeleton of a specimen which is in the University of Kansas and which is assigned to *B. occidentalis*. This was found near Russell Springs, Logan County, Kansas, and was described originally by Alban Stewart, under the name *Bison antiquus*; later by Lucas and McClung, who referred it to *Bison occidentalis*. Both Stewart and McClung gave numerous measurements. The specimen has been mentioned also by Williston in two or three papers. With this bison were found six or seven other individuals, all probably members of one herd. Beneath the scapula of this fine individual H. T. Martin

found a flint arrowhead. This fact has been treated by Williston and McClung.

Besides the measurements of the skull (figs. 4 and 5) presented on page 168, in the fifth column, it may be added that the width at the rough eminence above the fourth premolar is 168 mm.; the lower jaw has a height of 72 mm. at the hinder molar.

The teeth are worn down well toward the roots. The upper tooth line, not including the missing pm.³, is 144 mm. long. The following are the dimensions of the teeth so far as obtainable:



FIG. 4.—BISON OCCIDENTALIS. SKULL AT KANSAS UNIVERSITY. FRONTAL VIEW.

Measurements of teeth.

Upper.		Lower.	
	mm.		mm.
M. ¹ length.....	24	Pm. ⁵ length.....	14
M. ¹ width.....	30	Pm. ⁵ width.....	10
M. ² length.....	29	Pm. ⁵ length.....	20
M. ² width.....	29	Pm. ⁵ width.....	11.5
M. ³ length.....	33	M. ³ length.....	54
M. ³ width.....	26	M. ³ width.....	30

The width of m.³ was taken across the hinder lobe, the front lobe being injured; the widths of pm.₂ and of pm.₃ were taken at the rear. M.₂ measured across the middle lobe 29 mm.; across the hinder lobe, 11 mm. Inasmuch as the length of each tooth diminishes as it is worn toward the base, the lengths were doubtless greater earlier in life. For the dimensions of the upper teeth in skulls of *Bison bison*

at hand, see table on page 168. In the lower jaw of another *Bison bison*, No. 172689, U.S.N.M., from northern Alberta, the length of the last lower molar is 46 mm.; the width across the front lobe, 21 mm.; across the middle lobe, 20 mm.; across the hinder, 11 mm. It will be seen that at least this tooth in the fossil species is longer and especially much wider than in the existing bison. The dimensions of the upper teeth of this Kansas specimen differ somewhat from those of the specimen in the American Museum of Natural History.

As regards the direction taken by the horn-cores it may be said that a straight line joining the tips has its middle point 90 mm. above the occipital crest and at a somewhat shorter distance behind it. Near the bases the horn-cores are directed outward, somewhat back-

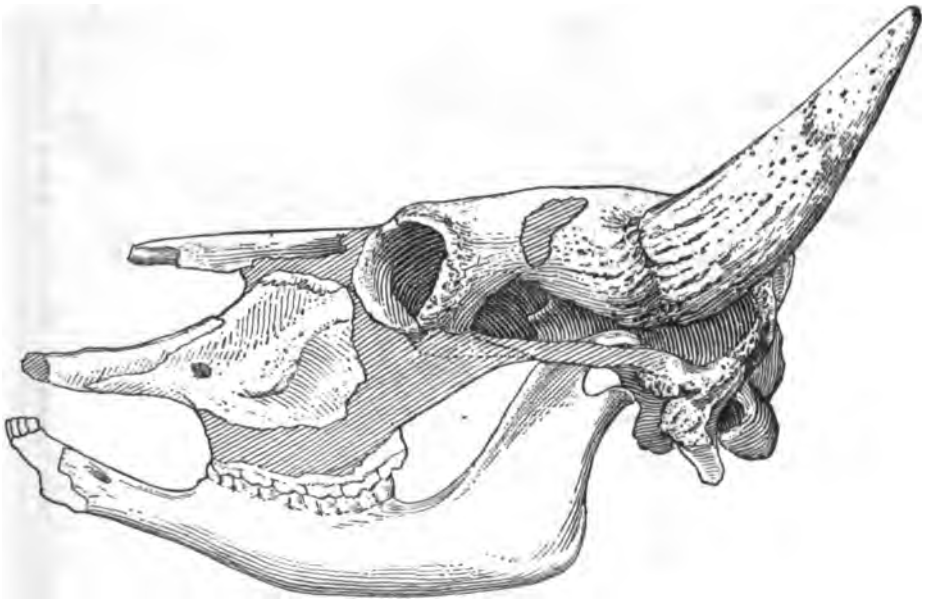


FIG. 5.—*BISON OCCIDENTALIS*. SKULL AT KANSAS UNIVERSITY. LATERAL VIEW.

ward, and slightly downward, but soon beginning to rise. At the base the horn-cores are only slightly flattened.

Measurements of the other parts of the skeleton have been published by Stewart and McClung. A drawing of the whole skeleton is here presented (fig. 6), prepared from a photograph furnished by the University of Kansas. The atlas is wholly artificial. The centrum of the axis has a length of 110 mm.; its spine rises 170 mm. above the lower surface of the centrum. The spine of the seventh cervical is 510 mm. high, but it is partly restored. The spine of the first dorsal is 540 mm. high; of the second, 600 mm. high. The centrum of the fifth dorsal is 72 mm. long; that of the tenth dorsal, 61 mm. long; that of the first lumbar, 70 mm. long. The sacrum has a length of

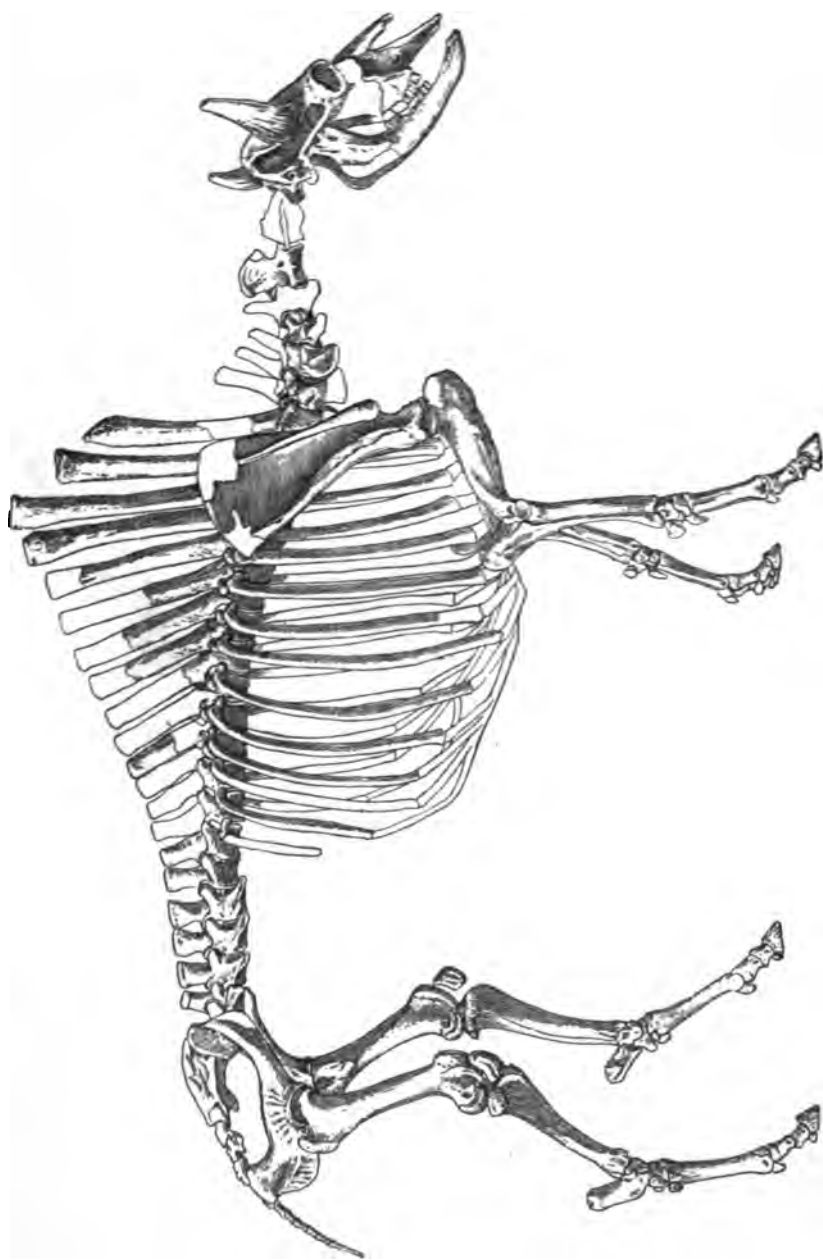


FIG. 6.—BISON OCCIDENTALIS. SKELETON AT KANSAS UNIVERSITY.

280 mm. The following additional measurements are given, and for comparison the corresponding ones of a mounted American bison in the U. S. National Museum, No. 12456.

Measurements of the scapula, pelvis, and limb bones.

Dimensions taken.	<i>Bison occidentalis.</i>	<i>B. bison.</i>
Scapula:	mm.	mm.
Length.....	575	490
Width of upper end.....	300	300
Humerus:		
Total length.....	396	315
Length from head to distal end, inner side.....	365	305
Fore-and-aft diameter of middle of shaft.....	65	73
Width of articular surface at lower end.....	107	110
Ulna, total length, in a straight line.....	470	435
Radius:		
Total length.....	345	335
Transverse diameter of middle of shaft.....	58	57
Transverse diameter of lower end.....	102	93
Anterior cannon bone:		
Length.....	210	208
Transverse diameter at lower end.....	88	83
Pelvis:		
From anterior end to middle of acetabulum.....	330±	295
From middle of acetabulum to rear of ischium.....	282±	280
Distance from lower border of one acetabulum to that of the other.....	220	212
Femur:		
Total length.....	523	440
Length from head to lower border of inner condyle.....	457	400
Transverse diameter at middle of shaft.....	60	53
Distance from inner surface of head to outer surface of greater trochanter.....	175	160
Tibia:		
Total length.....	426	412
Width of lower end.....	87	82
Calcaneum, total length.....	170	162
Hinder cannon bone:		
Total length.....	260	255
Transverse diameter at middle of length.....	40	40

It will be seen that, as compared with the mounted American bison, the Kansas specimen has all the limb bones longer, but not greatly longer. The length of the hind leg from the femur down, in the Kansas specimen, is 930 mm.; in the mounted American bison, 860 mm. Most of the measurements of the skull indicate a somewhat larger animal than the specimen in the American Museum of Natural History, No. 13731. The horn-cores are, however, considerably shorter than in the latter specimen. One of the most remarkable features of this specimen is the narrowness of that part of the face in front of the orbits. In this respect it is wholly different from the American Museum specimen and from one figured by Quackenbush¹ here reproduced (pl. 10, fig. 3, c), and from all other known specimens from Alaska or elsewhere. One might readily suppose that such a difference would indicate a distinct species. However, in Lydeker's Wild Oxen, Sheep, and Goats, there is a view of the skull of a bull and one of a cow of the European bison; and in the bull the face is narrowed as it is in the Kansas specimen. For the present, therefore, it seems best not to remove this specimen from *B. occidentalis*.

¹ Bull. Amer. Mus. Nat. Hist., vol. 26, pl. 17.

In the United States National Museum are two specimens which the writer refers to this species. They have the catalogue numbers 5514 and 2643. Each consists of the hinder part of the skull, together with the horn-cores.

No. 5514 (pl. 11, figs. 1, 2) was found on the Tanana River, about 20 miles above its mouth, by Mr. Charles Sheldon, by whom it was presented to the United States National Museum through Mr. W. H. Osgood. The measurements are to be found in the third column on page 168.

No. 2643 of the United States National Museum (pl. 11, figs. 3, 4) was obtained on the Old Crow River, in Yukon Territory, by A. G. Maddren, of the United States Geological Survey. It consists of the rear of the skull bearing the complete horn-cores. A figure showing the skull and horn-cores from behind was published by Mr. C. W. Gilmore.¹ The measurements are presented in the fourth column on page 168. The horn-cores are more strongly grooved than in most specimens. Both of the specimens just mentioned have likewise the horn-cores more flattened than most other individuals.

In the Field Museum of Natural History, Chicago, there is part of a skull with both horn-cores, the one of the right side lacking the tip (pl. 12, figs. 1, 2). The cranium is preserved to the fronto-nasal suture. The specimen is labeled as having come from Point Barrow and was purchased in 1902 from the University of Pennsylvania. The figures show the directions taken by the horns. The forehead is nearly flat.

The following measurements were taken by the writer:

Measurements of No. 6832, Field Museum Natural History.

	mm.
Width at the rear of the orbits.....	330
Width between the orbits and bases of horn-cores.....	290
Width between bases of the horn-cores.....	310
Extent from tip to tip of horn-cores (estimated).....	860
Distance between the hinder ends of the temporal fossæ.....	193

In the American Museum of Natural History there is part of a skull (pl. 12, figs. 3, 4) which presents the face as far forward as the fronto-nasal suture and both horn-cores, of which the left one is imperfect and the right one lacks a small part. The exact locality is unknown, but it is said to have been found somewhere in the valley of the Ohio River. This skull has furnished the following measurements:

¹ *Smiths. Misc. Coll.*, vol. 51, pl. 12.

Measurements of skull in American Museum Natural History.

	mm.
Distance from middle of occipital crest to fronto-nasal suture.....	266
Distance between bases of horn-cores.....	290
Width of constriction between orbits and bases of horn-cores.....	277
Width at the rear of the orbits.....	325
Distance between hinder ends of temporal fossae.....	170
Width at ear-openings.....	300
Height of occipital crest above lower lip of foramen magnum.....	150
Height of occipital crest above upper lip of foramen magnum.....	110
Length of horn-core on upper curve.....	325±
Length of horn-core on lower curve.....	375±
Diameter of base of horn-core fore and aft.....	115
Diameter of base of horn-core vertically.....	105
Circumference of base of horn-core.....	335
Distance between tips of horn-cores (estimated).....	340±

In the Pleistocene deposits of Alaska there have been found a number of specimens of this species whose horn-sheaths have been preserved. The substance which composes these horn-sheaths is subject to only slow decay and may, even in the climate of our northern States, when protected from weathering influences, resist destruction for ages. In the cabinet of Syracuse University there is the skull of a bison which was dug up about 1890 or previously, at a depth of 10 feet in a black muck, and which must have lain there many years. On the horn-cores of this skull there remain yet the horn-sheaths in a good state of preservation. The animal belonged to the existing species.

If in our climate the horns may endure so long, it is not astonishing that they should have been preserved since even early Pleistocene times in soils that have remained probably continuously frozen.

One of these specimens on which the horns yet remain has been illustrated by L. S. Quackenbush on plate 17, figs. 1, 2, numeral 2, of the paper which has already been quoted. This figure is here reproduced (pl. 10, fig. 3, c). The skull referred to is the one on the right side. It was found at the same locality as the skull above described and figured (pl. 10, figs. 1, 2, 3, a). The specimen which retains the horns probably remains at Fox Gulch, which place is not far from Dawson, Yukon Territory. No description of it has been published. The figure shows well the size and form of the horns. Were the sheaths removed the cores would probably have approximately the length and curvature of the specimen shown on the left side of figure 3.

Figure 1 of plate 13 represents another partial skull retaining the horns, which was seen by C. W. Gilmore, in a laundry, in Dawson, Yukon. No measurements were taken.

In the United States National Museum there is still another skull which it appears to be necessary to refer to *B. occidentalis*. This has

the catalogue number 5513, and was found 12 miles above the mouth of Pelly River, Yukon Territory. The finder was Charles Sheldon, who in 1905 presented the skull to the United States National Museum, through W. H. Osgood. It lacks the lower jaws, the maxillæ, premaxillæ, and the nasals. It is remarkable on account of the shortness of the horn-cores. The following measurements have been taken:

Measurements of No. 5513, United States National Museum.

	mm.
Distance from lower lip of foramen magnum to fronto-nasal suture.....	270
Width at mastoid region.....	290
Width at hinder ends of temporal fossæ.....	194
Width at constriction between orbits and horn-cores.....	288
Width at rear of orbits.....	355
Height of occipital crest above lower lip of foramen magnum.....	150
Width between bases of horn-cores.....	290
Diameter of base of horn-cores, fore and aft.....	102
Diameter of base of horn-cores, vertical.....	93
Length of horn-core on upper curve.....	220
Length of horn-core on lower curve.....	295
Circumference of horn-core at base.....	280
Distance between tips of horn-cores.....	650
Distance from occipital protuberance to middle of line joining rear of orbits....	215
Distance between base of horn-core at the tip.....	208

It will be seen that the dimensions of the horn-cores are greatly like those of *B. bison*. In this respect the specimen resembles that figured by Allen on plate 4 of his work already cited. Both these skulls differ, however, from those of *B. bison* in having the bases of the horn-cores pass outward from the skull without drooping, as they do probably always in the species last mentioned. Such skulls might be looked upon as illustrating the transition from *B. occidentalis* to the existing American buffalo.

A few words may be said regarding the specimen, consisting of the horn-cores and the rear of the skull, more or less damaged, but appearing in front to come forward to the notch for the nasals, which was described by Sir John Richardson¹ as doubtfully *Bison priscus*. Lucas² regarded this skull as specifically identical with the type of *B. crassicornis*. There is in the United States National Museum a cast of this skull and there is here presented (pl. 13, figs. 2, 3) figures showing it from above and from the rear. It will be seen that the horn-cores are not as long as in other specimens of *B. crassicornis*, and that they do not sag as much. The measurements show that the individual must have had nearly or wholly the adult size. It appears more probable that the skull is that of *B. occidentalis*. The horn-cores are less curved than is most specimens of this species, but its index of curvature is not the lowest one (p. 178).

¹ Zool. Voyage Herald, p. 24, pl. 7, fig. 1.

² Proc. U. S. Nat. Mus., vol. 21, p. 761.

Richardson has recorded various measurements some of which are here given, reduced to millimeters. These do not always agree exactly with those obtained by the writer from the cast.

Measurements of skull found at Kotzebue Sound.

Dimensions taken.	Richardson.	Hay.
From middle of occipital crest to rear of nasals.....	mm.	mm.
From lower border of foramen magnum to rear of nasals, basinasal length.....		235
Height of occipital crest from lower border of foramen magnum.....	157	255
Height of occipital crest from upper border of foramen magnum.....		145
Width between bases of horn-cores.....	305	110
Width between hinder ends of temporal fossae.....		305
Width at constriction between orbits and bases of horn-cores.....		185
Diameter of base of horn-core, fore-and-aft.....	94	273
Diameter of base of horn-core, vertical.....	76	97
Circumference of base of horn-cores.....		83
Length of horn-core on upper curve.....		290
Length of horn-core on lower curve.....		300
Distance between tips of horn-cores, in straight line.....	762	355
Tip of horn-core to upper border of base.....		800
		280

Hilzheimer, in his paper of 1909, described as a new species *Bison primitivus*, based on a part of a skull with complete horn-cores, which had been discovered on the Lena River. In his table of measurements this is called *B. sibiricus*, an error corrected by the author in his second paper. This skull furnished Hilzheimer the following measurements: Width at the ear-openings, 290 mm.; width at constriction between horns and orbits, 310; width at rear of orbits, 370; circumference of base of horn-core, 370; length of horn-core along lower curve, 465; distance from base of horn-core to tip, 340; distance between tips of horn-cores, 910. If now a comparison be made of these measurements with those of *Bison occidentalis*, on page 168, it will be seen that the skull measurements of *B. primitivus* differ not essentially. The length of the horn-cores is not as great as that of No. 13721 of the American Museum of Natural History. The index of horn-curvature, as this index is determined by Tscherski, as explained below, is 136.7, which falls within the curvature of *B. occidentalis* (p. 178). The ratio of the circumference of the base to the length of the horn-core is 79.5, which is likewise within the limits of *B. occidentalis*. The curvature and direction of the horn-cores suggest strongly some specimens of *B. occidentalis*, and it seems possible that *B. primitivus* represents a specimen of the latter with unusually long horns.

A comparison of Pallas's figure (here reproduced, pl. 8, fig. 3) of the skull described by him, as cited on page 161, with those of *B. occidentalis* suggests that possibly that skull belonged to the species just named. Tscherski¹ has compared this skull with those of several other Siberian bisons and has given various indices. In many re-

¹ Mém. Acad. Imp. Sci. St. Petersb., ser. 7, vol. 40, 1893, pp. 78-84.

spects it stands apart from all those with which it was compared. The horn-sheaths and horn-cores are shorter and more strongly curved. The index of curvature of the horn-sheaths is given as 275.5; that of the horn-cores, as 130.8. The latter index is not so small as in some specimens of *B. occidentalis*, as may be seen below. As shown by the second figure given by Pallas the horns of his specimen sag somewhat strongly as they pass outward, but this may be an individual variation.

We may indicate the curvature of the horn-cores of bisons as Tscherski has done in the case of the horn-sheaths and horn-cores. The shortest distance between the tip of the horn-core and the base, taken of course on the upper side, is made 100. The ratio of this to the length along the lower curve is then determined. In the case of the type of the species, No. 4157, U.S.N.M., this is 150; in the case of No. 5514, U.S.N.M., it is 140; in No. 2643, U.S.N.M., 142; in the American Museum specimen, it is about 122, according to estimates made from the photograph. Estimated from the figure published by Dr. J. A. Allen¹ a specimen from St. Michael, Alaska, presents an index of 125. The skull figured by Richardson and described here on page 176 has an index of 127. Here we have a pretty wide variation, a range probably as great as that found in horn-cores of specimens of *Bison bison*.

Reference has been made on page 162 to La Baume's paper on which he gives measurements of a number of skulls supposed to belong to *Bison priscus*. As bearing on the question of the relationship of *Bison occidentalis* to *B. priscus* the following statements may be made. We leave out of consideration La Baume's specimen from Marienburg, as being imperfect and probably not conspecific with the others. The shortest horn-core of five measured by La Baume measured 390 mm. along the upper curve and 470 mm. along the lower. The longest horn-core of the six specimens referred in the present paper to *B. occidentalis* measures 355 mm. along the upper curve, 420 mm. along the lower. With this shorter length there goes a stouter form. In the five skulls of La Baume's list in which may be determined the ratio of the length of the horn-cores along the lower curve, made equal to 100, to the circumference at the base, the ratios, or indices, vary from 57.5 to 71. In the six specimens of *B. occidentalis* here recorded, the ratios vary from 76 to 86. In the two specimens of *B. priscus* on which the measurement could be made, the distance from tip to tip of the horn-cores was respectively 1,010 and 1,050. In *B. occidentalis* the measurement varies from 700 mm. to 920 mm. It is evident therefore that the forms included under *B. priscus* have longer and slenderer horn-cores than do the individuals of *B. occidentalis*.

¹ American Bisons, pl. 4,

BISON CRASSICORNIS Richardson.

In his paper on The Fossil Bisons of North America, Lucas presented illustrations of three partial skulls of this species, all of which had been brought from Alaska. Since the publication of that paper a number of other specimens have come to light; and it is proposed to illustrate here some of these. Unfortunately up to this time, so far as the writer knows, nothing like a complete skull of the species has been discovered, or at least made known.

A fine specimen showing the rear of the skull and the horn-cores complete, except a very little at the extreme tip, is in the United States National Museum and has the catalogue number 5726. Mr. Gilmore in his paper previously referred to, on plate 10, published a figure showing a rear view of the skull. This figure is here reproduced, and another is furnished which gives a view from above (pl. 14, figs. 1, 2); that is with the face directed toward the observer.

The following measurements have been taken, as shown in the first column. Measurements of other skulls are presented in the second, third, and fourth columns. In the fifth column are measurements of a skull of a bison found in the basin of the Jana River, in Siberia, and described further on page 181.

Measurements of skulls.

Dimensions taken.	No. 5726, U.S.N.M.	No. 1584, U.S.N.M.	No. 5727, U.S.N.M.	No. 6834, Field Mus.	" <i>B. pris-</i> <i>cus</i> ," Jana River.
	mm.	mm.	mm.	mm.	mm.
Length from middle of occipital crest to rear of nasals.	280			337±	318
Distance from upper lip of foramen magnum to middle of occipital crest.....	111	110	105		
Distance between bases of horn-cores.....	345	366±	362	380	328
Width of skull at auditory openings.....	284	290±	290	330	318
Width of skull at hinder end of temporal fossæ.....	200	180±	183	187	206
Width of skull between bases of horn-cores and orbits.....	282	350±	315	360	321
Width of skull at rear of orbits.....	352	350±		400	379
Diameter of base of horn-cores, fore-and-aft.....	122	132	127	130	139
Diameter of base of horn-cores, vertical.....	120	108	111	97	124
Circumference of horn-cores at base.....	367	343	380	350	461
Length of horn-cores on upper curve.....	450±	455±	505±	490	557
Length of horn-cores on lower curve.....	535±	600±	570±	530	630±
Distance between tips of horn-cores.....	1,200±	1,120	1,270±	1,140	1,450±
Distance from middle of occipital crest to middle of line joining the rear of the orbits.....	230				

In No. 5726 the distance from the front of the foramen magnum to the suture between the frontal and the nasals, the basinasal distance, is 266 mm. It has not been obtained in the other specimens.

A view of the illustrations given here shows that this species had horns considerably longer than those of any of the species already described in this paper. The horn-cores are directed, at the base outward, slightly backward and downward, then they rise only slightly. Beyond the bases they sag so much that the lower borders are on a level with the foramen magnum; and they rise at the tips

not much above the level of the forehead. If, after the manner of Tscherski, we make the distance from the base of the horn-core to its tip equal to 100, the length along the lower curve will be found equal to 125, in both No. 5726 and No. 1584, U.S.N.M. This index is to be compared with that of the other species; but the actual length of the horn-core is likewise to be taken into consideration.

The specimen of *B. crassicornis* which was figured by Lucas (pl. 74), No. 1584, United States National Museum, was found, according to the record, by J. Henry Turner somewhere on either the Yukon River or the Kotlo River (Birch Creek), Alaska. It presents only the left side of the rear of the skull and the left horn-core, the tip of the latter being broken off. In the second column, on page 179, is found such measurements as can be obtained. Those with the sign \pm are estimated, but are not far from the correct figures. The diameters of the horns are not those given by Lucas, as that writer has apparently erred, an unusual thing in his case. The horn-cores of this specimen are flattened on the upper face much more than in the other specimens.

No. 5727 of the United States National Museum was found on Little Minook Creek, about 6 miles southeast from Rampart, Alaska. It was presented by Messrs. Bowen and Coole, miners on claim 21, through C. W. Gilmore. It was found at a depth of 21 feet from the surface, lying in the gravel, which itself lies on the bedrock. The gravel is overlain by what is there called muck. This, like the other specimens hitherto secured, presents only the rear of the skull, not reaching the orbits, together with the horn-cores. These last, however, lack a few inches at the tip. The measurements appear in the third column on page 179.

In the Field Museum of Natural History there is a pair of fine horn-cores joined to the rear of the skull (pl. 14, figs. 3, 4). The forehead extends anteriorly to the fronto-nasal suture. The specimen has the number 6834 and is labeled as having been secured at Point Barrow, Alaska. It is one of three bison skulls which were formerly in the University of Pennsylvania. The writer was kindly permitted to take notes and photographs of the specimen. The measurements appear in the fourth column on page 179. It will be observed that in most of the measurements this skull is the largest on the list. In the case of the distance between the hinder ends of the temporal fossæ this is short. This dimension seems, however, to be extremely variable. It will be noted that the horn-cores are more flattened at their base than any other specimen measured, although but little more than in No. 1584 of the United States National Museum.

Figure 5 of plate 14 represents a view of a partial skull which is in the Memorial Museum, at Golden Gate Park, San Francisco. It was

obtained at "26 claims below Carmack's," a few miles southeast of Dawson, Yukon Territory. The great value of this specimen lies in the fact that the horn-sheaths are yet preserved. The photograph from which the figure was engraved was kindly sent to the writer by W. G. Blunt, of the Memorial Museum. This gentleman informs me that the distance between the horns is 14 inches (350 mm.); the circumference of the horns at the base, $16\frac{1}{2}$ inches (414 mm.); the extent from tip to tip, 5 feet $5\frac{1}{2}$ inches (1,665 mm.).

This species, with its long, heavy, sagging horns, appears to be very distinct from any other mentioned in this paper. That the skulls here figured belong to the same species as those recorded under *B. antiquus* and *B. occidentalis*, the writer does not for a moment concede.

It seems to the author that F. A. Lucas was right when he identified Richardson's type of *B. crassicornis* with No. 1584 of the United States Museum and concluded that it was a species distinct from Leidy's *B. antiquus*.

Tscherski described¹ under the name *Bison priscus* various remains which had been discovered, some in the basin of the Jana River, some on Liakhof Island, some at the delta of the Lena. He figured one skull which had been found in the basin of the Jana River and which lacked some of the bones of the muzzle, but which still retained the horn-sheaths. Tscherski's figures are here reproduced (pl. 15, figs. 1, 2) on a somewhat smaller scale than the originals. A comparison of these illustrations with those here presented of Alaskan specimens seems to make it highly probable that the Siberian skull belonged to *Bison crassicornis*. In the fifth column, on page 179, are measurements which are in part those given by Tscherski, in part are determined from his data or from the illustrations. It is evident that the animal was a larger one than either of the others whose measurements are here given except No. 6834 of the Field Museum of Natural History, Chicago; and the horn-cores are apparently longer than even in this. Nevertheless, the space between the horn-cores is less than in the others. The dimensions of the bases of the horn-cores are those given by Tscherski for the bases of the horn-sheaths, but there can be little difference. The length of the horn-cores on the upper border has been taken from the Russian author's statements, on his page 85; the lower curve is estimated from his figure and indices. According to Tscherski's computations the length of the horn-core is to that of the horn-sheath as 100 to 144.3. The author just named gives as the index of the curvature of the horn-sheath 178.9. This figure is obtained by measuring the chord, the shortest distance between the upper border of the base of the horn and its tip, regarding this as 100 and comparing it with the

¹ Mém. Acad. Imp. Sci. St. Petersb., ser. 7, vol. 40, pp. 75-152.

length of the horn on the outer curve. In like manner we may obtain the index of the curvature of the horn-core. As determined by Tscherski, this is 119.4; in No. 1584, U.S.N.M., the index is about 125; in No. 5726 it is 125, as has already been stated.

If the width of the forehead is regarded as 100 the length of the forehead from the occipital crest to the rear of the nasals will be in Tscherski's Jana skull 83.9, while in No. 5726 of the United States National Museum it will be 79.

BISON ALLENI Marsh.

The type of this species is a horn-core which was found in the Blue River near Manhattan, Kansas, and which is preserved in the collection of Yale University. The writer has studied the original specimen and has taken measurements from it. He has also made use of a cast of the specimen now in the United States National Museum in making comparisons with other specimens. The measurements of the original are given in the second column of the following table. The writer's own measurements differed but little from those made by Lucas. There is a partial skull of the same species in the collection of Stanford University, California; and this has been figured by Lucas in the paper already cited (pls. 79 and 80). Lucas's measurements appear below in the third column.

In his paper already referred to, Gilmore published (pl. 11) a figure of a pair of horns joined by the rear of the skull. This is No. 2383, United States National Museum, and was discovered on Little Minook Creek, a few miles southeast of Rampart, Alaska. It was afterwards used to adorn the roof of a miner's cabin, and thus attracted the attention of Gen. Timothy E. Wilcox, of the United State Army, who secured it for the United States National Museum. This specimen is of especial value because of the presence of the sheaths of the horns. These are somewhat decayed away at the base and somewhat weathered and splintered elsewhere; but the specimen is extremely valuable, and adds greatly to our knowledge of the species. The measurements appear in the fourth column. Gilmore's illustration is reproduced for comparison with other specimens (pl. 15, fig. 3). In the first column are given the measurements of another skull which will be here especially considered, No. 7706, United States National Museum.

Measurements of skulls of *Bison alleni*.

Dimensions taken.	No. 7706, U.S.N.M.	Type- specimen.	Specimen in Stanford University.	No. 2383, U.S.N.M.
	mm.	mm.	mm.	mm.
Length from rear of condyles to front of premaxillæ.....	606			
Length from front of foramen magnum to front of premaxillæ.....	560			
Length from occipital crest to front of premaxillæ.....	630			
Length from occipital crest to rear of nasals.....	287			
Length from occipital crest to front of nasals.....	512			
Length from occipital crest to line joining rear of orbits.....	282			224
Length from front of premaxillæ to line joining rear of orbits.....	404			
Length from front of foramen magnum to rear of hard palate.....	230			
Length from front of foramen magnum to line joining rear of hinder molars.....	240			
Length from lower border of foramen magnum to rear of nasals, basibasal length.....	295			
Height of occipital crest from lower border of foramen magnum.....	152			163
Height of occipital crest from upper border of foramen magnum.....	111			126
Greatest width at ear openings.....	282			
Width of foramen magnum.....	46			50
Width of rear of skull at occipitotemporal sutures.....	242			215
Width at hinder ends of temporal fossæ.....	190			157
Width between bases of horn-cores.....	310			265
Width between bases of horn-cores and orbits.....	286			271
Width at articulations of lower jaws.....	253			225
Width at rear of orbits.....	333			330
Width at front of orbits.....	268			
Width on maxillary ridge at maxillomalar suture.....	212			
Width from outside to outside of nasals, straight.....	103			
Diameter of orbit, fore-and-aft.....	78			
Diameter of orbit, vertical.....	75			
Level of palate below occipital condyles.....	7			
Height of skull from palate to rear of nasals.....	185			
Diameter of base of horn-cores, fore-and-aft.....	97	140	160	111
Diameter of base of horn-cores, vertical.....	93	115	120	106
Circumference of base of horn-cores.....	340	415	490	343
Length of horn-core on upper curve.....	430	620	635	
Length of horn-core on lower curve.....	505	770	710	
Length of horn on upper curve.....	600			720
Length of horn on lower curve.....	757			805
Extreme distance between outer border of the two horns.....	980			1,150
Distance between tips of horn-sheaths.....	635			765
Distance between tips of horn cores.....	900		1,338	1,100±
Distance from upper border of base of horn core to tip.....	425			465

By far the most complete skull of a fossil bison yet found in North America is one which is here identified as *B. alleni* and which was discovered during mining operations on Hunter Creek just below the mouth of Dawson Creek and about 6 miles southeast of Rampart, Alaska. It was found on the top of gravel beneath 20 feet of silt. James Nelson, the finder, appreciating the scientific value of such a rare specimen, carefully exhumed it and shipped it to Henry M. Eakin, of the United States Geological Survey. From him it was purchased by the writer, and it is now deposited in the United States National Museum under the number 7706. The specimen consists of the skull nearly complete, including the lower jaws and five cervical vertebræ (pls. 16, 17). From the skull are missing most of the right malar bone, a part of the right zygomatic process of the squamosal, the ethmoid bones and vomer, the left coronoid process of the lower jaw, all the upper premolar teeth, the lower incisors and

the anterior two right lower premolars. The horn-sheaths are represented by the distal half or more of each, but the basal portion had decayed before exhumation. The bone is in a fine state of preservation, apparently mineralized, and not adhering when the tongue is applied to it. The surface is irregularly stained and mottled with light and dark brown. The lachrymals and the edges of the adjoining bones, the anterior faces of the pedicels of the horn-cores and some streaks across the forehead are of a light buff color. While the animal was mature, it was not aged. The suture between the frontal bones is still open to within about 40 mm. of the coronal suture; while the latter may be said to be just beginning to close. The teeth are well preserved and in fine condition for study. A comparison of the diameters of the horn-core and the length shows that the animal lacked considerable of being as large as either the type specimen or the one represented by the skull now

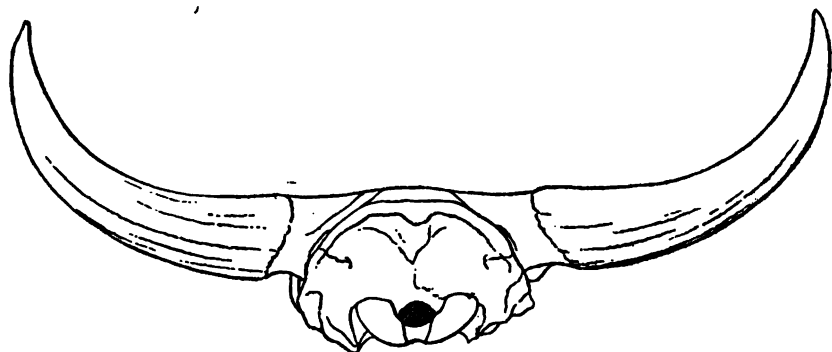


FIG. 7.—BISON ALLENI. SKULL IN UNITED STATES NATIONAL MUSEUM, No. 7706. VIEW FROM THE REAR.

in Stanford University, California.¹ That the specimen belonged to *B. alleni* seems evident from the rather long, slender, and uniformly curved horn-cores (fig. 7). They are much different from those of any of the species already mentioned in this paper. As will be seen from the illustrations, the horns are directed outward, upward, somewhat backward, and at length strongly inward. Toward the points they are thrown backward more than in No. 2383 of the United States National Museum. Such differences must be regarded as probably due to individual or sexual variation. On account of the weathering to which the skull was probably subjected before burial, the materials of the horn-sheaths is considerably loosened up and splintered. The color of this is mostly gray, but toward the tips the horns are much darker. These tips were originally probably nearly black for a distance of a hundred millimeters or more. On taking a full-face view of the skull (pl. 16, fig. 1) it will be seen that

¹ Lucas, Proc. U. S. Nat. Mus., vol. 21, p. 766, pls. 79 and 80.

it is narrower as compared with that of the American Museum specimen of *B. occidentalis* (pl. 10, fig. 1) and with that of the same museum's specimen here described as *Bison regius* (p. 192, pl. 18, fig. 1).

Seen in profile there is a prominence just in front of the occipital crest. The forehead is somewhat swollen behind the line joining the rear of the orbits. The nasals, where they join, are only slightly convex, fore and aft. Between the orbits the face is nearly flat. From the hinder edge of the hard palate to the fronto-nasal suture, in the midline, is 182 mm., close to one-third of the basilar length. The region occupying the front of the lachrymal and adjacent border of the maxilla is more depressed than in *Bison bison*. The lachrymal extends forward relatively farther than in *Bison bison*, its extremity being halfway between the anterior process of the frontal and the hinder end of the premaxilla. While being considerably longer than the same bone in *Bison bison* (138 mm. as compared with 110), the width is almost exactly the same (51 mm.). The ascending processes of the premaxillæ are more strongly concave on their upper border than in *B. bison*, and they approach nearer the nasals. The width of the foramen magnum, near its upper border, is 43 mm.; at the same place in *B. bison* the width is 50 mm. The vertical diameter is the same in the two specimens compared.

As might be expected, the lower jaw does not differ apparently from that of *B. bison*, except in its slightly greater size. From the incisive border to the angle it measures 457 mm.; from the lower border, just in front of the angle, to the summit of the articular surface, is 190; to the summit of the coronoid process, is 240. The height of the bone, at the rear of the last molar, is 78; at the front of the first true molar, 65; at the rear of the first premolar present (pm.), 52; at the middle of the diastema, 43. At the last point named the bone is 20 thick, slightly less than in the specimen of *B. bison* at hand.

On a comparison of the complete skull here described with the rear of the skull with the horns, No. 2383, U.S.N.M. (pl. 15, fig. 3), it is seen at once that the horns of the latter were larger at the base and considerably longer. If, in each case, we divide the distance of the tip from the base, taken in a straight line, into the length along the lower curve and multiply this by 100, we obtain, in No. 2383, the index about 130; in No. 7706, the index 128.2.

While there is this greater size of horns in No. 2383, the skull in nearly all of its measurements is smaller, being greater only in the height of the occipital crest and in the size of the foramen magnum. Inasmuch as the sheaths of the horns of No. 2383 can not be detached, the length of the horn-cores has been determined only approximately. Figure 7 presents a view of the horn-cores of No. 7706, as seen from behind.

The upper premolars of No. 7706 are missing, but the molars (fig. 8) are present and in excellent condition. The lower incisors are gone, as well as the anterior two premolars of the right side. The other premolars and molars are present (fig. 9). The following measurements have been taken, as shown in the first column of the table. In the second column are given the measurements of the teeth of the existing American bison. The upper molars are those of No. 22374, U.S.N.M., in which the premolars are missing, as they are in the fossil. The measurements of the lower teeth are from No. 38302, U.S.N.M. Both of these specimens were of approximately the same



FIG. 8.—BISON ALLENI. LEFT UPPER MOLARS OF No. 7706, UNITED STATES NATIONAL MUSEUM. M.³ AT RIGHT. $\times \frac{1}{2}$.

age as was the specimen of *B. alleni*. It must be understood that the length of the tooth as here given is that of the grinding surface from front to rear, and that this diminishes as the tooth is worn. The width is taken at the base of the crown, and this width is indicated by the outermost line in the illustrations. The double lines indicate the arrangement of the enamel on the worn surface of the tooth. As the tooth is worn down the bands of enamel, other than those surrounding the lakes, approach nearer and nearer the narrow outer lines.

Measurements of teeth.

Teeth measured.	<i>B. alleni.</i>	<i>B. bison.</i>
	mm.	mm.
Length of the upper premolar-molar series.....	170±	148
Length of the upper premolar series (estimated from the sockets).....	72±	62±
Length of the upper molar series.....	104	93
M. ¹ , length.....	30	26
width.....	27	27
M. ² , length.....	37	34
width.....	28	28.5
M. ³ , length.....	37	34.5
width.....	27	28
Length of the lower premolar-molar series.....	175	152
Length of the lower premolar series.....	60	65
Length of the lower molar series.....	112	97
Pm. ³ , length.....	15	13
width.....	9	9
Pm. ⁴ , length.....	22	19
width.....	12	11
Pm. ⁴ , length.....	25	22
width.....	15	13.5
M. ⁴ , length.....	30	25
width.....	20	16
M. ⁵ , length.....	35	32
width.....	21	18
M. ⁶ , length.....	45	41.5
width.....	21	16

A comparison of the teeth of *B. alleni*, as represented in the skull here described, shows that they do not differ in structure essentially from those of *Bison bison*. They are, however, considerably larger than those of most specimens of the latter, but the hinder lower molar is hardly larger than that of No. 172689, U.S.N.M., from northern Alberta.

Figure 8 represents the true molars of the left side of the upper jaw. In m.¹ the internal column between the two lobes had been worn down to where it joined the enamel surrounding the crown; in m.² this point had not yet been reached; in m.³ the summit of the column had just begun to wear. The enamel surrounding the cement lakes has a very simple structure and this will enable us to distinguish these teeth usually from those of *B. regius*, the next species to be described. So far as the writer can now judge, the teeth of *B. alleni* may usually be distinguished from those of *B. bison* by their greater size. Figure 9 gives a view of the lower teeth of the left side.

It may be profitable to determine certain indices for the purpose of showing the proportions of the skulls of bisons, as Osborn has proposed¹ for the horses. To obtain the cephalic index, the width at the rear of the orbits, multiplied by 100, is divided by the basilar length. The facio-cephalic index is obtained by dividing the distance from the front of the premaxillæ to the middle of a line joining the rear of the orbits, multiplied by 100, by the basilar length. The cranio-cephalic index is determined by dividing the cranial length² (distance from the middle of the occipital crest to the middle of the straight line joining the rear of the orbits, multiplied by 100) by the basilar length. In the case of the skull of No. 7706, here described the following results are secured: Cephalic index, 59.4; facio-cephalic index, 72.1; cranio-cephalic index, 41.4.

The atlas.—This bone (pl. 17, fig. 2) is wholly uninjured, except that a little of it has been broken off at the right hinder angle and a very little from the hinder border of the left hinder angle. Among the atlases described by Richardson, by Tscherski, by Dr. J. A. Allen, and Mr. A. Stewart are some which have practically the same size as that of the Alaskan bison here described; but the proportions are in some cases different.



FIG. 9.—BISON ALLENI. LEFT-LOWER PREMOLARS AND MOLARS OF No. 7706, UNITED STATES NATIONAL MUSEUM. $\times 4$.

¹ Mem. Amer. Mus. Nat. Hist., n. s., vol. 1, p. 57.

² In order to determine easily the cranial length it is necessary only to find mechanically the perpendicular of a right-angled triangle whose base is one-half of the distance between the rear of the orbits and whose hypotenuse is the distance from the occipital protuberance to the rear of an orbit. Similarly may be determined the facial length.

Measurements of skulls.

Dimensions taken.	No. 7706, U.S.N.M.	" <i>B. pris-</i> <i>cus</i> " from Jana River.	<i>B. lat-</i> <i>frons</i> (?), Darlen, Ga.	<i>B. occiden-</i> <i>talis</i> , Kansas University.
	mm.	mm.	mm.	mm.
Length of centrum on the median line below	56	61	59	60
Length of neural arch in median line	66	64		
Width of anterior articular surface	135	142	133	139
Height of anterior articular surface in median plane	58		70	68
Width of notch in front of centrum	66			
Width of hinder articular surface	138	144	136	128
Width of bone on line through hinder borders of the arterial foramina	235	224		
Greatest width of atlas	240		240	232
Height of bone when placed on its hinder angles	138			
Greatest height of hinder end	107		100	99
Distance from lower surface of hypophysis to top of arch	118			
Lateral diameter of spinal canal, front	50			
Lateral diameter of spinal canal, behind	65	59		
Vertical diameter of spinal canal, behind	60	56		

On comparing the atlas of No. 7706 with that of a specimen of *B. bison* certain differences are found, but it will require further comparisons in order to determine whether these differences are constant. When in the two atlases the distance from the outer end of the anterior articular surface to the outer end of the hinder articular surface is taken, it is found that in *B. bison* this is 48 per cent of the greatest width of the bone, while in *B. alleni* it is only 43 per cent. The notch in front of the neural arch is deeper than in the case of *B. bison*. The notch in front of the centrum is relatively and absolutely narrower in the fossil than in the living species. The inner borders of the foramina seen on the lower surface of the atlas have exactly the same distance between them in the atlas (greatest width 210 mm.) of the living bison as in the much wider atlas of *B. alleni*. In the latter, therefore, these foramina are much farther removed from the outer borders of the bone. In the American bison there is a much broader bar of bone running from the outer hinder angle of the wing to the hypophysis than in *B. alleni*. The atlas figured by Allen¹ seems in the latter respect to resemble more closely *B. bison*.

The axis.—This bone is completely preserved. The following are some of the dimensions. In the second column are the corresponding measurements from a mounted bison in the United States National Museum.

Measurements of axis.

Dimensions taken.	<i>B. alleni</i> .	<i>B. bison</i> .
	mm.	mm.
Length from front of odontoid process to lower border of hinder articular surface	138	140
Length from lower border of anterior articular surface to lower border of hinder articular surface	112	115
Width of anterior articular surface	133	127
Height of roof of spinal canal from lower border of anterior articular surface	90	80
Greatest height of bone near the hinder end	186	175
From outside to outside of lateral processes	160	140
From outside to outside of rear of pedicles	50	50
Greatest length of neural spine, fore and aft	108	112

¹ The American bison, pl. 2, figs. 1-4.

From the above comparative measurements it will be seen that in some of its dimensions the axis of *B. bison* is larger than that of *B. alleni*. At the same time the atlas of the same individual of *B. bison* has a width of only about 220 mm. A peculiar feature of this axis of *B. alleni* is that the foramina for the vertebral arteries are wanting. In the next vertebra behind, the canal on the left side has its normal size, while that on the right side is greatly reduced in size. Beyond the differences in proportions indicated in the measurements there are few distinguishing features which appear likely to be constant. It is noted that the centrum at the constriction in front of the transverse processes is relatively wider in *B. alleni* than in *B. bison*.

The third, fourth, and fifth cervicals.—These are present and in almost perfect condition. The extremities of the neural spines of the fourth and fifth are broken off. The following measurements are furnished:

Measurements of cervicals.

Dimensions taken.	Vertebra.		
	3	4	5
Length of centrum on floor of spinal canal.....	mm. 72	mm. 69	mm. 64
Width of anterior articular ball.....	44	45	42
Height of anterior articular ball.....	63	63	63
Width of hinder articular cup.....	56	55	55
Height of hinder articular cup.....	66	65	65
Distance from hypophysis to top of neural spine.....	182	185±	192±
Width across anterior zygapophyses.....	103	108	114
Width across posterior zygapophyses.....	98	104	112
From outside to outside of transverse processes.....	175	173	163
From outside to outside of anterior extremities of inferior transverse processes.....	80	120	144

In the United States National Museum are two horn-cores (Cat. No. 5318), the right and the left, which the writer identifies as those of *B. alleni*. These were collected in 1905, near Minidoka, Idaho, about 50 miles nearly east of Shoshone, by F. C. Horn, engineer in the United States Reclamation Service. They were reported by G. K. Gilbert to have been found beneath a flow of basalt. From the same collector and from the same locality there were sent some bones belonging to a large elephant, probably *Elephas columbi*, possibly *E. imperator*, a part of a lower jaw of an extinct horse, and some jaws and teeth and some other bones of what appears to have been *Camelops kansanus*. All of these bones give evidences of having been buried in a bed of gravel and sand, which adhere closely to them.

This discovery is an important one, inasmuch as it adds another to the very few instances in which undoubted remains of any bison have been found in this country associated with those of the camel, thus apparently establishing the presence of one or more species at

the time when the *Equus* beds were deposited. In 1913 L. H. Miller¹ announced the discovery of remains of *Bison*, *Equus*, and a camelid in the upper San Pedro Pleistocene, at San Pedro, California. Recently J. W. Gidley² reported that a phalange of a camel had been found associated with bones and teeth of *Elephas primigenius*, *Equus*, and *Bison*, on the Old Crow River, Yukon Territory. It is the understanding of the present writer that these bones and teeth were found in recent deposits along the river and at different points. While it is probable that they had been washed out of deposits of the same age it is not certain that they were. In 1871 E. D. Cope reported bones of *Bos* or *Bison* from Port Kennedy Cave, not far from Philadelphia. From the same cave there was later described the genus *Teleopternus*, which was supposed by Cope to belong among the camels, but about which there exist doubts.

The horn-cores here referred to are much damaged and present the appearance of having been broken from the skull by human hands; but of the skull no part is present. One horn-core seems to extend to the base, but this is not wholly certain. One presents 460 mm. of the distal end in an uninjured condition; the other presents about the same length, with only a little of the tip missing. Apparently the length of the better horn-core along the upper surface was 660 mm.; along the lower curve the length was not far from 750 mm. Owing to the parts missing at the base, it is not possible to determine the diameters at that point. At a distance of 500 mm. from the tip of the horn-core the fore-and-aft diameter is 120 mm.; the vertical diameter, 82. In the type the diameters at the same distance from the tip are, respectively, 130 mm. and 108 mm. It will be seen, therefore, that the cores of the Idaho specimen are slenderer and much more flattened. If we determine the index curvature as in other cases it is close to 125; in the type it is 136.5, the curvature here being greater. These indices agree closely with those of the specimens from Alaska.

The basal half of the cores is rather strongly and sharply ridged and grooved; the distal half has the ridges and grooves broader, but usually not so sharply defined. On the concave side of the distal half or more there is a deep channel which widens to the tip of the core. A similar groove is seen in the type and a less conspicuous one in the horn-cores of the Alaska skull.

These horn-cores are referred to *B. alleni* despite the much greater degree of flattening which they present. This flattening does not appear to be at all due to any post-mortem distortion.

Hilzheimer³ ventured to remove from *Bison priscus* a skull, well preserved and retaining the horn-sheaths, which had been found on

¹ Univ. California Pub. Geol., vol. 7, p. 115.

² Smiths. Misc. Coll., vol. 60, p. 1.

³ Sitz-Ber. Ges. Naturf. Freunde, Berlin, 1910, p. 144, figs. 8, 9.

the Vilni River, a tributary of the Lena, and which is now in the Berlin Geological Institute. It has been studied by both La Baume and Hilzheimer, and from their papers have been obtained the measurements here employed. A glance at Hilzheimer's illustrations suggests at once the close resemblance of the skull to the one from Hunter Creek, Alaska, here described. It is evident, however, that the face, in front of the orbits, was much narrower than in the Alaska skull; but this is the same difference which has been mentioned on page 173, in the discussion of *B. occidentalis*. The Siberian skull may, therefore, have belonged to a bull, the Alaskan to a cow. The following measurements of the two specimens are presented for comparison, and with them are given the same measurements compared with the basinasal length taken as 100.

Measurements, actual and reduced.

Dimensions taken.	Vilni River skull.		Hunter Creek skull.		Differences between reduced measurements.		
	Actual.	Reduced.	Actual.	Reduced.	Vilni River and Hunter Creek.	<i>Bison europæus</i> .	<i>Bos primigenius</i> .
	mm.	mm.	mm.	mm.	Per ct.	Per cent.	Per ct.
Basinasal length.....	265	100	300	100	0.0	0.0	0.0
Distance from occipital crest to nasals.....	284	99	287	95.6	3.4	5.6	16.8
Width between bases of horn-cores.....	374	131	310	103.3	27.7	14.0	21.6
Width at rear of orbits.....	267	128.7	333	111	17.7	12.2	16.8
Width at ear-openings.....	295	105.3	282	94	11.3	8.3	21.0
Circumference of base of horn-cores.....	340	.....	340	.....	.....	.....	.....
Length of horn along lower curve.....	710	.....	757	.....	.....	.....	.....

A comparison of the reduced measurements, found in the second and fourth columns, shows that the Siberian skull is considerably broader than the Alaskan, especially between the bases of the horn-cores; but likewise at the ear-openings and at the rear of the orbits. In order that the meaning of these differences may be, at least partly explained, the figures in the last three columns are presented. In the first of these three columns is given the difference between each reduced measurement in the Siberian skull and the corresponding one of the Alaskan.

The figures in the next two columns are derived from Tables 3 and 5 of La Baume's paper. In his Table 3 are presented the reduced measurements of 8 skulls of *Bison europæus* Owen (*B. bonasus*); in his Table 5 the reduced measurements of 17 skulls of *Bos primigenius*. The figures in the next to the last column of the table shown above have been obtained by taking the difference between the greatest and the least of the measurements of each kind in *Bison europæus*; those of the last column similarly from the reduced measurements of *Bos primigenius*. It will be seen that as regards the distance between the

occipital crest and the nasals, the difference is less between the Siberian and Alaskan skulls than in the other two species. Of course additional specimens of the Siberian and Alaskan forms would probably increase the difference. In the case of the width of the skull between the horn-cores, this is greater between the Siberian and the Alaskan skulls here compared than it is among all the other skulls; but the range in *Bos primigenius* is nearly as great. The great difference between the Vilni River skull and that from Hunter Creek may be indicative of a difference of species; future investigation must settle this. The differences found in the cases of the widths at the rear of the orbits and at the ear openings are not so great, and hence not so important perhaps. The figures in the last two columns show how variable are the skulls of the Bovidæ. It is to be noted likewise that the range of variation among the skulls of the extinct *Bos primigenius* is much greater than in the case of the existing European bison.

In case it shall result that Hilzheimer's *Bison europæus lenensis* is specifically the same as *Bison alleni*, the former name must be regarded as a synonym of the latter, this having been established in 1877.

BISON LATIFRONS, Ledy.

This species is treated incidentally under the succeeding one.

BISON REGIUS, new species.

Diagnosis.—A species related to *B. latifrons*, but having the horn-cores relatively longer, slenderer, and more strongly curved. Teeth with the enamel of the "lakes" furnished with reentering folds.

In the American Museum of Natural History there is a fine skull of a fossil bison which bears both horn-cores. This skull the writer has been permitted to study and describe; and likewise he has been furnished with the photographs from which have been prepared the figures here shown (pl. 18, figs. 1, 2). These present admirably the form and proportions of the skull and the characters of the horn-cores.

This very interesting specimen was found in the vicinity of Hoxie, Sheridan County, Kansas, in 1902, by Frank Lee and Harley Henderson. It was sold by them to Charles H. Sternberg and transferred by him to the American Museum of Natural History. This accession to the Museum was reported by Dr. W. D. Matthew¹ under the name *Bison latifrons*. An account of the discovery is given by Mr. Sternberg in his *The Life of a Fossil Hunter*, page 267, and the skull is illustrated by a figure. From this source are learned the circumstances connected with the discovery of the skull. The Missouri Pacific Railway Co. had shortened a creek by making a cut across a bend in it, and in doing so had come within about 2 feet of the skull. During a

¹ Science, vol. 29, 1909, p. 198.

subsequent freshet the skull was exposed; and shortly afterwards it was secured by Messrs. Lee and Henderson. This specimen was buried at a depth of 35 feet from the surface of the ground, but no account is given regarding the character of the deposit containing it.

The catalogue number of the specimen is 14346. The lower jaws were not secured. The nasal bones are missing, as well as the palatal processes of the premaxillæ. The base of the skull is damaged somewhat. The three molars of the right side are present and give important evidence regarding the relationships of the animal. The writer was at first strongly inclined to regard this skull as having belonged to the female of *Bison latifrons*; especially through the examination of the figures of skulls of the existing North American bison which are shown in J. A. Allen's work.¹ It is there seen that the females of this species have, often at least, horn-cores slenderer and more strongly curved than those of the males. If the horn-cores of the two sexes of *B. latifrons* varied in the same way, the fine pair in Cincinnati might be regarded as those of a bull; while the skull here described might be looked on as that of a cow. However, certain characters found in the teeth have convinced the writer that it is much more probable that the Hoxie specimen represents a distinct species.

Our knowledge regarding the great thickness and wide expanse of the horn-cores of *B. latifrons* rests principally on the fine pair, connected by the intervening part of the skull, which were found many years ago in Adams County, Ohio, and which are now in the collection of the Cincinnati Society of Natural History. These have been described and figured in various publications, especially by Lucas and Allen. The figures of the latter² are here reproduced (pl. 19) on a considerably smaller scale and joined so as to show their relative positions. Measurements have been presented by the writers just named, but these measurements differ somewhat in the two tables, and they differ from those taken by the writer on the cast of the cores in the United States National Museum. The three sets of measurements are here given:

Measurements of horn-cores of Bison latifrons.

Dimensions taken.	Allen.	Lucas.	Hay.
	mm.	mm.	mm.
Distance between the bases of the horn-cores	407	.....	332
Length of horn-core along upper curve	813	784	845
Length of horn-core along lower curve	853	840	910
Diameter at base of horn-core, fore-and-aft. ....	.....	166	167
Diameter at base of horn-core, vertical .....	.....	145	148
Circumference of horn-core at base	810	820	807
Distance between tips of horn-cores .....	.....	1,775	1,800

¹ The American Bisons, Living and Extinct, pls. 5-7.

² Idem, p. 7, pl. 1.

At my request, Prof. N. M. Fenneman, of the University of Cincinnati, has measured the longer horn-core and has found the length along the upper curve to be 828 mm.; along the lower curve, 880 mm. Apparently a slight damage at the base on the underside makes the starting point doubtful. Eight hundred and eighty millimeters may be regarded as correct. The writer finds that the distance from the upper part of the base of the horn-core to the tip, in a straight line, is 805 mm. This, divided into the length along the lower curve and multiplied by 100, gives as the index of curvature about 110. These measurements are to be compared with those of the skull here described as *Bison regius*.

Measurements of skull of type of Bison regius.

	mm.
Length of the skull from lower border of the foramen magnum to front of premaxillæ.....	580
Length of the skull from middle of occipital crest to front of premaxillæ.....	640
Length from middle of occipital crest to fronto-nasal suture.....	320 ±
Distance from middle of occipital crest to line joining rear of orbits.....	315
Distance from front of premaxillæ to line joining rear of orbits.....	425
Distance between bases of horn-cores.....	362
Width across rear of skull at ear openings.....	305
Height of occipital crest above lower lip of foramen magnum.....	165
Distance between hinder ends of temporal fossæ.....	200
Width of skull at rear of orbits.....	360
Width of skull at front of orbits.....	265
Width at constriction between horn-cores and orbits.....	342
Width in front of orbits on maxillo-malar suture.....	212
Width at middle of maxillo-premaxillary suture.....	125
Greatest distance, in a straight line, across nasals, as shown by space occupied by them.....	83
Diameter of orbit, fore-and-aft.....	72
Width across occipital condyles.....	140
Width of foramen magnum.....	50
Distance between the anterior premolars.....	110 ±
Distance between the hinder molars.....	135 ±
Length of horn-core on upper curve.....	910
Length of horn-core on lower curve.....	1,015
Diameter of base of horn-core, fore-and-aft.....	160
Diameter of base of horn-core, vertical.....	147
Circumference of base of horn-core.....	478
Distance between tips of horn-cores.....	1,725

When a ruler is laid along the hard palate and extended to the occipital condyles, it is found that the latter are about 58 mm. above the level of the palate. In this respect the specimen agrees with two skulls of the American bison at hand. In the specimen of *B. alleni* above described, from Hunter Creek, Alaska, the condyles fall slightly below the line of the palate.

The following measurements were taken on the teeth (fig. 10). The grinding surface of *m.*¹ stands at a height of about 22 mm. above the fork of the roots; the others at a height of nearly 40 mm. This shows that the teeth are only moderately worn. For comparison there are given in the second column the measurements of the same teeth of *Bison bison*, No. 22374, United States National Museum.

Measurements of teeth.

Teeth measured.	<i>B. regius.</i>	<i>B. bison.</i>
	mm.	mm.
Length of the molar series.....	111	93
<i>M.</i> ¹ , length.....	32	26
width.....	31	26.5
<i>M.</i> ² , length.....	39	33
width.....	32	28.5
<i>M.</i> ³ , length.....	40	34
width.....	30	28

If comparisons are made between the measurements and illustrations derived from remains of *B. latifrons* found in Ohio and the



FIG. 10.—BISON REGIUS. RIGHT UPPER MOLARS OF TYPE. *M*¹ AT LEFT. $\times \frac{1}{2}$.

corresponding measurements and illustrations depicting the type of *B. regius*, it will be seen that *B. latifrons* has the forehead wider by from 20 to 45 mm.; that the horn-cores are of slightly greater diameter, but are somewhat shorter, and that they are far less strongly curved. The writer admits that it is possible that these differences may be due to individual, racial, or sexual variation. In the last-named case the Ohio animal might represent the male; the Kansas specimen the female.

Unfortunately, so far as the writer is aware, no teeth have been found with any horn-cores which belong with certainty to *B. latifrons*. Leidy¹ described and figured five large molar teeth of a bison, which, from their size, he regarded as belonging to *B. latifrons*. They had been found near Natchez, Mississippi, in association with mastodon, horse, bear, deer, megalonyx, mylodon, and a large extinct cat. The measurements of these teeth are given as follows:

¹ Smiths. Contr. Knowl., vol. 5, p. 9, pl. 2, figs. 2-7.

Measurements of teeth of Bison latifrons.

Teeth.	Length.	Width.
	mm.	mm.
M. ¹	37.5	27.4
M. ²	37.5	27
M. ³	43.5	35.4

According to Leidy's figures, however, the second upper molar has a fore-and-aft extent of 39 or 40 mm., and the hinder molar an extent of 41 mm. The width of this last-mentioned tooth is that at the bottom, where greatest. The width of the other two seems to have been taken at the middle of the height of the tooth. Furthermore, it is not certain that Leidy had the first true molar; hence that measurement had better be disregarded. Otherwise, the two sets of teeth are of practically the same size.

Leidy stated that "the crescentic enamel pits or islands of the grinding surface are more simple than in the ox, and appear relatively more capacious as a result of their greater simplicity or less degree of inversion of the sides of the pits." Figure 3 of his plate 2 shows well the size of the islands or lakes and the simplicity of the enamel of their walls. Leidy's figure, showing the grinding surface of the second upper premolar, is here reproduced (pl. 19, fig. 2). An examination of the lakes of *Bison regius* shows a different state of affairs. Here the lakes have the sides, especially the outer one of each, and to a less degree the inner one, pushed strongly toward the interior of the lake. The result is to produce in each lake a pair of narrow cornua projecting outwardly and a much contracted interior. There is another feature which is less commonly seen in bisons. In the front border of some of the lakes, or in the hinder border of others, or in both of these, there is seen a sharp infolding of the enamel, which considerably complicates its arrangement. The writer finds this complication in none of several recent specimens of *B. bison* examined. In the front wall of the posterior lake of the first upper molar of a set of teeth figured by J. A. Allen, found at Big Bone Lick, Kentucky, and referred to *B. bison*, we find an inflexion of the enamel, such as is found in *B. regius*. In examining several specimens of *Bubalus caffer*, the African buffalo, the writer finds in most of the lakes of the upper molars similar infoldings of the enamel. The character appears, therefore, to be of specific importance. It is possible that the large teeth described by Leidy do not belong to *B. latifrons*; but if not, there is probably indicated still another undescribed bison. It is, however, probable that they do belong there; and if so, *B. latifrons* and *B. regius*, among American bisons, stand at the extremes of the complication of the enamel in the walls of the cement lakes.

In 1846 W. M. Carpenter¹ described and illustrated with two woodcuts a fossil bison which had been found at San Felipe, on the Brazos River, Texas. The skull was preserved forward to the frontonasal suture (pl. 19, fig. 3). The horn-cores had lost their extremities, but there remained 2 feet of the right one, and 18 inches of the left. The width of the skull between the horns was 14 inches (357 mm.). The circumference of the horn-core at the base was 17 inches (434 mm.); at a distance of 18 inches from the base (probably in a straight line), 14½ inches (376 mm.). The width at the rear of the orbits was 14½ inches (376 mm.); at the front of the orbits, 11½ inches (293 mm.). A comparison of these measurements with the corresponding ones of *B. regius* shows that the width between the horn-cores was almost the same; the width at the rear of the orbits 16 mm. greater in the Texas skull; at the front of the orbits 28 mm. greater in the Texas skull. This appears to show that the skull of the Kansas specimen narrowed more rapidly forward than that of the Texas bison. This might indicate that the Kansas specimen is the male, and the Texas specimen the female of the same species. Favorable to this view is the fact that the horn-cores of the Texas specimen are slenderer than those of the other skull. The bases of the horn-cores of the former are described as being nearly round. Calculations show that the diameter at the base was about 133 mm.; at a distance of 460 mm. from the base it was yet 117 mm. With the specimen described by Carpenter was a second upper molar; but it was so excessively worn that it affords no important characters. Its length near the roots was yet 40 mm.; the width, 30 mm.

It seems to be fitting, in closing this paper, that the principal characters by means of which the various species of North American bisons may be distinguished should be presented in a more succinct form than has been done on the preceding pages; and to this end the following table has been prepared:

Synopsis of the characters of North American bisons.

- a¹. Species with the bases of the horn-cores directed at right angles with the longitudinal axis of the face.
 - b¹. Horn-cores, measured along the upper curve, equal to about three-fourths the distance between the bases of the cores, and about equal to the circumference of the base..... *antiquus*.
- a². Species with the bases of the horn-cores directed obliquely to the longitudinal axis of the face and nearly toward the orbit of the opposite side.
 - b². Horn-cores short, stout, and curving outward, upward, and backward; length along the upper curve much less than the distance between the bases and not equaling the circumference of the base..... *bison*.
 - b³. Horn-cores directed outward, upward, and somewhat backward; the length along the upper curve usually exceeding somewhat the distance between the bases and about equal to the circumference of the base..... *occidentalis*.

¹ Amer. Journ. Sci., vol. 1, p. 245, figs. 1, 2.

- b⁴. Horn-cores more elongated and directed considerably downward proximally; tips rising little above the face; the sheaths directed upward distally; the length of the cores exceeding the distance between the bases by from 24 to 70 per cent, and the circumference of the base by from 21 to 40 per cent; index of curvature about 125.. *crassicornis*.
- b⁵. Horn-cores not sagging at the base; directed outward, upward, and somewhat backward; exceeding the distance between the bases by about 40 per cent, and the circumference of the base by from 22 to 32 per cent; index of curvature about 130; tips of horn-sheaths directed strongly inward..... *alleni*.
- b⁶. Horn-cores long, heavy, and moderately curved; length along upper curve more than twice the distance between the bases and exceeding by more than 50 per cent the circumference at the base; index of curvature 110. Teeth with the enamel of the "lakes" very simple..... *latifrons*.
- b⁷. Horn-cores, as indicated by the type, longer, slenderer, and more curved than in *B. latifrons*; length along the upper curve two and a half times the distance between the bases and exceeding the circumference of the base by 90 per cent; index of curvature about 130. Teeth with the enamel of the "lakes" with reëntering folds..... *regius*.

EXPLANATION OF PLATES.

PLATE 8.

Skulls of Old World bisons known as Bison priscus.

- Fig. 1.—Skull found near Pavia, Italy. After H. v. Meyer.
 2.—Skull supposed to have been found in Hungary. After H. v. Meyer.
 3.—Skull showing horns, found in Siberia. After P. S. Pallas.

PLATE 9.

Skulls of Bison priscus and B. occidentalis.

- Fig. 1.—Dorsal view of skull in British Museum of Natural History and known as *Bison priscus*. From a cast.
 2.—Rear view of same skull. From a cast.
 3.—Dorsal view of skull of the type of *Bison occidentalis*, No. 4157, United States National Museum.
 4.—Rear view of same skull.

PLATE 10.

Skulls of Bison occidentalis.

- Fig. 1.—Dorsal view of skull found in Yukon Territory, No. 13721, American Museum of Natural History.
 2.—Rear view of same skull.
 3a.—Oblique view of same skull. After Quackenbush.
 3c.—Dorsal view of skull showing horns, Yukon Territory. After Quackenbush.

PLATE 11.

Skulls of Bison occidentalis.

- Fig. 1.—Dorsal view of Alaskan skull, No. 5514, United States National Museum.
 2.—Rear view of same skull.
 3.—Dorsal view of skull from Yukon Territory, No. 2643, United States National Museum.
 4.—Rear view of same skull.

PLATE 12.

Skulls of Bison occidentalis.

- Fig. 1.—Dorsal view of skull from Alaska, No. 6832, Field Museum of Natural History, Chicago.
2.—Rear view of same skull.
3.—Dorsal view of skull in American Museum of Natural History, New York.
Exact locality unknown.
4.—Rear view of same skull.

PLATE 13.

Skulls of Bison occidentalis.

- Fig. 1.—Dorsal view of skull in Dawson, Yukon Territory, shows the preservation of the horns.
2.—Dorsal view of skull found at Kotzebue Sound. From a cast in the United States National Museum. Original in British Museum of Natural History.
3.—Rear view of same skull. From a cast.

PLATE 14.

Skulls of Bison crassicornis.

- Fig. 1.—Dorsal view of skull found in Alaska, No. 5726, United States National Museum. After Gilmore.
2.—Rear view of same skull.
3.—Dorsal view of skull found in Alaska, No. 6834, Field Museum of Natural History.
4.—Rear view of same skull.
5.—Rear view of skull found in Yukon Territory, now in Memorial Museum, San Francisco.

PLATE 15.

Skulls of Bison priscus? and B. alleni.

- Fig. 1.—Dorsal view of skull of supposed *B. priscus*, found in Siberia and retaining the horns. After Tscherski.
2.—Rear view of same skull.
3.—Rear view of skull of *B. alleni*, found in Alaska, No. 2383, United States National Museum. After Gilmore.

PLATE 16.

Skull of Bison alleni.

- Fig. 1.—Dorsal view of skull with horns, found in Alaska, No. 7706, United States National Museum.
2.—Rear view of same skull.

PLATE 17.

Skull and cervical vertebrae of Bison alleni.

- Fig. 1.—Lateral view of same skull as that of plate 16.
2.—Ventral view of atlas found with same skull.

PLATE 18.

Skull of Bison regius.

Type. In American Museum of Natural History.

Fig. 1.—Dorsal view.

2.—Rear view.

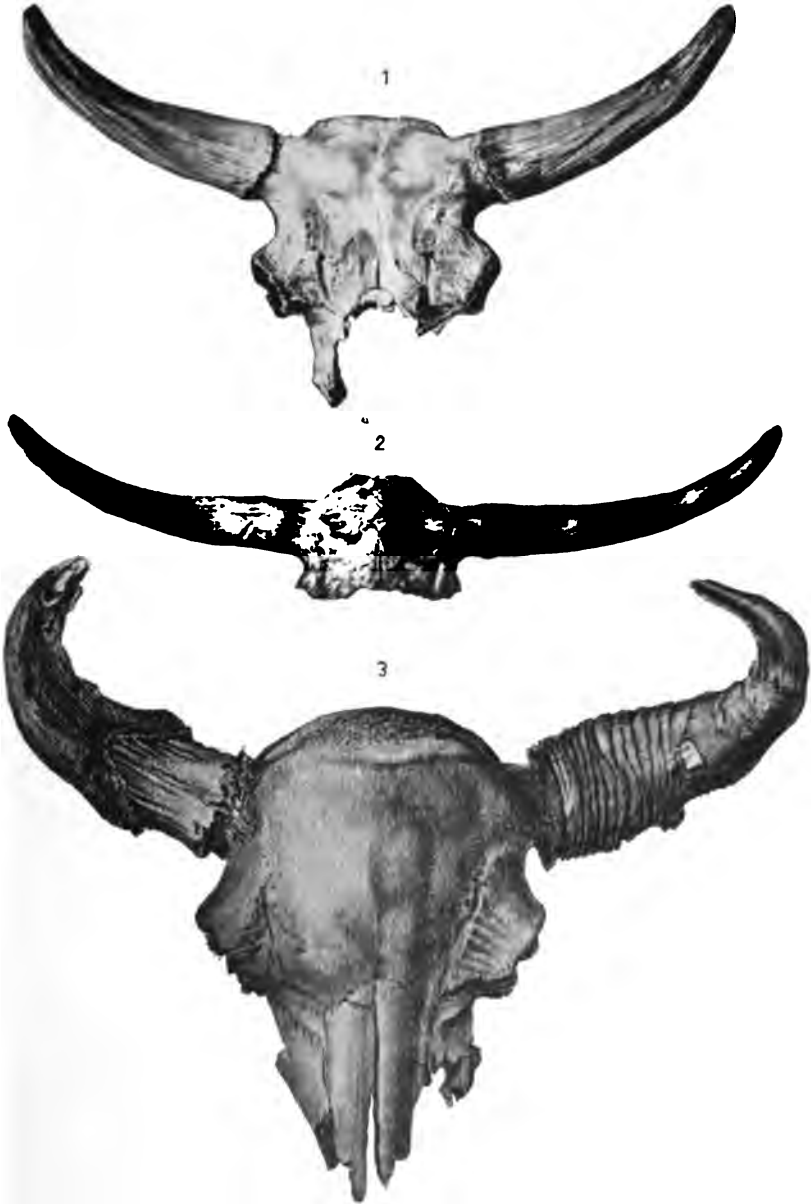
PLATE 19.

Skull, horn-cores, and tooth referred to Bison latifrons.

Fig. 1.—Front view of skull and horn-cores of specimen in Cincinnati Society of Natural History.

2.—Tooth supposed to belong to *B. latifrons*. After Leidy.

3.—Dorsal view of skull and horn-cores referred by Blake to *B. latifrons*. After Blake.



SKULLS OF OLD WORLD BISONS, KNOWN AS *BISON PRISCUS*.

FOR EXPLANATION OF PLATE SEE PAGE 198.



SKULLS OF *BISON PRISCUS* AND *BISON OCCIDENTALIS*.

FOR EXPLANATION OF PLATE SEE PAGE 198.



SKULLS OF *BISON OCCIDENTALIS*.

FOR EXPLANATION OF PLATE SEE PAGE 198.



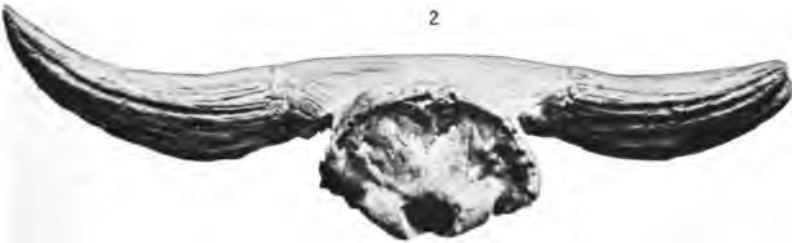
SKULLS OF *BISON OCCIDENTALIS*.

FOR EXPLANATION OF PLATE SEE PAGE 198.

1



2



3



4



SKULLS OF *BISON OCCIDENTALIS*.

FOR EXPLANATION OF PLATE SEE PAGE 199.



SKULLS OF *BISON OCCIDENTALIS*.

FOR EXPLANATION OF PLATE SEE PAGE 199.



SKULLS OF BISON CRASSICORNIS.

FOR EXPLANATION OF PLATE SEE PAGE 199.



SKULLS OF BISON PRISCUS ? AND BISON ALLENI.

FOR EXPLANATION OF PLATE SEE PAGE 199.





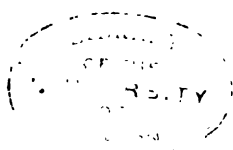
SKULL OF BISON ALLENI.

FOR EXPLANATION OF PLATE SEE PAGE 199.



SKULL AND CERVICAL VERTEBRÆ OF *BISON ALLENI*.

FOR EXPLANATION OF PLATE SEE PAGE 199.





SKULL OF BISON REGIUS.

FOR EXPLANATION OF PLATE SEE PAGE 200.





SKULL, HORN CORES, AND TOOTH REFERRED TO BISON LATIFRONS.

FOR EXPLANATION OF PLATE SEE PAGE 200.

NEW STARFISHES FROM THE PHILIPPINE ISLANDS,
CELEBES, AND THE MOLUCCAS.

By WALTER K. FISHER,

Assistant Professor of Zoology, Stanford University, California.

The new genera and species of starfishes described in this paper were obtained from among the Philippine Islands and the neighboring islands to the southward by the steamer *Albatross* during her cruise of 1907-1910. These species will be fully illustrated and described in greater detail in the final report on the collection.

In two previous papers¹ 10 new genera, one new subgenus, and 64 new species were described.

In the present paper the following new genera are characterized:

Halityle (Oreasteridæ, near *Culcita*).

Dissogenes (Linckiidæ, aberrant).

Tarachaster (Ganeriidæ, aberrant).

A new subgenus of *Rhipidaster*, *Xenorias*, founded on a new species, *Rhipidaster polyctenius*, is described.

A list of the new species and subspecies is given for ready reference.

LUIDIIDÆ.

Luidia prionota.

Luidia orientalis.

Luidia avicularia.

Luidia gymnochora.

BENTHOPECTINIDÆ.

Pectinaster hylacanthus.

Cheiraster ludwigi.

Cheiraster triplacanthus.

Benthopecten moluccanus.

Benthopecten polyctenius.

Benthopecten styracius.

OREASTERIDÆ.

Pentaceropsis tyloderma.

Asterodiscus helonotus.

Halityle regularis.

¹ New genera of starfishes from the Philippine Islands, Proc. U. S. Nat. Mus., vol. 40, May 17, 1911, pp. 415-427.

Four new genera and fifty-eight new species of starfishes from the Philippine Islands, Celebes, and the Moluccas, Proc. U. S. Nat. Mus., vol. 43, Feb. 5, 1913, pp. 599-648.

LINCKIIDÆ.

Dissogenes styracia.
Ferdina glyptodiscæ.
Fromia eusticha.

Fromia hemioplæ.
Ophidiaster trychnus.
Leiaster analogus.

ASTEROPIDÆ.

Marginaster paucispinus.

GANERIIDÆ.

Tarachaster tenuis.

ASTERINIDÆ.

Nepanthia pedicellaris.
Nepanthia platydiscæ.

Anseropoda macropora.

SOLASTERIDÆ.

Lophaster sulciensis.
Solaster tropicus.

Solaster scotophilus.
Rhipidaster (Xenorias) polycstenius.

MYXASTERIDÆ.

Asthenactis medusa.

Family LUIDIIDÆ.

LUIDIA PRIONOTA, new species.

Similar in general form to *Luidia forficifer* Sladen, but differing in lacking entirely adambulacral pedicellariæ; in having proximally at least 5 adambulacral spines in addition to the curved furrow spine, the 4 outer forming 2 longitudinally oriented pairs; central spinelets of paxillæ not granuliform; marginal spine usually longer than extreme width of inferomarginal plate; actinal intermediate pedicellariæ usually absent. Rays 5. $R=32$ mm., $r=5$ mm., $R=6r$; breadth of ray at base, 6 mm. Abactinal surface slightly arched, usually plane on radial region of ray; inferomarginals slightly arched, forming a broad border to actinal surface; marginal spines fairly long, single, forming a prominent fringe to ambitus.

Type.—Cat. No. 32622, U.S.N.M.

Type-locality.—Station 5181, off eastern Panay (6.6 miles northeast of Antonia Island), 26 fathoms, mud and fine sand.

L. prionota, on account of the absence of adambulacral pedicellariæ and the large number of adambulacral spines proximally can not be confused with *L. forficifer* or *L. quinaria* (including *L. limbata*). It differs from *L. penangensis* de Loriol, which has constantly 6 rays and a prominent madreporic body, in having larger paxillæ, in lacking adambulacral pedicellariæ, and in having more than 3 adambulacral spines.

The absence of adambulacral and abactinal pedicellariæ suggests *L. clathrata* of the West Indies and southern United States, and *L. foliolata* (southern Alaska to Mexico).

LUIDIA ORIENTALIS, new species.

Related to *L. sarsi* Dübœ and Koren, *L. africana* Sladen, and *L. asthenosoma* Fisher. Closely resembling *L. asthenosoma*, from which it differs in having deeper and broader marginal fascioles, slightly longer inferomarginal and adambulacral spines, longer inferomarginal spinelets, and actinal intermediate pedicellariæ tapering slightly when seen from side (untapered or obovate in *asthenosoma*). Rays 5. R = about 120 mm., r = about 14 mm. The tip of ray is regenerating so that the original was considerably longer; breadth of ray at base, 15 mm.

Type.—Cat. No. 32623, U.S.N.M.

Type-locality.—Station 5301, China Sea, vicinity of Hongkong (lat. $20^{\circ} 37' N.$; long. $115^{\circ} 43' E.$), 208 fathoms, gray mud, sand, bottom temperature $50.5^{\circ} F.$

L. orientalis differs from *L. sarsi* in having longer paxillar, marginal, and actinal spines, broader and deeper marginal furrows. It differs from *L. africana*, which represents *elegans* on the east side of the Atlantic, in having broader inferomarginal fascioles, longer inferomarginal spinelets, more tapered actinal pedicellariæ, and agrees with it as well as with *asthenosoma* in having longer rays than *sarsi*.

LUIDIA AVICULARIA, new species.

Very closely related to *L. integra* Kœhler, which it resembles in general appearance but from which it differs in the following particulars: Scattered spinopaxillæ among the normal paxillæ of the 3 dorsolateral series; superomarginal and abactinal paxillæ with small two-jawed pedicellariæ; central spinelets of superomarginal and abactinal paxillæ, sharp, longer than thick, not granuliform; inferomarginals encroaching conspicuously upon abactinal area and with marginal spines varying from 2 to 6; inferomarginal pedicellariæ present on some of the plates; the characteristic furrow pedicellariæ, proximally with dorsal jaw curved over end of the slightly curved ventral jaw; proximal adambulacral plates with generally more than 3 spines, and more than 1 subambulacral pedicellaria, pedicellariæ sometimes replacing the spines; generally 2 large dental pedicellariæ, directed over the peristome. Rays 10. R = 195 mm., r = 18 mm., $R = 10.5 r$; a shorter ray, $R = 175$ mm.; breadth of ray at base, 13 mm.; breadth 15 mm. from base, at widest part, 17 to 18 mm. Ray gradually tapering, blunt, abactinal surface slightly convex.

Type.—Cat. No. 32624, U.S.N.M.

Type-locality.—Station 5391, between Samar and Masbate (lat. $12^{\circ} 13' 15'' N.$; long. $124^{\circ} 05' 03'' E.$), 118 fathoms, bottom unrecorded; 1 specimen.

L. integra Kœhler was taken by the *Investigator*, off the Andaman Islands (lat. $13^{\circ} 06' N.$; long. $93^{\circ} 08' E.$), 60 to 75 fathoms.

LUIDIA GYMNOCHORA, new species.

Related to *L. denudata* Kœhler, but differing in having constantly 11 rays; prominent, central, two-jawed paxillar pedicellariæ, together with several small two-jawed pedicellariæ on the sides of the pedicels; superomarginal and dorsolateral spinopaxillæ distally; with the transverse processes of the regular paxillæ longer than the longitudinal (the reverse in *denudata*); frequently 3 or 4 inferomarginal spines; 1 to 5 inferomarginal pedicellariæ; inferomarginals broader actinally, the intervening naked spaces much wider than long, and elliptical to oblong in form; 1 or 2 pedicellariæ on the actinal intermediate plates; no slender furrow pedicellaria beyond a few plates at base of ray, except rarely and sporadically; second furrow spine compressed; several subambulacral pedicellariæ, the principal one situated adrad of the second and third spine. Rays 11. $R=230$ mm., $r=33$ mm.; breadth of ray at base, 22 mm., a short distance beyond base, 28 mm.; rays deciduous, and usually imperfect, the tips being in the process of regeneration or absent; many rays broken into 2 or 3 pieces; rays thin, plane, with very widely open, shallow ambulacral furrows; tube-feet long, sometimes reaching to the margin, and with a small conical button at tip; skeleton loose, dorsal integument thin.

Type.—Cat. No. 32625, U.S.N.M.

Type-locality.—Station 5409, between Cebu and Leyte, 20.8 miles southeast of Capitancillo Light, Cebu, 189 fathoms, green mud.

L. gymnochora—the name referring to the bare spaces between the inferomarginals—is especially characterized by a looseness and flexibility of the skeleton which it shares with *L. denudata* Kœhler from the Coromandel Coast, India, 133 fathoms. The most important differences have been enumerated above.

Family BENTHOPECTINIDÆ.**PECTINASTER HYLACANTHUS, new species.**

Related to *P. mimicus* Sladen, from which it differs in having the central spines of the paxillæ distributed all over the abactinal surface, and in having 13 (exceptionally 12 or 14) adambulacrals corresponding to the first 10 inferomarginals. $R=79$ mm., $r=10.5$ mm., $R=7.5 r$ approximately; breadth of ray at base, 11 to 12 mm. General appearance similar to that of *P. mimicus*; disk small, rays long, slender, recurved at tip; superomarginal plates confined to side wall of ray, with an upright sharp spine close to, or on upper margin; normally no abactinal pedicellariæ; abactinal spines numerous and generally distributed; small spinelets in 1 or sometimes 2 circles surrounding base of spine; adambulacral furrow spines 7 or 8 at base of ray; pedicellariæ variable, present usually on actinal interradi

areas, and sometimes also intermarginally, and on actinal surface of intermarginals.

Type.—Cat. No. 32626, U.S.N.M.

Type-locality.—Station 5467, Lagonoy Gulf, southeastern Luzon, 480 fathoms, green mud.

As indicated above this species closely resembles *P. mimicus*, from which it differs in having only 13 adambulacrals to the first 10 inferomarginals, while *mimicus* has 15 to 18. In *mimicus* the abactinal spines are absent from the lateral portions of the area, while in *hylacanthus* they are distributed all over the area. *P. mimicus* inhabits depths of from 692 to 1,092 fathoms, subjected to a temperature of 36.3° to 39.5° F., while *hylacanthus* is found in less than 500 fathoms, the only temperature record being 44.3° F.

This species closely resembles a species of *Cheiraster* which I have identified as *niasicus* Ludwig, the two occurring together. Both have fasciculate pedicellariæ. In *hylacanthus* the superomarginals are more lateral in position, and the spine is nearer the upper edge of the plate. The pedicellariæ have blunter, broader jaws, and the actinal intermediate pedicellariæ of *niasicus* are generally pectinate—that is, stand on two plates, although subcircular in shape. The papularium of *hylacanthus* is more swollen and when examined from the inner side the plates are seen to be more modified, especially in the center of the area, and the area itself shows no sign of being two-lobed. In *niasicus* the papularium is flatter and slightly two-lobed. The superficial similarity of the two species is, however, very striking.

CHEIRASTER LUDWIGI, new species.

Near *Ch. gazellæ* Studer, but with pectinate, superomarginal, suture pedicellariæ interbrachially and intermarginal pedicellariæ on the distal third of ray, in addition to very prominent actinal intermediate pedicellariæ; abactinal pedicellariæ very rare; 1 superomarginal spine near middle of plate; 1 inferomarginal spine with 1 accessory spinule below it; adambulacral plates very prominent, meeting in middle of furrow; furrow spines 8 or 7; 1 subambulacral spine (2 distally); oral spines 7; suboral spines 2; 17 adambulacrals to first 10 inferomarginals. $R=53$ mm., $r=9.5$ mm., $R=5.5$ r; breadth of ray at second superomarginal, 9 mm.

Abactinal plates only slightly elevated, the groups of small, subequal, bluntly pointed or obtuse spinelets distinctly spaced, sometimes more than the diameter of the group. No enlarged central spine anywhere on the abactinal surface. The larger plates of disk with 10 to 12 upright or slightly divergent spinelets; the smaller have 5 to 7, or upward of 10. On the ray 5 to 7 slightly slenderer spinelets surround a single central one, or 3 to 5 form a simple group.

Papularia small, 2-parted, with about 10 pores, the distal-most being even with a line across the ray between the interradial marginal sutures of either interbrachium.

Pedicellariæ occur abactinally; between superomarginals interbrachially; intermarginally, on outer part of ray; on actinal intermediate plates; irregularly on the inferomarginals.

Type.—Cat. No. 32627, U.S.N.M.

Type-locality.—Station 5660, Flores Sea (lat. $5^{\circ} 36' 30''$ S.; long. $120^{\circ} 49' E.$), 692 fathoms, gray mud, sand; bottom temperature, $39.2^{\circ} F.$

Cheiraster ludwigi would be placed in Ludwig's table (Notomyota, 1910, p. 546) next to *Ch. gazellæ*, from which it differs in having supero-, infero-, and intermarginal pedicellariæ, and equal actinal intermediate spinelets (probably not a specific character as it is variable in other species). From *Ch. trullipes*, *ludwigi* differs in having a well-developed actinal intermediate area, actinal intermediate and intermarginal pedicellariæ, larger abactinal paxillæ, longer furrow spines, 7 oral spines, and 17 (instead of 15) adambulacrals to the first 10 inferomarginals. *Ch. trullipes* was taken by the *Challenger* west of Luzon, in 1,050 fathoms, blue mud, bottom temperature $37^{\circ} F.$

This species is named in honor of Dr. Hubert Ludwig, whose paper on the Notomyota furnishes a most useful revision of *Cheiraster*.

CHEIRASTER TRIPLACANTHUS, new species.

Belonging to the *subtuberculatus* group; differing from *subtuberculatus* in having actinal pedicellariæ, 7 or 8 furrow spines, longer inferomarginal spines, and especially in having a transverse series of 3 prominent superomarginal spines on the distal half of ray and 1 spine only on the proximal half. Disk large, rays slenderer than in *subtuberculatus*, tapering very gradually from wide interbrachial arcs to a bluntly-pointed tip. $R=49$ mm., $r=12$ mm., $R=4r$; breadth of ray at first superomarginal 14 mm., at third, 8.5 mm. No enlarged abactinal spines; papularia large, flat, two-lobed; 1 inferomarginal spine, and proximally 1 or 2 small accessories; 8 or 9 oral, and 1 suboral spine.

Type.—Cat. No. 32628, U.S.N.M.

Type-locality.—Station 5651, Gulf of Boni, Celebes, 700 fathoms, green mud; bottom temperature, $38.7^{\circ} F.$

The transverse series of 3 prominent spines on the distal marginals is very characteristic and will serve to distinguish the species from *Ch. subtuberculatus* and *Ch. granulatus*.¹ The presence of only 1 prominent inferomarginal spine and of inferomarginal pedicellariæ are additional differences separating *triplicanthus* from *granulatus*.

¹ See Ludwig, Notomyota, p. 456.

Ch. subtuberculatus was taken by the *Challenger* at station 164, off the coast of Australia, east of Sydney, 950 fathoms, green mud; bottom temperature 36.5° F.

Genus BENTHOPECTEN.

Key to the species herein described.

- a¹. Abactinal plates with a single spinelet, the long spines of disk graduated in length into the spinelets of ray..... *moluccanus*.
- a². Abactinal plates with more than 1 spinelet, at least on disk, the comparatively few prominent spines of ray not graduated in length into those of disk.
 - b¹. Abactinal plates of ray with 5, or even more, spinelets; odd interradial superomarginal spine not unusually long (equal in length to first 1½ to 2 superomarginals); short accessory superomarginal spines; inferomarginal pedicellariæ on outer part of ray..... *polycetinus*.
 - b². Only 1 or 2 spinelets to each abactinal plate of ray; odd interradial superomarginal spine very long (equal in length to first 4 or 5 superomarginals); no accessory superomarginal spines; no inferomarginal pedicellariæ on outer part of ray..... *styracius*.

BENTHOPECTEN MOLUCCANUS, new species.

Differing from *B. huddlestonii* in having only 2 inferomarginal and 2 subambulacral spines, and from *B. acanthonotus* in having a larger adambulacral furrow comb (with 7 to 9 spines), pedicellariæ between the distal inferomarginal plates, very few or no accessory abactinal spinelets, a more restricted papular area, and inferomarginal spines which are subequal proximally. R=80 mm., r=8 mm., R=10r; breadth of ray at base, about 10 mm. Disk small, rays slender and very flexible. Abactinal plates with a single spine, those of disk graduated in length into spines of rays; superomarginals with 1 and inferomarginals with 2 spines; subambulacrals 2; furrow spines 7 to 9; oral spines variable, 5 to 8; suborals, 3 to 5; abundant abactinal pedicellariæ on disk, and variable on rays; inferomarginal pedicellariæ in interbrachium and on outer part of ray; actinal intermediate pedicellariæ often present; 19 or 20 adambulacral plates to first 10 inferomarginals.

Type.—Cat. No. 32629, U.S.N.M.

Type-locality.—Station 5618, Molucca Passage (lat. 0° 37' N.; long. 127° 15' E.), 417 fathoms, gray mud; 2 specimens.

In Ludwig's key to the species of *Benthopecten*,¹ *B. moluccanus* would occupy a position just after *B. huddlestonii*, with a coordinate subhead reading: Inferomarginal plates with 2 spines; adambulacral plates with 7 to 9 furrow and 2 subambulacral spines; mouth spines with 5 to 8 oral spines. *B. moluccanus* differs from *B. semisquamatus* (Sladen) and *B. antarcticus* (Sladen) in having pedicellariæ and more numerous furrow spines. It differs from *B. spinosus* Verrill in having pedicellariæ, in having only 2 (and larger) inferomarginal spines,

¹ Notomyseta, 1910, p. 465.

smaller disk, smaller actinal intermediate areas, and more numerous, long, abactinal disk spines which are graduated in length into those of the ray, not abruptly larger as in *spinosus*. *B. spinosus* is of a much stouter habit, as is also *B. mutabilis*, which does not at all resemble *moluccanus*, having the abactinal spines abruptly larger in the middle of the disk. *B. acanthonotus* differs in having a shorter furrow comb with 4 or 5 spines, several prominent accessory inferomarginal spinules, and 1 to 6 accessory spinelets in connection with the abactinal spines of disk, and the inferomarginal pedicellariæ confined to base of ray.

BENTHOPECTEN POLYCTENIUS, new species.

Closely related to *B. violaceus* (Alcock), but differing in having abactinal pedicellariæ, inferomarginal pedicellariæ far along the ray (in adult specimens), more numerous furrow spines, and 20 instead of 24 adambulacral plates to the first 10 inferomarginals. $R=224$ mm., $r=18$ mm., $R=12+r$; breadth of ray at base, 23 mm. Abactinal area of large specimen with numerous large pedicellariæ extending far along ray; abactinal plates with 4 to 8 short spinelets, and scattered spines on disk only; superomarginals with 1 spine, together with 2 unequal accessory spinules and 3 or 4 slender spinelets proximally, and only 1 accessory spinule over most of ray; 2 inferomarginal spines; 2 subambulacral spines, with often a third, smaller accessory; furrow spines 13 or 14 (9 or 10 on first 2 plates); 7 or 8 oral spines and 3 to 5 suboral spines; 20 adambulacral plates correspond to the first 10 inferomarginals, omitting the odd plate.

Type.—Cat. No. 32630, U.S.N.M.

Type-locality.—Station 5654, Gulf of Boni, Celebes, 805 fathoms, bottom not recorded; bottom temperature 38.3° F.

The following are the differences between *B. violaceus* and *B. polyctenius* of equal size, the type of the latter being much larger than that of *violaceus*.

<i>B. violaceus.</i>	<i>B. polyctenius.</i>
24 adambulacral plates correspond to first 10 inferomarginals.	20 adambulacrals correspond to first 10 inferomarginals.
No abactinal pedicellariæ.	Abactinal pedicellariæ few, on disk only. (In the type, numerous on disk and rays.)
Inferomarginal pedicellariæ in inter-brachial arcs only.	Inferomarginal pedicellariæ in inter-brachial arcs and far along ray also.
Furrow spines 7 or 8.	Furrow spines 9 to 11 (as high as 13 or 14 in type).

BENTHOPECTEN STYRACIUS, new species.

Similar in general appearance to *B. violaceus* but with numerous abactinal pedicellariæ, and very large odd interradiial superomarginal spines; differing from *B. polyctenius* in having only 1 or 2 spinelets

to each abactinal plate of the ray, much larger interradial superomarginal spines, no accessory superomarginal spines, fewer inferomarginal pedicellariæ (none on outer part of ray), fewer furrow spines. $R=105$ mm., $r=10.5$ mm., $R=10$ r; breadth of ray at base, about 10 mm.; odd interradial superomarginal spine, 17 mm. long. The inferomarginals bear 2 spines, the lower one-half to three-fourths the length of the upper, similar to those of *B. polyctenius*. The plates of outer third of ray are very slender and bear as a rule only 1 spine. Between the plates of proximal half of ray is a pectinate pedicellaria, but these may be absent from a number of plates, their occurrence being subject to variation. Actinal interradial areas small, bearing each 2 large pectinate pedicellariæ. Furrow spines 7 or 8, slender, bluntly pointed, the successive combs spaced a little less than their base line. (In *B. polyctenius* a comparable specimen has 9 to 11 spines, the combs spaced only one-half the length of their base line.) Subambulacral spines 2, the outer slightly the shorter, with a third quite small spinule usually present adrad of the outer spine. Nineteen to 22 plates correspond to first 10 inferomarginals, omitting the odd interradial. Oral spines 6; suboral, 3, in a series along middle of plate.

Type.—Cat. No. 32631, U.S.N.M.

Type-locality.—Station 5668, Macassar Strait (lat. $2^{\circ} 28' 15''$ S.; long. $118^{\circ} 49'$ E.), 901 fathoms, gray mud; bottom temperature, 38.2° F.

Family OREASTERIDÆ.

PENTACEROPSIS TYLODERMA, new species.

Differing from *P. obtusata* in having shorter rays, 1 series of subambulacral spines, in lacking inferomarginal tubercles except on the first few plates, in having less prominent distal superomarginals without smooth tubercles, and very much smaller granules among the papulæ than on the convex plates. $R=94$ mm., $r=49$ mm., $R=1.9$ r.; breadth of ray at base, 44 to 54 mm. Disk inflated, rays convex, much lower than disk; actinal surface subplane; interbranchial arcs well rounded; rays broad, tapering little until near the end, which is rounded. No true spines anywhere except on adambulacral and mouth plates.

Abactinal surface paved with plates of about 3 sizes, but only 2 of these are evident externally because the small ossicles which fill in the spaces between the large plates are covered with granules. There is a not very regular carinal series of about 12 convex, transversely elliptical plates, starting with the primary radial, spaced about one-fourth to one-half their longer diameter, which varies from 4 to 7 mm. Between this and the superomarginal series are 3 others, not at all regular, spaced, convex, decreasing in size toward the margin, the adradial plates being transversely elliptical,

the others irregularly roundish. Two dorsolateral series reach the end of ray, the third extends about two-thirds or three-fourths the length of ray, while in the interbrachial arcs are 2 additional series, the plates being rather small and of secondary size. These primary plates are covered with close-set, flat, or very faintly convex polygonal granules, which increase very rapidly in size from the margin toward the center, where 1 to several are conspicuously larger than the rest and slightly more convex. The plates of second size are widely spaced, unequal, and except near the ambitus are conspicuously smaller than the primary plates. They are most numerous on the disk and proximal portion of ray, rather few on the outer part of ray. They are convex and usually bear a relatively large hemispherical tubercle, very much larger than the granules surrounding it. Between the primary and secondary plates the integument is thickly beset with very small, unequal, convex, subconical, or even spinuliform granules, largest on the center of the small intercalary ossicles, and smallest on the margin of the papular pores. Small pedicellariæ with spatulate jaws, slightly higher than wide, or sometimes wider than high, are scattered among the granules, which they exceed little or not at all in size. Papular pores rather evenly distributed occupy all this granular area, and likewise between angular dorsal extensions of the superomarginal plates. There is no subdivision into areas. The arrangement of the abactinal plates is similar to that in the genus *Asterodiscus*, and unlike that of *Oreaster*. Ambitus bounded by superomarginals, the inferomarginals being actinal. Small intermarginal plates are found at the base of ray and irregularly near the tip. Furrow spines 8, the 2 central about as long as the slightly curved furrow margin. Subambulacral spines 2, less often 3, becoming 1 near the end of ray. Mouth plates with 14 to 18 furrow spines.

Type.—Cat. No. 32632, U.S.N.M.

Type-locality.—Tictauan Island, Mindanao.

ASTERODISCUS HELONOTUS, new species.

Similar in shape and general appearance to *A. truncatus* Coleman, but differing in having smaller and more numerous abactinal tubercles (of a similar form), much larger terminal superomarginal plate, less conspicuous marginal plates (the superomarginals not distinguishable); more numerous inferomarginal plates, 9 underlying the terminal superomarginal, and others bearing a large, compressed, fan-shaped tubercle; flattened or spatulate actinal intermediate spines near furrow, where they are larger than near margin; only 3 furrow spines; outer subambulacral spine flattened, and heavier than the inner (the reverse in *truncatus*); inner mouth spines shorter than the others. $R = 98$ mm., $r = 48$ mm., $R = 2r$; breadth of ray at base, about 53 mm.; general form stellate, depressed.

Abactinal tubercles similar in form to those of *A. truncatus*, but much smaller and much more numerous. Larger tubercles not arranged in evident series, in form resembling inverted truncated cones, the base of the cone being convex, and the truncated end immersed, as it were, in the plate and surrounding by a circle of small bead-like granules. Packed closely among the largest tubercles are more numerous smaller ones of several sizes, more numerous than in *A. truncatus*. These are clavate, or obovate, more or less irregular in form, and toward the margin of the disk a certain number become slender. The height of an average primary is 2 to 2.5 mm. and its breadth at the top 2.5 to 3 mm. (in *truncatus* similar measurements of a comparable specimen are 3.5 to 4.5 and 6 to 7.5). Between the tubercles are widely spaced small granules similar to those around the base of the tubercles. Numerous long, very slender, 2-jawed pedicellariæ, straight or curved at the end, stand beside many of the tubercles. There are 18 inferomarginals, of which 9 underlie the large terminal superomarginal. The other superomarginals are indistinguishable from the abactinal plates.

Type.—Cat. No. 32633, U.S.N.M.

Type-locality.—Station 5149, off Sirun Island, vicinity of Siasi, Sulu Archipelago, 10 fathoms, coral, shells.

In both *A. elegans* and *A. tuberculosus* the abactinal tubercles are conical, more or less acute, to hemispherical or truncate hemispherical, and R is equal to less than 1.8 r. In *A. truncatus* and *A. helonotus* the tubercles are obconical to obovate, broader at summit than base, and R is equal to 2 r.

• HALITYLE, new genus.

Differing from *Culcita* in having the marginal plates visible in the adult, and in having the papulæ in very numerous, regularly arranged, triangular areas resembling those of *Oreaster*; no spines on any plates except the adambulacral and mouth plates.

Type of genus.—*Halityle regularis*, new species.

HALITYLE REGULARIS, new species.

Differing from the species of *Culcita* in having well-defined marginal plates in the fully adult, no tubercles or spines on abactinal or actinal plates, and in having more numerous abactinal plates, forming a very regular triangular reticulum, between which are triangular papular areas arranged in regular series parallel to the radial series of plates, and much more numerous than in *C. schmideliana* or *C. novæ-guinææ*, or their varieties; R=133 mm., r=95 mm., R=1.4 r; form massive, pentagonal with slightly arcuate sides which are perpendicular and formed by the marginal plates and about 1 series of adjacent large papular areas with intervening perpendicular

trabeculæ (each of which joins the upper end of a superomarginal plate); abactinal surface more or less swollen, and marked off into regular triangular papular areas by narrow trabeculæ; whole surface finely granular with minute 2-jawed granuliform pedicellariæ; no spines; actinal intermediate plates sharply marked off by sutural grooves and covered with a close mosaic of unequal, smooth, very compact granules; the 3 chevrons nearest furrow with an odd inter-radial plate, the others without; furrow comb compact, perpendicular, with 8 to 11 slender spines, the aboral end of 1 comb slightly overlapping the adoral end of the next younger comb.

Type.—Cat. No. 32634, U.S.N.M.

Type-locality.—Station 5165, Tawi Tawi group, Sulu Archipelago, 9 fathoms, coral.

This curious, large starfish has retained the phanerozoniate character of young *Culcita*. This feature and the more numerous abactinal plates, regularly arranged triangular papular areas, and lack of spines or tubercles gives it a very characteristic facies, recalling somewhat a gigantic, tumid "*Goniodiscus sebæ*," but one without tubercles.

Family LINCKIIDÆ.

DISSOGENES, new genus.

Disk large, slightly inflated; rays moderately long and slender; whole body covered with small granules, obscuring the outlines of all plates except the marginal, which are confined to side wall of body, and are unarmed except for 1 to 3 small central spines on the first 2 or 3 superomarginals; abactinal plates of 2 kinds, irregular, mostly convex primary plates with 2 to 4 semicircular excavations on margin, overlying and bound together by secondary elliptical or oblong connecting ossicles, all very irregular in arrangement; primary plates of disk with small rigid central upright truncate spine; actinal intermediate areas with about 4 chevrons of similar longer spines; actinal intermediate plates extending in a single series nearly to end of ray, and a second series two-thirds the length of ray; adambulacral armature with 4 or 5, sometimes 3, prominent, slender furrow spines on a nearly straight furrow margin; subambulacral spines 2 on disk, 1 on rays, a little longer and much stouter than furrow spines. No pedicellariæ.

Type of genus.—*Dissogenes styracia*, new species.

DISSOGENES STYRACIA, new species.

Rays 5. $R = 110$ mm., $r = 28$ mm., $R = 4r$; breadth of ray at base, about 34 mm.; rays tapering at first rapidly, then gradually to pointed extremity; interbranchial arcs wide, rounded. Other characters as in genus.

Type.—Cat. No. 32635, U.S.N.M.

Type-locality.—Station 5617, off Ternate Island, west of Gilolo Island, Molucca Islands, 131 fathoms, bottom not recorded.

This genus, like *Narcissia* and *Ferdina* might reasonably be included in the Goniasteridæ. It is placed in the Linckiidæ, however, on account of the irregular abactinal skeleton, small marginals, and the close granulation which covers the body and obscures the outlines of the actinal and abactinal plates. The general appearance suggests the Linckiidæ. But the rather long slender furrow spines and prominent subambulacral spines are unlike those of any other genus of this family, while the abactinal and actinal intermediate spines are exceptional, and without parallel in any of the Linckiidæ having a large disk. The genus does not seem to be nearly related to any known.

FERDINA GLYPTODISCA, new species.

Resembling *F. offreti* Kœhler; differing in having all the prominent abactinal plates, and all the marginal plates with an extensive, central naked area; the smaller abactinal plates less distinct and not at all convex; granules smallest on center of obscured plates, largest over the sutures (reverse in *offreti*); abactinal area narrower, about equal to extreme width of superomarginal plate; inner series of small actinal intermediate plates lacking; adambulacral spines 3 (2 in *offreti*). Rays 5. $R=35$ mm., $r=11$ mm., $R=3.2$ r; breadth of ray at base, 13 mm. Rays and disk very rigid; abactinal surface sub-plane, actinal surface convex.

Type.—Cat. No. 32636, U.S.N.M.

Type-locality.—Station 5640, Buton Strait, Celebes (a mile west of Labuan Blanda Island), 24 fathoms, sand, broken shells.

Genus FROMIA Gray.

Key to some East Indian species of Fromia.

- a^1 . Superomarginal plates of distal half of ray large and small alternating; granules surrounding papular pores, larger than the others.....*major*.
- a^2 . Superomarginal plates not large and small, alternating.
 - b^1 . Abactinal plates of proximal half or two-thirds of ray in regular longitudinal series; marginal plates very regular, most of them longer than wide; rays slender; furrow spines 2 or 3, subambulacral spines 2; actinal pedicellariæ.....*eusticha*.
 - b^2 . Abactinal plates not in regular series.
 - c^1 . Most of the marginal plates with 1 or more central, enlarged tubercular granules; rays slender, about 3 times as long as width at base.....*hemiopla*.
 - c^2 . Marginal plates without central tubercles; rays usually about 2 to $2\frac{1}{2}$ times as long as width at base.....*milleporella*.

FROMIA EUSTICHA, new species.

Differing from typical *F. milleporella* in having longer, slenderer rays, more regularly arranged abactinal plates, only 2 adambulacral furrow spines on distal half of ray, and abundant actinal pedicellariæ.

R=41 mm., r=8.5 mm., R=4.8 r; breadth of ray at base, 9.5 mm. Rays slender, evenly tapering, abactinally plane; disk slightly convex; marginal plates very regular, mostly longer than wide, regularly decreasing in size, not alternate large and small; abactinal plates roundish or hexagonal, sometimes with faint indication of lobing, arranged in quincunx in regular longitudinal series; actinal plates in 3 regular series at base of ray; adambulacral with proximally 3 rather narrow furrow spines, 2 distally; 2 subambulacral spines and 1 to 3 subambulacral pedicellariæ. Granules of abactinal surface polygonal, close-set, fairly uniform, not larger in center of plate, about 8 to 10 in the transverse diameter of a carinal plate. Granules surrounding papular pores unequal, some of them a little larger than the granules of plates. Papulæ single, at the corners of the plates. Superomarginal plates 18, encroaching conspicuously upon abactinal surface. Inferomarginals 20. Actinal granules increasing in size toward furrow. On proximal half of ray there are rather abundant, granuliform 2- or 3-jawed pedicellariæ, from 2 to 5 times the diameter of adjacent granules.

Type.—Cat. No. 32637, U.S.N.M.

Type-locality.—Station 5146, vicinity of Siasi, Tapul Group, Sulu Archipelago, 24 fathoms, coral sand, shells.

FROMIA HEMIOPLA, new species.

Differing from *F. armata* Kœhler in the absence of abactinal conical tubercles, and the slighter development of the marginal tubercles; differing from *F. milleporella* in having 1 or more tubercular granules in the center of the marginal plates of the distal three-fourths or half of ray, in having slenderer rays, and broad, but thin, spatulate furrow spines. R=36 mm., r=9 mm., R=4 r; breadth of ray at base, 10 mm.

Marginal plates convex, the granules increasing in size toward the center, where the plates of at least the distal half of ray bear 1, 2, or even more enlarged tubercular granules, there being as high as 5 to 10 on the distal marginals of the type. The first half dozen plates usually lack a tubercle, and the tubercles become a trifle more prominent as the end of the ray is approached. Superomarginals 19 or 20; inferomarginals about 23 or 24. Adambulacral plates with proximally 3 or 4, or near end of ray 2, broad, flat subtruncate (spatulate) furrow spines, the end of the series with a curved contour and part or all of the aboral spine usually underlying the adoral spine of the succeeding plate. Subambulacral spines 2, sometimes 3, considerably shorter, round-tipped, heavier, but not broader than the furrow spines, and forming a straight series. External to these are 2 or 3 granules larger than the succeeding. Part or all of a second series of smaller granules belongs to the adambulacral plates.

Type.—Cat. No. 32638, U.S.N.M.

Type-locality.—Tonquil Island, Gumila Reef, south of Zamboanga, Mindanao.

This species differs from *F. balansæ* Perrier in having narrower rays, tuberculate marginals, and spatulate furrow spines.

OPHIDIASTER TRYCHNUS, new species.

Differing from *O. pusillus* Müller and Troschel in having the papulae in 8 longitudinal series and the central granules of the abactinal, marginal, and actinal plates enlarged, and subtuberculate on outer part of ray, and in having the pedicellariae sheaths toothed, not entire; differing from *O. tuberifer* in having 8 longitudinal series of papular pores, much larger and broader pedicellariae with the sheaths toothed, not entire, and in having a number of enlarged granules on the plates, not a single conical tubercle of predominant size. $R=19$ mm., $r=4$ mm., R = about 5 r ; breadth of ray at base, 5 mm. Rays cylindrical, only very slightly tapering, with a blunt extremity capped by a dorsal, convex, roundish terminal plate. Adambulacral plates wider than long, obliquely oriented; furrow spines 2, flattened, the adoral broadly spatulate, roundly truncate, about twice as long as breadth at tip; the aboral slightly shorter, much narrower, slightly tapering, and blunt. Forming a transverse, oblique, adorally trending series with the larger furrow spine, and without intervening granules, there is first a shorter compressed, broad, round-tipped granule, then a longer, much thicker ovoid or acorn-shaped slightly flattened tubercle, about as long as the larger furrow spine, but much more conspicuous. Between these consecutive transverse series there is a transverse series of elongate, bluntly pointed granules; and external to the series of tubercles there is a less regular series of shorter actinal intermediate tubercles, interspersed with a few longitudinally oriented pedicellariae. Relatively large two-jawed, excavate pedicellariae occur in variable numbers on the abactinal, marginal, and actinal intermediate plates. Each jaw is broadly spatulate, semicircular distally, broader than in *O. germani*, and has 4 or 5 relatively large teeth with corresponding indentations on the edge of the form.

Type.—Cat. No. 32639, U.S.N.M.

Type-locality.—Port Palapag, north coast of Samar; no record of depth or bottom, but probably collected on reef.

LEIASTER ANALOGUS, new species.

Resembling *L. coriaceus* Peters in having grooved furrow spines, but differing in having longer, slenderer rays, numerous pedicellariae, and the abactinal papulae in very definitely circumscribed areas. Differing from other species of *Leiaster* in having channeled furrow spines. $R=125$ mm., $r=18.5$ mm., $R=9$ r ; breadth of ray at base,

15 mm. Rays unequal, the longest 8.5 to 9 times as long as the width at base.

Type.—Cat. No. 32640, U.S.N.M.

Type-locality.—Station 5165, off Observation Island, Tawi Tawi Group, Sulu Archipelago, 9 fathoms, coral.

L. analogus differs from *L. leachii* in having perfectly smooth plates, not finely granulated ones, in having more numerous and grooved adambulacral furrow spines, and in having abundant pedicellariæ. *L. speciosus* is described as differing from *L. leachii* only in possessing pedicellariæ. Apparently *L. analogus* bears much the same relation to *coriaceus* that *speciosus* does to *leachii*. *L. glaber* and *L. callipeplus* lack pedicellariæ and have furrow spines without grooves.

Family ASTEROPIDÆ.

MARGINASTER PAUCISPINUS, new species.

Differing from *M. capreensis* (Gasco) [*M. fimbriatus* Sladen] in having no actinal intermediate and very few abactinal spinelets, broader marginal plates with slightly longer spines, more distinct lobes to the carinal plates, and 2 narrowly spatulate, webbed, subambulacral spinelets in a longitudinal series near the furrow margin; furrow spines 2 on the first 2 plates, then 1. R=11 mm., r=8 mm., general form arcuate pentagonal; whole body overlaid by skin; a few carinal, apical, and superomarginal spinelets, all inconspicuous, a conspicuous marginal fringe of webbed, flattened, narrowly spatulate spines; plates not superficially visible.

Type.—Cat. No. 32641, U.S.N.M.

Type-locality.—Station 5310, China Sea, vicinity of Hongkong (lat. 21° 33' N.; long. 116° 13' E.), 100 fathoms, sand, shells.

Family GANERIIDÆ.

TARACHASTER, new genus.

Rays slender, disk small; dorsolateral plates four-lobed, imbricated in regular transverse and longitudinal series; plates of median radial region mostly three-lobed, irregularly imbricated; marginal plates actinal in position, separated from adambulacrals over most of ray by a single series of actinal intermediate plates, and on disk by small plates in transverse series; actinal interradial areas small; papulæ single in the small interspaces between abactinal plates; plates convex and armed with a group of short, blunt, spinelets resembling parapaxillæ or pseudopaxillæ, 15 to 20 to a plate; marginal and actinal spinulation compact; adambulacral plates small with slightly curved furrow margin; spines small, crowded, grading into actinal spinulation; proximally 5 or 6, distally 3 or 4 furrow spines, with 2 to 4 crowded series each of 2 or 3 subambulacral spines. Well-developed

superambulacral ossicles; ampullæ double; tube feet rather small, with well-developed sucking disks.

Type of genus.—*Tarachaster tenuis*, new species.

TARACHASTER TENUIS, new species.

Rays 5. $R=67$ mm., $r=12$ mm., $R=5.5+r$; breadth of ray at base, 14 mm.; rays depressed, rather slender, long, bluntly pointed; disk small; sides of ray rounded and occupied by the abactinal plates; abactinal plates small, those on disk and along radial area of ray irregularly three-lobed, imbricating; dorsolateral, lateral, and narrow portion of ventral surface occupied by four-lobed plates in about 10 longitudinal series at base of ray, also forming transverse series; 3 series of larger plates adjacent to adambulacrals, the outer two being the marginals; plates covered by small, stout, upright, round-tipped, often clavate, close-set spinelets in groups resembling low parapaxillæ, 15 to 20 to a group; single papulæ between the abactinal plates; adambulacral plates small, armature dense, upright, the spinelets grading from the furrow series into those of the actinal intermediate and marginal plates; furrow spines proximally 5 or 6, distally 4 or 5, prismatic or four-sided, blunt or truncate, the proximal and distal shorter than the central 3 or 4; subambulacral spines in 2 or 3, sometimes 4, series, with 2 or 3, or proximally 4, shorter, less stout spines in each series. General appearance suggestive of a *Henricia* with closely placed plates.

Type.—Cat. No. 32642, U.S.N.M.

Type-locality.—Off Point Tagolo, northern Mindanao, 162 fathoms, sand; bottom temperature, 54.5° F.

It is difficult to place this genus. While it resembles *Henricia* superficially, the double ampullæ, closely placed and regularly imbricated plates, and presence of superambulacral ossicles debar *Tarachaster* from the Echinasteridæ. The two other families to which it shows most resemblance are the Ganeriidæ and Asterinidæ. *Tarachaster* resembles *Nepanthia* superficially, on account of the radial zone of irregularly arranged plates, but the actinal surface is more like that of the Ganeriidæ, to which the imbricated pseudo-paxillæ with definite lobes, the definite but not particularly conspicuous marginals, the actinal interradiæ plates in transverse columns, and the adambulacral armature would ally it. Superambulacral plates have not been reported in any of the three families.

Family ASTERINIDÆ.

NEPANTHIA PEDICELLARIS, new species.

Related to *N. brachiata* Kœhler, but differing in lacking a flange to the margin of rays, in having a narrower actinal intermediate area, with fewer (about 10) chevrons of plates, but more numerous

spinelets; subambulacral spines more numerous (8 to 12). Rays 6. $R=22$ mm., $r=8$ mm., $R=2.75 r$; breadth of ray at base, 7 or 8 mm.; abactinal surface arched, actinal surface plane; rays tapering, bluntly pointed, broader than usual in this genus; radial area of plates not very sharply marked off from lateral areas; plates crescent-shaped, the larger bearing 35 to 45 minute, sharp spinelets, and sometimes a simple pedicellaria composed of 2 spinelets stouter than the others; furrow spines 6 or 7, webbed, the adoral much the smaller; subambulacral spines webbed, 8 to 12; proximal actinal intermediate plates with 7 to 9 slender webbed spines.

Type.—Cat. No. 32643, U.S.N.M.

Type-locality.—Station 5482, off Cabugan Grande Island, Surigao Strait, east of Leyte, 67 fathoms, broken shells, stones, green mud.

In *N. belcheri* Perrier there are 7 rays, 6 furrow spines, and 3 subambulacral spines. In *N. joubini* the arms are slenderer and the furrow series symmetrical, not as in *pedicellaris* with the adoral spine much shorter than the aboral. The adambulacral spines are also much shorter, and the actinal intermediate plates bear numerous short spinelets. They are similar to the dorsolateral plates, and do not, as in *pedicellaris*, resemble the actinal intermediate plates of *Asterina*.

NEPANTHIA PLATYDISCA, new species.

Rays 5. $R=54$ mm., $r=23$ mm., $R=2.3 r$; breadth of ray at base, 36 mm.; interbrachia rounded; rays tapering evenly from base to bluntly pointed extremity; general form much flattened, and resembling an *Asterina* with thin disk; edges of disk and ray thin; abactinal plates divided into 2 areas, a median radial where the plates are irregularly distributed and lateral areas where the plates form transverse (and also to some extent longitudinal) series, the transverse with about 26 or 27 plates at base of ray; plates resembling small flat-topped pseudopaxillæ; actinal intermediate plates small, in transverse series, the larger plates with 15 to 20 slender, very sharp, webbed spines; furrow spines 7 or 8, webbed into a very convex fan; subambulacral spines 18 to 20, also webbed, usually erect. In favorable places they may be seen to form a very convex series with 6 or 8 spines in the concavity of the series, and involved in the same membrane. Mouth plates with 11 or 12 marginal spines; suboral spines 20 to 25, in 2 series, parallel to free margin, with 5 or 6 extra spines between the second series and the median suture.

Type.—Cat. No. 32644, U.S.N.M.

Type-locality.—Station 5645, Buton Strait, Celebes, 206 fathoms, bottom not recorded

This species has the general appearance of a very thin *Asterina*, with radial areas of irregularly arranged plates and lateral areas of serially arranged plates. The actinal intermediate plates are very

numerous and bear numerous webbed sharp spinelets, which are usually bent toward the margin and have the appearance of serrate combs. The spinelets are really in groups (as may be seen when they stand erect), and all are involved in the web.

The type of the genus *Nepanthia*, *N. maculata*, is an entirely differently formed animal, with cylindrical rays. It becomes difficult to separate *Nepanthia* sharply from *Asterina*, because *N. platydisca* really agrees with *Asterina* in form. The differentiation of the abactinal plates and the numerous actinal intermediate spinelets will separate this species from any known *Asterina*, while the flattened form and numerous adambulacral and actinal intermediate spines will separate it from *N. brachiata*, which has 6 rays and a more depressed, *Asterina*-like form than any other species heretofore described.

ANSEROPODA MACROPORA, new species.

Rays 5. $R=16$ mm., $r=8.5$ mm., R =slightly less than $2r$. Proportions and form variable; a four-rayed specimen has the following dimensions: $R=17.5$ mm., $r=13$ mm.; in the latter the margin of ray curves outward and has a broad leaf-like contour. Species characterized by presence along radial line of a zigzag series of 7 to 11 wartlike conspicuous protuberances composed of 4 upright spinulate plates, guarding a large papular pore; other abactinal plates with divaricate tuft of 8 to 12 very delicate spinelets; actinal intermediate area with spaced combs of 3 to 5 delicate, sharp, spinelets; furrow spinelets 5, webbed, the adoral set back slightly from margin; subambulacral spinelets 1 or 2, near adoral margin of plate.

Type.—Cat. No. 32645, U.S.N.M.

Type-locality.—Station 5146, Sulu Archipelago, off Sulade Island, southwest of Jolo, 24 fathoms, coral sand, shells.

This species belongs to the section of the genus in which there are few papular pores, in a single series, on either side of the median radial line. Its distinguishing peculiarity is the specialization of these pores, which are guarded by elevated plates, forming tubercular, spinulate, protuberances. The papulae themselves are large.

Family SOLASTERIDÆ.

LOPHASTER SULUENSIS, new species.

Resembling *L. furcilliger* Fisher in general form but with much lower paxillæ, especially the marginal, the pedicels being much shorter than the spines; inner or lower inferomarginal spines conspicuously longer than upper; furrow spines 5 or 6, rather long; subambulacral spines 3 or 4, heavier and longer than furrow spines, and equal to about 2 plates in length. Rays 5. $R=82$ mm., $r=16$ mm., $R=5r$; breadth of ray at base, 19 or 20 mm.; rays slender, gradually tapering, bluntly pointed; abactinal surface arched, actinal surface plane.

Abactinal plates strongly four-lobed, with a low pedicel, bearing 7 to 10 tapering, thorny, pointed spines, the median slightly longer than the peripheral. The spines vary from 1 to 2 mm. in length, while the pedicel is ordinarily about one-half the length of spines. Papular areas of apical region with 5 to 7 papulæ; those of proximal part of ray with 3 or 4; those of distal portion of ray with 1 or 2. Counting across base of ray about 18 longitudinal series of plates, rather regular in median radial region.

Marginal paxillæ comparatively small, the superomarginal decidedly smaller than the inferomarginal and usually alternating with them. The inferomarginal paxillæ have low pedicels, about as high as broad, surmounted by about 15 to 18 spines, of which 3 or 4 on the side toward furrow are about 2.5 mm. long while the others decrease in size to about 0.75 mm. on the dorsal side of the paxilla. The proximal superomarginals have 12 to 15 spines and the pedicel is about two-thirds the height of the inferomarginal pedicels, while the tuft of spines is of about half the bulk of the inferomarginal spines.

Actinal interradial areas small, the plates bearing 3 or 4 spinelets and extending about two-thirds the length of ray in a single series.

Type.—Cat. No. 32646, U.S.N.M.

Type-locality.—Station 5423, Sulu Sea, off Cagayan Island, 508 fathoms, gray mud, coral sand, bottom temperature, 49.8° F.

L. suluensis differs from *L. furcifer* in having longer, slenderer rays, longer paxillar spines, and relatively shorter pedicels, longer and unequal marginal paxillar spines, more numerous furrow spines, and very much longer subambulacral spines, the latter being longer than the marginal paxillæ with their spines. The mouth plates of *L. suluensis* are larger with more numerous and longer marginal spines (12 or 13). *L. suluensis* differs from *L. stellans* Sladen, and *L. abbreviatus* Kœhler (Antarctic species) in having a much less robust form, longer rays, more numerous furrow spines (4 short ones in *stellans* and 3 rather long ones in *abbreviatus*) and much more prominent subambulacral spines (longer, not shorter, than marginal paxillæ with their spines). *L. suluensis* resembles in general form 2 Antarctic species, *L. antarcticus* Kœhler and *L. gaini* Kœhler, but differs in having 5 or 6 instead of 4 furrow spines, 12 or 13 instead of 7 or 8 marginal mouth spines. *L. antarcticus* has 20 to 40 paxillar spines and much less prominent subambulacral spines when compared either with the fairly long furrow spines or the more prominent inferomarginal paxillæ. *L. gaini* has more prominent paxillar pedicels, less thorny paxillar spines, more prominent inferomarginal paxillæ, and the actinal intermediate paxillæ are reduced to about 4 in each interradial area. In *L. suluensis* they extend at least two-thirds the length of the ray.

SOLASTER TROPICUS, new species.

Rays 9 or 10. $R=145$ mm., $r=53$ mm., $R=2.7+r$; breadth of ray at base, about 35 mm. Disk large, rays fairly broad at base, tapering to a pointed extremity. Pseudopaxillæ very small, well spaced, with 4 to 6 small spinelets; inferomarginal plates prominent with numerous spinelets increasing very rapidly in size toward the inner or lower end of the compressed, transversely oriented tabulum or pedicel; distal marginals with mostly large spinelets only; furrow spines 5 or 6, rather long; subambulacral spines 5 to 7, subequal in length to furrow spines, but heavier; the inner end of the transverse comb is turned aborad, and the innermost spine is shorter than the second; superomarginal paxillæ small, alternating with the inferomarginals. Resembling somewhat *S. paxillatus*, but with more numerous furrow spines, less conspicuous subambulacrals, heavier inferomarginal spinelets, less conspicuous superomarginals, and fewer paxillar spinelets.

Type.—Cat. No. 32647, U.S.N.M.

Type-locality.—Station 5654, Gulf of Boni, Celebes, 805 fathoms; bottom not recorded.

This species is allied to *S. paxillatus* Sladen, but probably not very closely, while it also shows some resemblance to *S. borealis* Fisher, although it is not at all closely related to this form. The following differences separate *tropicus* from *paxillatus*. In *tropicus* the paxillæ have fewer, relatively coarser spinelets; marginal plates lower, with conspicuously heavier spinelets at the inner or lower end than at the upper or outer, and distal marginals occupied almost entirely by a relatively few large spinelets (somewhat as in *S. borealis*); in *S. paxillatus* the inner marginal spinelets are only a little larger than the outer and the armature of the distal marginals does not differ materially from that of the proximal; in *tropicus* the superomarginals are lower and less conspicuous, the furrow spines more numerous (5 or 6 instead of 3 or 4) and in large specimens the subambulacral spines are decidedly less prominent (subequal to furrow spines). *S. tropicus* differs from *S. borealis* in having less prominent marginal plates and much more numerous and smaller marginal spines, distinguishable superomarginal plates, more numerous and longer furrow spines, and more numerous and longer subambulacral spines. *S. regularis* Sladen has larger and more widely spaced paxillæ, more prominent marginal plates, and the subambulacral spines form a straight series. *S. subarcuatus* Sladen has fewer inferomarginal spines (10-12), fewer furrow spines (3 or 4), and fewer oral and suboral spines. *S. torulatus* Sladen has less prominent, actually situated marginals, with subequal spinelets, shorter furrow spines, fewer subambulacral spines in a straight series, smaller actinal inter-radial areas, and slightly more numerous abactinal paxillar spinelets.

SOLASTER SCOTOPHILUS, new species.

Related to *Solaster papposus*, but differing in being of a much more delicate habit, with more numerous furrow and suboral spines, smaller paxillæ, smaller and more numerous marginal paxillæ, and a much more delicate skeleton. Rays 9. $R=48$ mm., $r=14$ mm., $R=3.4 r$; breadth of ray at base, 10 mm.; disk large, rays slender, flexible, tapering to a sharp point; skeleton delicate, open, irregular; paxillæ small, the pedicel about 0.5 mm. high and the longest spinelets 1.25 mm. long; marginal paxillæ, 24 or 25, delicate; furrow spines very delicate, 8 or 9; subambulacral spines, 7 to 9; marginal mouth spines, 15.

Type.—Cat. No. 32648, U.S.N.M.

Type-locality.—Station 5651, Gulf of Boni, Celebes, 700 fathoms, green mud; bottom temperature 38.7° F.

The only species, besides *S. papposus*, to which *S. scotophilus* shows close resemblance are *S. penicillatus* (Sladen) and *S. japonicus* Fisher. *S. japonicus* is of the habit of *S. papposus*, having large penicillate paxillæ, and heavier spines generally than occur in *scotophilus*. From *S. penicillatus*, *scotophilus* differs in having much more numerous furrow spines (4 or 5 in *penicillatus*), more numerous marginal paxillæ, and smaller and more delicate abactinal paxillæ.

Genus RHIPIDASTER Sladen.**XENORIAS, new subgenus.**

Differing from *Rhipidaster* sensu strictu in the position of the marginal plates which are oblique, but instead of being parallel with one another are inclined at an angle of 45° and touch by the intermarginal ends, forming a series of chevrons along the side of ray. Abactinal plates and adambulacral plates essentially as in *Rhipidaster*.

Type of subgenus.—*Rhipidaster* (*Xenorias*) *polycstenius*, new species.

RHIPIDASTER (XENORIAS) POLYCTENIUS, new species.

Rays 7. $R=50$ mm., $r=14$ mm., $R=3.5 + r$; breadth of ray at base, 12 mm.; rays slightly convex, tapering evenly to bluntly pointed extremity. Differing from *R. vannipes* in having very much shorter abactinal spinelets invested in a common sheath; curiously compressed, obliquely oriented, lateral, superomarginal and inferomarginal plates (with intermarginal ends adrad) bearing a transverse comb of webbed spines, those at the abrad end of each plate much longer than the others; furrow spines 9 or 10; subambulacral comb of 4 spines; abactinal integument pulpy, hiding the skeleton which consists of 3- or 4-lobed, closely imbricated plates; papulæ 1 to 3 to each mesh.

Abactinal surface is covered with rather uniformly distributed fascicular tufts of small spinelets invested in a common pulpy sheath from which the tips of the spinelets protrude a short distance. These fascicles with their investment are about 1 mm. long and 0.75 mm. in diameter, and resemble tubercular projections of the integument. In those which appear to be nearly normal the investment forms a collar surrounding the spinelets, which are themselves imbedded in the central pulpy part of the sheath. Fascicles spaced about once their own diameter, or less, on disk and base of rays, and are arranged in quincunx on the sides of rays. Each pseudopaxilla consists of a low pedicel or convex plate, surmounted by 9 to 12, or sometimes fewer, very delicate, tapering, glassy spinelets ending in several points.

The marginal plates are conspicuous, low, transverse ridges, oriented obliquely, as well as bent aborad, each pair of marginals forming a chevron the angle of which is toward base of ray. A series of about 40 of these chevrons occupies the side of each ray. The spine-bearing crest of the marginals has the appearance of being bent aborad, and the upper end of the superomarginal and the lower end of the inferomarginal is in the form of a slight knob, each bearing about 3 prominent, tapering, sharp, closely appressed spines, the median usually the longer. The inferomarginal spines are longer than the corresponding superomarginal spines, being slightly longer than the extreme width of the plate. Six to nine slenderer, shorter spinelets continue the superomarginal series to the intermarginal end of the plate, while 3 to 5 similar spinelets complete the inferomarginal series. Both series are webbed. The large inferomarginal spines are on the angle between the lateral and actinal faces of ray, and proximally a fourth shorter spine is added to the actinal end of the series. The points of the spines frequently converge (the median being longest), and the group has the appearance of Sladen's figure of the "actinal intermediate" spines of *R. vannipes*.

Furrow spines 9 or 10, distally 8, united by membrane for two-thirds their length into a prominent scoop-shaped fan very much as in *R. vannipes*. On the surface of the plate is an oblique comb of 4 stouter, tapering, sharp spines, the 2 median the longest and slightly longer than the furrow spines.

Mouth plates prominent and strongly convex at the outer end. Marginal spines 15 to 17, the 3 inner long, slender, pointed, and directed over actinostome, the remainder usually standing upright, and much shorter and slenderer. A prominent suboral spine near inner end of plate, and 3 shorter spines near outer end of plate midway between suture and furrow margins.

Type.—Cat. No. 32649, U.S.N.M.

Type-locality.—Station 5622, off Makyan Island, Molucca Islands, 275 fathoms, gray mud.

Family MYXASTERIDÆ.

ASTHENACTIS MEDUSA, new species.

Differing from *A. papyraceus* Fisher¹ in lacking entirely the actinolateral membrane, in having 13 marginal mouth spines forming a sharply angular webbed series, the distal of conspicuous length, and in having 9 rays. $R = 225$ mm., $r = 52$ mm., $R = 4.3$ r; breadth of ray at base, 25 mm. Rays slightly swollen above base, tapering to slender, flexible, pointed extremity; dorsal surface of ray arched; that of disk flattened.

The adambulacral armature, with the exception of the actinolateral membrane, is very similar to that of *A. papyraceus*, consisting of 9 or 10 very delicate, webbed spines increasing in length from the inner to the outermost, the outer two being longest and standing on an extension of the next adorally situated plate (see figures of *A. papyraceus*). In *papyraceus* the consecutive outer spines are joined by a sort of actinolateral membrane, but in *A. medusa* they are independent, the membrane being joined to the side of the ray just above the base of the outer spine.

The mouth spines form an angular series, the first to seventh being on the actinostomial margin, the eighth on the angle of the plate directed toward mouth of furrow, while the remaining five form a group adjacent to the first adambulacral comb, on the very short furrow margin of the plate. All are joined by membrane, and the distal spines are of conspicuous length, though shorter than the innermost.

The abactinal spines are extremely delicate and resemble fine glassy hairs. Eight or nine are borne on an eminence of the extremely thin plates and are united by membrane. The fascicles are 6 to 8 mm. long and spaced 2 or 3 mm. apart.

Madreporic body slightly convex, 6 mm. in diameter, and situated slightly adcentral to the middle of r . The actinostome is wide (38 mm.) and the tube-feet large, with large sucking disks.

Type.—Cat. No. 32650, U.S.N.M.

Type-locality.—Station 5605, Gulf of Tomini, Celebes, 647 fathoms, bottom not recorded.

The absence of an actinolateral membrane suggests the possibility that in *Myxaster* the adambulacral armature may also be common to two plates. In such an event this species would be placed in *Myxaster*, and the actinolateral membrane might be retained as the diagnostic character of *Asthenactis*. For the present it seems best to classify this species in *Asthenactis* on the basis of the identity of structure of the adambulacral plates.

The name *medusa* is suggested by the twisted snake-like rays.

¹ For description and figures, see Starfishes of the Hawaiian Islands, U. S. Fish Commission Bulletin for 1908. Part 3, p. 1096, pl. 40, figs. 3, 3a.

ON A BRACKISH WATER PLIOCENE FAUNA OF THE SOUTHERN COASTAL PLAIN.

By WILLIAM HEALEY DALL,

Curator, Division of Mollusks, United States National Museum.

In Bulletin 5A, of the State survey, on the phosphates and marls of Georgia by S. W. McCallie, page 87, 1896, attention is called to a marl bed on the Satilla River by the following remarks:

Several miles further up the river, on Mr. James P. King's estate, occurs an extensive marl bed. The property on which the deposit is located is situated 6 miles south of Atkinson, and of late years it has become quite a popular resort for fishing parties, whose attention is usually attracted by the peculiar appearance of the deposit. The principal exposure occurs at the base of a bluff, on the left bank of the river, a few hundred yards north of the mansion house. The bluff, which is about 30 feet in height, shows the following geological section:

	Feet.
Soil	1½
Bluish clays	2
Motley, sandy clays	10
Light-colored, sandy clays	5
Yellowish, sandy clays	4
Laminated blue clays	2
White sand	1
Blue clay	2½
Marl	2

At the time of our visit only about 2 feet of the marl bed was exposed above the surface of the water. However, detached fragments of the bank below this level show that the bed attains a thickness at this point of 4 feet or more. The deposit consists almost entirely of small bivalve shells, with a sandy clay matrix. Associated with the shells are fragments of bones and what appear to be the remains of the carapaces of turtles and crabs. The marl has been used to a limited extent by Mr. King as a fertilizer on various crops, and it is said to have given very satisfactory results. It is evidently of much value, locally, as a fertilizer. However, it could not probably be transported to any distance with profit. Another outcropping of the deposits occurs about a mile farther up the river; but it here seems to be diminished in thickness, and also contains more sand and clay.

In 1911 the Hon. T. H. Aldrich examined some of this marl at the suggestion of Mr. McCallie, and, recognizing that many of the species were new and that the indications were that the fauna was of

Pliocene age, described in the *Nautilus*¹ a number of the species. His introductory remarks are as follows:

Some years since Professor S. W. McCallie, State geologist of Georgia, called my attention to a small block of soft marl in the State museum which had a number of shells in it, and at my solicitation the same was kindly forwarded to me for examination. I found the specimens were a mixture of fresh water and marine, and that the fresh water ones seemed to be new, besides being more or less distorted. The specimens were very fragile. Notwithstanding the greatest care many of the most distorted were badly broken. It is hoped that a future examination will reveal more species and an assortment of forms far greater than those here described. The horizon is probably *Pliocene*, and seems to represent a southern fauna. The exact locality is 4 miles south of Atkinson, Wayne County, Georgia, on the Satilla River. The list of species is as follows:

1. *Rangia cuneata* Gray. (Common, rather small.)
2. *Mulinexa lateralis* Say.
3. *Mulinexa congesta* Con.
4. *Dosinia*.....sp. ? (Young shells.)
5. *Modiolaria*.....sp. ?
6. *Gemma purpurea* H. C. Lea.
7. *Neritina*.....sp. ? (Too poor for identification.)
8. *Neverita*.....sp. ? (Fragments.)

The new species described were:

9. *Potamides saltillensis*.
10. *Potamides cancelloides*.
11. *Paludestrina plana*.
12. *Amnicola saltillensis*.
13. *Amnicola georgiensis*.
14. *Amnicola expansilabris*.
15. *Planorbis antiquitus*.

It is to be noted that by a typographical error the name *saltillensis*, from the Satilla River, was misspelled *saltillensis*, probably from some confusion with the Saltilla River of eastern Mexico.

Some of this marl was sent in to the United States Geological Survey by the parties under Dr. T. Wayland Vaughan's direction, who were working on the geology of the coastal plain of the United States, chiefly by Mr. George C. Matson. Part of the material came from the original locality on the Satilla River, Georgia (station 6132), and was collected for Mr. Matson by L. W. Stephenson. The same fauna was recognized in material from a well at the depth of 49 feet in the northeast quarter of section 28, township 3 north, range 2 west, Louisiana meridian, 6 to 8 miles southwest of Alexandria, Louisiana (station 6040). This locality is known as the Frank Muse place in Rapides Parish, owned by Dr. R. O. Simmons and others. Also from a well of the Producer's Oil Co., Pine Prairie oil field, Louisiana (station 6445). The depth here was given as 1,540 feet, but I accept this with all reserves. Lastly, several localities near Burkeville, Newton County, Texas, were discovered

¹ Vol. 24, No. 11, March, 1911, pp. 131-132, continued in the April number, pp. 138-140, with plates 8-10.

and explored for fossils by Messrs. Vaughan and Matson. These were, respectively, 1 (station 3614) and 3 (station 6440) miles southeast of Burkeville. The material here is a fragmentary rock, with very poorly preserved fossils, almost all in the form of molds or internal casts, and contains, besides traces of barnacle valves and mollusks, bones of birds and carbonized fragments of wood. The molluscan fauna is mostly the same as at the Satilla locality.

Mr. Geo. C. Matson has kindly furnished the following data in regard to the geological conditions at Burkeville:

My collection was obtained from the south side of Cow Creek about one to one and a half miles from the town of Burkeville, Texas. The fossils occurred as casts and molds in lenses of limestone about four to six inches thick. These lenses are exposed in a small gully and the available area for collection does not exceed four or five square feet.

The limestone is very hard and weathers light gray or yellow with a rough surface resulting from unequal resistance to solution. Associated with the imprints of shells are a few fragments of bones, but it is difficult to obtain anything but fragments of either vertebrate or invertebrate remains because the rock splits so irregularly. The limestone lenses are imbedded in a very plastic clay which is light blue or green where recently exposed but changes to black or brown on weathered surfaces. In this clay or scattered over its surface are many rounded or oval concretions of calcium carbonate, occasional vertebræ and fragments of other bones, together with oyster shells similar to those found in the limestone. The concretions vary from small nodules, apparently formed by the cementing of still smaller granules, to flat boulders from a few inches to a foot or more in diameter. Many of the larger concretions show concentric and radial cracks filled with calcite and are therefore to be classed as septaria.

The black clay found at this locality is not confined to the vicinity of Burkeville, for it extends southward about four miles and is reported some distance north of town. This clay may be traced into western Louisiana where it forms the Anacoco prairies. By means of scattered outcrops it is possible to determine its occurrence several miles east of the Texas-Louisiana boundary.

The interest of this fauna lies not only in its being strictly brackish water and containing a large number of hitherto unknown species, but in its wide distribution along the edge of the Pliocene coastal plain, forming a faunal horizon hitherto unrecognized.

The conditions appear to have been not unlike those which obtain at certain portions of the Gulf coast to-day; probably lagoons into which the streams poured fresh water carrying with it small fresh-water gastropods and occasionally valves of Unionidæ. On the other hand, the sea had access to the lagoons, keeping the salinity of the water such that oysters and anomias could flourish with other smaller mollusks which frequent oyster beds, while occasionally purely salt-water shells might be ejected by wandering fishes or carried by violent storms.

It will be noted that the softer marl of Satilla River has preserved most of the small fresh-water gastropods, which are absent from the coarser sediments of the western localities where the oysters appear

more abundantly, while the cerites and melanians are generally distributed.

This account of the fauna is published by permission of the Director of the United States Geological Survey, under whose auspices the fossils were collected.

A description of the species found follows:

RANGIA CUNEATA Gray, var. **SOLIDA**, new.

Plate 20, fig. 7.

Shell small, very solid, rounded triangular, externally smooth except for incremental lines; beaks low, pointed, close to the margin; dorsal margins nearly straight, meeting under the beaks at an angle; hinge much as in *R. cuneata* but the laterals shorter.

Length 20, height 17, diameter 10 mm.

Station 6040; abundant; also from the locality on the Satilla River, Georgia. Type, U. S. Nat. Mus., No. 166282.

This form differs from *R. cuneata* in many particulars; if the specimens collected are adult, there is an enormous difference in size; but of this I am uncertain and so lay no stress on this feature. Specimens of *R. cuneata* of the same size as the fossils differ by being more inflated and less triangular; by having the beaks more distant from the hinge line and the dorsal margins constituting one sweeping curve instead of meeting at an angle; by the longer and more sharply striated lateral teeth and larger cardinals.

This is the form referred to in Aldrich's list.

MULINIA SAPOTILLA Dall

Plate 20, fig. 1.

Mulinia sapotilla DALL, Trans. Wagner Inst., vol. 3, pt. 4, p. 902, pl. 28, figs. 7, 8, 9, 14, 1898.

Stations 6040 and 6445. Also in the Pliocene of the Caloosahatchie River, Florida, as one of the most characteristic species.

The specimens from the Satilla marl are all immature and vary very much in relative length, inflation, etc. I have seen no other *Mulinia* from these marls and feel reasonably confident that the *M. congesta* mentioned by Mr. Aldrich is an accidental intruder. *M. lateralis* might well occur here, but has not been found in any of the material I have examined.

HETERODONAX ALEXANDRA, new species.

Plate 20, fig. 8.

Shell differing from the recent *H. bimaculata* in the different proportions of the valves before and behind the beaks, the anterior portion being shorter and the posterior portion much more produced and more compressed. The posterior part of the valve is consider-

ably longer than the anterior, while these proportions are reversed in the recent shell. The fossil is also less solid than recent shells of the same size.

Although the fossil is only represented by two broken right valves the difference is so remarkable that I have no hesitation in regarding it as a distinct species.

The fossils come from station 6040, near Alexandria, Louisiana. Type, U. S. Nat. Mus., No. 166286.

MYTILOPSIS, sp. indet.

Very young specimens of a species of *Mytilopsis* allied to *M. leucopheatus* of Conrad were found in the marl from station 6040. They were too immature to be specifically identified. It is possible that this is the shell referred to *Modiolaria* by Mr. Aldrich, or that his shell may be *Modiolaria lateralis* Say, which is known from the Pliocene of Florida.

UNIO (LAMPUSILIST) SANDRIUS, new species.

Plate 20, figs. 4, 5.

Shell small, solid, bluntly rounded and inflated in front and rapidly attenuated and almost pointed behind; anterior end shorter, posterior longer, the beaks nearly at the anterior fourth of the shell; beaks with one or two obsolete concentric undulations, or quite smooth, small, distinctly prosocoelous; remainder of the surface smooth except for faint incremental lines and a shallow sulcus close to the posterior dorsal margin in each valve with an obsolete ridge on each side of it; in front of and under the beaks is a wide obscurely lozenge-shaped excavation, probably occupied in life by an extension of the ligament and with a sharp-edged border; ligamentary attachment behind the beaks linear; interior with the anterior muscular scar deeply impressed, the posterior scar faint; dentition in the left valve a transversely corrugated lamina, narrow and elongated, not divided into teeth, under which is a cavity for the tooth of the opposite valve; lateral tooth long, single, with a deep narrow sulcus above it; right valve with a strong obscurely triangular corrugated tooth, the distal end sharply bifid. Length of shell, 24; height, 12.5; diameter about 12 mm., measured on incremental lines of broken valve, the total length of which is over 30 mm.

Section 28, township 3, range 2, 6 to 8 miles west of south of Alexandria, Louisiana, at station 6040. Type, U. S. Nat. Mus., No. 166288.

There seems to be no recent species of close relationship to this. From the look of the fossil the color of the nacre was probably purple.

The locality is the "Frank Muse place," from about 48 feet below the surface in a well. Specimens from station 3614, in Texas, are too poor to be identified but have some resemblance to this species.

UNIO (PLEUROBEMA?) ALIKUS, new species.

Plate 20, fig. 2.

Shell represented by a fragment which from the incremental lines must have been a shorter, heavier, and more triangular shell than *U. sandrius*, the beaks are nearly terminal and, though decorticated, show a median depression but no traces of concentric sculpture; the ligamentary area is impressed much as in *U. sandrius*, but is much shorter, wider, and more triangular; the tooth above is divided into two laminae, transversely corrugated and narrow as seen from above, but below is very thick and ponderous and deeply raggedly cleft for the opposite cardinal. There is one left lateral and sulcus as in the last, but shorter. The proportions, taken from incremental lines, are length 16, height 11, diameter about 10.5 mm. The adult shell of course was at least twice that size.

Same locality (station 6040) as the last species, from which it differs in form, in weight, and especially in the character of the ligamentary area and left cardinal tooth. Type, U. S. Nat. Mus., No. 166289.

It might perhaps be regarded as nearest to *Pleurobema clava* of the recent fauna.

UNIO (UNIO) MUSIUS, new species.

Plate 20, fig. 6.

Shell short, rounded-triangular, represented by a fragment including the perfect umbo of a right valve; ligamentary area narrow, elongate, two rather thickish right laterals, the cardinal strong, triangular with the upper surface deeply transversely strigose; there is a faintly elevated ray from the beak which has six or seven subequidistant concentric lamellae, strongest behind and somewhat produced when they cross the ray; on the anterior umbonal slope two or three elevated threads arise in a radiating manner; becoming more prominent distally.

Length of fragment about 11 mm. Type, U. S. Nat. Mus., No. 166290.

This appears to resemble *U. obesus blandingianus* of the recent fauna; it comes from the same locality (station 6040) as the preceding species, from which it is obviously very distinct.

OSTREA VIRGINICA Gmelin.

Ostrea virginica GMELIN, Syst. Nat., p. 3336, 1792.

Ostrea elongata SOLANDER, Portland Cat. No. 3312, p. 151, 1786.

Stations 3614, 6040, 6440, and 6445. Also Pliocene of Florida, Pleistocene, and Recent.

The only stations from which identifiable oysters were obtained were 3614 and 6440, in Texas. But abundance of comminuted fragments and very young valves occurred at all the stations.

ANOMIA, sp. indet.

A large *Anomia* with irregular radial sculpture, but with the hinge-line and muscular impressions worn away, was obtained with the oysters at station 3614; and at station 6440 an impression, remarkably like a large *Lima*, but which is probably due to a distorted specimen of the same *Anomia*. If the surface sculpture is characteristic it is an undescribed species.

POTAMIDES MATSONI, new species.

Plate 21, figs. 1, 2, 7.

Shell solid, rude, subconic, of about 10 whorls; nucleus small, smooth; spire acute; axial sculpture of incremental lines and numerous flexuous low undulations hardly well defined enough to call ribs in average shells but strong and regular in some and obsolete in other specimens. Spiral sculpture of 1 strong posterior and 2 anterior weaker, flattish cords with channeled interspaces, the posterior interspace wider and more conspicuous, all surmounted at times by fine spiral threadlets which are frequently absent or obsolete; the rounded base has 6 or more similar cords with wider interspaces, varying in prominence in different individuals; aperture subquadrate, the outer lip very flexuous, a wide sinus above, the lip patulous on the base, the canal short, very wide and shallow and curved to the left; the pillar very short and the body covered with a smooth callus; the inside of the outer lip smooth. Length of shell 28, maximum width 13; width at seventh whorl, counting backward, 2.5 mm.

Station 6040, near Alexandria, Louisiana, Matson; also at stations 3614, 6440, and 6445. Type, U. S. Nat. Mus., No. 166293.

POTAMIDES MATSONI, var. *GRACILIOR* new.

Shell with practically the same sculpture, but more regular and slender, and with the sculpture more uniform. Length 20, maximum diameter of base 7 mm.

With the typical form but readily separable, and from the same localities, stations 6040, 6440, and 6445. Type, U. S. Nat. Mus., No. 166294.

CERITHIOPSIS? BURKEVILLENSIS, new species.

Plate 22, fig. 5.

Shell elevated, rather slender, with about eight whorls exposed, strongly sculptured; suture deep, spiral sculpture of a strong strap-like band immediately in front of the suture, and another behind the next suture; with a rather deep furrow in front of the band; axial sculpture of about 18 strong flattish ribs with narrower interspaces, passing under the furrows at either end, obscurely nodulating the presutural band, and having faint indications of a spiral groove divid-

ing the ribs about in the middle. Length of 8 whorls, 10; maximum diameter of last visible whorl, 2.5 mm.

Station 6440, near Burkeville, Texas, Matson. Type, U. S. Nat. Mus., No. 166316.

The base of the last whorl is missing in both molds. The sculpture recalls that of *Terebra*, but the general aspect is more like *Cerithiopsis*. The description is drawn from a gutta-percha cast from the original mold.

PACHYCHEILUS ANAGRAMMATUS, new species.

Plate 21, figs. 5, 8.

Shell slender, with about 11 whorls, the earlier ones smooth, rather flat-sided, but with a distinct suture; the later ones more rounded, with spiral cords, at first obscure, later sharp, with wider channeled interspaces, about 4 between the suture and the periphery; on the base about 6, the outer cord distinct, the others becoming more feeble and obscure toward the axis; or the whole shell may be smooth and flat-sided like the early whorls; aperture rounded, the peritreme sharp, simple, a rather thick callus spread over the body. Length of shell when complete, about 24; diameter of last whorl, 8 mm.

Stations 6040, Louisiana, and 6440, Texas; Matson. Type, U. S. Nat. Mus., No. 166295.

PACHYCHEILUS CANCELLOIDES Aldrich.

Potamides cancelloides ALDRICH, Nautilus, vol. 24, pt. 12, p. 138, pl. 8, figs. 2, 2a, 1911.

Station 6132, Aldrich and Matson, Satilla River, Georgia.

This species appears to belong rather to *Pachycheilus* than to *Potamides*.

PACHYCHEILUS SATILLENSIS Aldrich.

Potamides satillensis ALDRICH, Nautilus, vol. 24, pt. 11, p. 132, pl. 8, figs. 1, 1a-c, 1911.

Station 6132, Aldrich and Matson. Also at station 6440, near Burkeville, Texas, Matson.

PACHYCHEILUS SUAVIS, new species.

Plate 21, figs. 6, 9.

Shell acutely conical, with about 10 whorls, the apical portion sculptured, the last 2 whorls smooth, except for incremental lines; nucleus very small (not seen); subsequent whorls (except the last one or two) with about a dozen flexuous ribs with wider interspaces, crossed by 4 or 5 flattened spiral cords separated by narrow grooves; this sculpture is sometimes prolonged even to the last whorl, becoming gradually feebler, yet in the majority of cases it becomes obsolete on the eighth and is wholly absent on the last whorl. The latter is

ovately rounded and sculptured only by incremental lines, though in young specimens there is sometimes a series of fine spiral grooves near the canal. Aperture narrowly ovate, acute behind; outer lip flexuous, sharp, produced in front, smooth inside; pillar arcuate, smooth, with a thick layer of enamel extending over the body; suture distinct, not appressed. Length (slightly decollate), 20; maximum diameter, 9.5 mm. Length of figured specimen, 16 mm.

Station 6040 near Alexandria, Louisiana; also from station 6445, the Producer's Oil Co.'s well, Pine Prairie oil field, at a depth of 1,540 feet, Louisiana, Matson; and at station 6440, Texas. Type, U. S. Nat. Mus., No. 166298.

This is a form of rather unusual characters for the genus, but one of somewhat similar aspect among recent shells has recently been described by Doctor Pilsbry from Mexico.

TURRITELLA SATILLA, new species.

Plate 22, fig. 6.

Shell of 10 or more whorls, small, acute, fragile, with a minute smooth nucleus of 2 or 3 whorls; suture deep, distinct; spiral sculpture on the subsequent whorls of 3 prominent more or less beaded elevated threads or cords, with one or more simple minute threads in the wider interspaces; axial sculpture of incremental flexuous lines which, when strong, cut the major spirals into beads or nodules; base bordered by major cord, within which it is slightly concave and smooth; aperture subquadrate and simple. Length of type-specimen, 4.5; maximum diameter of base, 1.5 mm.

Station 6040, near Alexandria, Louisiana. Type, U. S. Nat. Mus., No. 166300.

Though so small a shell, this species possesses all the usual characters of the genus, and may grow to a much larger size.

ISAPIS OBSOLETA, new species.

Plate 22, fig. 8.

Shell small, with an acute spire and slightly turritid whorls; last whorls much the largest, ovate, spirally sculptured with 7 channeled grooves crossed by prominent lines of growth visible only in the grooves; interspaces smooth except for faint incremental lines; aperture ovate, outer lip sharp, simple; pillar arcuate, with a narrow umbilical chink behind it; nucleus lost. Length of shell, 3.5; diameter, 2.5 mm.

Station 6040, near Alexandria, Louisiana. Type, U. S. Nat. Mus., No. 166301.

A very distinct species of a genus which contains but a few species on the American coast.

STYROLA THELMA, new species.

Plate 20, fig. 3.

Shell small, elongate-conic, smooth except for incremental lines; suture distinct, not deep; apical portion decollate; aperture narrowly ovate, outer lip simple, blunt, base rounding into a strongly twisted short pillar, body with no visible callus. Length of decollate fragment (two whorls), 2; diameter, 1 mm.

Station 6040, near Alexandria, Louisiana. Type, U. S. Nat. Mus., No. 166302.

This fragment is sufficient to show the presence of the genus and the main characteristics of the shell.

PALUDESTRINA ALDRICHI, new species.

Plate 22, fig. 7.

Shell small, smooth, polished, elongate, with six or more well defined whorls; nucleus very minute, rather blunt; whorls with a little shoulder near the suture, giving them a slightly turritid appearance; there is no sculpture except faint incremental lines; aperture ovate with a continuous, simple peristome; umbilical chink narrow, distinct; base a little produced and evenly rounded. Length, 4.5; diameter, 1.6 mm.

Station 6040 near Alexandria, Louisiana. Type, U. S. Nat. Mus., No. 166303.

The several forms of this genus that follow appear to be distinct, but they show a certain amount of variation also between the individuals, so that it is difficult to estimate the value of the differences, observed.

PALUDESTRINA PLANA Aldrich.

Paludestrina plana ALDRICH, Nautilus, vol. 24, pt. 12, p. 139, pl. 8, fig. 3, 1911.

Station 6132, Aldrich and Matson; station 6040, Louisiana, Matson.

?PALUDESTRINA GEORGIENSIS Aldrich.

Amnicola georgiensis ALDRICH, Nautilus, vol. 24, pt. 12, p. 139, pl. 99, figs. 4, 4a; pl. 10, fig. 13, 1911.

Station 6132, Aldrich and Matson.

The remarkable deformations to which this species submits render its generic place difficult to determine.

?PALUDESTRINA SATILLENSIS Aldrich.

Amnicola saltillensis ALDRICH, Nautilus, vol. 24, pt. 12, p. 139, pl. 9, figs. 5-11; pl. 10, fig. 15, 1911.

Station 6132, Aldrich and Matson.

PALUDESTRINA CURVA, new species.

Plate 22, fig. 4.

Shell of about six whorls, which are notably rounded, giving a constricted aspect to the suture; surface smooth, polished; aperture entire, ovate; the peristome simple with a marked chink behind the inner lip. Length, 3.5; maximum diameter, 2 mm.

Station 6040, near Alexandria, Louisiana, Matson. Type, U. S. Nat. Mus., No. 166308.

This species is less elevated than *P. aldrichi*, and has much more rounded whorls than *P. turricula*.

PALUDESTRINA CINGULATA, new species.

Plate 22, fig. 1.

Shell small, slender, regular, with about 6 whorls, evenly rounded and with a distinct suture; surface polished, sculpture only of faint spiral grooves of which 1 or 2 near or in front of the periphery are more pronounced than the others; apex rather blunt, smooth; aperture ovate, simple, the peristome not reflected, simple, interrupted by the body over which there is a moderate coat of enamel; there is no umbilicus, but a minute chink behind the pillar lip.

Length, 4.6; diameter, 1.5 mm.

Station 6040, near Alexandria, Louisiana. Type, U. S. Nat. Mus., No. 166304.

PALUDESTRINA TURRICULA, new species.

Plate 22, fig. 9.

Shell small, compact, acute, of about 6 whorls; nucleus very small, blunt; surface of subsequent whorls smooth, polished, the incremental lines and occasional faint microscopic spirals form the only sculpture. The whorls are somewhat straight-sided, and the portion immediately in front of the suture is compressed into a small rounded shoulder which gives a turriculate aspect to the spire. Length, 4; diameter, 1.75 mm.

Station 6040, near Alexandria, Louisiana. Type, U. S. Nat. Mus., No. 166307.

This species is very common along with *P. aldrichi*, which is differentiated by its more elongate form, its rounded whorls, and more slender shell. The aperture in both species is exactly alike except for the little curve corresponding to the shoulder of the whorl.

PALUDESTRINA MILIUM, new species.

Plate 22, fig. 2.

Shell minute, ovate, of nearly 5 whorls; apex minute, rather blunt, last whorl much the largest; suture distinct, surface smooth and pol-

ished; aperture ovate, peristome entire, not interrupted by the body; a minute chink behind the pillar lip but no umbilical perforation. Length, 2; diameter, 1 mm.

Station 6040, near Alexandria, Louisiana. Type, U. S. Nat. Mus., No. 166309.

This little shell indicates by its color that when living it was of a dark, perhaps purplish, color.

PYRGULOPSIS? SATILLA, new species.

Plate 22, fig. 3.

Shell minute, smooth, with a rather swollen nucleus of a whorl and a half, and three or more subsequent sharply carinated whorls; the carina is at the anterior third of the whorl which slopes flatly down to it from the preceding suture; there is a second carina in front of the first on which the suture is wound and which is only visible on the base of the last whorl which is flattish. Aperture defective in the specimen. Length, 1.2; diameter, 0.5 mm.

Station 6040, near Alexandria, Louisiana. Type, U. S. Nat. Mus., No. 166310.

I refer this extremely minute shell to *Pyrgulopsis* at a venture, as it can not be regarded as a *Paludestrina* or the tip of a *Turritella*.

NERITINA SPARSILINEATA Dall.

Neritina, sp. indet. ALDRICH, Nautilus, vol. 24, pt. 11, p. 131, No. 7, 1911; vol. 26, pl. 1, figs. 3, 4, 1912.

Stations 3614, 6040, 6132, 6440, and 6445.

This species was figured but not named by Messrs. Aldrich and Pilsbry, and though the attention of Doctor Pilsbry was called to the omission, no name has yet been printed as far as I know. It is one of the most widespread and characteristic species of this horizon. An adult specimen measures 10 mm. in height and 7.5 mm. in greatest diameter. It is remarkable for its subacute conical form. The black lines vary as in *N. pupa*. The labial callus is profuse and the inner lip obsoletely striated or smooth.

PLANORBIS OPHIS, new species.

Plate 21, figs. 3, 4.

Shell small, deeply and closely enroled, the summit slightly less so than the base, and showing about four whorls; the coil from in front appears almost exactly symmetrical; aperture semilunate, the body protruding well into it, outer lip (adult?) thin, sharp; surface polished almost smooth above, the striations in harmony with the incremental lines are more perceptible on the base; the surface of the spire is concavely flattened, but as usual the basal parts in the umbilical cavity retain their rotundity. Diameter of coil 4; height of aperture 2.6 mm.

Station 6040, near Alexandria, Louisiana. Type, U. S. Nat., Mus., No. 166315.

PLANORBIS ANTIQUITUS Aldrich.

Planorbis antiquitus ALDRICH, Nautilus, vol. 24, pt. 12, p. 140, pl. 10, figs. 16, 16a, 16b, 1911.

Station 6132, Aldrich and Matson.

EXPLANATION OF PLATES.

PLATE 20.

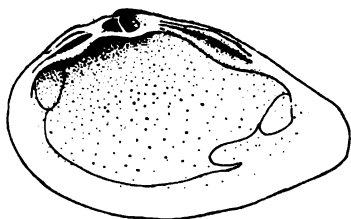
- Fig. 1. *Mulinia sapotilla* Dall, lon. 15 mm., p. 228.
2. *Pleurobema alixus* Dall, lon. 16 mm., p. 230.
3. *Syrnola thelma* Dall, alt. 2 mm., p. 234.
4. *Lamprolitis sandrius* Dall, from above, lon. 32 mm., p. 229.
5. The same, profile view of a young shell, 20 mm. long, p. 229.
6. *Unio musius* Dall, part of right valve showing sculpture of beak, lon. 11 mm., p. 230.
7. *Rangia* (*cuneata* var. ?) *solida* Dall, interior of right valve, lon. 20 mm., p. 228.
8. *Heterodonax alexandra* Dall, part of right valve, lon. 8 mm., p. 228.

PLATE 21.

- Fig. 1. *Potamides matsoni* Dall, young shell, alt. 12 mm., p. 231.
2. The same, side view of lip of adult shell.
3. *Planorbis ophis* Dall, view of base, lat. 4 mm., p. 236
4. The same, in profile.
5. *Pachycheilus anagrammatus* Dall, a profile view of outer lip, p. 232.
6. *Pachycheilus suavis* Dall, profile of the outer lip, p. 232.
7. *Potamides matsoni* Dall, adult shell, alt. 28 mm., p. 231.
8. *Pachycheilus anagrammatus* Dall, adult, alt. 24 mm. The upper whorls are less smooth than usual; p. 232.
9. *Pachycheilus suavis* Dall, adult, alt. 20 mm., p. 232.

PLATE 22.

- Fig. 1. *Paludestrina cingulata* Dall, alt. 4.6 mm., p. 235.
2. *Paludestrina milium* Dall, alt. 2 mm., p. 235.
3. *Pyrgulopsis satilla* Dall, alt. 1.2 mm., p. 236.
4. *Paludestrina curva* Dall, alt. 3.5 mm., p. 235.
5. *Cerithiopsis? burkevillensis* Dall, alt. 10 mm., p. 231.
6. *Turritella satilla* Dall, alt. 4.5 mm., p. 233.
7. *Paludestrina aldrichi* Dall, alt. 4.5 mm., p. 234.
8. *Isapis obsoleta* Dall, alt. 3.5 mm., p. 233.
9. *Paludestrina turricula* Dall, alt. 4 mm., p. 235.



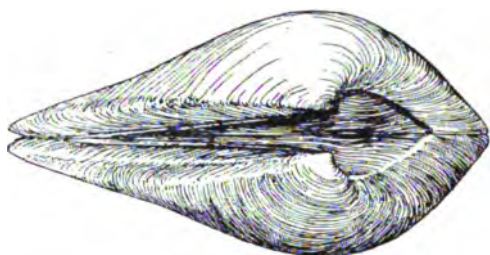
1



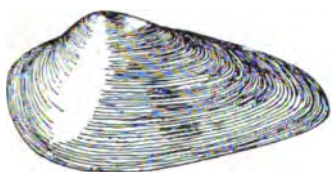
2



3



4



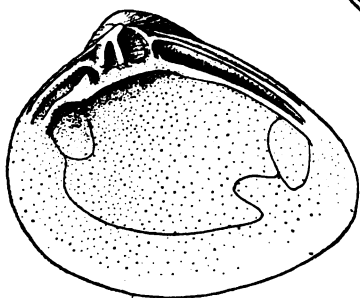
5



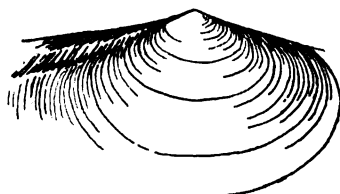
6



8

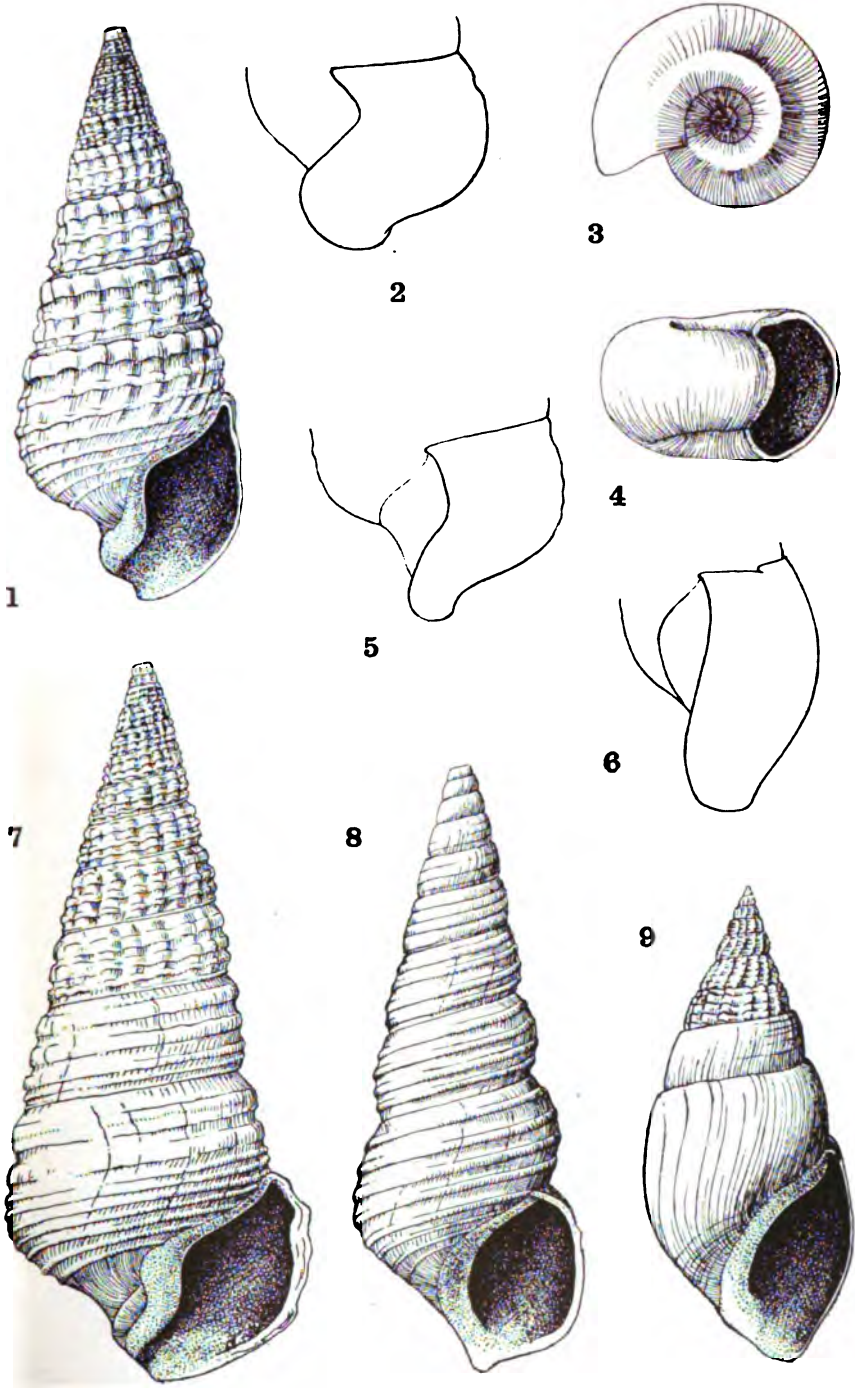


7



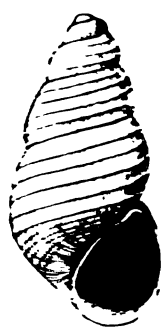
PLIOCENE MOLLUSKS OF THE COASTAL PLAIN.

FOR EXPLANATION OF PLATE SEE PAGE 237.



PLIOCENE MOLLUSKS OF THE COASTAL PLAIN.

FOR EXPLANATION OF PLATE SEE PAGE 237.



1



2

3



4



5



6



7



8

9



PLIOCENE MOLLUSKS OF THE COASTAL PLAIN.

FOR EXPLANATION OF PLATE SEE PAGE 237.

THE GENERA OF FLIES IN THE SUBFAMILY BOTANOBIINÆ WITH HIND TIBIAL SPUR.

By J. R. MALLOCH,

Of the Bureau of Entomology, United States Department of Agriculture.

In this paper is given a revision of the species in the genera *Hippelates* Loew, *Pseudohippelates* and *Prohippelates*, new genera, and *Ceratobarys* Coquillett. To anyone who has collected in the Southern States, and, in fact, almost anywhere in this country, many of the species of this group must be quite familiar, from their habit of settling on the hands and face. They prove a considerable annoyance in particular on warm days, evidently attracted to anyone who perspires at all freely. There is a belief, however well founded, that they are to a certain extent responsible for the transmission of "pinkeye" in the South. As indicated in the title the species have all a distinct hind tibial spur, by means of which they may be separated from all other Chloropidæ.

SYNOPTIC TABLE OF GENERA.

- | | |
|--|--------------------------------|
| 1. Frons with distinct orbital bristles..... | 2 |
| Frons with only hairs on orbits..... | 3 |
| 2. Scutellum elongated, disk flattened; proboscis in male with two long hairs. | |
| <i>Prohippelates</i> , new genus. | |
| Scutellum rounded, convex; proboscis of male normal. | |
| <i>Pseudohippelates</i> , new genus. | |
| 3. Arista flattened, straplike..... | <i>Ceratobarys</i> Coquillett. |
| Arista normal, not flattened..... | <i>Hippelates</i> Loew. |

TABLE OF SPECIES IN HIPPELATES.

- | | |
|--|---|
| 1. Mesonotum entirely glossy black, without any indications of dusting; legs entirely yellow..... | 2 |
| Mesonotum otherwise colored, yellow, brown, or brown-black; if black then with distinct dusting on disk, or if glossy black the legs with black or brown marks. . | 7 |
| 2. Anterior half of frontal triangle yellow, posterior half glossy black. | |
| 1. <i>partitus</i> Becker. | |
| Frontal triangle either all black, or with only the margins, anteriorly, yellow, never with the anterior portion transversely divided in color from posterior portion..... | 3 |

3. Mesonotum with discal hairs arranged in regular longitudinal rows of three to five..... 4
 Mesonotum with discal hairs indiscriminately arranged, or in more than five rows. (These rows are considered as including the two lateral, generally punctate, rows and that space between them, but not the space beyond these rows laterally.)..... 5
4. The space between the center and lateral rows of discal hairs bare except for 3-4 weak hairs on anterior half of mesonotum; frontal triangle barely extending mid-way to anterior margin of frons, almost entirely bare; arista bare; scutellum with apical bristles yellow, approximated..... 2. *nudifrons*, new species.
 The space between the central and lateral rows of hairs on disk occupied on its entire length by a regular series of short hairs; frontal triangle extending to almost the anterior margin of frons, its sides convex; third antennal joint blackened on dorsal surface; arista with short pubescence; apical bristles on scutellum not closely approximated..... 3. *nitidifrons*, new species.
5. Frontal triangle brownish yellow, only black on center, sides concave; head otherwise yellow; hind tibial spur about as long as diameter of tibia.
 4. *peruanus* Becker.
 Frontal triangle black, its sides straight; head not otherwise entirely yellow; hind tibial spur distinctly longer than diameter of tibia..... 6
6. Cheeks, except anterior margin narrowly, black; base of abdomen yellow; mid and hind coxæ generally darkened..... 5. *flavipes* Loew.
 Cheeks, except posterior margin narrowly, yellow; abdomen with three longitudinal rows of black spots; mid and hind coxæ yellow.
flavipes, var. *bicolor* Coquillett.
7. Mesonotum glossy black; legs mostly pale yellow, the tibiae for the greater part of that color, with generally only a more or less distinct brown, or black, band on hind pair..... 8
 Mesonotum, if glossy black, obscured by brown or whitish dusting; or legs mostly brownish or black; or mesonotum brownish, or yellow, with or without dusting or markings..... 11
8. Scutellum yellow, black at base..... 6. *scutellaris* Williston.
 Scutellum concolorous with mesonotum..... 9
9. Antennæ yellow; arista distinctly longer than breadth of frons; frons almost entirely black; scutellum truncate behind, the apical bristles situated widely apart on short tubercles..... 7. *truncata*, new species.
 Third antennal joint generally distinctly darkened above; arista shorter than breadth of frons; scutellum rounded behind..... 10
10. Hind femora and hind tibiae blackened on apical half.. 8. *apicata*, new species.
 All femora more or less blackened or browned on middle.
flavipes, var. *pusio* Loew.
11. Mesonotum entirely black, with more or less distinct grayish dusting..... 12
 Mesonotum yellow, or reddish, with or without dusting or markings..... 21
12. Legs mostly black; mesonotum slightly dusted..... 13
 Legs almost entirely yellow; mesonotum thickly dusted..... 18
13. Frons with lateral hairs in form of bristles..... 13a
 Frons with only hairs on lateral margins..... 14
- 13a. Triangle dusted, opaque..... *capax*¹ Coquillett.
 Triangle highly polished..... *gracilis*, new species.
14. Third antennal joint yellow or reddish below..... 15
 Third antennal joint entirely black..... 16

¹This species and *gracilis* I have put in a separate genus—*Pseudohippelates*—but included them here for convenience.

15. Fore coxæ yellow..... 9. *convexus* Loew.
Fore coxæ black..... 10. *nigricoxa*, new species.
16. Mesonotum with 3 glossy black stripes on pollinose ground..... 11. *subvittata*, new species.
Mesonotum without glossy stripes..... 16a
- 16a. Third antennal joint above normal size, arista haired, cheeks not more than one-half as high as third antennal joint..... 12. *texana*, new species.
Third joint about the usual size and about equal to cheek..... 13. *microcentris* Coquillett.
17. Frontal triangle black, with gray dusting except on a spot below front ocellus and one on each side of posterior ocelli..... 19
18. Frontal triangle without any glossy black spots, entirely gray dusted..... 14. *plebejus* Loew.
19. Proboscis elongated; tibial thorn situated slightly in front of tip..... 15. *proboscideus* Williston.
Proboscis normal; tibial thorn situated at apex of tibia..... 16. *nobilis* Loew.
20. Mesonotum with disk broadly brownish or blackish, gray dusted, humeri and pleuræ as well as hind margin, or whole, of scutellum yellow..... 17. *dorsatus* Williston.
21. Mesonotum reddish, brownish, or yellow, unstriped..... 22
Mesonotum yellow with distinct stripes..... 26
22. Mesonotum glossy brownish red, with distinct dusting; frontal triangle glossy black, or brown in center..... 18. *tener* Coquillett.
23. Mesonotum yellow, frontal triangle black..... 19. *equalis* Williston.
Mesonotum yellow, frontal triangle yellow..... 24
24. Scutellum with posterior margin truncate..... 25
Scutellum with posterior margin rounded..... 20. *flavidula*, new species.
25. Larger species, 2-3 mm.; arista distinctly pubescent; scutellum flattened, subtriangular, the apical margin truncate, apical marginal bristles long, cruciate..... *pallidus*¹ Loew.
Smaller species, 1.5 mm.; arista pubescent; scutellum shorter than broad, sides slightly convergent posteriorly, width at apex equal to length; apical bristles cruciate..... 21. *subequalis*, new species.
26. Mesonotum with three impressed lines generally more or less distinguished by blackish stripes, which are very narrow..... 22. *impressus* Becker.
Mesonotum with distinct, broad stripes..... 27
27. The stripes black on their entire length..... 23. *dorsalis* Loew.
Only the extremities of the stripes black, the remainder brownish yellow..... 24. *stramineus* Loew.

GROUP A.

Species with Mesonotum Glossy Black, without Dusting; Legs Entirely Yellow.

1. HIPPELATES PARTITUS Becker.

Figs. 1, 2.

Hippelates partitus BECKER, Ann. Mus. Nat. Hung., vol. 10, 1912, p. 89.

Female.—Glossy black; pale yellow on anterior half of frontal triangle, whole of head except occiput, posterior half of frontal triangle and frontal stripe on posterior half, entire legs, and halteres. Venter

¹ This species is put in a new genus, *Prokhippelates*, but is included here for convenience.

of abdomen yellowish or brownish, basal two segments dorsally yellowish. Hairs and bristles on body yellow; tibial spur black.

Frontal triangle elongate, occupying almost the entire width of frons at vertex, and extending almost to the extreme anterior margin of frons; sides straight, apex acute; surface hairs on frons pale, sparse; those on triangle forming a marginal line; antennæ of moderate size; arista bare, darkened on apical portion, barely as long as breadth of frons; proboscis fleshy, apical portion bent back under basal, but not as long as that part; cheeks glossy, about as high as third antennal joint; eyes bare, slightly higher than long. Mesonotum with lateral rows of hairs double from in front of middle, the center row single, the row between the center and lateral rows complete from anterior to posterior margins; surface of mesonotum very obscurely granulose; disk of scutellum distinctly granulose; apical marginal pair of bristles cruciate, approximated at base, their bases inserted in very slight tubercles, other marginal hairs weak, only one pair, in addition to the apical pair, noticeable. Hind tibial spur situated distinctly in front of apex of tibia, and about equal in length to tibial diameter. Wings clear, veins yellowish, third costal division slightly over one-half as long as second; veins 3-4 slightly divergent; outer cross vein slightly oblique, last portion of fifth vein $1\frac{1}{2}$ times as long as penultimate section of fourth.

Length, 1-1.5 mm.

Described by Becker from Alabama (Aldrich). Specimens in collection from Dallas, Texas, March 15, 1907, "on wild plum" (F. C. Bishopp), three specimens; Plummers Island, Maryland, May 25, 1912 (H. S. Barber), 1 specimen; Rosslyn, Virginia, September 2, 1912 (R. C. Shannon), 1 specimen.

Nothing is known of the early stages of this species, and, from the above data, there are evidently several generations in the year.

2. HIPPELATES NUDEFRONS, new species.

Figs. 5, 8.

Female.—Glossy black; head except frontal triangle and occiput, base of abdomen, legs and halteres reddish yellow. Wings clear, veins yellow. Bristles and hairs on thorax and abdomen yellow. Tibial spur black.

Frontal triangle occupying almost the entire width of frons at vertex, forming an equilateral triangle, its sides straight, apex about two-thirds the distance to anterior margin of frons; width of front a little more than that of either eye, its surface almost entirely bare; antennæ slightly under the normal size, third joint disklike; arista bare, not as long as width of frons; cheeks rather higher than width of third antennal joint; palpi normal; proboscis entirely yellow, geniculated but not thin, the end portion slightly shorter than basal; eyes

bare, slightly longer than high. Mesonotum with the hairs in three single rows anteriorly, those on outer rows double on posterior half, the disk is otherwise bare, except for sometimes 2-3 weak hairs between the rows anteriorly; surface of both mesonotum and scutellum finely granulose; scutellum with disk slightly flattened and almost bare; the apical pair of bristles are very closely approximated, the bases set in very minute tubercles, other marginal hairs short. Basal two segments and apex of last segment of abdomen yellowish. Hind tibial spur longer than diameter of tibia, situated close to apex. Wings with third costal section one-half as long as second; outer cross vein slightly oblique; last section of fifth vein slightly longer than penultimate section of fourth; veins 2-3 straight; 3-4 very slightly divergent at apices.

Length, 1.5-2 mm.

Type.—Cat. No. 15959, U.S.N.M.

Type-locality.—Frontera, Tabasco, Mexico (C. H. T. Townsend).

Paratypes.—Frontera, Tabasco, Mexico (C. H. T. Townsend); Vieques Island, Porto Rico, February, 1899 (A. Busck).

3. HIPPELATES NITIDIFRONS, new species.

Figs. 35, 36,

Female.—Glossy black; anterior margin of frons, face, antennæ except upper half of third joint, base and venter of abdomen, and legs yellow. Wings clear, veins except costa and first vein colorless. Bristles and hairs on thorax and abdomen brownish yellow; tibial spur black.

Frontal triangle elongate, reaching to almost the anterior margin of frons, occupying almost the entire width of vertex, about one-third longer than broad, its sides slightly convex; margins of triangle and surface of frontal stripe with pale hairs; sides of frons slightly divergent anteriorly, its breadth at center almost one-third more than that of either eye; eyes bare, distinctly, but not greatly, higher than long; antennæ rather small, third joint rounded; arista slightly pubescent, about equal in length to breadth of frons; cheeks equal in height to third antennal joint; proboscis rather shorter, and more fleshy, than that of preceding species. Lateral rows of hairs on mesonotum double from near anterior extremity, the hairs between them carried well back toward scutellum; mesonotum finely, scutellum coarsely granulose; apical scutellar bristles not so closely approximated as in *nudifrons* and the bases not set in such distinct tubercles. Tibial spur longer than diameter of tibia and set well up from apex. Wings with venation similar to *nudifrons*.

Length, 1.5-2 mm.

Type.—Cat. No. 15960, U.S.N.M.

Type-locality.—Jacksons Island, Maryland (H. S. Barber).

Paratypes.—Washington, District of Columbia, August 17, 1912 (R. C. Shannon); East Florida (W. H. Ashmead); Franconia, New Hampshire (Mrs. A. T. Slosson); Ile de Montreal, Canada (Beaulieu); Dallas, Texas, "on wounded horse," September 27, 1909 (H. Pinkus); Medina, Ohio; Caldwell, New Jersey, July 16, 1887, "on cows" (M. S. Crane); Riverton, New Jersey; and specimens without data as to locality bearing numbers 5115 "annoying dogs, D. C. (?) July 6, '91," and 4487, "annoying cattle."

4. HIPPELATES PERUANUS Becker.

Hippelates peruanus BECKER, Ann. Mus. Nat. Hung., vol. 10, 1912, p. 170.

Female.—Glossy black; frontal triangle glossy yellow, with a brown mark in center and on either side, the centers of which are black; head reddish yellow, occiput black, third antennal joint sometimes brown above; proboscis brown at apex; base, apex, and venter of abdomen yellowish; legs yellow, the apical tarsal joint sometimes brownish; halteres yellow. Wings clear, veins yellow. Bristles and hairs of body yellow, hind tibial spur black.

Frons rather narrow, but slightly more than equal to the width of either eye; triangle occupying almost the entire width of frons at vertex and extending about two-thirds to anterior margin; surface hairs weak, pale, those on triangle forming a marginal line; sides of triangle straight or very slightly concave, this latter appearance is heightened by the yellow margins; antennæ of moderate size; arista short, barely as long as breadth of frons, pubescent; cheeks as high as breadth of third antennal joint; eyes bare, almost round. Mesonotum with punctures at base of each of the surface hairs, those of the two lateral rows rather deep and forming rather distinct furrows, the hairs between the central and lateral rows irregularly arranged and generally 2-3 in number; scutellum with surface sparsely, pale haired, in outline not regularly rounded, the bases of the apical pair of cruciate, moderately approximated bristles set in short tubercles as are also the two much shorter lateral bristles. Hind tibial spur at half its own length in front of apex of tibia and in length equal to the tibial diameter. Wings rather narrow, third costal division equal to two-thirds the length of second; outer cross vein rather obliquely placed; last section of fifth vein about one-third longer than penultimate section of fourth.

Length, 1.5-2 mm.

Described from Peru and also recorded from Paraguay and Argentina by Becker.

I have specimens described above, which I consider are *peruanus* from the following localities: San Bernardino, Paraguay (K. Frieburg); San Antonio, de la Banos, Cuba; and Fajardo, Porto Rico, February, 1899 (Busck).

The Cuban specimen differs slightly from the one from Porto Rico, but I do not consider it sufficient to warrant me in describing it as distinct.

5. *HIPPELATES FLAVIPES* Loew.

Figs. 3, 4.

Hippelates flavipes LOEW, Dipt. Amer. Sept. Ind. Cent., 6, 1865, species 95.

Hippelates pusio LOEW, Dipt. Amer. Sept. Ind. Cent., 10, 1872, species 87.

Oscinis pallipes LOEW, Dipt. Amer. Sept. Ind. Cent., 3, 1863, species 69.

Hippelates splendens ADAMS, Kansas Univ. Sci. Bull., 2, No. 14, 1904, p. 453.

Hippelates bicolor COQUILLETT, Journ. N. J. Ent. Soc., vol. 6, 1898, p. 48.

Hippelates calcaratus ENDERLEIN, Sitzber. Ges. naturf. Freunde, Berlin, No. 4 (1911).

Male and female.—Colored as last species, but as a rule the anterior margin of frons is only narrowly yellow, and the third antennal joint is distinctly darkened above.

Frons occupying rather more than one-third the width of head; frontal triangle occupying almost entire width of frons at vertex, and reaching to almost the extreme anterior margin of frons, its sides straight, or slightly concave, hairs as in previous species; cheeks very rarely yellow in the type form, distinctly so in *bicolor*; eyes bare, slightly higher than long; antennæ of moderate size; arista slightly pubescent, as long as width of frons; proboscis glossy, black-brown, the apical portion bent back under the subapical almost as far as the length of that section. Mesonotum rather thickly covered with short hairs, the two lateral rows not easily distinguished except by the more distinct puncturation, the other hairs irregularly arranged, each with a shallow puncture at its base; the surface hairs and bristles are sometimes almost black, very rarely yellowish; scutellum with the apical pair of bristles cruciate, not closely approximated, the swelling at their bases very small. Abdomen generally yellow on basal two segments, but sometimes with three longitudinal rows of black spots (var. *bicolor*). Legs reddish yellow, the hind tibial spur situated well in front of apex of tibia, distinctly bent and much longer than diameter of tibia. Wings clear, veins yellowish; veins 3-4 subparallel; last section of fifth vein subequal with penultimate section of fourth, or slightly longer.

Length, 1.5-2 mm.

Described by Loew from Cuba. I have examined specimens in the U. S. National Museum collection from Dallas, Texas, September 19, 1911, "around horses" (F. C. Bishopp); Victoria, Texas, June 16; Hot Springs, Arkansas, June 25 (H. S. Barber); Crescent City, Florida, "Gnat, troublesome to eyes of animals"; Santa Rita, Mountains, Arizona, June 15 (Hubbard and Schwarz); East Point, Louisiana, October 7, 1907 (F. C. Bishopp); Batesburg, South Carolina, "in cotton blooms," September 30, 1911 (E. A. McGregor); Baracoa, Cuba, September (A. Busck); and one specimen with the

label "N. C." without other data. From the foregoing list it is evident that this species is both widely distributed and occurs both in early summer (June) and in the fall.

HIPPELATES FLAVIPIS, var. PUSIO Loew.

This variety differs from the type form in having the femora generally more or less blackened or browned and sometimes also the middle of hind tibia. In other respects it is as the type form, and I can see no reason for separating them as distinct species.

The localities of specimens in collection are Swansea, South Carolina, August, 1911 (F. Knab); Lake Worth, Florida (Mrs. A. T. Slosson); Biscayne Bay, Florida (Mrs. A. T. Slosson); Corpus Christi, Texas, July 21 (H. P. Wood); Victoria, Texas, "on horse," June 15 (J. D. Mitchell); Dallas, Texas, September 19, 1911 (F. C. Bishopp); Sharpsburg, Texas, June 16; Maryland, collection Coquillett; Las Vegas, Hot Springs, Arizona, August 11 (H. S. Barber); Archer, Florida, May; Tampico, Mexico, October 11, 1906 (F. C. Bishopp); and one specimen from Ottawa, Canada (Beaulieu).

The type-specimen of *bicolor* Coquillett came from Lake Worth, Florida, and in the same lot is a typical specimen of *pusio*. I have seen specimens from Texas that agree in color with the form described by Coquillett, and consider there is no ground for their separation from *flavipes*.

The variety *pusio* seems to have much the same range as *flavipes* and fills up some of the blanks in the occurrence of the type form (July–August).

With the single exception of *bicolor* the synonymy given herewith is that given by Becker in his paper on the group, and I can see no reason to doubt its correctness.

Williston records a supposed variety of *flavipes*¹ in a note as having the legs almost entirely black, except the tarsi, and the antennæ wholly black. I should be inclined to doubt this identification, though it is not an impossibility.

GROUP B.

Species with Mesonotum Glossy Black, without Dusting; Legs Partly Black.

6. HIPPELATES SCUTELLARIS Williston.

Hippelates scutellaris WILLISTON, Trans. Ent. Soc. Lond., 1896, p. 420.

Male.—Front yellow, including the lower part of the very large shining black triangle, which reaches very nearly to the base of the antennæ. Antennæ reddish yellow; the arista black and very finely pubescent. Eyes sparsely, but not distinctly, pubescent. Face yellow, somewhat blackish in the middle. Cheeks very narrow. Palpi yellow. Mesonotum wholly shining black, not pollinose. Scutellum reddish, blackish at the base, its straight distal margin with two rather remote bristles.

¹ Trans. Ent. Soc. Lond., 1896, p. 420.

Pleurae reddish yellow. Abdomen elongate; shining black, at its base obscurely reddish. Legs yellow, the hind tibiae somewhat and the last two joints of the tarsi brown. Wings nearly hyaline; third section of the costa as long as the second section.

Length, 2½ mm.

One specimen. St. Vincent.

I have not seen this species, which, if it is a *Hippelates*, must be a very distinct one. Becker says "Aus Kuba, St. Vincent" (coll. Williston), but as he does not indicate in his paper that he has seen specimens I infer that he has made a geographical error. The description reads very like that of a *Siphonella* or *Botanobia* species.

7. *HIPPELATES TRUNCATA*, new species.

Figs. 7, 9, 10.

Female.—Glossy black; frons opaque, except triangle, sometimes brownish anteriorly, proboscis and palpi black or brown, antennae yellow; arista brown; base of abdomen generally yellowish, and apex sometimes pale yellowish brown. Legs yellow; femora except bases and apices black, glossy; tips of tarsi brown. Wings generally slightly browned; veins brown. Halteres clear yellow. Hairs and bristles black or brown.

Frons about one-third wider than either eye, slightly longer than broad, triangle glossy, elongate, at its upper margin occupying nearly the entire vertex, extending to anterior margin of frons, sides straight, margin with a row of hairs situated in slight punctures; frontal stripe opaque, very indistinctly haired; antennae of moderate size, third joint rounded, and covered with short pubescence; arista distinctly longer than breadth of frons, and with sparse, but distinct, pubescence; cheeks very narrow, almost linear; a short bristle at anterior angle, the marginal bristles short, but distinct; eyes about 1½ times higher than greatest length, bare; proboscis short; palpi of normal size. Mesonotum with the disk covered with irregularly arranged hairs, each of which is situated in a shallow puncture, the lateral rows almost indistinguishable; scutellum flat, distinctly broader at base than long, sides converging posteriorly, posterior margin truncate, at each angle posteriorly there is a small, but distinct, tubercle, on each of which is situated a long bristle, the other marginal hairs short. Legs with hind femora slightly incrassated and a little bent, hind tibiae with the apical spur twice as long as tibial diameter, strongly curved, and situated at apex. Wings with second and third costal divisions subequal; veins 2-3 curved up at extreme apices; veins 3-4 divergent, the latter almost straight and ending in wing tip; last section of fifth vein slightly longer than penultimate section of fourth; surface of wing with the microscopic hairs unusually distinct.

Length, 1.5-2 mm.

Type.—Cat. No. 15961, U.S.N.M.

Locality of type.—Cacao, Trece Aguas, Alta v. Paz, Guatemala, April 25 (Schwarz and Barber).

Paratypes.—One specimen same data as type; one specimen, Motoropago, Vera Cruz, Mexico, February 11, 1892 (H. Osborn); and one specimen, San Rafael, Vera Cruz, Mexico, March 14 (C. H. T. Townsend).

8. HIPPELATES APICATA, new species.

Fig. 6.

Female.—Glossy black; head yellow except triangle and occiput, which are glossy black, and the upper half of frons which is blackened; third antennal joint browned above, or entirely yellow, arista brown; lower margin of cheeks narrowly brown; proboscis browned. Abdomen yellowish at base, apex, and ventrally. Legs yellow, apical half of hind femora and tibiæ black, last two tarsal joints on all legs black. Wings clear, veins yellow, costal vein brown. Halteres whitish yellow. All hairs and bristles on body yellowish. Hind tibial spur black, glossy.

Frons a little over one-third the width of head; triangle occupying almost entire width of vertex, reaching to four-fifths the distance to anterior margin, sides straight, apex acute, its entire length exceeding its greatest width, neither the marginal hairs nor punctures very distinct; surface hairs on frons sparse; cheeks as broad as third antennal joint, or slightly broader, marginal hairs weak; eyes about one-third higher than long, bare; proboscis geniculated, its apical portion almost as long as preceding portion, glossy, chitinated, but not slender; antennæ rather under the average size; arista short, not equal in length to width of frons, very shortly pubescent. Mesonotum with the hairs rather long, irregularly arranged posteriorly, but on the anterior half the lines are traceable, each hair situated in a distinct puncture, the outer rows most distinct, double; scutellum with disk granulose, the apical pair of bristles long, cruciate, the tubercles at base small, and not closely approximated. In some cases (probably immature specimens) the abdomen is almost entirely yellow with a black lateral spot on sides of third and a black fore marginal band on apical two segments. Hind tibial spur strongly bent; situated well in front of apex of tibia and distinctly more than twice as long as tibial diameter. Wings with third costal division one-half as long as second; veins 3-4 parallel, the latter ending just behind wing tip; outer cross vein oblique; last section of fifth vein slightly longer than penultimate section of fourth.

Length, 1.5-2 mm.

Type.—Cat. No. 15962, U.S.N.M.

Type-locality.—Mayaguez, Porto Rico, January, 1899 (A. Busck).

Paratypes.—One specimen, Vieques Island, Porto Rico (C. W. Richmond); one specimen, Habana, Cuba (S. Fernandez); and one specimen, Andros Key, Bahamas, August 1, 1904 (no collector's name).

GROUP C.

Species with Mesonotum Black, Covered with more or less Distinct Dusting; Legs Mostly Black with Yellow Markings.

9. HIPPELATES CONVEXUS Loew.

Hippelates convexus LOEW, Dipt. Amer. Sept. Ind. Cent., 6, 1865, species 94.

Male and female.—Glossy black, the color of mesonotum slightly obscured by gray pollinosity; frontal triangle highly glossy; frons yellow, darkened posteriorly; face and cheeks yellow; antennæ brown, third joint largely yellow below, and particularly so on inner side; proboscis brown; palpi pale yellow. Upper portions of pleuræ and lateral margins of mesonotum with gray pollen. Abdomen yellowish at base and ventrally. Legs yellow, mid and hind coxæ browned; mid and hind femora blackened; fore tibiæ sometimes browned at apex, mid tibiæ at middle and most of hind tibiæ as well as apices of all tarsi broadly black or brown. Wings grayish, veins brown. Halteres yellow. Bristles and hairs black or brown.

Frons occupying slightly over one-third the width of head; triangle almost touching margins of eyes at vertex, extending three-fourths to anterior margin of frons, its sides slightly convex; surface of frontal stripe and margins of triangle with sparse, but distinct, hairs; antennæ of rather above the average size, third joint rounded, or slightly truncate, at apex; arista pubescent, base swollen and the two basal joints slightly elongated; cheek equal in height to slightly over one-half the width of third antennal joint; proboscis not noticeably elongated, the apical portion very short, though turned back; eyes almost round, bare. Mesonotum without any distinct lateral rows of hairs with punctures at their bases, all the hairs arranged in rows, but difficult to trace because of the absence of these punctures; scutellum rounded in outline, convex, surface with sparse hairs, the two apical bristles not approximated, and no tubercles at their bases, besides the two strong bristles there are two weaker bristles anterior to them. Legs of moderate strength; hind tibial spur short, equal in length to tibial diameter, situated near the apex. Wings with third costal division about one-half as long as second; veins 3-4 slightly divergent; outer cross vein slightly oblique; penultimate section of fourth vein distinctly shorter than last section of fifth.

Length, 1.25-1.75 mm.

Locality originally described from: Cuba.

Localities of specimens in collection: Baracoa, Cuba, August, 1901 (A. Busck); Aguadilla, Porto Rico, September, 1901 (A. Busck);

San Jose de Guaymas, Mexico, April 10 (L. O. Howard); Managua, Nicaragua (Baker); San Marcos, Nicaragua (Baker); Tampico, Mexico, December 6 (F. C. Bishopp); Montserrat, Trinidad (A. Busck); and two specimens that agree fairly well with the description from Dallas, Texas, one by E. S. Tucker, and the other by Jones and Hood.

Becker records it from Tifton, Georgia (Melander), but I can not reconcile his description with that of Loew. He records it also from Peru to Argentina in his paper on the Nearctic Chloropidæ (p. 172).

10. HIPPELATES NIGRICOXA, new species.

Figs. 12, 14.

Female.—Glossy black; frontal triangle glossy black, frontal stripe opaque black posteriorly, orange yellow on anterior half; face and cheeks yellow, the latter with a whitish bloom; antennæ with basal joints brown, third joint broadly black above, distinctly reddish yellow below, at least on inner surface; proboscis brown; palpi yellow. Mesonotum glossy on disk, the shining parts rarely stripe like, lateral and posterior margins, as well as scutellum and upper portions of pleuræ with distinct gray pollinosity. Abdomen sometimes yellowish at base, brownish ventrally. Legs black; fore and mid trochanters, bases and apices, narrowly, of fore and mid femora, rarely the apex of hind femur, bases of fore tibiæ, bases and apices of mid tibiæ broadly, and bases of hind tibiæ narrowly, as well as bases of posterior tarsi yellowish. Wings slightly grayish, veins black-brown. Halteres yellow. Hairs and bristles black or brown.

Frons slightly over one-third the width of head; triangle occupying all except a narrow space on each side at vertex, extending four-sevenths the frons length, sides slightly convex; surface hairs distinct, those on margins and in center in front of triangle noticeably so; antennæ above normal size, but somewhat variable in this respect; third joint not rounded, slightly truncate; arista barely longer than width of frons, basal joints elongated, and slightly swollen, pubescence loose and distinct; cheeks linear, eyes bare, distinctly higher than long; proboscis not elongated, apical portion fleshy, bent back about one-half the length of preceding portion. Mesonotum with two slight longitudinal depressions, occupying the lines usually followed by the lateral rows of hairs, the surface hairs rather irregularly arranged, but usually 3-5 between the lateral depressions; scutellum rounded in outline, the surface hairs not very numerous, but distinct, marginal hairs rather longer than normally, the apical bristles not approximated, cruciate. Legs covered with short pale hairs; the apical spur on hind tibia bent, situated slightly before apex of tibia and not exceeding in length the diameter of tibia. Wings with the third costal division one-half as long as second; veins 3-4 subparallel;

outer cross vein slightly oblique, penultimate section of fourth vein equal to three-fourths the length of last section of fifth.

Length, 1.5–2 mm.

Type.—Cat. No. 15963, U.S.N.M.

Type-locality.—Montserrat, Trinidad, British West Indies, June 27 (A. Busck).

Paratypes.—Same data, six specimens; and two specimens from St. Thomas, West Indies, August 2 (A. Busck), which I am unable to separate from the Trinidad specimens by any reliable specific characters.

11. *HIPPELATES SUBVITTATA*, new species.

Very similar to *texana*, but differing in having the yellow color of frons and other parts of the head, including palpi, much obscured, almost black in some specimens. The triangle is more elongate than in *texana*, cheeks about as high as third antennal joint; the mesonotum has the disk anteriorly glossy, with two pollinose gray lines intersecting it, as extensions of the prescutellar pollinose patch, thus giving it the appearance of having three glossy black stripes; the surface hairs on mesonotum are much longer and more numerous than in *texana*, and the pollinosity on margins of mesonotum and scutellum more distinct. In other particulars the two species are very similar.

Type.—Cat. No. 15964, U.S.N.M.

Type-locality.—Longview, Texas, March 26, 1908 (E. S. Tucker).

Paratypes.—Two specimens, same data as type; one, Mound, Louisiana, May 24, 1907 (F. C. Bishopp); one, Jefferson, Texas, March 27, 1908 (E. S. Tucker); one, Texarkana, Texas, March 28, 1908, on Cornus (E. S. Tucker); one, New Boston, Texas, June 5, 1909 (F. C. Bishopp); and two, Washington, District of Columbia, June 6, 1912 (W. L. McAtee).

12. *HIPPELATES TEXANA*, new species.

Figs. 11, 13.

Female.—Similar to *nigricoxa* but the yellow color is rather more extensive on the legs, and slightly paler; the antennæ are entirely black; and the mesonotum is entirely covered with more sparse pollen.

Frons as in *nigricoxa*; triangle with sides distinctly convex, the anterior angle not acute but rounded; surface hairs on frons sparse but distinct, though short; antennæ distinctly above the average size, third joint rounded on lower side at apex, the upper corner slightly acute, pilosity not more distinct than in other species; arista as in foregoing species; cheeks higher than in *nigricoxa*, at least one-half as high as width of third antennal joint; the anterior margin slightly produced, marginal bristles pale; upper mouth margin black;

proboscis as in *nigricoxa*; eyes bare, oval, but not with the longest axis upright, placed so that their greatest height and length are about equal. Mesonotum with two broad, shallow sulci, unpunctured; surface hairs as in *nigricoxa* but shorter and more sparse; scutellum broad and short, rounded in outline, the marginal bristles stronger than in *nigricoxa* in comparison also with the other hairs on scutellum. Legs with the pale surface hairs as in preceding species, the tibial spur similar to that species. Wings with venation as in *nigricoxa*.

Length, 1.5–2 mm.

Type.—Cat. No. 15965, U.S.N.M.

Type-locality.—Brownsville, Texas, July 16, 1906, "Reared from cotton squares." (No collector's name.)

Paratypes.—One specimen, Dallas, Texas, "From cotton squares," July 21, 1905 (W. W. Yothers); six specimens, Ruston, Louisiana (W. D. Pierce and H. S. Smith). I have also seen a large series reared from cotton squares, Calvert, Texas, 1902 (G. H. Harris), and specimens from the following localities: Victoria, Texas (J. D. Mitchell); Liberty, Texas (E. S. Tucker); Logansport, Louisiana (E. S. Tucker); and Tampico, Mexico (F. C. Bishopp).

13. HIPPELATES MICROCENTRUS Coquillett.

Fig. 20.

Hippelates microcentrus COQUILLETT, *Invertebrata Pacifica*, Rep. Cal. and Nev. Dipt., vol. 1, 1904, p. 28.

Female.—Very similar in color to the preceding species, but the legs are very distinctly darker, the yellow color being confined to knee joints, bases and apices of mid tibiae, and bases of posterior two pairs of tarsi. The abdomen shows hardly any traces of yellow at the base. Halteres with yellow pedicel and white knob.

More elongate than either of the two preceding species. Frons occupying almost one-half the head width; triangle heart shaped, the posterior corners rounded, sides slightly convex, apex acute, occupying two-thirds the width of frons at vertex and extending slightly beyond middle of frons anteriorly; surface hairs regularly, but sparsely, arranged, the space in front of apex of triangle bare; antennae of similar shape to those of *texana* but rather smaller, the third joint with rather more distinct pilosity; arista as in *texana*, but less distinctly pubescent; cheeks with whitish pollen, equal to, or slightly higher than, width of third joint of antennae, proboscis as in *texana*. Mesonotum in all the specimens in type series in poor condition, due to pin, but evidently similar to *texana*; scutellum with four distinct bristles, the middle pair not approximated; upper portions of plurae pollinose, lower highly glossy. Legs slender, femora glossy; surface hairs pale; hind tibial spur curved, short,

equal to diameter of tibia. Wing with third costal division two-thirds as long as second; veins 3-4 parallel.

Length, 2-2.5 mm.

Redescribed from type. Locality, San Mateo County, California (Baker).

There is a single specimen in the U. S. National Museum collection from Motzorongo, Vera Cruz, Mexico, February, 1892 (H. Osborn), which differs slightly from the type, but not to such an extent that I consider it necessary to describe it as another species.

Becker records *microcentrus* from Bolivia.

GROUP D.

Species with Mesonotum Black, Thickly Gray, Dusted on Disk; Legs Almost Entirely Yellow.

14. HIPPELATES PLEBEJUS Loew.

Figs. 15, 17.

Hippelates plebejus Loew, Dipt. Amer. Sept. Ind. Cent., 3, 1863, species 68.

Female.—Black, slightly shining; frons yellow, triangle black, thickly gray dusted; antennæ yellow, third joint rarely darkened on upper surface; face and cheeks yellow; back of head black; proboscis black, glossy; palpi yellow. Mesonotum thickly covered with yellowish or grayish pollinosity; humeri, upper parts of pleuræ, and hind margin of scutellum generally yellow. Abdomen black with yellow hind margins to segments, yellow with black fore margins to segments, or yellow with three longitudinal rows of black spots. Legs entirely pale yellow. Wings clear; veins yellow. Halteres yellow. Bristles and hairs on body yellow; apical spur on hind tibia black.

Frons about one-third broader than either eye; triangle occupying almost entire width at vertex, forming an equilateral triangle, and extending to middle, or slightly beyond middle of frons; surface hairs on frons numerous, but not very distinct; anterior margin of frons slightly protruding; antennæ of moderate size, third joint rounded; arista not as long as width of frons, slightly pubescent; cheek about equal in height to breadth of third antennal joint, the anterior margin slightly produced; eyes bare, slightly higher than long. Mesonotum with three rather indistinct lines of shallow punctures, the disk with numerous, closely placed, short hairs; scutellum rounded in outline, the posterior margin with two long and two short bristles, the long ones not approximated at the base, disk with numerous short hairs. Surface hairs on abdomen short. Legs moderately stout; hind femora slightly thickened; hind tibial spur very long, and much bent, reaching to beyond middle of metatarsus, situated close to apex; hind metatarsus attenuated at base.

Wings with third costal division barely equal to one-half the length of second; veins 3-4 subparallel or sometimes slightly convergent; outer cross vein slightly oblique; last section of fifth vein and penultimate section of fourth subequal.

Length, 2-2.5 mm.

Originally described from District of Columbia. Sometimes the hind femur is slightly darkened on middle, and rarely the hind tibia.

I have seen specimens from: Columbus, Texas, August 15; Sharpshurg, Texas; Wades, Texas; San Diego, Texas; Brownsville, Texas; Beeville, Texas; Floresville, Texas; Maryland (collection Coquillett); Biscayne Bay, Florida (Mrs. A. T. Slosson).

15. HIPPELATES PROBOSCIDEUS Williston.

Hippelates (Siphomyia) proboscideus WILLISTON, Trans. Ent. Soc. Lond., 1896, p. 418.

This species answers in practically all particulars to the description given herewith for *plebejus* except in its possession of a small glossy black spot on the triangle in front of the anterior ocellus. In the description much importance is attached to the fact that the proboscis is elongated and geniculated, the apical portion being turned back for a distance a little shorter than the length of head. This is also the case in *nobilis* and *plebejus*. There is nothing in the description except the character above mentioned by means of which it may be separated from *plebejus*.

Locality.—St. Vincent, West Indies.

16. HIPPELATES NOBILIS Loew.

Figs. 18, 38.

Hippelates nobilis LOEW, Dipt. Amer. Sept. Ind. Cent., 3, 1863, species 67.

This species is very similar in most respects to *plebejus* Loew, but has the glossy spots on the frons more or less distinct, and the hind femora and tibiae have a distinct black ring on middle. In a series of specimens from Duncan, Oklahoma, July, 1909 (T. D. Urbahns), the frons is much narrower; the triangle reaches short of middle of frons; the cheeks are comparatively higher, and their anterior margin more protruding; the scutellum is less broadly yellow, the abdomen consistently with fore marginal bands on all segments except the basal two; and the hind tibiae have in all cases a very distinct middle band. The hind metatarsus also seems to be less distinctly attenuated at base.

I have examined one specimen in U. S. National Museum collection labeled "N. C." which differs from the series from Oklahoma in having no pale color on thorax, in having the abdomen with only narrow, hind marginal, yellow bands. In other respects as *nobilis*.

Without examination of more specimens I consider it unwise to give this form specific rank.

There are several specimens in same collection from Trinidad River, Panama, March 29, 1912 (A. Busck), which resemble the above specimen very closely, differing principally in size, being about 3 mm. as against 2 mm. Amongst these specimens there are some that represent different forms which are ranked as species at present and which cause me to have doubts as to the validity of these specific values. It is impossible, however, to say definitely whether the forms here listed are good species or only varieties without rearing them.

17. HIPPELATES DORSATUS Williston.

Hippelates (Siphomyia) dorsatus WILLISTON, Trans. Ent. Soc. Lond., 1896, p. 419.

This is merely a variety of *plebejus*, in which the yellow color of thorax is more than usually pronounced.

Described from St. Vincent, West Indies.

GROUP E.

Species with Mesonotum Yellow, or Reddish, Without Stripes.

18. HIPPELATES TENER Coquillett.

Fig. 30.

Hippelates tener COQUILLETT, Proc. U. S. Nat. Mus., vol. 22, 1900, p. 285.

Female.—Reddish yellow, shining; frons pale yellow anteriorly, becoming brown toward vertex; triangle narrowly gray dusted on margins, more broadly at posterior lateral angles, and on ocellar region, glossy red brown in center; occiput grayish; third antennal joint browned above; proboscis brown. Disk of mesonotum sometimes brownish, always with distinct pollinosity; upper half of pleuræ gray pollinose, lower half glossy. Abdomen reddish brown, basal segments and apices of segments yellowish. Legs yellow, blackened on fore tarsi, slightly on mid and hind femora at middle, and distinctly on apices of hind tibiæ as well as mid and hind tarsi. Wings grayish, veins brown. Halteres yellow. Bristles and hairs black, or brownish.

Frons short and broad, occupying almost one-half the width of head; outline of triangle rather indistinct, but traceable almost to eye margin at vertex, rounded in front, and extending to over middle of frons; surface hairs distinct, antennæ rather above average size, third joint rounded, arista not as long as width of frons, pubescent; cheek not very high, about half as high as third joint of antenna, not produced anteriorly; proboscis short, thick, the apical portion turned back for a short distance; eyes bare, slightly higher than long. Mesonotum impunctate, but with two very faint sulci,

surface hairs not very distinct nor numerous; scutellum short and broad, outline rounded, marginal bristles four in number the apical pair strong, not approximated at base, the basal pair much weaker, hairlike. Legs normal; hind tibial spur short, about equal to tibial diameter, curved, and situated near to apex. Wings with third costal division over one-half as long as second; venation normal.

Length, 1-1.5 mm.

Described from type-specimens.

Type-locality.—Fajardo, Porto Rico, February, 1899 (A. Busck).

Paratypes.—Utua, Porto Rico, January, 1899 (A. Busck); Managua, Nicaragua (Baker); Tabogo Island, Panama, July, (A. Busck); and Cordoba, Vera Cruz, Mexico (Dr. A. Fenyès).

The specimen from Mexico has the dorsum of mesonotum almost black. It might be possible to place this single specimen by using Becker's table for the species in *Hippelates*, but the type form would be very difficult to locate in it.

19. HIPPELATES EQUALIS Williston.

Hippelates equalis WILLISTON, Trans. Ent. Soc. Lond., 1896, p. 419.

Male and female.—Front broad, the very large shining black triangle extends to near the root of the antennæ; remainder of the front opaque black. Thorax light reddish yellow, the mesonotum shining. Scutellum flattened, subquadrate, the marginal bristles remote from each other on the angles. Abdomen reddish yellow, the distal segments somewhat obscure. Legs wholly light yellow; spur of the hind tibia long, curved and black. Wings grayish hyaline; second and third sections of the costa of nearly equal length.

Length, 2 mm.

Four specimens. St. Vincent. This species is related to *H. pallidus* Loew, but will be distinguished by the color of the front.

The above is a copy of Williston's description of *equalis*. The species is more closely allied to *subequalis* than to *pallidus*, but is evidently quite distinct. I have not seen this species.

20. HIPPELATES FLAVIDULA, new species.

Male.—Pale, shining, reddish yellow; ocellar spot, a small spot on third antennal joint at insertion of arista, a spot on lower anterior portion of mesopleura, and abdomen brown black. Wings clear, veins brownish. Bristles and hairs on body black.

Frons slightly over one-third the width of head; triangle glossy, occupying over two-thirds the width of vertex, extending over halfway to anterior margin of frons, sides slightly convex, apex obtuse; frontal stripe opaque, surface hairs rather numerous, but short; antennæ of moderate size, third joint rounded in front; arista brown, distinctly longer than width of frons, pubescent; cheeks narrow, not over one-half as high as width of third joint of antenna; proboscis short, yellow. Mesonotum impunctate; hairs arranged in rows, but not very numerous nor distinct; scutellum convex, the

margin rounded; four bristles present, the basal two much shorter than the widely placed apical pair, disk with short hairs. Legs with pale, short, surface hairs; apical spur on hind tibia strong, bent, situated a little before apex of tibia and about one-half longer than tibial diameter. Wings with veins 2 and 3 bent up a little at their apices; third division of costa a little over two-thirds as long as second; veins 3 and 4 divergent, the latter straight, finishing just below apex of wing; outer cross vein oblique.

Length, 1.25 mm.

Type.—Cat. No. 15966, U.S.N.M.

Type-locality.—Montserrat, Trinidad, West Indies, June 29, 1905 (A. Busck). One specimen.

21. *HIPPELATES SUBÆQUALIS*, new species.

Fig. 29, 37.

Female.—Shining reddish yellow; triangle entirely yellow, or with the ocellar spot darkened; the thorax has a black spot low down in front where it is connected with the head, and the abdomen is brownish apically. Wings browned slightly; veins brownish yellow. Halteres yellow. Hairs yellow, bristles brownish yellow.

Frons occupying about one-half the width of head; triangle nearly as wide as vertex, and extending to anterior margin of frons; antennæ rather above average size, third joint rounded; arista distinctly pubescent, brown, and longer than width of frons; cheeks linear; eyes higher than long; proboscis short. Mesonotum narrowed anteriorly, impunctate, hairs irregularly arranged, scutellum subquadrate, the posterior margin sometimes concave in outline; apical bristles situated on posterior angles, cruciate, diskal hairs and other marginal bristles weak. Legs slender; hind tibial spur long, reaching to beyond middle of metatarsus, curved, its base at apex of tibia. Wings with third costal division equal in length to second; third and fourth veins slightly divergent.

Length, 1.25–1.75 mm.

Type.—Cat. No. 15967, U.S.N.M.

Type-locality.—Montserrat, Trinidad, West Indies, June 29, 1905 (A. Busck).

Paratypes.—Six specimens same data.

There is a single specimen from Tabernilla, Canal Zone, Panama, taken by the same collector, which agrees in most respects with the type, but has a black central streak on the triangle.

This species is very close to *equalis* Williston, but I believe it is distinct, though Williston's description is not very comprehensive.

GROUP F.

Species with Mesonotum Yellow with Distinct Stripes.

22. HIPPELATES IMPRESSUS Becker.

Fig. 16.

Hippelates impressus BECKER, Ann. Mus. Nat. Hung., vol. 10, 1912, p. 92.

Female.—Yellow, subshining. Ocellar spot and back of head blackened; disk of thorax reddish yellow, covered with grayish pollen, the three punctate lines generally darkened. Abdomen generally brown above, or with anterior marginal dark bands, which sometimes are tridentate or almost in three rows of spots. Hairs pale, bristles brownish.

Frons distinctly, but not greatly broader than either eye; triangle nearly the whole width of vertex, forming an almost equilateral triangle, its apex slightly beyond middle of frons, sides straight; surface hairs sparse, weak; antennæ normal in size and shape; arista with basal joints elongated and swollen, apical portion brown, pubescent, length of arista slightly more than equal to width of frons; cheeks rather less in height than the breadth of third antennal joint; eyes bare, distinctly higher than long; proboscis with apical portion slightly prolonged, bent backward. Mesonotum with the sulci distinct, each of these with a double row of hairs in it, and between them and the central, narrower, line there are 3 and 4 rows of short hairs; scutellum with rounded outline; apical pair of bristles slightly approximated, basal pair much weaker than apical pair. Legs normal, hind tibial spur situated close to apex of tibia, bent, not longer than diameter of tibia. Wings with third costal division one-half as long as second; veins 3 and 4 subparallel; outer cross vein slightly oblique.

Length, 1.25–1.75 mm.

Described originally from Santa Gertrudes, Texas, a stage station about 50 miles from Brownsville, by Becker. I have before me specimens from the same lot, taken by E. A. Schwarz, and specimens from San Diego, Texas; Beeville, Texas; Sharpsburg, Texas; Santa Rosa, Texas; Newcrest, Texas; and Bright Angel, Arizona (H. S. Barber). None of the Texan specimens except those taken by E. A. Schwarz have collector's names on them. There are also two specimens in U. S. National Museum collection from Filmore Canyon, Organ Mountains, New Mexico (C. H. T. Townsend). These latter were taken at a height of about 6,000 feet in August; the dates for the other specimens range from end of April to June in Texas, and July 10 in the case of the one from Arizona. The Arizona specimen bears a label: "Very annoying by lighting on face and hands while working."

23. HIPPELATES DORSALIS Loew.

Figs. 33, 34.

Hippelates dorsalis LOEW, Dipt. Amer. Sept. Ind. Cent., 8, 1869, species 75.

Female.—Yellow, subshining; ocellar spot, upper surface of third antennal joint and back of head blackened. Mesonotum with three broad subopaque black stripes, the side ones shortened slightly, the middle one very narrowly divided by a yellow line, and, usually, two elongate spots in front of wing bases; pleuræ with generally the lower half of meso- and sternopleuræ black; scutellum black at base. Abdomen with the anterior half of segments occupied by a black, posteriorly tridentate band. Legs yellow, rarely with the hind tibiæ and apices of tarsi brownish. Halteres yellow. Wings clear, veins yellow. Hairs yellow, bristles black.

Frons occupying a little more than one-third the width of head; triangle ill-defined, not shining; occupying more than two-thirds the width of vertex and very short, not extending to middle of frons; surface hairs weak; antennæ small, third joint rounded, pilose; arista tapering, almost bare, not as long as width of frons; cheeks higher at anterior than at posterior margin, and at lowest part at least as high as width of third antennal joint, projecting at anterior margin; proboscis glossy brown, rather long, geniculated, apical portion almost as long as subapical; eyes almost round. Mesonotum impunctate, rather thickly covered with short, pale hairs; scutellum rounded in outline, slightly convex, disk with short hairs, apical bristles stronger than the subapical pair, not closely approximated. Legs normal; hind tibial spur as in *impressus*. Wings with venation as in *impressus*.

Length, 1.5–2 mm.

Originally described from Cuba by Loew. Specimens in U. S. National Museum collection are from Biscayne Bay, Florida (Mrs. A. T. Slosson).

Becker had not seen this species and placed it in his table among the species with the disk of mesonotum black or gray. Thus it is impossible to place it by the use of his table.

24. HIPPELATES STRAMINEUS Loew.

Figs. 19, 25, 32.

Hippelates stramineus LOEW, Dipt. Amer. Sept. Ind. Cent., 10, 1872, species 90.
Oscinis ovalis ADAMS, Ent. News, 1906, p. 110.

Female.—Pale yellow, subopaque. Ocellar spot, upper side of third antennal joint, and a spot on back of head black. Mesonotum with three reddish-yellow stripes, the middle one of which is divided, the side stripes are shortened in front and posteriorly, the middle one reaches the anterior margin but is much shorter posteriorly than the

lateral stripes; on the extremity of the middle stripe anteriorly there is a black spot while the lateral stripes are blackened at apices anteriorly and slightly on the small rounded portion behind humeri; there is also an elongate black spot in front of wing base; pleuræ with a glossy black spot on lower portion of the mesopleura and another more obscure one on above hind coxa; scutellum yellow, with rarely a blackened area on disk. Abdomen yellow, with either narrow, fore-marginal, tridentate black bands, or three longitudinal rows of spots. Legs with tarsi sometimes browned at apices. Wings clear, veins yellow. Halteres yellow. Hairs yellow, bristles black.

Frons occupying one-half the width of head; triangle poorly defined, nearly as wide posteriorly as vertex, and extending to distinctly beyond middle of frons, both triangle and frontal stripe opaque; lateral margins with the hairs setulose, becoming stronger toward posterior margin; frons slightly protruding in front; antennæ of moderate size, third joint rounded in front; arista tapering, nearly bare, shorter than width of frons; cheeks high, about twice as high as third joint of antennæ, and over half as high as the eye, which is small and almost round; proboscis not elongated. Mesonotum impunctate, the hairs short and rather irregular; between the prescutellar bristles there is a row of 4-6 setulæ; scutellum short but the outline not regularly rounded, the apex somewhat acute; bristles strong, the apical pair not much approximated. Legs normal; hind tibial spur shorter than diameter of tibia. Wings with veins 2-3 divergent; third costal division one-half as long as second; veins 3-4 subparallel.

Length, 2 mm.

Described from Tifton, Georgia.

Represented in U. S. National Museum by specimens from Clarendon, Texas, July 31, 1909 (V. I. Safro); Victoria, Texas (J. D. Mitchell); Plano, Texas, July, "in cornfield" (E. S. Tucker); Mesilla Park, New Mexico (C. N. Ainslie).

PROHIPPELATES, new genus.

This genus is distinguished from *Hippelates* by the presence of orbital bristles and from *Pseudohippelates* by the presence of the two long hairs on proboscis in male and the flattened scutellum.

Type of this genus.—*Hippelates pallidus* Loew.

PROHIPPELATES PALLIDUS Loew.

Figs. 21-24.

Hippelates pallidus LOEW, Dipt. Amer. Sept. Ind. Cent., 6, 1865, species 93.

Female.—Pale yellow, shining; ocellar spot, and sometimes apex of abdomen, blackened; arista black, or brown. Mesonotum occasionally with indications of a reddish stripe on either side, but usually only

the disk rather more inclined to reddish yellow than the pleuræ. Hairs and bristles on body yellow, those bristles on posterior part of mesonotum and scutellum black. Apical tibial spur glossy black. Wings clear, veins brownish yellow.

Frons distinctly, but not greatly, over one-third as wide as head; triangle large, occupying almost the entire vertex, and extending nearly to anterior margin; lateral frontal hairs strong, four along eye margin being bristlelike, the whole four directed backward, the lower two slightly outward; antennæ large, third joint rounded; arista not longer than width of frons, very distinctly pubescent; cheeks very narrow, not equal to more than one-third as high as width of third antennal joint; a distinct bristle at anterior margin; proboscis geniculated, but thick and fleshy; palpi large, hairy; eyes bare or slightly pilose, much higher than long. Mesonotum with the surface hairs very numerous, and irregularly arranged; scutellum flattened on disk, subtriangular, apex truncate, apical bristles placed on angles, long, cruciate, the subapical pair separated from apical by as far as distance between apical bristles. Legs strong, hind femora thickened somewhat; surfaces of all legs covered with hairs; apical spur of hind tibiæ very long, strong, and curved, in length reaching nearly to apex of metatarsus, its base at near apex of tibia. Wings with third costal division two-thirds as long as second; outer cross vein oblique.

Length, 2-3 mm.

Originally described from Cuba. There is a large series of specimens of both sexes in U. S. National Museum collections from Andros Key, Bahama Islands, West Indies, "on shells," June, 1912 (P. Bartsch); and one male from Havana, Cuba (E. A. Schwarz).

The male has the head a little smaller than the female, and has two very long hairs attached to the proboscis as shown in figure 21. In other respects they are similar.

PSEUDOHIPPELATES, new genus.

This genus differs from *Hippelates* in its much more elongated shape, the possession of frontal bristles, and the stronger bristling of the cheeks and anterior mouth margin. The hypopygium of the male is large and knoblike.

Type of this genus.—*Hippelates capax* Coquillett.

PSEUDOHIPPELATES CAPAX Coquillett.

Fig. 40.

Hippelates capax COQUILLETT, Journ. N. J. Ent. Soc., vol. 6, 1898, p. 48.

Male and female.—Shiny black; disk of mesonotum distinctly obscured by yellowish gray pollinosity; frons black, anterior margin yellow, carried in the form of a short stripe backward to the apex of the triangle and separating the velvety black side spots which

extend well beyond apex of triangle; triangle shiny black, obscured by grayish pollen; face and cheeks yellow, the latter blackened on posterior margin, occiput black; antennæ black; palpi yellow; proboscis brown-black; upper mouth margin black. Abdomen yellowish ventrally, and on apices of abdominal segments. Legs yellow, blackened on upper surface of fore femora, apices of mid and hind femora, and whole of tibiæ and tarsi, except bases. Wings slightly browned, veins dark brown. Halteres yellow, all hairs and bristles on body and legs black.

Slender. Frons occupying one-half the width of head, the sides slightly divergent posteriorly; triangle equilateral, extending well toward eye margin at vertex and two-thirds of the length to anterior margin of frons; no hairs on margins of triangle, those on lateral margins of frons strong, the two on lower half bristlelike and pointing out over eye, the surface hairs absent on the pale center, except in front; antennæ above average size, third joint rounded, pubescent; arista swollen, and tapering, at base, as long as width of frons, pubescent; cheek slightly produced anteriorly, in height equal to about one-half the width of third antennal joint, marginal hairs distinct, the anterior one setulose; proboscis thick, apical portion bent back for a short distance; palpi normal. Mesonotum without punctures, the hairs short, in the lateral two rows single, in the center row double; pleuræ concolorous with disk of mesonotum; scutellum with posterior margin rounded, apical pair of bristles long, not closely approximated nor cruciate, besides these two long bristles there are two shorter marginal bristles and a few discal hairs. Legs rather slender, and elongated; hind tibial spur situated at apex and about equal in length to tibial diameter. Wings narrow, third costal division equal to two-thirds the length of second; third and fourth veins gradually, but slightly divergent; outer cross vein upright, last portion of fourth vein twice as long as penultimate portion; last portion of fifth vein three-fifths as long as penultimate portion of fourth.

Length, 2-3 mm.

Redescribed from type-specimen. Locality, Algonquin, Illinois.

Other specimens in collection as follows: One from Bascayne Bay, Florida; one with No. 265, no other data; and one from Frontera, Tabasco, Mexico, March 26, "light" (C. H. T. Townsend). The Mexican specimen is the smallest of the lot and rather immature, but I have not the least doubt as to its identity.

PSEUDOHIPPELATES GRACILIS, new species.

Figs. 26-28.

Female.—Black, shining. Frons black, opaque; anterior margin broadly yellow, the pale color carried back in center much as in

capax; triangle highly polished; antennæ yellow, third joint above, and arista black; face and cheeks pale yellow, the latter white dusted, proboscis black-brown, glossy; palpi yellow. Mesonotum with distinct brownish pollinosity; humeri glossy; pleuræ pollinose on above all coxæ, a broad stripe between fore and hind pairs glossy; scutellum colored as disk of mesonotum. Abdomen colored on dorsum as disk of mesonotum, yellowish below. Legs yellow; mid and hind coxæ brownish, apices of all femora browned; tibiæ browned, except at bases; all tarsi brown. Wings clear, veins dark brown. Halteres reddish yellow.

Frons about one-half the width of head; triangle elongate, occupying rather more than two-thirds the width of vertex, and extending slightly more than two-thirds to anterior margin of frons; surface hairs rather stronger than in *capax*, not numerous; lateral setulæ strong; antennæ above the average size; third joint disklike; arista very distinctly pubescent, length equal to width of frons, for profile see fig. 26. Mesonotum sparsely haired, the hairs rather setulose, and forming three short rows, the center one very short; scutellum with four marginal bristles and a few, weak, discal hairs, outline of scutellum rounded. Surface of abdomen with rather setulose hairs. Legs slender, elongate, hairy; hind tibial spur as in fig. 27. Wing is in fig. 28.

Length, 3–4 mm.

Type.—Cat. No. 15969, U.S.N.M.

Type-locality.—Canal Zone, Panama, April, 1907 (A. Busck), a large series of specimens.

The male differs from the female in having the pale color rather more pronounced, in having the cheeks not so high, and the proboscis smaller, as well as in its possession of a large knoblike hypopygium.

Genus *CERATOBARYS* Coquillett.

Figs. 31, 39.

Ceratobarys COQUILLETT, Journ. N. J. Ent. Soc., vol. 6, 1898, p. 45.

There is but a single species belonging to this genus in North America so far as is known. It is very similar to certain yellow species in the genus *Crassiseta* but may be known from them at once by the possession of the hind tibial spur. From all the species in *Hippelates* and *Pseudohippelates* it may be known by the strap-shaped arista as shown in fig. 39.

I have seen specimens from Georgia; Plano, Texas, June, in oat field (E. S. Tucker); and College Station, Texas, from wheat, February, 1891 (F. M. Webster).

SPECIES NOT INCLUDED IN TABLE.

HIPPELATES GENALIS Thomson.

Hippelates genalis THOMSON, Eugen, Resa, Dipt., vol. 1, 1869, p. 608.—BECKER, Ann. Nat. Mus. Hung., vol. 10, 1912, p. 91.

Becker's description is:

Von rostroter Grundfarbe; Thoraxrücken und Schildchen matt dunkel braungrau, ersterer mit 3 feinen etwas eingedruckten Linien, kurz Schwarz behaart, letzteres am Rande gelb ohne längere Randborsten; Schulterbeulen gelbbraun; Brustseiten glänzend schwarzlich, fein hell pubeszent, Kopf gelb; Stirn rotgelb, gleichbreit, so breit wie ein Auge, mit kleinem glänzend braunen Scheiteldreieck, das am Schiitel nur die halbe Breite einnimmt und nur bis zur Stirnmittle reicht. Augen groß kreisrund, nackt. Fühler gelb drittes Glied schwarzbraun mit nackter Borste. Taster gelb, oberer innerer Mundrand geschwarzt. Russel lang dünne mit langen geknickten Saugflächen wie bei einer *Siphonella*. Backen gelb, sehr schmal, nicht breiter als das halbe breite Fühlerglied; Hinterkopf auf der Mitte verdunkelt. Hinterleib braun. Beine rotgelb; Hinter-Schenkel und Schienen auf der Mitte etwas gebräunt; Hinter-Schienen mit einem langen Schwarzen gekrümmten Dorn, dessen Spitzel bis zur Mitte des Metatarsus reicht und dessen Wurzel nicht am der Spitze, sondern schon etwas vor derselben beginnt. 2½ mm. lang. Aus Kalifornien. Type im Reichmuseum Stockholm.

This species evidently comes close to *nobilis* Loew., but the frontal triangle in *genalis* is described as "glänzend," which is not the case in any of the species in the *plebejus* group. I have not seen the species, which may ultimately prove to be identical with *nobilis*.

HIPPELATES LITURATUS Becker.

Hippelates lituratus BECKER, Ann. Mus. Nat. Hung., vol. 10, 1912, p. 87.

Becker gives the name *lituratus* in his table of species on page 87, but does not give any description of the species subsequently. The only characters given are those that may be deduced from the table as follows:

Thorax shining black; antennæ yellow, third joint partly black, arista shortly pubescent; legs mostly yellow, only the femora brown on middle; hind tibial spur before apex of tibia; abdomen yellow with brown bands on anterior margins of segments.

This description is not sufficient to identify the species which requires to be fully described to distinguish it from its allies.

HIPPELATES LONGULUS Becker.

Hippelates longulus BECKER, Ann. Mus. Nat. Hung., vol. 10, 1912, p. 89.

Thoraxrücken und Schildchen glänzend Schwarz, jedoch mit sehr feinen brauner Pubeszenz, sehr fein und undeutlich reihenförmig behaart. Haare dunkel. Schulterbeulen und Brustseiten matt aschgrau bestäubt. Schwinger gelb. Kopf gelb. Hinterkopf Schwarz. Stirn matt dunkelrotbraun, an der vordern Kante rotgelb. Scheiteldreieck glänzend schwarz, gleichseitig, nicht ganz bis zum Stirnvorderrande

reichend. Fühler schwarz, dritte Glied gross mit stumpfer Oberecke, deutlich etwas pubeszent mit zarter deutlich behaarter Borste. Gesicht und Backen weissgelb, letztere nicht ganz so breit wie das dritte Fühlerglied; Mundrand mit 2 deutlich feinen Borsten; Taster gelb, Russel dick mit etwas verlängerten Sauglappen und ganz schwarz. Hinterleib ziemlich matt, braun, am Bauche vorne gelb. Beine fast ganz schwarz braun, äusserste Kniespitzen der vordern Beine rostgelb; der Schienen dorn steht dicht an der Spitze der Schiene und ist nicht besonders gross. Flügel schmal, deutlich etwas gebräunt mit dicken braunen Adern; dritte und vierte Längsader schwach divergierend. 2. mm. lang. 1 Exemplar aus Kanada (Coll. Aldrich).

I have not seen this species, which is, in addition to the above description, distinguished in the synoptic table by the following characters:

Fühlerborsten deutlich behaart, drittes Fühlerglied gross, deutlich pubeszent; Gesicht und Backen weisslich. Thoraxrücken ausserordentlich fein punktiert und weitläufig schwarz behaart. Brustseiten matt aschgrau. Hinterleib matt Schwarzbraun. Beine schwarz-braun nur die äussersten Kniespitzen rostgelb. Flügel schmal braunlich.

The above description evidently proves this species to be distinct from any of those in my table.

EXPLANATION OF PLATES.

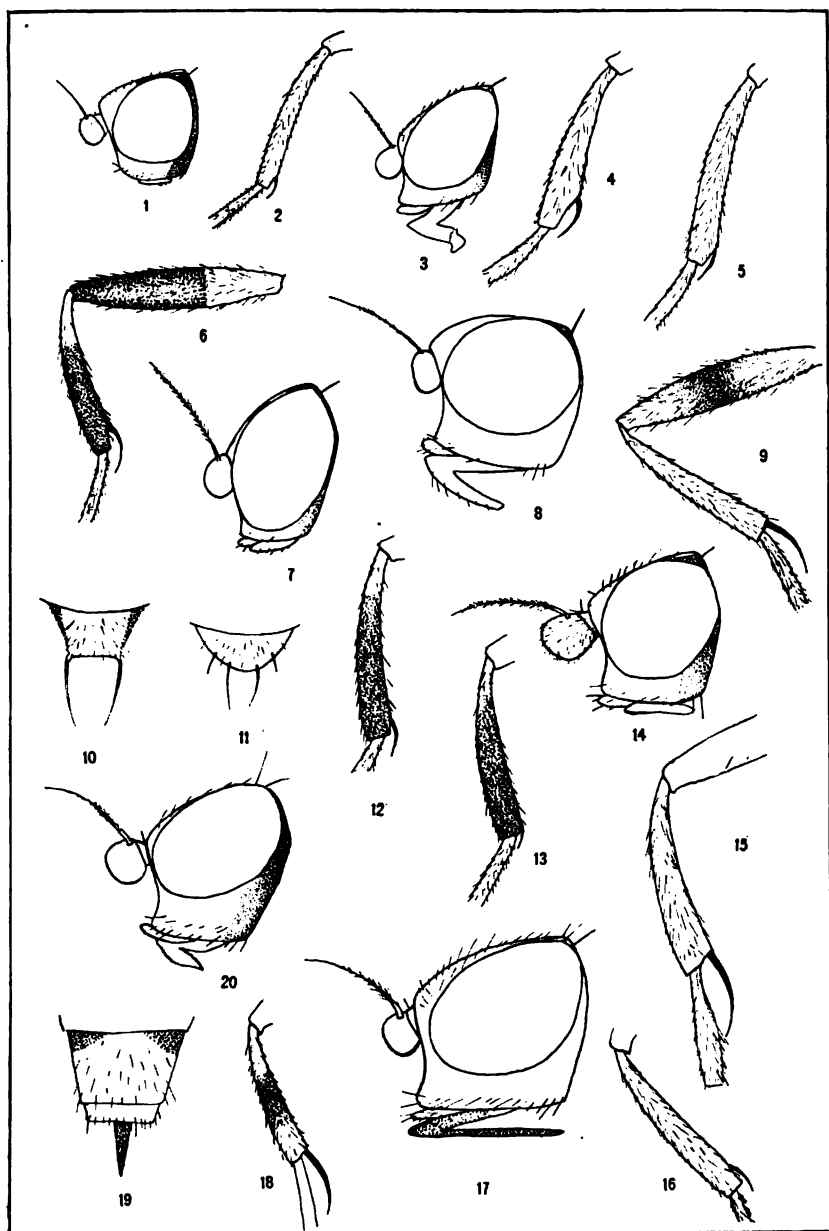
PLATE 23.

- Fig. 1. *Hippelates partitus*, head in profile.
2. *Hippelates partitus*, hind tibia.
3. *Hippelates flavipes*, head in profile.
4. *Hippelates flavipes*, hind tibia.
5. *Hippelates nudifrons*, hind tibia.
6. *Hippelates apicata*, hind femur and tibia.
7. *Hippelates truncata*, head in profile.
8. *Hippelates nudifrons*, head in profile.
9. *Hippelates truncata*, hind femur and tibia.
10. *Hippelates truncata*, scutellum.
11. *Hippelates texana*, scutellum.
12. *Hippelates nigricoxa*, hind tibia.
13. *Hippelates texana*, hind tibia.
14. *Hippelates nigricoxa*, head in profile.
15. *Hippelates plebejus*, hind tibia.
16. *Hippelates impressus*, hind tibia.
17. *Hippelates plebejus*, head in profile.
18. *Hippelates nobilis*, hind tibia.
19. *Hippelates stramineus*, apex of abdomen of female.
20. *Hippelates microcentrus* head in profile.

PLATE 24.

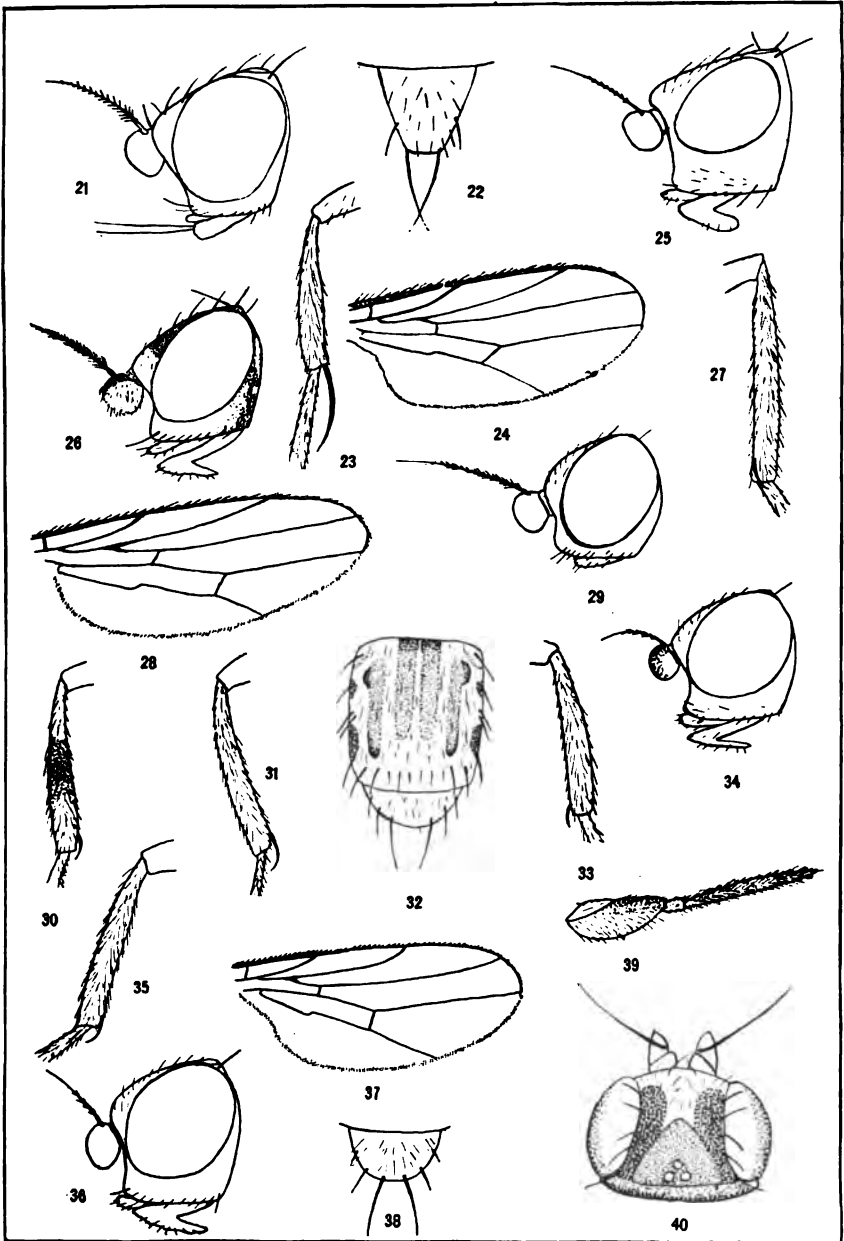
21. *Prohippelates pallidus*, head in profile.
22. *Prohippelates pallidus*, scutellum.
23. *Prohippelates pallidus*, hind tibia.
24. *Prohippelates pallidus*, wing.
25. *Hippelates stramineus*, head in profile.
26. *Pseudohippelates gracilis*, head in profile.

- Fig. 27. *Pseudohippelates gracilis*, hind tibia.
28. *Pseudohippelates gracilis*, wing.
29. *Hippelates subaequalis*, head in profile.
30. *Hippelates tener*, hind tibia.
31. *Ceratobarys eulophus*, hind tibia.
32. *Hippelates stramineus*, dorsum of thorax.
33. *Hippelates dorsalis*, hind tibia.
34. *Hippelates dorsalis*, head in profile.
35. *Hippelates nitidifrons*, hind tibia.
36. *Hippelates nitidifrons*, head in profile.
37. *Hippelates subaequalis*, wing.
38. *Hippelates nobilis*, scutellum.
39. *Ceratobarys eulophus*, antenna.
40. *Pseudohippelates capax*, head from above.



DETAILS OF FLIES IN SUBFAMILY BOTANOBIINÆ.

FOR EXPLANATION OF PLATE SEE PAGE 265.



DETAILS OF FLIES IN SUBFAMILY BOTANOBIINÆ.

FOR EXPLANATION OF PLATE SEE PAGES 265, 266.

CAMELS OF THE FOSSIL GENUS CAMELOPS.

By OLIVER P. HAY,

Research Associate of the Carnegie Institution of Washington.

One of the most interesting revelations furnished us by the study of vertebrate paleontology is that our country was inhabited, still after the beginning of the Pleistocene, by camels belonging to more than one genus and to several species. Our knowledge of these species has been meager enough, although the number named has not been so restricted. Most of these species have been founded on such scanty materials that comparisons among them could hardly be made with any accuracy or certainty. In 1898¹ Doctor J. L. Wortman considered the materials then available, and he ended by including under the name *Camelops kansanus*, given by Leidy in 1854, not only the type of this species, but likewise Leidy's species *Megalomeryx niobrarensis* and his Californian *Auchenia hesternus*, Cope's *Holomeniscus sulcatus*, and the specimens from Oregon and Texas which the author just mentioned had described under the name of *Holomeniscus hesternus*, and Cragin's *Auchenia huerfanensis*, found in Colorado. *Camelops kansanus* had itself been based on a fragment of the snout, consisting of portions of the left premaxilla and maxilla, with the root of an incisor and a part of the socket of a canine. This specimen had been found in 1854, or previously, in what was described as "gravel drift," somewhere within the present State of Kansas.

Happily, these camels are beginning to emerge from the obscurity which has enveloped them. That wonderful deposit of remains of Pleistocene vertebrates, the asphalt beds of Rancho La Brea, near Los Angeles, California, has furnished to Doctor John C. Merriam a few complete skulls and the greater part of the skeleton of one, possibly of two, species of camels. The skulls are described by him in a paper recently issued.² Two complete skulls are figured, of which one is identified as representing the species which Leidy called *Auchenia hesternus*, the other as being near this species and probably belonging to it. Merriam accepts Wortman's conclusion that these camels are

¹ Bull. Amer. Mus. Nat. Hist., vol. 10, p. 93.

² Univ. California Publ., Geol., vol. 7, pp. 305-323, figs. 1-11.

generically distinct from *Auchenia* and with him accepts Leidy's name *Camelops*.

The present writer has recently had occasion to study some of the materials belonging to Pleistocene camels. In the United States National Museum is Leidy's type of his *Megalomeryx niobrarensis*, a fragment of the left side of the lower jaw containing a much worn second premolar; likewise the little worn right lower second molar identified as belonging to the same species.¹ In looking for other materials the writer found Cragin's type of his *Auchenia huerfanensis*. This was discovered in 1884 in beds of volcanic ashes, along a small tributary of the Huerfano River, in Huerfano County, Colorado, by the geologist Mr. R. C. Hills, of Denver. It had afterwards been for some time deposited in the Colorado Scientific Society, and while there had been described by Professor F. W. Cragin. Later it was presented, together with a considerable quantity of other fossil materials, by Hills to the United States National Museum. Here it now has the catalogue number 7819. It presents a part of the right maxilla with the last premolar and the molars, all in good condition; a part of the left maxilla with the roots of two premolars and of two molars; the right ramus of the lower jaw, lacking most of the symphysis and containing the fourth premolar and the first molar; the left ramus, lacking most of the ascending portion, and of the symphysis, and furnishing all the molars in fair condition, and the root of the fourth molar; portions of both premaxillæ; a part of the occiput; many small fragments of the brain-case and of the face; the distal ends of the metapodials of one foot; and one proximal phalanx.

The writer has at hand likewise some remains of two or three individuals of a camel which evidently belonged to the same genus as those already mentioned. These remains consist of two symphyses of lower jaws, with the incisors and canines; a part of a right horizontal portion of a lower jaw, containing the cheek-teeth; a few other lower teeth and parts of still others; and one as yet uncut upper last molar. These materials were found in 1905, by Mr. F. C. Horn, at Minidoka, Idaho, not far from Shoshone, in a bed of gravel which was overlain by a lava flow. In the same gravels were found bones of a large elephant, a part of a lower jaw of a horse, and two horn-cores of a bison, which the writer identifies as *Bison alleni*. A part of the camel remains bears the United States National Museum catalogue number 2579; another part, the number 5315.

In the National Museum there are three incisors and a part of a large molar of a camel which were found in 1867, by Mr. E. L. Berthoud, in "loess deposits of the big ravine on north bank of Big Thompson River," near Greeley, Colorado. The locality is close

¹ Journ. Acad. Nat. Sci. Phila., n. s., vol. 7, p. 161, pl. 14, figs. 12-14.

to the line between townships 4 and 5 north, range 66 west. The teeth were discovered at a depth of 35 feet from the surface. The catalogue number is 870.

The most important of the specimens above mentioned are, of course, those constituting the type of Cragin's *Auchenia huerfanensis*.

It may be as well, first of all, to establish, if possible, the relationships of Leidy's *Camelops kansanus*, Leidy's *Auchenia hesternus* (as represented by Merriam's specimens), and Cragin's *Auchenia huerfanensis*. That all belong to the same genus there seems to be little reason to doubt. Comparisons between *Camelops kansanus* and Merriam's specimens are limited to the anterior half of the premaxilla, the anterior extremity of the maxilla, the last incisor, and a part of the socket for the canine. Merriam¹ writes that compared with Leidy's type the anterior end of the rostral region of the Rancho La Brea skulls shows little to distinguish it, the general proportions of the elements present and the location of the teeth being nearly the same. However, it seems to the writer that Merriam's drawing, figure 5, shows that the premaxilla has almost exactly the form and proportions of that of the lama. At the point of the alveolar border where the maxillo-premaxillary suture is encountered, the premaxilla begins to narrow as it passes backward. In the type of *Camelops kansanus* the bone continues to widen backward as far as it is preserved. Leidy's figure appears to show also that the whole alveolar border in front of the canine was more strongly sigmoid than in the specimens from Rancho La Brea. Leidy himself stated that the premaxilla is of very much more robust proportions than in the lama or the camel. It seems to me that Merriam has done right in not identifying his specimens as *Camelops kansanus*.

It is still more certain that the type of *Camelops huerfanensis* is different from both *C. kansanus* and *C. hesternus*. Plate 25, figure 2, represents an exterior view of the left premaxilla of the Huerfano specimen and Plate 25, figure 3, the inner surface of the same bone; while figure 4 of the same plate presents a view of the maxillary border. That part which was in front of the exit of the incisor is wanting. It is evident that the maxilla extended forward on the alveolar border nearly to the incisor tooth. Just below, behind, and outside of the bottom of the socket for the incisor there is a great thickening of the premaxilla. On this thickening, mesiad of the line of suture, there is a concave surface which is taken to be a part of the wall of the socket for the canine. The presence of the canine here furnishes the reason for the thickening of the premaxilla at this place. If this conclusion is correct, the canine must have emerged immediately behind the incisor just as it does in the Bactrian camel.

¹Univ. California Publ., Geol., vol. 7, p. 212.

In the type of *Camelops kansanus* there is a space of 45 mm. between the two teeth. It is to be noted further that the maxillo-premaxillary suture in *C. kansanus* crosses the alveolar border 20 mm. behind the incisor. What may have been the form of the nasal border of the premaxilla of *C. kansanus* behind the part present in the type, we do not know. As will be seen, that of *C. huerfanensis* is strongly concave, differing thus from *C. hesternus*, the species of *Camelus*, and the lama, in all of which this border is sinuous. Unfortunately, the anterior end and the upper border of the left maxillary which came into contact with the premaxilla is broken away.

The type of *C. huerfanensis* differs from Merriam's specimens of *C. hesternus* in having the posterior palatine foramina placed farther backward; that is, opposite the first molar, instead of opposite the third or fourth premolar. In the specimens described by Merriam the mental foramina are said to be situated immediately below or slightly behind the canine, as in the lama. In *C. huerfanensis* they are placed but little in front of the hinder end of the symphysis and probably well behind the canines. In the camel last mentioned the coronoid process of the lower jaw is relatively wider than in the *C. hesternus*, as shown by Merriam's figure 5.

It is possible to describe some of the very fragmentary parts of the skull of Cragin's type. A part of the occipital region (Plate 25, fig. 1) is present, but it does not extend down to the foramen magnum. There was a strong sagittal crest, but its summit has crumbled away. The width of the occiput, measured along a line passing through the lateral foramina, was close to 110 mm., the same as in the case of the dromedary present. The lambdoidal crest is thin and sharp. On the supraoccipital surface there is a median descending ridge, rough and rounded, and separating two deep excavations. Exterior to these there is on each side another deep excavation, at the bottom of which is placed the lateral foramen. This region resembles that in Merriam's specimens. The paroccipital process is longer, thicker, and wider than in the Bactrian camel, and at its extremity presents a hook. Its form is quite like that of the lama. A fragment of the right maxilla has near its upper edge a depression which corresponds, doubtless, to the fossa mentioned by Merriam.

Figures 2-4 of Plate 25, as already stated, give views of the left premaxilla. The total length of the fragment is 126 mm.; the width of the upper end is 26 mm.; at the narrowest part, 20 mm.; near the anterior end, 31.5 mm. The thickness, a short distance below the upper, or hinder end, is 7 mm.; just at the bottom of the socket for the incisor, 17 mm. The incisor socket indicates that the tooth was large, its height, close to the place of emergence of the tooth, being 22 mm. The socket was at least 40 mm. deep. The surface believed

to have supported the upper side of the canine indicates that this tooth also was one of considerable size. The left maxilla shows that the infraorbital foramen was above the front of the first molar. The region in front of this is not so constricted as in the dromedary. Between the fourth premolars the palate was 50 mm. wide; at the front of the last molars, 87 mm. The palate was therefore narrower than in Merriam's specimens. The left posterior palatine foramen is situated somewhat behind that of the opposite side (Plate 26, fig. 1).

The right ramus of the lower jaw permits various measurements to be taken. The symphysis presents only about 22 mm. of its hinder end. From the hinder end of this to the rear of the bone, above the angle, is 385 mm.; to the rear of the condyle, 415 mm.; to the extremity of the coronoid process, about 450 mm. The depth of the jaw at the rear of the symphysis is 48 mm.; at the front of pm., 59 mm.; at the front of m., 83 mm.; at the rear of m., 110 mm. The measurements indicate a jaw longer than that of Merriam's specimen 20028, but with the depth about the same.

It is not possible to determine accurately what was the length of the symphysis in the type of *C. huerfanensis*. After making such estimates as are possible with the materials at hand the length is taken to have been at least 125 mm. On this assumption the length of the jaw, to a point on the hinder border and on a level with the premolars, will be about 505 mm.; to the rear of the condyle, about 530 mm.; to the rear of the coronoid process, about 540 mm.

The width of the coronoid process at the middle of its height is 46 mm.; that from the front of this process to the rear of the condyle, is 92 mm.; the former being therefore just one-half of the latter dimension. In the specimens of *Camelus* and *Auchenia* at hand the width of the process is considerably less than half that of the jaw across the condyle; and the same appears to be true in the case of Merriam's specimens.

Returning to the symphyses it may be well here to describe those from Minidoka, Idaho. The largest one, No. 2579, is 120 mm. long and was about 50 mm. wide at the narrowest place; 58 mm. wide at the bases of the outer incisors. The mental foramen is placed four-fifths of the distance from the front to the rear of the symphysis and well behind the canine. In Merriam's specimens the foramen is below or slightly behind the canine, and somewhat further forward than in *C. huerfanensis*. In the other specimen from Minidoka (Plate 26, fig. 2), the symphysis has a length of 103 mm. and the foramen is nearer the rear of the union. In these jaws, which probably belonged to the same species as Cragin's specimen, the canines are situated nearer the incisors than they are in those found in California. It may be noted here that in the type of *C. huerfanensis* the fourth

premolar is placed 65 mm. behind the symphysis, while in Merriam's specimen, No. 20028, furnishing a shorter jaw, the same tooth seems to be at a distance of 75 mm. from the symphysis. Merriam has stated that the symphysis in *Camelus* is much longer than in *Auchenia*. This depends, however, on the species. From the specimens at hand it is found that in the Bactrian camel the length of the symphysis equals about 26 per cent of the length from the incisive border to the rear of the condyle; in *Auchenia*, 28 per cent; in the dromedary, 35 per cent. On the assumption that the symphysis of Cragin's species was 125 mm. long, its length would be 23.5 per cent of the length of the jaw. It is not improbable that the symphysis was really longer than 125 mm. Judging from the drawings presented, Cope's Texas specimen¹ referred to *hesternus*, had a symphysis equal to 24 per cent of the length of the jaw, estimated as in the other cases. In that jaw the position of the canine and that of the mental foramen are as in Cragin's type. That jaw was, however, shorter than the latter by about 100 mm. Furthermore, the fourth premolar appears to be much nearer to the symphysis than in the case of Cragin's type, apparently only about 40 mm. distant.

The teeth of the various specimens at hand which are supposed to belong to *C. huerfanensis* must be described. None furnishes the last upper incisor; but the left premaxilla (Plate 25, figs. 2-4) described above contains the socket of this tooth. This has already been described. Likewise, the only trace of the upper canine is shown on that premaxilla, as already noted.

In Cragin's type the fourth premolar of the right side and all the molars are present and in excellent condition. On the left side little is left of the teeth except the roots of the third and fourth premolars and of the first and second molars. (Plate 26, fig. 1.) So far as may be determined from the two roots of the third premolar, this tooth had the size of the corresponding one in Merriam's specimen, referred to *C. hesternus*. In the table below are given the measurements of the upper cheek-teeth. The height of the crowns is given as an indication of the stage of wear; for as the teeth are worn down, the antero-posterior diameter, here called the length, diminishes (except in the case of the third premolar and the last molar), while the transverse diameter increases. In these measurements the length of the crown is taken along the middle of the width of the grinding surface, while the width of the tooth is taken at the base and where greatest. The length of the whole series and of the molar series is taken in a straight line, not along the curve.

¹ Geol. Surv. Texas, 4th Ann. Rep., 1892, pp. 71, 93, pl. 21, figs. 3, 4.

Measurements of the premolars and molars of the upper jaw.

	mm.
Length of the premolar-molar series, pm. ³ —m. ⁶ , inclusive.....	171
Length of the teeth, from front of pm. ⁴ to rear of m. ³	152
Length of the molar series.....	129
Pm. ³ , height.....	
length.....	18.8
width.....	11
Pm. ⁴ , height.....	38
length.....	25
width.....	25
M. ¹ , height.....	35
length.....	38.5
width.....	30
M. ² , height.....	57
length.....	48
width.....	30
M. ³ , height.....	62
length on grinding surface.....	45
length at middle of height.....	56
width.....	28.5

These measurements may be compared with those given by Merriam on page 316 of his paper; but some of his measurements appear to have been taken somewhat differently. If in the Huerfano specimen we measure the distance from the front of pm.⁴ to the rear of m.⁶ along the outer curve we shall have 167 mm.; and along the outer curve of the molars alone, 138 mm. Merriam mentions the fact that in his specimen 20028 the metastyle of the last upper molar is drawn out posteriorly as a wing; but that this wing is not present in the specimen 20040. In the Huerfano specimen this metastyle is large and is bent strongly inward, as may be seen from figure 1, plate 26. The width of this metastyle, from side to side, is 14 mm. Accompanying the materials from Minidoka is a third upper molar which had not yet been cut, and whose base had not yet been completed. The metastyle forms a broad sharp border, but shows no tendency to be bent mesiad.

The lower incisors of the Huerfano specimen are missing. They are present in the two symphyses from Minidoka. Those of No. 5315 are shown in figure 2 of Plate 26. The outer incisors had only just begun to wear. They have a length of 60 mm., a width of 13 mm. at the middle of the length, and a thickness of 9 mm. The second incisors are naturally more worn. They have a width of 18 mm. and a thickness of 10 mm. at the middle of the length. The first incisors are about 17 mm. wide and 12 mm. thick. All are flat on the upper surface and convex from side to side on the lower, or front, surface. They are relatively more powerful teeth than in the lama or the dromedary.

The incisors of No. 2579, from Minidoka, are still more worn than those just described, and they belonged to a larger animal. Those of the first pair, in their worn condition, are at least 73 mm. long. All these incisors were directed forward more strongly than in the lama and the Bactrian camel, as the latter is represented in the specimen at hand. It must be stated further, that the lateral incisors of figure 2, Plate 26, are, relatively to the others, much larger than in Cope's specimen from Texas.¹ None of these incisors are as strongly curved as they are in the lama.

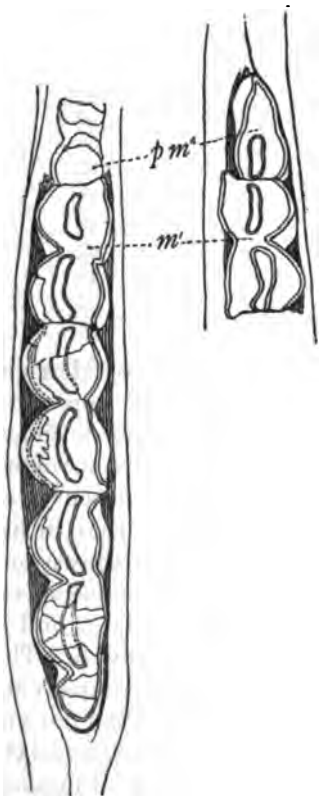


FIG. 1.—MOLARS (m^1) AND PREMOLARS (pm^1) OF LOWER JAWS OF THE TYPE OF *CAMELOPS HUERFANENSIS*. X $\frac{1}{2}$.

Figures 3 and 4, Plate 26, represent of the natural size the two incisors, i_1 and i_2 , right side, which were found in 1867 by E. L. Berthoud. It is, of course, not certain that they belonged to *Camelops*, but it is probable that they did. These teeth are spatulate in form, not greatly curved, and are somewhat twisted. What is taken to be the second right incisor (Plate 26, fig. 4) is worn very slightly; the other incisor (fig. 3) not all. I_1 has a length, in a straight line, of 92 mm.; a width of 23 mm. near the anterior end; while at the middle of the length, the width is 18 mm.; the thickness 10.5 mm. A section of the tooth at this place would greatly resemble that of the corresponding tooth from Minidoka. I_1 had not quite completed its growth at the base. It is 80 mm. long, 26 mm. wide near the front; 21 mm. wide and 10 mm. thick at the middle of the length.

As in other specimens supposed to belong to *Camelops*, the lower jaw of the Huerfano skull has present no traces of any premolars in front of the fourth. In a part of a jaw (Plate 26, fig. 5) from Minidoka, which belongs possibly with the symphysis numbered 5315, there is left the base of the crown and the root of a small third premolar. This has a diameter of 7 mm., fore and aft, and a transverse diameter of 6 mm. In the anterior border of the fourth premolar there is a groove which appears to have been occupied by the crown of this third premolar.

¹ Geol. Surv. Texas, 4th Ann. Rept., 1892, pl. 21, fig. 4.

The following are the measurements of the fourth premolar and the molars of the type of *Camelops huerfanensis* (fig. 1) and of teeth of No. 5315, from Minidoka. Merriam's measurements of the lower teeth of his specimen No. 20040, referred to *C. hesternus*, are added in the third column; and in the fourth the measurements given by Cope for his Texas specimen. In *C. huerfanensis* the fourth premolar and first molar are present in the right ramus, while in the left ramus the premolar is represented by the socket only.

Measurements of lower premolars and molars.

Teeth measured.	Huerfano specimen.	Minidoka specimen.	No. 20040 Univ., Cal.	Cope's Texas specimen.
Length of lower teeth, pm. ₄ to m. ₃ , inclusive.....	mm. 171	mm. 143	mm. 162.2	mm. 27
Length of molar series.....	144	118	134.7	16
Pm. ₄ , height.....	30	25		
length.....	27	23	27.5	
width.....	15	14	13.4	
M. ₁ , height.....	30	30±		
length.....	35	27	39	38
width.....	20	17	21.5	19
M. ₂ , height.....	55±	45		
length.....	45	40	46	44
width.....	24	20	21.2	20
M. ₃ , height.....	65±	63		
length.....	62	56	58	56
width.....	21	20	18.5	16

It will be observed that the teeth of the Minidoka specimen are distinctly smaller than those of the type of *C. huerfanensis*. As regards the premolar and the first two molars, the shortness along the grinding surface may be partly explained by their being more worn; but this explanation does not apply to the last molar. Moreover, the teeth are all narrower. It may be that the individuals which bore these teeth differed considerably in size; and this difference in size may have been due to difference of sex.

The conclusions reached by the writer may be put into the following form:

1. *Camelops kansanus* is known from the type only and is a species distinct both from *C. hesternus*, as represented by Merriam's specimens, and from *C. huerfanensis*.

2. *C. hesternus* is a species distinct from *C. huerfanensis* Cragin.

3. Cope's Texan specimen, referred to *C. hesternus*, can not be determined as yet with certainty. It probably belongs to *C. huerfanensis*, as does probably *C. sulcatus* Cope. Merriam is inclined to refer the Texan specimen to *C. hesternus*, as represented by the California specimens; but it is to be noted that in the latter the line of the lower cheek teeth is considerably shorter than the distance from the front of the fourth premolar to the incisive border, while in Cope's specimen the tooth line is considerably longer than the jaw, in front of the premolar. This would appear to furnish some indication that

the Texan specimen belongs with neither *C. hesternus* nor *C. huerfanensis*.

4. It is impossible at present to decide the status of *Megalomeryx niobrarensis* Leidy. The decision must await new discoveries.

5. The writer accepts, therefore, as species of *Camelops* to be carried on the rolls, until further knowledge is obtained, *C. kansanus*, *C. californicus*, *C. hesternus*, *C. vitakerianus*, *C. niobrarensis*, *C. macrocephalus*, and *C. huerfanensis*, the latter to include provisionally *C. sulcatus* (Cope) and the Texan mandible referred by Cope to *C. hesternus*.

Leidy and Cragin referred to the genus *Auchenia* the species mentioned in this paper. Wortman distinguished the two genera on the presence of a prominent lamina, or style, at the anterior outer angle of the two hinder lower molars of *Auchenia*, a structure absent from the same teeth of the species of *Camelops*. Merriam accepts this separation.¹ It seems to the present writer that there are various other characters which are of perhaps genera importance. It is evident that the species of *Camelops*, so far at least as represented by *C. hesternus*, had skulls relatively longer and narrower than those of *Auchenia*. In the latter the width at the rear of the orbits is equal to about 54 per cent of the length from the front of the foramen magnum; while, according to Merriam's illustrations and measurements, the corresponding width in *Camelops* equals only about 45 per cent of the corresponding length. There is an important difference in the upper molars. In *Auchenia* the length of the grinding surface is nearly equal to the width of the tooth measured at the base; that is, when these molars are well worn down the grinding face is nearly square. In *Camelops* the teeth are relatively long antero-posteriorly. In *Camelops* the lower incisors are less curved than in *Auchenia* and directed more strongly forward; that is, they are more procumbent. In *Auchenia* the nasals are strongly expanded at the hinder end; in *Camelops* they are narrow posteriorly. In *Auchenia* the lachrymal vacuity is crowded outward against the inner border of the lachrymal, while in *Camelops* the vacuity hardly or not at all comes into contact with the lachrymal. In *Camelops* there is fossa in the upper border of the maxilla; in *Auchenia* there is none.

EXPLANATION OF PLATES.

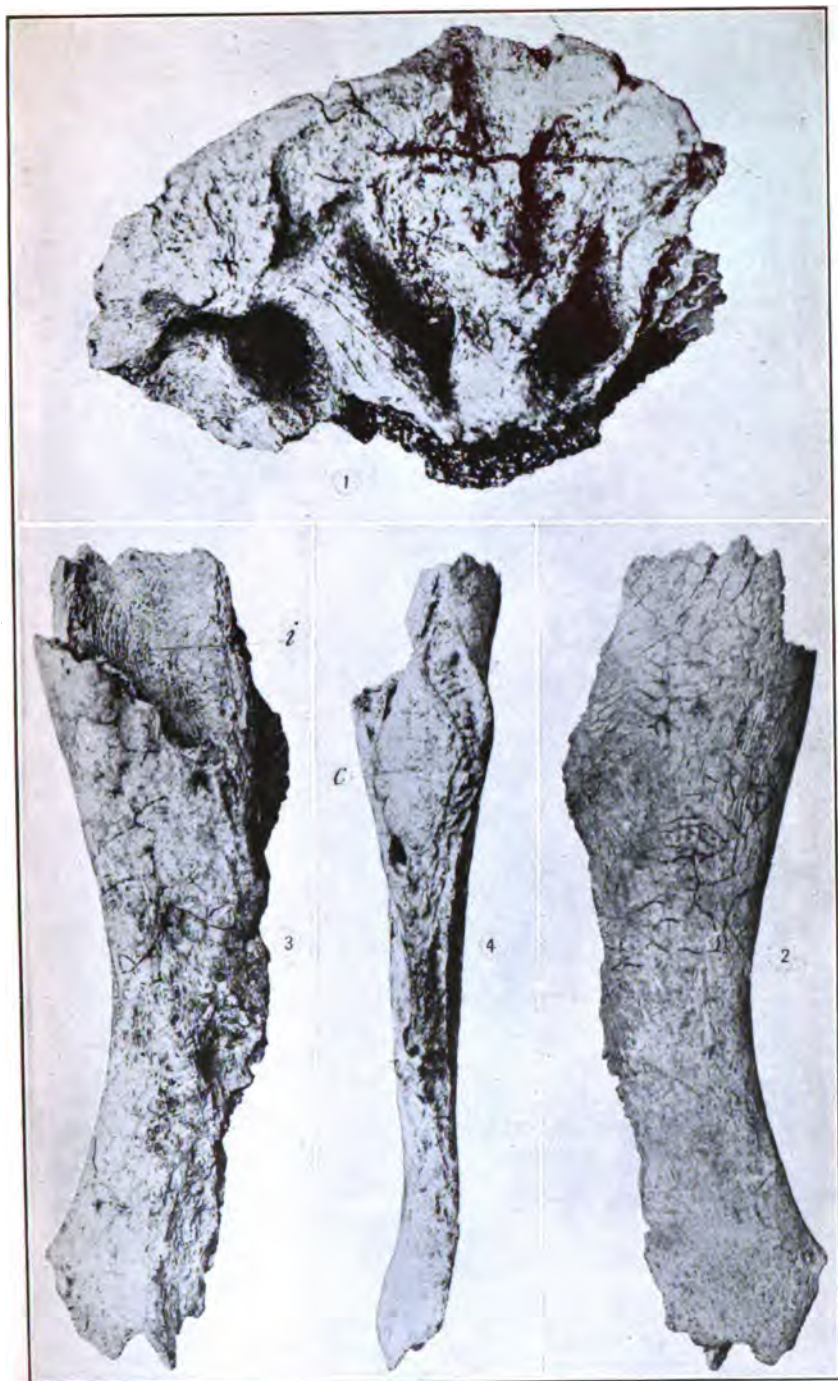
PLATE 25.

Figs. 1-4. *Camelops huerfanensis* Cragin.

1. Rear of the skull, to show its form, the two excavations on each side of the midline, and the intervening ridges. Part of the right side is missing.
- 2-4. Left premaxilla.
 2. View from the outside.
 3. View from the inner side. *i*, Socket for the third incisor.
 4. View of the border which articulated with the maxilla. *c*, Surface which formed a part of the socket for the canine.

PLATE 26.

- Fig. 1. *Camelops huerfanensis*. Palate showing premolars and molars. Type. $\times\frac{1}{2}$.
2. *Camelops huerfanensis*? Symphysis showing incisors and canines. No. 5315 U. S. Nat. Mus. $\times\frac{1}{2}$.
- 3, 4. Third and second incisors. No. 870 U. S. Nat. Mus. $\times 1$.
5. Part of right ramus of lower jaw. Shows minute pm_{-3} , pm_{-4} , m_{-1} and m_{-2} . No. 5315 U. S. Nat. Mus. $\times\frac{1}{2}$.



SKULL AND PREMAXILLA OF *CAMELOPS HUERFANENSIS*.

FOR EXPLANATION OF PLATE SEE PAGE 277.



DETAILS OF TEETH AND JAW OF *CAMELOPS HUERFANENSIS*.

FOR EXPLANATION OF PLATE SEE PAGE 277.

REVISION OF THE CRINOID GENUS HIMEROMETRA.

By AUSTIN HOBART CLARK,

Assistant Curator, Division of Marine Invertebrates, United States National Museum.

HISTORY OF THE GENUS.

The first known species of the genus *Himerometra* was described by P. H. Carpenter in 1881 under the name of *Actinometra robustipinna*. Looking backward at Carpenter's work from our present vantage point which we have reached through the gradual accumulation of facts extending over a period of more than 30 years, it seems to us somewhat extraordinary that Carpenter should have referred this form to the genus *Actinometra* instead of to the genus *Antedon* as, using the systematic scheme of the day, he ought to have done; but it was a very natural thing to do—in fact it is difficult to see how he could have done otherwise, for the single specimen known to him is without a disk and without cirri, and is so badly broken that only a single one of the enlarged proximal pinnules is reasonably complete. He knew of no "tridistichate" *Antedon* in which the size of the lower pinnules decreases from the "distichal pinnule" outward, though this is the usual condition in the "tridistichate" species of *Actinometra*; therefore, as the disk and tips of the lower pinnules, upon which he chiefly relied in separating *Antedon* from *Actinometra*, were absent, he very logically placed the species in the latter genus.

But the reference of *robustipinna* to *Actinometra* instead of to *Antedon*, however natural it may have been, was most unfortunate, for all subsequent students have accepted Carpenter's generic determination, so that the species has remained entirely outside of the literature on the group to which it belongs, and instead has assumed a position in another group with which it has nothing whatever to do.

In 1890 Hartlaub described as new three additional species of this genus, redescribing them in greater detail and figuring them in 1891. Two of these new species (*Antedon martensi* and *Antedon kraepelini*) he placed side by side in a new section of the "Savignyi group" of Carpenter's classification characterized by the presence of palmar

(i. e., IIIBr) series of two ossicles each of which the axillary is "without a syzygy," by the absence of lateral processes on the lower pinnules, and by the possession of very stout distichal pinnules (P_D); the two species he separated according to the presence (*martensi*) or absence (*kraepelini*) of a strong eversion of the distal borders of the proximal brachials and the more abrupt (*martensi*) or more gradual (*kraepelini*) taper of the proximal pinnules; he remarked that the outer palmar (IIIBr) series of *Antedon kraepelini* are often "three jointed, with a syzygy in the axillary" (i. e., $4[3+4]$). The third species he placed in a new section of the "Savignyi group" including species in which the inner palmar series are two jointed (i. e., 2) and the outer are three jointed with a syzygy in the axillary (i. e., $4[3+4]$); with this new species, which he called *Antedon crassipinna*, he placed, under the name of *Antedon bipartipinna*, *Craspedometra acuticirra*.

Hartlaub recognized the close relationship between his *Antedon martensi* and his *Antedon kraepelini*, but though he noticed that the outer palmars of the latter are often $4(3+4)$ while the inner are 2, the very character upon which he placed most reliance in differentiating *Antedon crassipinna*, he failed to detect the similarity of the two.

Antedon martensi, described from a small and imperfect specimen from Singapore, is a valid species; *Antedon kraepelini*, described from a badly broken specimen from Akyab, Burma, is, so far as I can see after a minute examination of both type specimens, the same as the *Actinometra robustipinna* of Carpenter, which Hartlaub had no reason to suspect was in the slightest degree related to it; *Antedon crassipinna* was described from specimens from Amboina, but he includes under this name a specimen from Cochin China, which he studied in the Hamburg Museum; the specimens from Amboina represent the same species as Carpenter's *Actinometra robustipinna*, also from the Moluccas, while the specimen from Cochin China, represents a form recently described under the name of *Himerometra magnipinna*, with the type of which I was able to compare it directly.

In 1894 Bell described, in the "Granulifera group" of Carpenter, a new species from the Macclesfield Bank, which he called *Antedon inopinata*. Had he referred it to the "Savignyi group," where it belongs, he would have noticed its identity with one or other of the three species described by Hartlaub. It represents the same form as Hartlaub's *Antedon kraepelini*, and the specimens from Amboina referred to *Antedon crassipinna*, and also it is the same species as the *Actinometra robustipinna* described by Carpenter.

In 1895 Professor K  hler recorded *Antedon crassipinna* from the Sunda Islands; while I have not seen his specimens, I have not the slightest doubt that he is right in his identification. His record I

interpret as referring to Hartlaub's *Antedon crassipinna* from Amboina, which is the same as *Antedon inopinata*, *Antedon kraepelini*, and *Actinometra robustipinna*.

In 1902 Bell, under the very comprehensive name of *Antedon palmata*, recorded a comatulid from the Maldive Islands which, proving to be a species of *Himerometra*, has been named *Himerometra sol*.

In January, 1908, the present author described an interesting new species of this genus under the name of *Himerometra persica* from the Persian Gulf, in July of the same year noted the fact that he had seen specimens of *Himerometra crassipinna* (i. e., *martensi*, his conception of *crassipinna* up to this time being entirely based upon specimens from Singapore) erroneously labeled "Japan," and in August published a note in which he stated that, while absolutely unrecognizable from the description, Bell's *Antedon inopinata* evidently belonged to the "Savignyi group" of Carpenter and not to the "Granulifera group" in which it had been described; at the same time he called attention to the redescription of Carpenter's *Actinometra robustipinna* by Köhler; not having at the time seen the type of *Actinometra robustipinna*, it was only natural to assume, as Köhler had done, that the *Actinometra* from Amboina with enormously large lower pinnules was really the species described by Carpenter, though now we know that it is really *Comanthus bennetti*, while Carpenter's species is a *Himerometra*.

In December, 1908, there was published by the present author a preliminary notice of a large collection of comatulids made by the United States fisheries steamer *Albatross* among the Philippine Islands, in which there were described as new *Himerometra bartschi*, *H. robustipinna*, and *H. magnipinna*, while *H. persica*, recently described from the Persian Gulf, was recorded from the Philippines. *Himerometra bartschi* and *H. magnipinna* are valid species, and the latter is the form to which the specimen from Cochin China, recorded by Hartlaub under the name of *crassipinna*, must be referred, though the fact was not recognized at the time; *H. persica* is in reality the closely related *H. bartschi*, while the species described as *H. robustipinna* is, by a curious coincidence, the same as the *Actinometra robustipinna* of Carpenter.

In 1909 the present author recorded and described at some length numerous specimens of a species of *Himerometra* from Singapore; these he referred to *H. crassipinna*, believing them to represent the *Antedon crassipinna* of Hartlaub. Subsequent investigation has shown that in reality they represent the *Antedon martensi* of Hartlaub, and should have been recorded under the name of *Himerometra martensi*. At the same time he redescribed *Antedon martensi* (under the name of *Heterometra martensi*), basing the redescription upon a small and immature specimen from Singapore which appeared to meet the

requirements of the original description. A recent reexamination of this individual has shown that it is undoubtedly referable to *Himerometra bartschi*, the long and rather slender cirri, the very long and comparatively slender proximal pinnules which become very delicate and flagellate distally, and the incipient carination of the lower pinnules being sufficiently diagnostic.

In 1911 *Himerometra magnipinna* was recorded from Palawan, in the Philippine Islands, and, in a paper on the recent crinoids preserved in the Leyden Museum, a redescription of the type specimen of Carpenter's *Actinometra robustipinna* which the author had recently examined in Leyden was published.

In a paper on the crinoids of the Hamburg Museum which appeared in 1912 the type specimen of *Antedon kraepelini* was redescribed, and Hartlaub's specimen from Cochin China, which he had referred to his *Antedon crassipinna*, was redetermined as identical with *Himerometra magnipinna*, the redetermination having been based upon a direct comparison with the type of the latter. *Himerometra magnipinna* was also recorded from Isabela, on the island of Basilan, Philippines; Ekalin, on St. Mathias Island; and from Pitilu, in the Admiralty Islands. In a paper on the crinoids of the Berlin Museum published a few days later, the identity of the specimen described by Hartlaub as *Antedon martensi* with the specimens recorded from Singapore under the name of *Himerometra crassipinna* was announced, and both were referred to *H. crassipinna* as the true identification of the types of that form had not at that time been determined. *Himerometra crassipinna* (i. e., *H. martensi*) was also recorded from British North Borneo (the comparison being made with specimens from Singapore), and *H. magnipinna* was recorded from St. Mathias Island.

In the present author's monograph of the crinoids of the Indian Ocean the first comprehensive survey of the genus *Himerometra* was published. In this the following species are admitted as valid:

Himerometra bartschi, Philippine Islands.

Himerometra magnipinna, Philippine Islands; St. Mathias Island.

Himerometra pulcher, new name (*Himerometra robustipinna* A. H. Clark, 1908, not *Actinometra robustipinna* P. H. Carpenter, 1881), Philippine Islands.

Himerometra inopinata, Macclesfield Bank.

Himerometra sol, Maldive Islands.

Himerometra crassipinna, Amboina; Singapore; Pulau Ubin, Singapore; ?Cochin China.

Himerometra kraepelini, Akyab, Burma.

Himerometra persica, Persian Gulf; Philippine Islands.

Himerometra sp. (*Actinometra robustipinna*), Moluccas.

Antedon martensi as in 1909 was referred to the genus *Heterometra* instead of to the genus *Himerometra*.

LIST OF THE REFERENCES TO SPECIES OF THE GENUS *HIMEROMETRA*,
WITH THE CORRECT DETERMINATION OF EACH.

- Actinometra robustipinna* P. H. CARPENTER, Notes from the Leyden Museum, vol. 3, 1881, p. 201.—A. H. CLARK, Notes from the Leyden Museum, vol. 33, 1911, p. 182; Crinoids of the Indian Ocean, 1912, pp. 116, 117*robustipinna* (2)
- Antedon crassipinna* HARTLAUB, Nachr. Ges. Göttingen, Mai 1890, p. 185; Nova Acta Acad. German., vol. 58, 1891, No. 1, p. 32, pl. 1, figs. 1, 5, 10.*robustipinna* (2)+
magnipinna (3)
- Antedon crassispina* KOEHLER, Mem. soc. zool. France, vol. 8, 1895, p. 480.
.....*robustipinna* (2)
- Antedon inopinata* BELL, Proc. Zool. Soc. London, 1894, p. 398.—A. H. CLARK, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 477*robustipinna* (2)
- Antedon kraepelini* HARTLAUB, Nachr. Ges. Göttingen, Mai 1890, p. 183; Nova Acta Acad. German., vol. 58, 1891, No. 1, p. 22, pl. 2, figs. 15, (21).—A. H. CLARK, Smiths. Misc. Coll., vol. 60, 1912, No. 10, p. 18*robustipinna* (2)
- Antedon martensi* HARTLAUB, Nachr. Ges. Göttingen, Mai 1890, p. 182; Nova Acta Acad. German., vol. 58, 1891, No. 1, p. 21, pl. 1, figs. 3, 6.—A. H. CLARK, Proc. U. S. Nat. Mus., vol. 43, 1912, p. 394*martensi* (1)
- Antedon palmata* (part) BELL, in Gardiner, Fauna and Geography of the Maldive and Laccadive Archipelagoes, vol. 1, 1902, pt. 3, p. 224*sol* (4)
- Heterometra martensi* A. H. CLARK, Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 164; Crinoids of the Indian Ocean, 1912, p. 127.
.....*bartschi* (5)
- Himerometra bartschi* A. H. CLARK, Smiths. Misc. Coll. (Quart. Issue), vol. 52, 1908, p. 212; Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7; Crinoids of the Indian Ocean, 1912, p. 114*bartschi* (5)
- Himerometra crassipinna* A. H. CLARK, Smiths. Misc. Coll. (Quart. Issue), vol. 50, 1907, p. 356*robustipinna* (2)+
magnipinna (3)
- A. H. CLARK, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 319; Smiths. Misc. Coll. (Quart. Issue), vol. 52, 1908, p. 213; Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 155; Proc. U. S. Nat. Mus., vol. 43, 1912, p. 394
.....*martensi* (1)
- A. H. CLARK, Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7; Crinoids of the Indian Ocean, 1912, p. 116*martensi* (1)
.....*robustipinna* (2)
.....*magnipinna* (3)
- Himerometra inopinata* A. H. CLARK, Crinoids of the Indian Ocean, 1912, p. 114
.....*robustipinna* (2)
- Himerometra kraepelini* A. H. CLARK, Smiths. Misc. Coll. (Quart. Issue), vol. 50, 1907, p. 356; Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7; Crinoids of the Indian Ocean, 1912, p. 116*robustipinna* (2)
- Himerometra magnipinna* A. H. CLARK, Smiths. Misc. Coll. (Quart. Issue), vol. 52, 1908, p. 214; Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7; Proc. U. S. Nat. Mus., vol. 39, 1911, p. 540; Smiths. Misc. Coll., vol. 60, 1912, No. 10, p. 17; Proc. U. S. Nat. Mus., vol. 43, 1912, p. 394; Crinoids of the Indian Ocean, 1912, p. 114*magnipinna* (3)
- Himerometra martensi* A. H. CLARK, Smiths. Misc. Coll. (Quart. Issue), vol. 50, 1907, p. 356; Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7*martensi* (1)
- Himerometra persica* A. H. CLARK, Smiths. Misc. Coll. (Quart. Issue), vol. 50, 1907, p. 356; Bull. Mus. Comp. Zool., vol. 51, 1908, No. 8, p. 243; American Naturalist, vol. 43, 1909, p. 256*persica* (6)

- A. H. CLARK, Smiths. Misc. Coll. (Quart. Issue), vol. 52, 1908, p. 214...*bartschi* (5)
A. H. CLARK, Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7; Crinoids of the Indian Ocean, 1912, p. 116.....*bartschi* (5)
persian (6)
Himerometra pulcher A. H. CLARK, Crinoids of the Indian Ocean, 1912, p. 114
robustipinna (2)
Himerometra robustipinna A. H. CLARK, Smiths. Misc. Coll. (Quart. Issue), vol. 52, 1908, p. 213; Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7.*robustipinna* (2)
Himerometra sol A. H. CLARK, Crinoids of the Indian Ocean, 1912, p. 115.....*sol* (4)
Himerometra sp. A. H. CLARK, Notes from the Leyden Museum, vol. 33, 1911, p. 182; Crinoids of the Indian Ocean, 1912, p. 117.....*robustipinna* (2)
A. H. CLARK, Smiths. Misc. Coll., vol. 60, 1912, No. 10, p. 18....*robustipinna* (2)

THE PHYLOGENETIC INTERRELATIONSHIPS OF THE SPECIES OF THE GENUS *HIMEROMETRA*.

Though the structure of the cirri and of the arms is in all remarkably uniform, on the basis of the structure of the proximal pinnules the six species of the genus *Himerometra* fall into three groups of two each, and these three groups appear to represent three distinct steps in phylogenetical advancement.

In the allied genera *Craspedometra* and *Heterometra* the enlarged proximal pinnules are, though greatly elongated, comparatively slender, and become very delicate and flagellate distally; they are more or less carinate proximally, and the component segments meet end to end without any overlapping; the first pinnule (including the pinnules on the division series if any be present) is shorter than the second, and the second is shorter than the third.

In *Himerometra persica* and *H. bartschi* the proximal pinnules, excepting in their relative proportions, are not very different from the type characteristic of *Craspedometra* and of *Heterometra*—they are comparatively slender, becoming very delicate and flagellate distally, are composed of smooth segments which meet evenly end to end, and have retained to some extent the proximal carination. *Himerometra bartschi*, with its more numerous arms and cirrus segments and the shorter and much less strongly carinate basal segments of its proximal pinnules, is more highly differentiated from the primitive type than is *H. persica*.

In *Himerometra sol* and *H. magnipinna* the proximal pinnules are exceedingly stout and have lost all trace of the carination of their basal segments, while the middle and outer segments have developed everted and prominent distal ends; they still retain, however, the flagellate tip. In *H. sol* the proximal pinnules appear to include a greater number of segments than do those of *H. magnipinna*, while the eversion of the distal edges of the segments is much more strongly marked, and is smooth and not spinous or serrate. *H. sol* therefore may be considered a less specialized type than *H. magnipinna*.

In *Himerometra martensi* and *H. robustipinna* the proximal pinnules are essentially as in *H. sol* and *H. magnipinna*; but the specialization has been carried a step further by the suppression of the flagellate tip, so that the pinnules are reduced to stout curved horn-like structures. *H. martensi*, in which the distal edges of the pinnule segments are prominently spinous, appears to be a step in advance over *H. robustipinna*.

Of these three specific groups the most primitive (including *H. persica* and *H. bartschi*) has the greatest range, from the Persian Gulf to the Philippines, the more specialized of the two species inhabiting the East Indies and the more generalized the Persian Gulf; the next most primitive (including *H. sol* and *H. magnipinna*) has the next greatest range, from the Maldive Islands to the Philippines and the Admiralty Islands, and again the more specialized of the two species inhabits the East Indian region and the more generalized the western limit of the range of the group, the Maldive Islands; the most specialized (including *H. martensi* and *H. robustipinna*) has the most restricted range, occurring only as far to the westward as the Mergui Archipelago, the more specialized of the two species being known only from the Straits Settlements and North Borneo, while the more generalized ranges from the Mergui Archipelago to the Moluccas and the Philippines.

KEY TO THE SPECIES OF THE GENUS *HIMEROMETRA*.

- a¹. Enlarged proximal pinnules slender, flagellate distally, and very long (slightly more than one half as long as the cirri), composed of from 36 to 40 perfectly smooth segments most or all of which are longer than broad; a few of the earlier segments are narrowly, but prominently, carinate; the earlier segments of the following pinnules are very strongly carinate; the segments in the outer half of the cirri have prominent dorsal spines.
 - b¹. 20-25 arms; about 35 cirrus segments; all of the segments in the proximal pinnules longer than broad (Persian Gulf)..... *persica* (6)
 - b². 35-55 arms; about 40 cirrus segments; a few of the basal segments in the proximal pinnules are broader than long (Philippine Islands)..... *bartschi* (5)
- a². Enlarged proximal pinnules very stout, with all or nearly all of the component segments broader than long, or at least as broad as long; none of the segments are carinate; following pinnules without carinate processes on the earlier segment
 - b¹. Enlarged proximal pinnules with about 30 segments, very stout basally and distally gradually tapering to a delicate and flagellate tip; the distal edges of the segments in the middle half or proximal two-thirds are swollen and may be strongly everted, but are always smooth, never spinous.
 - c¹. Cirri very stout, stouter than in any other species of the genus; the enlarged proximal pinnules have the segments in the basal two-thirds with strongly produced and everted distal edges (Maldive Islands)..... *sol* (4)
 - c². Cirri rather short and weak without, or with only slight traces of, dorsal processes on the outer segments; the enlarged proximal pinnules have the segments in the middle half with slightly swollen distal edges (Cochin China, Philippine and Admiralty Islands, and St. Mathias Island). *magnipinna* (3)
 - b². Enlarged proximal pinnules with 20 or fewer segments, distally tapering more or less abruptly and without a flagellate tip.

- c'. Segments of the enlarged proximal pinnules entirely smooth; the distal edges of the component segments may be slightly swollen, or they may be unmodified, but they are never spinous; distal edges of the proximal brachials smooth, or only very slightly produced (Arrakan coast, Burma, Amboina, the Sunda and Philippine Islands and Macclesfield Bank).. *robustipinna* (2)
- c". Segments of the enlarged proximal pinnules with prominently everted and spinous distal ends; distal edges of the proximal brachials strongly produced and everted (Singapore and North Borneo)..... *martensi* (1)

THE SPECIES OF THE GENUS HIMEROMETRA.

1. HIMEROMETRA MARTENSI (HARTLAUB).

Antedon martensi HARTLAUB, Nachr. Ges. Göttingen, Mai 1890, p. 182 (Singapore); Nova Acta Acad. German., vol. 58, 1891, No. 1, p. 21, pl. 1, figs. 3, 6 (Singapore; more fully described and figured).—A. H. CLARK, Proc. U. S. Nat. Mus., vol. 43, 1912, p. 394 (examination of the type-specimen shows that *Antedon martensi* is the same as the *Himerometra crassipinna* from Singapore).

Himerometra martensi A. H. CLARK, Smiths. Misc. Coll. (Quart. Issue), vol. 50, 1907, p. 356 (listed); Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7 (listed).

Himerometra crassipinna A. H. CLARK, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 319 (specimen erroneously labeled "Japan"); Smiths. Misc. Coll. (Quart. Issue), vol. 52, 1908, p. 213 (compared with *H. bartolachi*, new species, and with *H. robustipinna*, new species); p. 214 (compared with *H. magnipinna*, new species); Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7 (listed); Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 155 (Singapore); Proc. U. S. Nat. Mus., vol. 43, 1912, p. 394 (British North Borneo; Singapore, the type of *Antedon crassipinna* agrees in every particular with specimens of *Himerometra crassipinna* from Singapore); Crinoids of the Indian Ocean, 1912, p. 116 (Singapore and Pulau Ubin, Singapore; the record from Amboina refers to *H. robustipinna*, and that from Cochin China to *H. magnipinna*).

Range.—Known from Singapore, Pulau Ubin, off the northeastern corner of Singapore Island, and from British North Borneo.

Depth.—Littoral.

2. HIMEROMETRA ROBUSTIPINNA (P. H. Carpenter).

Actinometra robustipinna P. H. CARPENTER, Notes from the Leyden Museum, vol. 3, 1881, p. 201 (Moluccas).—A. H. CLARK, Notes from the Leyden Museum, vol. 33, 1911, p. 182 (shown not to be an *Actinometra* at all, but to belong to the "Savigni group" of *Antedon*, falling in the genus *Himerometra*; doubtfully referred to *H. crassipinna* from Singapore, i. e., *H. martensi*); Crinoids of the Indian Ocean, 1912, pp. 116, 117 (doubtfully referred to *H. crassipinna* from Singapore, i. e., *H. martensi*).

Antedon kraepelini HARTLAUB, Nachr. Ges. Göttingen, Mai 1890, p. 183 (Akyab, Burma); Nova Acta Acad. German., vol. 58, 1891, No. 1, p. 22, pl. 2, figs. 15, (21) (Akyab, Burma; more fully described and figured).—A. H. CLARK, Smiths. Misc. Coll., vol. 60, 1912, No. 10, p. 18 (type-specimen appears to be a small individual of *H. robustipinna*).

Antedon crassipinna HARTLAUB, Nachr. Ges. Göttingen, Mai 1890, p. 185 (Amboina; but not specimen from Cochin China, which represents *H. magnipinna*); Nova Acta Acad. German., vol. 58, 1891, No. 1, p. 32, pl. 1, figs. 1, 5, 10 (Amboina; but not specimen from Cochin China, which represents *H. magnipinna*; more fully described and figured).

Antedon inopinata BELL, Proc. Zool. Soc. London, 1894, p. 398 (Macclesfield Bank, 31-36 fathoms).—A. H. CLARK, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 477 (not recognizable from the description; originally described as a member of the "Granulifera group" of *Antedon*, but belongs in the "Savigni group").
Antedon crassipinna KOEHLER, Mem. soc. zool. France, vol. 8, 1895, p. 420 (Sunda Islands).

Himerometra crassipinna (part) A. H. CLARK, Smiths. Misc. Coll. (Quart. Issue), vol. 50, 1907, p. 356 (listed); Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7 (listed); Crinoids of the Indian Ocean, 1912, p. 116 (records from Amboina; not records from Singapore and from Pulau Ubin, Singapore, which refer to *H. martensi*, or records from Cochin China, which refer to *H. magnipinna*; Hartlaub's specimen from Cochin China appears to represent a different species from that represented by examples from Singapore).

Himerometra kraepelini A. H. CLARK, Smiths. Misc. Coll. (Quart. Issue), vol. 50, 1907, p. 356 (listed); Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7 (listed); Crinoids of the Indian Ocean, 1912, p. 116 (listed; synonymy; locality).

Himerometra robustipinna (new species) A. H. CLARK, Smiths. Misc. Coll. (Quart. Issue), vol. 52, 1908, p. 213 (Albatross Station 5165; Philippine Islands, south of San Gasanga, Tataan group; 9 fathoms); p. 214 (compared with *H. magnipinna*, new species); Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7 (listed).

Himerometra sp. A. H. CLARK, Notes from the Leyden Museum, vol. 33, 1911, p. 182 (Moluccas; examination of the type of Carpenter's *Actinometra robustipinna* shows it to be a *Himerometra*, questionably referable to *H. crassipinna* from Singapore, i. e., *H. martensi*); Crinoids of the Indian Ocean, 1912, p. 117 (type of Carpenter's *Actinometra robustipinna* a typical *Himerometra*, possibly *H. crassipinna*).

Himerometra sp. A. H. CLARK, Smiths. Misc. Coll., vol. 60, 1912, No. 10, p. 18 (examination of the type of Hartlaub's *Antedon kraepelini* shows that it is a true *Himerometra*; it appears to be a small specimen of *H. robustipinna* A. H. Clark).

Himerometra pulcher A. H. CLARK, Crinoids of the Indian Ocean, 1912, p. 114 (new name for *Himerometra robustipinna* A. H. Clark, 1908, not *Actinometra robustipinna* P. H. Carpenter, 1881; synonymy, range, and depth).

Himerometra inopinata A. H. CLARK, Crinoids of the Indian Ocean, 1912, p. 114 (type-specimen of *Antedon inopinata* Bell, 1894, redescribed and shown to be a *Himerometra*; correction of original depth record, 31-36 fathoms, to read 13-36 fathoms, the depth given on the label attached to the specimen).

Range.—Known from Akyab on the Arrakan Coast, Burma, the Sunda Islands, the Moluccas, Amboina, south of San Gasanga (Sanga Sanga) (Tataan group), Philippine Islands, and from Macclesfield Bank.

Depth.—Littoral, and down to 13 (136) fathoms.

3. *HIMEROMETRA MAGNIPINNA* A. H. Clark.

Antedon crassipinna (part) HARTLAUB, Nachr. Ges. Göttingen, Mai, 1890, p. 185 (specimen from Cochin China); Nova Acta Acad. German, vol. 58, 1891, No. 1, p. 32 (but not figs. 1, 5, 10, on pl. 1) (specimen from Cochin China; the specimens from Amboina, upon which the description and the figures are based, represent *H. robustipinna*).

Himerometra crassipinna (part) A. H. CLARK, Smiths. Misc. Coll. (Quart. Issue), vol. 50, 1907, p. 356 (listed); Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7 (listed); Crinoids of the Indian Ocean, 1912, p. 116 (record from Cochin China).

Himerometra magnipinna A. H. CLARK, *Smiths. Misc. Coll. (Quart. Issue)*, vol. 52, 1908, p. 214 (*Albatross* Station 5139, Philippine Islands, between Jolo and Pangasinan Islands, 20 fathoms [type locality]; and Station 5147, off Balinpongpong Island, south of Jolo, 21 fathoms); *Proc. Biol. Soc. Washington*, vol. 22, 1909, p. 7 (listed); *Proc. U. S. Nat. Mus.*, vol. 39, 1911, p. 540 (Ulugan Bay, Palawan); *Smiths. Misc. Coll.*, vol. 60, 1912, No. 10, p. 17 (redescription and identification of Hartlaub's specimen from Cochin China; additional records, Isabela, Basilan, province of Mindanao, Philippine Islands; Ekalin, St. Mathias Island; Pitilu, Admiralty Islands); *Proc. U. S. Nat. Mus.*, vol. 43, 1912, p. 394 (St. Mathias Island); *Crinoids of the Indian Ocean*, 1912, p. 114 (synonymy, range, and depth).

Range.—Known from Cochin China, the following localities in the Philippine Islands, Ulugan Bay, on the northwestern coast of Palawan, Isabela, on Basilan, south of the western end of Mindanao, between Jolo and Pangasinan Islands, and off Balinpongpong Island, south of Jolo, Pitilu, Admiralty Islands, St. Mathias Island (east of the Admiralty Islands), and from Ekalin on St. Mathias Island.

Depth.—Littoral, and down to 21 fathoms.

4. *HIMEROMETRA SOL* A. H. Clark.

Antedon palmata BELL, in Gardiner, *Fauna and Geography of the Maldive and Laccadive Archipelagoes*, vol. 1, 1902, pt. 3, p. 224 (Kolumaduli, Maldives; 38 fathoms).

Himerometra sol A. H. CLARK, *Crinoids of the Indian Ocean*, 1912, p. 115 (description based upon Bell's specimen of *Antedon palmata* recorded at the reference cited; compared with *H. magnipinna*).

Range.—Only known from Kolumaduli in the Maldive Islands, southwest of Ceylon.

Depth.—38 fathoms.

5. *HIMEROMETRA BARTSCHI* A. H. Clark.

Himerometra bartschi A. H. CLARK, *Smiths. Misc. Coll. (Quart. Issue)*, vol. 52, 1908, p. 212 (*Albatross* Station 5146, west of Tapul Island, south of Jolo, 24 fathoms [type locality]; also found at station 5147, off Balinpongpong Island, south of Jolo, 21 fathoms); p. 214 (compared with *H. magnipinna*, new species); *Proc. Biol. Soc. Washington*, vol. 22, 1909, p. 7 (listed); *Crinoids of the Indian Ocean*, 1912, p. 114 (synonymy, range, and depth).

Himerometra persica A. H. CLARK, *Smiths. Misc. Coll. (Quart. Issue)*, vol. 52, 1908, p. 214 (*Albatross* Station 5163, Philippine Islands, south of San Gasanga, Tataan group, 28 fathoms; also Philippine Islands, without more definite data); *Proc. Biol. Soc. Washington*, vol. 22, 1909, p. 7 (part) (listed); *Crinoids of the Indian Ocean*, 1912, p. 116 (part) (records from the Philippine Islands).

Heterometra martensi A. H. CLARK, *Vidensk. Medd. fra den naturhist. Forening i København*, 1909, p. 164 (Singapore); *Crinoids of the Indian Ocean*, 1912, p. 127 (Singapore).

Range.—Known only from Singapore and from the Philippine Islands, where it has been dredged at the following localities; off Balinpongpong Island, south of Jolo, west of Tapul Island, south of

Jolo, and south of San Gasanga (Sanga Sanga) (Tataan group) south of Jolo; there is also a record from the Philippine Islands, with no additional data.

Depth.—Littoral, and down to 28 fathoms.

6. *HIMEROMETRA PERSICA* A. H. Clark.

Himerometra persica A. H. CLARK, Smiths. Misc. Coll. (Quart. Issue), vol. 50, 1907, p. 356 (listed; nomen nudum); Bull. Mus. Comp. Zool., vol. 51, 1908, No. 8, p. 243 (Persian Gulf); Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7 (listed); American Naturalist, vol. 43, 1909, p. 256 (occurs in the Persian Gulf, but the genus is not represented in the Red Sea); Crinoids of the Indian Ocean, 1912, p. 116 (synonymy, habitat, and depth; excepting the records from the Philippine Islands which refer to *H. bartschi*).

Range.—Only known from the Persian Gulf.

Depth.—Littoral.

95278°—Proc.N.M.vol.46—13—19

A REVIEW OF THE FISHES OF THE GENUS *OSMERUS* OF THE CALIFORNIA COAST.

By MARY FISK,
Of Stanford University, California.

In the following paper, three species of the genus *Osmerus* are discussed. All three species formerly have been confused with *Osmerus thaleichthys*. One, *Osmerus starksi*, is a new species, and another, *Osmerus attenuatus*, has not been recognized since it was described in 1880,¹ by Lockington.

Grateful acknowledgment is made to Prof. E. C. Starks, of Stanford University, for his able assistance in the preparation of this paper.

The drawing of the new species is the work of Mr. W. S. Atkinson.

Key to the species of *Osmerus*.

- a¹. Pectorals extending to origin of ventrals; ventrals reaching anus..... *thaleichthys*
- a². Pectorals not extending to origin of ventrals; ventrals not reaching anus.
 - b¹. Body very slender, the depth $6\frac{1}{2}$ to $7\frac{1}{2}$ in length; distance between origin of pectorals and origin of ventrals greater than length of head; pectorals extending one-half the distance to origin of ventrals; commissure of mouth nearly straight..... *attenuatus*
 - b². Body not very slender, the depth 5 to $5\frac{1}{2}$ in length; distance between origin of pectorals and origin of ventrals equal to or less than length of head; pectorals extending more than one-half the distance to origin of ventrals, commissure of mouth curved..... *starksi*

OSMERUS THALEICHTHYS Ayres

This species may be known at once by the long pectoral and ventral fins. The former reach to or slightly beyond the origin of the ventrals, and the latter extend to the anus. As in *Osmerus starksi*, the commissure of the mouth is curved, in contrast to the almost straight jaws of *Osmerus attenuatus*. The gill rakers are longer, and more delicate and slender than in either of the other two species. The dentition is weaker than that of *Osmerus attenuatus*, and there is no prominent tooth on the tip of the tongue.

The head is contained in the total length, without caudal, a little more than 4 times. The snout is contained in the head 4 to $4\frac{1}{2}$ times. The maxillary is contained twice in the head, and reaches four-fifths the diameter of the eye to its posterior margin. The lower jaw projects slightly. The eye is contained 4 times in the head, and its diameter is slightly less than the interorbital width. The interorbital

¹ Proc. U. S. Nat. Mus., vol. 3, p. 66.

space is contained $3\frac{1}{2}$ to $3\frac{1}{2}$ times in the head. The opercle is faintly marked by two series of concentric rings, the upper overlapping and obliterating the lower. The gill rakers number 12 or 13 + 30 and the longest one is contained $1\frac{1}{2}$ times in the eye.

The depth, in the length without caudal, is 5 to 6 times. The depth of the caudal peduncle is contained $3\frac{1}{2}$ times in the length of the head. The number of scales along median line of back, from occipital region to caudal, is from 63 to 67.

The fin rays number: Pectoral, 11; ventral, 8; dorsal, 10 or 11; anal, 18 to 20. The pectoral is contained seven-eighths time in the head; the ventrals, $1\frac{1}{2}$ times; the dorsal, $1\frac{1}{2}$; the anal, $1\frac{1}{2}$; and the caudal, $1\frac{1}{2}$. All of the fins are longer, comparatively, than in either of the other two species. The distance of the dorsal from the tip of the snout is one-half the total length without caudal. The distance of the insertion of the ventrals from the chin is equal to the distance of the dorsal from the tip of the snout. The pectoral extends to or slightly beyond the origin of the ventrals. The ventrals reach to or slightly beyond the vent. The distance between the posterior insertion of the dorsal and the insertion of the adipose dorsal is a little less than the length of the head, greater than in *Osmerus starksi* or *Osmerus attenuatus*. The distance between the origin of the pectoral and the origin of the ventrals is equal to the length of the head. The anterior origin of the ventrals is two-thirds of the diameter of the eye in front of the anterior origin of the dorsal. The tip of the dorsal extends not quite to a point opposite the origin of the anal. The adipose dorsal is inserted slightly anterior to the posterior origin of the anal.

Here described from 10 specimens obtained in the market in San Francisco, California.

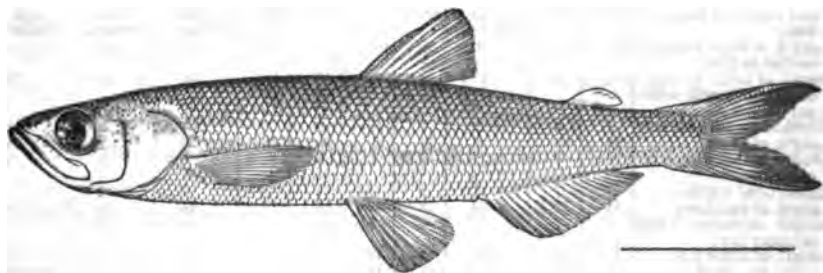
Measurements of Osmerus thaleichthys.

Total length of body in mm.....	105	97	96	95	94	96	97	94	83	83
Length of body without caudal in mm.....	86	76	77	83	79	82	82	79	70	67
Depth of body in hundredths of length without caudal.....	16	20	20	20	19	20	20	18	19	20
Depth of caudal peduncle.....	8	7+	8	8	8	8	7+	7+	7	7
Length of head.....	25	25	24	25	24	24	25	25	25	25
Longitudinal diameter of eye.....	6.5	6	6	6	7	6	7	6	6	6
Interorbital width.....	7	7-	7	7-	7	7	7-	7-	7	7
Length of maxillary.....	13	18	12	13	13	12	12	13	13	13
Length of snout to tip of upper jaw.....	6	6	6	6	6	6+	6	6+	6	6
Length of lower jaw.....	13	14	14	14-	14	13	12.5	14	14	14
Length of pectoral.....	27	26	26	27	26	26	26	26	27	26
Length of ventrals.....	21	21	22	19	19	20	20	20	20	19
Longest dorsal ray.....	18	18	18	16	16	17	19	18	18	17
Longest anal ray.....	14	13	14	11	11	11	12	13	13	12
Longest caudal ray.....	21	22	22	Broken.	20	20	20	21	20	21
Distance of dorsal from tip of snout.....	53	51	49	51	50	51	52	52	52	54
Distance of ventral from chin.....	51	51	51	50	49	48	51	51	50	50
Distance from tip of lower jaw to adipose fin.....	84	84	82	82	84	84	82	83	84	84
Distance from origin of pectoral to origin of ventrals.....	24	23	24	23	23	22	24	23	22	21
Number of dorsal rays.....	10	11	10	10	11	11	11	11	11	10
Number of anal rays.....	20	20	18	18	18	20	20	19	20	19
Scales in longitudinal series above lateral line.....	63	64	64	65	63	67	65	67	66	63
Gill rakers on first gill arch.....	13+30	13+29	13+28	13+28	13+29	13+30	13+29	13+30	13+28	13+30
Sex.....	Fe-male.	Male.	Male.	Female.	Fe-male.	Fe-male.	Fe-male.	Fe-male.	Male.	Fe-male.

OSMERUS STARKSI Fisk, new species.

This species may be distinguished from the other two here discussed by the difference in the length of the pectorals. These fins reach about three-fourths of the distance from their base to the origin of the ventrals, while in *Osmerus thaleichthys* they extend to or overlap the beginning of the ventrals, and in *Osmerus attenuatus* they extend only half the distance between their origin and the insertion of the ventrals. The depth is 5 to $5\frac{1}{2}$ in the total length without caudal (slightly less than that of *Osmerus thaleichthys*, but greater than in *Osmerus attenuatus*). The gill rakers are shorter, coarser, and heavier than those of *Osmerus thaleichthys*, but are longer and more slender than those of *Osmerus attenuatus*. The dentition is weaker than that of either of the other species, and there are two small teeth on the tip of the tongue, instead of a single large one, as in *Osmerus attenuatus*.

The head is contained 4 times in the total length without caudal. The length of the snout in the head is contained 4 to $4\frac{1}{2}$ times. The

*OSMERUS STARKSI*, NEW SPECIES.

maxillary is contained twice in the head, and reaches nearly to the posterior margin of the eye. The lower jaw is more blunt than in *Osmerus attenuatus*, and projects slightly. The eye is contained a little less than 4 times in the head, and its diameter is slightly less than the interorbital width. The interorbital space is contained $3\frac{1}{2}$ to $3\frac{3}{4}$ times in the head. The opercle is smooth, and slightly marked at its edge with weak longitudinal striæ. The gill rakers number 11 to 13 + 26 or 27 and the longest one is contained $1\frac{1}{2}$ times in the eye.

The depth, in the length without caudal, is 5 to $5\frac{1}{2}$. The depth of the caudal peduncle is contained $2\frac{1}{2}$ to 3 times in the length of the head. The scales along median line of back, from occipital region to caudal, number 63 to 67.

The number of fin rays is: Pectoral, 11 or 12; ventral, 8; dorsal, 10 or 11; anal, 18 to 20. The pectoral is contained $1\frac{1}{2}$ to $1\frac{3}{4}$ times in the head; the ventrals, $1\frac{1}{2}$ times; the dorsal, $1\frac{1}{2}$ to $1\frac{3}{4}$; the anal, $2\frac{1}{2}$; and the caudal, $1\frac{1}{2}$. The distance of the dorsal from the tip of the snout is more than one-half of the total length without caudal.

The distance of the ventrals from the chin is less than the distance between the dorsal and the tip of the snout. The pectoral extends to a distance equal to the interorbital space, from the origin of the ventrals. The ventrals reach to within two-thirds of the diameter of the eye from the vent. The distance between the posterior insertion of the dorsal and the insertion of the adipose dorsal is contained $1\frac{1}{2}$ times in the head. As in *Osmerus thaleichthys*, the distance between the origin of the pectoral and the origin of the ventrals is equal to the length of the head. The anterior origin of the ventrals is one-half of the diameter of the eye in front of the anterior insertion of the dorsal. The tip of the dorsal extends to a point opposite the origin of the anal. The adipose dorsal is inserted slightly anterior to the posterior end of the anal, as in the other two species.

Here described from ten specimens found in the market in San Francisco. The type (Cat. No. 74834, U.S.N.M.) is deposited in the United States National Museum; cotypes are at Stanford University.

Measurements of Osmerus starksi.

Total length of body in mm.	121	111	Tail broken.	103	117	109	109	Tail broken.	Tail broken.	Tail broken.
Length of body without caudal in mm.	100	92	90	85	101	92	92	91	80	75
Depth of body in hundredths of length without caudal.	20	17	17	18	17	18	17	18	19	19
Depth of caudal peduncle	8	8	8	7	8-	8	8-	7+	8	8
Length of head.....	26	25	26	24	25	25	25	25	28	27
Longitudinal diameter of eye.	6	6	7	6.5	6.5	6	6.5	6.7	8	7
Interorbital width.....	7	7	7	7	7	7	7-	7	7	7
Length of maxillary.....	13	13.5	14	13	12	13	13	14	15	14
Length of snout to tip of upper jaw.	6	7-	7	6	7-	6	7	6.5	7	7
Length of lower jaw.....	13	14	15	14	13	14	14	14.5	15	16-
Length of pectoral.....	19	20	20	18	18	19	20	19	Broken.	Broken.
Length of ventrals.....	15.5	17	15	14	14	14	15	Broken.	do.....	Broken.
Longest dorsal ray.....	16	17	Broken.	17	15	17	18	do.....	do.....	Broken.
Longest anal ray.....	9	10	do.....	9	8	8	9	do.....	do.....	do.....
Longest caudal ray.....	20	20	do.....	20	19	20	20	do.....	do.....	do.....
Distance of dorsal from tip to snout.	54	54	54	54	52	53	52	53	56	54
Distance of ventral from chin.	50	52	51.5	52	50	49	51	49	49+	53
Distance from tip of lower jaw to adipose fin.	82	82	84	83	82	81	82	83	83	84
Distance from origin of pectoral to origin of ventrals.	26	26	24	25	25	23+	26	22	21	26
Number of dorsal rays..	11	10	11	11	11	10	11	10	11	10
Number of anal rays....	18	18	18	18	20	18	18	Broken and missing.	19	Missing.
Scales in longitudinal series above lateral line.	72	73	.....	70	72	70	71	.....	.....	.....
Gill rakers on first gill arch.	11+26	12+26	12+26	13+26	12+26	12+26	12+26	13+26	13+27	Broken.
Sex.....	Male.	Male.	Male.	Male.	Male.	Male.	Male.	Male.	Male.	Male.

OSMERUS ATTENUATUS Lockington.

Osmerus attenuatus is a larger fish than either *Osmerus starksi* or *Osmerus thaleichthys*, and may be recognized by its comparatively slender body, its short pectorals, and the straight commissure of

the mouth. The dentition is stronger than in either *Osmerus thaleichthys* or *Osmerus starksi*, and on the tip of the tongue there is a single curved tooth not found in the other species.

The head is contained 4 times in the total length without caudal. The snout is more pointed than that of *Osmerus thaleichthys* or *Osmerus starksi*, and lacks the shallow indentation at its end which characterizes the other two. It is contained in the head $3\frac{1}{2}$ times. The maxillary is contained 2 to $2\frac{1}{2}$ times in the head, and reaches three-fourths of the diameter of the eye to a point opposite its posterior margin. The lower jaw is sharper and more slender than in the other two species, and projects rather strongly. The eye is contained $4\frac{1}{2}$ times in the head, and its diameter is slightly less than the interorbital width. The interorbital space is contained 4 times in the head. The opercle is somewhat translucent and bears striae similar to those in *Osmerus starksi*. The gill rakers number 11 or $12+22$ to 25, and the longest one is contained twice in the eye.

The depth, in the length without caudal, is $6\frac{1}{2}$ to $7\frac{1}{2}$. The depth of the caudal peduncle is contained 4 times in the length of the head. The number of scales along median line of back from occipital region to caudal is 70 to 74.

The fin rays number: Pectoral, 12; ventral, 8; dorsal, 11 to 12; anal, 15 to 16. The pectoral is contained $1\frac{3}{4}$ to $1\frac{1}{2}$ times in the head; the ventrals, $1\frac{3}{4}$ times; the dorsal, $1\frac{1}{2}$; the anal, 3; and the caudal, $1\frac{1}{2}$. The distance of the dorsal from the tip of the snout is $1\frac{1}{2}$ to $1\frac{1}{4}$ of the total length without caudal—greater than in either *Osmerus thaleichthys* or *Osmerus starksi*. The distance of the ventral from the chin is slightly less than the distance from the dorsal to the tip of the snout. The distance between the origin of the pectoral and the origin of the ventrals is contained $3\frac{1}{2}$ times in the length. The pectoral extends to a distance equal to twice the interorbital space from the origin of the ventrals. The ventrals reach to within $1\frac{1}{2}$ the diameter of the eye from the vent. The distance between the posterior insertion of the dorsal and the anterior insertion of the adipose dorsal is contained $1\frac{1}{2}$ times in the head—less than in *Osmerus thaleichthys* or *Osmerus starksi*. The distance between the origin of the pectoral and the origin of the ventrals is greater than in the other two species, as it equals $1\frac{1}{2}$ times the length of the head. The anterior origin of the ventrals is one-half the diameter of the eye in front of the anterior origin of the dorsal. The tip of the dorsal extends to a point one-half of the diameter of the eye in front of the origin of the anal. The adipose dorsal is placed slightly anterior to the posterior insertion of the anal.

Here described from 10 specimens taken from San Francisco Bay, collected by N. B. Scofield.

Measurements of *Osmerus attenuatus*.

Total length of body in mm.....	137	133	135	132	133	140	135	131	141	146
Length of body without caudal in mm.....	117	114	116	114	120	113	117	111	122	127
Depth of body in hundredths of length without caudal.....	15	15	14	15	15	14	15	15	16	16
Depth of caudal peduncle.....	5	6.5	6	7-	7-	6	6+	6+	6.5	7-
Length of head.....	24	26	25	25	24	25	25	26	26	26
Longitudinal diameter of eye.....	6	6.5	6	6	5.5	6	6	6	6	6
Interorbital width.....	6.5	7	6	7	7-	6	7	6.5	7	6+
Length of maxillary.....	12.5	13	12	12	11.5	13	12	13	12	12
Length of snout to tip of upper jaw.....	7	7	7	7-	7.5	7-	7	7-	7	7-
Length of lower jaw.....	14	15	14	14-	15	14	14	15	14	14
Length of pectoral.....	17	15	16	16	15	16	15	16	15	15
Length of ventrals.....	15	15	15	16	15	15	15	15	15	15
Longest dorsal ray.....	14	14	14	15	13	14	14	14	13	13
Longest anal ray.....	8	9	9	9	8	9	8	8	8	8
Longest caudal ray.....	20	19	19	18	20	20	18	20	19	19
Distance of dorsal from tip of snout.....	58	56	57	57	58	57	55	58	56	57
Distance of ventral from chin.....	54	56	53	56	57	55	53	57	54	53
Distance of tip of lower jaw to adipose fin.....	84	84	83	87	86	84	82	84	81	82
Distance from origin of pectoral to origin of ventrals.....	30	30	29	29	30	31	28	30	30	28
Number of dorsal rays.....	11	11	11	11	11	12	12	11	12	11
Number of anal rays.....	15	16	16	16	16	15	16	16	16	16
Scales in longitudinal series above lateral line.....	71	72	71	74	72	73	70	72	73	73
Gill rakers on first gill arch.....	10+25	12+24	12+25	11+24	11+22	10+24	12+25	11+25	11+24	12+24
Sex.....	Fe-male.	Fe-male.	Fe-male.	Male.	Fe-male.	Fe-male.	Fe-male.	Fe-male.	Fe-male.	Fe-male.

The measurements of the 10 specimens at hand were compared with those of Mr. Lockington, in his original description of *Osmerus attenuatus*. They were found to correspond so closely as to prove without question that this species is referable to the species *Osmerus attenuatus*.

His table of measurements, from the original description, reduced to the terms employed in this paper, follows:

Measurements of *Osmerus attenuatus*.

Total length of body, in mm.....	104	114	133	145	128	152
Length without caudal, in mm.....	87	97	112	123	109	129
Depth of body, in hundredths of length without caudal.....	16	15	14	15	15	15
Depth of caudal peduncle.....	6	6-	6	6	6	6
Length of head.....	28	26	25	25	26	24
Diameter of eye.....	7	6	7	6	6	6
Interorbital width.....	6	5+	5+	7	6	7
Length of snout to tip of upper jaw.....	7	7	7	6	7	6
Length of lower jaw.....	16	15	15	14	14	Not given.
Length of pectoral.....	15	15	14	15	15	16
Length of ventrals.....	13	12	13	13	12+	13+
Longest dorsal ray.....	Not given.	15	15	15	14	15+
Dorsal from tip of snout.....	57	56	57	57	56	56
Ventral from chin.....	56	55	57	55	54+	55
Tip of lower jaw to adipose fin.....	85	79	82	85	83	85

A comparative table of average measurements, compiled from 10 specimens from each species:

Measurements.	<i>Osmerus thaleichthys.</i>	<i>Osmerus starkel.</i>	<i>Osmerus attenuatus.</i>
Length in mm.....	78.1	80.8	117.1
Head in hundredths of length.....	24.7	25.6	25
Eye.....	6.25	6.6	6
Maxillary.....	12.7	13.5	12.5
Depth.....	19.2	18	15
Pectoral.....	26.3	19.1	15.6
Ventrals.....	20.1	15	15.1
Longest dorsal ray.....	17.5	16.6	13.8
Longest anal ray.....	12.4	8.3	8.4
Longest caudal ray.....	20.8	19.8	18.6
Dorsal, from snout.....	51.5	53.6	56.9
Ventral, from chin.....	50.2	51.3	55.3
Number of dorsal rays.....	10.6	10.6	11.3
Number of anal rays.....	19.4	18.4	15.8
Interorbital width.....	7	7	6.6
Length of snout.....	6	6.6	6.9
Lower jaw to adipose fin.....	83.3	82.6	83.7
Length of lower jaw.....	18.7	14.2	14.3
Depth of caudal peduncle.....	7.6	8	6.4
Origin of pectoral to origin of ventrals.....	22.9	24.3	29.5
Number of scales.....	65	72	72
Gill rakers.....	13+28	11+25	11+24
Sex.....	3♂, 8♀	10♂	1♂, 9♀

A REVIEW OF THE PHILIPPINE LAND MAMMALS IN THE UNITED STATES NATIONAL MUSEUM.

By N. HOLLISTER,

Assistant Curator, Division of Mammals, United States National Museum.

INTRODUCTION.

The Philippine mammals in the United States National Museum number 1,454 specimens. This is probably by far the largest collection from the archipelago in any museum. Several papers dealing more or less fully with certain groups or describing new species in the collection have been published from time to time, but no account of the collection as a whole has ever been printed. Since many unpublished island records of great interest to workers in Philippine mammalogy will be made available by the presentation of a complete list of this splendid collection, the following catalogue has been prepared.

More than two-thirds of the specimens from the islands have been contributed by Dr. Edgar A. Mearns alone, and many others have reached the museum from various collectors solely through his efforts. A small collection of specimens, many of special interest, sent for determination by the Philippine Bureau of Science, is listed in the present report. Material from this source, mostly collected by Richard C. McGregor and A. Celestino, is credited throughout the list by the initials "P. B. S."

Following is a list of the collectors and a summary of the specimens examined and listed in the preparation of this report:

Dr. Edgar A. Mearns.....	1,012
Philippine Bureau of Science.....	98
J. B. Steere.....	87
Dr. Paul Bartsch.....	57
Dr. Robert B. Grubbs.....	35
George C. Lewis.....	28
Dr. Carroll Fox.....	26
D. B. Mackie.....	23
L. M. McCormick.....	20
Wm. D. Carpenter.....	10
John Whitehead.....	10

Dr. J. C. Le Hardy.....	9
Government Board, Pan-American Exposition.....	8
Dr. C. L. Forbush.....	4
Henry Musser.....	4
Dr. H. N. Kierulff.....	3
Col. E. B. Babbitt and Capt. F. R. McCoy.....	2
Robert A. Schroder.....	2
U. S. Bureau of Fisheries.....	2
W. L. Merritt.....	1
Mrs. F. D. Grant.....	1
Capt. Luther S. Kelly.....	1
Capt. G. F. Chase.....	1
F. Lamson-Scribner.....	1
Dr. E. H. Porter.....	1
H. Cuming.....	1
British Museum.....	1
Dr. J. R. Harris.....	1
E. L. Moseley.....	1
Collector unknown.....	4

Total number specimens..... 1, 454

LIST OF PUBLISHED PAPERS BASED WHOLLY OR IN PART ON THE PHILIPPINE MAMMALS IN THE UNITED STATES NATIONAL MUSEUM.

ANDERSEN, KNUD. On the Bats of the *Rhinolophus arcuatus* Group, with Descriptions of Five new Forms. Ann. and Mag. Nat. Hist., ser. 7, vol. 16, pp. 281-288, September, 1905.

Describes *Rhinolophus tropes* from the Mearns collection (p. 284).

———. On the Bats of the *Rhinolophus macrotis* Group, with Descriptions of Two new Forms. Ann. and Mag. Nat. Hist., ser. 7, vol. 16, pp. 289-292, September, 1905.

Describes *Rhinolophus hirsutus*, type in the U. S. National Museum.

———. On Some Bats of the Genus *Rhinolophus*, with Remarks on their Mutual Affinities, and Descriptions of Twenty-six new Forms. Proc. Zool. Soc. London, 1905, vol. 2, pp. 75-145, pls. 3, 4. October 17, 1905.

Much of the material from the Philippine Islands representing this genus was examined by the author, and one new species, *Rhinolophus virgo*, was described from the U. S. National Museum collections (pp. 88-90).

———. On *Hipposiderus diadema* and its closest Allies. Ann. and Mag. Nat. Hist., ser. 7, vol. 16, pp. 497-507, November, 1905.

———. A List of the Species and Subspecies of the Genus *Rhinolophus*, with some Notes on their Geographical Distribution. Ann. and Mag. Nat. Hist., ser. 7, vol. 16, pp. 648-662, December, 1905.

———. Catalogue of the Chiroptera in the Collection of the British Museum. Second Edition. Vol. 1: Megachiroptera, pp. i-ci; 1-854. 1912.

ELLIOT, DANIEL GIRAUD. A Review of the Primates. Monograph No. 1, Amer. Mus. Nat. Hist., 1913, vol. 1, pp. i-cxxvii; 1-317; i-xxxviii; numerous plates.

U. S. National Museum specimens of *Tarsius* from the Philippines described by the author.

Vol. 2, pp. i-xviii; 1-382; i-xxvi, numerous plates.

U. S. National Museum specimens of *Ptilopus* from the Philippines described by the author.

HOLLISTER, N. Two New Species of *Epimys* from Luzon. Proc. Biol. Soc. Washington, vol. 24, pp. 89-90, May 15, 1911.

Describes *Epimys calcis* and *E. querceti* from Luzon.

———. A List of the Mammals of the Philippine Islands, exclusive of the Cetacea. Philippine Journ. Sci., sec. D, vol. 7, No. 1, pp. 1-64, February, 1912.

———. Two New Philippine Fruit Bats. Proc. Biol. Soc. Washington, vol. 26, pp. 111-112, May 3, 1913.

Original descriptions of *Pteropus balatus* and *P. mearnsi*.

LYON, MARCUS WARD, JR. Remarks on the Insectivores of the Genus *Gymnura*. Proc. U. S. Nat. Mus., vol. 36, pp. 449-456, pls. 34-37, May 27, 1909.

Figures the skull, dentition, and alcoholic specimen—the type—of *Podogymnura truei* (pls. 35, 36, 37).

———. Tree-shrews: An Account of the Mammalian Family Tupaiidae. Proc. U. S. Nat. Mus., vol. 45, pp. 1-187, pls. 1-5. 1913.

MEARNS, EDGAR A. Descriptions of New Genera and Species of Mammals from the Philippine Islands. Proc. U. S. Nat. Mus., vol. 28, pp. 425-460. 1905.

Describes six new genera and twenty-five new species; the genus *Cynomolgus* (= *Pithecus*) is treated monographically. The new genera and species from the Philippine collection are: *Cynomolgus mindanensis*, *C. m. apoenalis*, *C. sulcirostris*, *C. cagayanus*, *Pteropus lanensis*, *P. cagayanus*, *Urogale*, *U. cylindrus*, *Podogymnura*, *P. truei*, *Mus tagulayensis*, *M. albicularis*, *M. magnirostris*, *M. mindanensis*, *M. zamboanga*, *M. kelleri*, *M. todayensis*, *M. vulcani*, *M. v. opicis*, *M. pentasensis*, *M. commissarius*, *Bullimus*, *B. bagobus*, *Limnomys*, *L. sibuanus*, *Tarsomys*, *T. apoenalis*, *Apomys*, *A. hyllocetes*, *A. petrus* and *A. insignis*.

MILLER, GERRIT S., JR. A Second Specimen of *Odontonycteris meyeri* Jentink. Proc. Biol. Soc. Washington, vol. 18, p. 253, December 9, 1906.

———. The Families and Genera of Bats. Bull. 57, U. S. National Museum, pp. i-xvii, 1-282, pls. 1-14. 1907.

———. Descriptions of Two New Genera and Sixteen New Species of Mammals from the Philippine Islands. Proc. U. S. Nat. Mus., vol. 38, pp. 391-404, pls. 18-20. August 19, 1910.

Describes the following genera and species from the National Museum collection: *Crocodyrus halcomus*, *C. beatus*, *C. mindorus*, *C. grandis*, *Pteropus pumilus*, *Chilophylla*, *C. hirsuta*, *Taphozous platys*, *Epimys gala*, *Tryphonys*, *T. adustus*, *Batomys dentatus*, *Apomys bardus*, *A. major*, and *A. musculus*. Several new species in the collection of the Philippine Bureau of Science are also named.

———. Note on the *Mus commissarius* of Mearns. Proc. Biol. Soc. Washington, vol. 24, p. 38, February 24, 1911.

———. The Cranial and Dental Characters of *Chilophylla*. Proc. Biol. Soc. Washington, vol. 25, p. 117, June 29, 1912.

———. A New Pteropine Bat from Luzon. Proc. Biol. Soc. Washington, vol. 26, pp. 73-74, March 22, 1913.

Original description of *Eonycteris robusta*, from Montalban, Luzon.

The following 18 new species are described in the present paper:

Pachyura occultidens. See page 303.
Taphonycteris capito. See page 308.
Miniopterus paululus. See page 311.
Chaerephon luzonius. See page 312.
Nannosciurus surrutilus. See page 313.
Epimys coloratus. See page 317.
Epimys robiginosus. See page 318.
Epimys mayonicus. See page 319.
Epimys leucophæatus. See page 320.

Epimys vigoratus. See page 321.
Epimys basilanus. See page 322.
Epimys ornatulus. See page 322.
Epimys benguetensis. See page 323.
Limnomys mearnsi. See page 324.
Limnomys picinus. See page 325.
Apomys microdon. See page 327.
Pithecus mindorus. See page 328.
Rusa nigellus. See page 332.

Family ERINACEIDÆ.

PODOGYMNURA TRUEI Mearns.

Specimen.—One, the type, from Mindanao: Mount Apo (Mearns).

Family SORICIDÆ.

PACHYURA LUZONIENSIS (Peters).

Specimens.—One hundred and seventy-five, from the following localities:

Luzon: Malabon, 9 (Carpenter); Manila, 164 (Mearns, P. B. S., Fox, Lewis); Porto Real, 1 (Lewis); San Fernando de Union, 1 (Lewis).

There is an immense and most puzzling variation in size in the large series of specimens from the vicinity of Manila Bay, but after long study I am forced to believe that it is genuine individual variation within a single species. Measurements, average and extreme, of the hind foot, without claws, of 125 specimens from Manila is 18.8 (15–21.7) mm. This almost unparalleled variation may be due to an admixture of races from the shipping in the harbor, as *Pachyura* is a well-known rival of the house rat and house mouse about buildings, and has been captured on vessels. Series of specimens from remote parts of Luzon are much needed for comparison with the Manila specimens.

In the following table of cranial and dental measurements, only fully adult skulls, with basal suture obliterated, or at least tightly closed, are used. Even in the oldest specimens the teeth show comparatively little wear.

Measurements of selected adult skulls of Pachyura luzoniensis from Manila.

Number.	Sex.	Condyl- basal length.	Zygo- matic breadth.	Mastoid breadth.	Inter- orbital breadth.	Palatal length.	Mandible.	Maxillary tooth row (entire).	Mandibu- lar tooth row (entire).
		mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
142850	Male	36	9.7	12.5	5.8	13	17.1	13.4	11.8
142879	do.	31.8	9.6	13.2	5.6	13.5	17	13.7	12.4
142875	do.	31.7	9.8	13.7	5.9	14.7	17.4	13.6	12
142882	do.	30.9	10.2	13.2	5.9	13.5	17	13.4	12.1
142898	do.	31.4	9.9	13.8	5.8	13	16.8	13.2	12
142899	do.	30.6	9.4	12.2	5.7	13	16	13.2	12
142903	do.	28.7	8.8	12	5.3	12.2	15.6	12.4	11.5
142913	do.	28.5	9.1	11.9	5.3	12.4	16.1	12.5	11.5
142921	do.	28.8	8.7	11.9	5.7	12.1	14.8	12.6	11.6
142961	do.	29.1	9.4	12.3	5.6	12.9	15.6	12.8	11.9
143025	do.	32.6	10.1	14.5	5.9	13.5	17.1	13.5	12.4
144646	do.	29.4	9.7	12.4	5.7	13.1	16.3	12.9	11.6
173871	do.	32.7	9.9	13.9	6.1	14	17.9	13.5	12.5
101487	Female	30.7	9.5	13.2	5.7	13	16.5	13.1	12
142936	do.	26.6	8.4	11.3	5.2	11.7	14.1	11.7	10.7
142941	do.	27	8.4	11.3	5.2	11.6	14.6	12	11.1
142945	do.	25.7	8.4	11	5	11.6	14.5	11.6	10.8
142980	do.	26.9	8.8	11.9	5.4	11.9	14.2	12	11.1
142987	do.	26.8	8.7	11.7	5.2	11.6	15	12	11.2

PACHYURA OCCULTIDENS, new species.

Type.—From Ilo-ilo, Panay. Young adult male in alcohol, skull removed, Cat. No. 175761, U.S.N.M. Collected in August, 1912, by Dr. Carroll Fox.

Diagnosis.—Size large; in general much like larger specimens of *Pachyura luzoniensis*, but skull relatively wider interorbitally, and second unicuspid tooth very large, almost equal to third.

Color of specimens in alcohol indistinguishable from that of the Luzon species.

Skull and teeth.—Skull very much like that of *P. luzoniensis*, but heavier interorbitally. Teeth large, crowded, the rows shortened. First three unicuspid large, the second only slightly smaller than third; fourth unicuspid greatly reduced, lying entirely posterior to line between anterior tips of large premolars, and not visible from outer side; the large premolar, from this view, in contact with third unicuspid.

Measurements of type (from alcoholic specimen).—Head and body, 115 mm.; tail vertebræ, 70; hind foot, without claws, 19. Skull of type: Condylbasal length, 30.7; mastoid breadth, 13.6; least inter-orbital breadth, 5.7; upper tooth row, entire, 13.6; mandible, 17.0; lower tooth row, entire, 12.2.

Specimens.—Four, from the following localities:

Panay: Ilo-ilo, 2 (Fox).

Negros: 1 (Steere).

Mindanao: 1 (Steere).

The shrew originally described as *Crocidura edwardsiana*¹ is placed in the genus *Pachyura* in the Supplement to Trouessart's Catalogue, and I followed this disposition of the species in my recent list of Philippine mammal names.² I am lately informed by Doctor Trouessart that the type of the Sulu species is an undoubted *Crocidura*.

CROCIDURA GRAYI Dobson.

Specimens.—Five, from Luzon: Hights-in-the-oaks, Benguet (Mearns).

CROCIDURA HALCONUS Miller.

Specimens.—Seven, from the following localities: Mindoro: Bula-lacao, 1 (Mearns); Mount Halcon, 6, including the type (Mearns).

CROCIDURA BEATUS Miller.

Specimen.—One, the type, from Mindanao: Mount Bliss (Mearns). This species and *C. halconus* are members of the *grayi* group.

CROCIDURA MINDORUS Miller.

Specimens.—Two, the type and paratype, from Mindoro: Mount Halcon (Mearns).

¹ Trouessart, Le Naturaliste, No. 42, p. 330, 1880.

² Philippine Journ. Sci., sec. D, vol. 7, No. 1, February, 1912.

CROCIDURA GRANDIS MILLER.

Specimen.—One, the type, from Mindanao: Grand Malindang Mountain (Mearns).

Family TUPAIIDÆ.

TUPAIA PALAWANENSIS Thomas.

Specimen.—One, from Palawan: Puerte Princesa (P. B. S.).

TUPAIA MÖLLENDORFFI Matschie.

Specimens.—Two, from Culion (P. B. S.).

TUPAIA CUYONIS MILLER.

Specimens.—Nine, including the type, from Cuyo (P. B. S.).

UROGALE EVERETTI (Thomas).

1892. *Tupaia everetti* THOMAS, Ann. and Mag. Nat. Hist., ser. 6, vol. 9, p. 250, March.

1905. *Urogale cylindrura* MEARNs, Proc. U. S. Nat. Mus., vol. 28, p. 435.

1912. *Urogale cylindrura* and *Urogale everetti* HOLLISTER, Philippine Journ. Sci., vol. 7, sec. D, No. 1, p. 7, February.

1913. *Urogale everetti* LYON, Proc. U. S. Nat. Mus., vol. 45, p. 157.

Specimens.—Three, from the following localities: Mindanao: Mount Apo, 2 (Mearns); Mount Bliss, 1 (Mearns).

Family GALEOPTERIDÆ.

CYNOCEPHALUS VOLANS (Linnaeus).

Specimens.—Twenty-three, from localities as follows:

Bohol: "Bohol," 4 (Furbush); Sevilla, 4 (P. B. S.).

Mindanao: Catagan, 1 (Mearns); Iligan, 1 (Grubbs); "Mindanao," 2 (Steere); Pantar, 1 (Mearns).

Basilan: Basilan, 2 (P. B. S., Schroder); Isabela, 8 (Mearns).

Skins and skulls from the various islands seem to be indistinguishable. All of the skins of males are dark brown, and all of females are gray.

Measurements of skulls of Cynocephalus volans from Isabela, Basilan.

No.	Sex.	Condyl- lobasal length.	Zygo- matic breadth.	Greatest breadth of rostrum.	Inter- orbital breadth.	Postor- bital breadth.	Breadth brain- case above roots of zygo- mata.	Man- dible.	Max- illary tooth row (en- tire).	Man- dibu- lar tooth row (en- tire).	Obser- vations.
144658	Male....	mm. 65.7	mm. 43.5	mm. 24.7	mm. 18.4	mm. 15.1	mm. 24	mm. 50.6	mm. 33	mm. 35.8	Old.
144659	...do....	65.5	43.6	23.2	17	15.7	23.1	50.3	33.1	36.8	Adult.
144660	...do....	68.3	41.6	23.8	15.5	17.3	23.3	51.9	34.4	37.7	Young.
144662	...do....	61.1	42.1	24.3	17.1	17.7	24.3	48.4	32.3	35.7	Do.
144655	Female..	70.2	46.8	27	19.5	15.7	24.5	54.6	35.8	38.5	Adult.
144656	...do....	67	43.1	25	19.4	16.7	23.2	52.2	33.7	37.8	Do.

Family PTEROPIDÆ.

ONYCTERIS ROBUSTA Miller.

1913. *Onycteris robusta* MILLER, Proc. Biol. Soc. Washington, vol. 31, p. 73, March 22.

Specimen.—One, the type, from Luzon: Montalban (Bartsch).

ROUSETTUS AMPLEXICAUDATUS (Geoffroy).

Specimens.—Nine, from the following localities:

Luzon: Montalban, 5 (Bartsch).

Lubang: 1 (P. B. S.).

Negros: 3 (Steere).

PTEROPUS HYPOMELANUS CAGAYANUS Mearns.

1905. *Pteropus cagayanus* MEARNs, Proc. U. S. Nat. Mus., vol. 28, p. 433.

1912. *Pteropus cagayanus* and *Pteropus hypomelanus hypomelanus* HOLLISTER, Philippine Journ. Sci., vol. 7, sec. D, No. 1, p. 9, February.

1912. *Pteropus hypomelanus cagayanus* ANDERSEN, Cat. Chiroptera Brit. Mus., vol. 1, p. 121.

Specimens.—Twenty-one, from the following localities:

Luzon: San Miguel, Ilocos Norte, 7 (Mearns).

Cuyo: 3 (Mearns).

Panay: Concepcion, 7 (Steere); "Panay," 1 (Steere).

Cagayan Sulu: 3, including the type (Mearns).

PTEROPUS MEARNSI Hollister.

1913. *Pteropus mearnsi* HOLLISTER, Proc. Biol. Soc. Washington, vol. 26, p. 112, May 3.

Specimens.—Six, from localities as follows:

Mindanao: Zamboanga, 2 (Mearns).

Basilan: Isabela, 4, including the type (Mearns).

PTEROPUS SPECIOSUS Andersen.

Specimens.—Eight, from the following localities:

Mindanao: Zamboanga, 1 (Mearns).

Malanipa: 7 (Mearns).

PTEROPUS BALUTUS Hollister.

1913. *Pteropus balutus* HOLLISTER, Proc. Biol. Soc. Washington, vol. 26, p. 111, May 3.

Specimen.—One, the type, from Balut, Serangani Group (Mearns).

PTEROPUS PUMILUS Miller.

Specimens.—Two, the type and paratype, from the following locality: Palmas: 2 (Mearns).

PTEROPUS VAMPIRUS LANENSIS Mearns.

Specimens.—Thirty-three, from localities as follows:

Luzon: Batac, Ilocos Norte Province, 13 (Mearns); San Fernando de Union, 1 (Lewis).

Panay: Concepcion, 1 (Steere).

Leyte: 1 (Steere).

Palawan: 1 (U. S. Fish Comm.).

Mindanao: Mercedes, 7 (Mearns); Panguil Bay, Tangob, 1 (Mearns);

Pantar, 1, the type (Mearns); Zamboanga, 3 (Mearns, Harris).

Cabo: 4 (Mearns).¹

ACERODON JUBATUS JUBATUS (Eschscholtz).

Specimens.—Fifteen, from localities as follows:

Luzon: Pasaeva, 1 (McCormick).

Mindoro: Bulacao, 3 (Mearns).

Leyte: 11 (Steere).

ACERODON JUBATUS MINDANENSIS Andersen.

Specimens.—Fifty-six, from the following localities:

Mindanao: Zamboanga, 2 (Mearns).

Banga: Port Banga, 14 (Mearns).

Cabo: 40 (Mearns).

ACERODON LUCIFER (Elliot).

Specimen.—One topotype, from Panay: Concepcion (Steere).

MACROGLOSSUS LAGOSCHILUS LAGOSCHILUS Matschie.

1899. *Macroglossus lagochilus* MATSCHIE, Megachiroptera des Berliner Mus., p. 97.

1912. *Macroglossus lagochilus* and *Odontonycteris meyeri* HOLLISTER, Philippine Journ. Sci., vol. 7, sec. D, p. 11, February.

1912. *Macroglossus lagochilus lagochilus* ANDERSEN, Cat. Chiroptera Brit. Mus., vol. 1, p. 165.

Specimens.—Two, as follows:

Cagayan Sulu: 1 (Mearns).

Philippine Islands: 1 (Exch. Brit. Mus.).

The bat described by Dr. Jentink as *Odontonycteris meyeri*, and later recorded from Cagayan Sulu by Miller, proves to be identical with *Macroglossus lagochilus*.²

Family EMBALLONURIDÆ.

EMBALLONURA ALECTO (Eydeux and Gervais).

1839. *Vespertilio* (*Nycticeus*) *alecto* EYDOUX and GERVAIS, Voy. autour du Monde, vol. 5, pt. 2, p. 7. (Manila, Luzon.)

1862. *Emballonura discolor* PETERS, Monatsb. Königl. Preuss. Akad. (1861), p. 711. (Paracali, Luzon.)

1912. *Emballonura monticola* HOLLISTER, Philippine Journ. Sci., vol. 7, sec. D, p. 12, February. (Not of Temminck, 1838.)

Specimens.—Ten, from the following locality: Guimarás: 10 (Steere).

¹ Cabo Island, in Igat Bay, South Mindanao.

² See Andersen, Cat. Chiropt. Brit. Mus., vol. 1, p. 754, 1912. The genus and species were based on an abnormal specimen.

The Guimarás specimens differ from Bornean examples of *E. monticola* in the smaller size of the skulls. The earliest name for the form represented is *alecto* Eydoux and Gervais. The Guimarás bats agree very well with the original description of *alecto*, and the measurements are much the same. The only discrepancy is that Eydoux and Gervais placed their *alecto* in a subgeneric group (*Nycticeus*), one of their characters for which is the presence of only two upper incisors. Dobson places *alecto* in the synonymy of *E. monticola*, without comment, and the name doubtless refers to the Philippine species we have been calling *E. monticola*. The measurements given by Dobson for *monticola*, and apparently taken from his Luzon specimen, do not agree with the measurements given by Eydoux and Gervais nor with the measurements given by Peters, and refer to a much smaller bat. The *Emballonura discolor* of Peters is a synonym of *E. alecto*, as here understood. The lengths of forearms in the ten Guimarás specimens are 46.2 mm, 44.2, 45, 45.5, 45.9, 45, 47, 45.7, 42, 44.

TAPHOZOUS PHILIPPINENSIS Waterhouse.

Specimens.—Thirty, from the following localities: Luzon: Malabon, 22 (Mearns); Montalban, 8 (Bartsch).

External measurements of alcoholic specimens of Taphozous philippinensis from Luzon.

Locality.	Number.	Sex.	Forearm.	Second digit metacar- pal.	Ear from crown.	Ear from notch.	Tragus from ear notch.	Foot with claws.	Free portion of tail.
			mm.	mm.	mm.	mm.	mm.	mm.	mm.
Malabon	144851	Male	42.4	50.3	15.2	21.7	7.5	11.5	14.2
Do	144852	do	42.3	51.4	15.5	21.5	7.5	11.5	14.2
Do	144853	do	42.3	51.4	15.5	21	6.5	10.2	18.5
Do	144854	do	42.3	52.2	17.2	20	6.7	11.5	17
Do	144855	do	42.3	51.4	14.5	21	8	12	17
Do	144856	do	42.9	52.1	15	22	6.5	11	12.6
Do	144857	do	44.4	53	13.5	20.2	7	11.5	18
Do	144858	do	42.4	51.5	15.1	21.1	7.4	11	14.2
Do	144859	do	41.7	51.5	16	21.2	6.8	11	14.2
Do	144860	do	42.3	52	14.3	21.2	7.9	10.7	12.5
Do	144861	do	42.9	54	16	22.4	7.4	12.4	14.5
Do	144862	do	45.3	53	12.2	22.9	7.6	12	15.4
Montalban	175841	do	58.7	48.8	15.2	20	6	11.4	14
Malabon	144862	Female	40.4	50	16.1	21.4	7.4	10.5	15
Do	144865	do	44.4	52.5	15.5	20	6	11	14
Do	144867	do	50.3	60	16	21	7	11.2	15.5
Do	144860	do	45.6	53.5	18.4	20	6.7	11.5	16
Do	144862	do	44.9	54	16	22	7	12	35
Do	144868	do	44.2	51.7	15.2	22	7.5	11.6	12
Montalban	175836	do	48.2	51	17	20.6	7.2	10.1	14
Do	175837	do	43.4	54	14.8	22	7.2	11	15.2
Do	175838	do	58.7	46.5	14.5	21.8	6.4	10.8	17.5
Do	175839	do	61.7	50.5	17	24.6	5.7	12	14.9
Do	175840	do	57.9	46	15.3	19.5	6	10.9	14.2
Do	175842	do	63.1	51.5	14.5	21	7	11.4	15
Do	175843	do	59.8	48	14.6	18.8	6.9	10.9	15.5

came from Pandan, Catanduanes Island, and represent another species, described below.

TAPHONYCTERIS CAPITO, new species.

Type.—From Pandan, Catanduanes Island. Adult female, skin and skull, U. S. National Museum, No. 155149. Collected in 1909 by D. B. Mackie.

Diagnosis.—Like *Taphonycteris phuto*, from Mindanao, but slightly smaller, with shorter pollex, uniformly shorter metacarpals, and smaller claws. Skull larger, especially broader; teeth actually smaller.

Color.—Upperparts rich brownish-black, sparingly spotted with white on head, back, and rump. Underparts sepia, marbled with whitish. Wings and interfemoral membrane, in dry skin, intense black. An immature topotype is almost pure black above, with no white markings.

Skull and teeth.—The skull, compared with skull of *T. phuto*, is larger, especially broader; rostral portion much more massive, with greater interorbital breadth. Teeth actually smaller than in *phuto*.

Measurements of type.—Forearm, 73 mm.; third finger, 119; third finger metacarpal, 71.5; fourth finger metacarpal, 51.1; fifth finger, 67; fifth finger metacarpal, 36. Skull: Condylbasal length, 21.6; zygomatic breadth, 16.1; mastoid breadth, 13.9; breadth of braincase, 11.0; postorbital constriction, 5.1; interorbital constriction, 8.7; maxillary tooth row, 10.2; mandible, 18.7; mandibular tooth row, 11.9.

Specimens.—Two, from Catanduanes: Pandan (Mackie).

In addition to the external characters assigned to the subgenus *Taphonycteris* by Dobson, are peculiarities of the skull and teeth which make it seem of generic value. Chief among these are the total lack of emargination on the inner side of the audital bullæ, and the large proportional size of the small upper premolar.

MEGADERMA SPASMA SPASMA (Linnaeus).

Specimens.—Three, from localities as follows:

Mindanao: Catagan, 1 (Mearns); Iligan, 1 (Grubbs).

Philippine Islands: 1 (P. B. S.).

Family RHINOLOPHIDÆ.¹

RHINOLOPHUS VIRGO Andersen.

Specimens.—Three, including the type, from Luzon: Pasacao, South Camarines Province (McCormick).

RHINOLOPHUS HIRSUTUS Andersen.

Specimen.—One, the type: Guimarás (Steere).

¹ With the exception of the Philippine Bureau of Science material, specimens from each lot listed under the various species of this genus have been determined at the British Museum by Dr. Knud Andersen.

RHINOLOPHUS ARCUATUS ARCUATUS Peters.

Specimens.—Fifty-seven, from localities as follows:

Luzon: Irian, Benguet, 17 (P. B. S.); Montalban, 35 (Bartsch); Pasacao, South Camarines, 4 (McCormick).

Mindanao: Mount Halcon, 1 (Mearns).

RHINOLOPHUS ARCUATUS EXIGUUS Andersen.

Specimens.—Five, from Guimarás (Steere).

RHINOLOPHUS SUBRUFUS Andersen.

Specimens.—Three, from the following localities:

Luzon: Irian, Benguet, 2 (P. B. S.).

Mindanao: Mount Apo, 1 (Mearns).

RHINOLOPHUS INOPS Andersen.

Specimen.—One, the type, from Mindanao: Mount Apo (Mearns).

Family HIPPOSIDERIDÆ.¹**HIPPOSIDEROS ANTRICOLA** (Peters).

Specimens.—Two, from localities as follows:

Luzon: Pasacao, South Camarines, 1 (McCormick).

Mindanao: Cottabato, Rio Grande, 1 (Mearns).

HIPPOSIDEROS DIADEMA GRISEUS (Meyen).

Specimens.—Nineteen, from the following localities:

Luzon: Malolos Bulacan, 3 (Lewis); Montalban, 3 (Bartsch).

Catanduanes: Baras, 2 (Mackie); Pandan, 1 (Mackie).

Guimarás: 8 (Steere; Moseley).

Mindanao: Mount Apo, 1 (Mearns); Zamboanga, 1 (Mearns).

HIPPOSIDEROS PYGMEUS (Waterhouse).

Specimens.—Fourteen, from localities as follows: Luzon, Montalban, 3 (Bartsch); Pasacao, South Camarines, 11 (McCormick).

CHILOPHYLLA HIRSUTA Miller.

Specimen.—One, the type, from Mindoro: Alag River (Mearns).

Family VESPERTILIONIDÆ.

MYOTIS RUFOPICTUS (Waterhouse).

1845. *Vespertilio rufo-pictus* WATERHOUSE, Proc. Zool. Soc. London, p. 3. (Philippine Islands.)

1912. *Myotis formosus* HOLLISTER, Philippine Journ. Sci., vol. 7, sec. D., p. 16, February. (Not *Vespertilio formosa* HODGSON.)

Specimen.—One, from Luzon: Malolos Bulacan (Lewis).

This specimen agrees in all details, except the number of premolars, with Tomes' account of the type-specimen of *Vespertilio rufopictus* Waterhouse,² which seems to require recognition as a distinct species.

¹ Specimens from each lot listed have been determined at the British Museum by Dr. Knud Andersen.

² Tomes, Proc. Zool. Soc. London, 1856, p. 85.

In our specimen the second upper premolar is wanting on one side, and on the other side is minute and not visible from without. The first and third lower premolars of each side are in close contact; the second premolars are crowded entirely out of the rows, and are not visible from outer sides. This probably accounts for Tomes' description of the dentition of the species as *pm* 2-2, a most natural mistake if the skull was not removed and thoroughly cleaned.

MYOTIS MACROTARSUS (Waterhouse).

Specimens.—Three, from localities as follows: Mindanao: Iligan, 2 (Grubbs); Zamboanga, 1 (Mearns).

PIPISTRELLUS IMBRICATUS (Horsfield).

Specimens.—Seven, from Luzon: Manila (Steere).

GLISCHROPUS TYLOPUS (Deben).

1875. *Vesperugo (Glischropus) tylopus* DOBSON, Proc. Zool. Soc. London, p. 473.

1907. *Glischropus tylopus* MILLER, Bull. 57 U. S. Nat. Mus., p. 205, June 29.

Specimen.—One, from Palawan (Steere).

The single specimen is slightly smaller than any individual in a series from Borneo, the specimens of which differ greatly among themselves, however, in size. The species was heretofore known from the Philippines only by the questionable record of Casto de Elera.¹

NYCTALUS STENOPTERUS (Deben).

1875. *Vesperugo stenopterus* DOBSON, Proc. Zool. Soc. London, 1875, p. 470. (Sarawak, Borneo.)

Specimen.—One, from Mindanao: Zamboanga (Mearns).

This species has not previously been recorded from the Philippine Islands.

TYLONYCTERIS PACHYPUS (Temminck).

1841. *Vespertilio pachypus* TEMMINCK, Monog. de Mamm., vol. 2, p. 217.

1872. *Tylonycteris* *meyeri* PETERS, Monatsb. Königl. Preuss. Akad. Wiss., p. 705. (Southern Luzon.)

Specimens.—Three, from the following localities:

Luzon: Montalban, 2 (Bartsch).

Palawan: 1 (Steere).

SCOTOPHILUS TEMMINCKII (Horsfield).

Specimens.—Sixty-eight, from localities as follows:

Luzon: Dingras, Ilocos Norte, 3 (Mearns); Manila, 1 (Mearns); San Fernando de Union, 16 (Lewis).

Catanduanes: Pandan, 3 (Mackie).

Ticao: 2 (P. B. S.).

Sibuyan: 1 (P. B. S.).

Panay: Guimaras, 1 (Steere).

¹ Catálogo Sistemático de Toda la Fauna de Filipinas, vol. 1, p. 12, Manila, 1895.

Negros: 8 (Steere).

Mindanao: Iligan, 31 (Grubb).

Palawan: Malampaya Sound, 1 (Mearns).

Philippine Islands: 1 (Mearns).

MINIOPTERUS ESCHSCHOLTZII (Waterhouse).

1845. *Vespertilio eschscholtzii* WATERHOUSE, Proc. Zool. Soc. London, Jan. 14 (1845), p. 3, April. (Philippine Islands.)

1912. *Miniopterus schreibersii* HOLLISTER, Philippine Journ. Sci., vol. 7, sec. D, p. 18, February. (Not *Vespertilio schreibersii* KÜHL, 1819.)

Specimens.—Six, from localities as follows:

Luzon: Irian, Benguet, 2 (P. B. S.); Malabon, 1 (Carpenter).

Guimaras: 2 (Steere).

Philippine Islands: 1 (Cuming).

The Philippine bats heretofore placed with *Miniopterus schreibersii* differ enough from European specimens of the latter to merit recognition as a distinct species. The skulls of the island examples are slightly larger and have conspicuously broader and heavier rostra.

MINIOPTERUS TRISTIS (Waterhouse).

Specimen.—One, from the following locality: Lubang (P. B. S.).

Measurements of Miniopterus eschscholtzii and M. tristis.

Species and locality.	Number.	Sex.	Forearm.	Third digit metacarpal.	Foot with claw.	Skull: Condylar length.	Zygomatic breadth.	Breadth of brain case.	Mandible.	Maxillary tooth row (entire).	Mandibular tooth row (entire).
<i>M. eschscholtzii</i> :			mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Irian, Benguet, Luzon.....	48 P. B. S.	Female	43.9	38	7.6	14.2	8.4	7.6	10.8	7	7.5
Do.....	66 P. B. S.	do.	44.3	39.5	8.4	14.2	8.4	7.6	10.5	7	7.5
Malabon, Luzon.....	144848.		40.9	35.5	7.5						
Guimaras Island.....	105504.		44.1	38.2	7.5						
Do.....	105507.		44.3	38.2	7.2						
<i>M. tristis</i> :											
Lubang Island	21 P. B. S.	Male	51.9	47	10.2	18.5	10.4	8.9	14.8	9.1	10.0

MINIOPTERUS PAULULUS, new species.

Type.—From Guimaras Island. Adult in alcohol, skull removed, U. S. National Museum No. 105493. Collected in December, 1887, by J. B. Steere.

Diagnosis.—Size very small, less than in *M. pusillus* Dobson; forearm 35 mm. to 36.4. General characters apparently as in *M. australis* Tomes, but size considerably less. Wing from some distance (1 to 2 mm.) above lower end of tibia; calcar turns from leg slightly above the starting point of wing, about one-fifth length of tibia from foot. Upper surface of interfemoral membrane to end of third caudal vertebra, and entire length of tibiae, thinly haired. Color of hair (alcoholics) throughout uniform dark blackish-brown, without lighter underfur.

Measurements of type.—Forearm, 35 mm.; third metacarpal, 31; fourth metacarpal, 29.5; fifth metacarpal, 27; hind foot, 7. Forearm measurement in four topotypes ranges from 35.1 to 36.4. Skull of type: Greatest length, 13.4; condylobasal length, 12.5; zygomatic breadth, 7.0; breadth brain case, 6.6; upper tooth row, entire, 6.1; mandible, 9.4; lower tooth row, entire, 6.5.

Specimens.—Five, from the type locality, all in alcohol: Guimarás: 5 (Steere).

Family MOLOSSIDÆ.

CHÆREPHON LUZONUS, new species.

Type.—From Cagayan, Cagayan Province, northern Luzon. Adult male in alcohol, skull removed, U. S. National Museum No. 144881. Collected by Dr. Edgar A. Mearns.

Diagnosis.—About intermediate in size between *Chærephon plicatus* and *C. pusillus*. Much lighter colored than *plicatus*; brown above, drab and buffy below. Wing from near center of tibia.

Color (from alcoholic specimen).—Upperparts dark brown, close to warm sepia, the hairs drab near roots. Underparts with hairs drab at basal half, buffy at tips, giving a general color of grayish-buff; lighter, almost pure white, on throat and lower belly.

Skull and teeth.—Skull most like that of *C. jobensis*, but very much smaller; about intermediate in size between skulls of *jobensis* and *pusillus*. Teeth much smaller than in *jobensis* or *plicatus*.

Measurements.—From alcoholic type: Head and body, 54 mm.; tail, 33; hind foot, 10; forearm, 44.4. Skull of type: Greatest length, 17.6; condylobasal length, 16.2; zygomatic breadth, 10.0; mastoid breadth, 9.6; interorbital constriction, 3.1; maxillary tooth row, including canine, 6.0; mandible, 11.8; mandibular tooth row, entire, 7.0.

Specimen.—The type: Luzon: Cagayan, 1 (Mearns).

The Philippine records of *Chærephon plicatus* doubtless refer to the species here described.

Family MUSTELIDÆ.

MYDAUS MARCHEI Huet.

Specimen.—One, from Palawan: Iwahig (Mearns).

AONYX CINEREA (Illiger).

Specimen.—One, from Palawan: Iwahig (Mearns).

Family VIVERRIDÆ.

VIVERRA TANGALUNGA Gray.

Specimens.—Six, from localities as follows:

Luzon: Mariveles, Bataan, 1 (P. B. S.).

Lubang: 1 (P. B. S.).

Palawan: Iwahig, 1 (Mearns).

Mindanao: Catagan, 1 (Mearns); Lake Lanao, 1 (Mearns); Mount Apo, 1 (Mearns).

With a splendid series of sixty skins and skulls of *Viverra tanga-lunga* from Sumatra, Borneo, and many of the smaller Malayan islands, for comparison with the Philippine material, I am unable to find the slightest constant character to divide the species into geographical races.

PARADOXURUS PHILIPPINENSIS Jourdan.

Specimens.—Five, from the following localities:

Luzon: Nagpartian, Ilocos Norte, 2 (Mearns).

Ticao: 1 (P. B. S.).

Mindoro: Bulacao, 1 (Mearns).

Palawan: [Iwahig?], 1 (Mearns).

PARADOXURUS MINAX Thomas.

Specimens.—Five, from the following localities: Mindanao: Baganga, 1 (Mearns); Catagan, 1 (Mearns); Grand Malindang, 1 (Mearns); Mount Apo, 1 (Mearns); Zamboanga, 1 (Mearns).

The material representing this genus from the Philippines is far too little to work out the forms satisfactorily. The characters given by Thomas for his *P. minax* are mostly untrustworthy, as shown by our material, limited as it is. The Mindanao animal does not seem to differ in size or size of skull from the Luzon form. It does, however, average darker in color, so far as shown by the few available skins, and doubtless will prove to be a recognizable race.

Family CANIDÆ.

CANIS FAMILIARIS Linnaeus.

Specimens.—Five skulls of the native domestic dog, from the following localities:

Luzon: Baguio, Benguet, 1 (Mearns).

Mindanao: Little Santa Cruz Island, 1 (Mearns); Sarangani Bay, 1 (Mearns); Zamboanga, 2 (Mearns).

Family SCIURIDÆ.

NANNOSCIURUS CONCINNUS (Thomas).

Specimens.—Nine, from the following localities: Basilan: "Basilan," 6 (P. B. S.); Isabela, 3 (Mearns).

NANNOSCIURUS SURRUTILUS, new species.

Type.—From summit of Mount Bliss, 5,750 feet, Mindanao. Adult female, skin and skull, U. S. National Museum No. 144641. Collected May 28, 1906, by Dr. Edgar A. Mearns. Orig. No. 6170.

Diagnosis.—Like *Nannosciurus concinnus*, of Basilan, but darker colored, less reddish; and with longer, more slender, skull.

Color of type.—General color of upperparts dark reddish-brown, finely marked with black; much darker and less reddish than in *N. concinnus*; the underfur broadly slate-black; terminal half of hairs ringed with black and ochraceous-tawny, and tipped with black. Cheeks and sides more buffy, less reddish. Underparts with underfur deep neutral-gray, the hairs tipped with buckthorn-brown. Hands and feet like back but brighter, more reddish-orange. Tail above and below mixed black and Sudan-brown, with more black at tip. "Iris hazel."

Skull and teeth.—Skull longer and more slender than that of *concinus*, the nasals and rostrum narrower and the braincase elongated; audital bullæ slightly larger. Teeth as in *concinus*.

Measurements of type.—Total length, 164 mm.; tail vertebræ, 77; tail to end of hairs, 113; hind foot, 25. Skull: Greatest length, 27.7; condylobasal length, 24.9; zygomatic breadth, 16.8; interorbital breadth, 10.2; maxillary tooth row, 4.2; mandible, 16.4; mandibular tooth row, 4.0.

Specimens.—Four, from the following localities: Mindanao: "Mindanao," 2 (Steere); Mount Malindang, 1 (Mearns); Summit of Mount Bliss, 1 (Mearns).

This new form apparently needs no special comparison with *N. samaricus*, as the coloration is widely different from that described of the Samar animal.

SCIURUS SAMARENSIS Steere.

Specimens.—Two, from Samar or Leyte (Steere).

SCIURUS MINDANENSIS Steere.

Specimens.—Three, from the following localities: Mindanao: Catagan, 1 (Mearns); Lower Rio Grande Valley, 1 (Mearns); Mount Malindang, 1 (Mearns).

SCIURUS PHILIPPINENSIS Waterhouse.

Specimen.—One, from Basilan (P. B. S.).

SCIURUS JUVENCUS Thomas.

Specimens.—Three, from the following locality: Palawan: Puerta Princesa, 3 (Mearns, P. B. S.).

Family PETAURISTIDÆ.

SCIUROPTERUS CRINITUS Hollister.

Specimen.—One, the type, from Basilan (P. B. S.).

SCIUROPTERUS NIGRIPES Thomas.

Specimens.—Two, from localities as follows: Palawan: "Palawan," 1 (Mearns); Tinabag, 1 (P. B. S.).

The museum specimen of this species is blotched everywhere with white, and has the belly pure white, much as described of the series in the American Museum of Natural History by Dr. J. A. Allen.¹ The Philippine Bureau of Science skin is of the normal color, as described of the type by Thomas.

Family MURIDÆ.**CLEENOMYS SILACEUS** (Thomas).

Specimen.—One, from Luzon: Hights-in-the-oaks, Benguet (Mearns).

CHROTOMYS WHITEHEADI Thomas.

Specimens.—Four, from localities as follows: Luzon: Irisan, Benguet, 1 (P. B. S.); Lepanto Province, 3 (Whitehead).

PHLEOMYS PALLIDUS Nehring.

Specimens.—Three, from localities as follows: Luzon: Hights-in-the-oaks, Benguet, 2 (Mearns); Irisan, Benguet, 1 (P. B. S.).

The Irisan and one of the Hights-in-the-oaks specimens are virtually alike in color; the other specimen from Hights-in-the-oaks lacks the black patch on the withers. Doctor Mearns records the weight of his specimens as four pounds each. A female collected August 2 contained one small fetus; mammae, † inguinal only. A specimen brought to Doctor Mearns alive ate several bodies of skinned birds in the evening and drank water freely.

Measurements of skulls of Phleomys pallidus from Luzon.

Number.	Locality.	Sex.	Condylar length.	Zygomatic breadth.	Length of nose.	Interorbital breadth.	Mandible.	Maxillary tooth row.	Mandibular tooth row.	Observations
151519	Hights-in-the oaks.	Female	mm. 85	mm. 46.4	mm. 34.4	mm. 16	mm. 57.3	mm. 19.8	mm. 20.2	Basal suture closed.
151520	.....do.....	.....do.....	84.5	43.4	30.5	15.8	55.9	18.9	20.4	Do.
49 P. B. S.	Irisan.....	.....	82.3	40.5	31.3	13.8	54.6	19.3	20.3	Basal suture open.

EPIMYS EVERETTI (Günther).

Specimens.—Seven, from the following localities: Luzon: Baguio, 3 (Mearns); Hights-in-the-oaks, 3 (Mearns); Irisan, 1 (P. B. S.).

¹ Bull. Amer. Mus. Nat. Hist., vol. 28, p. 14, January 29, 1910.

EPIMYS GALA Miller.

Specimens.—Three, including the type, from Mindoro: Alag River, 3 (Mearns).

EPIMYS TAGULAYENSIS (Mearns).

Specimens.—Three, from the following localities:

Mindanao: Tagulaya, Gulf of Davao, 1, the type (Mearns); Upper Baganga River, 1 (Mearns).

Basilan: 1 (Steere).

The specimen from Basilan probably represents a new species, but it is too young and in too poor condition to separate it from the small series of *tagulayensis*.

EPIMYS ALBIGULARIS (Mearns).

Specimens.—Fifteen, including the type, from: Mindanao: Mount Apo (Mearns).

Measurements of rats of the Epimys everetti group.

Species and number.	Locality.	Sex.	Head and body.	Tail vertebrae.	Hind foot with claws.	Skull: Condylar length.	Zygomatic breadth.	Mandible.	Maxillary tooth row.	Mandibular tooth row.	Observations.
<i>E. everetti</i> :	Baguio, Luzon.	Male	mm. 239	mm. 258	mm. 47	mm. 51.1	mm. 25.3	mm. 30.7	mm. 8.8	mm. 8.5	Young adult.
151500	Haights-in-the-oaks, Luzon.	do	210	240	49	47.7	22.4	29.3	8.4	8.5	Teeth moderately worn.
151508	do	do	192	210	47	40.3	19.8	26.3	8.9	9	Teeth little worn.
151502	do	Female	235	265	49	49.7	23.9	31.3	9.1	9	Teeth much worn.
145792	Baguio, Luzon.	do	183	200	45	43.2	21.8	26.2	8.9	8.5	Teeth moderately worn.
151504	do	do	172	193	42	40.8	21	24.1	8.2	8.1	Teeth moderately worn.
46 P. B. S.	Irisan, Luzon.	do	225	230	43	48.4	.....	.....	8.5	8.3	Teeth much worn.
<i>E. gala</i> :	Alag River, Mindoro.	Male	209	241	48	48	24.8	31.2	9.6	9.4	Type.
144633	do	Female	170	185	44	40.9	.....	26.4	9.5	9.4	Teeth little worn.
<i>E. tagulayensis</i> :	Tagulaya, Mindanao.	Male	262	260	52	51.5	26.7	31.6	10	9.3	Type.
125264	Baganga, River, Mindanao.	do	.....	.....	.....	52.5	27	31.8	9.3	9	Teeth considerably worn.
<i>E. albigularis</i> :	Mt. Apo, Mindanao.	do	260	236	52	51.8	25.8	32.6	10	9.8	Type.
125268	do	do	257	260	54	52.8	26.2	31.4	10.2	9.9	Teeth considerably worn.
125267	do	do	192	203	46	43.5	22.2	26.8	9.1	9.2	Teeth little worn.
125254	do	Female	235	245	49	47.9	24.2	29.9	9.4	9.4	Teeth moderately worn.
125256	do	do	209	216	46	43.2	22	27	9.3	9.5	Teeth little worn.
125257	do	do	215	210	46	45.7	23.5	27.7	9.7	9.7	Do.
125259	do	do	225	226	47	47.9	24.5	28.8	9.3	9.4	Teeth moderately worn.
125261	do	do	231	250	49	50.6	24.8	30.7	9.3	9.3	Do.
125262	do	do	245	255	50	49.8	25.9	31.4	9.2	9.6	Do.
125263	do	do	240	248	50	50.3	25.9	31	9.3	9.3	Do.

EPIMYS TYRANNUS Miller.

Specimen.—One, the type, from Ticao (P. B. S.).

EPIMYS NORVEGICUS (Erzleben).

Specimens.—Thirty-seven, from localities as follows:

Luzon: Aparri, 1 (Mearns); Manila, 30 (Mearns).

Mindoro: Calapan, 2 (Mearns).

Panay: Ilo-ilo, 1 (Fox).

Mindanao: Zamboanga, 3 (Mearns).

EPIMYS MAGNIROSTRIS (Mearns).

Specimens.—Two, including the type, from Mindanao: Zamboanga (Mearns).

This species proves to be an aberrant member of the *rattus* group, related to the forms on Mindanao and the adjacent islands, and to true *neglectus*. The supraorbital beads are much less rounded than is usual in species of the *rattus* group, and are in fact much as in *E. norvegicus*; but the teeth are typical of the *rattus* group.

EPIMYS COLORATUS, new species.

Type.—From Musser's Plantation, 3 miles west of Isabela, Basilan Island. Adult female (teeth considerably worn), skin and skull, U. S. National Museum No. 144571. Collected February 21, 1906, by Dr. Edgar A. Mearns. Orig. No. 6044.

Diagnosis.—A member of the *rattus* group related to *E. magnirostris* of Zamboanga, but differing in having the underparts dark grayish-buff, and the skull smaller, short, broad, and more heavily built. Pelage harsh.

Color.—General color above and on sides dark russet-brown; the hairs gray at bases and mixed with numerous brown-tipped, yellowish spines, especially forward. Underparts grayish-buff, blending with color of upperparts without distinct line of demarcation. The pelage below is made up of buffy spines and softer hairs of gray. Throat and anal regions with numerous pure ochraceous hairs. Hands and feet marked with broad bands of blackish-brown, extending from color of arms and legs along upper surface to base of digits; digits pale buffy white.

Skull and teeth.—Skull smaller than skull of *E. magnirostris*; larger than that of *E. neglectus* of Borneo; heavier built and more arched, with relatively wider braincase; supraorbital beads especially heavy, more curved on parietals than in *magnirostris*, which has the beads almost parallel, much as in species of the *norvegicus* group. Teeth as in *magnirostris*; considerably larger than in *neglectus*.

Measurements of type (from well-made skin).—Head and body, 211 mm.; tail, 222; hind foot, without claw, 34. Skull: Greatest length, 42.8; condylobasal length, 41.8; palatal length, 24.2; zygomatic

breadth, 20.4; interorbital breadth, 6.6; mastoid breadth, 16.9; upper tooth row, alveoli, 8.1; mandible, 26.1; lower tooth row, 7.2.

Specimens.—Six, from the type locality: Basilan: Isabela (Mearns, Musser).

EPIMYS ROIGINOSUS, new species.

Type.—From Cagayancillo, Cagayan Island. Adult male (teeth considerably worn), skin and skull, Coll. Philippine Bureau of Science No. 33. Collected February 7, 1903, by R. C. McGregor and A. Celestino.

Diagnosis.—A member of the *rattus* group; most like *E. coloratus* of Basilan, but with the sides, limbs, hands, and feet very much lighter, the feet buffy-white, rarely marked with a faint brownish band above. Underparts cream color, sharply marked from color of sides, the hairs unicolor or very slightly darkened with gray at bases. Skull like that of *coloratus* but with supraorbital beads much more curved on parietals, nearly pyriform; palatine foramina wide and bowed. Teeth smaller, only slightly larger than in *neglectus* from Borneo.

Measurements of type (from well-made skin).—Head and body, 217 mm.; tail, 187. Skull: Greatest length, 43.6; condylobasal length, 42.4; zygomatic breadth, 21.3; mastoid breadth, 16.8; interorbital breadth, 7.0; upper tooth row, 7.3; mandible, 25.1; lower tooth row, 6.3.

Specimens.—Twelve from the type locality, all in the collection of the Philippine Bureau of Science.

Cagayan: Cagayancillo, 12 (P. B. S.).

EPIMYS RATTUS (Linnaeus).

Specimens.—Eight, from localities as follows:

Luzon: Manila, 2 (Mearns, Fox).

Panay: Ilo-ilo, 6 (Fox).

EPIMYS MINDANENSIS (Mearns).

Specimens.—One hundred and three, from the following localities:

Luzon: Baguio, Benguet, 22 (Mearns); Laoag, Ilocos Norte, 6 (Mearns); Manila, 12 (Mearns); San Isidro, 1 (Lewis).

Catanduanes: Bagamanoc, 3 (Mackie); Baras, 1 (Mackie); Biga, 1 (Mackie); Calolbong, 2 (Mackie); Caramoran, 1 (Mackie); "Catanduanes," 2 (Mackie); Jimoto, 1 (Mackie); Pandan, 2 (Mackie).

Mindoro: Alag River, 18 (Mearns); Bulalacao, 1 (Mearns); Mount Halcon, 1 (Mearns); Mount Malindang, 2 (Mearns); San Jose, 2 (Fox).

Batan: 1 (P. B. S.).

Romblon: 1 (P. B. S.).

Masbate: 1 (P. B. S.).

Ticao: 7 (P. B. S.).

Panay: Ilo-ilo, 2 (Fox).

Negros: 2 (Steere).

Mindanao: Davao, 3 (Mearns); Margo Satúbig, 2 (Kierulff); Pantar, 4 (Mearns); Todaya, Mount Apo, 2, including the type (Mearns).

I am unable to divide this species satisfactorily into island races over all this range. In Mindanao and on some of the southern islands forms are well marked. Doubtless a large series of specimens of comparable age and pelage would make it possible to recognize races on many of the northern islands as well.

EPIMYS MINDORENSIS (Thomas).

Specimens.—Eleven, from Mindoro: Mount Halcon (Mearns).

On the evidence of specimens from the Alag River and lower slopes of Mount Halcon, listed under *Epimys mindanensis*, I mistrust that this handsome mountain species, distinct as it appears to be, does really intergrade with the wide ranging lowland form.

EPIMYS ZAMBOANGÆ (Mearns).

Specimen.—One, the type, from Mindanao: Zamboanga (Mearns).

EPIMYS KELLERI (Mearns).

Specimen.—One, the type, from Mindanao: Davao (Mearns).

From the fact that no specimens referable to the true *Epimys neglectus* of Borneo have been found in the material representing the *rattus* group from the Philippine Islands in the United States National Museum collections nor among the numerous specimens examined for the Philippine Bureau of Science, I believe that *E. neglectus* should be dropped from the list of Philippine mammals.

EPIMYS QUERCETI Hollister.

Specimens.—Two hundred and fourteen, from localities as follows: Luzon: Haighte-in-the-oaks, Benguet, 56, including the type (Mearns); Manila, 158 (Mearns, Fox).

The Manila examples are not typical and have slightly smaller teeth than the series from Benguet. The Manila specimens are, however, mostly in alcohol, and without a series of skins it does not seem best to attempt the separation of a form based on so slight an average character.

EPIMYS MAYONICUS, new species.

Type.—From Mount Mayon, Albay Province, Luzon (4,000 feet). Male adult, skin and skull (teeth considerably worn), United States National Museum No. 144600. Collected June 5, 1907, by Dr. Edgar A. Mearns. Original No. 6438.

Diagnosis.—Externally like *Epimys querceti*, but slightly less in size, with more yellowish sides, hips, and underparts; pelage more spiny than in any example of *querceti* in a series of over 50 specimens, but these differ greatly among themselves in this respect. Skull differs from that of *querceti* in its much narrower, almost parallel-

sided [not spatulate] nasals, rounded, higher audital bullæ, and larger teeth.

Measurements of type (from dry skin).—Head and body, 117 mm.; tail vertebrae, 112; hind foot (moistened), without claws, 23.7. Skull: Greatest length, 30.6; condylobasal length, 28.6; zygomatic breadth, 14.6; breadth braincase, 13.2; interorbital breadth, 4.7; length of nasals, 11.2; upper tooth row, alveoli, 5.6; mandible, 17.2; lower tooth row, alveoli, 5.4.

Specimen.—One, the type, from Luzon: Mount Mayon, Albay (Mearns).

Dr. Mearns's catalogue records of the single specimen: "Caught in a patch of tall cane grass just above timber line." This form will doubtless prove to be a geographical race of *Epimys querceti*.

EPIMYS LEUCOPHEATUS, new species.

Type.—From Bagamanoc, Catanduanes Island. Adult female (teeth slightly worn), skin and skull, United States National Museum No. 155144. Collected May 27, 1909, by D. B. Mackie. Original No. 5.

Diagnosis.—Size small; pelage very spiny. Differs from all the Philippine members of the *concolor* group in its pale grayish-brown coloration and relatively heavy skull, with massive rostrum.

Color.—Upperparts from head to rump dark brownish-drab, a mixture of sulphur-yellow spines with brown tips and softer hairs with dark gull-gray bases and cinnamon-buff tips. Cheeks, sides, and limbs paler, more grayish; hands and feet pale buffy-white. Underparts pale buffy-white with brighter yellowish wash on groin and at base of tail; hair of belly and chest faintly gray at base.

Skull and teeth.—Skull most resembling that of *E. querceti* of Luzon, but with decidedly heavier, wider, rostrum and smaller, more rounded, audital bullæ. Teeth essentially as in *querceti*.

Measurements of type (from well made dry skin).—Head and body, 114 mm.; tail, 112; hind foot, without claws, 24. Skull: Greatest length, 28.9; condylobasal length, 27.4; zygomatic breadth, 14.2; breadth braincase, 13.2; nasals, 10.2; breadth rostrum, 5.4; interorbital breadth, 4.9; upper tooth row, alveoli, 5.1; mandible, 16.5; lower tooth row, 5.0.

Specimen.—One, the type, a breeding female from Catanduanes: Bagamanoc (Mackie).

EPIMYS CALCIS Hallister.

Specimens.—Twenty-three, including the type, from Luzon: Baguio Benguet, 23 (Mearns).

EPIMYS NEGRINUS (Thomas).

Specimens.—Three, from the following localities: Negros: Canlaon Volcano, 2 (P. B. S.); "Negros," 1 (Steere).

EPIMYS VIGORATUS, new species.

Type.—From Mount Halcon, Mindoro (spur of main ridge at 4,500 feet). Adult male (teeth considerably worn), skin and skull, U. S. National Museum No. 144637. Collected November 15, 1906, by Dr. Edgar A. Mearns. Orig. No. 6306.

Diagnosis.—Like *Epimys todayensis* of Mindanao, but larger, with decidedly longer tail and hind foot. The largest member of the *concolor-ephippium* group known from the Philippines.

Color.—Almost precisely as in *E. todayensis*.

Skull and teeth.—The skull, compared with skulls of *todayensis*, is somewhat larger; the anterior half of the skull is shortened and the braincase is elongated; the outline of the supraorbital heads and occiput, in adult skulls, is thus more ovate-pyriform than in *todayensis*. Teeth as in *todayensis*.

Measurements of type, compared with measurements of the largest adult male *todayensis* in the collection, the latter in parentheses: Total length, 307 (285) mm.; tail vertebrae, 166 (130); hind foot, 32 (28). Skull of type: Greatest length, 35.0; condylobasal length, 32.6; palatal length, 18.7; nasals, 12.1; interorbital breadth, 5.4; breadth of braincase, 14.4; upper tooth row, alveoli, 5.9; mandible, 19.5; lower tooth row, alveoli, 5.4.

Specimens.—Five, from localities as follows: Mindoro: Alag River, 1, (Mearns); Bulalacao, 2 (Mearns); Mount Halcon, 2, including the type (Mearns).

EPIMYS TODAYENSIS (Mearns).

Specimens.—Sixteen, from localities as follows: Mindanao: Cagayan, 8 (Mearns); Margo Satubig, 1 (Mearns); "Mindanao," 1 (Steele); Todaya, Mount Apo, 4, including the type (Mearns); Zamboanga, 2 (Mearns).

The material from Zamboanga District is too poor for positive determination, but apparently belongs here. It consists only of two broken skulls from hawk stomachs and one alcoholic specimen in poor condition.

EPIMYS VULCANI (Mearns).

1905. *Mus vulcani* MEARNS, PROC. U. S. NAT. MUS., vol. 28, p. 446.

1905. *Mus vulcani apicis* MEARNS, PROC. U. S. NAT. MUS., vol. 28, p. 447.

1912. *Epimys vulcani vulcani* and *Epimys vulcani apicis* HOLLISTER, Philippine Journ. Sci., vol. 7, sec. D, p. 30, February.

Specimens.—Nine, including the types of *vulcani* and *apicis*, from Mindanao: Mount Apo (Mearns).

After detail study of all the species in the group, many represented by large series, the slight differences exhibited by the single specimen designated as the type of *apicis* seem too slight, and probably of too doubtful constancy, to recognize a form by name.

EPIMYS PANTARENSIS (Mearns).

Specimen.—One, the type, from Mindanao: Pantar (Mearns).

EPIMYS BASILANUS, new species.

Type.—From Basilan Island. Adult male (teeth slightly worn), skin and skull, U. S. National Museum No. 144635. Collected in February, 1906, by Dr. Edgar A. Mearns. Orig. No. 6039.

Diagnosis.—Like *Epimys todayensis* of Mindanao, but smaller, with smaller skull and teeth; underparts less buffy, more yellowish.

Measurements of type (from well-made dry skin).—Head and body, 130 mm.; tail, 130; hind foot, without claws, 25.5. Skull of type, compared with type skull of *E. todayensis*, measurements of latter in parentheses: Greatest length, 30.8 (34.3); condylobasal length, 28.9 (32.3); nasals, 10.9 (13.2); interorbital constriction, 4.9 (5.2); palatal length, 16.2 (18.4); upper tooth row, alveoli, 5.2 (5.8); mandible, 17.2 (19.6); lower tooth row, alveoli, 5.2 (5.9).

Specimens.—Four, from the following localities:

Basilan: 3 (Mearns).

Sulu: 1 (Mearns).

This rat is closely related to *E. todayensis*, of which it is only a smaller insular race. The three Basilan specimens were "trapped in the forest, away from human habitations." The Sulu specimen, an odd skull, is inseparable from the Basilan skulls, but series of skins from the two islands might show the Sulu form to be distinct.

EPIMYS ORNATULUS, new species.

Type.—From Cagayancillo, Cagayan Island. Adult female (teeth slightly worn), skin and skull, Collection of Philippine Bureau of Science No. 37. Collected February 8, 1903, by R. C. McGregor and A. Celestino.

Diagnosis.—A small, bright-colored member of the *concolor-ephippium* group; most like *E. pantarensis* of Mindanao, but feet white, not grayish-buff, and underparts yellow, not buff. Smaller and brighter colored than *E. luteiventris* of Palawan.

Color.—General color of upperparts bright Sudan-brown, finely lined with blackish, made up of brown-tipped yellowish spines and of soft hairs gray at base and ringed and tipped with bright ochraceous and blackish; brighter on rump and hips. Sides lighter, yellowish-tawny; under parts straw-yellow, the hairs of middle breast and belly pale gray at bases; hands and feet thinly covered with white, or very pale cream hairs.

Skull and teeth.—Most like those of *Epimys pantarensis*, of same essential size but skull with longer, more slender rostrum and nasals.

Measurements of type (from well-made dry skin).—Head and body, 118 mm.; tail, 119; hind foot (moistened), without claws, 23.5. Skull:

Greatest length, 30; condylobasal length, 27.2; zygomatic breadth, 14.2; upper tooth row, alveoli, 5.3; mandible, 16.1; lower tooth row, 4.9.

Specimen.—One, the type, from: Cagayan: Cagayancillo (P. B. S.).

EPIMYS DATÆ (Meyer).

Specimens.—Eight, from Luzon: Hights-in-the-oaks, Benguet (Mearns).

Measurements of Epimys datæ from Hights-in-the-oaks, Benguet Province, Luzon.

Number.	Sex.	Head and body.	Tail vertebra.	Hind foot with claws.	Skull: Condylobasal length.	Zygomatic breadth.	Mandible.	Maxillary tooth row.	Mandibular tooth row.	Observations.
145809.....	Male.....	mm. 182	mm. 148	mm. 36	mm. 34.2	mm. 16	mm. 21.2	mm. 6.1	mm. 6.5	Teeth little worn.
145797.....	Female.....	150	178	41	37	17.5	23.3	6.7	6.5	Teeth moderately worn.
145798.....	do.....	150	160	39	26.3	17.3	22.4	6.5	6.6	Do.
145803.....	do.....	133	127	35	30.9	15.8	19.3	6.2	6.2	Teeth little worn.
145808.....	do.....	128	127	36	31	15.8	18.9	6.5	6.8	Last molar not yet on level.

EPIMYS BENGUETENSIS, new species.

Type.—From Camp John Hay, Baguio, Benguet Province, Luzon (5,000 ft.). Adult female, skin and skull (teeth moderately worn), U. S. National Museum No. 145790. Collected May 1, 1907, by Dr. Edgar A. Mearns. Orig. No. 6405.

Diagnosis.—Like *Epimys datæ* but smaller and lighter colored; the underparts conspicuously different, light buff with a strong tendency toward ochraceous [in *datæ* naphthaline yellow].

Color of type (in worn pelage).—Upperparts mixed gray and ochraceous-buff, the hairs broadly dark gray at bases, tipped with ochraceous-buff. Cheeks and sides much lighter, almost pure warm-buff, the under fur of a lighter shade than on back. Entire underparts light buff, with a strong wash of ochraceous, the hairs very light gray at bases. Feet pinkish-buff with a faintly darker streak along upper surface; tail light brown, unicolor; whiskers dark brown and black [in *datæ* mixed with white].

Skull and teeth.—Except for its smaller size the skull does not differ appreciably from that of *Epimys datæ*. The last upper molars lack the antero-internal supplementary cusps, but that this is a somewhat variable character in *datæ* is shown by one specimen in which this cusp is present on one side and absent on the other.

Measurements of type (estimated from dry skin).—Head and body, 130 mm.; tail, 130; hind foot, without claws (moistened), 32. Skull: Condylobasal length, 33.3; zygomatic breadth, 16; interorbital

breadth, 5.3; breadth of braincase, 15.3; length of nasals, 32; upper tooth row, crowns, 6.2; mandible, 20.9; lower tooth row, 6.2.

Specimen.—One, the type, from Luzon: Baguio (Mearns).

The type of this new species has been compared with a series of eight skins and skulls of *Epimys datæ* collected by Doctor Mearns at Hights-in-the-oaks, northern Benguet Province. From color characters the forms seem very different, but the skulls indicate a close relationship.

BULLIMUS BAGOBUS Mearns.

Specimen.—One, the type, from Mindanao: Mount Apo (Mearns).

BULLIMUS LUZONICUS (Thomas).

1895. *Mus luzonicus* THOMAS, Ann. and Mag. Nat. Hist., ser. 6, vol. 16, p. 163.

1912. *Epimys luzonicus* HOLLISTER, Philippine Journ. Sci., vol. 7, sec. D, p. 29.

Specimen.—One, from Luzon: Hights-in-the-oaks (Mearns).

Measurements of the skull of *Bullimus luzonicus*, No. 151505, an adult female with teeth considerably worn: Greatest length, 56.4 mm.; condylobasal length, 54.4; zygomatic breadth, 26.4; palatal length, 29.6; greatest breadth of rostrum, 10; interorbital breadth, 7.7; mastoid breadth, 20.8; length of mandible, 34.2; maxillary tooth row, 10.3; mandibular tooth row, 10.3.

LIMNOMYS SIBUANUS Mearns.

Specimen.—One, the type, from Mindanao: Mount Apo (Mearns).

LIMNOMYS MEARNSI, new species.

Type.—From summit of Grand Malindang Peak (9,000 feet), Mindanao. Adult female (teeth somewhat worn), skin and skull, U. S. National Museum No. 144622. Collected June 7, 1906, by Dr. Edgar A. Mearns. Orig. No. 6190.

Diagnosis.—Size small; coloration much darker than in *Limnomys sibuanus*, upperparts more slate-gray, less reddish; underparts whitish, not buffy. Skull much smaller, with larger teeth.

Color.—Upperparts an indefinite dull grayish-brown, the pelage long and soft, deep neutral gray, tipped with dull brown; sides paler; underparts entirely whitish, the hairs unicolor. Hands thinly haired with white; feet blackish, edged with white; toes white.

Skull and teeth.—Skull much smaller than that of *L. sibuanus*, with relatively wider and much more rounded braincase; supraorbital beading very slight. Teeth larger, relatively wider and much more rounded, m^1 specially wider and less narrowed anteriorly.

Measurements of type.—Total length, 220 mm.; tail vertebrae, 133; hind foot, 27.5. Skull: Condylobasal length, 25.3; zygomatic breadth, 14.4; breadth of braincase, 14.0; interorbital constriction, 4.5; length of nasals, 9.6; upper tooth row, crowns, 5.2; mandible, 15.8; lower tooth row, 5.4.

Specimens.—Three, from the type-locality: Mindanao: Grand Malindang Mountain (Mearns).

LIMNOMYS PICINUS, new species.

Type.—From spur of main ridge of Mount Halcon (4,500 feet), Mindoro. Adult female (teeth moderately worn), skin and skull, U. S. National Museum No. 144605. Collected November 16, 1906, by Dr. Edgar A. Mearns. Orig. No. 6311.

Diagnosis.—Size medium; tail and ears short; coloration wholly different from the other known members of the group, blackish above, dusky below. Pelage long and very soft.

Color.—Above blackish, the head, forward part of body, and sides, finely lined with ochraceous-buff. The hairs are uniformly dark neutral gray, with narrow tips of ochraceous-buff. Scattered through the pelage of back are numerous overlying hairs of pure black, which greatly reduce the effect of the ochraceous tips on the ordinary hairs. Center of back and rump almost pure blackish; cheeks lighter, more grayish-buff. Underparts dark grayish-drab, not sharply marked from color of sides, the hairs gray at bases, tipped with drab. Hands and feet brownish-black, the digits with long yellowish-white hairs; tail brownish-black above, slightly lighter, more brownish, below.

Skull and teeth.—Skull smaller than that of *L. sibuanus*, larger than in *L. mearnsi*; in general shape more like that of *mearnsi*, with wide, rounded braincase and indistinct beading. Teeth slightly larger than in *mearnsi*; much larger than in *sibuanus*.

Measurements of type.—Total length, 205 mm.; tail vertebrae, 100; hind foot, 28. Skull: Condylbasal length, 26.7; zygomatic breadth, 14.9; breadth of braincase, 14.4; length of nasals, 10.1; upper tooth row, crowns, 5.4; mandible, 16.2.

Specimen.—One, the type, from Mindoro: Mount Halcon (Mearns).

This species is so different in color from the other two known forms of *Limnomys* that no direct comparison is necessary.

TRYPHOMYS ADUSTUS Miller.

Specimen.—One, the type, from Luzon: Haights-in-the-oaks (Mearns).

MUS COMMISSARIUS Mearns.

Specimens.—Sixty-five, from localities as follows:

Luzon: Manila, 55 (Mearns, Fox, U. S. Bur. Fish.); San Fernando de Union, 3 (Lewis).

Panay: Ilo-ilo, 3 (Fox).

Mindanao: Davao, 2, including the type (Mearns); Margo Satúbig, 1 (Kierulff); Zamboanga, 1 (Mearns).

The common *Mus musculus*, introduced into almost all parts of the world, continues to be unknown from the Philippine Islands.

Measurements of skulls of Mus commissarius from the Philippine Islands.

Locality.	Number.	Sex.	Condylor- sal length.	Zygoma- tic breadth.	Breadth of braincase.	Interorbital breadth.	Mandible.	Maxillary tooth row.	Mandibular tooth row.	Observations.
Manila, Luzon.....	142980	Male.....	15.2	10	9.3	3.5	10.8	3.4	2.9	Teeth little worn.
Do.....	142982	.....do.....	18.7	9.5	9.1	3.6	10.4	2.9	2.8	Adult, but m^2 and m^3 wanting.
Do.....	143085	.....do.....	18.3	10.1	9.5	3.4	10.5	3.3	2.9	Teeth little worn.
Do.....	143108	.....do.....	17.5	9.1	9	3.3	10.1	3.3	2.7	Do.
Do.....	143109	.....do.....	17.4	9.6	9.3	3.7	9.7	3.3	2.7	Do.
Do.....	143110	.....do.....	17.1	8.4	8.6	3.4	9.8	2.9	2.7	Teeth moderately worn.
Do.....	175784	.....do.....	18	10.2	9.8	3.5	9.9	3.1	2.8	Teeth little worn.
Do.....	175786	.....do.....	18.5	9.9	9.3	3.7	10.6	3.4	2.8	Adult, but m^2 wanting.
Do.....	175788	.....do.....	19.4	9.7	9.3	3.7	10.9	3.3	2.6	Teeth moderately worn.
Do.....	142983	Female.....	19.2	9.1	8.9	3.5	10.7	3.2	2.7	Do.
Do.....	143089	.....do.....	20.1	11	9.4	3.7	11.3	3.6	2.9	Teeth much worn.
San Fernando de Union, Luzon.	143883	Male.....	18.3	9.8	9.1	3.5	10.4	2.9	2.7	Teeth little worn.
Do.....	143885	.....do.....	17.4	9.6	8.9	3.4	8.8	3	2.7	Do.
Davao, Mindanao.	135213	Female.....	19	10.4	9.2	3.5	10.9	3.1	2.6	Type.
Zamboanga, Mindanao.	144920	.....do.....	16.1	8.9	8.4	3.5	9.2	2.7	2.6	Teeth little worn.

TARSOMYS APOENSIS Mearns.

Specimens.—Five, from the following localities: Mindanao—Grand Malindang Mountain, 2 (Mearns); Mount Apo, 1, the type (Mearns); Mount Bliss, 2 (Mearns).

Measurements of Tarsomys apensis from Mindanao.

Locality.	Number.	Sex.	Head and body.	Tail verte- brae.	Hind foot.	Skull: Con- dylor-sal length.	Zygoma- tic breadth.	Mandible.	Maxillary tooth row.	Mandibular tooth row.	Observations.
Mount Apo.....	125280	Male....	135	120	32	34.5	17.4	20.9	6.1	5.9	Type. Teeth moderately worn.
Mount Bliss.....	144616	Female..	140	127	33	36.8	18.3	23.1	6.6	6.4	Teeth much worn.
Do.....	144617	.....do....	118	115	31.5	.....	.....	19.5	6.2	6.1	Teeth considerably worn.
Grand Malindang Mountain.	144618	.....do....	136	134	32	.....	.....	21.7	6.4	6.5	Teeth much worn.
Do.....	144619	.....do....	142	138	32.5	36	18.4	22.3	6.2	6.1	Do.

BATOMYS DENTATUS Miller.

Specimen.—One, the type, from Luzon: Hights-in-the-oaks (Mearns).

CARPOMYS MELANURUS Thomas.

Specimens.—Three, from Luzon: "Northern Luzon" (Whitehead).

CRATEROMYS SCHADENBERGI (Meyer).

Specimens.—Five, from the following localities: Luzon, Baguio, 1 (P. B. S.); "Northern Luzon," 4 (Whitehead).

Measurements of adult skulls of *Crateromys schadenbergi*.

Locality.	Number.	Sex.	Condylar length.	Zygomatic breadth.	Interorbital breadth.	Length of nasals.	Maxillary breadth.	Palatal length.	Mandible.	Maxillary teeth row.	Mandibular teeth row.
Baguio, Benguet.....	44	Male....	mm. 65.7	mm. 36.7	mm. 8.1	mm. 28.7	mm. 22.2	mm. 34.8	mm. 43.5	mm. 18.9	mm. 16.2
"Northern Luzon".....	P.B.S. 102546	do.....	67.1	36.6	8.1	28.8	22.6	36.8	44.8	16.5	17.7
Do.....	102544	Female..	67.8	37.7	8.2	28.4	22.2	37.7	45.5	17.8	17.9
Do.....	102545	do.....	65.1	35.4	7.4	28.8	21.1	35	42.9	15	15.8
Do.....	102564	do.....	67.5	.....	7.9	27.8	22.8	36.4	43.2	16.3	16.2

APOMYS HYLOCETES Mearns.

Specimens.—Nine, including the type, from Mindanao: Mount Apo (Mearns).

APOMYS PETRÆUS Mearns.

Specimens.—Two, including the type, from Mindanao: Mount Apo (Mearns).

APOMYS INSIGNIS INSIGNIS Mearns.

Specimens.—Twelve, including the type, from Mindanao: Mount Apo (Mearns).

APOMYS INSIGNIS BARDUS Miller.

Specimens.—Twenty-five, from localities as follows: Mindanao: Catagan, 1 (Mearns); Mount Bliss, 12, including the type (Mearns); Mount Lebo, 3 (Mearns); Mount Malindang, 9 (Mearns).

This form is a slightly characterized geographical race of *Apomys insignis*. The only distinguishing character is the slightly narrower skull, an average difference.

APOMYS MICRODON, new species.

Type.—From Biga, Catanduanes Island. Adult male, skin and skull (teeth little worn), U. S. National Museum No. 155145. Collected May 8, 1909, by D. B. Mackie. Orig. No. 6.

Diagnosis.—Of medium size, slightly smaller than the Mindanao forms; thus widely different from either of the two known northern species, from Benguet Province, Luzon. Differs from all other forms of *Apomys* in the relatively small size of teeth.

Color of type (in worn pelage).—Upperparts dark cinnamon-brown; sides lighter, almost tawny-olive; underparts buffy-gray, strongly washed with pale cinnamon. Hands, feet, and tail brown, the tail apparently unicolor.

Skull and teeth.—The skull of the single specimen is broken in the posterior parts, but it is apparently much as in *Apomys insignis* from Mindanao in general shape; the teeth are much less in size, smaller than in any species of *Apomys* except the little *Apomys musculus* of Luzon.

Measurements of type, (from well-made dry skin).—Head and body, 106 mm.; tail, 135; hind foot, without claws, 25.5. Skull: Palatal length, 16.1; interorbital breadth, 4.8; upper tooth row, alveoli, 5.3; mandible, 15.5; lower tooth row, alveoli, 4.9.

Specimen.—One, the type, from Catanduanes: Biga (Mackie).

APOMYS MAJOR Miller.

Specimens.—Five, including the type, from Luzon: Hights-in-the-oaks (Mearns).

APOMYS MUSCULUS Miller.

Specimens.—Two, including the type, from Luzon: Baguio (Mearns).

Family LEMURIDÆ.

NYCTICEBUS PHILIPPINUS Cabrera.

1908. *Nycticebus philippinus* CABRERA, Bol. Real. Soc. Esp. Hist. Nat., vol. 8, p. 137.

Specimen.—One, from Mindanao: Catagan (Schroder).

The discovery of a specimen of the slow lemur in the collection from Mindanao is of very great interest. The specimen is preserved in alcohol and is too young to show if the characters described of the type by Cabrera are constant. It seems best, however, to recognise the Mindanao form, as further collecting will almost surely prove the species distinct from the Tawi Tawi form, *N. menagensis*. Cabrera's name was proposed chiefly to replace *menagensis*, supposed at the time to be without standing in nomenclature, but now becomes available for the Mindanao slow lemur.

Family TARSIIDÆ.

TARSIVS FRATERCULUS Miller.

Specimens.—Two, including the type, from Bohol: Sevilla (P. B. S.).

TARSIVS CARBONARIUS Heude.

Specimens.—Four, from the following localities: Mindanao: Catagan, 1 (Mearns); "Mindanao," 1 (Steere); Zamboanga, 2 (Mearns).

Family LASIOPYGIDÆ.

PITHECUS SYRICHTA Linnaeus.

Specimens.—Sixteen, from localities as follows: Luzon: Batangas, 4 (Govt. Board, Pan-Amer. Exp.); Nagpartian, Ilocos Norte, 12 (Mearns).

PITHECUS MINDORUS, new species.

Type.—From Alag River, Mindoro. Adult male, skin and skull, U. S. National Museum No. 144674. Collected in November, 1906, by Dr. Edgar A. Mearns. Orig. No. 6301.

Diagnosis.—Size large, coloration dark; externally resembling *Pithecus syrichta* of Luzon, but darker and richer colored; skull much like that of *P. mindanensis* of Mindanao and Basilan, but larger.

Color.—General color of upperparts a dark, rich russet-brown, most intense on head and shoulders; the hairs long and coarse, deep mouse-gray at bases and marked on terminal half with alternate rings of black and rich ochraceous-tawny; usual black markings on head; sides and hips lighter than back, with less black and more yellow. Outer sides of arms and legs mixed gray and ochraceous-tawny, becoming duller, almost old-gold near wrists and ankles; hands and feet grayish-buff. Underparts, including inner sides of limbs, dirty buffy-gray. Tail blackish above near base, becoming dark gray at end; below dark buffy-gray. "Iris yellowish-brown; bare space above eye grayish-white; bare skin of muzzle light brown; feet olive-plumbeous; claws plumbeous-black; scrotum brownish-flesh color."

Skull and teeth.—The skull differs greatly in general shape from that of the Luzon macaque (which is long and comparatively narrow with a deep and narrow palate). It is shaped almost exactly like that of the Mindanao species, broad and rounded, with wide and heavy rostrum and wide, shallow palate; but it is decidedly larger, with a much heavier mandible. The teeth show the small supplementary, middle inner cusps on the molars, as usual in *mindanensis*. These cusps are, apparently, not normally present in *syrichta*.

Measurements of type.—Total length, 1,100 mm.; tail, 580; hind foot, 140; girth of chest, 390. Skull: Greatest length, 136; condylo-basal length, 112; zygomatic breadth, 84.9; front of orbit to tip of premaxillary, 54.8; breadth of rostrum above canine, 36.9; breadth of braincase above roots of zygomata, 62.9; palatal length, 57.8; postpalatal length, 45; upper molar-premolar series, 32.9; mandible, 102; mandibular molar-premolar series, 42.2.

Specimens.—Three, from the following localities: Mindoro: Alag River, 1, the type (Mearns); Bulalacao, 1 (Porter); Mount Halcon, 1 (Mearns).

While differing specifically from the Luzon and the Mindanao species, the Mindoro macaque exhibits a curious combination of the distinguishing characteristics of both.

PITHECUS MINDANENSIS (Mearns).

1905. *Cynomolgus mindanensis* MEARNS, Proc. U. S. Nat. Mus., vol. 28, p. 428.

1906. *Cynomolgus mindanensis apoensis* MEARNS, Proc. U. S. Nat. Mus., vol. 28, p. 429.

1912. *Pithecus mindanensis mindanensis* and *Pithecus mindanensis apoensis* HOLLISTER, Philippine Journ. Sci., vol. 7, ser. D, p. 37.

Specimens.—Thirty-seven, from following localities:

Mindanao: Catagan, 9 (Mearns); Lake Lanao, 2 (Mearns); Mount Apo, 5, including type of "*apoensis*" (Mearns); Pantar, 10, including the type (Mearns); Sutug River, Gulf of Davao, 1 (Mearns); Tangob, 2 (Mearns); Zamboanga, 3 (Mearns).

Basilan: "Basilan," 1 (P. B. S.); Isabela, 3 (Mearns).

Balut: 1 (Mearns).

In the light of the abundant material collected by Doctor Mearns on his second expedition in Mindanao, it seems impossible to recognize a subspecies, *apoensis*, from the island.

PITHECUS CAGAYANUS (Mearns).

Specimen.—One, the type, from Cagayan Sulu (Mearns).

PITHECUS SULUENSIS (Mearns).

Specimen.—One, the type, from Sulu: Crater Lake Mountain (Mearns).

In the following table of measurements no skulls are listed which are not fully adult, with all the permanent teeth in place.

Cranial and dental measurements of adult Philippine macaques.

Species and locality.	Number.	Sex.	Greatest length.	Zygomatic breadth.	Palatal length.	Breadth of brain-case.	Front of orbit to tip of premaxillae.	Width of palate at m_1 .	Length of mandible.	Maxillary molar-premolar row.	Mandibular molar-premolar row.
<i>Pithecus syrichta.</i>											
Nagpartian, Luzon.....	144677	Male.....	125	74.8	52.8	53.7	49.7	17.2	80.3	32.6	39.3
Do.....	144678	do.....	134.5	82.5	58.1	59.8	53.9	18.3	97.5	32.3	41.1
Do.....	144680	do.....	140.5	.....	57.8	61.6	54	15.9	103.5	33.5	42.7
Do.....	144679	Female.....	101.5	69.2	43.8	56.4	38.3	16.3	79.8	31.7	35.6
Do.....	144681	do.....	104	70	46.8	57.4	42.8	15.1	81.6	31.2	35.2
Do.....	144683	do.....	105	67.8	45	55.3	39.7	17.2	81	30.4	34.3
Do.....	144684	do.....	115.5	69.8	46.8	55.9	43.8	14	83.8	32.6	36.9
Do.....	144685	do.....	111	67.4	45.5	55.8	40	15.4	76.7	30.7	34.7
Batangas, Luzon.....	114140*	do.....	110	69.5	43.8	56.8	41.8	17.2	80.3	30.2	34.4
Do.....	144141	do.....	110	66	42.9	55.9	38.2	15.9	75.6	30.6	36
<i>Pithecus mindorus.</i>											
Alag River, Mindoro.....	144674	Male.....	136	84.9	57.3	62.9	54.8	20.2	103	32.9	42.3
<i>Pithecus mindanensis.</i>											
Catagan, Mindanao.....	144671	Male.....	123	83.8	53.3	55.9	49.6	16.5	83.9	31.2	40.7
Do.....	144672	do.....	127.5	82.4	55.7	56.9	50.4	15.3	92.9	31.4	40.3
Do.....	144694	do.....	129	83.4	53.3	59.1	50.2	16.6	97.2	31.9	39.4
Do.....	144697	do.....	122.5	82.7	50.7	58.6	48.2	17.4	92.4	30	37.3
Lake Lanao, Mindanao.....	151661	do.....	131	80.4	51.3	58.2	47.4	16.8	88.4	29.6	36.9
Do.....	151662	do.....	123	81.1	50.9	58.9	48.3	16.6	87.7	30.4	39.7
Pantar, Mindanao.....	123448	do.....	120.5	81.8	51.7	60.8	45.7	16.2	88.8	32.3	42.2
Do.....	123450*	do.....	122.2	82.4	54.2	58.3	50.9	16.8	99.7	30.3	38.7
Do.....	123453	do.....	123	78	49.4	58.4	45.4	17.4	89.5	30.9	39.4
Do.....	123456	do.....	122.5	83	50.3	60	47.5	18.3	91.1	33.8	42.2
Tangob, Mindanao.....	144669	do.....	128.7	.....	56.6	60.1	55.8	18.2	98.3	32.3	41.3
Isabela, Basilan.....	144665	do.....	114.5	79.8	44.7	57.8	42.5	18.4	85.5	29.4	37.3
Do.....	144666	do.....	120	81.5	49	56.2	44.8	16.4	90.3	30	39.1
Catagan, Mindanao.....	144673	Female.....	101.9	67.6	38.9	56.1	33.3	15.6	72.1	28.7	33
Do.....	144692	do.....	102.6	67.2	41.4	55.1	37	17.1	76.9	29.4	35.7
Do.....	144695	do.....	95.4	65.7	37.2	52.8	31.8	16	72.9	29.5	34.5
Pantar, Mindanao.....	123449	do.....	105.5	67.7	42.2	54.7	38.8	16.7	78	29.6	33.7
Do.....	123455	do.....	110	55.3	44.7	55.3	40.8	16.2	81.1	29.4	36.4
Mount Apo, Mindanao.....	125321	do.....	107	71.6	39.6	56.7	34.7	15.2	77.3	29	34.3
Do.....	125322	do.....	.....	70.2	41.8	.....	37.1	.....	78.8	29.4	34.2
Zamboanga, Mindanao.....	144698	do.....	94	64.5	36.1	51.9	31.3	15.6	70.2	26.7	32
Tangob, Mindanao.....	144670	do.....	106	68.8	41.4	53.6	35.9	15.3	75.8	28.4	34.8
Salut Island.....	144664	do.....	99	.....	38.9	52.3	34.4	14.5	73.1	28	34.1
<i>Pithecus cagayanus.</i>											
Cagayan Sulu.....	125325*	Male.....	110	77.6	45.4	55.9	43.2	16.2	82.3	29.6	37.8
<i>Pithecus suluensis.</i>											
Crater Lake Mtn., Sulu.....	125324*	Male.....	125	89.6	51	58.1	46.7	17.7	93	30.1	37

*Type.

†Type of *Oryzomys mindanensis apoensis*.

Family SUIDÆ.

SUS PHILIPPENSIS Nehring.

Specimen.—One, from Luzon: Casiguran (Mearns).

SUS INCONSTANS Heude.

Specimen.—One, from Mindanao: Catagan (Mearns).

SUS CALAMIANENSIS Heude.

Specimen.—One, from Culion (Lamson-Scribner).

SUS DOMESTICUS Erleben.

Specimens.—Three, from the following localities: Luzon: Hights-in-the-oaks, 1 (Mearns); Laoag, 1 (Mearns).

Mindanao: Zamboanga, 1 (Mearns).

Family CERVIDÆ.

RUSA PHILIPPINUS (Smith).

Specimens.—Five, from the following localities: Luzon: Abra Province, 1 (Chase); Ilocos Sur Province, 3 (Govt. Board Pan-Am. Exp.); Manila, 1 (Mearns).

RUSA BARANDANUS (Heude).

1888. *Ussa barandanus* HEUDE, Mem. Hist. Nat. Emp. Chinois, vol. 2, pt. 1, p. 22.

Specimens.—Seven, from Mindoro (Le Hardy).

RUSA FRANCIANUS (Heude).

1888. *Ussa francianus* HEUDE, Mem. Hist. Nat. Emp. Chinois, vol. 2, pt. 1, p. 24.

Specimens.—Twenty-three, from localities as follows: Mindanao: Catagan, 10 (Mearns); Grand Malindang Mountain, 1 (Mearns); Lanao, 4¹ (collector unknown); "Mindanao," 1¹ (Kelly); Pantar, 1 (Mearns); Santa Maria, 1 (Mearns); Zamboanga, 5¹ (Mearns).

There are apparently two forms of deer represented in the above series, or the variation in the size of the teeth in the common Mindanao *Rusa* is much greater than is usual in animals of this family. Without more material from other parts of the island, and especially topotypes of *francianus*, from Matai, Gulf of Davao, it seems undesirable to attempt to divide the species into local races.

¹ Frontals and antlers only.

Measurements of adult skulls of *Rusa barandanus* and *R. francianus*.

Species and locality.	Number.	Sex.	Greatest length.	Greatest breadth.	Greatest length of nasals.	Greatest breadth of nasals.	Palatal length.	Maxillary molar row.	Maxillary tooth row.	Observations.
<i>R. barandanus</i> :			mm.	mm.	mm.	mm.	mm.	mm.	mm.	
Mindoro.....	144463	Male.....	245	108	78.7	34.1	135	40.1	67.4	Teeth considerably worn.
Do.....	144464	...do.....	268	117	98.7	36.4	150	44.8	73.1	Do.
Do.....	144465	...do.....	270	110	95.9	36.3	147	45.6	76.1	Teeth moderately worn.
Do.....	144466	...do.....	268	115.5	98.2	34.5	145	44.3	75.7	Teeth considerably worn.
<i>R. francianus</i> :										
Catagan, Mindanao.....	144706	...do.....	262	110	87.8	42.9	157	48.3	80.8	Teeth moderately worn.
Do.....	144701	Female..	264.5	104	90.9	41	150	52.5	88	Do.

RUSA BASILANENSIS (Heude).

1888. *Melanaxis basilanensis* HEUDE, Mem. Hist. Nat. Emp. Chinois, vol. 2, pt. 1, p. 49.

Specimen.—One pair of antlers with frontals from Basilan: Isabela (Mearns).

There are evidently two species of deer on Basilan. One, *Rusa nigricans* (*Cervus steerii* Elliot), is fairly well known. It is a much smaller species than is represented by the frontals and antlers collected by Doctor Mearns at Isabela. The species described by Heude was based on a mutilated skull, which was doubtfully supposed to represent a species related to *R. alfredi* of the more northern islands. From the excellent figure of this skull and the antlers, I judge Doctor Mearns's specimen to be the same. If this is so, the species is a member of the group of larger Philippine deer, including *philippinus* of Luzon and *francianus* of Mindanao.

RUSA NIGELLUS, new species.

Type.—From Mount Malindang at 8,000 feet, Mindanao. Skin and skull of adult male (permanent teeth in place, but little worn), Cat. No. 144711, U.S.N.M. Collected May 30, 1906, by Dr. Edgar A. Mearns. Orig. No. 6193.

Diagnosis.—A small deer apparently related to *Rusa nigricans*, but with prominent facial markings, smaller skull, and much smaller teeth. Very much less in size than the common deer of Mindanao, *Rusa francianus*.

Color of type.—Face brownish-black, marked by two transverse bands of golden-brown, the first over muzzle 10 mm. above nose pad; the second across forehead, bowing to each horn. Lower lip whitish; chin blackish; throat dark brown with median longitudinal stripe of pale cinnamon. Nape and back of ears black; lining of ears buffy-white. Neck and body dark blackish-brown, the mummy-brown of

Ridgway, 1912, mixed with numerous blackish hairs; middle belly darker, more blackish; pectoral and inguinal regions ochraceous-buff, sharply marked from general color of middle underparts, legs, and sides. Outer sides of fore legs blackish; a narrow stripe of bright ochraceous down inner side to hoofs. Hind legs blackish above, with a narrow blackish stripe in front extending down to near hoofs; a wide area of ochraceous on back side from region of knee to the lateral hoof.

Skull and teeth.—Skull apparently much as in *B. nigricans*, but smaller, the adult male skull slightly smaller than the female of *nigricans*. Antler pedicles very long; even longer than usual in this group of small Rusine deer. Teeth much smaller than in *nigricans*. The antlers of the type are small, with very short brow tines. A shed antler from Grand Malindang Mountain, apparently of this species, is much the same. It is 115 mm. long from the burr, without fork, and with a short brow tine of only 21 mm. length on upper surface.

Measurements of type (from skin).—Head and body, 1,000 mm.; tail, 80; ear, moistened, 80. Skull: Total length, estimated, 214; zygomatic breadth, 92.5; palatal length, 124; length of median frontal suture, 78; greatest length of nasals, 67; greatest width of nasals, 34.5; least width of nasals, 13.8; anterior point of nasals to end of premaxillæ, 29.5; orbit to end of premaxillæ, 108.5; length of horn pedicle from orbit, 72.5; upper molar-premolar row, 66; upper molar row, 41; upper premolar row, 27.5; greatest width m^2 , 13.6; lower molar-premolar row, 72.

Specimens.—Two, from localities as follows: Mindanao: Grand Malindang Mountain, 1¹ (Mearns); Mount Malindang, 1 (Mearns).

Family BOVIDÆ.

BUBALUS BUBALIS (Linnaeus).

Specimens.—Four, from localities as follows:

Luzon: "Northern Luzon," 2 (McCoy and Babbitt).

Philippine Islands: 2 (Govt. Board Pan-Am. Exp.).

BUBALUS MINDORENSIS Heude.

Specimens.—Three, from Mindoro (Le Hardy, Merritt).

Family EQUIDÆ.

EQUUS CABALLUS Linnaeus.

Specimen.—One skull of the native domestic pony from Luzon: Laoag, Ilocos Norte (Mearns).

¹ Antler only.

APPENDIX.

About 50 species of mammals, currently recognized from the Philippine fauna, are still wanting in the collection of the United States National Museum. Certain other wide-ranging species, known to inhabit the archipelago, are not represented by specimens from the Philippine Islands. Examples of all these forms, listed below, are greatly desired.

Family SORICIDÆ.

CROCIDURA EDWARDSIANA Trouessart.

Type-locality.—Sulu.

Family TUPAIIDÆ.

TUPAIA PALAWANENSIS Thomas.

Type-locality.—Palawan.

TAPAIA MOLLENDORFFI Matschie.

Type-locality.—Culion.

TUPAIA CUYONIS Müller.

Type-locality.—Cuyo.

Family PTEROPIDÆ.

CYNOPTERUS BRACHYOTIS BRACHYOTIS (Müller).

1838. *Pachysoma brachyotis* MÜLLER, Tijds. Nat. Gesch., vol. 5, pt. 1, p. 146.

1862. *Pachysoma luzoniense* PETERS, Monatsb. Königl. Preuss. Akad. (1861), p. 708. (East slope of Volcano Yriga, Camarines, Luzon).

1912. *Cynopterus luzoniensis* HOLLISTER, Philippine Journ. Sci., vol. 7, sec. D, No. 1, p. 8. February.

1912. *Cynopterus brachyotis brachyotis* ANDERSEN, Cat. Chiroptera Brit. Mus., vol. 1, p. 614.

Type-locality.—Dewei River, Borneo. Recorded from Luzon and Mindanao.¹

THOOPTERUS NIGRESCENS (Gray).

Type-locality.—Morty Island, Malay Archipelago. Recorded from Luzon.

PTENOCHIRUS JAGORII (Peters).

Type-locality.—Daraga, Albay, Luzon. Recorded also from Mindoro and from Mindanao.

¹ Andersen, Cat. Chiroptera Brit. Mus., vol. 1, p. 618.

PTEROPUS LEUCOPTERUS Temminck.

Type-locality.—"Philippine Islands." Known only from Luzon.¹

PTEROPUS MINUS Andersen.

1908. *Pteropus minus* ANDERSEN, Ann. and Mag. Nat. Hist., ser. 8, vol. 11, p. 364. October.

Type-locality.—Macassar, Celebes. Recorded from Luzon.²

HARPYIONYCTERIS WHITEHEADI Thomas.

Type-locality.—Mindoro. The type, in the British Museum, is the only specimen known.

Family RHINOLOPHIDÆ.**RHINOLOPHUS ANDERSENI** Cabrera.

Type-locality.—Philippines (probably Luzon).

RHINOLOPHUS PHILIPPINENSIS Waterhouse.

Type-locality.—Luzon. Recorded also from Mindanao.

RHINOLOPHUS RUFUS Eydeux and Gervais.

Type-locality.—Manila, Luzon.

Family HIPPOSIDERIDÆ.**HIPPOSIDEROS BICOLOR** (Temminck).

Type-locality.—Java, Amboina, and Timor. Has been recorded from Luzon and Palawan.

HIPPOSIDEROS CORONATUS (Peters).

Type-locality.—Mainit, Mindanao.

HIPPOSIDEROS OBSCURUS (Peters).

Type-locality.—Paracali, Luzon. Known also in Dinagat, and reported from Mindanao.

Family VESPERTILIONIDÆ.**PIPISTRELLUS IRRETTUS** (Carter).

Type-locality.—Chusan Island, China. Known from the Philippine Islands.

PIPISTRELLUS TENUIUS (Temminck).

Type-locality.—Java and Sumatra. Has been recorded in Mindanao.

MINIOPTERUS AUSTRALIS Tomas.

Type-locality.—Australia. Recorded from Luzon.

¹ Andersen, Cat. Chiroptera Brit. Mus., vol. 1, p. 313, 1912.

² Andersen, Cat. Chiroptera Brit. Mus., vol. 1, p. 123, 1912.

MINIOPTERUS PUSILLUS Deben.

Type-locality.—India or Philippine Islands. Recorded from Luzon and Mindanao.

MINIOPTERUS TIBIALIS (Tomes).

Type-locality.—Amboyna. Recorded from Luzon.

MURINA CYCLOTIS Deben.

Type-locality.—Darjeeling, Northeast Bengal. Has been recorded from Mindanao.

KERIVOULA HARDWICKII (Horsfield).

Type-locality.—Java. Has been recorded in Mindanao and in Samar.

KERIVOULA JAGORII (Peters).

Type-locality.—Samar.

KERIVOULA PELLUCIDA (Waterhouse).

Type-locality.—Philippine Islands.

KERIVOULA WHITEHEADI Thomas.

Type-locality.—Isabela, Northeast Luzon.

Family **MUSTELIDÆ**.**MYDAUS SCHADENBERGII** Jentink.

Type-locality.—Calamianes Islands.

Family **VIVERRIDÆ**.**PARADOXURUS TORVUS** Thomas.

Type-locality.—Bongao, Tawi Tawi Group.

ARCTICTIS WHITEI Allen.

Type-locality.—Iwahig, Palawan.

MUNGOS PALAWANUS Allen.

Type-locality.—Iwahig, Palawan.

MUNGOS PARVUS (Jentink).

Type-locality.—Calamianes Islands.

Family **FELIDÆ**.**FELIS MINUTA** Temminck.

Type-locality.—Java. Known to occur on Calamianes, Cebu, Negros, Palawan, and Panay.

Family **SCIURIDÆ**.**NANNOSCIURUS SAMARICUS** Thomas.

Type-locality.—Samar.

SCIURUS ALBICAUDA Matschie.

Type-locality.—Culion.

SCIURUS MÖLLENDORFFI Matschie.

Type-locality.—Culion.

SCIURUS PHILIPPINENSIS Waterhouse.

Type-locality.—Mindanao. Known also from Basilan.

SCIURUS STEERII Günther.

Type-locality.—Balabac.

Family PETAURISTIDÆ.**SCIUROPTERUS CRINITUS** Hollister.

Type-locality.—Basilan.

Family MURIDÆ.**CRUNOMYS FALLAX** Thomas.

Type-locality.—Isabela, Luzon.

CRUNOMYS MELANIUS Thomas.

Type-locality.—Mount Apo, Mindanao.

RHYNCHOMYS SORICOIDES Thomas.

Type-locality.—Highlands of northern Luzon.

PHLEOMYS CUMINGI (Waterhouse).

Type-locality.—Luzon. Recorded also from Marinduque and Mindoro.

PHLEOMYS ELEGANS (Cabrera).

1901. *Capromys elegans* CABRERA, Bol. Soc. Españ. Hist. Nat., p. 372. December.

1912. *Phleomys elegans* CABRERA, Trab. Mus. Cien. Nat., No. 3, p. 30.

Type-locality.—Philippine Islands.¹

EPIMYS LUTEIVENTRIS (Allen).

Type-locality.—Iwahig, Palawan.

EPIMYS TYRANNUS Miller.

Type-locality.—Ticao Island.

MUS CASTANEUS Waterhouse.

Type-locality.—Philippine Islands.

¹ Cabrera, Trab. Mus. Cien. Nat., No. 3, 1912, p. 30.

RATOMYS GRANTII Thomas.

Type-locality.—Highlands of northern Luzon.

CARPOMYS PLEURUS Thomas.

Type-locality.—Highlands of northern Luzon.

Family **HYSTRICIDÆ**.**THECURUS PUMILUS** (Günther).

Type-locality.—Puerto Princesa, Palawan. Known also from Balabac and from Calamianes.

Family **MANIDÆ**.**MANIS JAVANICA** Desmarest.

Type-locality.—Java. Known from Palawan, and has been recorded on Culion.

Family **LEMURIDÆ**.**NYCTICEBUS MENAGENSIS** (Lydekker).

Type-locality.—Bongao and Tawi Tawi.

Family **TARSIIDÆ**.**TARSIVS FRATERCULUS** Miller.

Type-locality.—Sevilla, Bohol.

TARSIVS PHILIPPENSIS Meyer.

Type-locality.—Samar.¹

Family **HYLOBATIDÆ**.**HYLOBATES FUNEREUS** Geoffroy.

Type-locality.—Sulu.

Family **SUIDÆ**.**SUS AEGENOBARBUS** Hoot.

Type-locality.—Palawan.

SUS BARBATUS BALABACENSIS Major.

Type-locality.—Balabac Island.

SUS BARBATUS PALAVENSIS Nehring.

Type-locality.—Puerto Princesa, Palawan.

SUS CEBIFRONS (Heude).

Type-locality.—Masbate. Recorded also from Cebu.

¹ Elliot, Rev. Primates, vol. 1, p. 10, 1912.

SUS MINUTUS Heude.

Type-locality.—La Laguna to Tarlac, Luzon.

Family TRAGULIDÆ.**TRAGULUS NIGRICANS** Thomas.

Type-locality.—Balabac.

Family CERVIDÆ.**RUSA ALFREDI** (Sclater).

Type-locality.—Philippines (received from Manila). Recorded from Cebu, Guimarás, Leyte, Masbate, Negros, Panay, and Samar.

RUSA CALAMIANENSIS (Heude).

1888. *Hyelaphus calamianensis* HEUDE, Mem. Hist. Nat. Emp. Chinois, vol. 2, pt. 1, p. 49.

1897. *Cervus culionensis* ELLIOT, Field Mus. Pub. Zool., vol. 1, No. 7 (not paged), June. (Culion.)

1912. *Rusa culionensis* HOLLISTER, Philippine Journ. Sci., vol. 7, sec. D, No. 1, p. 40.

Type-locality.—Calamian, Philippine Islands.

RUSA NIGRICANS (Brooke).

1877. *Cervus nigricans* BROOKE, Proc. Zool. Soc. London (1877), pt. 1, p. 57, June 1.

1896. *Cervus steerii* ELLIOT, Field Col. Mus. Pub. Zool., vol. 1, No. 3, p. 72, May. (Basilan.)

1912. *Rusa nigricans* and *Rusa steerii* HOLLISTER, Philippine Journ. Sci., vol. 7, sec. D, p. 40. February.

Type-locality.—Philippines. Known only from Basilan.

The status of none of the following deer, described by P. M. Heude in the *Mémoires concernant l'Histoire Naturelle de l'Empire Chinois*, has ever been determined, because of lack of material. Good series of specimens, particularly skulls with perfect sets of teeth, from all the type localities will be necessary before these names can properly be dealt with.

Ussa ambrosianus. Nueva Ecija, Luzon.

Ussa atheneensis. Luzon.

Ussa baryceros. La Laguna and Batangas, Luzon.

Ussa brachyceros. Batangas, Luzon.

Melanaxis breviceps. Masbate Island.

Ussa chrysotrichos. La Laguna and Batangas, Luzon.

Ussa cinereus. Cebu Island.

Ussa corteaus. Mariveles, Luzon.

Ussa crassicornis. Cebu.

- Ussa dailliardianus*. Jala-Jala, Laguna, Luzon.
Melanaxis (?) *elegans*. Philippine Islands.
Ussa elorzanus. Bataan Province, Luzon.
Ussa garcianus. Nueva Ecija, Luzon.
Ussa gonzalinus. Philippines, probably Luzon.
Ussa gorrichanus. Batangas, Luzon.
Ussa guevaranus. Mariquina, Luzon.
Ussa guidoteanus. Batangas, Luzon.
Ussa hipolitianus. La Laguna and Batangas, Luzon.
Ussa longicuspis. Probably Luzon.
Ussa macarianus. Nueva Ecija, Luzon.
Ussa maraisianus. Jala-Jala, Laguna de Bay, Luzon.
Ussa marzaninus. Nueva Ecija and La Laguna, Luzon.
Melanaxis masbatensis. Masbate Island.
Ussa michaelinus. San Miguel de Murcia, Tarlac, Luzon.
Ussa microdontus. Batangas, Luzon.
Ussa nublans. La Laguna, Luzon.
Ussa ramosianus. Nueva Ecija, Luzon.
Ussa rosarianus. Nueva Ecija, Luzon.
Ussa roxasianus. Batangas, Luzon.
Ussa rubiginosus. Bataan and Nueva Ecija, Luzon.
Cervus soloensis. Sulu.

1885. [*Cervus*] *soloensis* HEUDE, Catalog. des Cerfs Tâchetés, p. 1.

1894. *Sitelaphus soloensis* HEUDE, Mem. Hist. Nat. Emp. Chinois, vol. 2, pt. 3, p. 147.

- Ussa spatharius*. La Laguna, Luzon.
Ussa telesforianus. Batangas (?), Luzon.
Ussa tuasoninus. Batangas, Luzon.
Ussa verzosanus. Nueva Ecija, Luzon.
Ussa vidalinus. San Miguel de Murcia, Tarlac, Luzon.
Ussa villemerianus. San Miguel de Murcia, Tarlac, Luzon.

Family BOVIDÆ.

BUBALUS MAINITENSIS Heude.

Type-locality.—Lake Mainit, Mindanao (domesticated).

BUBALUS MOELLENDORFFI Nehring.

Type-locality.—Busuanga Island, Calamianes. Also recorded from Culin.

EXPLANATION OF PLATES.

PLATE 27.

Skull of type-specimen of *Pithecus mindorus*, U.S.N.M. Cat. No. 144674, from Alag River, Mindoro (two-thirds natural size).

- Fig. 1. Dorsal view.
2. Ventral view.

PLATE 28.

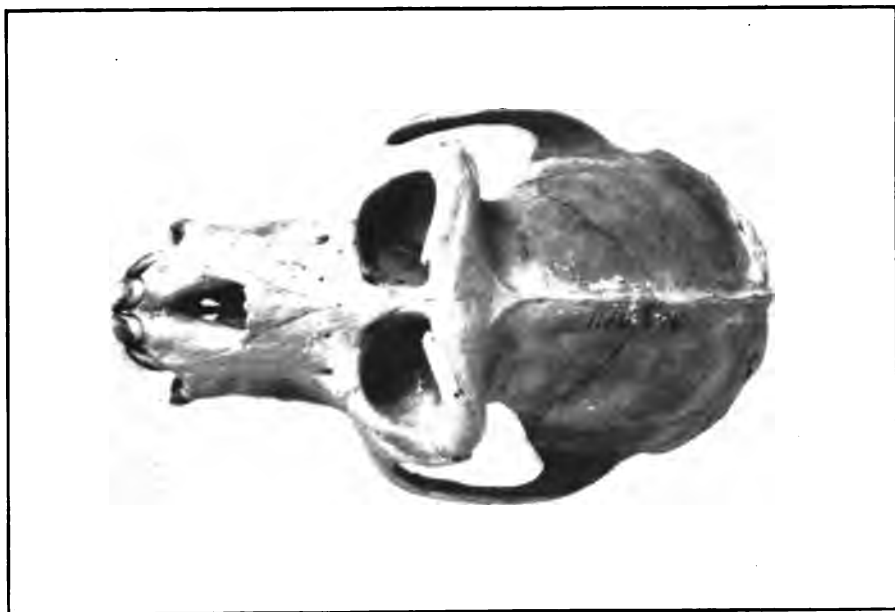
Skull of type-specimen of *Pithecus mindorus*, U.S.N.M. Cat. No. 144674, from Alag River, Mindoro (two-thirds natural size).

- Fig. 1. Left mandibular ramus.
2. Mandible, dorsal view.
3. Skull, lateral view.

PLATE 29.

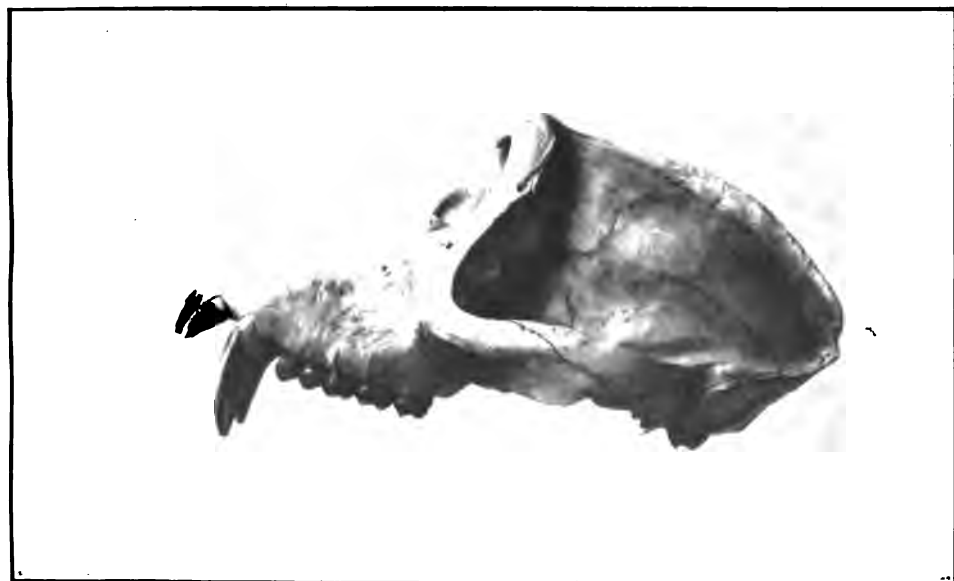
Skull and teeth of type-specimen of *Rusa nigellus*, U.S.N.M. Cat. No. 144711, from Mount Malindang, Mindanao.

- Fig. 1. Skull, dorsal view (one-third natural size).
2. Left mandibular ramus (one-third natural size).
3. Right maxillary tooth row (natural size). —



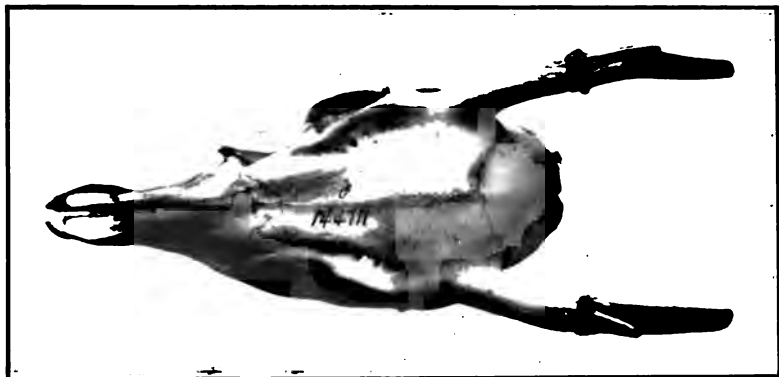
SKULL OF PITHECUS MINDORUS FROM MINDORO.

FOR EXPLANATION OF PLATE SEE PAGE 341.



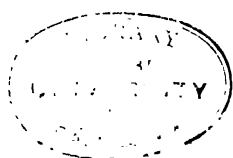
SKULL OF PITHECUS MINDORUS FROM MINDORO.

FOR EXPLANATION OF PLATE SEE PAGE 341.



SKULL AND TEETH OF *RUSA NIGELLUS* FROM MINDANAO.

FOR EXPLANATION OF PLATE SEE PAGE 341.



DESCRIPTIONS OF NEW HYMENOPTERA, NO. 8.

By J. C. CRAWFORD,

Associate Curator, Division of Insects, United States National Museum.

This paper contains the results of an examination of a small but extremely interesting collection from Trinidad, sent by Mr. F. W. Urich. Coming from a region from which so little is known, most of the species proved to be undescribed. Attention is also called to the habits recorded in this paper of the female of *Trissolcus euschisti* brooding over her eggs, until they are almost ready to hatch.

Where both sexes of a species are described, the one described last is the allotype. Comparative measurements were given in figures were made with the Zeiss binocular microscope equipped with number 2 eyepieces and the α_1 objective and an eyepiece micrometer.

Superfamily SERPHIDOIDEA.

Family SCELIONIDÆ.

TRISSOLCUS EUSCHISTI Ashmead.

On August 4, 1912, Mr. H. L. Viereck collected on Plummers Island, Maryland, some hemipterous eggs (later determined by Mr. Heidemann as probably the genus *Perillus*) over which a female of the above species was brooding. For several days while kept in a vial she continued to show great solicitude over the eggs which at the time they were collected were beginning to turn dark as a result of the development of the pupæ. She continued this brooding until separated from the eggs to keep her distinct from the progeny, the first of which appeared on August 13. In all ♀2 issued (all females) and some three or four died without being able to emerge.

TRISSOLCUS URICHI, new species.

Female.—Length about 1.25 mm. Black, the legs, except coxæ, and antennæ, except the brown club, rufo-testaceous; face reticulated and with scattered punctures; no smooth medial area in front of

anterior ocellus; first joint of funicle slightly but distinctly longer than pedicel; mesoscutum, except anteriorly where granulose, granular-reticulate, at extreme rear exactly the same as medially; scutellum with similar sculpture, with a median longitudinal carina and a row of pits at apex; metanotum and propodeum coarsely rugose; wings hyaline; first segment of abdomen with rugæ almost reaching apex; second segment with a basal row of pits, and rest of segment smooth.

Male.—Length about 1.2 mm. Similar to the female, except in secondary sexual characters.

Type-locality.—Port of Spain, Trinidad.

Described from 18 females and 2 males reared from the eggs of a hemipteron during January, 1912, by F. W. Ulrich, after whom the species is named.

Type.—Cat. No. 16034, U.S.N.M.

TRISSOLCUS TRINIDADENSIS, new species.

Female.—Length about 1.2 mm. Black, the antennæ brown, with the scape and pedicel lighter; coxæ black, femora, except the lighter apices, dark brown, tibiæ and tarsi light brown; face reticulated, with scattered punctures and with no medial smooth area in front of anterior ocellus; first joint of funicle hardly longer than pedicel; mesonotum anteriorly rugulose, medially granulose-reticulate; posteriorly more shiny and more granulose; scutellum apically with a row of pits, with a median longitudinal carina, basally rugulose, disk shiny, almost smooth; wings hyaline; segment one of abdomen longitudinally rugose almost to apex; second segment with a basal row of pits.

Male.—Length about 1.05 mm. Similar to the female except in secondary sexual characters, the antennæ (only 9 joints remaining) testaceous; the legs lighter brown than in female, with the femora not much darker than the tibiæ.

Type-locality.—St. Augustine, Trinidad.

Described from 8 females and 1 male reared from the eggs of *Sphyracoris obliquus* on cotton, May, 1912, by F. W. Ulrich.

Type.—Cat. No. 16035, U.S.N.M.

This species closely resembles the last but is smaller, has darker colored antennæ and legs, and has the sculpture at the rear of the mesoscutum and on base of scutellum different from that on middle of mesoscutum.

TELENOMUS TABANOCIDA, new species.

Female.—Length about 0.85 mm. Black, the antennæ and legs brown, the coxæ darker, the trochanters and bases of femora and the tarsi lighter; head wider than long but not twice as wide; face smooth,

polished; pedicel distinctly longer than the first joint of the funicle, which is hardly longer than broad, following joints of funicle, not as long as broad; club five-jointed; mesoscutum shiny, with large, scattered punctures; wings hyaline; abdomen narrow, elongate, as long as the head and thorax combined; first and second abdominal segments each with a row of short striæ basally; second segment about one and one-half times as long as broad.

Male.—Length about 0.75 mm. Brown, with the abdomen darker; face testaceous, shading into brown above; antennæ and legs, including coxæ, testaceous; similar in sculpture to the female; the three basal joints of the funicle subquadrate, the rest transverse, the apical joint subquadrate.

Habitat.—St. Josephs River, Trinidad.

Described from 10 females and 15 males reared from tabanid eggs in January, 1912, by F. W. Urich.

Type.—Cat. No. 16036, U.S.N.M.

TELENOMUS MERIDIONALIS Ashmead.

Among the material sent by Mr. Urich there is a fine series of this species reared from the eggs of a pentatomid, with the record, La Josefina, Sangre Grande, Trinidad, January, 1912, F. W. Urich, collector.

TELENOMUS ALBITARSIS Ashmead.

The above-mentioned material contained a large series of this form reared from the eggs of a noctuid, with the record, St. Joseph, Trinidad, September, 1912, P. Lachmere-Guppy, collector.

Superfamily CHALCIDOIDEA.

Family EURYTOMIDÆ.

CHRYSEIDA INOPINATA Brues.

The U. S. National Museum possesses one female from Brownsville, Texas, with the date, June 6, E. A. Schwarz, collector, and one male from the same locality, with the record, "2-3-'13" bred from *Oncideres putator* by M. M. High, Chittenden (Bureau of Entomology, U. S. Department of Agriculture), No. 1921.

NEORILEYA ASHMEADI, new species.

Female.—Length about 2 mm. Black, with the scape rufo-testaceous, obscured with fuscous, and the femora and tibiæ, except apices, honey color; apices of femora and tibiæ and the tarsi whitish; antennæ (the club missing) dark brown; head and thorax finely umbilicately punctured; face with a median carina from antennal fossa to mouth parts and also laterad a few striæ converging towards mouth parts; outer orbits with a carina coming over top of eye and down inner orbits to a point opposite middle of antennal fossa, where

it runs diagonally and downward to antennal fossa; wings hyaline; abdomen finely punctured above.

Habitat.—St. Clair, Trinidad.

Described from 7 specimens reared August, 1912, from unknown eggs by Mr. F. W. Urich.

Type.—Cat. No. 16037, U.S.N.M.

This species greatly resembles *N. flavipes* Ashmead, but in that species the inner orbits are little or not at all convergent; the diagonal carina running from carina along inner orbit to antennal fossa touches the latter almost at base and is continued below base.

The species is named in honor of Dr. W. H. Ashmead, who described not only this genus, but also many others in his generic revision of the Chalcidoidea.

Family PERILAMPIDÆ.

PERILAMPIDEA, new genus.

Antennæ 13 jointed with 2 ring joints, the pedicel shorter than the first joint of funicle; eyes distinctly hairy; mandibles 3-toothed; thorax above coarsely umbilicately rugoso-punctate; parapsidal furrows indicated only by an indistinct depression of the surface anteriorly; axillæ widely separated; stigmal vein about two-thirds as long as the marginal; postmarginal longer than the marginal; hind tibiæ with 2 apical spurs; abdomen compressed.

This genus resembles *Perilampus* in the thorax, but the antennæ have 2 ring joints, the eyes are conspicuously hairy, the stigmal and postmarginal veins are long and the abdomen is compressed.

Type.—*Perilampidea syrphi* Crawford.

PERILAMPIDEA SYRPHI, new species.

Female.—Length about 2.25 mm. Head and thorax very dark blue, back of head and disk of mesoscutum bronzy; scape and pedicel testaceous, rest of antennæ brown; face rather finely reticulated by carinæ, along upper inner orbits becoming umbilicate; thoracic notum except extreme sides of scutum and axillæ with coarse irregular reticulate umbilicate punctures; parapsidal furrows indicated anteriorly only by a slight depression of the integument, otherwise obsolete; under side of projecting apical portion of scutellum more finely reticulated; wings hyaline, veins light brown; coxæ brown with purple reflections; femora brown, their apices and the rest of the legs whitish; abdomen brown.

Habitat.—Moruga, Trinidad.

Described from 3 specimens reared by F. W. Urich, in May, 1912, from the larva of a syrphid preying on *Dactylopius citri* found on cacao.

Type.—Cat. No. 16038, U.S.N.M.

Family ENCARTIDÆ.

(BRASEMA) ANASTATUS RUGOSICOLLIS (Cameron).

This species has been reared from the eggs of *Microcentrum rhombifolium* at Lindsay, California, by Mr. J. R. Horton, of the United States Department of Agriculture.

OEENCYRTUS TRINIDADENSIS, new species.

Female.—Length about 0.8 mm. Green, the scutellum, lower part of face and apex of abdomen bronzy; face above antennæ and the mesoscutum and scutellum, except at apex, reticulate; scape dark brown, rest of antennæ lighter brown; pedicel about as long as joints 1 and 2 of funicle combined, the first joint of funicle slightly longer than the second; ocelli in an equilateral triangle; femora dark brown, fore and mid tibiæ narrowly and hind tibiæ broadly, annulate with dark brown.

Male.—Length about 0.62 mm. Similar to the female but the head green, the dorsum more aeneous, with some bronzy reflections, the antennæ testaceous and the bands on the tibiæ somewhat narrower.

Habitat.—Port of Spain, Trinidad.

Described from many specimens reared from the eggs of a pentatomid in February, 1912, by F. W. Urich.

Type.—Cat. No. 16039, U.S.N.M.

The female differs from *O. anassæ* in the dark femora and annulate tibiæ; from *johnsoni* by the annulate tibiæ; *clisiocampæ* has the second joint of funicle slightly longer than first and the lateral ocelli farther from each other than to anterior ocellus.

OEENCYRTUS CHRYSOPÆ, new species.

Female.—Length, 0.5 mm. Above greenish, the scutellum aeneous; face mostly aeneous, pleuræ brown; antennæ and legs testaceous with a very slight brownish tinge, the coxæ slightly darker; pedicel much longer than first joint of funicle, the joints of the funicle subquadrate (see fig. 1); mesoscutum shiny, almost smooth; scutellum with crowded very fine punctures, resembling minute thimblelike punctures; wings hyaline.



FIG. 1.—OEENCYRTUS CHRYSOPÆ. OUTLINE OF ANTENNA OF FEMALE.

Type-locality.—Verdant Vale, Arima, Trinidad.

Host.—Eggs of *Chrysopa* species.

Described from specimens reared by Mr. F. W. Urich.

Type.—Cat. No. 16040, U.S.N.M.

This species is distinguished by the subquadrate joints of the funicle.

SIGNIPHORA GIRAULTI, new species.

Female.—Length about 1 mm. Blue-black (when mounted on a slide brown) the face and legs more brownish, the tarsi whitish; face with a few scattered punctures; mesonotum transversely striated; fore wings with the anterior margin fumated out to end of the marginal vein and at this point extending entirely across wing and dilated on inner posterior margin (see fig. 2); cilia at apex of anterior wing very short, those at apex of hind wings much longer; submarginal vein with four bristles, marginal vein with one at extreme base, and at apex

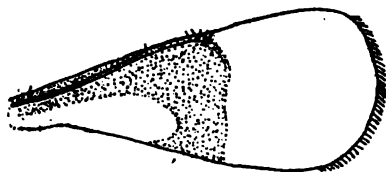


FIG. 2.—SIGNIPHORA GIRAULTI. FRONT WING OF FEMALE.

and on stigmal a group of five; near base of wing a bristle on the disk of wing between submarginal vein and anterior margin of wing; mid femora at apex above with two spines, with one on side and one near lower margin; mid tibiae with one above near base and one at apex with two on side at apex and one near apex on lower margin; apical spur of mid tibiae with about 14 teeth the basal two of which are shorter and more slender than those immediately following (fig. 3).

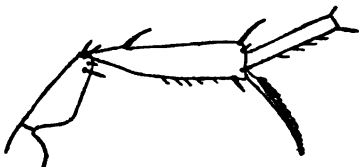


FIG. 3.—SIGNIPHORA GIRAULTI. MIDDLE LEG OF FEMALE.

Described from four specimens (three on slides and one on card point) labeled "La Lune and Moruga, Trinidad, from *Dactylopius citri*, F. W. Urich, collector.

Type.—Cat. No. 16041, U.S.N.M.

In the illustration of the wing the bristles have been made more distinct than they really are, in order to show more clearly.

This species belongs to the *nigra* group as defined by Girault and in his table¹ would run near *corvina* which has the fumation of the wing quite different, the marginal fringes of the hind wing no longer than those on the fore wing, etc.

The species is named after Mr. A. A. Girault, who has recently monographed this most interesting group.

Family EULOPHIDÆ.

DEROSTENUS FULLOWAYI, new species.

Female.—Length about 1 mm. Green, head and thorax above including scutellum with minute thimblelike punctures, abdomen except the brown apices of segments with very similar sculpture; antennæ brown, joints of funicle almost as broad as long, the first

¹ Proc. U. S. Nat. Mus., vol. 45, p. 227 and following.

shorter than the pedicel; wings with a distinct but small cloud back of stigmal knob; legs whitish, the coxæ green, the hind femora, except tips, brown, with more or less green tinge.

Male.—Unknown.

Described from specimens reared at Honolulu, Hawaii, by Mr. D. T. Fulloway from *Agromyza diminuta*, together with a species of *Diaulinus* and one of *Chrysocharis*, the type mounted in balsam, paratypes both in balsam and on card points.

Type.—Cat. No. 15674, U.S.N.M.

In some of the paratypes the middle femora are more or less brown.

This species resembles *D. punctiventris* Crawford, but has much stronger and deeper sculpture, has the scutellum with as strong sculpture as the rest of the mesonotum (in *punctiventris* the scutellum is almost smooth medially) and has the legs differently colored.

FAMILY MYMARIDÆ.

Tribe GONATOCEBINI.

XENOMYMAR, new genus.

Tarsi 5 jointed, abdomen sessile, antennæ female, 8 jointed, the third joint shorter than pedicel, the fourth joint as long as scape (see fig. 4); of male, 13 jointed; fore wings almost parallel sided with the marginal vein very long extending three-fifths of the length of the dilated portion of wing (see fig. 5); cilia at apex of fore wings about one and one-half times as long as greatest width of wing; disk of wing with hairs toward apex indistinctly arranged in about 3 rows; sheaths of ovipositor somewhat exerted.

Type.—*Xenomymar urichi* Crawford.

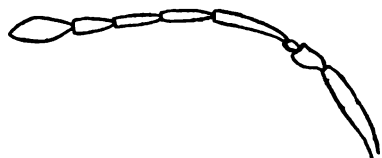


FIG. 4.—XENOMYMAR URICHI. ANTENNA OF FEMALE.

XENOMYMAR URICHI, new species.

Female.—Length, about 0.5 mm. Very light yellowish with the head somewhat brownish, the antennæ at base more nearly colorless and apically more brownish; and the wings somewhat infuscated beyond the base of the marginal vein.

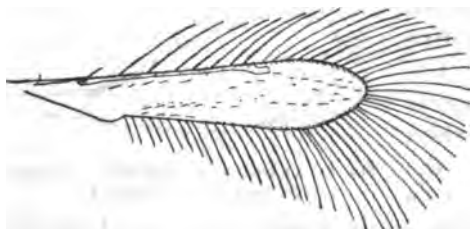


FIG. 5.—XENOMYMAR URICHI. FRONT WING OF FEMALE.

Male.—Length, about 0.4 mm. Similar to the female;

joints 4–13 of antennæ subequal in length.

Habitat.—Verdant Vale, Trinidad.

Described from 12 specimens (on two slides, one slide with four females and two males labeled types, the other with six females labeled paratypes) with the additional data issued from grass January 27, 1913. F. W. Ulrich, collector.

Type.—Cat. No. 16042, U.S.N.M.

GONATOCERUS ANOMOCERUS, new species.

Female.—Length, about 0.65 mm. Dark brown, the under side of thorax lighter, the antennæ and legs testaceous and slightly suffused with brownish; antennæ anomalous, the first, second, and fourth segments of funicle almost ring-like (see fig. 6); fore wings



FIG. 6.—GONATOCERUS ANOMOCERUS. ANTENNA OF FEMALE.

broad, hyaline, disk covered with cilia but with an oblique hairless streak just beyond apex of marginal vein and extreme base of wing without cilia; marginal cilia

short; hind wings narrow, with marginal cilia longer than width of wing, along anterior margin with a single row of discal cilia; disk of hind wing otherwise bare; valves of ovipositor not exerted.

Male.—Length, about 0.6 mm. Similar but with normal antennæ (apical three joints missing) somewhat lighter in color than in the female, as are the legs.

Type-locality.—Verdant Vale, Trinidad.

Host.—Eggs of *Horiola arcuata*.

Described from five specimens (on one balsam slide) reared July, 1912, by Mr. F. W. Ulrich.

Type.—Cat. No. 16043, U.S.N.M.

The peculiar antennæ of the female readily distinguish this species.

Tribe ANAPHINI.

ANAPHOIDEA LATIPENNIS, new species.

Female.—Length, about 0.68 mm. Brown, with the legs and antennæ, except the brown club, flavous; basal half of abdomen flavous with some brown intermingled; pedicel slightly longer than second joint of funicle; (relative length of antennal joints is as follows, scape 24; pedicel 14, funicle 5, 12, 12, 9, 10, 9, respectively; club 33, fore wings broad, the hind margin strongly curved (see fig. 7); disk of fore wings closely covered with cilia, not distinctly in rows but at widest point about 20 rows; cilia not extending basad of marginal vein; an oblique hairless line extending almost to anterior margin and at its anterior end somewhat beyond apex of marginal

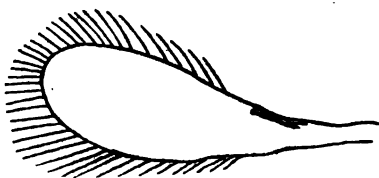


FIG. 7.—ANAPHOIDEA LATIPENNIS. OUTLINE OF FOREWING OF FEMALE.

vein; fore wings along submarginal vein slightly infuscated, extending outward to about middle of marginal vein, from here distinct and extending caudad across wing, thence outward along hind margin to about middle of wing; longest cilia slightly over half the greatest width of wing; disk of hind wing on outer half with a row of cilia at front and one at hind margin and between them 4-6 indistinct rows; sheaths of ovipositor exerted about one-third length of abdomen.

Male.—Length about 0.55 mm. Similar to female but antennæ entirely flavous, and band at base of abdomen not as distinct as in female.

Type-locality.—Verdant Vale, Trinidad, West Indies.

Host.—Eggs of *Horiola arcuata*.

Described from seven specimens (on two balsam slides), the type slide with 3 females and 1 male; reared in July, 1912, by Mr. F. W. Urich.

Type.—Cat. No. 16044, U.S.N.M.

Distinguished by the lighter color band at base of abdomen, and broad wings.

Tribe MYMARINI.

NEOMYMAR, new genus.

Tarsi four jointed, abdomen petiolate; antennæ nine jointed, the scape not longer than the thickness of the head (anterio-posteriorly); fourth joint of antennæ not longer than fifth, the sixth somewhat shorter, seventh and eighth shorter, club not as long as these two joints combined (see fig. 8); apical half of fore wings broadened, without veins, and covered with irregularly placed hairs; marginal cilia long.

Type.—*Neomymar vierecki* Crawford.

This genus differs from *Mymar* in the short scape, the short fourth joint of antennæ in the female, in having more of the fore wing dilated, and without a longitudinal row of bristles.

NEOMYMAR VIERECKI, new species.

Female.—Length, about 1.25 mm.; antennæ, about 1.5; fore wing, about 1.62. Light brown with the legs, including coxæ, very light yellowish; the hind tibiæ somewhat infuscated apically; antennæ about the color of the legs, with the basal part of joints 4-6 and apex of eighth joint somewhat infuscated and the club very dark brown; cilia of fore wings longer than greatest width of wing; fore wing except a strip along anterior margin with irregularly placed



FIG. 8.—NEOMYMAR VIERECKI. ANTENNA OF FEMALE.

hairs, the anterior ones in a more or less distinct row; hind wings linear, the marginal cilia about two-thirds as long as those on fore wings.

Habitat.—Rosslyn, Virginia.

One specimen collected October 1, 1912, by Mr. H. L. Viereck, after whom the species is named.

Type.—Cat. No. 16045, U.S.N.M.

DESCRIPTIONS OF NEW SPECIES OF CRABS OF THE FAMILIES GRAPSIDÆ AND OCYPODIDÆ.

By MARY J. RATHBUN,

Assistant Curator, Division of Marine Invertebrates, United States National Museum.

Four new species of Indo-Pacific crabs from various sources are here described. They are additional to those included in special faunal reports now in preparation. A similar paper was published as No. 1971 of these Proceedings.

Family GRAPSIDÆ.

ERIOCHEIR LEPTOGNATHUS, new species.

Plate 33, figs. 2 and 3.

Type-locality.—Shanghai, China; received from E. Deschamps; 1 female, immature.

Type.—Cat. No. 45567, U.S.N.M.

Dimensions.—Type female, length 10.6 mm., width 11.6 mm.

The single specimen has been dried. Surface much more even than in the species already known; postfrontal and pregastric lobes slightly marked; a finely granulate ridge a little concave forward runs inward from the third lateral tooth; carapace bordered by a raised granulate line; front short, 3-lobed, middle lobe broad and straight (not emarginate) at the middle.

Antero-lateral margin arcuate, tridentate; the first or orbital tooth the longest, rectangular, separated by a U-shaped notch from the second tooth which is acute-angled and sharp; third tooth smaller, acute. The line forming the upper border of the declivous postero-lateral area is sinuous and does not quite reach the posterior margin; postero-lateral margins slightly convergent.

Ischium and merus of outer maxillipeds narrower and longer than in other species; gape correspondingly wider. No tooth on upper margin of arm; an acute tooth at inner angle of wrist; no hair on outer surface of palm; fingers tapering regularly to the slender tips.

The merus joints of the first three legs have an acute subdistal tooth; on the last leg the tooth is rectangular and inconspicuous.

This species differs from *E. japonicus* de Haan,¹ *E. sinensis* (Milne Edwards),² and *E. rectus* (Stimpson),³ in its more even surface, shorter front with straighter margin, shallower orbits, and narrower maxillipeds.

PTYCHOGNATHUS JOHANNÆ, new species.

Plate 30.

Type-locality.—Johanna Island, Comoro Islands, Western Indian Ocean; collected by Hildebrandt; received in exchange from the Berlin Museum; 1 male.

Type.—Cat. No. 22799, U.S.N.M. (formerly No. 4598, Berlin Museum).

Dimensions.—Male, length 16.3 mm., width 19 mm.

Carapace flattened except anteriorly, slightly narrowed anteriorly, regions not delineated; surface punctate, mostly nongranulate; H-depression and postfrontal lobes well marked; front inclined, bimarginate, sinuous, lobes of lower margin projecting beyond those of upper margin; upper margin of orbit sinuous, directed backward and outward; tooth at angle of orbit obtuse; other lateral teeth blunt; teeth not well separated, second overlapping first, and third overlapping second, forming closed fissures and shallow sinuses; the vertical, postero-lateral area separated from the dorsal surface by a ridge only in the posterior half.

Antennules folded obliquely transversely. Epistome narrow, posterior edge crenate. Exognath very convex, its greatest width equaling that of the ischiognath; the latter increasing in width distally; lobe of merognath very large and extended laterally.

Chelipeds of male stout. In the single specimen the right one is much the smaller, perhaps due to regeneration. Upper and inner margins of arm with a scant fringe of hair; inner angle of wrist bluntly rectangular; a patch of hair below the outer angle; left palm about two and one-half times as high as its superior length; a very large patch of long hair on the outer face near the fingers and continued half way along the fingers; largest prehensile teeth near middle of immovable finger; on the outside of this finger near the tip there is a very inconspicuous Y-shaped fringe of short hair; within the spoon of both fingers are several small fascioles of hair.

Legs moderately hairy.

Abdomen of male triangular-oblong; on each side of the first segment there is a deep cavity which occupies about one-fourth of the segment.

¹ *Grapus* (*Eriochel*) *japonicus* de Haan, Fauna Japon., Crust., 1835, p. 50, pl. 17.

² *Eriochirus sinensis* Milne Edwards, Arch. Mus. Hist. Nat., Paris, vol. 7, 1854, p. 146, pl. 2; figs. 1-12.

³ *Eriochirus rectus* Stimpson, Proc. Acad. Nat. Sci. Phila., vol. 10, 1858, p. 108 [49].

This species is closely related to *P. riedelii pilosa* de Man,¹ but differs in several important particulars. The form of the maxilliped is very different; the exognath is narrower, the ischiognath has not parallel sides, nor is the merognath elongate, but broader than long; the palm lacks the curved groove near the wrist which is characteristic of *riedelii*² and *r. pilosa*; the abdomen is broader and less triangular, the length of the sixth segment is less than half its proximal width.

SESARMA (SESARMA) TIOMANENSE, new species.

Plate 31.

Type-locality.—Pulo Tioman, Malay Peninsula; Dr. W. L. Abbott; October 14, 1900; 1 female, ovigerous.

Type.—Cat. No. 24806, U.S.N.M.

Dimensions.—Female, length, 34.7 mm.; greatest width, at third lateral tooth, 42 mm.; width between orbital angles, 40 mm.; width of front at level of eyes, 21 mm.; extreme length of propodus of cheliped, 35.2 mm.; superior length of same (spine excluded), 13.3 mm.; height of same (spine excluded), 19 mm.; length of movable finger, 23.7 mm.

Carapace very high, very convex antero-posteriorly; hepatic, mesogastric, cardiac and intestinal regions bordered by deep grooves; surface mainly covered with tufts of dark-colored bristles. The narrow part of the mesogastric region is traversed in its posterior half by a high, blunt median ridge, which is surmounted by a band of bristles. Postfrontal lobes deeply separated, the median furrow much deeper and wider than the outer furrows, which are continued backward to the widest part of the mesogastric region; lobes of the inner pair twice as wide as those of the outer pair; the inner lobes appear transverse in dorsal view, but curve downward toward the middle in front view; the outer lobes have an oblique edge, sloping downward to the inferior angles of the front. The surface of the front below the lobes is very shallow; the lower margin is cut into two broad lobes separated by an equally broad sinus, while the outer angles are produced outward and downward in a triangular and subacute tooth.

Superior margin of orbit transverse, deeply sinuous. Three acute lateral teeth, including the orbital tooth, each higher than the preceding, the second the longest, the third the shortest; margins denticulate. Side margins of carapace arcuate.

Epistome very deep, the lateral tooth of its lower border spiniform. Merus of outer maxillipeds considerably longer than ischium.

Chelipeds slightly unequal, distinguished by their spinous margins. Inner margin of ischium and merus armed with spines; instead of a large tooth near the distal end of the merus there are two small

¹ In Weber's Zool. Ergebnisse einer Reise in Niederländisch Ostindien, vol. 2, 1892, p. 323.

² *Gnathograpsus riedelii* A. Milne Edwards, Nouv. Arch. Mus. Hist. Nat., Paris, vol. 4, 1898, p. 122, pl. 27, figs. 1-5.

bispinous projections; outer margin of merus also spinous; upper margin bluntly denticulate with oblique rugose lines and armed sub-distally with an acuminate spine. Upper surface of wrist covered with flattened tubercles, its inner distal margin spinous, the spines at the inner angle enlarged on the right or larger cheliped only; below the inner proximal margin there is a laminiform margin which is denticulate and terminates below the inner angle in a sharp spine; inner surface with a few spines and spinules. Outer surface of palm covered with flattened tubercles, of fingers with flattened granules; tubercles and granules are interspersed with horn-tipped spinules; upper and lower margins spinulose, the upper margin terminating distally in a spine; a few broken lines of fine granules parallel to the upper margin; inner surface of palm roughened irregularly, and without a transverse ridge. Fingers moderately gaping in female, prehensile edges irregularly toothed, a strong tooth on each finger just behind the spoon-shaped extremities; tips acute; a line of 11 or 12 horny-tipped spinules on upper margin of movable finger.

Ambulatory legs rather flat and broad, the third pair nearly three times as long as the carapace; merus joints with a sharp subdistal spine; merus of third pair about two and a half times as long as wide; dactyli broad and strongly curved, and a little longer than their respective propodi measured on the outer or upper margin.

Abdomen of female subcircular, broader than long, the terminal segment a little broader than long and so deeply set in the preceding segment that its distal end projects very slightly beyond the latter.

This species has much in common with *S. indicum* Milne Edwards, 1837.¹ See the description by de Man.² It differs most strikingly in possessing a median ridge on the mesogastric region, and in the shape of the lower border of the front, which has a broad, shallow median sinus instead of the narrow, deep one of *indicum*.

Family OCYPODIDÆ.

TYMPANOMERUS DESCHAMPSI, new species.

Plate 32; plate 33, fig. 1.

Type-locality.—Shanghai, China; E. Deschamps; 10 males, 4 females; 1 male is the type.

Type.—Cat. No. 44527, U.S.N.M.

Additional locality.—Korea; Dr. N. M. Ferebee, U. S. N.; June, 1884; 3 males, 1 female.

Dimensions.—Type male, length 6.8 mm., width 10.6 mm.

General appearance like that of *T. stapletoni* de Man.³ Carapace thick, convex, subrectangular, the orbital margin being nearly

¹ *Sesarma indica* Milne Edwards, Hist. Nat. Crust., vol. 2, 1837, p. 74.

² Notes Leyden Museum, vol. 5, 1883, p. 166.

³ Rec. Indian Mus., vol. 2, 1908, p. 212, pl. 18, fig. 1.

transverse (somewhat sinuous and slightly sloping backward to the outer tooth); the sides of the carapace subparallel along the lower margins, upper margins convergent posteriorly; a blunt-pointed triangular antero-lateral tooth, followed by a triangular sinus, behind which the carapace attains its greatest width; surface roughened by short rugose lines from which arise short setæ; some of the rugæ, as on the postbranchial region, are granulous. Front at greatest or superior width, over one-fourth as wide as the carapace; margin arcuate, bordered by a smooth raised line; surface with a broad longitudinal groove. A transverse raised line parallel to the posterior margin; close behind the ridge there is a row of punctæ.

The merus of the maxilliped projects laterally beyond the outer border of the ischium, and bears an L-shaped groove anteriorly. Chelipeds about twice as long as carapace; carpus short, the four sides of its dorsal surface subequal, inner angle rounded; palm higher than its horizontal length, and longer than the fingers, nearly smooth, upper margin finely granulated; above the lower margin a prominent crest extends the length of the palm and finger; lower edge of propodal finger horizontal, bimarginate; the prehensile edge of the dactylus has a long, low prominence on its basal half; the opposite surface of the fixed finger is deeply channeled. Merus joints of the first three legs broad and furnished with a tympanum occupying more than half its length; dactyli nearly as long as propodi.

First segment of male abdomen subequal in width (or transverse dimension) to third, anterior margin concave; second segment subequal in length to first, both measured on median line, and shortened at each end to a minute round lobe; third and fourth segments of equal length, sides separately arcuate, the fourth segment narrower, fifth a little broader than long, strongly constricted near the proximal end; sixth subrectangular, broader than long; seventh triangular with tip rounded.

Differs from *T. stapletoni* in its wider carapace; front rounded instead of angled; palm with a strong ridge on outer surface; finger with a basal prominence; and in the different proportions of the abdominal segments. (See de Man's fig. 1 d.)

EXPLANATION OF PLATES.

PLATE 30.

Ptychognathus johanns.

- Fig. 1. Type male. Front view, $\times 2$.
2. Type male. Dorsal view, $\times 2$.
3. Type male. Ventral view, $\times 2$.

PLATE 31.

Sesarma (Sesarma) tiomanense.

- Fig. 1. Type female. Front view, slightly reduced. .
2. Type female. Dorsal view, slightly reduced.
3. Type female. Ventral view, slightly reduced.

PLATE 32.

Tympanomerus deschampsi.

- Fig. 1. Type male. Front view, $\times 3$.
2. Type male. Dorsal view, $\times 3$.
3. Type male. Ventral view, $\times 3$.

PLATE 33.

- Fig. 1. *Tympanomerus deschampsi*. Abdomen of male, $\times 3$.
2. *Eriocheir leptognathus*, type female. Dorsal view, $\times 3$.
3. *Eriocheir leptognathus*, type female. Ventral view, $\times 3$.

1



2



3



NEW CRABS OF FAMILIES GRAPSIDAE AND OCYPODIDAE.

FOR EXPLANATION OF PLATE SEE PAGE 358.

TY



1



2



3

NEW CRABS OF FAMILIES GRAPSIDAE AND OCYPODIDAE.

FOR EXPLANATION OF PLATE SEE PAGE 358.

1



2



3



NEW CRABS OF FAMILIES GRAPSIDAE AND OCYPODIDAE.

FOR EXPLANATION OF PLATE SEE PAGE 358.





1



2



3

NEW CRABS OF FAMILIES GRAPSIDAE AND OCYPODIDAE.

FOR EXPLANATION OF PLATE SEE PAGE 358.



DESCRIPTIONS OF TWENTY-THREE NEW GENERA AND THIRTY-ONE NEW SPECIES OF ICHNEUMON-FLIES.

By HENRY L. VIERECK,

Of the Bureau of Entomology, United States Department of Agriculture.

This paper is based chiefly upon South American material in the collection of the United States National Museum and in the Königlische Zoologische Museum, Berlin. The specimens from the Berlin museum were collected for the most part by Mr. J. D. Anisits in Paraguay and were submitted to the writer for identification with the assurance that the United States National Museum was to be favored with duplicates of the several species.

In addition to the South American species which were mostly collected at large there are a few reared species that promise to become of economic importance.

FAMILY BRACONIDÆ.

ASPIGONUS STRAMINEICOLOR, new species.

Type-locality.—San Bernardino, Paraguay, K. Fiebrig, S. V. 22.

Type.—Königliche Zoologische Museum, Berlin.

Structurally this species is so similar to the genotype of *Baeacis* that I think its true position may be approximated by comparing it with *Aspigonus* (*Baeacis*) *abietis* Ratzeburg. *Aspigonus diversicornis* Wesmæl the genotype of *Aspigonus* is unknown to the writer through a specimen. It would seem to the writer that *Baeacis* must fall as a synonym of *Aspigonus* if it offers no more differences than those mentioned in the original description of the genus.

Female.—Length, 4.5 mm.; sheaths of the ovipositor apparently as long as the body; tegument uniformly stramineous except for part of the head; face without a shallow fossa between the eyes and the scrobes, antennæ 30-jointed, blackish, scape stramineous beneath, space between the ocelli black, mandibles stramineous at base shading to castaneous then to black at the tips; rugæ of the propodeum arranged so as to represent the poorly defined limits of areolæ; first dorsal segment virtually smooth and polished throughout like the rest of the abdomen; otherwise very similar to the species compared.

CALOBRACON BICOLOR PÆNEUNICOLOR, new subspecies.

Type-locality.—Asuncion, Paraguay, November and December, 1904, J. D. Anisits.

Type.—Königliche Zoologische Museum, Berlin.

Female.—Length 14 mm.; agrees with the original description of *Colobracon bicolor* Szepligeti except in the first abscissa of the cubitus which is not broken at the base, in the yellowish postorbital line, in the blackish tegulæ, reddish mesosternum and almost entirely black or blackish abdomen.

Allotopotype.—Somewhat smaller than the type, otherwise essentially as in the type. Two female paratypes are from Villa Morra and were collected November 19 and October 14, 1905, the latter specimen is only 11 mm. long

Genus CHELONUS Panzer.

TABLE OF SOME SOUTH AMERICAN SPECIES.

- | | |
|--|-----------------------------------|
| 1. Carapace simple at apex, uniformly sculptured..... | 2. |
| Carapace with a characteristic area or foramen at apex; antennæ less than twenty jointed..... | 5. |
| 2. First joint of the flagel hardly shorter than the scape or as long or somewhat longer than the scape..... | 3. |
| First joint of the flagel distinctly shorter than the scape; carapace with subbasal lateral maculæ..... | <i>bipustulatus</i> Viereck. |
| 3. Carapace hardly twice as long as wide in the middle..... | 4. |
| Carapace nearly three times as long as wide in the middle..... | <i>buscki</i> Viereck. |
| 4. Scape stramineous..... | <i>gossypii</i> Viereck. |
| Scape black or blackish..... | <i>chilensis</i> Viereck. |
| 5. Carapace twice or nearly twice as long as wide in the middle..... | 6. |
| Carapace nearly three times as long as wide in the middle..... | <i>ruficollis</i> Viereck. |
| 6. Basal two-thirds of the carapace reticulate..... | <i>szepligetii</i> , new species. |
| Basal two-thirds of the carapace striate, with reticulations between the striae. | <i>townsendi</i> Viereck. |

CHELONUS (CHELONELLA) SZEPLIGETII, new species.

Type-locality.—Pernambuco, Brazil.

Type.—Cat. No. 13795, U.S.N.M.

Female.—Length 3 mm.; compared with the original description of *Chelonus sobrinus* Szepligeti, the male of which alone is described. This differs as follows: Front medially shining, striato-punctate, laterally dullish punctured, notauli represented by reticulations which in addition give character to the prescutum and the posterior half of the scapulæ; carapace reticulate, the reticulation becoming almost lost toward the apex of the segment, the latter with a nearly circular foramen that apparently represents the similarly placed foramen in the male, fore femora pale stramineous to yellowish, mid and hind femora basally and apically pale yellowish, hind tibiæ with a sub-basal brownish mark and with the apex brownish to blackish;

antennæ 16-jointed, flagel blackish, first joint of the flagel hardly more than two-thirds the length of the scape.

Allotype.—Essentially as in the type but with the antennæ more than 16-jointed and with the apical foramen of the carapace having its greatest diameter at least twice the length of the shortest diameter.

The above specimens as well as three paratopotypes were collected by Koebele and Branner and bear the following legends, February '83, 1-18-'83 No. 70, and 10/2, '83 collected on cotton. Of the paratopotypes there is one specimen only 2 mm. long. A paratype from San Bernardino, Paraguay, bears the label K. Fiebrig S. V. and S. VI, and belongs to the Königliche Zoologische Museum, Berlin.

CYANOPTERUS DIVERSUS, new species.

Type-locality.—Bahia, Brazil, No. 819, March 14, 1883, A. Koebele.

Type.—Cat. No. 16215, U.S.N.M.

Female.—Length, 10 mm.; agrees with the original description of *Ipobracon disparatus* Szepligeti except in the mesonotum which is mostly black, in the mesopleuræ being reddish above the furrow and in the longer ovipositor which is approximately 3 mm. long; basal area of the second segment triangular, its sides angulate near the middle.

Paratypes from Asuncion, Paraguay, Cape Laureles, February 4, 1906; Cape Olympo, December 11, 1904; Villa Morra, December 21, 30, 1904; in the Königliche Zoologische Museum, Berlin, show that this species varies in length to 8 mm. and in color, the mesopleuræ being entirely black below the furrow in one case and the abdomen black or blackish all over in another, the third dorsal segment is uniformly convex in some cases while in others there is a slight elevation of the tegument at the base in the middle.

In the punctured apical half of the third segment this species approaches *Bathyanulax* Szepligeti, as originally described. In the suggestion of a basal area on the third segment it indicates a transition to *Digonogastra* Viereck. It may be that the males of this species are typical *Digonogastra* Viereck, this proving to be the case *Digonogastra* Viereck will have to be reduced to at most subgeneric rank.

This species may be the same as *Bracon semifasciatus* Brullé, from which it can be distinguished at least by the reddish and black mesonotum and the shorter ovipositor.

ERISTERNAULAX, new genus.

Type.—*Eristernaulax leucotænia*, new species.

Related to *Allotypus* Foerster, but tangibly differs in the mesepisternum being provided near its lower edge with an oblique foveolate groove extending almost all the way from the anterior to the posterior edge of the mesopleuræ, in the notauli which are prominent

anteriorly, meeting as faint impressions in a shallow pit about two-thirds the distance from the anterior edge of the mesonotum; mesepisternum with a clearly defined intumescence in the upper anterior angle, this apparent intumescence being really due to an arcuate impression of the mesepisternum which forms the boundary between the anterior superior and posterior inferior portions of the mesepisternum; labrum conspicuous, the mandibles when flexed not meeting the edge of the clypeus.

ERISTERNAULAX LEUCOTENIA, new species.

Type-locality.—San Bernardino, Paraguay, June 9, K. Fiebrig S. V.

Type.—Königliche Zoologische Museum, Berlin.

Female.—Length, 2 mm.; black and polished; face indistinctly punctured, clypeus castaneous, mandibles stramineous with dark tips, malar line a little shorter than the mandibles are wide at base, scape and pedicel stramineous, flagel 31-jointed, all joints at least nearly three times as long as thick and dark brown excepting the sixteenth to nineteenth joints, inclusive, which are whitish; occipital carina interrupted above, the space between the upper ends of the carinae approximately at least twice as wide as the distance between the lateral ocelli, ocelli nearly equidistant, the lateral ocelli distinctly nearer to each other than to the nearest point on the eye margin; pronotal furrow interrupted medially, laterally foveolate, tegulae, wing base, and legs, including the coxae stramineous, except the hind tarsi which are dark, wings with a brownish tinge, costa dark brown, stigma and veins brownish stramineous; propodeum with a median longitudinal carina, longitudinal carinae wanting between the basal transverse carina and the base of the propodeum, lateral longitudinal carinae virtually complete, basal and apical transverse carinae present, petiolarea with a transverse carina; metapleuræ wrinkled; first dorsal segment narrower at base than at apex, a little longer than wide at apex, longitudinally striate, brownish stramineous, second segment stramineous, abdomen stramineous apically and ventrally; ovipositor hardly longer than the apical truncature of the abdomen.

Paratopotype.—June 7, K. Fiebrig S. V.

Genus EUPHORIDEA Ashmead.

Euphoridea ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 116.

Type.—*Euphoridea claripennis* Ashmead, not described.

This is an undoubted *Ancylocentrus* Foerster, the type of which is regarded by Marshall as a synonym of the genotype of (*Leiophron*, Authors not Nees, Haliday¹) = *Ancylocentrus* Foerster.²

¹ The first species to be included under *Leiophron* Nees is conspecific with the genotype of *Pygostolis* Haliday which latter thus becomes a synonym of the former.

² In Foerster's classification (Verh. natur. Ver. preuss. Rheinland, vol. 19, 1862, p. 264), line 3 from the bottom of the page, should read *nicht gespalten* and the last line *gespalten*.

(EUPHORIDEA) ANCYLOCENTRUS CLARIPENNIS (Ashmead).

Type-locality.—Agr. College, Michigan.

Type.—Cat. No. 13073, U.S.N.M.

Female.—Length, 1.75 mm.; related to *Ancylocentrus ater* Nees, Marshall, from which it differs as follows: Antennæ 23-jointed, scape, pedicel, and first joint of the flagel as well as the mouth and the legs rather stramineous; valves of the ovipositor blackish.

ICHNEUTIDEA SECUNDA Rohwer.

=*Proteropoides herzogi* VIERECK.

Proteropoides herzogi Viereck was based upon an abnormal specimen of *Ichneutidea secunda* Rohwer.

MACRONEURA RUFOBALTEATA, new species.

Type-locality.—S. Bernardino, Paraguay, December 19, K. Fiebrig.

Type.—Cat. No. 16216, U.S.N.M.

Female.—Length 17 mm.; apparently related to *Bracon interruptus* Brullé, from the original description of which it differs as follows: Mandibles mostly black or blackish, palpi translucent brownish; prosternum with black maculations, otherwise the thorax is reddish like the propodeum; pale portions of the legs reddish, fore wings blackish with the second fifth mostly yellowish like the fourth fifth, stigma yellowish except for the blackish base, hind wings blackish, the basal sixth yellowish, the third sixth rather hyaline; abdomen reddish throughout, but of a darker hue than the thorax; ovipositor 67 mm. long.

Allotype.—Essentially as in the type.

Allotype-locality.—Asuncion, Paraguay, Villa Morra, January 26, 1906, J. D. Anisits.

Allotype.—Königliche Zoologische Museum, Berlin. Male paratypes in the Berlin Museum have the hind coxæ and proximal trochanters more or less black or blackish.

MACRONEUROIDES, new genus.

Type.—*Macroneuroides erythropleura*, new species.

Closely resembles *Macroneura* Szepligeti from which it may be known by the abdomen which is simple and lanceolate as in *Oya-nopteridea* Viereck and in the "cubical" head, the temples as seen from the side being at least as wide as the shortest diameter of the eyes and extending laterally almost as far as the outside line of the eyes.

MACRONEUROIDES ERYTHROPLEURA, new species.

Type-locality.—S. Bernardino, Paraguay, caught flying, December 18 and 29, K. Fiebrig.

Type.—Cat. No. 16217, U.S.N.M.

Female.—Length 18.5 mm.; black and polished; face more or less sculptured; anterior edge of the clypeus nearly reflexed, mandibles reddish near the base of the inner margin; scape nearly three times as long as thick in the middle, almost cylindrical and expanded at the apex, somewhat as in *Atanycolus* Foerster, flagel over 50-jointed, its first joint nearly twice as long as the second, a tangible line of demarkation between the vertex and the face; mesonotum reddish black laterally, mesopleuræ below the furrow between the anterior superior region and the rest of the segment, or episternauli and the mesosternum reddish, scutel more or less reddish posteriorly, wings fuscous with blackish veins and mostly testaceous stigma, radial cell near its base with a yellowish band between the stigma and the radius, the same band extending a little below the radius into the second cubital cell, third discoidal cell with a hyaline area in the anterior superior corner; first dorsal segment nearly one and one-half times as long down the middle as wide at apex and reddish laterally and basally, second and third segments somewhat reddish at base and with an oblique furrow on each side, the dorsum of the abdomen smooth and polished, hypopygium a little longer than the pygidium; exserted portion of the ovipositor 48 mm. long.

A paratype hails from Sapucay, Paraguay, January 23, 1900, W. F. Foster.

One paratopotype is only 15 mm. long with a correspondingly shorter ovipositor. Paratypes in the Königliche Zoologische Museum, Berlin, are from Asuncion, Paraguay—Sapucay, December, 1904; January 12, 1905, and Villa Morra, December 6, 1905, J. D. Anisits.

One of the paratypes from Sapucay collected by Mr. J. D. Anisits has the second and third segments partly translucent testaceous.

METEORUS MAMESTRÆ, new species.

Type-locality.—Rocky Ford, Colorado, bred from *Mamestra trifolii*, July 11, 1912, H. O. Marsh.

Type and allotopotype.—Cat. No. 16218, U.S.N.M.

Female.—Length 3.5 mm.; this species agrees with *M. vulgaris* Cresson in the absence of fossæ on the first dorsal abdominal segment, in having the greatest diameter of the lateral ocelli distinctly shorter than the space between them and the eye margin and in having the postpetiole striate, but differs chiefly in having the postpetiole more distinctly striate, in the almost uniformly stramineous color of the body, in the dark stramineous head and in the dorsulum and dorsum

of the abdomen being very pale stramineous as compared with the rest of the body, except that the abdomen is darkened beyond the third segment.

Allotopotype.—Essentially as in the type, with data the same as in the type. This species may prove to be a variety of *M. vulgaris* Cresson.

Two male paratopotypes bearing the same data as the type and allotopotype agree with *M. vulgaris* Cresson in color but differ therefrom in that the sculpture is as in the type.

PHANEROTOMA STRAMINEA, new species.

Type-locality.—Igaripe, Brazil.

Type.—Cat. No. 16219, U.S.N.M.

Female.—Length 3.5 mm.; mostly stramineous, sculptured and shining; flagel 21-jointed; closely related to *Phanerotoma humeralis* Ashmead from which it may be known by the nervulus being very oblique, not at all parallel to the second abscissa of the discoidal vein, and forming an angle of approximately 30° with the first abscissa of the discoidal vein and by the uniformly stramineous dorsulum and scutel. Paratypes are from San Bernadino, Paraguay, March 4, April 12, and June 23, K. Fiebrig and in the Königlische Zoologische Museum, Berlin.

PHANEROTOMELLA ALBISCAPA (Ashmead).

—*Phanerotoma albiscapa* ASHMEAD.

APANTELES (PROTAPANTELES) IGLESIASI, new species.

Type-locality.—Sao Paulo, Brazil, Instituto de Butantan, No. 1, F. Iglesias.

Type.—Cat. No. 16220, U.S.N.M.

Female.—Length 2.5 mm.; agrees with the original description of *A. (P.) creatonoti* Viereck except as follows: Scape and pedicel stramineous at least in front, all veins more or less brownish, hind tibiae uniformly stramineous with a brownish tinge, propodeum almost entirely smooth and polished; first dorsal plate distinctly but not much wider at base than at apex, entirely pale stramineous as is the rest of the first abdominal segment, second plate fused with the rigid, usually membranous, sides of the second segment except on the basal half where it is defined by furrows, the basal lateral corners of the second dorsal segment stramineous as are the lateral margin of the same segment and the basal, lateral angles of the third dorsal segment, the first dorsal plate one-third or less than one-third as wide at apex as the second plate is wide at its apex, the second dorsal segment, except as noted above, entirely black or blackish, the third dorsal segment longer than the second but not half again as long and black except as noted above, pygidium stramineous, sides of the

abdomen partly brownish or castaneous, venter excepting the first segment mostly black. Named in honor of Mr. Francisco Iglesias.

PANTELES (PROTAPANTELES) CACECIE Riley.

—*Pseudapanteles galladiploppi* ASHMEAD, Smith's Ins. New Jersey (1899), 1900.

TRACHAGATHIS, new genus.

Type.—*Trachagathis taeniogaster*, new species.

Related to *Agathis* Latreille; front not deeply excavated on each side, with a carina between the eye and the lateral ocellus but touching neither the one nor the other, anterior ocellus not set in a median boss; mesopleural furrow extending from just in front of the mid coxæ to near the center of the mesopleuræ, notauli distinctly meeting near the beginning of the posterior fourth of the mesonotum, median vein in the fore wings almost completely obliterated, second submarginal cell punctiform, the petiole of the same distinctly longer than the first abscissa of the radius; propodeum exareolate; first dorsal segment nearly four times as long as wide at base. Otherwise essentially as in the genotype of *Agathis* Latreille.

TRACHAGATHIS TÆNIOGASTER, new species.

Type-locality.—San Bernardino, Paraguay, April 9, K. Fiebrig.

Type.—Königliche Zoologische Museum, Berlin.

Female.—Length 4.5 mm.; black and shining, head virtually sculptureless, a little wider than long, maxillary palpi with the first and second joints blackish, the remaining joints stramineous, labrum brownish, its anterior margin rather stramineous, flagel 34-jointed, blackish, the joints longer than thick, scape black and shining, pedicel brownish; mesonotum indistinctly pitted, mesopleuræ sculptured somewhat like the mesonotum except back of the furrow where the tegument is granular like the metapleuræ and hind coxæ, scutal roughened, tegulæ, veins and stigma blackish, membrane with a brownish tinge, all coxæ and trochanters and rest of hind legs mostly black or blackish, fore tibiæ and femora mostly stramineous, mid femora and tibiæ brownish and stramineous, tarsi infuscated; first, dorsal segment granular, second segment less granular than the first and with its basal two-thirds as well as its depressed lateral margin stramineous, the third, dorsal segment less granular than the second, the remaining dorsal segments apparently sculptureless and polished; exerted portion of the ovipositor nearly as long as the body.

ZADIOLOGASTER, new genus.

Type.—*Zadiologaster anomus*, new species.

Head a little wider in front than long; thorax thicker dorso-ventrally than at its widest from side to side.

Agrees with Ashmead's description of *Diolcogaster* Ashmead. The genotype of the latter genus agrees best with the description of *Photomicroplitis* Ashmead as given in the original. The latter genus may prove to be the same as *Diolcogaster* Ashmead.

ZADIOLCOGASTER ANOMUS, new species.

Type-locality.—Asuncion, Paraguay.

Type.—Königliche Zoologische Museum, Berlin.

Female.—Length 3.5 mm.; stramineous and shining; scape and pedicel mostly stramineous, flagel 16-jointed, dark brown to blackish, all joints at least a little longer than twice as thick and, excepting the apical joint, constricted medially, making the flagel appear 31-jointed, face separated from the malar space by a faint impressed line, ocelli more or less set off by dark marks on the adjoining tegument; mesonotum punctured, the punctures two or three puncture widths apart, scutel with its punctures much more separated than those on the mesonotum, tegulæ and wing base concolorous with the body, wings with a brownish tinge, the membrane beyond the veins darker than the rest, veins blackish like the stigma, areolet in the form of an obtuse angled triangle, the longest side bounding the areolet as long as the petiole, the two combined as long as the radius, claws dark, hind tibiæ with dark tips, hind tarsi dark brown; propodeum virtually sculptureless; first plate parallel sided or nearly so, longitudinally furrowed, nearly three times as long down the middle as wide at base and poorly sculptured in part, apparently mostly smooth, second dorsal segment smooth and polished, with an oblique furrow on each side of the basal half, hypopygium longer than the pygidium; ovipositor exerted, the sheaths blackish, shorter than the hind metatarsi.

Allotopotype.—Essentially as in the type. Cocoon 5 by 1.5 mm., snow white and covered with loose silk.

The types and paratopotypes are labeled No. 59; 18, 14/xi, '05 and 19, 14/xi, '05, J. D. Anisits.

Genus ZELOMORPHA Ashmead.

Zelomorpha ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 129.

Type.—*Zelomorpha arizonensis* Ashmead, not described.

Related to *Disophrys* Foerster from the genotype of which it differs, especially in the shorter malar space, which is distinctly less than half as long as the eye, in the flattened mandibles, which are modified to slide over each other like the blades of a pair of scissors, by the rostrum which hardly extends farther beyond the labrum than the latter is long, by the face which is poorly produced between the antennæ, by the antennal carinæ hardly surpassing the scrobes, by the absence of a branch to the second transverse cubitus and by the second dorsal, abdominal segment being distinctly longer than wide.

ZELOMORPHA ARIZONENSIS Ashmead.

Type-locality.—Arizona.

Type.—Cat. No. 16221, U.S.N.M.

Female.—Length 8.5 mm.; head, thorax, and propodeum reddish; lateral ocelli oval, distinctly nearer to the eye margin than to each other, the distance between them and the nearest eye margin shorter than the shortest diameter of the same ocelli, flagel more than 23-jointed, with all the joints to the twenty-third inclusive distinctly longer than thick, with appressed pubescence and almost equidistant, almost erect, isolated setæ, antennæ brownish throughout, mouth parts mostly pale brown, mandibles rather stramineous, castaneous beyond the middle except for the blackish tips, space between ocelli dark brownish; tegulæ and wing base brownish, fore and mid coxæ rather stramineous with a brownish tinge, rest of fore and mid legs mostly brownish, hind legs with their coxæ, trochanters and femora reddish, their tibiæ reddish brown except for the brownish base and apex, their tarsi dark brown; wings transparent with a brownish tinge; the stigma and veins brownish; second transverse cubitus angulate at or a little below the middle; propodeum with ten areæ the areola forming an acute angled triangle, the petiolarea forming a hexagon twice as long as its greatest width; first, dorsal segment blackish, smooth and shining, at least one and one-half times as long as wide at apex and nearly three times as wide at apex as at base; first to third inclusive and most of fourth, dorsal segments black or blackish, rest of abdomen rather reddish stramineous, second segment parallel sided, somewhat longer than wide and not impressed laterally; hypopygium a little shorter than the pygidium, the sheaths brownish with stramineous tips and apparently a little shorter than the second segment is wide, ovipositor brownish stramineous and curved downward. A paratopotype in the collection of the American Entomological Society has the flagel 41-jointed and the first, dorsal segment rather reddish. In four paratypes from Laredo, Texas, May 27, the dorsum of the abdomen is usually mostly reddish and in one specimen the thorax is partly asymmetrically blackish.

The above descriptions are the result of a comparison of a specimen of the genotype of *Disophrys* Foerster from Blankenburg, Germany, with the material noted above. In other important particulars the two species agree.

Family ICHNEUMONIDÆ.

AGLAJOPPIDEA, new genus.

Type.—(*Trogus*) *Aglaojoppidea fascipennis* (Cresson).

Judging from descriptions this is related to *Aglaojoppa* Cameron, from the original description of which it differs in the female in the propodeum being exareolate except for the basal transverse carina

which is almost complete and the median longitudinal carinæ which extend from near the basal transverse carina all the way to the apex, in the apex of the hind femora reaching apparently a little beyond the apex of the fourth, dorsal segment and in the apical, dorsal segment being only half as long as the penultimate segment, and in the male in the pygidium being distinctly less than half as long as the penultimate segment. In the male there is no fold to the ventral segments.

AGLAJOPOPIDÆA PICTIPENNIS, new species.

Type-locality.—Villa Morra, Asuncion, Paraguay, March 20, 1905, J. D. Anisits.

Type.—Königliche Zoologische Museum, Berlin.

Female.—Length 13.5 mm.; essentially as in (*Trogus*) *Aglaojoppidea fascipennis* (Cresson) from which it may be known by its concolorous abdomen.

Allotype-locality.—San Bernardino, Paraguay; K. Fiebrig, collector.

Allotype.—No. 16222, U.S.N.M. Essentially as in the type.

CRYPTANURIDIMORPHA, new genus.

Type.—*Cryptanuridimorpha elegans*, new species.

Carina bordering the posterior cavity of the mouth highly developed and meeting to form a tubular cavity, front with a solitary spine; notauli deep, areolet closed, recurrent vein interstitial; spiracles of the first, abdominal segment nearer to each other than to the apex. Related to *Polycyrtus* Spinola.

CRYPTANURIDIMORPHA ELEGANS, new species.

Type-locality.—Chauchamayo, Peru; W. F. H. Rosenberg.

Type.—Cat. No. 16223, U.S.N.M.

Male.—Length 17.5 mm.; reddish brown and polished; clypeus and mandibles yellowish, the latter black at tips, rest of head mostly black excepting the palpi and the tubular portion of the mouth which are stramineous and the eleventh to fifteenth joints of the flagel, which are whitish beneath; the following joints are broken off in the type and lost; fore legs brownish stramineous, the second and following joints of their tarsi blackish, mid legs almost concolorous with the body, their tarsi blackish, hind legs concolorous with the body, except their femora, tibiæ and basal three-fourths of their metatarsi which like the apical two-thirds of the onychii are black or blackish, the rest of the hind tarsi whitish, wings tinged with brown, the stigma and veins dark brown to blackish; propodeal spines directed upward, outward and backward and blunt; first abdominal segment mostly reddish brown, the postpetiole, however, black, the following dorsal

segments black and shaggy with coarse whitish hairs, the ventral segments stramineous and shaggy in much the same way as the dorsal segments.

CRYPTOPHION, new genus.

Type.—*Cryptophion strandi*, new species.

Clypeus with a transverse carina, not at all separated from the face, malar line nearly as long as the mandibles are wide at base, occiput not extending above the hind edge of the eye as seen from the side, hind ocelli apparently a little nearer to each other than to the occipital carina, eyes subemarginate, almost parallel, slightly converging below; presternum produced into a shelflike process supporting the head, anterior coxæ almost cubical, epicnemium not furcate, notauli wanting, scutellum laterally carinate nearly to the middle; hind legs decidedly longer than the mid or fore legs, their coxæ pyriform, their tibiae nearly twice as long as their metatarsi, longer spur fully two-thirds as long as their metatarsi, third tarsal joint about two-thirds the length of the second, fourth about two-thirds the length of the third, fifth distinctly though not much longer than the fourth, their claws angulate at base, nervulus almost interstitial, recurrent vein interstitial with the second transverse cubitus, areolet petiolate, forming an equilateral triangle, nervellus postfurcal, not broken; propodeum channeled, biangulate, its spiracles approximately three times as long as wide at the middle of the upper third; abdomen depressed to the end of the second segment, compressed beyond, apex of abdomen truncate, ovipositor almost as long as the truncature.

This is a transition genus between Cryptinæ and Ophioninæ. Sternauli complete, undulate and foveolate as in some Cryptinæ; propodeum at most not attaining the end of the basal third of the hind coxæ; first abdominal segment geniculate, its spiracles nearer to the apex than to each other, petiole depressed, wider than thick dorso-ventrally. Habitus as in Campoplegini. This genus probably will eventually represent a new tribe.

CRYPTOPHION STRANDI, new species.

Type-locality.—Asuncion, Paraguay, Villa Morra, November 9, 1905, J. D. Anisits.

Type.—Königliche Zoologische Museum, Berlin.

Female.—Length 6.5 mm.; black, shining, covered with pale golden pubescence, mostly rugoso-punctate, rugose or reticulate; antennæ brownish, mandibles yellowish with reddish brown tips, palpi stramineous; shelf-like process of the presternum stramineous, fore and mid legs lemon yellow excepting their onychii which are brownish and the pectinate claws and empodii which are blackish, the collar-like flange of the pronotum stramineous, tegulae and wing bases yellowish, wings

brownish, scutellum with a U-shaped border of radiating hairs, hind coxæ black, brownish, and yellowish, hind femora and hind tibiae reddish brown, the latter brownish at base and apex with brownish spurs, hind tarsi yellowish excepting their appendages which are blackish; propodeum virtually crowded out by the transverse oblong areola, petiolarea excavated and occupying the greater portion of the apical five-sixths of the propodeum, propodeal protuberances laminate and directed outward, backward, and downward; abdomen reddish and yellowish and more or less covered with blackish stains, first, dorsal segment mostly stramineous, its spiracles nearer to the apex than to each other.

CRYPTOPTERIGIMORPHA, new genus.

Type.—*Cryptopterigimorpha tubulifera*, new species.

Related to *Cryptanuridimorpha* Viereck with the original description of which it agrees except in the recurrent vein, which is not interstitial.

In a more rational classification of the Ichneumonidae than is now popular these two genera will represent at least a new tribe because of the unusual conformation of the oral cavity.

CRYPTOPTERIGIMORPHA TUBULIFERA, new species.

Type-locality.—Piches and Perene Vs, Peru Soc. Geog. de Lima; altitude 2,000–3,000 feet.

Type.—Cat. No. 16224, U.S.N.M.

Female.—Length 14 mm.; brownish stramineous and shining; head and antennæ mostly black, palpi stramineous, mandibles yellow with blackish tips, clypeus partly brown, part of the third, all of the fourth to the tenth joints, inclusive, and most of the eleventh joint of the flagel whitish, the fifteenth and many of the following joints of the flagel faceted above, the malar space shagreened or granular while the rest of the head is rather polished and punctured; prothorax, mesonotum and the anterior edge of the mesopleuræ mostly black or blackish, fore and mid legs paler than the body and the hind legs, their tibiae rather sinuate, their second tarsal joint at the tip and the following tarsal joints entirely blackish, hind tarsi whitish, their claws dark brown, wings tinged with brown, their veins dark; propodeum exceedingly as in *Cryptopteryx* Ashmead, the spines rather truncate at the tip; sheaths of the ovipositor nearly half as long as the abdomen.

DIAGLYPTIDEA, new genus.

Type.—*Diaglyptidea roepkei*, new species.

Agrees with the original description of *Diaglypta* Foerster. *Diaglypta* (Foerster) Ashmead does not agree with the original description of *Diaglypta* Foerster, and is related to *Allocota* (Foerster) Ashmead.

DIAGLYPTIDEA ROEPKEL, new species.

Type-locality.—Salatiga, Java, labeled, "Ex. *Zuratha oramerella*, W. Roepke."

Type.—Cat. No. 15340, U.S.N.M.

Female.—Length, 4 mm.; face as seen from in front with the proportion of its greatest width to the length from the top of the head to the anterior edge of the clypeus as 37:25, lateral ocelli apparently a little nearer to the anterior ocellus than to each other, but apparently a little nearer to each other than to the eye margin, head black, front polished laterally, sculptured medially, face finely sculptured, clypeus punctured, its anterior edge virtually straight, cheeks, temples, and malar space polished, mouth parts, including the mandibles and palpi, various shades of pale stramineous, the mandibles with castaneous tips, maxillary palpi distinctly longer than the head is wide in front, the third joint longest and apparently as long as the first flagellar joint, which latter is apparently ten times as long as wide at base, scape and pedicel pale stramineous, almost whitish like the palpi, flagel 29-jointed and blackish brown except for the first and second joints, which are brownish stramineous except for the second joint, which is apically concolorous with the rest of the flagel; thorax and its appendages, except as noted below, stramineous, dorsulum and scutel finely sculptured and dullish; claws and empodii brownish, mid and hind onychii blackish or brownish but stramineous at base, wings almost colorless but with a faint brownish tinge, the costa dark, the stigma and veins stramineous, nervellus broken a little below the middle, areolet unusual in outline for this tribe, in that it forms an oblong with the upper side undeveloped; propodeum stramineous except for the first pleural area and the basal area, which are black, areola partly brownish, propodeum sculptured and shining; abdomen stramineous except for blackish marks on the first, dorsal segment and a black pigmentation extending from the apical third of the second segment down the middle of the dorsum almost to the end of the fifth, dorsal segment without a break except for the stramineous edges of the segments involved, first, dorsal segment longitudinally striate except along the apical margin, second, dorsal segment more or less longitudinally striate, thyridia shining, the space between them narrower than the greatest length of either of the thyridia, the remaining dorsal segments polished, exserted portion of the ovipositor a little longer than the first, dorsal, abdominal segment.

Allotype.—Differs from the type especially in the first joint of the flagel, which is apparently seven times as long as wide at base, in the 25-jointed flagel, which has the first joint apically and the second joint entirely concolorous with the rest of the flagel, in the thorax which is black with mostly pale appendages barring all the tarsi and

the hind tibiæ which are brownish, in the wings, which are distinctly tinged with brown and have a black stigma and dark-brown veins, in the black propodeum, and in the abdomen, which is black except for the lateral margin and the apical margin laterally on the second segment as well as some of the margins of the ventral segments, all of which are more or less stramineous. A series of paratopotypes of both sexes indicate that this is a constant species.

Named in honor of Dr. W. Roepke.

DIGONOCRYPTUS, new genus.

Type.—*Digonocryptus bidens*, new species.

Related to *Hoplocryptus* Thomson, from which it differs in the clypeus having a transverse elevation that is emarginate medially, in the anterior edge of the clypeus being bidenticulate, in the interstitial nervulus, in the parallel sided areola, in wanting an apical transverse carina on the propodeum except for a bare indication in the form of an elevation of the tegument on each side and by the virtually non-carinate first segment.

DIGONOCRYPTUS BIDENS, new species.

Type-locality.—Villa Morra, Asuncion, Paraguay, April 10, 1905, J. D. Anisits.

Type.—Königliche Zoologische Museum, Berlin.

Female.—Length, 11 mm.; black and shining; head, thorax, and their appendages colored in much the same way as in the genotype of *Monogonocryptus* Viereck, except that the basal half of the mandibles, which is mostly yellowish, the mesopleuræ, which are yellowish except along the edges and along the sternaui, in the mesosternum, which is brownish with a yellowish mark posteriorly, in the propleuræ, which are yellow laterally and posteriorly, in the fore and mid femora, which are yellow above and stramineous at the base, in the hind legs, the coxæ, trochanters, and base of femora of which are brownish except for the yellowish white superior face of the coxæ, their femora mostly black, their tibiæ and tarsi yellow except the claws and empodii, which are brown and in the metapleuræ and sides of the metanotum, which are mostly yellow; propodeum with its confluent basal area almost polished with a yellow area on each side near the spiracles and at the base in the middle, rest of the propodeum striate with a yellow border on each side and a yellow band down the middle, the apical transverse carina angularly produced on each side; dorsal abdominal segments with a yellow border laterally and apically excepting the apical segment, which is bordered with yellow only laterally, venter yellowish excepting the second and third segments, which are more or less brownish, sheaths of the ovipositor apparently as long as the first and second, abdominal segments combined.

EPIOPELMIDEA, new genus.

Type.—*Epiopelmidea erythrogastra*, new species.

Related to *Hepiopelmus* Wesmael from which it differs especially in the Joppa-like head, in the slenderer teeth, of the mandibles, in the apical joint of the hind tarsi not being distinctly longer than the third but almost exactly as long as the same, in the virtual absence of the apical, propodeal carina, in the absence of a juxtacoxal area and in the longer hypopygium which almost extends as far as the pygidium. Habitus as in *Patroclus* Cresson.

EPIOPELMIDEA ERYTHROGASTRA, new species.

Type-locality.—Villa Morra, Asuncion, Paraguay, October 1, 1905, December 19, 1904, J. D. Anisits.

Type.—Königliche Zoologische Museum, Berlin.

Female.—Length, 12.5 mm.; black, shining and punctured; orbits excepting the malar space, basal half of mandibles, lateral edge of clypeus and more or less of the sixth to thirteenth joints of the flagel yellowish, almost all of the pale joints of the flagel blackish at apex beneath, labial palpi blackish, maxillary palpi stramineous; pronotum with a yellow margin along its upper and lower edges, propodeum with a submarginal yellowish stripe, fore and mid legs with their coxæ and proximal trochanters mostly yellow and stramineous, rest of these legs stramineous except the third to fifth tarsal joints which are mostly blackish, tegulæ and wing bases more or less, a longitudinal stripe on each side of the mesonotum, disk of scutellum and postscutellum, intumescence beneath the forewings and back of the mesopleuræ and two almost confluent large marks on the mesopleuræ yellow, wings brownish with blackish veins and a stramineous stigma, metapleuræ mostly yellow, hind legs reddish stramineous, except for a large yellow mark on their coxæ above, their tibiae and metatarsi which are mostly stramineous and the rest of their tarsi which are blackish; abdomen reddish except for the yellow apical half of the postpetiole, ovipositor hardly exerted.

JOPPOCRYPTUS, new genus.

Type.—*Joppocryptus egregius*, new species.

This is a Cryptine, with a Joppine habitus, that differs from *Cryptopteryx* Ashmead, to which it bears some resemblance, especially as follows: Cheeks much wider near the mandibles than opposite the middle of the eyes, clypeus planate, its anterior margin truncate, mandibles falcate, deeply cleft, the outer tooth distinctly longer than the inner tooth, occipital carina joining the carina bordering the

mouth where the latter meets the hind edge of the base of the mandibles, face somewhat impressed between the scrobes, the impression bordered by a more or less well developed carina, antennæ spindle shaped in outline, flattened on one side beyond the middle; notauli represented by rugæ, scutal carinate laterally almost to the apex; propodeum with median and lateral, longitudinal carinæ, well separated from the metapleuræ by a carina, spiracular area and second pleural area confluent, area dentipara and the third lateral area confluent, petiolarea nearly three times as long as the areola, juxtacoxal area outlined; spiracles of first abdominal segment nearer to the apex than to each other, second segment with yellowish gastrocoelæ that are about as far from each other as from the base of the segment, thyridia present on the second segment.

In view of the evident confluence of characters found in the Ichneumoninæ with characters found in the Cryptinæ that is shown by this genus it may become necessary to assign it to a new tribe in the Cryptinæ.

JOPPOCRYPTUS EGREGIUS, new species.

Type-locality.—Villa Morra, Asuncion, Paraguay, February 12, 1905.

Type.—Königliche Zoologische Museum, Berlin.

Female.—Length, 9 mm.; brownish stramineous and shining; head black except as follows: Beveled area of the face below the scrobes and the portion of the face adjoining the clypeus brownish to brownish stramineous, clypeus, malar space and lower end of cheeks stramineous, mandibles yellowish except for the blackish tooth and tips, palpi stramineous, joints of the flagel with the apical half of the eighth, the ninth to thirteenth, inclusive, entirely or almost entirely and the fourteenth to seventeenth inclusive, beneath, yellowish white, front with a yellowish margin bordering each eye; hind femora blackish, hind tarsi yellowish except for the onychii which like the onychii of the other legs are more or less blackish, rest of tarsi and all the tibiæ paler than the thorax, rather stramineous, wings transparent with a brownish tinge, stigma stramineous, veins blackish; propodeal spines prominent, the propodeum reticulately sculptured; abdomen mostly sericeous and rather punctately sculptured, its petiole brownish translucent except for the black tip, postpetiole smooth and polished except for its apical corners which are punctured and black except for an apical stramineous edge, thyridia stramineous, third to seventh segments inclusive, with an apical yellow edge, second and third ventral segments yellowish, ovipositor longer than the first, abdominal segment, exserted portion of the sheaths of the ovipositor nearly as long as the fourth, dorsal, abdominal segment.

LAMPROCRYPTIDEA, new genus.

Type.—*Lamprocryptidea magnifica*, new species.

Agrees with the original description of *Lamprocryptus* Schmiedeknecht except in the absence of notauli, in the scutal lacking sharp keels, in the apical propodeal carina being represented by two blunt, truncated processes, in the propodeal spiracles being oval, in the open areolet with the outer side wanting, in the longer tibial spurs being at least half as long as the hind metatarsi, and in the ovipositor being hardly one-third the length of the abdomen. Hind coxæ not cylindrical nor nearly as long as the first segment of the abdomen; spiracles of the first abdominal segment nearer to each other than to the apex; front raised into a carinate swelling close to the junction of the front with the eyes. Regarded as a Mesostenine this genus would be allied to *Crypturopsis* Ashmead.

LAMPROCRYPTIDEA MAGNIFICA, new species.

Type-locality.—Asuncion, Paraguay, Villa Morra, February 12, 1905, J. D. Anisits.

Type.—Königliche Zoologische Museum, Berlin.

Female.—Length, 15 mm.; black, rather dull, mostly shagreened; palpi stramineous, fifth to eleventh joints, inclusive, of the flagel entirely or mostly whitish on the upper side, head mostly punctured or rugose; wings transparent, brownish with blackish veins, fore and mid legs, hind coxæ, and trochanters mostly reddish stramineous, excepting the onychii and their appendages which are mostly blackish; propodeum mostly reticulated, its processes brown, directed backward, outward, and slightly upward; petiole castaneous, the abdominal segments beyond the second with a sericeous bloom, the sixth dorsal segment luteous at its apex, the seventh dorsal segment with most of its upper aspect luteous, sheaths of the ovipositor approximately as long as the first abdominal segment.

MONOGONOCRYPTUS, new genus.

Type.—*Monogonocryptus diversicolor*, new species.

Appears to be related to *Caenocryptus* Thomson and certainly related to *Digonocryptus* Viereck, from which it differs in the anterior edge of the clypeus having but a single median tooth, in the transverse elevation not being interrupted in the middle by an emargination, in the nervulus uniting with the media before the basal vein, in the converging sides of the areola, in the presence of a complete apical transverse carina, and in the spiracles of the first segment being as near to or a little nearer to the apical edge as to each other.

MONOGONOCRYPTUS DIVERSICOLOR, new species.

Type-locality.—Villa Morra, Asuncion, Paraguay, November 19, 1905, J. D. Anisits.

Type.—Königliche Zoologische Museum, Berlin.

Female.—Length, 13 mm.; black and shining; an orbital margin, greater part of lower half of the cheeks, face, except where it joins the black granular malar space, clypeus except laterally and on its anterior beveled margin as well as the labrum yellow, seventh to thirteenth joints, inclusive, of the flagel mostly yellowish, mandibles blackish brown throughout, palpi whitish, the apical joint of the maxillary palpi brownish; pronotum with its anterior and superior margins mostly yellow, wing bases, disk of the scutel and postscutel, and the swollen superior margin of the mesopleuræ yellow, the tegulæ rather whitish, wings almost colorless except for a brownish tinge and blackish stigma and veins, fore and mid legs with their coxæ and trochanters mostly yellowish white, their femora blackish with a yellow stripe above, apically, their tibiæ yellow, the fore tibiæ cylindrical, except for the rather constricted, tapering base, the cylindrical portion apparently four times as long as thick, their tarsi brownish to black, hind legs reddish excepting the tibiæ and tarsi which are yellow barring the apical edge of the fourth joint which is brownish, and the onychii and their appendages which are black; propodeum with the confluent basal areæ almost bare excepting the spiracular area which is rather sericeous like most of the rest of the propodeum which latter is mostly dullish rugose or rugulose; petiole apically and the postpetiole basally black, elsewhere the first dorsal segment is yellow, second dorsal segment black with the lateral margin and an apical border more or less yellow, third dorsal segment blackish at base, rest of the dorsal segments reddish, ventral plica yellowish, rest of venter mostly brownish stramineous, sheaths of the ovipositor apparently longer than the first abdominal segment.

Genus NONNUS Cresson.

This genus is more properly placed in the Campoplegini than in the Labenini and differs from *Zachresta* Foerster as represented by *Zachresta popofensis* Ashmead especially in the cheeks being less than half as wide as the eyes, in the eyes converging below though not to as marked a degree as in *Cymodusa* Holmgren, in the slitlike propodeal spiracles which extend to the metapleural carinæ, in the propodeum having only a basal and apical carina, in the hind coxæ being rather cylindrical and almost if not quite three times as long as thick at the thickest portion, in the sessile, pentagonal areolet, in the nervulus being as far beyond the basal vein as the former is long, in the third abscissa of the discoidal vein being as long as the second, in the nervellus being broken a little below the

junction of its middle with its basal third, and by the second dorsal segment being at least three or nearly three times as long down its middle as wide at apex. In *Zachresta* Foerster as represented by the above species the propodeum hardly extends beyond the insertion of the hind coxæ. *Ophionocryptus* Schmiedeknecht is manifestly synonymous with *Nonnus* Cresson.

PEZOMACHUS (PEZOMACHUS) APANTELICIDA, new species.

Type-locality.—Japan.

Type.—Cat. No. 13086, U.S.N.M.

Female.—Length 3 mm.; first joint of flagel longer than the second, three times as long as thick in the middle or a little longer, fifth joint of flagel twice as long as thick in the middle, flagel 16-jointed, the joints excepting the apical joint cylindrical, antennæ stramineous to brownish, head black, finely sculptured, impunctate, brown, blackish posteriorly and along the sutures; thorax finely sculptured, impunctate, brown, blackish posteriorly and along the sutures, legs excepting their tibiæ and femora pale stramineous, their femora stramineous, translucent, their tibiæ more or less infuscated except at base and in the middle where they are more or less pale stramineous; propodeum as long as or longer than the thorax as seen from above, propodeal carinæ reduced to a comma-like ridge on each side; first, dorsal, abdominal segment gradually broadened out from the base to the apex where it is nearly three times as wide as at the base, stramineous, translucent, infuscated basally, second, dorsal segment similar to the first in color, the succeeding dorsal segment black, abdomen impunctate and nearly shining to polished, more or less sculptured with an exceedingly fine reticulation, exerted portion of the ovipositor nearly as long as the first, abdominal segment.

Allotopotype.—Length somewhat greater than in the type; first joint of the flagel longer than the second, four times as long as thick in the middle, flagel 20-jointed; thorax mostly blackish, apterous, legs colored as in the female except that the hind tibiæ are darker; propodeum with its comma-like carinæ supplemented by a basal carina; first, dorsal, abdominal segment hardly twice as wide at apex as at base, longitudinally impressed, infuscated except for a broad apical band which is stramineous, second, dorsal segment similar to the first in its color scheme; otherwise essentially as in the type.

In the male paratopotypes there is a tendency toward the obliteration of the depression of the first, dorsal segment, toward dark brown, hind femora, darker hind tibiæ and a greater extent of yellowish on the first and second dorsal segments, than in the type. In the paratypes the size varies in either sex down to 2 mm. Seven female and four male paratypes were examined.

PHAENOLABRORYCHUS, new genus.

Type.—*Phaenolabrorychus anisitsi*, new species.

Related to *Labrorychus* Foerster, but differs greatly in the remarkably produced propodeum which has a smooth cylindrical process extending from the base of the hind coxæ almost to the apex of the proximal joint of the hind trochanters, by the propodeal spiracles being apparently concealed in a pit, by the furrowed scutal, by the hind ocelli almost adjoining the occipital carina, by the anterior edge of the clypeus which is rounded and provided with two nipple-like processes, by the presence of notauli, by the decidedly antifurcal nervulus, by the nervulus not being broken, by the hind metatarsi being nearly four times as long as the succeeding joint and by the second abdominal segment being approximately as long as the first. The above description is based upon a comparison with a male of *Labrorychus tenuicornis* Gravenhorst.

PHAENOLABRORYCHUS ANISITSI, new species.

Type-locality.—Villa Morra, Asuncion, Paraguay, June 20, 1905, J. D. Anisits.

Type.—Königliche Zoologische Museum, Berlin.

Female.—Length 16 mm.; reddish brown, sculptured and shining; head of a peculiar yellowish red color except the greater part of the front, vertex and occiput which are black, mandibles dark stramineous with blackish tips, scape yellowish brown, rest of antennæ dark brown to blackish, front punctured and with a poorly defined median longitudinal welt on each side of the middle; dorsulum, mesopleuræ and mesosternum mostly black, tegulæ yellowish, scutal yellowish-brown, fore and mid legs brownish stramineous, their empodii blackish, their claws brown, the latter toothed, hind legs mostly black or blackish, their coxæ and trochanters partly castaneous, their spurs brownish stramineous, wings brownish, almost colorless, with blackish veins; propodeum reticulated, its process brownish stramineous; first abdominal segment black, the remaining abdominal segments reddish brown, with a blackish tinge but not concolorous with the thorax and propodeum.

PHOTOCRYPTUS, new genus.

Type.—*Photocryptus photomorphus*, new species.

Related to *Cryptus* Fabricius from which it differs especially in the slender first, abdominal segment which has its spiracles nearer to each other than to the apex, but nearer to the apex than to the base and its petiole nearly cylindrical and not at all carinate, in the mesonoto-scutellar carinæ not reaching to the middle of the scutal, in the distance between the lateral ocelli being apparently a little less in the female

and a little greater in the male than the distance between them and the nearest point on the eye margin and in the nervellus being antefurcal.

PHOTOCRYPTUS PHOTOMORPHUS, new species.

Type-locality.—Sapucay, Asuncion, Paraguay, December, 1904, J. D. Anisits.

Type.—Königliche Zoologische Museum, Berlin.

Female.—Length 14 mm.; yellow and shining, front, except a border along the eyes and back of the ocelli, vertex and superior half of the occiput, superior aspect of the pedicel and the flagel mostly black, the latter brownish near its base beneath, mandibles with blackish tips, mesonotum with lateral, median and a posterior band black, scutel black posteriorly, mesosternum black except for a yellow band on each side, mesopleuræ with a black mark adjoining the prepectal carina and a black band near the superior margin, prepectus mostly black, wings including the stigma and the veins of the outer half yellowish stramineous, the remaining veins blackish, fore and mid legs almost entirely yellow, their onychii and the appendages of the latter more or less brownish, hind legs with yellow coxæ that are black at the base beneath and at the apex above, their proximal trochanter yellow beneath, black above, their distal trochanter mostly blackish, their femora mostly yellowish on the basal half and testaceous on the apical half, their tibiæ yellow or yellowish at base and above and beneath, elsewhere brownish, their tarsi mostly blackish, their metatarsi pale beneath, metapleuræ and mesopleuræ black along their contiguous edges; propodeum black in front of the basal transverse carina and with a blackish mark on each side and down the middle back of the basal transverse carina; first, abdominal segment with blackish sides and with most of the posterior fourth of the petiole and all but an apical margin of the postpetiole brownish, all but an apical margin and a narrow lateral margin of the second, dorsal segment brownish or black, the third, dorsal segment brownish and yellow at base, thence black with an apical yellow margin as in all except the apical segment, the remaining segments black with an apical yellow margin that occupies all or nearly all of the sides of the segment, apical dorsal segment black, ventral abdominal segments colored in much the same way as the dorsal segments, sheaths of the ovipositor somewhat longer than the abdomen.

PHOTOPTERA, new genus.

Type.—*Photoptera erythronota*, new species.

Related to *Paraphylax* (Foerster) Ashmead from which it differs especially in the well defined notauli and in the *Diaghyptidea*-like palpi.

PHOTOPTERA ERYTHRONOTA, new species.

Type-locality.—Salatiga, Java, labeled, "Ex. *Zaratha oramerella*," W. Roepke.

Type.—Cat. No. 15341, U.S.N.M.

Female.—Length 4 mm.; differs from the original description of *Diaglyptidea roepkei* Viereck as follows: Head larger but the ratio of dimensions virtually the same; front finely sculptured laterally, anterior edge of the clypeus slightly arcuate and with inequalities, the latter appearing somewhat like the teeth on the anterior edge of the clypeus in *Polytribax* (Foerster) Viereck, first joint of the flagel apparently eight times as long as thick at base, scape and pedicel stramineous, flagel 21-jointed, the first and second joints more or less brown; thorax reddish, tegulæ stramineous, fore and hind legs mostly stramineous with a blackish tinge, hind legs, in color, analagous to the fore and hind legs except in being darker and with blackish stains and in having the tibæ and metatarsi mostly black, the former with a whitish band at the base, wings maculated after the same pattern found in *Hemiteles areator* Panzer, with, in addition, the apical third of the hind wings blackish, the veins and stigma black, areolet with sides of equal length, scutel mostly polished, propodeum reddish except for blackish stains; abdomen black above except for an apical margin to the first, seventh, and eighth segments which is stramineous, the stramineous portion of the segments as well as an apical margin to the second and third, the apical half of the fourth and the remaining, dorsal segments all polished; elsewhere the dorsum of the abdomen is more or less striato-punctate, thyridia rudimentary and represented by small depressions.

Allotopotype.—Chiefly as in the type but with the anterior edge of the clypeus more as in *Polytribax* (Foerster) Viereck, the flagel 21-jointed, the front and vertex mostly polished as is the dorsulum and the propodeum; the thorax, propodeum and hind femora black; abdomen black above, smooth and mostly polished except for the stramineous apex of the first segment and the stramineous base of the second segment.

One female paratopotype is apparently only two-thirds as long as the type.

POLYAENIDEA, new genus.

Type.—*Polyaenidea pretiosa*, new species.

Regions of the mesonotum prominent, notauli deep and distinct; spiracles of the first, abdominal segment in the females as near or nearer to the apex than to each other, in the males nearer to each other than to the apex; front armed with two spines as in *Polyaenus* Cresson.

Related to *Polyaenus* Cresson.

POLYAENIDEA PRETIOSA, new species.

Type-locality.—Sapucay, Asuncion, Paraguay, December 2, 1904, J. D. Anisits.

Type.—Königliche Zoologische Museum, Berlin.

Female.—Length 12.5 mm.; black and shining; face and clypeus mostly, labrum entirely luteous, cheeks mostly luteous as is the front along the eye margins, palpi yellowish with the apical joints rather brownish, tip of fourth and most of fifth to thirteenth flagellar joints, inclusive, yellowish, head including the mandibles more or less punctured, region of the malar line rugulose or granular; pronotum on each side of its upper and lower edge with a yellowish area, the upper edge in addition with an angular production on each side from which there descends a carina, propleuræ yellow near the edge nearest the coxæ, the edge resting on the fore coxæ stramineous, prescutum and scapulæ punctured especially anteriorly, the former with a large yellow spot posteriorly, tegulæ luteous internally stramineous externally, wings with a brownish tinge, their veins mostly blackish, anterior edge of the axillæ yellow except near the disk of the scutel which latter as well as the posterior edge of the axillæ are yellow, disk of the post scutel and the posterior edge of the same yellow, pleuræ with most of the lower half and a spot on the upper edge yellow, mesosternum yellow except laterally and down the middle, a spot under the hind wings and most of the metapleuræ yellow, fore coxæ yellow in front, brownish stramineous behind, hind coxæ and rest of legs mostly brownish stramineous, fore and mid onychii blackish; propodeum with a yellow stripe on each side involving the propodeal spines which are directed outward, backward, and upward; abdomen reddish brown, sheaths of the ovipositor approximately 4 mm. long.

Allotype.—Essentially as in the type but with the ninth to thirteenth flagellar joints yellowish.

POLYCYRTIDEA, new genus.

Type.—*Polycyrtidea gracilis*, new species.

Occipital carina meeting the carina bordering the posterior cavity of the mouth, malar line approximately as long as the mandibles are wide at the base; propodeum with only a basal carina and without spines; first, abdominal segment almost cylindrical, apparently six times as long as wide at the apex.

Agrees with *Polycyrtus* Spinola in having a solitary spine on the front, in the deep notauli and in the spiracles of the first, abdominal segment being nearer to each other than to the apex but differs especially in the areolet being open.

POLYCYRTIDEA GRACILIS, new species.

Type-locality.—C. Laureles, Asuncion, Paraguay, Jan. 27, 1906, J. D. Anisits.

Type.—Königliche Zoologische Museum, Berlin.

Female.—Length 11 mm.; head mostly yellow, its front, vertex, and occiput mostly black, frontal spine rather blunt and black, scape brownish, yellow beneath, pedicel brownish with a yellow mark above, fifth to fourteenth flagellar joints testaceous, rest of the flagel dark brown to blackish, tips of the mandibles blackish, palpi yellowish; pronotum with its upper edge produced on each side into a blunt process, this same edge as well as the lower edge with a yellow border that is medially interrupted, tubercles yellow, fore coxæ and trochanters and the fore femora beneath yellow, rest of fore legs brownish stramineous except the onychii which are blackish, prescutum with a yellow spot on each side, scapulæ with a yellow border anteriorly and internally, mesopleuræ with four yellow spots, the uppermost two being united, tegulæ yellow with a stramineous outer edge, scutel and upper edge of axillæ mostly yellow as are the metapleuræ, elsewhere the thorax is mostly black, mid legs with the same color scheme as the fore legs, hind legs reddish brown excepting the coxæ which are yellow and black, the yellow proximal trochanters, the brown distal trochanters, the blackish tips of the tibiæ and the tarsi which excepting the blackish onychii are whitish; propodeum with a yellow arch the sides of which are partly welts and lateral, low protuberances; abdominal segments brownish or blackish with broad yellow borders, the first segment excepted, which is mostly yellow with the apical half discally mostly blackish; sheaths of the ovipositor 1.5 mm. long.

POLYCYRTIMORPHA, new genus.

Type.—*Polycyrtimorpha amoenus*, new species.

Related to *Polycyrtus* Spinola from which it differs chiefly in the occipital carina meeting the carina bordering the posterior cavity of the mouth.

POLYCYRTIMORPHA AMOENUS, new species.

Type-locality.—Villa Morra, Asuncion, Paraguay, 10-4-04, J. D. Anisits.

Type.—Königliche Zoologische Museum, Berlin.

Female.—Length 15 mm.; black and polished; face, clypeus, labrum, mandibles, malar space, lower half of cheeks, lower half of occiput, orbital margin, palpi and fifth to thirteenth flagellar joints inclusive mostly yellow; upper and lower edge of the pronotum with a yellow margin, propleuræ, mesopleuræ, and mesosternum mostly yellow, tegulæ, wing bases, edges of the axillæ, posterior half of the disk of the scutel, disk of the postscutel, the hind edge of the latter,

the intumescence back of the hind wing insertion and the metapleuræ mostly yellowish, the latter rather testaceous, wings brownish with blackish veins and stigma, the latter with a pale streak, legs mostly brownish stramineous, the fore coxæ mostly yellowish, all coxæ with a dorsal black stripe, the fore and mid onychii mostly black; basal propodeal area with a great, yellow, comma-like mark on each side, the apical propodeal area with a broad yellow stripe on each side, involving the prominent spines; dorsal, abdominal segments margined laterally and apically with a broad yellowish band, the lateral margin of the second and third, dorsal segments with a yellowish extension toward the middle of these segments, ovipositor almost as long as the abdomen.

Genus POLYCRYTUS Spinola.

Carina bordering the posterior cavity of the mouth neither highly developed nor meeting to form a tubular cavity and not meeting the occipital carina.

THYMARIMORPHA, new genus.

Type.—*Thymarimorpha platygastra*, new species.

Recalls the genus *Thymaris* Foerster but is related to *Anisitsia* Viereck from which it may be known by the postfurcal nervellus which is not angulated, by the propodeum not being furrowed and by the almost equilateral areolet.

THYMARIMORPHA PLATYGASTRA, new species.

Type-locality.—C. Olympo, Asuncion, Paraguay, 11-12-'04, J. D. Anisits.

Type.—Königliche Zoologische Museum, Berlin.

Male.—Length 8.5 mm.; black, shining, and sculptured; face and clypeus longitudinally striate, the latter subemarginate, mandibles yellow with brownish tips, scape and pedicel mostly yellow, flagel dark brown except the first joint which is yellowish at its base and partly pale brown, palpi yellowish white; fore legs yellow except the onychii and claws which are brownish and the empodii which are blackish, mid coxæ yellow, hind coxæ pale brownish stramineous, rest of legs missing, notauli represented by an area of transverse striæ on each side of the dorsulum, tegulæ yellow basally, apically almost colorless with a stramineous tinge, wings pale brown, almost colorless, except the tips which are conspicuously infumated, veins more or less dark brown; propodeum with poorly defined carinæ, the basal area almost crowded out by the areola which latter is rather coffin shaped, its posterior boundaries, however, becoming confused with the sculpture of the propodeum; abdomen brownish stramineous, the second, ultimate, and penultimate, dorsal segments more or less blackish.

ZAGLYPTOMORPHA, new genus.

Type.—*Zaglyptomorpha attenuata*, new species. Related to *Glypta* Gravenhorst from which it differs chiefly in the elongate abdomen which has its first to fifth segments, inclusive, distinctly longer than wide at the apex and by the prominently angularly produced anterior, superior edge of the pronotum which is prolonged downward as a trenchant carina.

ZAGLYPTOMORPHA ATTENUATA, new species.

Type-locality.—Villa Morra, Asuncion, Paraguay, October 1, November 9, 1905, December 19, 1904; also from Tembetary, Sapucay, Asuncion, Paraguay, September 12, 1904, J. D. Anisits.

Type.—Königliche Zoologische Museum, Berlin.

Female.—Length 10 mm.; brownish stramineous; head mostly black, face with a brownish mark on each side near the clypeus, lower end of the cheeks and the mouth parts stramineous, tips of the mandibles blackish, apical edge of the scape stramineous; upper and lower edge of the pronotum, propleuræ, tegulæ, intumescence beneath the fore wings, wing bases, disk of scutel and postscutel, fore and mid coxæ, fore trochanters, and mid and hind, distal trochanters yellow, mid, proximal trochanters yellow except for a blackish mark at base above, fore and mid femora yellowish at base, elsewhere stramineous, rest of fore legs stramineous excepting the claws and empodii, which are dark, mid tibiæ yellowish except for a brownish annulus at apex and near the base, mid tarsi blackish except at the joints and the basal third of the metatarsi which are pale, hind coxæ luteous, with an elongate black mark beneath, hind proximal trochanter mostly black, partly yellowish, hind femora almost entirely blackish except for the upper face which is yellow, hind tibiæ luteous, blackish above and with a subbasal and apical blackish annulus, hind tarsi colored in much the same way as the mid tarsi; propodeum with a completely defined areola which is distinctly longer than its greatest width; abdomen mostly black and punctured, its venter pale, its dorsum with brown marks, its second, third, and fourth segments with their apical margins yellowish stramineous, sheaths of the ovipositor distinctly although not much longer than the abdomen.

ZAMASTRUS, new genus.

Type.—*Zamastrus photopsis*, new species.

Agrees with the original description of *Mastrus* Foerster but is evidently a Mesostenine with a Hemiteline venation in which the second, lower side of the areolet is represented only by a shadowlike vein; only the basal carina is present on the propodeum, which latter

has in addition two smooth, conical projections where its posterior face joins the superior face. In the *Mesostenini* its nearest relative appears to be *Christolia* Brullé. Spiracles of the first, abdominal segment nearer to each other than to the apex.

ZAMASTRUS PHOTOPSIS, new species.

Type-locality.—Sapucay, Asuncion, Paraguay, January 12, 1905, J. D. Anisits.

Type.—Königliche Zoologische Museum, Berlin.

Female.—Length 9 mm.; reddish brown and granular; head mostly black, front with a broad whitish margin along the eye margin, scape, pedicel, and clypeus brownish stramineous; malar space, labrum, and mandibles mostly whitish, the latter blackish at the tips, palpi pale stramineous, fourth to eighth joints of the flagel whitish above, rest of the flagel black; upper edge of the pronotum with a whitish margin, tegulæ anteriorly and the upper edge of the mesopleuræ whitish, rest of tegulæ brownish, fore coxæ pale stramineous as are the fore trochanters, femora, and tibiæ except for the blackish cast on the upper surfaces of these parts which is so arranged as to make the tibiæ appear as though they had a pale stramineous band at their base, fore tarsi mostly pale to dark brown, mid legs colored in much the same way as the fore legs, hind coxæ, trochanters, and femora mostly almost concolorous with the thorax, hind tibiæ and tarsi colored in much the same way as the same parts in the mid legs; propodeal spines yellowish and directed backward and outward; abdomen brownish stramineous and more or less finely sculptured and sericeous, the apical angles of the postpetiole and second, dorsal abdominal segment yellowish, the latter stramineous, apical margin of the third, sixth, and seventh dorsal segments more or less yellowish, basal lateral angles of the second and third dorsal segments black or blackish, apical margin of the fifth and most of the sixth, dorsal segments blackish, apical, dorsal segment black with a yellowish apical edge, sheaths of the ovipositor approximately as long as the first abdominal segment.

A LIST OF THE ROTATORIA OF WASHINGTON AND VICINITY, WITH DESCRIPTIONS OF A NEW GENUS AND TEN NEW SPECIES.

By HARRY K. HARRING,

Of the United States Bureau of Standards, Washington, D. C.

INTRODUCTION.

The investigation of the Rotatorian fauna of this region was begun about five years ago, and has revealed an entirely unsuspected wealth of rare and undescribed species. In the appended list are recorded 236 previously described species. As far as practicable preserved material of these has been deposited in the National Museum, so that their identity may be verified. A large number of new species have been found; of these 10 are here described and figured.

It should not be inferred that Washington affords unusual opportunities for collecting Rotatoria, or that any vast territory has been overrun; nearly the entire list is based on collections made in the old Fish Ponds, now filled in, the ponds at Kenilworth, District of Columbia, and Lakeland, Maryland, swamps and ponds at Four-Mile Run, Virginia, and occasional trips to Black Pond, Virginia, and Glenburnie, Maryland. But little work has so far been done on the Potomac River.

For the determination of most of the Bdelloids I am indebted to Mr. David Bryce, of London, England, who has at all times placed his unsurpassed knowledge of this group at my disposal.

For the illustrations an arbitrary sliding scale has been used; for an animal measuring $100\ \mu$ a size of 50 mm. was selected and for each succeeding $100\ \mu$ 10 mm. added, so that the size of the illustration is 40 mm. + 10 mm. for each $100\ \mu$ of the total length. While no doubt objections may be urged against this arrangement, it has the advantage of keeping figures of the largest Rotatoria within the limits of an octavo page, while the smallest are sufficiently large to show the necessary detail. For the trophi a base size of 25 mm. for an actual $10\ \mu$ has been used, adding 2.5 mm. for each succeeding $10\ \mu$; the size of the illustration thus becomes 22.5 mm. + 2.5 mm. for each $10\ \mu$ of the length.

LIST OF ROTATORIA FOUND IN THE DISTRICT OF COLUMBIA, MARYLAND, AND VIRGINIA.

Order PLOIMA.

- Notommata aurita* (Müller).
Notommata brachyota Ehrenberg.
Notommata caudata Collins.
Notommata cerberus (Gosse).
Notommata contorta (Stokes) = *Diglena contorta* Stokes.
Notommata copeus Ehrenberg.
Notommata cyrtopus Gosse.
Notommata melandocus (Gosse) = *Furcularia melandocus* Gosse.
Notommata najas Ehrenberg.
Notommata pachyura (Gosse) = *Copeus pachyurus* Gosse = *Copeus triangulatus* Kirkman.
Notommata pseudocerberus de Beauchamp.
Notommata saccigera Ehrenberg.
Notommata silpha (Gosse) = *Notommata forcipata* of Gosse, not Ehrenberg, = *Diglena silpha* Gosse.
Notommata torulosa (Dujardin).
Notommata tripus Ehrenberg.
Taphrocampa annulosa Gosse.
Taphrocampa clavigera Stokes.
Taphrocampa selenura Gosse.
Proales decipiens (Ehrenberg).
Pleurotrocha petromyzon (Ehrenberg).
? *Pleurotrocha sordida* (Gosse) = *Proales sordida* Gosse.
Eosphora elongata Ehrenberg.
Cephalodella catellina (Müller) = *Diglena catellina* (Müller).
Cephalodella forcicula (Ehrenberg) = *Furcularia forcicula* Ehrenberg.
Diaschiza auriculata (Müller) = *Diaschiza lacinulata* (Müller).
Diaschiza eva (Gosse).
Diaschiza exigua Gosse.
Diaschiza forcicata (Ehrenberg) = *Diaschiza cæca* (Gosse).
Diaschiza gibba (Ehrenberg).
Diaschiza globata Gosse.
Diaschiza gracilis (Ehrenberg).
Diaschiza megalcephala (Glasscott).
Diaschiza sterea (Gosse).
Diaschiza tenuior Gosse.
Rousseletia corniculata, new species.
Monommata orbis (Müller) = *Furcularia longiseta* (Müller).
Dicranophorus auritus (Ehrenberg) = *Eosphora aurita* (Ehrenberg).
Dicranophorus forcipatus (Müller) = *Diglena forcipata* (Müller).
? *Dicranophorus grandis* (Ehrenberg) = *Diglena grandis* Ehrenberg.
Encentrum aper, new species.
Encentrum myriophylli, new species.
Encentrum ricciae, new species.
Diglena caudata Ehrenberg = *Diglena biraphis* Gosse.
Diglena clastopis Gosse.
Diglena permolkis Gosse.
Proales felis (Müller).
Taphrocampa saundersiae Hudson.
Theorus uncinatus Ehrenberg.

Epiphanes brachionus (Ehrenberg) = *Notops brachionus* (Ehrenberg).

Epiphanes clavulata (Ehrenberg) = *Notops clavulatus* (Ehrenberg).

Epiphanes senta (Müller) = *Hydatina senta* (Müller).

Cyrtonia tuba (Ehrenberg).

Proalides tentaculatus de Beauchamp.

Microcodon clavus Ehrenberg.

Mikrocodides chilena (Gosse).

Brachionus angularis Gosse.

Brachionus budapestinensis Daday.

Brachionus calyciflorus Pallas = *Brachionus pala* Ehrenberg.

Brachionus caputiflorus Pallas = *Brachionus bakeri* Müller = *Brachionus urceolaris* Müller.

Brachionus havanaensis Rousselet.

Brachionus patulus Müller = *Brachionus militaris* Ehrenberg.

Brachionus plicatilis Müller = *Brachionus mülleri* Ehrenberg.

Platys quadricornis (Ehrenberg) = *Noteus quadricornis* Ehrenberg.

Keratella cochlearis (Gosse) = *Anurza cochlearis* Gosse.

Keratella quadrata (Müller) = *Anurza aculeata* Ehrenberg.

Keratella serrulata (Ehrenberg) = *Anurza serrulata* Ehrenberg.

Keratella stipitata (Ehrenberg) = *Anurza stipitata* Ehrenberg.

Notholca bostoniensis Rousselet.

Notholca striata (Müller).

Anurzopsis fissa (Gosse) = *Anurza hypelasma* Gosse.

Mytilina compressa (Gosse) = *Diplax compressa* Gosse.

Mytilina trigona (Gosse) = *Diplax trigona* Gosse.

Mytilina ventralis (Ehrenberg) = *Salpina ventralis* Ehrenberg.

Euchlanis deflexa Gosse.

Euchlanis dilatata Ehrenberg.

Euchlanis oropha Gosse.

Euchlanis pyriformis Gosse.

Dipleuchlanis propatula (Gosse).

? *Lecane affinis* (Levander) = *Cathypna affinis* Levander.

? *Lecane flexilis* (Gosse) = *Distyla flexilis* Gosse.

Lecane hornemanni (Ehrenberg) = *Distyla hornemanni* (Ehrenberg).

Lecane leontina (Turner) = *Cathypna leontina* Turner.

Lecane ludwigii (Eckstein) = *Distyla ludwigii* Eckstein.

Lecane luna (Müller) = *Cathypna luna* (Müller).

Lecane ohioensis (Herrick) = *Distyla ohioensis* Herrick.

Lecane signifera (Jennings) = *Distyla signifera* Jennings.

Lecane spinifera (Western) = *Distyla spinifera* Western.

Lecane stichæa, new species.

Lecane stokesii (Pell) = *Distyla stokesii* (Pell).

Lecane unguolata (Gosse) = *Cathypna unguolata* Gosse.

Monostyla acus, new species.

Monostyla arcuata Bryce.

Monostyla bifurca Bryce.

Monostyla bulla Gosse.

? *Monostyla closterocerca* Schmarda.

Monostyla cornuta (Müller).

Monostyla crenata, new species.

Monostyla furcata Murray.

Monostyla galeata Bryce.

Monostyla hamata Stokes.

Monostyla lunaris Ehrenberg.

- Monostyla monostyla* (Daday) = *Diarthra monostyla* Daday.
Monostyla quadridentata Ehrenberg.
Monostyla sylvatica, new species.
Lepadella acuminata (Ehrenberg) = *Metopidia acuminata* Ehrenberg.
Lepadella cristata (Rousselet) = *Colurus cristatus* Rousselet.
Lepadella oblonga (Ehrenberg) = *Metopidia oblonga* Ehrenberg.
Lepadella ovalis (Müller) = *Metopidia solidus* Gosse.
Lepadella patella (Müller) = *Metopidia emarginata* (Ehrenberg).
Lepadella quinquecostata (Lucks) = *Metopidia quinquecostata* Lucks.
Lepadella salpina Ehrenberg.
Lepadella triptera Ehrenberg.
Colurella bicuspidata (Ehrenberg).
? *Colurella colurus* (Ehrenberg) = *Colurus amblytelus* Gosse.
Colurella obtusa (Gosse).
Colurella sulcata (Stenroos) = *Metopidia sulcata* Stenroos.
Squatinella bifurca (Hudson) = *Stephanops bifurcus* Hudson.
Squatinella longispinata (Tatem) = *Stephanops longispinatus* Tatem.
Squatinella mutica (Ehrenberg) = *Stephanops muticus* Ehrenberg.
Squatinella tenella (Bryce) = *Stephanops tenellus* Bryce.
Trichotria breviodactyla, new species.
Trichotria pocillum (Müller) = *Dinocharis pocillum* (Müller).
Trichotria similis (Stenroos) = *Dinocharis similis* Stenroos.
Trichotria tetractis (Ehrenberg) = *Dinocharis tetractis* Ehrenberg.
Macrochætus collinsii (Gosse) = *Dinocharis collinsii* Gosse.
Macrochætus subquadratus Perty = *Polychætus subquadratus* (Perty).
Scaridium eudactylotum Gosse.
Scaridium longicaudum (Müller).
Trichocerca bicristata (Gosse) = *Rattulus bicristatus* (Gosse).
Trichocerca bicuspes (Pell) = *Rattulus bicuspes* (Pell).
Trichocerca cylindrica (Imhof) = *Rattulus cylindricus* (Imhof).
Trichocerca elongata (Gosse) = *Rattulus elongatus* (Gosse).
Trichocerca flava (Voronkov) = *Rattulus flavus* Voronkov.
Trichocerca iernis (Gosse) = *Rattulus gracilis* (Tassin).
Trichocerca longiseta (Schrank) = *Rattulus longiseta* (Schrank).
Trichocerca lophassa (Gosse) = *Rattulus lophassus* (Gosse).
Trichocerca multicrinis (Kellicott) = *Rattulus multicrinis* (Kellicott).
Trichocerca rattus (Müller) = *Rattulus rattus* (Müller).
Diurella brachyura (Gosse).
Diurella cavia (Gosse).
Diurella dixon-nuttalli Jennings.
Diurella insignis Herrick.
Diurella porcellus (Gosse).
Diurella rousseleti (Voigt).
Diurella stylata Eyferth.
Diurella sulcata (Jennings).
Diurella tenuior (Gosse).
Diurella tigris (Müller).
Diurella weberi Jennings.
Elosa worrallii Lord.
Chromogaster ovalis (Bergendal) = *Anapus ovalis* Bergendal.
Gastropus hyptopus (Ehrenberg).
Gastropus minor (Rousselet).
Gastropus styliifer Imhof.
Ascomorpha ecaudis Perty.

Ascomorpha saltans Bartsch.
Synchæta bicornis Smith.
Synchæta cecilia Rousselet.
Synchæta littoralis Rousselet.
Synchæta longipes Gosse.
Synchæta oblonga Ehrenberg.
Synchæta pectinata Ehrenberg.
Synchæta stylata Wierzejski.
Synchæta tremula (Müller).
Polyarthra euryptera Wierzejski.
Polyarthra trigla Ehrenberg=*Polyarthra platyptera* Ehrenberg.
Sphyrias lofuana (Rousselet).
Plasoma lenticulare Herrick.
Plasoma truncatum (Levander).
Asplanchna brightwellii Gosse.
Asplanchna herrickii de Guerne.
Asplanchna intermedia Hudson.
Asplanchna priodonta Gosse.
Asplanchnopus multiceps (Schränk).
Asplanchnopus hyalinus, new species.
Harringia rousseleti de Beauchamp.
Testudinella incisa (Ternetz)=*Pterodina incisa* Ternetz.
Testudinella intermedia (Anderson)=*Pterodina intermedia* Anderson.
Testudinella parva (Ternetz)=*Pterodina parva* Ternetz=*Pterodina bidentata* Ternetz.
Testudinella patina (Hermann)=*Pterodina patina* (Hermann).
Testudinella truncata (Gosse)=*Pterodina truncata* Gosse.
Pedalia fennica (Levander)=*Pedalion fennicum* Levander.
Pedalia mira (Hudson)=*Pedalion mirum* Hudson.
Filinia cornuta (Weisse)=*Triarthra breviseta* Gosse.
Filinia longiseta (Ehrenberg)=*Triarthra longiseta* Ehrenberg.
Filinia passa (Müller)=*Triarthra mystacina* Ehrenberg.

Order FLOSCULARIACEA.

Floscularia conifera (Hudson)=*Melicerta conifera* Hudson.
Floscularia melicerta (Ehrenberg)=*Melicerta najas* (Ehrenberg).
Floscularia ringens (Linnæus)=*Melicerta ringens* (Linnæus).
Limnias ceratophylli Schrank.
Limnias melicerta Weisse=*Limnias annulatus* Bailey.
Ptygura brachiata (Hudson)=*Ecistes brachiatus* Hudson.
Ptygura crystallina (Ehrenberg)=*Ecistes crystallinus* Ehrenberg.
Ptygura mucicola (Kellicott)=*Ecistes mucicola* Kellicott.
Sinantherina socialis (Linnæus)=*Megalotrocha alboflavicans* Ehrenberg.
Lacinularia flosculosa (Müller)=*Lacinularia socialis* Ehrenberg.
Beauchampia crucigera (Dutrochet)=*Cephalosiphon limnias* of Gosse, not Ehrenberg.
Conochilus hippocrepis (Schränk)=*Conochilus volvox* Ehrenberg.
Conochilus unicornis Rousselet.
Conochiloides dosnarius (Hudson).

Order COLLOTHECACEA.

Collothea ambigua (Hudson)=*Floscularia ambigua* Hudson.
?Collothea annulata (Hood)=*Floscularia annulata* Hood.
Collothea campanulata (Dobie)=*Floscularia campanulata* Dobie.
Collothea cornuta (Dobie)=*Floscularia cornuta* Dobie.

Collotheca coronetta (Cubitt) = *Floscularia coronetta* Cubitt.
Collotheca cyclops (Cubitt) = *Floscularia cyclops* Cubitt.
Collotheca mira (Hudson) = *Floscularia mira* Hudson.
Collotheca mutabilis (Hudson) = *Floscularia mutabilis* Hudson.
Collotheca ornata (Ehrenberg) = *Floscularia ornata* Ehrenberg.
Collotheca pelagica (Rousselet) = *Floscularia pelagica* Rousselet.
Collotheca tenuilobata (Anderson) = *Floscularia tenuilobata* Anderson.
Stephanoceros fimbriatus (Goldfuss).
Cupelopagis vorax (Leidy) = *Apsilus vorax* (Leidy).
Acychus inquietus Leidy.

Order BDELLOIDA.

Adineta gracilis Janson.
Adineta vaga (Davis) (form *major*).
Philodina acuticornis Murray.
Philodina citrina Ehrenberg.
Philodina megalotrocha Ehrenberg.
Philodina plena (Bryce).
Rotaria citrina (Ehrenberg) = *Rotifer citrinus* Ehrenberg.
Rotaria elongata (Weber) = *Rotifer elongatus* Weber.
Rotaria macroceros (Gosse) = *Rotifer macroceros* Gosse.
Rotaria macrura (Ehrenberg) = *Rotifer macrurus* Ehrenberg.
Rotaria neptunia (Ehrenberg) = *Actinurus neptunius* Ehrenberg.
Rotaria rotatoria (Pallas) = *Rotifer vulgaris* Schrank.
Rotaria sordida (Western) = *Callidina sordida* Western.
Rotaria tardigrada (Ehrenberg) = *Rotifer tardus* Ehrenberg.
Macrotrachela aculeata Milne.
Macrotrachela crucicornis (Murray) = *Callidina crucicornis* Murray.
Macrotrachela habita (Bryce) = *Callidina habita* Bryce.
Macrotrachela multispinosa Thompson.
Macrotrachela musculosa Milne.
Macrotrachela nana (Bryce) = *Callidina nana* Bryce.
Macrotrachela papillosa Thompson.
Macrotrachela plicata (Bryce) = *Callidina plicata* Bryce.
Macrotrachela quadricornifera Milne.
Dissotrocha aculeata (Ehrenberg).
Dissotrocha macrostyla (Ehrenberg).
Mniobia russeola (Zelinka).
Habrotracha angusticollis (Murray).
Habrotracha annulata (Murray).
Habrotracha auriculata Murray.
Habrotracha constricta (Dujardin).
Habrotracha lata (Bryce).
Habrotracha pusilla (Bryce).
Scepanotrocha rubra Bryce.

NOTOMMATA PACHYURA (Gosse).

Copeus pachyurus GOSSE, Hudson and Gosse, *Rotifera*, 1886, vol. 2, p. 31, pl. 16, fig. 4.
Copeus triangulatus KIRKMAN, *Journ. Royal Micr. Soc.*, 1906, p. 264, pl. 12, figs. 10, 11.
Notommata pachyura HARRING, *Bull. 81 U. S. Nat. Mus.*, 1913, p. 79.

This species occurs here nearly the entire year; as all intermediate stages may be found between the humpless and the three-humped

form, there can be no doubt about their specific identity. The first explanation of the variation that suggested itself was the Ostwald "viscosity-adaptation" theory; the temporal distribution appeared, however, to contradict any simple temperature effect as the probable cause. To test this a record of the temperature of the water was taken weekly for a year, with notes on the occurrence of the two forms.

Beginning in January, the humpless form appeared first; the intermediate and fully humped forms did not appear until the latter part of June, when the temperature was 26.5° C. The humpless form continued to occur, although in reduced numbers, throughout the summer. The humped form was far more abundant and persisted until the beginning of November, when the temperature had dropped to 6.5° C. This would seem to exclude any direct temperature effect as the controlling factor. It is highly probable that the key to these and similar variations has been supplied by the work of Powers on *Asplanchna*, and that a change of food organisms is the cause.

ROUSSELETIA, new genus.

ROUSSELETIA CORNICULATA, new species.

Plate 37, figs. 1-3.

The body of this small species is fairly stout, gibbous dorsally, with a slight constriction separating the head from the posterior portion. A well-marked tail projects over the foot, which is rather long; at its termination a single long dorsal seta is occasionally present, but generally it is broken off. The two short, conical toes occupy only the ventral half of the foot joint.

The corona is nearly terminal and has a well-developed circum-apical band without any dorsal gap. From the unciliated apical plate project two conspicuous, slightly decurved papillæ, resembling those of the genus *Plasoma*. The buccal field is semicircular and evenly ciliated, with the mouth near the ventral edge.

The ganglion is large, with an eyespot at its posterior termination. The elongate-pyriform retrocerebral sac is filled with highly refractive granules, even in the two anterior branches of the duct.

The mastax is of huge proportions, equaling fully half the length of the body proper. The short esophagus leads to a large stomach without separate intestine; the gastric glands are small and difficult to find. In full grown individuals the stomach extends forward as a blind pocket on each side of the mastax. The entire animal is colored an almost opaque green, due to the presence of symbiotic *Zoochlorellæ*. The ovary is normal and the contractile vesicle rather small. The two foot glands are club-shaped and of moderate length.

The mastax is of the virgate or "pumping" type and highly specialized, the mallei being reduced to very slender, unjointed and strongly curved rods, a short spur projecting downward near the

middle; the fulcrum is large, its lower end broadly fan-shaped and in the transverse plane, so far as known the only instance of its kind. The rami consist of a network of ribs, roughly semicylindrical in shape; each ramus is pierced by two large holes. A rod-shaped epipharynx with decurved ends assists in supporting the oral region.

Total length 130 μ ; trophi, 42 μ .

Type.—Cat. No. 16516, U.S.N.M., was collected at Kenilworth, District of Columbia, where the species occurs in fair numbers among the weeds in shallow ponds throughout the greater part of the year.

That this species belongs to the Notommatidæ is evident; the corona is of a frequently recurring type and not far removed from that of the genus *Diaschiza*. The frontal papillæ, while very characteristic, are probably of small systematic importance, as they are found in widely varying degrees of development in otherwise closely related species. The mastax is, however, of such an unusual type, that it seems advisable to make this species the type of a new genus. It has been named for Mr. Charles F. Rousselet, of London, to whom every student of the Rotatoria, including the writer, is indebted for generous assistance and advice.

ENCENTRUM APER, new species.

Plate 34, figs. 7-10.

The body is slender and nearly cylindric, passing rather abruptly into a short foot. While the integument is very flexible and without any indication of any segmentation when the animal swims, some inconspicuous transverse folds appear when it is crawling about in search of food. One fold is immediately behind the auricles, a second separates the head from the body, and a third marks off a short posterior segment. The foot is short and considerably smaller than the last segment of the body; the anterior portion of the toes tapers gradually to a fine, slightly decurved point.

The corona is almost ventral; the auricles are not very prominent. At the base of the moderate-sized anterior hook or ligula, in front of the auricles, there is on each side a slight emargination for the insertion of a "tusk," or tooth-like projection. The purpose of this structure is unknown; nothing similar is to be found among the related species available for comparison. It is not a mere flap of the integument, but a well-defined, bluntly conical tooth of high refractive index, which demonstrates its abrupt termination at the point of insertion; there is no suggestion of a gradual transition to the normal structure of the integument. Immediately behind this "tusk" a tuft of very long and stout, immobile sensory setæ project laterally and somewhat posteriorly.

The ganglion is large; a small retrocerebral sac is present, but no subcerebral glands. While no eyespots are visible in the living or

preserved specimens, two faintly orange-colored globules appear behind the auricles when the tissues are dissolved in potassium hypochlorite; no doubt these are identical with the eyespots of other members of the genus.

The contractile vesicle and ovary are normal; the foot-glands are large and lead by a narrow duct to a mucus reservoir at the base of the toes.

The trophi are forcipate and slightly asymmetric. The fulcrum is a thin triangular plate; the rami are stout, with rather blunt points; on their ventral side well-developed alulæ serve for the attachment of the abductor muscles. The right uncus has two teeth, which form a fork, embracing the ramus; the left uncus is a flat triangular plate, reenforced by ribs and resting on a flattened portion of the ramus. The manubria are also slightly dissimilar, the left one being the more strongly developed and a little posterior with respect to the position of the right manubrium.

Total length, 240 μ ; toes, 33 μ ; trophi, 37 μ .

Type.—Cat. No. 16517, U.S.N.M., was collected at Kenilworth, District of Columbia, in a weedy pond among branches of *Myriophyllum* in incipient decay.

This species appears to be the one described by Gosse¹ as *Diglena caudata* Ehrenberg. A comparison of Ehrenberg's figure and description in *Die Infusionsthierchen* with Gosse's *Diglena biraphis* shows, however, that these are beyond doubt identical, so that a new name is necessary for the misdetermined animal.

ENCENTRUM MYRIOPHYLLI, new species.

Plate 34, figs. 1-3.

The body is moderately stout and slightly gibbous dorsally; a large frontal ligula overarches the corona. Posteriorly the body tapers gradually to the short foot; the toes are very slightly decurved and end in fine points.

The corona is very oblique, and has prominent auricles. The ganglion is rather small; the retrocerebral sac is pyriform and reaches to the stomach. At the base of the ligula are two moderately large eyespots.

The forcipate trophi are notable for the reduction of the mallei; the incus, on the contrary, is unusually powerful. The fulcrum is a rather short, broad, and thin plate, rounded posteriorly; the rami are very large at the base and taper to stout, incurved points. The manubria are long, very slender, round rods with a double curve in the dorso-ventral plane; the unci, as usual in this type of mastax-have but a single tooth, which is also long and slender; the needle,

¹ The Rotifera, Vol. 2, p. 51.

like point is slightly incurved and no doubt immovably united to the rami.

The stomach is without separate intestine; the ovary, contractile vesicle, and foot-glands are normal.

Total length, 160 μ ; toes, 26 μ ; trophi, 24 μ .

Type.—Cat. No. 16518, U.S.N.M., comes from Kenilworth, District of Columbia, where the species occurs in small numbers among the branches of *Myriophyllum*.

ENCENTRUM RICCLÆ, new species.

Plate 34, figs. 4-6.

The body tapers gradually toward the foot, which is short and sharply marked off, with a tail projecting over it dorsally; a prominent triangular ligula overarches the corona. The toes are cylindric and of the same diameter throughout their length, straight at the base, and strongly decurved posteriorly; the ends are rounded.

The oblique corona has two fairly prominent auricles at the base of the ligula. The ganglion is moderate-sized and closely overlaid by the rather small retrocerebral sac; no subcerebral glands have been found, nor are any eyespots present.

The hexagonal cells of the stomach are conspicuous; the functions of an intestine are apparently performed by the posterior third of the stomach, although not separated from it by any constriction; its walls do not show the cell divisions. Ovary and contractile vesicle are normal, the foot-glands fairly long and nearly cylindric.

The trophi are forcipate and, while not aberrant, are quite characteristic. The inner edges of the rami are nearly semicircular; a long, curved, needlelike tooth passes abruptly into the irregularly triangular posterior section. The fulcrum is rodlike, its extreme end slightly recurved. The manubria are strongly curved, their upper ends forked, embracing the exterior edges of the rami; the unci are divided into an uncus proper and a long, curved tooth. A relatively considerable space separates the unci from the manubria and their original relation has been completely lost, the unci acting merely as a second tooth to the rami, to which they are immovably united by muscular bands, at the base of the tooth further reenforced by a small V-shaped member, resting with one branch on the ramus, the other on the tooth. The manubriæ have become simple auxiliaries to the rami; their form makes it obvious that the adductor muscles of the rami are attached to them, thereby effecting the closing movement, the crutch of the manubria being united to the triangular alulæ by flexible ligaments.

Total length, 190 μ ; toes, 22 μ ; trophi, 31 μ .

This species was found in the fall among clumps of *Riccia fluitans* in ponds at Kenilworth, District of Columbia. Apparently it does not

swim unless absolutely compelled to do so, clinging with the greatest tenacity to the diatom-covering so abundant on this plant. It is most difficult to isolate, partly on account of its extreme hyalinity; as soon as disturbed it immediately wriggles back into the mud, and the search has to begin all over again. It has not been possible to preserve it in anything resembling its normal form.

DIOLENA CLASTOPIS Gosse.

Plate 34, figs. 11-13.

For some time this species was in doubt; the animal found here does not have the remarkably long-stalked subcerebral glands figured by de Beauchamp¹ and the slender, L-shaped epipharyngeal rods are not shown in his figure of the trophi.² De Beauchamp was good enough to send me some material for comparison, which demonstrated that the two animals are alike in all respects, except that the specimens from France have the subcerebral glands, readily seen even in preserved material, while in the local form they are totally absent. An exactly parallel case is cited by de Beauchamp (p. 158): Specimens of *Dicranophorus* (= *Eosphora*) *auritus* (Ehrenberg), collected near Bourg (Ain), have long subcerebral glands, while others from near Paris have extremely short glands. It seems possible that each of these two species may eventually prove divisible into two valid subspecies; however, the discovery, or at least the recognition, of the retrocerebral organ by de Beauchamp is of comparatively recent date and no information is as yet available concerning the extent of its possible variation, so that it seems preferable to consider these forms provisionally as belonging to a single species.

LECANE STICHEA, new species.

Plate 35, figs. 4-6.

In complete retraction the dorsal plate of the lorica is ovate; the frontal edge curves slightly forward. For two-thirds of its length the ventral plate is nearly parallel-sided, the posterior end being rounded; it projects considerably beyond the dorsal plate and very slightly over the movable foot joint. At the anterior edge of the lorica there are two conspicuous lateral points. The lateral sulci are of moderate depth. Both dorsal and ventral plate are faceted as shown in the figure.

The first foot joint is hardly distinguishable, the second, or movable, joint is comparatively large and stout, somewhat enlarged posteriorly and has a broadly heart-shaped emargination in front. The toes are a little less than half the length of the dorsal plate; in dorsal view they are parallel-sided, in lateral view they taper notice-

¹ Arch. Zool. Exp., ser. 4, vol. 10, p. 157, fig. XII F.

² P. 227, fig. XXXV B.

ably for one-fourth of their length, then increase slightly in width, only to be again reduced in the posterior fourth. The claw is of moderate size.

The dorsal plate is in retraction less gibbous than in the majority of species of this genus.

Total length 143 μ ; length of dorsal plate 90 μ , width 75 μ ; length of ventral plate 103 μ , width 58 μ ; toes 32 μ , claw 7 μ ; width of anterior points 62 μ ; tail projects beyond dorsal plate 13 μ .

The description and measurements refer throughout to fully contracted specimens.

Type.—Cat. No. 16519, U.S.N.M., is from Glenburnie, Maryland, where the species is abundant in *Sphagnum*.

MONOSTYLA ACUS, new species.

Plate 36, figs. 1-3.

In complete retraction the dorsal plate of the lorica is subcircular, with an anterior sinus of moderate depth, the sides of which form nearly straight lines. The ventral plate is oval and slightly narrower than the dorsal; the anterior sinus is of the same form as that of the dorsal plate and projects very slightly beyond it. The ventral plate extends over the foot, beyond the dorsal plate, as a broad shield or tail. The lateral sulci are deep, the posterior sulcus moderately so. The lorica is without any markings.

The first foot joint is rounded anteriorly and is, as usual in the genus, immovable; the second foot joint is heart-shaped posteriorly and squarely truncate in front. The toe is approximately four-fifths as long as the entire body, very slender and slightly decurved at the base; the claw is very long. There are three annular constrictions of the mucus duct, the posterior annulus being about as far from the end of the toe as the length of the claw, the second an equal distance forward of the posterior, and the third about one and a half times the length of the claw removed from the second.

The dorsal plate is strongly gibbous posteriorly; the anterior portion of the ventral plate bends downward in the center, as does also the dorsal plate, so that they are in contact, and in a frontal view, if such were obtainable, they would appear as a very broad V, of nearly the same outline as the anterior margin in dorsal view.

Total length 180 μ ; length of dorsal plate 85 μ , width 82 μ ; depth of frontal sinus 10 μ ; tail projects beyond dorsal plate 15 μ ; length of ventral plate 100 μ , width 72 μ ; distance between inner edges of lateral sulci 53 μ ; length of toe 64 μ , of claw 12 μ ; greatest depth of body 38 μ .

Type.—Cat. No. 16520, U.S.N.M., comes from Glenburnie, Maryland, where the species is common in *Sphagnum*, growing in swampy parts of the woods.

MONOSTYLA CRENATA, new species.

Plate 36, figs. 4-6.

In complete retraction the dorsal plate of the lorica is subovate, the anterior margin being almost straight. The ventral plate is oval, slightly narrower than the dorsal and projects but very little beyond it posteriorly; the anterior sinus is deep, rounded at the bottom and has strongly curved sides. The lateral sulci are deep, but narrow, the edges of the dorsal and ventral plate being nearly in contact their entire length. The posterior sulcus is of moderate depth. The lorica is not faceted.

The second foot-joint is slightly heart-shaped, excised in front, where it articulates with the rigid first joint, which is oval in outline. The toe is nearly three-fourths as long as the body, moderately stout and slightly decurved at the base; the claw is very small. The mucus duct is without constrictions.

The ventral plate is markedly convex and the dorsal very strongly so; owing to this, as well as the difference in outline, a considerable opening remains between the two plates of the lorica, when the head is completely retracted.

Total length, 190 μ ; length of dorsal plate, 108 μ , width, 88 μ ; length of ventral plate, 118 μ , width, 80 μ ; depth of ventral sinus, 20 μ ; distance between inner edges of lateral sulci at their widest point, 68 μ , at narrowest (posterior), 42 μ ; length of toe, 72 μ , of claw, 8 μ ; greatest depth of body, 60 μ .

Type.—Cat. No. 16521, U.S.N.M., is from Kenilworth, District of Columbia; the animal is locally the most abundant species of the genus, and seems to be widely distributed; it is common in collections from the Bureau of Fisheries station at San Marcos, Texas, and also in the collections of the Panama Biological Survey. Mr. James Murray informs me that he finds it in Australasia.

MONOSTYLA SYLVATICA, new species.

Plate 35, figs. 1-3.

In complete retraction the dorsal plate of the lorica is nearly circular and has a shallow, rounded anterior sinus. The ventral plate is ovate and but four-fifths the width of the dorsal; the anterior sinus is of moderate depth, rounded at the bottom and with nearly straight sides. The lateral sulci are completely obliterated in contracted specimens, so that the dorsal and ventral plates appear to be joined by flat plates. The posterior sulcus is shallow. The lorica is without either dorsal or ventral markings.

The first, immovable, foot joint is oval, the second heart-shaped; the slightly decurved toe is about half the length of the body and has a small claw.

The dorsal plate is strongly gibbous posteriorly, and the depth of the body is almost half the length of the lorica. The anterior edges of the ventral plate curve upward.

Total length, 152 μ ; length of dorsal plate, 96 μ , width, 100 μ ; length of ventral plate, 100 μ , width, 82 μ ; width of anterior points of dorsal plate, 32 μ , of ventral plate, 53 μ ; length of toe without claw, 44 μ , claw, 8 μ ; depth of body, 48 μ .

Type.—Cat. No. 16522, U.S.N.M., was collected among submerged mosses growing on rocks in a small stream near the Bureau of Standards.

TRICHOTRIA BREVIDACTYLA, new species.

Plate 38, fig. 2.

The body of this species is slightly gibbous dorsally and obscurely faceted; the entire surface of the lorica is stippled. The last segment of the body is very broad at the base and tapers rapidly to the foot, so that in dorsal view it appears triangular; on its dorsal side it has a deep depression. The foot has two joints, the anterior one large and conical, the posterior small and cylindric. The toes are blade-shaped and of moderate length; their upper and lower edges are straight and parallel, the point being formed by a downward curve of the upper edge. In other respects the animal agrees with *Trichotria pocillum*, *T. tetractis*, and *T. similis*.

Length, 340 μ ; toes, 48 μ .

Type.—Cat. No. 16523, U.S.N.M.

Two specimens only of this species were collected in the Potomac River.

DIURELLA PORCELLUS (Gosse).

Plate 38, fig. 1.

A *Diurella* agreeing in all respects with *D. porcellus* (Gosse), except in having a very high ridge extending the entire length of the body, occurs occasionally in the ponds at Kenilworth. It is uncertain whether this should be considered a case of dimorphism or whether we are dealing with two species; as an exactly parallel case occurs in the closely related genus *Trichocerca* (= *Rattulus*), it appears inadvisable to give any systematic name to this form, until more is known about the limits of variation in the family.

I am indebted to Mr. F. R. Dixon-Nuttall, of Eccleston Park, England, for the figure of this form.

SPHYRIAS LOFUANA (Rousselet).

Plate 37, figs. 4-8.

Notops lofuana ROUSSELET, Proc. Zool. Soc. London, 1910, p. 795, pl. 75, figs. 1-3.
Sphyrias lofuana HARRING, Bull. 81, U. S. Nat. Mus., 1913, p. 96.

This species was described by Rousselet from a single specimen found in a plankton collection from the Lofu River, a tributary of

Lake Tanganyika, Central Africa. As no living material was available it is but natural that the description is not as full as might be desired, and some additional notes may be of interest.

The body of this species is rather short and stout; the head is roughly triangular in outline with two large, short, lateral projections bearing suboval ciliated lobes. A marked constriction divides the head from the body, which is marked dorsally with strong longitudinal folds, gradually disappearing on the sides. The foot is long and wrinkled, but not jointed, slightly tapering and has a projecting skin-fold or tail at its base. The moderately large toes are straight on their inner edges, curved on the outer.

The tubular dorsal antenna is on the posterior part of the body, immediately behind the constriction, and is joined to the integument in its entire length; the lateral antennæ, small setigerous pimples, are situated just above the foot. The two eyespots are on the ciliated lobes, near their upper edges. The mouth is an oval slit with its long axis in the median plane; at the sides are two short papillæ tipped with sensory setæ.

The mastax is of the virgate type; the fulcrum is long and straight, formed of two plates joined together at the edges, so that their cross-section is V-shaped, with the apex dorsally. The rami are roughly triangular, with numerous pointed teeth on their inner edges; while quite formidable looking, it is doubtful whether these teeth play any part in subdividing the food; more probably they act as a sort of strainer for the "pump." The manubria are long and slightly incurved; the unci have one large, nearly straight, tooth, and at their bases two rudimentary teeth joined together by a thin plate. Two straight rods, expanded at their dorsal ends into triangular plates, pass dorso-ventrally across the mastax; at the ventral ends they are joined to the rami by muscular bands, the plate-like ends being embedded in the dorsal wall of the mastax. As will be seen from the ventral and frontal views of the trophi, these rods are not connected to the manubria, nevertheless they follow these in their longitudinal movements, acting apparently as a hinge. This appearance is caused by their attachment to the dorsal wall of the mastax, which naturally moves with the mallei. That these rods are of an epipharyngeal nature is highly probable; their attachment to the rami is, however, without a parallel among other Rotatoria. The "pumping" action of the virgate mastax can be seen very clearly in this species on account of the transparency of the head. The rest of the alimentary tract calls for few remarks; two elongate, club-shaped mastax glands are in the usual position; the short esophagus leads to the globose stomach, which is without separate intestine; the left gastric gland is immediately behind the mastax, while the right one is crowded

back by the ribbon-shaped ovary. The contractile vesicle is normal; the excretory canals have each five flame-cells.

The ganglion is a large triangular mass lying over the mastax and extends nearly the entire width of the head. At the posterior angle a granular, opaque deposit is usually found; this is no doubt the retrocerebral sac, although it can not be stained *intra-vitam*.

At the point of attachment of the four dorsal longitudinal muscles small tufts of sensory setæ are present. The animal is carnivorous; its food seems to consist principally of the smaller Bdelloids and *Conochilus*, whose trophi are often found in its stomach. When swimming, the frontal part of the head is withdrawn and puckered up, so that the animal appears squarely truncate in front.

As this species does not have any close relatives among known genera of Rotatoria, it has been made the type of a new genus; its affinities seem to be with *Synchaeta* and *Plasoma*, but it is a parallel, rather than an intermediate, branch of the Ploima.

Total length, 320 μ ; trophi, 62 μ .

Sphyras lofuana inhabits weedy ponds; it was first found in the old Fish Ponds, now filled in, and a few specimens occurred in the swamps at Four Mile Run; it is not uncommon in the ponds at Kenilworth. From the list of species accompanying the original description it is evident that its presence in the Lofu River is adventitious; all the species are pond forms and not one of the 22 is normally a river plankton.

ASPLANCHNOPUS HYALINUS, new species.

Plate 38, figs. 3 and 4.

The body of this species is moderately elongate, the posterior, globose portion being separated from the head by a very slight constriction or neck. The foot is nearly one-third as long as the body and jointed, the terminal joint being about twice as long as the basal. The toes are somewhat blade-shaped and approximately the same length as the first foot-joint; the mucus glands are as long as the entire foot.

The corona is terminal and of the usual *Asplanchna*-type; a circumapical band interrupted ventrally at the mouth and laterally by two small papillæ bearing red pigment-spots. The ciliation of the buccal field is limited to a line of short cilia on each side of the mouth, passing from there transversely to the two lateral papillæ. The dorsal antennæ are not far posterior to the corona; there are two distinct tufts of setæ, united internally by the usual muscle; two nerve-threads pass to the ganglion. The lateral antennæ are in the usual position. The ganglion has a prominent eyespot at its posterior end. The retrocerebral sac is well developed, as well as the subcerebral glands, these being about half as long as the sac.

The voluminous mastax incloses the incudate trophi, which are notable for the simplicity of their structure; they are without any inner teeth, reinforcing ribs or other complexities found in the majority of the species of this family.

From the mastax a very short esophagus leads to the large stomach, which is divided by a slight constriction, the anterior portion showing the same characteristic muscular network as the walls of the mastax. The posterior section is thick-walled, with large cells for absorption of the products of digestion. Two rounded gastric glands open into the anterior portion of the stomach immediately behind the entrance of the esophagus.

The lateral canals, with eight flame cells each, lead to the moderate-sized contractile vesicle. The ovary is ribbon-shaped; as far as known, the animal is oviparous, at least nothing has been observed that would indicate the contrary.

Total length, 520 μ ; length of body, 395 μ ; greatest depth, 255 μ ; length of foot without toes, 90 μ ; toes, 36 μ ; length of trophi, 70 μ ; width, 48 μ .

Type.—Cat. No. 16524, U.S.N.M.

This species is interesting in that it seems to retain more of the primitive organization than any other known species of the family. While the trophi are as highly specialized as any, the stomach shows unmistakable evidence of the transition from the *Notommata*-type, where the principal part of the digestion takes place in the anterior section, to the usual *Asplanchna*-type, where this has become indistinguishable from the esophagus and virtually forms part of it. The dorsal antennæ are in nearly the same position as that of *Notommata*, but still retain the characteristic features of *Asplanchnidæ*; under sufficient magnification they are seen to be distinctly double, the two setigerous pits being about 8 μ apart. The well-developed, even though small, retrocerebral organ, the conspicuous foot and the small number of flame cells are all nearer the primitive type than in other members of the family. The animal is excessively transparent, and in its habits, as well as general appearance, resembles far more the *Notommatidæ* than its congener, the predacious and powerful *Asplanchnopus multiceps* (Schränk).

A few specimens of this species were found in the middle of August, 1911, on tide-swept flats at Four-Mile Run, near Washington. They occurred only at a certain stage of the outgoing tide, which seems to indicate that they came from the swampy region above the place where they were actually found. It has not been seen since.

TESTUDINELLA PARVA (Ternetz).

Pterodina parva TERNETZ, Rot. Umg. Basels, 1892, pp. 20, 42, pl. 3, figs. 21, 22.

Pterodina bidentata TERNETZ, Rot. Umg. Basels, 1892, pp. 20, 44, pl. 3, fig. 23.

Pterodina emarginata WIERZEJSKI, Bull. Acad. Sci. Cracovie (for 1892) 1893, p. 407.

Pterodina calcaris LANGER, Verh. Ver. Nat.- u. Heilkde., Pressburg, n. ser., vol. 19, 1909, p. 46, fig. 3.

Testudinella bidentata HARRING, Bull. 81 U. S. Nat. Mus., 1913, p. 100.

Testudinella parva HARRING, Bull. 81 U. S. Nat. Mus., 1913, p. 100.

In recent collections from Kenilworth this species has occurred in considerable numbers, and in all stages from the form with well-developed posterior teeth on the edge of the lorica to the toothless form, including specimens with the tooth present on one side and absent on the other. As one name must be dropped, and *parva* has page priority, apart from its being rather more suitable, it seems best to retain this as the specific name.

EXPLANATION OF PLATES.

All the figures are highly magnified; for actual measurements see text.

PLATE 34.

- Fig. 1. *Encentrum myriophylli*, lateral view; page 395.
2. *Encentrum myriophylli*, trophi, ventral view.
3. *Encentrum myriophylli*, trophi, right lateral view.
4. *Encentrum ricciae*, lateral view; page 396.
5. *Encentrum ricciae*, trophi, ventral view.
6. *Encentrum ricciae*, trophi, right lateral view.
7. *Encentrum aper*, lateral view; page 394.
8. *Encentrum aper*, dorsal view of head.
9. *Encentrum aper*, trophi, ventral view.
10. *Encentrum aper*, trophi, right lateral view.
11. *Diglena clastopis*, lateral view; page 397.
12. *Diglena clastopis*, trophi, ventral view.
13. *Diglena clastopis*, trophi, right lateral view.

PLATE 35.

- Fig. 1. *Monostyla sylvatica*, ventral view; page 399.
2. *Monostyla sylvatica*, dorsal view.
3. *Monostyla sylvatica*, lateral view.
4. *Lecane stichæa*, ventral view; page 397.
5. *Lecane stichæa*, lateral view.
6. *Lecane stichæa*, dorsal view.

PLATE 36.

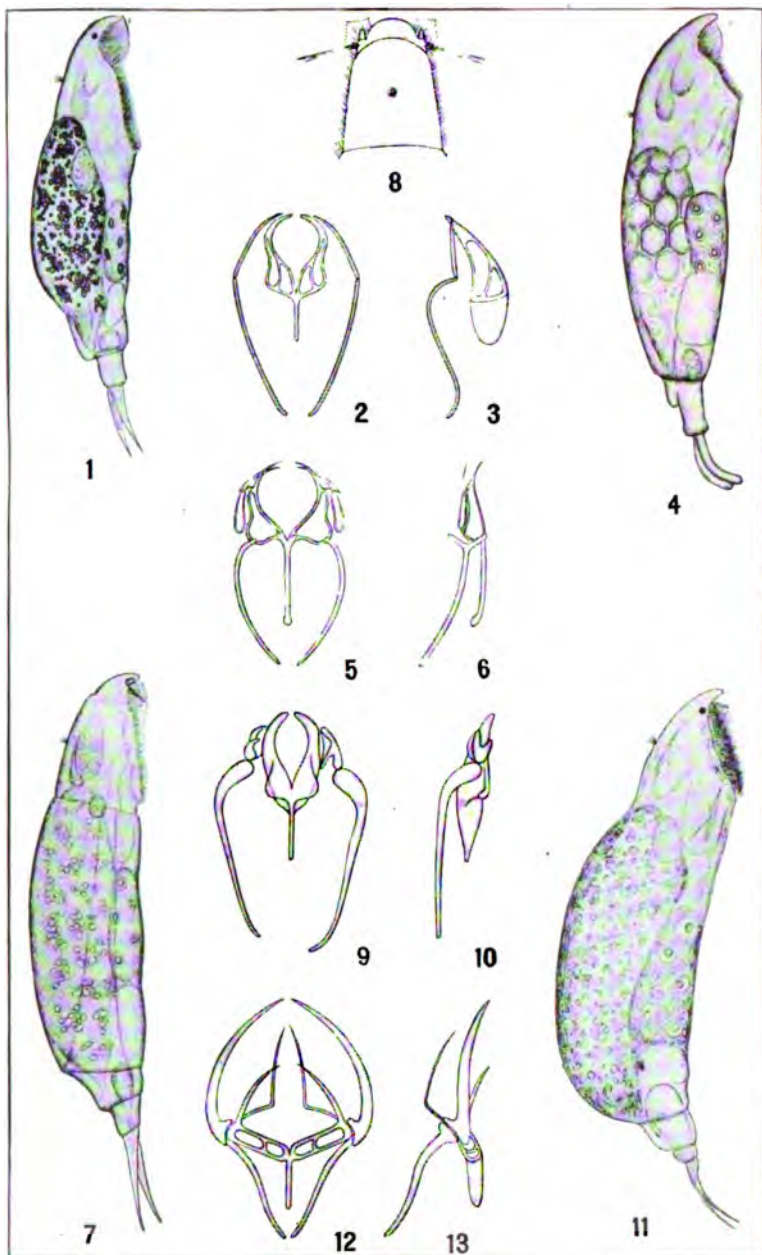
- Fig. 1. *Monostyla acus*, ventral view; page 398.
2. *Monostyla acus*, lateral view.
3. *Monostyla acus*, dorsal view.
4. *Monostyla crenata*, ventral view; page 399.
5. *Monostyla crenata*, lateral view.
6. *Monostyla crenata*, dorsal view.

PLATE 37.

- Fig. 1. *Rousseletia corniculata*, lateral view; page 393.
2. *Rousseletia corniculata*, trophi, ventral view.
3. *Rousseletia corniculata*, trophi, left lateral view.
4. *Sphyrias lofuana*, lateral view; p. 400.
5. *Sphyrias lofuana*, dorsal view.
6. *Sphyrias lofuana*, trophi, left lateral view.
7. *Sphyrias lofuana*, trophi, oblique frontal view.
8. *Sphyrias lofuana*, trophi, ventral view. .

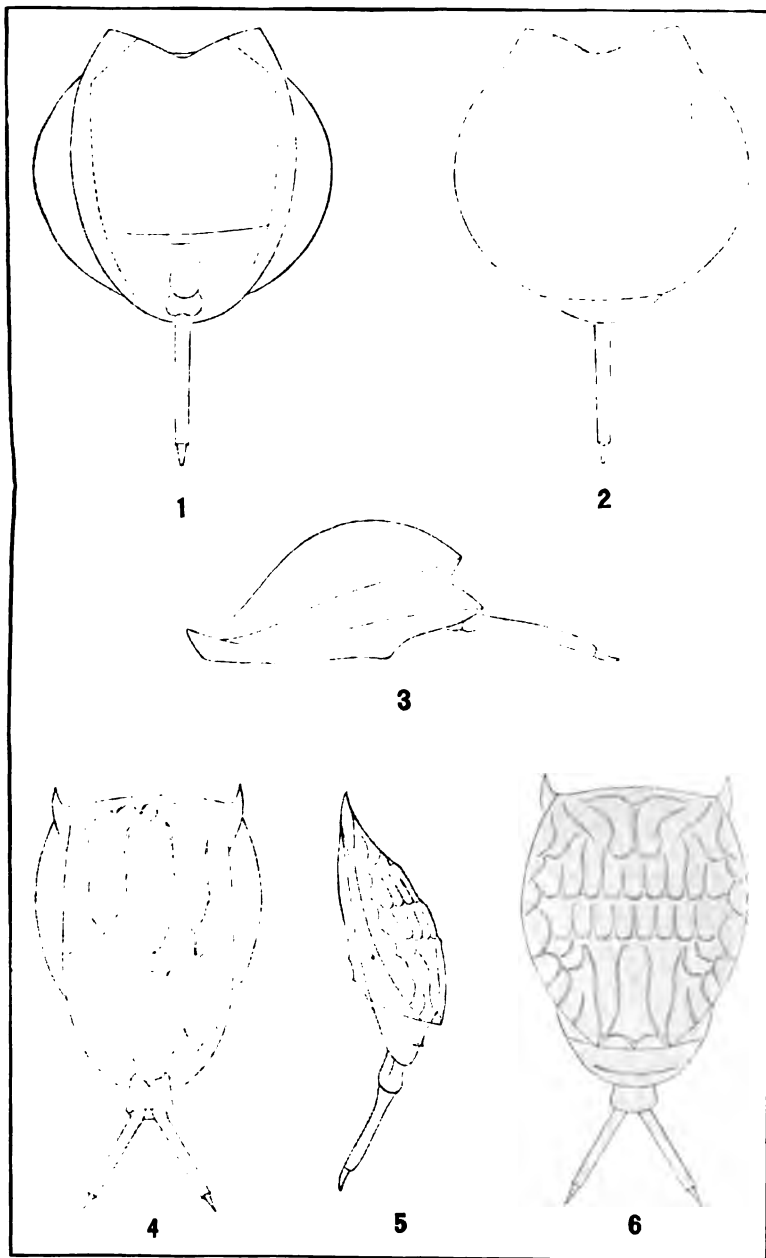
PLATE 38.

- Fig. 1. *Diurella porcellus*, lateral view; page 400.
2. *Trichotria brevidactyla*, lateral view; page 400.
3. *Asplanchnopus hyalinus*, lateral view; page 402.
4. *Asplanchnopus hyalinus*, trophi, ventral view.



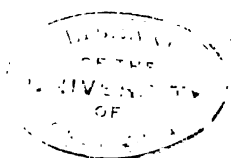
ROTATORIA OF WASHINGTON AND VICINITY.

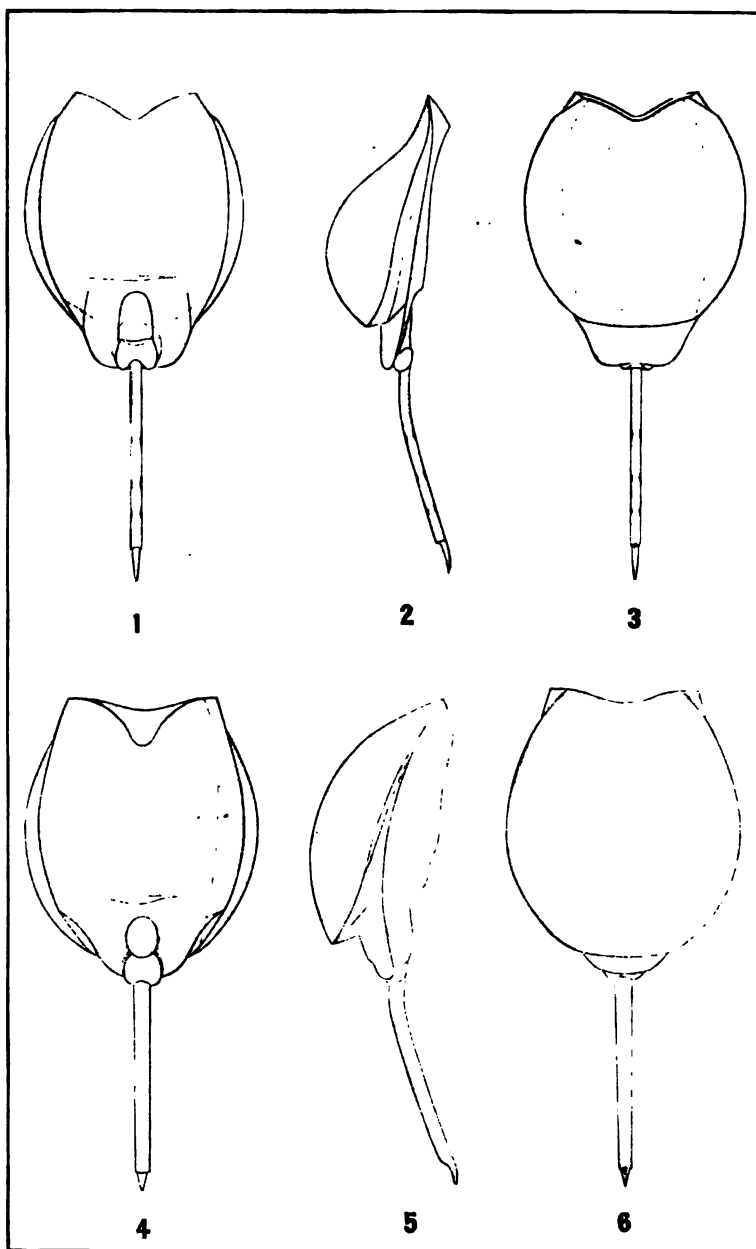
FOR EXPLANATION OF PLATE SEE PAGE 404.



ROTATORIA OF WASHINGTON AND VICINITY.

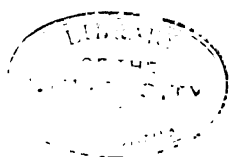
FOR EXPLANATION OF PLATE SEE PAGE 404.

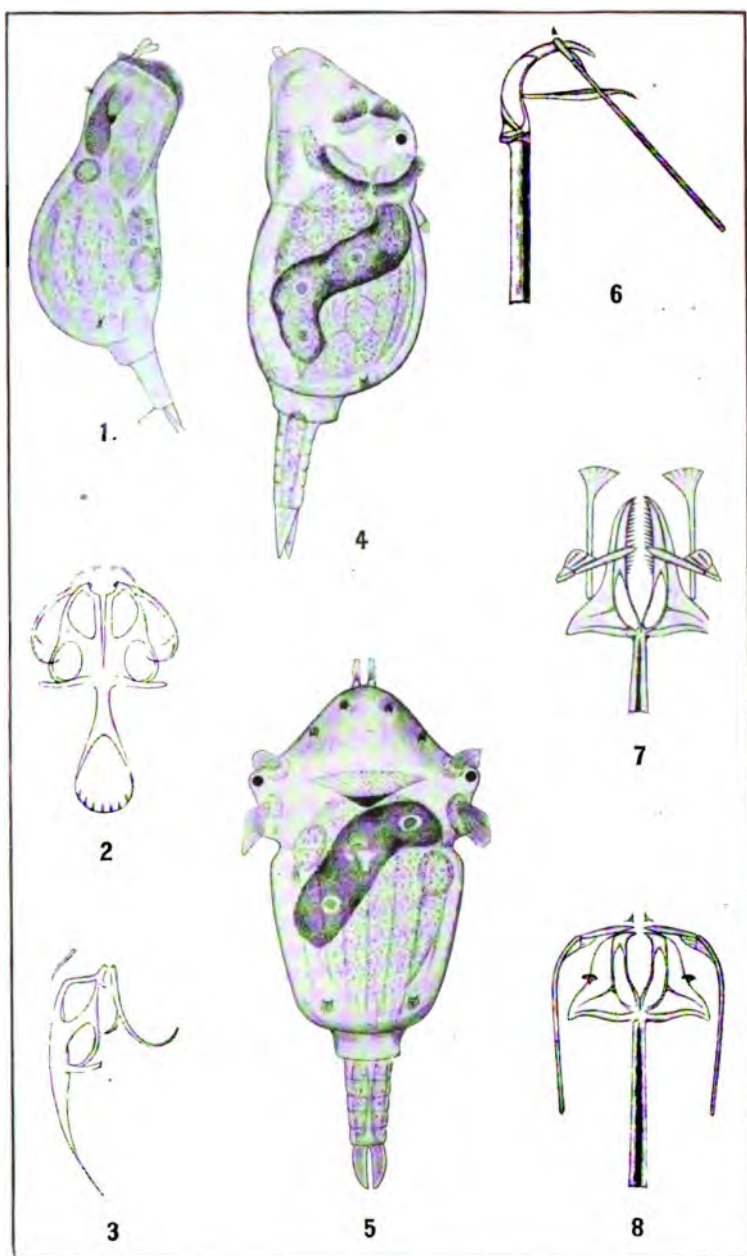




ROTATORIA OF WASHINGTON AND VICINITY.

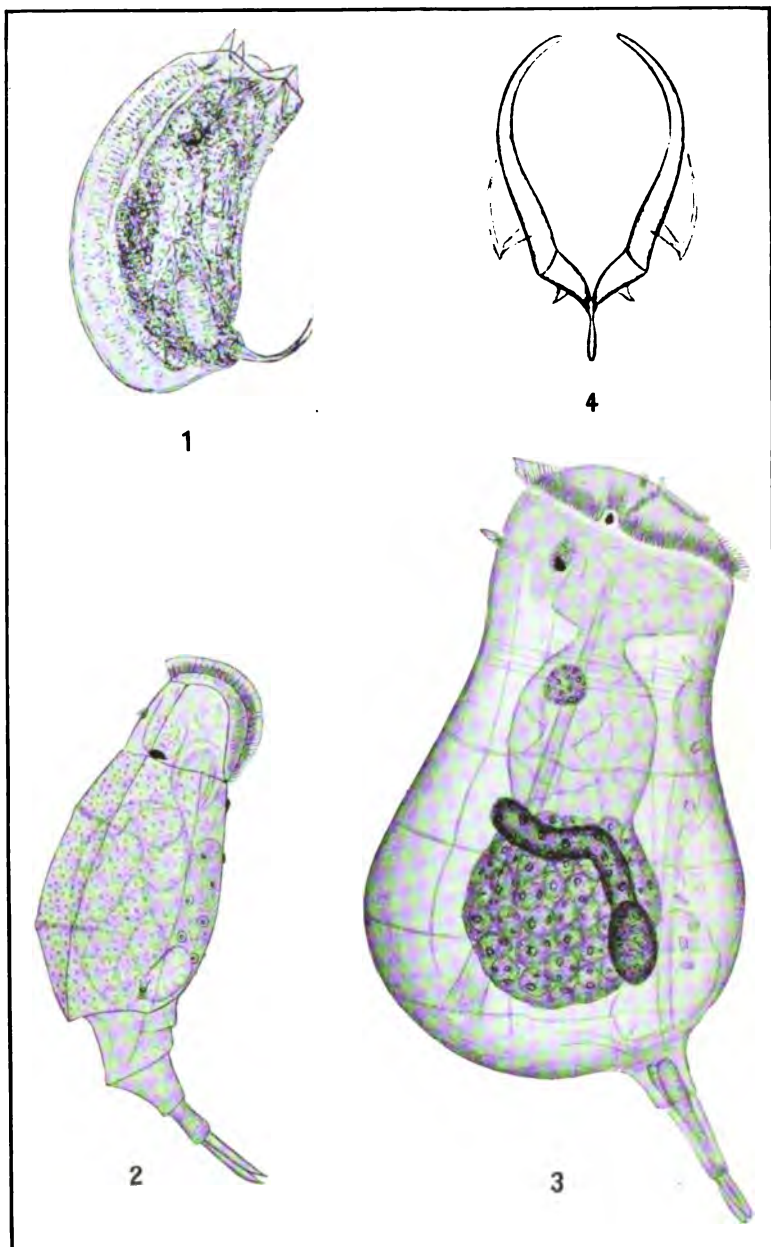
FOR EXPLANATION OF PLATE SEE PAGE 404.





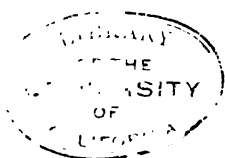
ROTATORIA OF WASHINGTON AND VICINITY.

FOR EXPLANATION OF PLATE SEE PAGE 405.



ROTATORIA OF WASHINGTON AND VICINITY.

FOR EXPLANATION OF PLATE SEE PAGE 405.



GAD-FLIES (TABANIDÆ) OF THE GENUS STIBASOMA.

By FREDERICK KNAB,

Custodian of Diptera, United States National Museum.

The genus *Stibasoma* was established by Schiner for certain American species distinguishable from *Tabanus* by their robust appearance, broad and thick abdomen, long process of the third antennal joint, curved and thickened anterior tibiæ, and the broadly ciliate hind tibiæ. These characters are not equally well developed in all the species of the genus, and there is, on the other side, an approximation toward them in certain species of *Tabanus*, so that the genus may be said to be a rather weakly defined one. This is shown by the fact that even recent authors have failed to properly place some of the species. Yet the genus seems to represent a natural group.

The genus is restricted to tropical America exclusive of the Antilles, ranging from Mexico to Uruguay. The position of the species recently described from Australia by Prof. J. Surcouf, under the name *Stibasoma hemiptera* (Bigot MSS.), is uncertain and must be excluded, his specimen lacking the antennæ.¹ The ciliation of the legs must be considered a very unimportant character and one that could have been evolved independently in different regions. Indeed, it is developed to different degrees in different species of *Stibasoma* and in *S. fulvohirtus* there is no distinct ciliation on the front and middle tibiæ. On the other hand, there is an approach to the condition of the hind tibiæ of *Stibasoma* in certain species of *Tabanus*, where we find a well-marked ciliation. The condition of the first posterior cell of the wing, which Surcouf seems to consider as diagnostic, is variable in *Stibasoma*, and in the same species may be slightly narrowed toward the margin or continue of equal width.

Recently some specimens belonging in the genus *Stibasoma* were received for identification, and it became necessary to consult the literature on the group. A synopsis was published by Miss Gertrude Ricardo in 1904,² in which six species were referred to the genus.

¹ Note sur un Diptère piqueur du genre *Stibasoma* Schiner, Bull. Mus. Nat. d'Hist. Nat., 1912, pp. 61-63.

² Ann. Mag. Nat. Hist., ser. 7, vol. 14, pp. 300-362.

Since then some species have been characterized, and in addition certain of the older species described in *Tabanus* can be referred here with certainty. One specimen before me proves to belong to an undescribed species. Brèthes has referred to *Stibasoma* Macquart's *Tabanus fenestratus*, but, as it would seem, wrongly.¹ None of the characters peculiar to the genus are mentioned by Macquart, and his figure shows the antennæ without the characteristic long process on the third antennal joint and no ciliation on the hind tibiæ.² Whether Professor Brèthes had another species before him or a wrong conception of the genus does not appear.

A series of five specimens of *Stibasoma fulvohirtus* before me, taken by Prof. F. W. Ulrich, in Trinidad, makes it evident that the coloration of the vestiture, which is given primary importance in the separation of the species by Miss Ricardo, is subject to considerable variation, and therefore unreliable. This will appear from the notes which follow under some of the species. The wing coloration appears to be the most constant color-character, and therefore is employed as far as possible in the following table:

TABLE OF THE SPECIES.

1. Wings in great part black.....	2
Wings not black.....	7
2. Wings pale at extreme tip, but without pale discal spot.....	3
Wings with a pale discal spot.....	4
3. Body entirely black.....	<i>willistonii</i> Lutz.
Abdomen with a yellow basal band.....	<i>theotsenia</i> (Wiedemann).
4. Discal spot extending to costa, yellow.....	<i>flavistigma</i> Hine.
Discal spot not extending to costa.....	5
5. Wings with discal spot "lurid".....	<i>mallophoroides</i> (Walker).
Wings with discal spot clear.....	6
6. Clear spot restricted to discal cell.....	<i>festivus</i> (Wiedemann).
Clear spot extending into second basal cell.....	<i>dyridophorum</i> , new species.
7. Wings clear, with two dark bands.....	<i>pachycephalum</i> Bigot
Wings yellow and gray.....	8
8. Wings yellow, gray on apical third.....	<i>tristis</i> (Wiedemann).
Wings gray along posterior margin.....	9
9. Body black, a yellow basal patch at sides of abdomen.....	<i>bicolor</i> Bigot.
Abdomen banded.....	10
10. Wings gray, yellow at base and anterior margin.....	<i>dives</i> (Walker).
Wings yellowish, gray at tip and along posterior margin.....	<i>fulvohirtus</i> (Wiedemann).

STIBASOMA WILLISTONII Lutz.

Stibasoma theotsenia WILLISTON (not Wiedemann), Kans. Univ. Quart., vol. 3, 1895, p. 194.

Stibasoma willistonii Lutz, Centralbl. Bakt., Abt. I, Orig., vol. 44, 1907, p. 143.

This species differs from *theotsenia* by the absence of the yellow band at the base of the abdomen. Williston had a single male, and suppos-

¹ Anal. Mus. Nac. Buenos Aires, ser. 3, vol. 13, p. 475, 1911.

² Dpt. exot., vol. 1, part 1, p. 135, pl. 16, figs. 3, 1833.

ing the difference to be sexual, referred it to *theotzenia*. Lutz states that he possesses many females which agree with this male in coloration, and therefore indicated a distinct species. The third antennal joint, in addition to the long dorsal process, shows an obtuse tooth on the lower side, although it is less marked than in the new species described below. Williston's specimen, which is before me, is from Chapada, in the interior of Brazil; Lutz records the species from Rio de Janeiro, São Paulo, and Santa Catharina.

As other species of *Stibasoma* show great variation in the coloration of the body vestiture, it is possible that *willistonii* is only a color variant of *theotzenia*. A comparison of structures, such as the shape of the antennæ, should decide this point.

STIBASOMA THEOTENZIA (Wiedemann).

Tabanus theotzenia WIEDEMANN, Aussereurop. zweifl. Ins., vol. 1, 1823, p. 136.

Stibasoma theotzenia SCHINER, Reise d. Novara, Dipt., 1868, p. 94.

Stibasoma thiotzenia LUTZ, Centralbl. Bakt., Abt. I, Orig., vol. 44, 1907, p. 143.

Lutz states that he possesses a male which differs from the female only in the sexual characters. Unknown to me. Reported from Brazil and Montevideo.

STIBASOMA FLAVISTIGMA Hine.

Stibasoma flavistigma HINE, Ohio Nat., vol. 12, 1912, p. 516.

Described from a female collected in Vera Cruz, Mexico. Unknown to me.

STIBASOMA MALLOPHOROIDES (Walker).

Tabanus mallophoroides WALKER, Trans. Ent. Soc. Lond., n. ser., vol. 4, 1857, p. 123.

This species is unknown to me in nature, but its position is obvious from the description. Walker mentions not only the short stout body, but also the long process of the third antennal joint and the ciliation of the tibiæ. Furthermore, he states: "Allied to *T. festivus*, Wied." Amazon region.

STIBASOMA FESTIVUS (Wiedemann).

Tabanus festivus WIEDEMANN, Aussereurop. zweifl. Ins., vol. 1, 1823, p. 135.

Tabanus festivus WILLISTON, Kans. Univ. Quart., vol. 3, 1895, p. 195.

Through the courtesy of the American Museum of Natural History, I have before me Professor Williston's specimen, and, although the antennæ are broken, there can be no doubt that it is a typical *Stibasoma*. The specimen, a female, agrees in every respect with Wiedemann's description, except that the ciliation on the outer side of the hind tibiæ is yellow instead of snow-white, as indicated by Wiedemann. The specimen is from Chapada, Brazil.

STIBASOMA DYRIDOPHORUM, new species.

Body and legs dark, with black vestiture, the abdomen with yellow lateral patches at base; wings black, with the tips and a discal spot hyaline.

Female.—Antennæ black; third joint with an obtuse but prominent tooth on the lower side, and above with a long, thick process, slightly enlarged toward apex, rounded at tip, and reaching nearly to the apex of the third annulation. Frons narrow, nearly parallel-sided, the frontal callosity convex, elongate subovate, as wide as the frons, continued upward by a raised line which becomes obsolete toward the vertex. Face whitish pruinose. Cheeks with long black ciliation. Palpi black.

Thorax blackish brown, clothed with black hair, two indistinct reddish lines on the dorsum; humeri and ante-alar callosities yellowish brown; pleuræ brown, with black hair, a small tuft of snow-white hair close before wing insertion. Scutellum reddish brown, darker in the middle, with black hair (mostly rubbed off).

Abdomen dorsally reddish brown, the first and second segments pale, with dense lateral tufts of long sulphur-yellow hair and a mixture of black and yellow hair on the disk (somewhat abraded), the black hairs predominating; hind margin of second segment and all of the succeeding segments densely black haired. Venter ferruginous, the second and third segments with large quadrate lateral patches of dense sulphur-yellow hair, which are joined to the yellow patches of the dorsum; the remaining vestiture ferruginous, with some black hairs intermixed at the sides posteriorly, a tuft of black hair medianly at the base of the second segment.

Legs reddish brown, the front tibiæ thickened and blackish on the distal two-thirds; vestiture black, the hind tibiæ with long black ciliation with ferruginous luster on outer side and shorter bright ferruginous ciliation on inner side; hind tarsi with ferruginous hair. Claws black. Pulvilli and empodia yellow.

Wings rather narrow, smoky black, a triangular hyaline spot in the middle of the second submarginal cell, an elongate hyaline spot occupying most of the discal cell and extending well over into the second basal cell. Halteres with a pale greenish knob.

Length: Body about 14 mm.; wing 12 mm.

Trinidad, West Indies (P. L. Guppy).

Type.—Cat. No. 16362, U.S.N.M.

A single specimen sent by Prof. F. W. Urich, with the note "Followed the collector persistently."

The abdomen is more slender and tapering than usual in this genus, but this is no doubt due to the fact that the specimens had not fed. The obtuse tooth on the under side of the third antennal joint is present also in *S. willistonii*, although developed to a less degree. No such tooth exists in *S. fulvohirtus*.

STIBASOMA PACHYCEPHALUM Bigot.

Stibasoma pachycephalum BIGOT, Mém. Soc. Zool. France, vol. 5, 1892, p. 636.

Tabanus chionostigma OSTEN SACKEN, Biol. Centr. Amer., Dipt., vol. 1, 1886, p. 54, pl. 1, fig. 11.

This species is unknown to me, but from a comparison of the descriptions of Bigot and of Osten Sacken, and the latter's figure, the above synonymy is indicated. The figure in the *Biologia* shows a characteristic *Stibasoma*, except that the thickening of the fore tibiae is not distinctly shown. This may be easily due to oversight by the artist. The detailed figure of the antenna shows the usual process of the third joint, reaching beyond the second annulation and rounded at the tip. The descriptions do not wholly agree, but I believe the differences can be safely attributed to the individualities of the authors and more particularly to the superficiality of Bigot. Bigot's two specimens were from Mexico, Osten Sacken's specimen from Panama, Vera Paz, Guatemala.

STIBASOMA NICOLOR Bigot.

Stibasoma bicolor BIGOT, Mém. Soc. Zool. France, vol. 5, 1892, p. 636.

Stibasoma bicolor RICARDO, Ann. Mag. Nat. Hist., ser. 7, vol. 14, 1904, pp. 361, 362

Described from Brazil. Unknown to me. Miss Ricardo calls the wings hyaline, but Bigot distinctly states that they are gray; in other respects their descriptions agree. It is possible that in the specimen seen by Miss Ricardo the color of the wings was poorly developed. The coloration of the body appears to be much like *dyridophorum*, while the wings resemble those of *dives*.

STIBASOMA DIVES (Walker).

Tabanus dives WALKER, List Dipt. Brit. Mus., vol. 1, 1848, p. 166.

Stibasoma dives RICARDO, Ann. Mag. Nat. Hist., ser. 7, vol. 14, 1904, pp. 361, 362.

Described from the Amazon. Unknown to me. Apparently resembles *fulvohirtus* in many respects.

STIBASOMA TRISTIS (Wiedemann).

Tabanus tristis WIEDEMANN, Aussereurop. zweifl. Ins., vol. 1, 1828, p. 164.

Stibasoma tristis SCHINER, Reise d. Novara, Dipt., 1868, p. 94.

Brazil. Unknown to me.

STIBASOMA FULVOHIRTUS (Wiedemann).

Tabanus fulvohirtus WIEDEMANN, Aussereurop. zweifl. Ins., vol. 1, 1828, p. 155.

Tabanus compactus WALKER, List Dipt. Brit. Mus., vol. 5, 1854, p. 222.

Stibasoma fulvohirtum SCHINER, Reise d. Novara Dipt., 1868, p. 94.

Stibasoma fulvohirtum OSTEN SACKEN, Biol. Centr. Amer., Dipt., vol. 1, 1886, p. 57.

Five females from Trinidad, sent by Prof. F. W. Urich, are before me, and show remarkable variation in body coloration. Two of these, like Wiedemann's type, have the mesonotum and scutellum densely clothed with bright ferruginous yellow hair; these have the first

abdominal segment clothed with hair of the same color, while the succeeding segments are black-haired, with apical fringes of white hair. Wiedemann states that the abdomen of his specimen was dorsally yellow-haired in its whole length, with white segmental bands, and only the venter black-haired and white-banded. The three other specimens from Trinidad have the mesonotum and scutellum black-haired, with only some small tufts of pale brownish hair on the anterior and posterior angles; in these specimens the base of the abdomen is likewise black-haired. One of the three last described specimens even has the pleuræ black-haired, while in the other two the pleuræ are fulvous-haired. All five specimens agree in the coloration of the wings, which appears to be very constant, and also in the disposition of the black and white vestiture of the tibiæ. The specimens of Walker and Osten Sacken agree with the two first mentioned, while Schiner's specimen apparently belonged to the black form. Osten Sacken has discussed an equally extreme variation in the thoracic vestiture of *Tabanus atratus*.¹ *Stibasoma fulvohirtus* has been previously recorded from Brazil (Wiedemann), Ega (Teffé) on the upper Amazon (Walker-Ricardo), Colombia (Schiner), and Panama (Osten Sacken).

¹ Mem. Boston Soc. Nat. Hist., vol. 2, 1875, p. 455.

REVISION OF THE BATS OF THE GENUS GLOSSOPHAGA.

By GERRIT S. MILLER, Jr.,

Curator, Division of Mammals, United States National Museum.

The first American leaf-nosed bat to be described in detail was the *Vespertilio soricinus* of Pallas, now the type of the genus *Glossophaga*, an animal which attracted special attention by its small size, shrew-like head, and conspicuously extensible tongue. Pallas wrote two accounts of the species, the first¹ based on a female, the second² on a male. Although the external characters and the general anatomy are treated with unusual minuteness, and no less than four plates are partly or wholly devoted to the animal, no exact determination of the original *Vespertilio soricinus* is possible. Two species, one of them recently described as *G. longirostris*, are now known to inhabit the region from which Pallas received his material, and not one of the characters described or figured is diagnostic. The name has, however, been uniformly applied for about 50 years³ to the more widely distributed and better known of the two animals, while there is nothing in either of the accounts given by Pallas which definitely points to any other conclusion. Therefore no change is required.⁴

During the first half of the nineteenth century a few synonyms were applied to *Glossophaga soricina*, principally because of failure to understand the characters described by Pallas. The history of this period was so fully treated by Peters in 1865 that it needs no special mention here. In 1896 and 1897 two more names were added to the synonymy of true *soricina*, apparently because the larger Mexican race was supposed to be the typical form. Local insular forms were

¹ *Miscellanea Zoologica*, pp. 48-53, pl. 4, figs. 16-18, pl. 5. 1766.

² *Spiloglegia Zoologica*, fasc. 3, pp. 24-35, pl. 2, pl. 4, figs. 1-10. 1767.

³ Peters, *Monatsber. k. preuss. Akad. Wiss. Berlin*, 1865, pp. 351-354, and 1868, pp. 352-353; Debacon, *Cat. Chir. Brit. Mus.*, 1878, pp. 499-501 (description and most of the listed specimens); Miller, *Proc. Acad. Nat. Sci. Philadelphia*, 1898, pp. 330-333; all subsequent writers who have distinguished between *G. soricina* and *G. longirostris*.

⁴ It might be urged that the measurement of the forearm published in the *Miscellanea* is more likely to apply to *G. longirostris* than to *G. soricina*. It is 1 inch 5½ lines—37 mm. In the common South American form of *soricina* the length of forearm ranges from 33 to 36.6 mm., in *G. longirostris* from 34.6 to 39.4 mm. Half a millimeter is obviously too slight a discrepancy to receive serious consideration. In the second specimen measured by Pallas the length of forearm is 34 mm.

made known in 1898 and 1902. The continental member of the *longirostris* group was distinguished from *Glossophaga soricina* in 1898, while the two insular forms, one specifically distinct, the other differing from the mainland animal by average characters only, were described respectively in 1900 and 1913.

The material on which this revision is based consists of about 700 specimens.¹ It appears to be sufficiently complete to form the basis for definite general conclusions, though much evidently remains to be learned regarding details. The genus contains two superspecific groups, the less modified but more wide-ranging *soricina*-group with six forms distinguishable by average characters only, and the more specialized *longirostris*-group with three forms, two of which are sharply differentiated. In range the *soricina*-group covers the entire continent from Paraguay and southern Brazil to Durango, Mexico, with one insular form on the Tres Marias Islands and another in Jamaica; the *longirostris*-group appears to be restricted to the coast region of northern South America and the adjacent islands (Curaçao and the southern Lesser Antilles).

The species and subspecies here recognized, with their type-localities, are as follows:

(*Soricina*-group.)

Glossophaga soricina (Pallas) (p. 415).

Glossophaga soricina soricina Pallas (p. 418). Surinam.

Glossophaga soricina microtis, new subspecies (p. 419). Sapucay, Paraguay.

Glossophaga soricina leachii (Gray) (p. 419). Realajo, Nicaragua.

Glossophaga soricina mutica (Merriam) (p. 420). Maria Madre Island, Tres Marias Islands, Mexico.

Glossophaga soricina valens, new subspecies (p. 420). Balsas, Cajamarca, Peru.

Glossophaga soricina antillarum Rehn (p. 420). Port Antonio, Jamaica.

(*Longirostris*-group.)

Glossophaga longirostris Miller (p. 421).

Glossophaga longirostris longirostris Miller (p. 422). Santa Marta, Colombia.

Glossophaga longirostris rostrata (Miller) (p. 423). Grenada, Lesser Antilles.

Glossophaga elongata Miller (p. 423). Willemstad, Curaçao.

Genus GLOSSOPHAGA Geoffroy.

1818. *Glossophaga* GEOFFROY, Mém. Mus. Hist. Nat. Paris, vol. 4, p. 418.

1838. *Phyllophora* GRAY, Mag. Zool. and Bot., vol. 2, p. 489 (*amplexicauda*=*soricina*).

1847. *Nicon* GRAY, Proc. Zool. Soc. London, p. 15 (*caudifer*=*soricina*; wrongly supposed by Gray to be identical with the *caudifer* of Geoffroy).

1868. *Glossophaga* PETERS, Monatsber. k. preuss. Akad. Wiss. Berlin, p. 362.

1907. *Glossophaga* MILLER, Fam. and Gen. Bats, p. 137. June 29, 1907.

Type-species.—*Vespertilio soricinus* Pallas.

Geographic distribution.—Warmer parts of America from Paraguay and southern Brazil to central Mexico; Jamaica; Lesser Antilles.

¹ U. S. National Museum, 564; Field Museum of Natural History, 108; American Museum of Natural History, 22; Museum of Comparative Zoology, 9.

Diagnosis.—Glossophagine bats with: (a) thirty-four teeth i. $\frac{2-2}{2-2}$, c. $\frac{1-1}{1-1}$, pm. $\frac{2-2}{3-3}$, m. $\frac{3-3}{3-3}$ —34, (b) incisors both above and below in unbroken series, (c) complete zygoma, and (d) short tail extending barely to middle of wide uropatagium.

Remarks.—The genus *Glossophaga* contains the most widely distributed and best-known members of the family. Though superficially much resembled by *Lichonycteris* and *Lonchophylla* the genus is at once recognizable by its technical characters.

Key to the species and subspecies of Glossophaga.

Outer upper incisor about equal to inner in bulk; upper premolars essentially alike in crown outline when viewed from below.

Brain case narrow and low, its dorsal profile usually not forming evident angle with that of rostrum in interorbital region (Curaçao).....*elongata* (p. 423).

Brain case broad and high, its dorsal profile usually forming evident angle with that of rostrum in interorbital region (Northern South America and southern Lesser Antilles).....*longirostris* (p. 421).

Width of m_2 about one-third length; inflation of brain case extreme (Northern South America).....*longirostris longirostris* (p. 422).

Width of m_2 about one-half length; inflation of brain case not extreme (Grenada and Grenadines).....*longirostris rostrata* (p. 423).

Outer upper incisor obviously less than inner in bulk; upper premolars usually unlike in crown outline when viewed from below.....*soricina* (p. 415).

Length of forearm 33 to 36.6 mm.; condylobasal length of skull usually less than 20.6 mm. (18.6 to 21).

Condylobasal length of skull 19.8 to 21 mm.

(Panama to central Mexico).....*soricina leachii* (p. 419).

Condylobasal length of skull 18.6 to 20 mm.

Ear from meatus 14 to 15 mm. (Brazil, eastern Peru, British Guiana, Venezuela, Trinidad).....*soricina soricina* (p. 418).

Ear from meatus 13 to 14 mm. (Paraguay).....*soricina microtis* (p. 419).

Length of forearm 35.4 to 40 mm.; condylobasal length of skull usually more than 20.6 mm. (20.6 to 21.4).

Brain case conspicuously inflated; rostrum more robust (central and western Peru).....*soricina valens* (p. 420).

Brain case moderately inflated; rostrum less robust.

Crown area of molars normal (Tres Marias Islands). *soricina mutica* (p. 420).

Crown area of molars slightly increased (Jamaica). *soricina antillarum* (p. 420).

GLOSSOPHAGA SORICINA (Pallas).

(Synonymy under subspecies.)

Geographic distribution.—Tropical America from Paraguay and southern Brazil to central Mexico; also the islands of Trinidad, Jamaica, and the Tres Marias group.

Diagnosis.—Skull usually less than 21 mm. in condylobasal length (18.6 to 21.6 mm.), its rostral portion small, appearing much shorter than brain case; outer upper incisor distinctly less than inner in bulk; pm^3 and pm^4 noticeably unlike in crown outline.

Color.—General color of upper parts cinnamon (Ridgway, color

standards, pl. 29) mixed with black, the combination of different hues of cinnamon with different admixtures of black giving rise to many degrees of individual variation. These variations tend to group themselves around two extremes, in one of which the general effect is between bister and black, in the other snuff-brown or royal-brown. Direct intermediates between the blackish and rich reddish phases are rare or absent, but the two extremes may be connected by a series of specimens showing gradually paling tints leading to a neutral condition which can not be definitely referred to one phase rather than to the other. In extreme neutral specimens the snuff-brown or bister, is reduced to a wash overlying the pale-pinkish-cinnamon under color which everywhere appears conspicuously at surface. Under parts slightly less dark than back, often with a tinge of drab. Membranes (dry) an indefinite dark brown; ears not so dark as membranes.

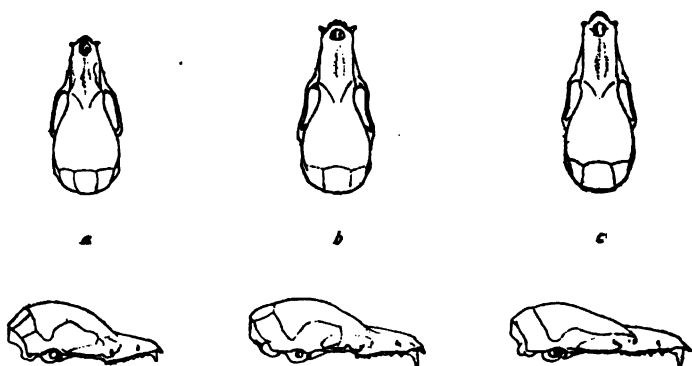


FIG. 1.—DORSAL AND LATERAL VIEWS OF SKULL: *GLOSSOPHAGA SORICINA* (a), *G. LONGIROSTRIS* (b), AND *G. ELONGATA* (c). ALL NATURAL SIZE.

Skull.—The general features of the skull (fig. 1a) are too well known to require special description.¹ Variation in size is not conspicuous. Taking the species as a whole the condylobasal length varies 3 mm., or 14.9 per cent of the mean. In each of two of the smaller races, *soricina* and *leachii*, the variation is 1.2 mm., or, respectively, 6.2 and 5.9 per cent, while in the large Peruvian form it is 1 mm., or 4.7 per cent. The Peruvian animal is not represented by so many specimens as the others. Hence the percentage of variation is probably too low. With sufficient material it may be expected to be about 6 per cent in any race. The breadth of brain case appears to be more variable than the length of skull, though the actual measurements show that such is not the case. In the two small races, *soricina* and *leachii*, the extremes are 0.6 and 0.4 mm. apart, or respectively, 6.9 and 4.5 per cent of the mean for each form. In the larger Peruvian animal the variation is the same as in *leachii*. Referred to the mean condylobasal

¹ See H. Allen, Trans. Amer. Philos. Soc., N. S., vol. 19, p. 243, pls. 6 and 7, 1906. Miller, Fam. and Gen. Bats, p. 138, June 29, 1907.

length the percentages of variation for the three forms are 3.1, 2—, and 1.9. The greater apparent variation in breadth is due to the fact that the widened region extends further forward in some individuals than in others, thus probably causing appreciable differences in the capacity of the brain case. While some of the narrower skulls bear a slight resemblance to those of *Glossophaga longirostris* the likeness is superficial, since the relative lengths of rostrum and brain case are always noticeably different in the two species.

Teeth.—Like the skull, the teeth have already been sufficiently described so far as their general features are concerned. Regarding the upper incisors and the premolars a few details are required.

When viewed either from the front, from behind, or on the cutting edge, the outer upper incisor of each pair is seen to be an obviously smaller tooth than the inner. Exact comparison of bulk is difficult, owing to the greater obliquity of the cutting edge of the outer tooth, but the difference, perhaps chiefly due to these peculiarities in obliquity, is always appreciable, the apparent size of the larger tooth exceeding that of the other by one-fifth or one-fourth. It becomes more evident as the cutting edges of the teeth wear down, in a few individuals approaching the proportion of 1 to 2. Anterior upper premolar narrowly elliptical in crown outline, the width at middle about one-third the length, the outer and inner borders nearly parallel, the former usually a little concave, the latter apparently always perceptibly convex; width of region in front of cusp less than that behind, but contrast not conspicuous. Posterior upper premolar with crown outline, except in rare instances, unlike that of first, the width at middle nearly half the length, the outer border and region in front of cusp much as in the anterior tooth, but postero-internal portion of crown so developed inward as to destroy the symmetry of the outline. This postero-internal projection varies considerably in extent; usually its border is rounded, though not infrequently it forms an acute angle, while in rare instances it is sharply limited posteriorly by an evident notch; cingulum in most specimens well developed, though never forming a cusp.

Measurements.—See under subspecies.

Remarks.—Although the species as a whole is not invariably distinguishable from its allies by small size alone, this character is usually diagnostic in northern South America, the only region where two members of the genus (*longirostris* and the small typical race of *soricina*) are known to occur together. Exact determination of specimens is not practicable without recourse to cranial and dental characters.

In its three large races (*antillarum*, *mutica*, and *valens*) *Glossophaga soricina* appears to present an instance of the independent development of nearly identical characters in isolated localities so far apart

as Jamaica, the Tres Marias Islands, and northern Peru. While there is no difficulty in distinguishing each large form from its geographically nearest small form, the characters of the large races as compared with each other are so slight that if all the known specimens of the three were mixed together without labels they would not appear to make an unusually variable form. On close study slight average characters can be detected, and in view of the obviously independent origins of the three it seems best to recognize each as a distinct race.

GLOSSOPHAGA SORICINA SORICINA (Pallas.)

1766. *Vespertilio soricinus* PALLAS, *Miscellanea Zoologica*, p. 48.

1767. *Vespertilio soricinus* PALLAS, *Spicilegia Zoologica*, fasc. 3, p. 24.

1818. *Glossophaga amplexicauda* GEOFFROY, *Mém. Mus. Hist. Nat.*, Paris, vol. 4, p. 418. (Rio Janeiro).

1823. *Glossophaga amplexicaudata* SPLX, *Sim. et Vesp. Brasil sp. nov.*, p. 67. (Rio Janeiro).

1843. *Phyllophora nigra* GRAY, *Cat. Mamm. Brit. Mus.*, p. 20 (nomen nudum). Brazil.

1844. *Phyllophora nigra* GRAY, *Voyage of the Sulphur*, Zool., vol. 1, p. 18, pl. 5, fig. 1. Tropical America [=Brazil]. Based on same specimen as the nomen nudum. (Volume not seen; reference verified by Witmer Stone.)

1896. *Glossophaga villosa* H. ALLEN, *Proc. U. S. Nat. Mus.*, vol. 18, p. 779. (Probably Guiana or Venezuela¹). Not of Rengger, 1830. Type in U. S. Nat. Mus.

1897. *Glossophaga truci* H. ALLEN, *Science*, U. S., vol. 5, p. 153. January 22, 1897. (Substitute for *villosa* H. Allen.)

Type-locality.—Dutch Guiana. No locality is mentioned in the first account of the species. In the *Spicilegia* (p. 24) Pallas says that he has seen specimens from Surinam and the Caribbean Islands.² I have therefore chosen Dutch Guiana as the type locality.³ Type specimen probably lost.⁴

Geographic distribution.—Tropical America from southern Brazil to Trinidad and the coast of Colombia; west to eastern Peru.

Diagnosis.—Size minimum for the genus (forearm, 33 to 37 mm.; condylobasal length of skull, 18.6 to 19.8 mm.); ear normal, its height from meatus, 14 to 15 mm.

Measurements.—For detailed measurements see table, page 425.

Specimens examined.—Eighty-three, from the following localities:

BRAZIL—*Sao Paulo*: San Sebastiao, 4 skins (U.S.N.M. and Field). *Goyaz*: Baiao, Rio Tocantins, 1 skin (Field); Catema, Rio Tocantins, 1 skin (Field). *Maranhao*: Maranhao City, 3. *Brazilian Guiana*: Faro, Rio Jamunda, 2 skins (Field).

PERU—*Loreto*: Moyobamba, 16 (5 skins), Field.

BRITISH GUIANA. Berbice, 1.

¹ See Lyon and Osgood, *Cat. Type-Sp. Mamm. U. S. Nat. Mus.*, p. 264. January 23, 1900.

² Inter *Vespertiliones* . . . haec species in calidioribus Americae tractibus non infrequens esse videtur, quippe quam Surinamo et e Caribaeis insulis saepiuscula adlatam vidi.

³ Bull. U. S. Nat. Mus., No. 79, p. 39. December 31, 1912.

⁴ Peters, *Monatber. k. preuss. Akad. Wiss. Berlin*, 1865, pp. 353-354.

VENEZUELA. Maracay, Oragua, 1; San Julian, near La Guaira, 5 skins and 1 extra skull; "Guayara," 2 (type and paratype of *truci* H. Allen).

TRINIDAD. Port of Spain, 41.

COLOMBIA. Bonda, 5 (Am. Mus.).

GLOSSOPHAGA SORICINA NICROTIS, new subspecies.

Type.—Adult female (in alcohol). No. 115061 U.S.N.M. Collected at Sapucay, Paraguay, June, 1901, by William Foster. Original No. 66.

Geographic distribution.—Paraguay. Limits of range not known.

Diagnosis.—Like *Glossophaga soricina soricina*, but with ear reduced in size, its height from meatus 13 to 14 mm.

Measurements.—For detailed measurements see table, page 426.

Specimens examined.—Twelve, from the following localities in Paraguay: Sapucay, 6 (3 skins); Villa Rica, 6.

GLOSSOPHAGA SORICINA LEACHII (Gray).

1844. *Monophyllus leachii* GRAY, Voyage of the *Sulphur*, Zool., vol. 1, p. 18. (Volume not seen; reference verified by Witmer Stone.)

1847. N[icon] *caudifer* GRAY, Proc. Zool. Soc. London, p. 15 (renaming of *leachii* wrongly supposed to be identical with the *Glossophaga caudifer* of Geoffroy¹).

Type-locality.—Realejo, Nicaragua. Type-specimen in British Museum (O. Thomas, in recent letter).

Geographic distribution.—From Panama north to central Mexico (Durango and Tamaulipas).

Diagnosis.—Like *Glossophaga soricina soricina*, but skull very constantly longer, its condylobasal length ranging from 19.8 to 21 mm.

Measurements.—For detailed measurements see table, page 426.

Specimens examined.—Three hundred and thirty-three from the following localities:

PANAMA. Balboa, 5 skins (Field); Canal Zone, 16; Colon, 3; Paraiso, 22; no exact locality, 2.

COSTA RICA. Boqueron, 21 (Am. Mus. and Field); San José, 2.

NICARAGUA. Escondido River, 50 miles from Bluefields, 2; Granada, 1 (Field).

BRITISH HONDURAS. Stann Creek, 4.

MEXICO. *Campeche*: Apazote, 2 (1 skin); La Tuxpana, Champoton, 3. *Tabasco*: Montecristo, 7 (6 skins). *Ohiapas*: Ocuilapa, 1; Tuxtla, 1. *Oaxaca*: Chicapa, 3 (2 skins); Huilotepec, 1; Llano Grande, 6; Oaxaca City, 2; Pinotepa, 39 (4 skins); Puerto Angel, 2 (skins); San Geronimo, 5 skins (Field); Santa Efiginea, 2 (1 skin); Tuxtepec, 3 (1 skin). *Vera Cruz*: Achotal, 36 (7 skins), (Field); Catemaco, 11 (1 skin); Jaltipan, 2 (skins); Mirador, 3; no exact

¹ "N. *caudifer*, Leach's Nicot—*Glossophaga caudifer*, Geoff. Mem. Mus. IV. 418. t. 17—*Monophyllus leachii*, Gray, Zool. Sulph. 18. *Tab. Central America*." The generic diagnosis of *Nicon* contains the characters of *Glossophaga* only. Geoffroy's *caudifer* is a *Lonchoglossa*.

locality, 19 (5 skins). *Puebla*: Tuchtenan, 1 (skin). *Morelos*: Cuernavaca, 18 (4 skins); 20 miles south of Cuernavaca, 19. *Oaxima*: Manzanillo, 1. *Jalisco*: Ameca, 4. *Tepic*: Acaponeta, 2; San Blas 27 (4 skins); Santiago, 3. *Sinaloa*: Plomosas, 4; Rosario, 1. *Durango*: Chacala, 25. *Tamaulipas*: Altamira, 2.

GLOSSOPHAGA SORICINA MUTICA (Merriam).

1898. *Glossophaga mutica* MERRIAM, Proc. Biol. Soc. Washington, vol. 12, p. 18. January 27, 1898.

Type-locality.—Maria Madre Islands, Tres Maria Islands, State of Jalisco, Mexico. Type-specimen in United States National Museum.

Geographic distribution.—Tres Marias Islands.

Diagnosis.—Like *Glossophaga soricina leachii* of the adjacent mainland but larger, the forearm ranging in 27 adults from 36 to 39 mm. (instead of from 33 to 37 mm. in 123 specimens), the condylobasal length of skull usually more than 20.6 mm. (range in 12 skulls from 20.6 to 21, while in 32 skulls of *leachii* the length of 20.6 is attained only 9 times and exceeded only 5 times); skull rather slender, the brain case not specially inflated, the rostrum weak, and the interorbital swellings inconspicuous.

Measurements.—For detailed measurements see table, page 427.

Specimens examined.—Thirty-three (4 skins), all from Maria Madre Island.

GLOSSOPHAGA SORICINA VALENS, new subspecies.

Type.—Adult female (in alcohol) No. 19868 Field Museum of Natural History. Collected at Balsas, Province of Cajamarca, Peru, by W. H. Osgood and M. Anderson. Original No. 4723.

Geographic distribution.—Central and western portions of northern Peru. (Balsas, Charapex, Zorritos.¹)

Diagnosis.—Very similar to *Glossophaga soricina mutica*, but skull with more inflated brain case, heavier rostrum, and more prominent interorbital swellings.

Measurements.—For detailed measurements see table, page 428.

Specimens examined.—Thirty-three, from the following localities in Peru: Balsas, Province of Cajamarca, 29 (2 skins), Field; Charapex Province of Piura, 4.

GLOSSOPHAGA SORICINA ANTILLARUM Rehn.

1902. *Glossophaga soricina antillarum* REHN, Proc. Acad. Nat. Sci. Philadelphia, p. 37. April 23, 1902.

1913. [*Glossophaga*] *antillarum* MILLER, Proc. Biol. Soc. Washington, vol. 26, p. 32. February 8, 1913.

Type-locality.—Port Antonio, Jamaica. Type-specimen in Academy of Natural Sciences of Philadelphia.

Geographic distribution.—Jamaica.

¹ The measurements of forearm, 36.4, 37, and 38.5 mm. in three specimens from Zorritos, published by Dr. Glover M. Allen (Bull. Mus. Comp. Zool., vol. 52, p. 35, July, 1908), are characteristic of the large Peruvian form.

Diagnosis.—Very similar to *Glossophaga soricina mutica* but probably averaging larger (the two adults examined are about equal in size to the largest among 24 *mutica*); molars both above and below with crown area sensibly increased.

Measurements.—For detailed measurements, see table, page 428.

Specimens examined.—Five (three young), all from Port Antonio, Jamaica.

GLOSSOPHAGA LONGIROSTRIS Miller.

(Synonymy under subspecies.)

Geographic distribution.—Coast region of Colombia and Venezuela; southern Lesser Antilles (Grenada, Grenadines, Dominica). Limits of range very imperfectly known.

Diagnosis.—Like *Glossophaga soricina*, but skull (fig. 1b) longer, its condylobasal length usually more than 21 mm. (21 to 22.4 mm.), with rostral portion so much more developed as to appear nearly as long as braincase; outer upper incisor about equal to inner in bulk; pm³ and pm⁴ not noticeably unlike in crown outline; braincase broad and high, its dorsal profile usually forming evident angle with that of rostrum in interorbital region.

Color.—The color does not differ appreciably from that of *Glossophaga soricina*. Among the skins examined the extremes of coloration, blackish, reddish, and pallid, are less frequent than in the smaller animal.

Skull.—The skull (fig. 1b) is distinguishable from that of *Glossophaga soricina* by its larger size and by the greater development of the rostrum, the region lying to the front of the postorbital constriction appearing about equal to the braincase in length, while in the smaller animal it is obviously shorter. Dorsal profile not conspicuously different from that in *G. soricina*, but braincase rising less abruptly in front, this reduction of abruptness not sufficient to do away with the noticeable angle over anterior part of orbit. In the features not directly affected by the essential proportions of rostrum and braincase the skulls of the two species present no tangible points of difference. Individual variation appears to be about as extensive as in *Glossophaga soricina*, though the material examined is not sufficient to give so satisfactory results as in the case of the smaller animal. In 12 specimens of true *longirostris* the variation in condylobasal length is 1.4 mm., or 6.4 per cent of the mean, while in 17 skulls of *rostrata* it is only 1 mm., or 4.6 per cent. The breadth of braincase in the two races shows a variation of 0.6 mm., or 6.7 per cent, and 0.4 or 4.5 per cent, respectively. Referred to mean condylobasal length of skull the percentages for the two forms are 2.7 and 1.8. While the percentages of variation in length and breadth are about the same as in *G. soricina* the appearance of the skulls is more uniform, probably because the anterior portion of braincase is less subject to change.

Teeth.—Though in general like those of *Glossophaga soricina* the teeth of *G. longirostris* present certain characters by which they may be easily recognized. When viewed either from the front, from behind, or on the cutting edge the outer upper incisor never appears to be obviously smaller than the inner tooth, while in most specimens, at least when unworn, it has the greater bulk. Anterior upper premolar very narrowly elliptical in crown outline, the width at middle about one-fourth the length, the general form otherwise much as in *G. soricina*. Posterior upper premolar with postero-internal region usually much less developed than in *G. soricina*, so that in the majority of specimens the crown outline though less narrowly elliptical does not differ noticeably from that of the anterior tooth. Individuals of either species may be found, however, in which the form of this tooth is not diagnostic. The same narrowness of crown characterizes the lower premolars as compared with those of *Glossophaga soricina*. Upper molars essentially as in the related species, but lower molars narrower in proportion to their length.

Measurements.—See under subspecies.

Remarks.—Though it does not exceed in general size the larger races of *Glossophaga soricina* this animal is distinctly larger than the typical form of *soricina*, the only one that it is known to occur together with. It appears to be less widely distributed than the related species, no specimen referable to it having been seen from any other region than the coast of northern South America and the adjacent Lesser Antilles. As all members of the genus are easily procured wherever they occur, this fact probably has more significance than might otherwise be the case. The insular representative proves to differ from that of the mainland by average characters only. It is therefore treated as a subspecies.

GLOSSOPHAGA LONGIROSTRIS LONGIROSTRIS MILLER.

1898. *Glossophaga longirostris* MILLER, Proc. Acad. Nat. Sci. Philadelphia, p. 330. July 25, 1898. (Near Santa Marta, Colombia.)
1900. *Glossophaga longirostris* ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 13, p. 89. May 12, 1900. (Bonda and Taguaga, Colombia.)
1901. *Glossophaga longirostris* ROBINSON and LYON, Proc. U. S. Nat. Mus., vol. 24, p. 151. October 3, 1901. (Vicinity of La Guaira, Venezuela.)

Type-locality.—Near Santa Marta, Colombia. Type-specimen in Museum of Comparative Zoology, Cambridge, Mass.

Geographic distribution.—Coast region of Colombia and Venezuela.

Diagnosis.—Inflation of brain case and general size of skull maximum for the species; postero-external projection of m^1 and m^2 broad; m_1 and m_2 relatively large, the length of m_2 about three times width.

Measurements.—For detailed measurements see table, page 428.

Specimens examined.—Forty-eight, from the following localities:

COLOMBIA. Bonda, 2 skins; Taguaga, 1 skin, 6 skulls (Am. Mus.).

VENEZUELA. Vicinity of La Guaira, 40 (25 skins).

Remarks.—In the original description attention was directed to the fact that the type-skull, the only one then known, lacked the incisors. Two years later Dr. J. A. Allen reported of a series of 34 specimens from Bonda and Taguaga, Colombia, that, "in nearly one-half . . . the incisors are all present in both jaws; in about one-third of the series they are entirely absent in both jaws; in the remainder some of the incisors are present and the alveoli of those lacking are clearly indicated."¹ This tendency toward defectiveness of the incisors in Colombian specimens may be due to some local peculiarity in the conditions under which the animals live. I can find no trace of it in the skulls of 18 individuals from the vicinity of La Guaira, Venezuela, or in the same number of *G. longirostris rostrata* from the Lesser Antilles.

GLOSSOPHAGA LONGIROSTRIS ROSTRATA (Miller).

1908. *Glossophaga longirostris* G. M. ALLEN, Bull. Mus. Comp. Zool., vol. 52, p. 85. July, 1908. (Union Island and Carriacou.) Not of Miller, 1898.
 1911. *Glossophaga longirostris* G. M. ALLEN, Bull. Mus. Comp. Zool., vol. 54, p. 229. July, 1911. (Grenada and the Grenadines.) Not of Miller, 1898.
 1913. *Glossophaga rostrata* MILLER, Proc. Biol. Soc. Washington, vol. 26, p. 32. February 8, 1913. (Westerhall estate, Grenada.)

Type-locality.—Westerhall estate, Grenada, Lesser Antilles. Type-specimen in United States National Museum.

Geographic distribution.—Grenada and the Grenadines (Union and Carriacou), Lesser Antilles; Dominica?²

Diagnosis.—Braincase less inflated than in *Glossophaga longirostris longirostris* and general size of skull slightly less; postero-external projection of m^1 and m^2 narrower; m_2 and m_3 relatively smaller, the length of m_2 about twice width.

Measurements.—For detailed measurements see table, page 429.

Specimens examined.—Twenty-three from the following localities in the Lesser Antilles:

Grenada, 14 skins; Union Island, 1 skin (M. C. Z.); Carriacou, 5 skins, 3 extra skulls (M. C. Z.).

Remarks.—Though individuals can be selected which are indistinguishable from certain specimens of true *longirostris* the appearance of a series of skulls from the islands is sufficiently characteristic to justify the recognition of this form.

GLOSSOPHAGA ELONGATA MILLER.

1900. *Glossophaga elongata* MILLER, Proc. Biol. Soc. Washington, vol. 13, p. 124. April 6, 1900.

Type-locality.—Willemstad, Curaçao. Type-specimen in United States National Museum.

Geographic distribution.—The island of Curaçao.

¹ Bull. Amer. Mus. Nat. Hist., vol. 13, pp. 80-80. May 12, 1900.

² Two specimens, one too young the other too mutilated for exact identification.

Diagnosis.—Like *Glossophaga longirostris*, but skull (fig. 1c.) with rostrum more extremely elongated and braincase reduced in both height and relative width, its dorsal profile not forming evident angle with that of rostrum in interorbital region.

Color.—The only skins seen are four prepared after a few months' immersion in formalin. They show no peculiarities of color as compared with the other members of the genus.

Skull.—Apart from the characters already mentioned the skull (fig. 1c.) does not differ appreciably from that of *Glossophaga longirostris*. The range of variation is essentially as in the other species. In 20 skulls the variation in condylobasal length is 1.4 mm., or 6.2 per cent of the mean, that in breadth of braincase 0.6 mm., or 6.9 per cent. Referred to the mean condylobasal length the variation in breadth of braincase is 2.6 per cent.

Teeth.—The teeth do not differ appreciably from those of *Glossophaga longirostris*.

Measurements.—For detailed measurements see table, page 429.

Specimens examined.—One hundred and thirty-three, all from the island of Curaçao.

Remarks.—Contrary to what might be expected the local member of the *longirostris* group inhabiting Curaçao is much more differentiated from that of the mainland than is the race found in the Lesser Antilles. Every specimen examined is immediately recognizable by its relatively narrow braincase and faintly angled dorsal profile.

Measurements of *Glossophaga*—Continued.

Locality.	Number.	Glossophaga soricina soricina—Continued.											Observations.					
		Sex.	Head and body.	Tail.	Tibia.	Foot.	Forearm.	Third finger.	Fifth finger.	Ear.	Condylar length of skull.	Rostral breadth.		Breadth of brain case.	Mandible.	Maxillary tooth-row.	Mandibular tooth-row.	
Peru: Morobamba.	119233	♂	57	6	14	11	35	71	50	.....	19.4	4.4	8.6	13.8	7.2	7.4	Teeth not worn.	
	Do.	119234	♂	54	8	14	9	34	71	51	.....	19.8	4.2	8.4	13.2	7.0	7.2	Do.
	Do.	119235	♂	60	8	13	9	33.6	73	49	.....	19.0	4.2	8.4	13.4	6.8	7.2	Teeth slightly worn.
	Do.	119236	♂	60	8	13	9	33.6	73	49	.....	19.0	4.2	8.4	13.6	7.2	7.4	Teeth not worn.
	Do.	119237	♂	57	9	14	9	34.4	73	51	.....	19.6	4.4	8.4	13.8	7.2	7.6	Teeth slightly worn.
	Do.	119238	♂	56	9	13.6	9	35	75	49	.....	19.8	4.4	8.4	13.8	7.2	7.8	Do.
	Do.	119239	♂	56	8	14	9	34	70	50	14	10.0	4.2	8.4	13.8	7.0	7.2	Teeth moderately worn.
	Do.	119240	♂	49	8	14	9	36	71	51	14	10.4	.....	8.4	13.6	7.2	7.6	Teeth not worn.
	Glossophaga soricina microtis.																	
Paraguay: Villa Rica.	105663	♂	52	8	14.6	9.2	34	70	51	12.2	18.8	4.4	8.8	13.2	6.8	7.2	Do.	
	Do.	105664	♂	50	8	13.6	9.2	34.6	73	50	13	18.8	4.4	8.8	13.2	7.0	7.2	Do.
	Do.	105670	♂	48	7	14	9.6	35	73	51	13	19.8	4.6	8.8	13.8	7.2	7.6	Do.
	Sapucay.	115063	♂	56	9	13	8.4	34	70	48	13	19.2	4.4	8.6	13.2	7.0	7.2	Do.
	Villa Rica.	105671	♂	52	8.4	14	9	34.4	73	50	13.6	.....	.....	.....	.....	.....	Teeth moderately worn.	
	Do.	105672	♂	56	7	14	9	35	74	52	14	19.8	4.6	8.8	14.0	7.4	7.8	Teeth slightly worn.
	Sapucay.	115060	♂	51	8.4	14	10	35	72	52	14	19.8	4.8	9.0	14.0	7.2	7.6	Do.
	Do.	115061	♂	51	7	14	9	34	72	52	13	19.6	4.2	8.8	13.2	7.0	7.2	Do.
	Do.	115062	♂	49	9	14	9.6	35	74	52	13.4	19.8	4.2	8.8	13.2	7.2	7.6	Do.
	Do.	121470	♂	51	7	15	9	34.6	74	52	14	19.8	4.6	8.8	14.0	7.2	7.6	Teeth not worn.
Glossophaga soricina leachii.																		
Mexico: Tepic.	92270	♂	48	6	13.4	8.4	32	72	48	14	20.0	4.4	8.6	14.0	7.4	8.0	Teeth not worn.	
	Do.	92271	♂	48	6	13	9	31.4	72	50	13	20.2	4.6	8.0	14.0	7.4	8.0	Do.
	Do.	92453	♂	50	6	13	9	31.4	73	50	14	20.2	4.6	8.0	14.0	7.4	8.0	Do.
	Do.	92510	♂	51	7	14	10	32.6	73	50	14	20.6	4.4	8.8	14.0	7.2	7.6	Do.
	Do.	92571	♂	51	7	14	10	32.6	73	50	14.6	20.6	4.4	8.8	14.0	7.4	8.0	Do.

Do	92274	51	7	12.4	9	32.5	70	47	15	20.4	4.1	8.0	12.6	7.3	7.6	Do.
Do	92275	52	7.4	12.4	9	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Teeth slightly worn.
Do	92276	53	7.4	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92277	54	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Teeth not worn.
Do	92278	55	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92279	56	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92280	57	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92281	58	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92282	59	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92283	60	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92284	61	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92285	62	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92286	63	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92287	64	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92288	65	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92289	66	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92290	67	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92291	68	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92292	69	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92293	70	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92294	71	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92295	72	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92296	73	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92297	74	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92298	75	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92299	76	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92300	77	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92301	78	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92302	79	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92303	80	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92304	81	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92305	82	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92306	83	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92307	84	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92308	85	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92309	86	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92310	87	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92311	88	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92312	89	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92313	90	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92314	91	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92315	92	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92316	93	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92317	94	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92318	95	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92319	96	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92320	97	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92321	98	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92322	99	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92323	100	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92324	101	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92325	102	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92326	103	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92327	104	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92328	105	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92329	106	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92330	107	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92331	108	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92332	109	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92333	110	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92334	111	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92335	112	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92336	113	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92337	114	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92338	115	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92339	116	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92340	117	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92341	118	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92342	119	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92343	120	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92344	121	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92345	122	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92346	123	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92347	124	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92348	125	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92349	126	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92350	127	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92351	128	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92352	129	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92353	130	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92354	131	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92355	132	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92356	133	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92357	134	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92358	135	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92359	136	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92360	137	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92361	138	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92362	139	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do	92363	140	8	12.4	10.4	32.5	70	47	15	20.4	4.0	8.0	12.6	7.3	7.6	Do.
Do																

American Museum of Natural History.

Type-

Field Museum of Natural History.

Measurements of *Glossophaga*—Continued.

Locality.	Number.	Head and body.										Measurements of skull.										Observations.	
		Sex.	Tail.	Tibia.	Foot.	Forearm.	Third finger.	Fifth finger.	Ear.	Condylal length.	Rostral breadth.	Breadth of brain case.	Mandible.	Maxillary tooth-row.	Mandibular tooth-row.								
<i>Glossophaga soricina valens.</i>																							
Peru: Balsas.	19873	♂	56	6	15	9.6	38	78	54	14	21.4	4.8	9.0	15.0	8.0	8.2	Teeth not worn.						
Do.	19879	♂	54	8.4	15.4	10.6	37	79	54	14.4	21.4	4.6	8.8	14.8	7.6	8.0	Teeth slightly worn.						
Do.	19882	♂	50	8.4	15	10.4	38	77	55	14	20.4	4.6	9.0	14.4	7.4	8.0	Do.						
Do.	19884	♂	54	8	14.4	10	38	76	58	14.6	21.4	4.6	8.8	15.0	7.8	8.2	Teeth moderately worn.						
Do.	19885	♂	53	8.4	15.4	10	37.4	78	54	15	20.6	4.6	8.8	14.8	7.8	8.0	Teeth slightly worn.						
Do.	19886	♂	53	8	15.4	10	36.6	75	53	14.6	21.0	4.6	9.0	14.4	7.8	8.0	Do.						
Do.	19887	♂	51	10	14	10	36	74	54	16	21.0	4.6	8.6	14.6	7.8	8.0	Do.						
Do.	19888	♂	52	10	14	10	35.4	74	53	14	20.6	4.6	8.6	14.0	8.0	8.2	Teeth not worn.						
Do.	19890	♂	54	9.4	14	10	36.4	75	54	15	20.6	4.8	9.0	14.6	7.6	8.0	Do.						
Do.	19896	♂	55	9	14.4	10	37.4	80	56	14.6	20.6	4.4	8.8	14.4	7.6	8.0	Teeth slightly worn.						
Do.	19898	♂	55	8	15.4	10	40	80	55	15	21.2	4.6	9.0	15.0	8.0	8.2	Teeth not worn.						
Do.	19870	♂	56	7	15.4	10	37.6	76	54	15.4	21.2	4.8	9.0	14.8	8.0	8.2	Teeth slightly worn.						
Do.	19877	♂	54	8	14.6	10	38	78	53	14.6	21.0	4.8	9.0	14.8	8.0	8.2	Teeth not worn.						
Do.	19883	♂	53	6	15	10	38	79	55	14.6	21.2	4.8	9.0	14.8	7.8	8.0	Do.						
Chapex.	170195	♂	55	9.4	15	9	37.4	79	53	14	21.2	4.6	9.0	14.8	7.8	8.2	Do.						
Do.	170194	♂	55	9	15.4	9	38	80	55	14	21.2	4.6	8.8	14.8	7.8	8.2	Do.						
Do.	170196	♂	57	7.6	15.6	9.6	36.4	77	53	14	21.0	4.6	9.0	15.0	7.6	8.2	Do.						
<i>Glossophaga soricina antillarum.</i>																							
Jamaica.	113921	♂	55	6	14.4	10	37.6	79	54	15.6	21.2	4.4	9.0	14.8	7.8	8.0	Teeth slightly worn.						
Do.	113922	♂	54.6	8	15	11	38.6	77	55	15	21.0	4.6	9.0	14.8	7.8	8.0	Do.						
<i>Glossophaga longirostris longirostris.</i>																							
Venezuela: Near La Guaira.	102905	♂	56	9	14	11	38.6	80	54	15.6	21.0	4.4	9.2	15.0	7.8	8.4	Teeth slightly worn.						
Do.	102915	♂	56	11	15	11	37	79	55	15.6	21.2	4.6	9.2	15.2	8.8	8.4	Teeth not worn.						
Do.	147763	♂	50	11	14.4	11	37	75	54	15.6	21.8	4.6	9.0	15.0	8.0	8.2	Teeth slightly worn.						
Do.	147769	♂	50	8	15	10.4	38	80	54	15.6	21.8	4.6	9.2	15.0	8.0	8.4	Teeth not worn.						
Do.	102920	♂	54	8	15	9.6	37.4	76	53	14.4	21.4	4.8	9.4	15.0	8.0	8.2	Teeth slightly worn.						
Do.	102921	♂	57	7	16	10.4	35.4	79	53	14.6	21.2	4.6	9.8	15.0	7.8	8.2	Teeth not worn.						
Do.	102922	♂	57	7	16	10.4	35.6	83	56	13.4	21.4	4.6	9.0	15.6	8.2	8.6	Teeth slightly worn.						
Do.	102924	♂	56	7	14	10	36	75	54	15	21.0	4.8	9.0	15.0	8.2	8.6	Do.						

Do	102858	9	14	10	37.4	76	54	14.6	22.0	4.6	9.2	15.8	8.0	8.6	Teeth not worn.
Do	102859	11	15	10.4	37.4	79	54	16	22.0	4.3	9.0	15.4	8.0	8.4	Teeth slightly worn.
Colombia. Borda.	102860	15	15	11	38.4	76	54	.....	22.0	4.3	9.0	15.6	8.0	Do.	
Do	102101	15	15	11	38.4	75	54	.....	22.0	4.6	9.0	15.0	7.8	8.2	Teeth not worn.
<i>Glossophaga longirostris rostrata.</i>															
Grenada.	111493	16.4	10	38	78	53	21.2	4.6	8.8	15.0	8.0	8.4	8.0	8.4	Teeth not worn.
Do	111495	16	10.4	38.4	81	55	21.0	4.6	9.0	15.2	8.0	8.2	8.0	8.2	Do.
Do	111497	15	11	39	79	54	21.2	4.4	9.0	14.8	7.8	8.2	8.0	8.2	Do.
Do	111498	14.6	10.4	37	78	55	21.4	4.4	9.0	14.8	7.8	8.2	8.0	8.2	Do.
Do	111499	14.6	10.4	37	78	55	21.4	4.4	8.8	15.0	7.8	8.2	8.0	8.4	Do.
Do	111500	15	10.6	37.4	82	53	21.8	4.6	9.0	14.8	8.0	8.4	8.0	8.4	Do.
Do	111502	14.4	10.4	38.4	75	51	22.0	4.6	9.0	15.2	8.2	8.4	8.0	8.4	Do.
Do	111503	15	11	34.6	74	52	21.8	4.2	8.8	15.2	8.0	8.4	8.0	8.4	Do.
Do	111504	16	10	38.6	81	55	21.4	4.2	8.6	15.0	7.8	8.2	8.0	8.4	Do.
Carriacou.	111021	16	10.4	38	78	53	21.2	4.6	8.8	14.8	8.2	8.4	8.0	8.2	Teeth slightly worn.
Do	111023	16	10.4	38	78	53	21.6	4.2	8.8	14.8	8.0	8.2	8.0	8.2	Teeth not worn.
Do	111026	15.4	10	38.4	79	54	21.8	4.2	8.8	15.0	8.0	8.2	8.0	8.2	Do.
Do	111080	16	10	38	78	53	21.2	4.2	8.6	14.8	7.8	8.0	8.0	8.0	Teeth moderately worn.
Do	111083	16	10	38	78	53	21.2	4.2	8.6	14.8	7.8	8.0	8.0	8.0	Teeth slightly worn.
Do	111088	16	10	38	78	53	21.2	4.2	8.8	15.0	7.8	8.2	8.0	8.6	Teeth not worn.
Do	111094	16	10	38	78	53	22.0	4.4	9.0	15.4	8.2	8.6	8.0	8.6	Do.
Do	111097	16	10	38	78	53	21.2	4.0	8.8	15.0	7.8	8.2	8.0	8.6	Do.
Do	111098	16	10	38	78	53	21.2	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111099	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111100	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111101	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111102	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111103	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111104	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111105	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111106	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111107	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111108	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111109	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111110	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111111	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111112	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111113	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111114	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111115	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111116	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111117	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111118	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111119	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111120	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111121	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111122	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111123	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111124	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111125	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111126	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111127	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111128	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111129	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111130	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111131	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111132	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111133	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111134	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111135	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111136	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111137	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111138	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111139	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111140	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111141	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111142	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111143	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111144	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111145	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111146	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111147	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111148	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111149	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111150	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111151	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111152	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111153	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111154	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111155	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111156	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111157	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111158	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111159	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111160	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111161	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111162	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111163	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111164	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111165	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8	8.2	8.0	8.2	Do.
Do	111166	16	10	38	78	53	21.4	4.2	8.8	15.0	7.8				

NEW HYMENOPTERA FROM NORTH AMERICA.

By A. B. GAHAN,

Of the Bureau of Entomology, United States Department of Agriculture.

With a single exception, the following Hymenoptera were bred by the Cereal and Forage Insect Division of the United States Department of Agriculture, Bureau of Entomology. The single exception is that of an interesting new genus and species of Proctotrypoidea parasitic in the eggs of the Chinch Bug and reared by J. W. McCulloch, of the Kansas Agricultural Experiment Station.

Superfamily VESPOIDEA.

Family ELIIDÆ.

Genus ELIS Fabricius.

The following described species runs to the genus *Plesia* in Doctor Ashmead's classification of the Myzinidæ.¹ According to Mr. Rohwer, *Plesia* Jurine is a synonym of *Elis* Fabricius.²

ELIS ATRIVENTRIS, new species.

Female.—Length 20 mm. Agrees with the description of (*Meria*) *Elis collaris* Say, except as follows: The two yellow spots above the base of the antennæ are confluent with the frontal orbital lines; the yellow band on the posterior margin of the prothorax is not interrupted; there is a large yellow spot between the notauli on the mesonotum and a smaller one on the scutellum, the venter is immaculate black.

Head, prothorax, mesonotum, mesoscutellum, and mesopleuræ with large deep punctures; propleuræ and metapleuræ lineated, the latter more coarsely so; propodeum without punctures or rugæ of any kind.

Male.—Differs from the female in the usual sexual characters, and also as follows: The clypeus is entirely yellow; two yellow spots at base of antennæ are not confluent with the frontal orbital lines; line

¹ Can. Ent., vol. 35, 1903, p. 5.

² Proc. U. S. Nat. Mus., vol. 40, p. 551.

behind the eyes absent; two spots of yellow on the mesopleuræ, an anterior one and a smaller posterior; dorsal segments 1 to 6 of the abdomen with uninterrupted apical bands of yellow and the seventh segment with a spot each side; ventral segments 2 to 6 laterally at apex with a spot of yellow; intermediate and posterior knees, tibiæ, and tarsi yellow like the anterior, instead of ferruginous, as in the female; propodeum coarsely punctate.

A female paratype is smaller than the type and differs from it in having the spots on the second abdominal segment more widely separated. The male agrees very well with the description of (*Tiphia*) *Elis maculata* Fabricius.

Type-locality.—Elkpoint, South Dakota.

Type.—Cat. No. 16349, U.S.N.M.

Host.—*Lachnosterna*, sp.

Two female and one male specimen reared by C. N. Ainslie and recorded in the Department of Agriculture, Bureau of Entomology, under Webster No. 8860.

Superfamily ICHNEUMONOIDEA.

Family BRACONIDÆ.

Subfamily BRACONINÆ.

BRACON (TROPIDOBRACON) MEROMYZÆ, new species.

Female.—Length 2.5 mm. to 3 mm. Antennæ about as long as the whole body, 31-jointed in the type; face below antennæ with some minute indistinct punctures laterally; otherwise the head and thorax except the propodeum, smooth and polished; parapsidal grooves complete; propodeum with a prominent median longitudinal carina, mostly smooth, but with a narrow aciculate area either side of the median carina and the lateral margins more or less aciculate-punctate. Wings slightly fuscous, the first abscissa of radius oblique and equal to half the second abscissa; radial cell extending to the wing apex; second cubital cell narrow and elongate; abdomen as long as the thorax; first dorsal abdominal plate rugose, longer than wide, with a deep fovea medially at base, the apical middle prominent, and a smaller smooth fovea at each lateral posterior angle connected with the basal fovea by oblique furrows; dorsal segments 2 and 3 finely rugulose, 3 and 4 more faintly so, the following segments smooth; ovipositor exerted one-third the length of the abdomen. Head, antennæ, mandibles at apices, thorax, and first dorsal abdominal plate black; median spot on the second segment corresponding somewhat to the first dorsal plate and a median streak varying in width on the following segments blackish; mouth parts and apical portions of cheeks, the legs, including coxæ, tegulæ, all of the venter, and the dorsal segments of the abdomen, except as stated, bright honey-

yellow; ovipositor one-third the length of the abdomen and black. Wing veins and stigma blackish brown.

Male.—Differs from the female only in having the underside of scape and pedicel slightly testaceous, the abdomen narrower, its dorsum less obviously streaked with black in the middle.

Type-locality.—Elkpoint, South Dakota.

Type.—Cat. No. 16350, U.S.N.M.

Host.—*Meromyza americana*.

Three male and three female specimens from the type-locality reared by C. N. Ainslie from the above-mentioned host and recorded under Webster No. 8840, Bureau of Entomology, United States Department of Agriculture. Also one male specimen reared by J. A. Hyslop at Hagerstown, Maryland, from the same host, and recorded under Webster No. 5967. In the collection of the United States National Museum is one specimen labeled "*Bracon meromyzæ*" in Ashmead's handwriting, and bearing the following data: "Par. on *Meromyza americana*; Ames, Iowa, Oct. 14, 1891." The name, however, does not appear to have been used in literature.

The species is separated from *gastroidæ* Ashmead by the rugulose dorsal segments of the abdomen.

Subfamily EUPHORINÆ.

EUPHORIANA, new genus.

Apparently most closely related to the genus *Euphorus* Nees, from which it differs by having the cubital, discoidal, and anal veins as well as the cubital crossveins and recurrent nervure entirely effaced, the forewing without cubital and discoidal cells; the median nervure is also effaced or very indistinct; the radial cell is cultriform, narrow, the first abscissa of radius obsolete or punctiform; the second and third abdominal segments not separated and extending almost to the apex of the abdomen.

Head from above subquadrate, a little wider than long, the temples as broad or broader than the eyes and only slightly rounded; face below the antennæ sharply truncate; prothorax prominent; meso-scutum with faint parapsidal grooves; abdominal petiole about thrice as long as wide at the apex, gradually widening from base to apex; abdomen pyriform, the ovipositor concealed or very slightly exerted.

Type of the genus.—*Euphoriana uniformis*, new species.

EUPHORIANA UNIFORMIS, new species.

Plate 39, fig. 1.

Male.—Length 1.8 mm. Color pale reddish yellow, with the apical half of the antennæ and the apical half of the abdomen slightly fuscous. Vertex, frons, occiput, and temples polished; the vertex

and frons with a few widely-scattered round shallow punctures; face below the antennæ with close shallow punctures and densely covered with fine hairs; mandibles edentate; clypeus transverse and polished; antennæ short, 16-jointed, the first and second flagellar joints subequal and a little the longest of the flagellar joints. Prothorax above and at sides closely punctate; mesoscutum polished, with a few indistinct shallow punctures posteriorly, the parapsidal grooves uniting before reaching the scutellum; mesopleuræ mostly smooth, with a punctate area medially; propodeum evenly rugoso-punctate without carinæ; wings slightly fuscous, with a transverse hyaline streak across the middle and embracing the basal half of the stigma; posterior tarsi longer than their tibiæ, the first tarsal joint as long as the three following, or nearly as long. Abdominal petiole longitudinally striate, the following segments smooth.

Female.—Similar to the male, but with the antennæ 15-jointed, and the body color slightly more ferruginous.

Type-locality.—Hagerstown, Maryland.

Type.—Cat. No. 16351, U.S.N.M.

Host.—*Meromyza americana*.

The male type was reared by J. A. Hyslop from the above-mentioned host and locality, July 18, 1912, and is recorded under Webster No. 5967, Bureau of Entomology, United States Department of Agriculture.

The female type collected at Garden City, Kansas, by W. H. Menke, July, 1896.

Family ALYSIIDÆ.

Subfamily DACNUSINÆ.

COELINIDÆA FERRUGINEA, new species.

Female.—Length 3.5 mm. Agrees with *C. meromyzæ* Forbes in sculpture, but differs as follows: Abscissa of cubitus separating the first cubital and discoidal cells usually incomplete, effaced basally; the head viewed laterally appears distinctly longer (antero-posteriorly) than high (dorso-ventrally), while in *meromyzæ* it is only a little longer than high; the parapsidal grooves are deep and complete, not interrupted on the disk of the mesonotum. General color of the whole insect flavo-ferruginous; the color of the thorax variable, often mixed with brownish or even blackish on the dorsum, pleuræ, and propodeum; apical two-thirds of the antennæ and apical half of the abdomen dark brown or blackish.

Male.—Similar to the female, but with the antennæ, legs, and thorax darker.

Type-locality.—Elkpoint, South Dakota.

Type.—Cat. No. 16352, U.S.N.M.

Host.—*Meromyza americana*.

Three specimens (two females and one male) from the type-locality, reared by C. N. Ainslie and recorded under Webster No. 8840, Bureau of Entomology, United States Department of Agriculture; also four specimens in the United States National Museum, labeled, "273° Par. on *Meromyza americana*, James Fletcher, Col. at Ottawa, July 21, 1899".

Superfamily CHALCIDOIDEA.

Family PTEROMALIDÆ.

Subfamily PTEROMALINÆ.

PTEROMALUS EURYMI, new species.

Female.—Compared with *P. puparum*, this species is larger, more robust, the abdomen short ovate, very slightly conical, not as long as the thorax, its first dorsal segment comprising half its total length and the legs, except their coxæ, reddish testaceous

Head distinctly wider than the thorax, strongly and closely punctate, the clypeal area aciculate-striate; seen from above, the head is distinctly more than three times as broad as long, the occiput a little concave, the ocell-ocular and postocellar lines nearly equal. Thorax punctured like the head, except that the punctures on the dorsal aspect of the prothorax are distinctly coarser; apical one-fourth of the mesoscutellum with a slightly different sculpture from the remainder, the line of demarcation appearing as an indistinct transverse furrow before the apex; propodeum without median carina, but with the lateral folds very distinct, strongly punctate, except the region outside the spiracular sulci, which is more faintly sculptured and somewhat shining; neck of the propodeum about half the length of the hind coxæ, the punctures of the dorsal surface larger and not as deep as those on the rest of the propodeum. Wings hyaline, the venation typical. Abdomen smooth and polished, broader than the thorax, and only slightly longer than broad.

Color aeneous; face below antennæ blackish; scape, mandibles, and legs, except coxæ, testaceous; the apical tarsal joints brownish; antennal pedicel and flagellum brownish black; all coxæ concolorous with the thorax; base of first dorsal segment brassy, remainder of the first segment and the venter metallic blue-green, dorsal segments beyond the first blackish in some lights.

Male.—Similar to the female in sculpture, but much more highly metallic in color and with the antennal pedicel and flagellum testaceous, like the scape.

Type-locality.—Tempe, Arizona.

Type.—Cat. No. 16353, U.S.N.M.

Host.—*Eurymus eurytheme*.

Described from a large number of specimens reared from the above-named host by V. L. Wildermuth and recorded under Webster No. 7222 of the Bureau of Entomology, United States Department of Agriculture.

DIERACHYS METEORI, new species.

Female.—Length, 2.5 mm. Head and thorax dark aeneous, nearly black in some lights, reticulate-punctate; the punctures of the thorax deeper than those of the head; clypeus slightly concave on the anterior margin medially, the lateral angles appearing as two very short obtuse teeth; mandibles both four-dentate; cheeks opposite base of mandibles with a broad depression extending laterally and upward half way to the lower extremity of the eye; occiput margined as in *D. boucheanus*; postocellar line one-third longer than the ocell-ocular line; antennal scape and pedicel blackish, the flagellum brownish testaceous, pedicel distinctly shorter than the first funicle joint, first ring-joint transverse, the second very slightly longer than broad, first funicle joint the longest of the funicle joints, following funicle joints longer than broad, except the sixth, which is nearly quadrate; club 3-jointed and somewhat longer than the two preceding joints of the funicle. Punctures of the mesonotum not so deep on the lateral lobes as medially and on the scutellum; scutellum about as long as the mesoscutum; propodeum with a slight median carina, the spiracular sulci and lateral folds present and distinct, surface of the propodeum within the lateral folds distinctly and very finely punctate, the region between the folds and spiracular sulci with shallow reticulate sculpture, beyond the sulci to the lateral margins smooth; spiracles large and long-oval. Wings hyaline, the marginal vein only slightly longer than the postmarginal, the stigmal and postmarginal subequal. All coxæ, trochanters, and femoræ, except the apices of latter, black; median and posterior tibiæ medially and two or three apical joints of all tarsi brownish-black; apices of all femoræ, most of the front tibiæ, bases and apices of median and posterior tibiæ, and basal joint of all tarsi pale yellowish. Abdomen conic ovate, slightly longer than the thorax, smooth, shining, metallic green.

Male.—The antennæ are longer than in the female; pedicel very short, scarcely longer than broad; ring joints both transverse; funicle joints elongate, 1 to 5 being at least twice as long as broad, the sixth a little shorter, but considerably longer than broad. The depression at base of mandibles is shorter than in the female, the postmarginal vein is slightly longer than the stigmal, and the median and hind tibiæ are slightly lighter than in the female. Color as in the female.

Type-locality.—Brownsville, Texas.

Type.—Cat. No. 16354, U.S.N.M.

Host.—*Meteorus* infesting *Laphygma frugiperda*.

Described from 14 specimens, 12 females and 2 males, reared by E. G. Smythe from the above-mentioned host and recorded under Webster No. 6446, Bureau of Entomology, United States Department of Agriculture; also two specimens from Memphis, Tennessee, recorded under Webster No. 9600.

This species differs in some respects from the type species of *Dibrachys*, and should perhaps form a new genus. It runs to *Dibrachys* in Mr. Kourdumoff's recently published revision of the subfamily Pteromalinae,¹ however, and for the present is placed in that genus, where it should be easily recognized by the characters of clypeus and cheeks.

Family ENCYRTIDÆ.

Subfamily EUPELMINÆ.

EUPELMINUS METEORI, new species.

Female.—Length 2.8 mm. Head above shining with fine, irregular, transverse wrinkles above the ocelli, the sculpture becoming slightly fainter and more reticulate on the frons; temples and cheeks strongly aciculate-punctate, and the face from upper angle of the scrobes downward rather coarsely rugoso-punctate, the area within the scrobes and below more finely so; eyes bare. Antennæ 13-jointed, clavate; scape not attaining the anterior ocellus; ring-joint slightly longer than broad; first funicle joint twice as long as the ring-joint and about equal to the pedicel, the second equal to or a little longer than the first, broadening slightly to the apex, the following funicle joints shorter and thickening gradually; club compressed, slightly longer than the two preceding funicle joints combined, the sutures more or less oblique; maxillary palpi short and somewhat flattened toward apex. Mesoscutum hollowed out, the median lobe very narrow, almost linear and less than two-thirds the length of the mesoscutum, lateral lobes elevated, their lateral margins sharp and their inner faces faintly wrinkled and shining; scutellum as long or a little longer than the median lobes of the mesoscutellum and forming a high, sharp, smooth ridge; pleuræ and mesosternum with fine, more or less reticulate sculpture, the lines becoming deep striations along the dorso-posterior margin. Wings reduced to small scale-like appendages which do not extend beyond the apex of the propodeum. Abdomen about as long as the thorax, convex above, slightly compressed from the sides, the segments above and below finely reticulated; ovipositor exerted one-third the length of the abdomen.

Head dark above, the face, cheeks, and temples with strong brassy reflections; apices of mandibles, palpi, antennal pedicel, and flagellum black; scape, thorax, legs, and first dorsal abdominal segment reddish

¹ *Revue Russe d'Entomologie*, vol. 13, 1913, p. 2.

testaceous, the color of the thorax more or less mixed with brownish, abdomen beyond the first segment black; ovipositor sheaths black at base and apex, with a broad yellowish band between.

Type-locality.—Brownsville, Texas.

Type.—Cat. No. 16355, U.S.N.M.

Host.—*Meteorus* infesting *Laphygma frugiperda*.

Five specimens reared by E. G. Smythe and recorded under Webster No. 6446, Bureau of Entomology, United States Department of Agriculture.

Family ELASMIDÆ.

ELASMUS APANTELL, new species.

Plate 39, fig. 2.

Female.—Length 2 mm. Antennæ rather short, with pedicel and funicle joints subequal, the club compressed and shorter than the funicle. Face with large round punctures on frons, vertex, and along orbits, each puncture distinct and separate, the intervening surface smooth; facial impression distinct, not margined above, the surface within the impression, as well as the clypeus and cheeks, without punctures; occiput finely wrinkled.

Pronotum and mesoscutum covered with long recumbent hairs, beneath which the surface appears shining and slightly scaly; mesoscutellum shining, but under strong magnification finely marked with wavy lines; postscutellum triangular, the apex acute; pleuræ, and outer surfaces of all coxæ, and femoræ with fine aciculate lines. Abdomen smooth and polished, as long as the head and thorax together. Wings hyaline, densely pubescent. Spines on the dorsal margin of the posterior tibiæ arranged so as to form a double row of diamond-shaped cells, the inner row consisting of three cells and the outer of four; middle and anterior tibiæ outwardly with a row of similar spines along each margin, which on the median legs continue as parallel lines to the apex of the second tarsal joint.

General color black, with a bluish metallic tinge on head and thorax above; antennal flagellum brownish; postscutellum conspicuously yellowish-white; all trochanters, apical third of anterior femoræ, extreme apex of median femoræ, all tibiæ, and more or less of all tarsi white, the color of the latter obscured by blackish hairs; first two ventral segments of the abdomen more or less yellowish.

Type-locality.—Memphis, Tennessee.

Type.—Cat. No. 16356, U.S.N.M.

Host.—*Apanteles harnedi* Viereck.

Described from two specimens reared from cocoons of the above-mentioned host by W. P. McConnell and recorded under Webster No. 9600, United States Department of Agriculture, Bureau of Entomology.

Family EULOPHIDÆ.

Subfamily TETRASTICHINÆ.

TETRASTICHUS BRUCOPHAGI, new species.

Female.—Length 1.8 mm. Antennal pedicel and the three funicle joints subequal in length, the club about as long as the two last funicle joints combined; head not wider than the thorax; malar space long, equaling or nearly equaling the height of the eyes; whole head finely lineolated with a few round punctures on the cheeks; prothorax finely punctured; mesoscutum and scutellum finely lineolated, the parapsidal grooves deep and broad, the median line of the mesoscutum distinct but fine; two longitudinal grooves on the mesoscutellum very distinct, the distance between them not equal to half the length of the scutellum; metanotum about half as long as the propodeum and faintly sculptured; propodeum with faint subreticulate sculpture similar to that of the metanotum, the median carina distinct; abdomen conic ovate, as long as head and thorax.

Color dark blue-green; antennæ very dark brownish, the apex of scape below, and underside of pedicel paler; all coxæ, trochanters, and femoræ greenish black; apices of all femoræ, all tibiæ, and the tarsi, except apical joint, pale yellow.

Male.—Similar to the female except for secondary sexual characters.

Type-locality.—Corcoran, California.

Type.—Cat. No. 16357, U.S.N.M.

Host.—*Bruchophagus*, sp. from alfalfa seed.

Thirty specimens from the type-locality, reared by T. D. Urbahns and recorded under Webster No. 6712, Bureau of Entomology, United States Department of Agriculture. Eight specimens also reared by Mr. Urbahns, labeled, "Tulare County, California," and recorded under Webster No. 6045.

TETRASTICHUS (TETRASTICHODES) DETRIMENTOSUS, new species.

Female.—Length 1.5 mm. Face and occiput very finely lineolated; antennæ 9-jointed with a ring-joint which is visible only when mounted in balsam and under high magnification, the three funicle joints subequal and each slightly longer than the pedicel; club broader than the funicle and about as long as the two preceding funicle joints, its third joint small. Prothorax punctate; mesoscutum finely lineolated without a median longitudinal grooved line, the parapsidal furrows deeply impressed; lineolation of the scutellum very faint, the two longitudinal grooved lines distinct; propodeum smooth, with a distinct median longitudinal carina; prepectus faintly reticulated, the remainder of pleuræ smooth. Abdomen about as long as the head and thorax, pointed-ovate, and practically smooth,

though with very obscure reticulate lines under high magnification. Wings hyaline; the stigmal vein slightly clavate, with a distinct short uncus above the apex.

Color dark aeneous, nearly black; antennal scape pale; pedicel and flagellum brownish black; all femoræ black; apices of all femoræ, all tibiæ, and tarsi pale yellowish.

Male.—Antennal scape shorter than in the female, slightly swollen and black; antennal ring-joint prominent, about as long as wide, first flagellar joint longer than the pedicel (antennæ broken off at the second flagellar joint); abdomen shorter and narrower than the thorax; otherwise the male differs from the female only in the usual sexual characters.

Type-locality.—Lakeland, Florida.

Type.—Cat. No. 16358, U.S.N.M.

Host.—*Coccinella sanguinea*.

Twenty specimens from the type-locality reared by G. G. Ainslie and recorded under Webster No. 5252 I, Bureau of Entomology, United States Department of Agriculture.

Subfamily EULOPHINÆ.

SYMPIESIS AGROMYZÆ, new species.

Female.—Length 1.6 mm. to 2 mm. Head bluish, with some slight brassy reflections; thorax bright brassy-green; antennæ blackish, the scape pale at base; legs, including all coxæ, pale yellowish, the apical tarsal joints brownish; wings hyaline and rather thickly ciliated; abdomen bluish or brownish black, often more or less testaceous basally above and below.

Funicle joints 1 and 2 subequal, more than twice as long as the pedicel and slightly longer than joints 3 and 4 of the funicle; club one and a half times the length of the last funicle joint; occiput with very faint reticulate sculpture, the rest of the head smooth and polished; clypeal region sometimes very faintly sculptured. Thorax shining; the prothorax and mesoscutum sparsely covered with long hairs, with faint scale-like sculpture, less pronounced on the lateral lobes of the latter; mesoscutellum with much more distinct reticulate sculpture; metanotum nearly smooth; propodeum perfectly smooth, with a short but distinct neck and highly polished, with very distinct median and lateral carinæ and a transverse carina before the apex; marginal vein distinctly longer than the postmarginal, the latter about two and a half times as long as the stigmal, which is clavate, with a short but distinct uncus above and before the apex. Abdomen smooth, polished, as long as the head and thorax or slightly shorter, and with a short but distinct petiole.

Type-locality.—Lakeland, Florida.

Type.—Cat. No. 16359, U.S.N.M.

Host.—*Agromyza parvicornis*.

Three specimens from the type-locality reared by G. G. Ainslie and recorded under Webster No. 7599 A F, Bureau of Entomology, United States Department of Agriculture.

Family MYMARIDÆ.

Subfamily GONATOCERINÆ.

GONATOCERUS EXIMIUS, new species.

Female.—Length 0.7 to 0.8 mm. In Girault's diagnostic table of the species of this genus¹ this species runs to section II, but apparently differs from both species included in that section in having the ovipositor much longer, it being exerted at least three-fourths the length of the abdomen and in some cases longer than the abdomen.

Antennæ 11-jointed, longer than the body; the scape extending above the vertex, slightly swollen below and toward the apex; pedicel about as long as broad, much broader than the first funicle joint and scarcely as long; joint 4 of the funicle slightly the longest of the funicle joints; club solid and slightly longer than the two last funicle joints combined.

Head and thorax under high magnification with faint reticulate sculpture; abdomen sessile, a little longer than the thorax, strongly compressed from the sides for its whole length, viewed from the side ovate; the ovipositor slender, strongly exerted, extending beyond the apex of abdomen nearly or quite the length of the abdomen.

Forewing oar-shaped, very slightly and uniformly infumated, the venation ending at about the basal one-third of the wing; marginal vein very slightly obliqued into the wing at apex; discal cilia moderately coarse, and not arranged in definite rows; marginal cilia moderately long, the longest about equal to half the greatest breadth of the wings; longest marginal cilia of the hind wings at least four times as long as the width of the wing, those on the anterior margin about half as long as those on the posterior margin. Hind tarsi much shorter than their tibiæ, the basal tarsal joint about one and one-half times the length of the second.

Head, thorax, and abdomen black, the latter at base and extreme apex pale testaceous. Antennæ brownish black, the scape at base and below more or less pallid; legs, including all coxæ, pale brownish-yellow, the femoræ in some specimens dark brown medially; ovipositor sheaths black.

Male unknown.

Type-locality.—Orlando, Florida.

Type.—Cat. No. 16360, U.S.N.M.

¹ Proc. Amer. Ent. Soc., vol. 37, p. 273.

Four tag-mounted specimens from the type-locality reared by G. G. Ainslie from Jassid eggs and recorded under Webster No. 8381 C, Bureau of Entomology, United States Department of Agriculture.

Superfamily PROCTOTRYPOIDEA.

Family SCELIONIDÆ.

Subfamily TELENOMINÆ.

EUMICROSOMA, new genus.

Head transverse, as wide as the thorax; occiput triangularly concave, lateral ocelli close to but not touching the eye-margin; from in front the head is distinctly broader than long dorso-ventrally, the face broad and nearly flat; antennæ inserted at the mouth with a small toothlike process separating them at the bases, 11-jointed and distinctly clavate in the female, in the male 12-jointed and submoniliform. Thorax widest at the shoulders, tapering gradually posteriorly; prothorax concealed from above; mesoscutum rounded in front, only a little convex, and without parapsidal grooves; mesoscutellum flat, transverse; postscutellum unarmed, flat, separated from the scutellum by a curved row of punctures; propodeum short, truncate behind, with a median longitudinal carina and a transverse carina bounding the truncature above, laterally on the dorsum deeply striate, medially on either side of the median carina nearly smooth; lateral angles of the propodeum rounded. Forewings narrow, with marginal cilia longer than the width of the wing; marginal vein close to the costa, and nearly as long as the submarginal, extending beyond the middle of the wings; stigmal vein short, appearing as a continuation of the marginal and only very slightly oblique, its apex scarcely thickened; postmarginal obsolete; discal cilia of the forewings irregularly placed. Posterior wings linear, with long marginal cilia. Abdomen elliptical, not wider than the thorax, flattened above, the lateral margins not acute; first segment broader than long; second segment very long, extending almost to the apex of the abdomen, its apex rounded; ovipositor concealed or exerted not more than one-fourth the length of the abdomen.

Type.—*Eumicrosoma benefica*, new species.

This genus runs to *Typhodytes* in J. J. Keiffer's key to the *Telenominæ*,¹ but is readily separated from that genus by antennal and venational characters.

EUMICROSOMA BENEFICA, new species.

Plate 39, fig. 3.

Female.—Length 0.75 mm. Head from above more than twice as broad as long antero-posteriorly, the vertex faintly sculptured, face

¹ Wytzman's *Genera Insectorum*, Fascicule 80 B, 1900, p. 105.

perfectly smooth and polished, the region below the eyes faintly punctured; antennal scape not quite reaching the front ocellus; pedicel longer than joints 1 and 2 of the funicle combined; funicle five-jointed, the joints subequal, not longer than broad; club four-jointed, joint 1 much longer than the last funicle joint, but smaller than the following club joints, which are equal and subquadrate. Mesoscutum faintly reticulated anteriorly, the disk perfectly smooth and highly polished with a very few small round punctures; scutellum, postscutellum, and true metanotum smooth, without punctures; propodeum as described; anterior margin of the forewing to the apex of the venation with only a few short marginal cilia, beyond with long cilia, the longest being twice the width of the wing. First segment of the abdomen nearly twice as broad as long, with coarse longitudinal striæ, second segment similarly striate at base and much more faintly so beyond to the apex.

Head and thorax shining black. Antennæ, palpi, legs, including coxæ, and the whole abdomen reddish yellow. Antennal pedicel and club slightly fuscous.

Male.—Antennæ fuscous, submoniliform, without a distinct club; pedicel globose, thicker but not longer than the first funicle joint; funicle joints 1, 2, and 3 slightly larger than the following; apical joint of the club as long as the two preceding joints combined; abdomen a little shorter than in the female and distinctly fuscous on the apical half. Otherwise like the female.

Type-locality.—Manhattan, Kansas.

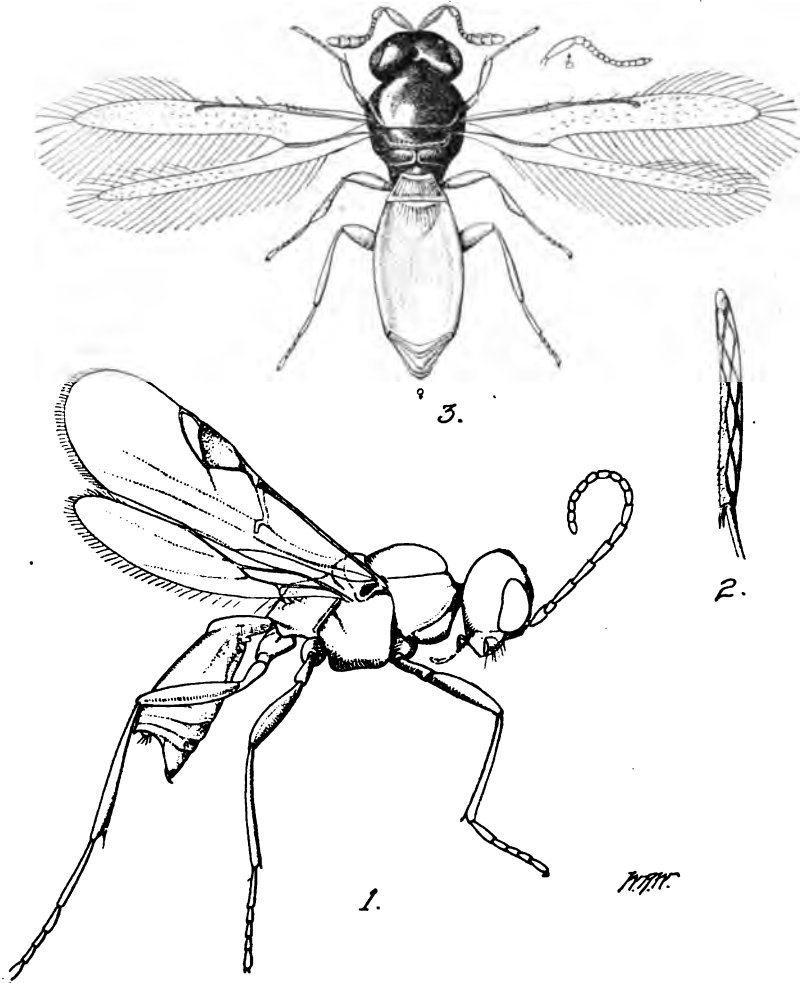
Type.—Cat. No. 16361, U.S.N.M.

Host.—*Blissus leucopterus*.

Described from over 40 specimens received from J. W. McCulloch and reared by him from the eggs of the Chinch Bug.

EXPLANATION OF PLATE 39.

- Fig. 1. *Euphoriana uniformis*, female.
2. *Elasmus apanteli*, hind tibiæ of.
3. *Eumicrosoma benefica*, female.



SOME NEW HYMENOPTERA.

FOR EXPLANATION OF PLATE SEE PAGE 443.

SOME NEW AMERICAN PYCNODONT FISHES.

By JAMES WILLIAMS GIDLEY,

Assistant Curator of Fossil Mammals, United States National Museum.

In the United States National Museum are several specimens representing five apparently undescribed species of Pycnodont fishes. One of these is referable to *Microdon*, a genus hitherto not known from deposits of this continent. The others are apparently referable to species of two other Old World forms *Celodus* and *Anomæodus*, but the latter genera have already been reported from American deposits. These specimens form the basis of the following descriptions and brief note:

MICRODON TEXANUS, new species.

Type.—Vomerine plate containing nearly all the teeth. (Cat. No. 7621, U.S.N.M.) See fig. 1, p. 445.

Paratype.—Portion of left splenial containing teeth of three rows. (Cat. No. 7065, U.S.N.M.)

Type-locality.—Hamilton County, Texas. The paratype came from near Vanderpool, Bandera County, Texas. Both the type and paratype specimens come, apparently, from similar deposits, and are probably of Lower Cretaceous age.

Description.—Size, large, as compared with *M. elegans*, the type-species; dental surface relatively broad and decidedly convex laterally, with teeth of the inner rows loosely spaced; teeth of the various rows about the same relative proportions to each other as those of *M. discoides* (Woodward), but differ from those of the latter in general form; teeth of median row broadly elipsoid, about one and one-half times broader than long; inner paired series irregularly triangular, with long axis obliquely inclined and set well within the interspaces of the median row; teeth of outer paired series much larger than those of inner paired rows,



1a

FIG. 1.—MICRODON TEXANUS. TYPE. VOMERINE PLATE. NAT. SIZE. 1. PALATINE VIEW. 1a. SECTION ABOUT MIDDLE POINT TAKEN FROM POSTERIOR VIEW.

and irregularly quadrangular; teeth of median row smooth, not pitted; unworn teeth of paired rows present shallow, apical depressions which are distinctly wrinkled.

The teeth of the splenial plate from Vanderpool, Texas (No. 7065, see fig. 2, p. 446), correspond well in size and general appearance with

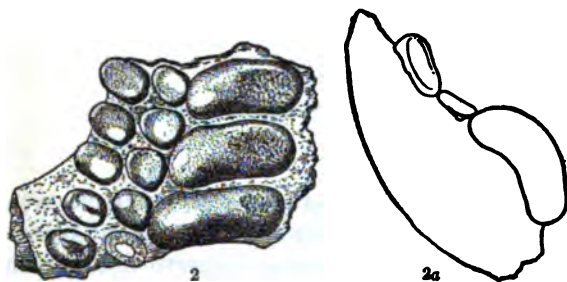


FIG. 2.—*MICRODON TEXANUS*. PARATYPE. PORTION OF LEFT SPLENIAL, NAT. SIZE. 2. SUPERIOR VIEW. 2a. POSTERIOR END VIEW, OUTLINE.

those of the type-specimen, while their form and wear surfaces fit exactly those of the vomerine piece. There seems, therefore, little doubt that this specimen pertains to the same species as the latter.

This specimen presents several distinct-

characters. The teeth of the principal series are more than twice as broad as long, and considerably exceed the combined width of the outer two rows, but the inner half of each tooth bends sharply downward, so that only the outer half is opposed by the vomerine teeth; there are apparently no teeth inside the principal row; those of the

outer two rows are nearly equal in size and but slightly broader than long; the unworn tooth of the outermost series has the characteristically wrinkled apical depression seen in the vomerine teeth.

CCELODUS PARADENS, new species.

Type.—Nearly complete left splenial with most of the teeth present. (Cat. No. 7624, U.S.N.M.) See fig. 3.

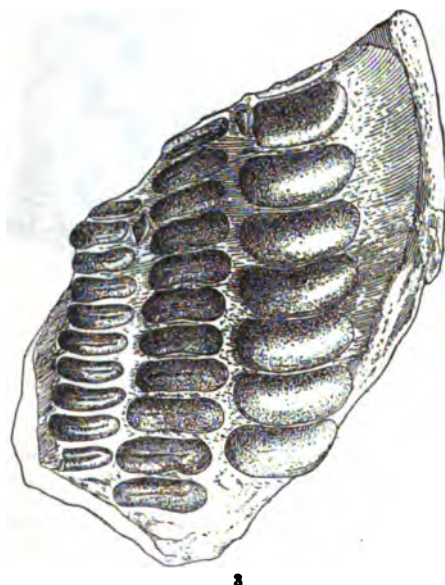


FIG. 3.—*CCELODUS PARADENS*. TYPE. A NEARLY COMPLETE LEFT SPLENIAL. 3. SUPERIOR VIEW. 3a. SECTION TAKEN FROM ANTERIOR VIEW.

Locality.—Near Gainesville, Cooke County, Texas. Probably Lower Cretaceous in age.

Description.—Teeth of principal row decidedly kidney or bean shaped in form and about the size of those of the corresponding row in *C.*

cantabrigiensis Woodward, but the width of teeth of principal row is considerably less than combined width of outer two rows. Teeth of principal row without apical indentations; teeth of outer rows similar to each other in proportions, but with transverse width relatively much greater than those of the principal row; teeth of outer two rows very distinctly indented at apex with smooth or but faintly crenulate margins in the unworn teeth.

CELODUS DECATURENSIS, new species.

Type.—Portion of left splenial with five teeth of principal row, five teeth and two bases of the median row, and five pedicles, or tooth bases, of the outermost row. (Cat. No. 16, U.S.N.M.) See fig. 4, p. 447.

Type-locality.—Decatur, Wise County, Texas. Probably of Lower Cretaceous age.

Description.—In general proportions the splenial dentition is nearly as in *Celodus mantelli* (Agassiz), but the teeth differ from those of the latter in their much larger size and other important details, as follows: Teeth of principal series slightly reniform, a little more than twice as broad as long and about equaling the combined width of the outer two rows; teeth of inner row of outer series about half the size, but of about the same proportions as those of principal row and about one and one-half times wider than those of the outermost row. Teeth of outermost row proportionally much narrower transversely than those of the other rows, being nearly as long as wide; teeth of entire series with narrow apical pits having slightly crenulate borders. This species differs also from *C. stantoni* Williston in the presence of well-defined apical pits and the relatively smaller size and narrower proportions of the teeth adjacent to the principal row. The teeth of the outermost row in other American species are not known to me, and are represented only by their bases as preserved in the type-specimen of the present species. These show the teeth of this series to be not more than half the width of those of the middle series. The specimen resembles in some respects the one described by Cope, *C. browni*,¹ but, comparing it with Cope's

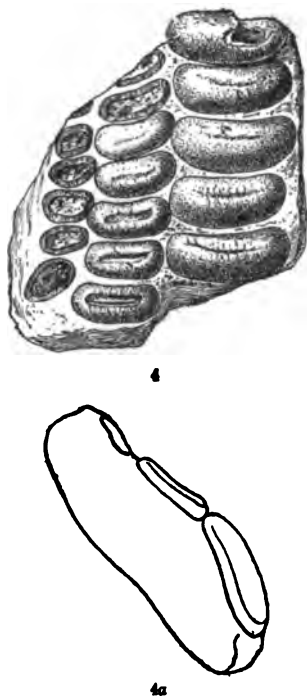


FIG. 4.—*CELODUS DECATURENSIS*.
TYPE. PORTION OF LEFT SPLENIAL.
NAT. SIZE. 4. SUPERIOR VIEW. 4a.
POSTERIOR END VIEW, OUTLINE.

to the principal row. The teeth of the outermost row in other American species are not known to me, and are represented only by their bases as preserved in the type-specimen of the present species. These show the teeth of this series to be not more than half the width of those of the middle series. The specimen resembles in some respects the one described by Cope, *C. browni*,¹ but, comparing it with Cope's

¹ Journ. Acad. Nat. Sci. Philadelphia, (2), vol. 9, 1895, p. 447, pl. 20, fig. 10.

figure, it presents some differences of specific value. The teeth are larger and differently proportioned, those of the principal row being relatively narrower transversely, while those of the adjacent outer row are relatively wider and are set less obliquely to those of the principal series. It also differs from the specimens from Kansas, figured by Williston and referred to *C. browni*,¹ in the relatively less wide proportions of the teeth of both series, and in the presence of the well-marked apical pits. Williston's specimen seems to differ markedly from Cope's type in proportions of the teeth, and perhaps should have been referred to a distinct species.

In size and proportions of the tooth rows to each other, the Texas specimen here described quite nearly resembles in a general way the British species, *C. cantabrigiensis* Woodward, from the Cambridge Greensand, but it differs from the latter in the possession of distinct apical pits or grooves and the somewhat wider proportions of all the teeth.



FIG. 5.—*ANOMGEODUS LATIDENS*.
TYPE. PORTION OF LEFT SPLE-
NIAL. NAT. SIZE.

ANOMGEODUS LATIDENS, new species.

Type.—Portion of left splenial containing nearly all the teeth. (Cat. No. 2194, U.S.N.M.) See fig. 5, p. 448.

Locality.—Nine miles west of Tupelo, Mississippi. Probably Cretaceous in age.

Description.—Larger than *A. phasceolus* (Hay),² but much smaller than *A. robustus* (Leidy). The teeth of the principal row in general form resemble those of *A. phasceolus*, but present the following characteristic differences: They are relatively broader as compared with their length, more closely

set together in the jaw, and are decidedly more expanded anteroposteriorly at their outer ends. Further differences are seen in the teeth of the inner flanking series, which are relatively somewhat smaller and are arranged opposite the interspaces instead of opposite the teeth of the principal series, as in *A. phasceolus*. A peculiarity of this species seems to be the rapid decrease in transverse width from behind forward of the teeth in the principal series. (See fig. 5, p. 448.)

¹ Kansas Univ. Quart., vol. 9, ser. A, 1900, p. 28, pl. 6, fig. 12.

² The type of this species was originally described by Leidy under the name *Pycnodus fabi* (Proc. Acad. Nat. Sci. Phila., 1872); but in 1899 Hay (Amer. Nat., vol. 33, 1899, p. 788) proposed the name *P. phasceolus* to replace *P. fabi*, preoccupied. The generic reference of this form should have been to *Anomgeodus* and not to *Pycnodus*.

ANOMGEODUS MISSISSIPPIENSIS, new species.

Type.—Posterior portion of right splenial with four teeth of the principal row and three of the outer flanking row. (Cat. No. 75, U.S.N.M.) See fig. 6, p. 449.

Locality.—Guntown, Mississippi. Probably from deposit of Cretaceous age

Description.—Larger than *A. latidens*. Teeth of principal series less wide as compared with anteroposterior length and more decidedly expanded at their outer ends; teeth of flanking series triangulate, relatively large and opposite the interspaces of the principal series as in *A. latidens*. The teeth of the principal series are closely set together as in the latter species, but are less sharply convex fore and aft and are even more broadly expanded at their outer ends. The teeth are hollow beneath. This character, however, may have no significance peculiar to the species.

Comparative measurements of largest tooth in principal series of splenial plates described by Leidy and the two species of this genus here reported are given below.

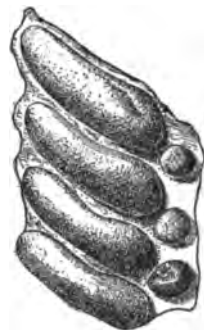


FIG. 6.—*ANOMGEODUS MISSISSIPPIENSIS*. TYPE. PORTION OF RIGHT SPLENIAL. NAT. SIZE.

	Length antero-posterior).	Breadth (transverse).
	mm.	mm.
<i>A. phascolus</i> (Hay). (Same as <i>Pycnodon faba</i> Leidy).....	7.4	18.5
<i>A. robustus</i> (Leidy).....	9.5	30
<i>A. latidens</i> , new species.....	5.5	22
<i>A. mississippiensis</i> , new species.....	7.5	24

Specimens of Pycnodont fishes in American deposits are comparatively rare and consist for the most part of fragments of vomerine and splenial plates on which a few teeth, or in some instances only their bases, have been preserved. Several of the specimens in the United States National Museum collection here described are more than usually complete and for that reason have been carefully and fully figured. The specimens referable to *Microdon* are especially important in that they record for the first time the presence of this genus in deposits of this continent.¹

Cope once referred to this genus a specimen from the Lower Cretaceous of Texas, which he called *Microdon dumbelli* but afterward assigned to the genus *Mesodon*.²

¹ Cope, Proc. Amer. Philos. Soc., 1892, p. 128 (*Microdon dumbelli*).

² Journ. Acad. Nat. Sci. Phila. (2), vol. 9, 1895, p. 444. (*Mesodon dumbelli*) *Mesodon* (preoccupied)—*Typodus* according to Hay, Bull. 179, U. S. Geol. Survey, 1902, p. 372.

NORTH AMERICAN SPRING-TAILS OF THE SUBFAMILY TOMOCERINÆ.

By JUSTUS W. FOLSOM,
Of the University of Illinois, Urbana, Illinois.

Collectors who are not especially interested in Collembola often have their attention attracted by large and agile specimens of *Tomocerus*. The species of this genus are among the largest "spring-tails" that we have, attaining often a length of 5 mm. They occur under loose bark, in damp, decaying logs, in moss, and generally on the ground, under dead leaves, logs, or other objects. Some species are lead-colored before they lose their scales; others are purplish or blackish, and the scales give the insects a metallic appearance, with more or less iridescence. After the scales are lost the body-color is frequently yellow, but is highly variable, even in individuals of the same species.

The forms of North American Tomocerinae discussed in this paper—few in number, but all that are known at present—are as follows:

Tomocerus flavescens Tullberg.

Tomocerus flavescens Tullberg, var. *separatus*, new variety.

Tomocerus flavescens Tullberg, var. *americanus* Schött.

Tomocerus flavescens Tullberg, var. *arcticus* Schött.

Tomocerus bidentatus, new species.

Tomocerus vulgaris Tullberg.

Tomocerus minor Lubbock.

Tritomurus californicus, new species.

T. flavescens, *vulgaris*, and *minor* are common and well known in Europe. *Tritomurus* is a rare and little-known European genus, to which belong several specimens that I have received from California.

For much of my material I am indebted to many collectors, whose names appear beyond, and especially to Dr. A. D. MacGillivray. All specimens recorded without a collector's name were collected by myself. The ownership of specimens is designated in parentheses, the omission of which indicates that specimens are contained in my private collection at present. Cotypes have been deposited in the

United States National Museum, Washington, District of Columbia, and in the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

The subject here considered was studied in the entomological laboratory of the University of Illinois, of which it forms contribution No. 35.

Subfamily TOMOCERINÆ Schäffer.

Tomocerinx SCHÄFFER '96, p. 177.—BÖRNER '06, p. 161.

Tomocerini SCHÄFFER '97, p. 35.—BÖRNER '01, p. 60; '06, p. 161.—ABSOLON '03, p. 108.

Eyes twelve or none. Antennæ four segmented; third segment much longer than the fourth; last two segments subsegmented. Prothorax reduced, membranous. Mesonotum covering pronotum, but not projecting over the head. Tibiotarsi one or two segmented; clavate tenent hair present or not. Both claws present. Unguis pseudonychiate, with basal folds and simple (not double) teeth. Third abdominal segment longer than the fourth. Dentes three-segmented, with stout basal spines; mucrones long, subcylindrical. Anal segment with three cerci. Scales present, with longitudinal ridges and transverse striæ. Two genera, as follows:

Eyes twelve; tibiotarsi two-segmented; clavate tenent hair present. *Tomocerus*, p. 452.
Eyes absent; tibiotarsi one-segmented; clavate tenent hair absent. . *Tritomurus*, p. 469.

Genus TOMOCERUS Nicolet.

Tomocerus NICOLET '41, p. 67.

There are six eyes on each side of the head (fig. 1). The antennæ (fig. 2) are long, but exceed the body in length in only a few species of the genus. The short terminal antennal segment is often absent through mutilation; this segment and the third are subdivided into short rings, which in the latter segment often number one hundred and fifty or more, except in young individuals.

The leg, in Collembola, consists primarily of seven segments, five of which were formerly termed, respectively, coxa, trochanter, femur, tibia, and tarsus, as in other insects. Börner's ('02) comparative studies of the segmentation of the legs of myriopods and insects have led him to apply the term "tibiotarsus" to the so-called tibia of Collembola and to adopt de Meijere's ('01) term praetarsus for the small segment that bears the claws. In *Tomocerus* the tibiotarsus, functionally a single segment, is morphologically at least two segments, as shown by the presence of a suture just above the tenent hair. Occasionally a second suture occurs as an abnormality, dividing the tibiotarsus into three segments (fig. 3), which are probably a

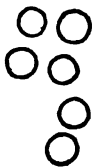


FIG. 1.—TOMOCERUS
FLAVESCEUS, VAR.
ARCTICUS. EYES
OF RIGHT SIDE.
X 320.

tibia and two tarsal segments—a primitive condition normal in *Pauropus* and *Polydesmus*. In *Tomocerus*, as in other Collembola,

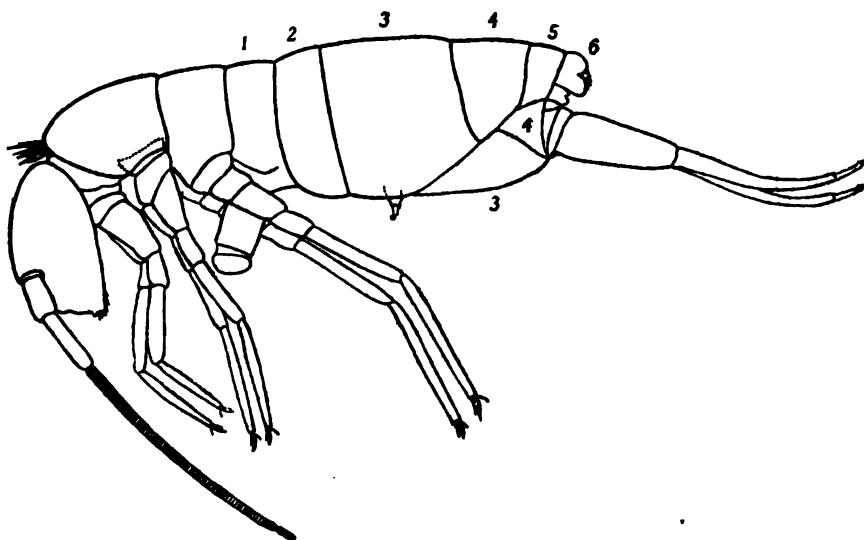


FIG. 2.—*TOMOCERUS FLAVESCENS*, VAR. *AMERICANUS*. THE ABDOMINAL SEGMENTS ARE NUMBERED. X 20

two pre-coxal segments are present (fig. 2). These Willem ('00, p. 93) regards as equivalent to the two pre-coxal segments of the cockroach, that occur in other Orthoptera under various modifications, as described by Miall and Denny.

The structure of the claws of *Tomocerus* has been described minutely by Absolon ('03). Some disagreement has existed in regard to the precise structure of the teeth of the unguis, which are of considerable phylogenetic importance. In a lateral view of the unguis a single series of teeth is seen, as in plate 40, figure 3. Willem ('00, p. 45) maintained that these minute teeth are not single, but paired, the two teeth of each pair being side by side, and one hiding the



FIG. 3.—*TOMOCERUS FLAVESCENS*, VAR. *AMERICANUS*. TIBIOTARSUS SHOWING AN ABNORMAL THIRD SEGMENT. X 57.

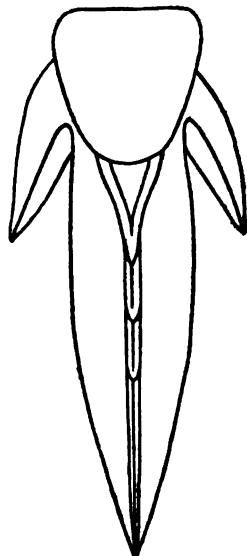


FIG. 4.—*TOMOCERUS FLAVESCENS*, VAR. *AMERICANUS*. CONCAVE ASPECT OF UNGUIS TO SHOW THE FORM OF THE TEETH. X 644.

other in a lateral aspect of the claw. Börner ('01, p. 39) described the unguis as being triangular in transverse section, with a simple, or

unsplit, inner edge, on which the teeth are situated; these teeth being simple, not doubled. Absolon ('03, p. 103) described the inner edge ("Innenkante") as being formed by the union of the edges of two lamellæ, with a series of simple teeth on one of these lamellæ.



FIG. 5.—*TOMOCERUS FLAVESCENS*, VAR. *AMERICANUS*. LEFT SIDE OF TENACULUM. $\times 238$.

Wahlgren ('06a, p. 64) arrived independently at the same conclusion as Absolon. I find that the inner border is formed by the united edges of two lamellæ, that the teeth are simple, and that each tooth arises from both lamellæ, as in figure 4—not from one of them. My figure for *T. flavescens* var. *americanus* agrees essentially with that of Börner ('01, p. 39) for *T. plumbeus* (Linnaeus) Tullberg, the species used by all these European investigators; and in examples of the latter species, received from Doctor Schäffer, I have seen the teeth as described by Börner.

Wahlgren's figure ('06a, p. 64) is correct for an oblique view of the claw, but is misleading as to the exact relation of the teeth to the pair of lamellæ. In order to see this relation, the claw must be turned until it presents a symmetrical view, as in figure 4.

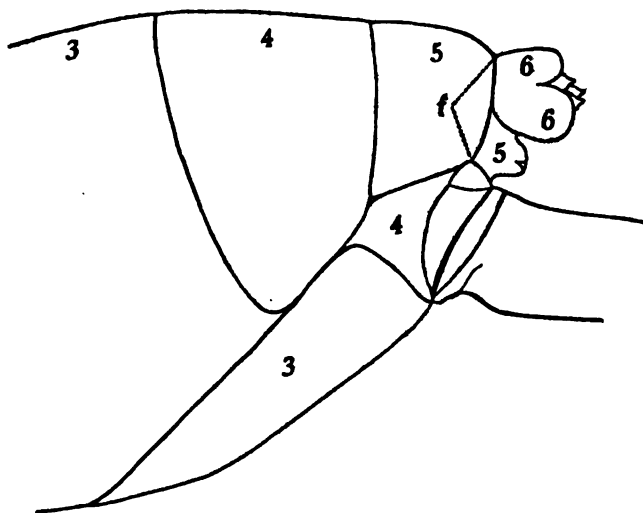


FIG. 6.—*TOMOCERUS FLAVESCENS*, VAR. *AMERICANUS*. POSTERIOR SEGMENTS OF ABDOMEN, NUMBERED TO SHOW RELATIVE POSITIONS OF TERGA AND STERNA. *f*, FOLD. $\times 39$.

The tenaculum (fig. 5) of the third abdominal segment does not vary greatly in the genus *Tomocerus*. The base of the tenaculum bears anterior setæ, which differ somewhat in number and position in different species without, however, having any specific value of practical importance.

The furcula is an appendage of the fourth abdominal segment in all Collembola. This relation, evident in the more generalized genera, as *Achorutes*, is not obvious in such forms as *Tomocerus* without the aid derived from a study of certain other genera, particularly *Isotoma*. Indeed, it has been said frequently that the furcula in *Tomocerus* is appended to the fifth abdominal segment. The correct view is that maintained by Willem ('00, pp. 40, 45), to whose evidence I can add a little, as follows:

In a specimen treated with hot potassium hydroxide a suture becomes evident that separates the sternum of the fourth abdominal segment from the tergum of the fifth, as in figure 6.

Before such treatment the suture is indistinguishable, and the furcula appears to be attached to the fifth abdominal segment.

Willem ('00, p. 44) notes that the genital segment (fifth abdominal) is more elongate in the male than in the female. This elongate condition is shown in figure 7, in which the genital segment is extended for its entire length. When not extended the posterior part of the segment is telescoped into the anterior part, giving the appearance shown in figure 6, in which *f* represents the external line of folding, which might easily be mistaken for a suture. In the female the genital segment is telescoped but slightly.

Willem called attention also to the presence of three "cerci" on the anal segment, and stated that these are shorter in the male than in the female. The so-called cerci, one dorsal and two ventral, are shown in figures 7 and 8.

Returning to the furcula—each dens is divided by two transverse sutures into three regions (fig. 9). In brittle alcoholic specimens the dens frequently breaks at one or the other of these sutures. The dental spines are limited to the middle and the proximal region or to the middle region. These spines, as regards number, relative size, form, and arrangement, furnish good specific characters. The spines increase in number with the age of the individual and vary a little in number in individuals of the same age. It follows that one should

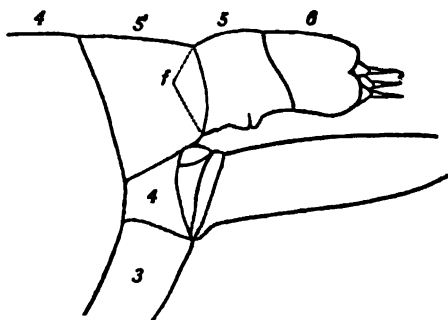


FIG. 7.—*TOMOCERUS FLAVESCENS*, VAR. *AMERICANUS*. POSTERIOR SEGMENTS OF ABDOMEN OF MALE, SHOWING PROTEUDED GENITAL SEGMENT. *f*, FOLD. $\times 30$.

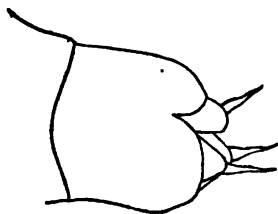


FIG. 8.—*TOMOCERUS FLAVESCENS*, VAR. *AMERICANUS*. ANAL SEGMENT OF MALE, SHOWING CERCI. $\times 102$.

hesitate to describe a species of *Tomocerus* as new until he has ascertained, at least approximately, the range of variation in these dental spines; and that of the claws and body color as well, it may be added.

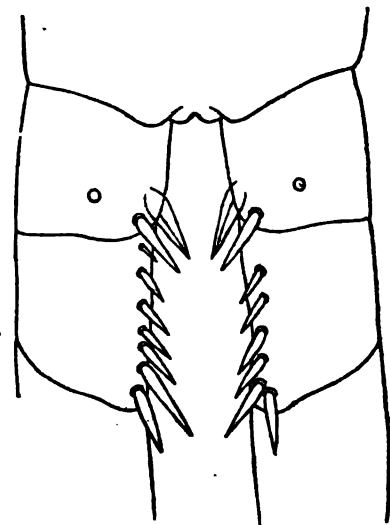


FIG. 9.—*TOMOCERUS FLAVESCENS*, VAR. *SEPARATUS*. BASES OF DENTES TO SHOW SEGMENTATION AND SPINES. $\times 124$.

For describing the dental spines Ågren ('03, p. 144) used a formula which has been generally adopted. Such a formula for plate 40, figure

2, would be $\frac{1}{7, 2}$. Here the horizontal line represents the suture between the proximal and middle series of spines, and the fat-faced type indicates the larger size of certain spines. In this paper I have changed the formula a little by running it on a single line, using an oblique line to indicate the suture. Thus the preceding formula becomes $1/7, 2$.

The form of the mucrones is distinctive of *Tomocerus* (and *Tri-tomurus*) if we leave out of consideration two apparently aberrant

European species, namely, *doderii* Parona and *niveus* Joseph. Each mucro (fig. 10) bears dorsally (the furcula being extended behind the body) two large proximal teeth, an apical tooth or hook, and a large anteapical tooth; and between the basal and apical teeth there is, in almost all species of the genus, a series of small, equal, "intermediate teeth," which vary slightly in number in individuals of the same size.

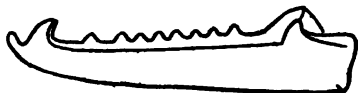


FIG. 10.—*TOMOCERUS FLAVESCENS*, VAR. *SEPARATUS*. RIGHT MUCRO. $\times 275$.

Key to Species of *Tomocerus*.

- Intermediate dental spines subequal or gradually increasing in size distally; two large distal spines (plate 40, figs. 2, 4, 6)..... *flavescens*, p. 457.
 Intermediate dental spines unequal, with a large spine near the middle of the series; one large distal spine (plate 40, fig. 8; plate 41, figs. 10, 13, 14).
 Teeth of unguis 4 to 7:
 Dental spines simple..... *vulgaris*, p. 463.
 Dental spines tridentate..... *minor*, p. 466.
 Teeth of unguis 2..... *bidentatus*, p. 463.

TOMOCERUS FLAVESCENS Tullberg.

Plate 40, figs. 1, 2.

Macrotoma flavescens TULLBERG, 1871; 1872.—REUTER, 1876.—UZEL, 1890.*Tomocerus flavescens* SCHÖTT, 1894.—DALLA TORRE, 1895.—SCHÄFFER, 1896.—POFFE and SCHÄFFER, 1897.—LIE-PETTERSEN, 1897; 1898.—SCHERBAKOV, 1898a, 1898b.—CARL, 1899; 1901.—SKORIKOW, 1900.—KRAUSBAUER, 1901.*Tomocerus niger* REUTER, 1895.—CARPENTER and EVANS, 1899.—SCHÄFFER, 1900.—BÖRNER, 1901.—FOLSOM, 1902.—AXELSON, 1904.—BANTA, 1907.*Tomocerus plumbeus* PACKARD (part), 1873.—ÅGREN, 1903.—(Axelson) LINNANIEMI, 1905, 1906, 1907.—WAHLGREN, 1906.*Pogonognathus plumbeus* BÖRNER, 1909.—(Axelson) LINNANIEMI, 1912.

Description.—The typical *T. flavescens* as known in Europe has the following distinguishing characters, as appears from the published descriptions and figures and from the specimens that I have received:

Body color yellow; either pure yellow or with a varying amount of purplish or grayish pigmentation, especially on the anterior border of the mesonotum, on the coxæ, tibiæ, distal portions of the femora, and the first two antennal segments; the last two being purplish. Antennæ shorter than the body. Unguis (pl. 40, fig. 1) usually bidentate, occasionally tridentate. Unguiculus lanceolate, with one tooth or with none. Dental spines (pl. 40, fig. 2) 6 to 8; large spines three; one proximal and two distal; the intermediate spines becoming successively smaller toward the base of the dens. Near each large proximal spine is a transparent lanceolate lamella. Length 5 mm., occasionally 6 mm.

Variation.—There is great variation in the body color. Tullberg's original description reads, "ground-color yellowish gray or pure yellow," and Brook refers to the color variation as follows: "The majority have had yellow as the basis of the ground-color, sometimes with brown patches and sometimes with the yellow fading away into a leaden color almost like that of the scales."

Tullberg gave the first recognizable description of this species. His description, giving the teeth of the unguis as two and the dental spines as seven or eight, has been supplemented by Ågren ('03), who mentions the occurrence of three teeth on the unguis and gives as the formula for the dental spines 1-3/3-5, 2. In eight European specimens sent to me by Doctor Schäffer the teeth of the unguis number either two or three, and the dental formula is 1/4-5, 2.

Some of my specimens from various parts of the United States agree exactly with European descriptions and specimens of the species. In this country, however, three teeth on the unguis are the rule in large specimens, small individuals having usually two, and in large specimens the number of dental spines ranges from 9 to 12, inclusive; thus specimens 4.5 to 5 mm. in length have the formula 1/8, 2 or 1/9, 2.

Some of our American specimens have the clear yellow body color of the typical European *flavescens*, but as a rule the color is other yellow or buff or cream yellow. Before the scales are removed the insect is lead-colored. As a rule, the antennæ are shorter than the body. I have, however, from Georgia, a single specimen of unusual size (length 6 mm.), in which the antennæ are longer than the body, in the ratio of 8:7, and curl at the ends.

The number of intermediate teeth on the mucro ranges from five to twelve in specimens 2.5 mm. or more in length, with an average of seven or eight. The unguiculus is usually one-toothed, and on the largest specimens a small second tooth may be present.

The prevalent American variety, with tridentate unguis (pl. 40, fig. 1), is the form that I have been referring to, in correspondence, under the name of *separatus*.

From the original descriptions one might infer that *T. flavescens* Tullberg, *T. americanus* Schött, and *T. arcticus* Schött were three different species. Such is not the case, however, as I have already pointed out. (Folsom '02, p. 97-102.) In Alaska the three forms intergrade in one and the same locality; though in most other parts of the United States the three are fairly distinct. *Flavescens* is, for purposes of nomenclature, the typical form, with *separatus*, *americanus*, and *arcticus* as its varieties, and these forms may ordinarily be distinguished as follows:

Key to forms of Tomocerus flavescens Tullberg.

One or two large dental spines at the proximal end of the series.

One large proximal spine:

Teeth of unguis 2 *T. flavescens*, typical form.

Teeth of unguis 3 *T. flavescens*, var. *separatus*, new variety.

Two large proximal spines; teeth of unguis 3 or 4. *T. flavescens*, var. *americanus* Schött.

No large proximal dental spines; teeth of unguis 4, rarely 5, var. *arcticus* Schött.

This table refers to large specimens (2.5 mm. or more in length); in small specimens there are fewer teeth on the large claws and fewer spines on the dentes.

Synonymy.—Tullberg described *flavescens* in 1871 and 1872, and all the European authorities know what form he meant. His description, being the first adequate diagnosis of the species, should be accepted in the interests of stability. Several writers, however, have tried to supplant *flavescens* with previous names, based on insufficient descriptions, to the confusion of the nomenclature. The name used most often to supersede *flavescens* has been *niger* of Bourlet ('39, p. 390), whose description of *Macrotoma nigra* is as follows:

Même longueur que la précédente pour le corps et les antennes; corps couvert d'écaillés noires, offrant à la vue simple un léger reflet argenté. Corps dépouillé de ses écailles, présentant une couleur d'un jaune de cire. Bord antérieur du thorax

garni d'une frange de poils noirs et courts; antennes grises, ou d'un gris fauve; pattes d'un brun verdâtre, tarses bruns, ventre jaunâtre. Cette espèce, ainsi que la précédente, se trouve sous les pierres et le vieux bois.

This description is so broad as to have scarcely any specific value. The expression "wax-yellow" has, however, been seized upon by "priority-hunters" as an excuse to drop the name *flavescens* in favor of *niger*.

Ågren ('03, p. 145) believed that the name *flavescens* should be retained, but nevertheless proposed a still earlier name, *plumbea* Templeton, since Templeton ('35, p. 93) described *Podura plumbea* as having a golden yellow body color. Now at least four other writers have followed Ågren and adopted the name *plumbea*, though Templeton's description is so vague that previous authorities had agreed in rejecting it.

As a matter of fact, *flavescens* is not the only European species of *Tomocerus* with a clear yellow body color. *T. vulgaris* is often bright yellow, so that Schött ('94, p. 41) thought it most probable that *vulgaris* was the species named *niger* by Bourlet. *T. tridentiferus* Tullberg is also sometimes yellow, as Carpenter and Evans ('99, p. 237) have noted; and *T. sibiricus* Axelson is characteristically bright yellow.

In fact, yellow is the basis of the body color in many species of *Tomocerus*, and the body color is so variable as to be of little specific importance, as Brook ('83, p. 23) showed long ago.

The only justifiable course is to retain the name *flavescens* Tullberg.

The specimens of *Tomocerus* that I determined for Banta ('07, p. 55) are *flavescens* Tullberg, var. *americanus* and var. *separatus*.

The specimens that Packard ('73, p. 38) referred to *T. plumbeus* Linnaeus belong to two species: *vulgaris* Tullberg and *flavescens* Tullberg. These specimens are in the Museum of Comparative Zoölogy, Cambridge, Massachusetts, where I studied them. Of those labeled "Brunswick, Me., Sept. 10, A. S. P.," four are *flavescens*; "Salem, Mass., A. S. P.," six *flavescens*; "Knoxville, Tenn., Dr. J. Curtis," 136 *flavescens*. All these specimens of Packard's are of the common tridentate form that I call *separatus* to distinguish it from the typical bidentate form of Tullberg's description.

Distribution.—The typical bidentate form of *flavescens*, as described by Tullberg, is rare but widely distributed in this country, so far as I can infer from the material I have studied. The following are the only records that I have of its occurrence:

Illinois.—Urbana, March 19.

Tennessee.—Knoxville, April 5, H. E. Summers.

California.—V. L. Kellogg (Stanford University, J. W. F.).

Washington.—V. L. Kellogg, L. Bremner (Stanford University, J. W. F.).

In most parts of Europe *T. flavescens* is a common species.

TOMOCERUS FLAVESCENS Tullberg, var. **SEPARATUS**, new variety.

Plate 40, figs. 1, 2.

This tridentate variety, already referred to, is well established in this country, and to distinguish it from the typical bidentate form which is common in Europe but rare here, I have been using the varietal name *separatus*.

Maine.—Brunswick, September 10, A. S. Packard, jr. (M. C. Z.). Orono, October, F. L. Harvey.

New Hampshire.—Jaffrey, September, S. Henshaw. Franconia, Mrs. A. T. Slosson. Walpole, July 14.

Massachusetts.—Salem, September, December, A. S. Packard, jr. (M. C. Z.). Arlington, April 4, 17, 23, May 14, August 6, 15, 16, September 19, 21, 30, October 1, 13, 14, 17, November 6, December 10. Belmont, April 19. Waltham, July 29. Wellesley, February 25, A. P. Morse. Weston, July 16.

New York.—Ithaca, July 1, September 24, A. D. MacGillivray. Long Island, N. Banks.

Pennsylvania.—Hazleton, G. W. Dietz. Harrisburg, February 24, October 4, November 6, 14, 24, December 14, H. A. Surface. Lewisburg, October 25, H. A. Surface. Rockville, April 7, H. A. Surface. Tyrone, April 3, H. A. Surface. Highspire, January 20, April, September 22, H. A. Surface. Eberly's Mill, July 28, H. A. Surface. Kennett Square, April 16, H. A. Surface. Hummelstown (limestone cave), November, H. A. Surface.

District of Columbia.—Washington, February 2, N. Banks.

Georgia.—Burton, May 20, J. C. Bradley. St. Simon Island, May, J. C. Bradley. Rabun County, May 24, J. C. Bradley.

Tennessee.—Knoxville, Dr. J. Curtis (M. C. Z.); April 5, March 15, H. E. Summers. Cloud Ford, August, C. C. Adams.

Ohio.—Salem, March 21, A. D. MacGillivray. Salineville, February 4, December 24, A. D. MacGillivray.

Indiana.—Richland (Mayfield's cave), May 6, 8, June 4, October 29, December, A. M. Banta (A. M. B., J. W. F.).

Illinois.—Urbana, April 9, October 19, 26.

Missouri.—Columbia, October 19, G. I. Reeves. St. Louis, January 27, H. Schwarz.

Michigan.—Washtenaw County, November 3, J. Dawson (Univ. Mich.).

Cotypes.—Cat. No. 16261, U.S.N.M.

TOMOCERUS FLAVESCENS Tullberg, var. **AMERICANUS** Schott.

Plate 40, figs. 3, 4.

Tomocerus americanus SCHÖTT, 1896.

Tomocerus plumbeus PACKARD (part), 1873.

Tomocerus niger, var. *americanus* FOLSOM, 1902.

Tomocerus arcticus GUTHRIE, 1903.

Description.—Ungues tridentate or quadridentate (pl. 40, fig. 3). Unguiculus unidentate. Dental spines nine to eleven, rarely twelve, the two proximal and the two distal considerably larger than the rest (pl. 40, fig. 4). Dental formula typically $2/5-7, 2$; rarely $2/8, 2$. Length 4 mm.

Variation.—The body color, clear yellow in Alaskan specimens, is highly variable in specimens from other parts of the United States. Thus it may be cream yellow, straw yellow, bright ferruginous or grayish; the grayish specimens frequently having elongate rounded oblique whitish spots on the sides of the thorax and abdomen. In Illinois I have collected at one time specimens illustrating all these color variations from a single square foot of soil. A variable amount of dark pigment occurs on the anterior border of the mesonotum, on the coxæ, tibiæ, and distal ends of the femora, and on the abdominal segments and the manubrium.

The teeth of the ungues are commonly 4, 4, 4; 3, 3, 3; or 4, 3, 3. The tooth of the unguiculus is occasionally absent. The intermediate teeth of the mucrones vary from six to ten in specimens three to four millimeters in length, with an average of eight or nine.

Tomocerus americanus can not be regarded as a distinct species, since it intergrades with typical *flavescens* in all the characters that are of specific importance, as I showed in my paper on Alaskan Apterygota ('02, p. 99). Such intergradations as these occur:

Teeth of unguis.	Dental formula.	Locality.
2, 2, 2	$2/4, 2$	Alaska, Tennessee,
2, 2, 2	$2/5, 2$	Alaska, Illinois.
4, 3, 3	$1/5, 2$	Indiana, Missouri.

Frequently the same individual has spines of *flavescens* on one dens and those of *americanus* on the other.

One of my specimens from Indiana is especially interesting as a transitional form. The spines of the right dens are those of typical *flavescens*. Those of the left dens are *flavescens* varying into *americanus*; for the second large basal spine is represented by a greatly thickened hair; while on the right dens in the corresponding place there is a simple hair.

Synonymy.—Of the specimens referred to *T. plumbeus* Linnæus by Packard ('73, p. 38), those from Texas are *americanus*. The specimens, three in number, labeled "Waco, Tex., Belfrage," were studied by me in the Museum of Comparative Zoölogy, Cambridge, Massachusetts, in 1897-98. They had quadridentate ungues. Only one specimen, however, retained enough of the furcula to show the spines; these were $2/5, 1$ on the right side and $2/3, 2$ on the left.

The form regarded as *T. arcticus* by Guthrie ('03, p. 79) is *americanus*, as is evident from his description and figures as well as from seventeen of his original specimens that I have examined.

Distribution.—The variety *americanus* is widespread in the United States.

New Hampshire.—Walpole, July 14. Mount Washington, Mrs. A. T. Slosson.

Massachusetts.—Arlington, April 23, September 12, October 14, December 10. Norwood, August 26. Weston, June 12.

New York.—Ithaca, July 21, September 24, A. D. MacGillivray.

New Jersey.—Jamesburg, July 4, N. Banks.

Virginia.—Fredericksburg, February 18, W. D. Richardson. New Church, January 4, W. J. Phillips.

Ohio.—Oxford, November 4, S. R. Williams. Yellow Springs, April 3, August 28, 29. Salem, April 3, A. D. MacGillivray. Salineville, February 4, December 25, 29, A. D. MacGillivray.

Indiana.—Indianapolis, February 2, J. D. Hood. Richland (Mayfield's cave), May 8, A. M. Banta (A. M. B., J. W. F.).

Illinois.—Somer, April 6, August 12, October 26, 29, November 2, 6. Urbana, March 19, October 4, 19, 25. Mount Carmel, November 9.

Tennessee.—Knoxville, April 4, 5, H. E. Summers.

Missouri.—Columbia, February, C. R. Crosby.

Michigan.—Isle Royale, July 24, H. A. Gleason (Univ. Mich., J. W. F.).

Minnesota.—May 25, July 30, August 5, J. E. Guthrie (Univ. Minn.).

Mississippi.—Agricultural College, H. E. Weed.

Texas.—Waco, G. W. Belfrage (M. C. Z.).

New Mexico.—Beulah, May 3, T. D. A. Cockerell.

California.—San Francisco, G. Eisen (Cal. Acad. Sci.). Palo Alto, V. L. Kellogg (Stanford Univ., J. W. F.).

Oregon.—Siskiyou, September 6, A. P. Morse. Benton County, August 21, H. E. Ewing. Mount Chintimini, 5,000 feet, H. E. Ewing.

Washington.—L. Bremner. Olympia, T. Kincaid.

Alaska.—Muir Glacier, June 12 (U.S.N.M.). Cook Inlet (U.S.N.M.) Yakutat Bay, June (U.S.N.M., J. W. F.).

TOMOCERUS FLAVESCENS Tullberg, var. **ARCTICUS** Schott.

Plate 40, figs. 5, 6.

Tomocerus arcticus SCHÖTT, 1894.—DALLA TORRE, 1895.—SCHÄFFER, 1900b.—SKORIKOW, 1900.

Tomocerus niger, var. *arcticus* FOLSOM, 1902.

Description.—Body color citron yellow. Antennæ two-thirds the length of the body; first two segments yellow, second often purplish distally; last two pale purple. Legs yellow throughout. or with

purplish coxæ and tibiæ. Ungues (pl. 40, fig. 5) quadridentate, occasionally five-toothed; unguiculi unidentate, the tooth sometimes obscure or absent, however. Dental spines (pl. 40, fig. 6) normally six or seven on each side, rarely eight, becoming successively larger distally; formula $0\frac{1}{4}-6, 2$; two large ovate-lanceolate acuminate transparent lamellæ occur near the manubrium, as usual in *flavescens*. Maximum length, 4 mm.

Variation.—In a single lot of fifty-five specimens from the Muir Glacier, Alaska, I found some individuals with one large proximal spine on each dens and with ungues either quadridentate or tridentate. These variations into typical *flavescens* I have discussed in a previous paper ('02, p. 101).

Distribution.—Hitherto this variety has been known only from the far north (the "*arcticus*" of Guthrie ['03, p. 79] being *americanus*). It was discovered by the *Vega* Expedition in 1878-9 in eastern Siberia, and found by the Harriman Expedition in 1899 in Alaska. The Harriman specimens, now in the U. S. National Museum, were taken at Popof Island, Cook Inlet, Sitka, Yakutat Bay, and Muir Glacier. The following records extend the known range southward.

Washington.—Olympia, T. Kincaid.

Oregon.—Corvallis, December 24, H. E. Ewing.

TOMOCERUS BIDENTATUS, new species.

Plate 40, figs. 7, 8.

Body color yellow, mottled throughout with dark pigment. Eyes six on each side. Antennæ shorter than the body; purple throughout, or with first two segments yellow. Unguis (pl. 40, fig. 7) stout, usually bidentate, occasionally tridentate; unguiculus broadly lanceolate, untoothed. Dental spines (pl. 40, fig. 8) thirteen to seventeen; formula $3-4, 1\frac{1}{4}-6, 1, 3-4, 1$; basal lamellæ present, as in *flavescens*. Mucrones with four to seven intermediate teeth. Length, 2.2 mm.

Rarely the distal tooth of the unguis is absent.

The dental spines suggest those of *T. vulgaris*, but the claws of the two species are quite different, as appears from a comparison of figures 7 and 9 of plates 40 and 41, respectively.

Twenty-eight cotypes. Yellow Springs, Ohio, August 28. Knoxville, Tennessee, April 5, H. E. Summers. New Church, Virginia, January 4, W. J. Phillips.

Cotypes.—Cat. No. 16262, U.S.N.M.

TOMOCERUS VULGARIS Tullberg.

Plate 41, figs. 9-11.

Macrotoma vulgaris TULLBERG, 1871; 1872.—UZEL, 1890.

Tomocerus plumbeus PACKARD (part), 1873.

Tomocerus vulgaris TULLBERG, 1876.—REUTER, 1891; 1895.—BROOK, 1883.—DALLA TORRE, 1888.—SCHÜTT, 1894.—SCHÄFFER, 1896; 1900a; 1900b.—POPPE and SCHÄFFER, 1897.—SCHERBAKOV, 1898.—CARPENTER and EVANS, 1899.—CARL, 1899.—SKORIKOW, 1900.—ABSOLON, 1903.—BÖRNER, 1901.—KRAUSBAUER, 1901.—ÅGREN, 1903.—(Axelson) LINNANIEMI, 1905, 1907, 1912.—WAHLGREN, 1906b.

Podura vulgaris VOIGTS, 1902.

Tomocerus niger GUTHRIE, 1903.

Description.—General color purplish black; when denuded of scales, clear yellow, dull yellow, yellowish white, dirty white, or gray. Antennæ two-thirds as long as the head and body in large specimens; third and fourth segments, and often the second segment, purplish. Tibiæ often dusky. Unguis slender (pl. 41, fig. 9), four to six toothed; unguiculus lanceolate, often minutely unidentate. Tenaculum with twelve or thirteen anterior setæ in large specimens. Dental spines simple, usually 13 to 15, less often 12 or 16, and rarely 17 or 18, on each side; formula usually 4-6, 1/2-5, 1, 2, 1; extreme formula 4-7, 1/2-5, 1, 1-3, 1. The large dental spines are constant in number and position, and the first and third of these are out of line with the rest of the series, being more lateral in position (pl. 41, fig. 10). Mucrones with five to seven intermediate teeth, rarely more (pl. 41, fig. 11). On the dorsum of the head are several stiff, finely feathered setæ. Mesonotal collar of dense setæ. Maximum length, 4 mm.

Variation.—The body-color is quite variable, as already noted. Frequently the anterior border of the mesonotum is pigmented, while the rest of the body is unicolorous; sometimes the meso- and metanotum and the bases of the legs are mottled with pigment; or the entire body may be mottled. Individuals of different sizes show marked structural differences. With age, the subsegments of the third antennal segment increase in number and become shorter, and this segment increases in relative length, as do also the third abdominal segment and the dentes; furthermore, the teeth of unguis and mucrones and the spines of the dentes increase in number. Some of these changes in ratio and number are expressed in the following table, adapted from one by Schäffer (1900, p. 275). The measurements are from successively larger insects, beginning with very small specimens (No. 1):

Size.	Ant. 4: Ant. 3.	Ant. 4: Dens.	Mucro: Dens.	Abd. 4: Abd. 3.	Teeth of Unguis.	Middle teeth of Mucro.
1	1:1	1:1	1:2.5	1:1	1	1
2	1:1	1:1	1:4	1:1	} Obscurely 4-6.	2
3	1:1.3	1:1	1:4	1:1.3		3
4	1:1.5	1:1	1:4	1:1.3		3
5	1:1.75	1:1.5	1:5	1:1.5	} Clearly 4-6.	7
6	1:2.9	1:1.8	1:5.9	1:1.5		8

As Schäffer remarks, the postembryonal changes are so great that one knowing only the smallest and the largest individuals might easily mistake them for two distinct species.

In the largest specimens the unguis sometimes shows a trace of a seventh tooth at the distal end of the series. The tooth of the unguiculus may or may not be present, but usually occurs on large, well-preserved specimens. The total number of dental spines increases with age and varies slightly in individuals of the same size. Ågren gives the formula for European specimens as 4-6, 1/3, 1, 2, 1. This would apply also to most American specimens, though a more representative formula is 4-6, 1/2-5, 1, 2, 1. Rarely the formulæ 7, 1/5, 1, 2, 1 and 4, 1/2, 1, 3, 1 occur.

Linnaniemi ('12, p. 179) gives as the extreme formula for the dental spines 5-7, 1/1-2, 3, 1-2, 1-2, 1. I have never seen, however, *large* spines at the base of the second series. Regarding the spines as forming two series, separated by the transverse suture, new spines appear at the base of each series, and these spines are small. In the number of spines the dentes of the two sides seldom differ by more than one.

The number of intermediate teeth on each mucro is rarely eight to eleven.

Reuter ('91, p. 228) gave the name of *sibiricus* to a variety of *vulgaris*, characterized by its yellow body color and twelve dental spines—five proximal and seven distal. Linnaniemi ('07, '09, '12) regards *sibiricus* as a distinct species, and has described it fully ('12, p. 180) as *sibiricus* (Reuter) Axelson. His material is certainly not *vulgaris*, since the dental spines have the formula 1-3, 2/3-5, 2-3, and their maximum number is only thirteen, even in specimens 4 mm. in length.

There is, however, a clear yellow variety of *vulgaris*, of which I have specimens from Germany (from Schäffer) and from Maine, Massachusetts, and Colorado, along with gradations between the yellow variety and a heavily pigmented form.

Synonymy.—*T. vulgaris* is a common species in Europe, where there has been no question as to the validity of the name *vulgaris*, Tullberg's description and figures being sufficient to define the species.

My American specimens agree with the European examples that I have received from Schäffer.

Some of the specimens referred to *T. plumbeus* Linnæus by Packard ('73, p. 38) are *T. vulgaris*, as I found by an examination of his specimens in the Museum of Comparative Zoölogy at Cambridge. Thus one of the five specimens labeled "Brunswick, Me., Sept. 10, A. S. P." is *vulgaris*, and six of the twelve labeled "Salem, Mass., A. S. P." are *vulgaris*.

Guthrie ('03, p. 80) found *vulgaris* in Minnesota. His figures leave no doubt as to what species he had in hand, and his specimens, which I received for study, are *vulgaris*. Guthrie, however, put *vulgaris* as a synonym of *niger* Bourl.

Distribution.—*T. vulgaris* is common under loose bark, under logs or boards on the ground, under stones or dead leaves, and among decaying fruits or vegetables; it occurs in greenhouses also.

Maine.—Brunswick, September 10, A. S. Packard, jr. (M. C. Z.). Orono, April 22, October, F. L. Harvey.

New Hampshire.—Franconia, Mrs. A. T. Slosson.

Massachusetts.—Salem, A. S. Packard, jr. (M. C. Z.). Cambridge or Arlington, January 16, February 1, 25, 26, 28, March 1, 10, 11, 26, 27, 28, April 8, 9, 11, 12, 13, 17, 22, 23, 30, May 7, 20, 23, June 1, 2, 6, 8, 10, July 10, 12, 16, 22, 30, August 20, 23, September 11, 15, 17, 21, 22, 25, October 2, 13, 19, 26, November 16, 27, December 3, 7, 10. Wellesley, March 11, A. P. Morse.

New York.—Ithaca, April 19, September 24, A. D. MacGillivray.

Pennsylvania.—Hazleton, May 29, June, W. G. Dietz.

Illinois.—Champaign, August 13. Urbana, March 27, April 7, 9, 11, 21, October 21.

Colorado.—Fort Collins, February 5, C. F. Baker.

Minnesota.—Minneapolis, January 2, May 19, J. E. Guthrie (Univ. Minn.).

Washington.—L. Bremner.

Canada.—Ontario Peninsula, September 25, October 25, G. S. Miller, jr.

TOMOCERUS MINOR Lubbock.

Plate 41, figs. 12-14.

Macrotoma minor LUBBOCK, 1862.

Macrotoma tridentifera TULLBERG, 1872.—UZEL, 1890.—REUTER, 1890.

Tomocerus plumbeus LUBBOCK, 1873.

Tomocerus tridentiferus BROOK, 1883.—SCHÖTT, 1894.—REUTER, 1895.—CARPENTER, 1895; 1904; 1907.—SCHÄFFER, 1896.—LIE-PETTERSEN, 1897; 1898.—PORPE and SCHÄFFER, 1897.—CARL, 1899; 1901.—CARPENTER and EVANS, 1899.—SKORIKOW, 1900.—WILLEM, 1900; 1902.—ABSOLON, 1901.—KRAUSBAUER, 1901.

Tomocerus norvegicus LIE-PETTERSEN, 1897.

Tomocerus minor SCHÄFFER, 1900a.—BÖRNER, 1901.—SCHÖTT, 1902.—ÅGREN, 1903.—(Axelson) LINNANTEM, 1906; 1907; 1911; 1912.—WÄHLGREN, 1906.

Description.—The body, with scales, is lead colored, becoming purplish in large individuals. Denuded of scales, the body varies from yellow to blackish; commonly the yellow ground color is thickly powdered with blackish dorsally and laterally, and the sides of the thorax and of the first two abdominal segments have conspicuous yellow oblique spots. Occasionally the body color is reddish. Antennæ shorter than the body; basal segment usually yel-

lowish; the other segments purplish. Unguis (pl. 41, fig. 12) long, slender, slightly curved, five to seven toothed; unguiculus unidentate. Dental spines (pl. 41, fig. 13) tridentate, commonly nine to fifteen in large specimens, rarely as many as twenty; formula usually 4-6/2-5, 1, 1-2, 1. Intermediate teeth of mucrones five to eight, as a rule, sometimes nine or ten. Length, 4 mm.

Variation.—North American specimens agree with the six European examples that I received from Doctor Schäffer. The unguis is usually six-toothed, but may be five-toothed through the absence of the distal tooth; and some of the largest specimens may have seven teeth, owing to the addition of a small tooth at the distal end of the series. The number of dental spines in one large specimen that I have from the State of Washington is as many as twenty, with the formula 8/8, 1, 2, 1 (pl. 41, fig. 14), and the spines fall into two longitudinal series—a variation mentioned by Linnaniemi ('12). Rarely a spine bears a small fourth tooth.

Distribution.—*T. minor* occurs in almost all parts of Europe. My North American specimens are from few but widely separated localities.

Massachusetts.—Cambridge, January 26, February 2, 9, 18, 23, 25, March 1, 8.

Washington.—L. Bremner.

Canada.—Toronto, Ontario, June 26, R. J. Crew.

All the Massachusetts specimens were collected by me in a greenhouse, and I was unable to find the species out of doors, even in the immediate vicinity of the greenhouse mentioned. In regard to the habitat of the specimens from the State of Washington and from Canada, I have no data.

CAVERNICOLOUS SPECIES OF TOMOCERUS.

Packard ('77, p. 159) described as follows a white variety of *Tomocerus* from a cave in Utah:

Tomocerus plumbea (Linn.) var. *alba*.—Several specimens of a pale variety of this species of "spring-tail" occurred, some of which were pure white, thoroughly bleached out, while others were more or less dusky. Several of the larger specimens were pale, with traces of dark markings on the body; the antennæ, legs, and "spring" were white, much paler than the body. In such examples the antennæ are whitish, with the two basal joints tinged with brown, the flagellum white, with a slight purplish tinge. Legs and spring almost pure white. Eyes black and well developed. Specimens one-half or two-thirds grown are pure white, except the small, black eyes, which are connected by a double black line; while other specimens, fully grown, are perfectly white.

Similar individuals occurred in the Carter Caves of eastern Kentucky, and still others occurred which were much darker than the Utah ones, forming a series connecting the extreme white variety, *alba*, with the ordinary plumbeous form, which latter is found in the United States east of the Mississippi, Greenland, and Europe.

The occurrence of the white variety in a cave indicates that the ordinary form is probably to be met with west of the Rocky Mountain range.

Had I not had a series from the Carter Caves connecting the white variety with the ordinary out-of-door plumbeous form, I might have been inclined to regard it as a new and undescribed species, although it represents no structural differences in the form or length of the appendages from the normal form. But the series affords a capital example of the successive steps in the formation of a new form, whether we call it a new variety or species, while the causes of the changes are sufficiently apparent. Examples such as these and others I have before me to be hereafter described amount almost to demonstrative evidence of the truth of the doctrine of the transformation of species.

Some years later Packard ('88, p. 65) described from caves in Kentucky and Virginia a form that he took to be the same white variety, but for which he used, perhaps inadvertently, a second name—*pallidus*. His account follows:

Tomocerus plumbeus Templeton, var. *pallidus*.—One specimen from Zwingle's Cave was but slightly changed, being almost wholly plumbeous; it occurred one-quarter of a mile from daylight (Sanborn).

In a number of other specimens from Zwingle's Cave and others of the Carter Caves the body is white, as well as the spring and the legs, but the tarsi retain a slight plumbeous tinge. The antennæ are partly pale, the two basal joints being bathed with leaden gray. Ten examples collected by us had distinct black eyes, but minute and angular in outline, having suffered a considerable reduction in size. Specimens collected by us from the ice-house cave were white, with dusky antennæ and black eyes, and were like those just described.

Specimens from X Cave were all bleached, like those from the other Carter Caves, but in some examples the eyes were connected by a narrow, black band.

Specimens from Weyer's Cave and the adjoining Cave of Fountains were just like those in the Carter Caves, being white, with small, black eyes and dull, purple leaden antennæ and tarsi. Those in the New Market Cave were white, with black eyes and dark lead colored antennæ.

In One Hundred Dome Cave specimens said to have been collected one-quarter of a mile from the entrance were all dark, of the usual out-of door plumbeous color.

Remarks.—It is evident that the var. *pallidus* has been produced by the influence of its cave life. Var. *pallidus* occurs in a cave near Salt Lake, Utah, and the specimens do not differ from the bleached ones in the Kentucky and Virginia caves. The trunk becomes bleached, while the extremities of the antennæ and legs retain somewhat of the colors of the out-of-door form. None have been found without eyes. The shallowest caves, such as the ice-house cave, in Carter County, Kentucky, as well as the deeper ones, possess this variety. We also find the normal *plumbeus* in similar caves, though probably near daylight, but the inference that the pale bleached variety has been produced by want of light is a natural and the only possible one. It is proved by finding in Zwingle's Cave a slightly changed *plumbeus* associated with numerous *pallidus*.

Packard's types of his cave Collembola seem to be lost. They were not in the Museum of Comparative Zoölogy, Cambridge, Massachusetts, with the rest of his material when I searched for them about fifteen years ago, and Packard wrote to me that he did not know where they were. I have made efforts to obtain specimens of this form from collectors of cavernicolous species, but without success as yet.

Genus TRITOMURUS (Frauenfeld) Absolon.

Tritomurus v. FRAUENFELD, 1854, p. 15.*Tritomurus* ABSOLON, 1903, p. 94.

Hitherto only one species of *Tritomurus* has been known—*T. scutellatus*, a European cavernicolous species. I have, however, from California, several specimens that belong in the genus *Tritomurus*, as redescribed by Absolon.

TRITOMURUS CALIFORNICUS, new species.

Plate 41, figs. 15–17.

Color when denuded of scales, yellow, minutely dotted with black. Ocular patches black, small, irregular in form; eyes absent. Antennæ shorter than the body; first two segments yellowish, purple basally; third and fourth segments ringed with purple. Unguis tridentate or bidentate, the teeth being on the basal half of the inner margin (pl. 41, fig. 15). Unguiculus without teeth. Fourth abdominal segment slightly longer than the third. Dental spines sixteen to eighteen; proximal spines in two series (pl. 41, figs. 16, 17); formula 7–9, 1/2–3, 1, 1–3, 1, 2, 1. Mucrones with four or five intermediate teeth. Length, 3 mm.

Described from six cotypes; Santa Clara County, California, C. F. Baker.

This form may easily be mistaken for a species of *Tomocerus* until close examination shows the absence of tenent hair, tibiotarsal suture, and eyes. In one small specimen a knobbed tenent hair was present on one of the legs, and its form was like that of *Tomocerus*. My formula for the dental spines doubtless does not express the entire range of variation, as it is based on an examination of only six specimens.

The single European species of *Tritomurus* lives in caves. In regard to the habitat of this Californian species, however, I have no data as yet.

Cotypes.—Cat. No. 16263, U.S.N.M.

REFERENCES.

- ABSOLON, K. 1901. Weitere Nachricht über europäische Höhlencollembohlen. Zool. Anz., 24: 1–11.
 —. 1903. Untersuchungen über Apterygoten. Ann. k. k. naturh. Hofmus. Wien, 18: 91–111.
 ÅGRÉN, H. 1903. Zur Kenntniss der Apterygoten-Fauna Süd-Schwedens. Stett. ent. Zeit., 64: 113–176.
 AXELSON, W. M. 1904. Verzeichniss einiger bei Golaa, im südöstlichen Norwegen eingesammelten Collembolen. Ent. Tidskr., 25: 65–84.
 —. 1905. Zur Kenntniss der Apterygotenfauna von Tvärminne. Fests. Palmén, No. 15: 1–46.
 —. 1906. Beitrag zur Kenntniss der Collembolenfauna in der Umgebung Revals. Acta Soc. F. F. Fenn., 28, No. 2: 1–22.

- BANTA, A. M. 1907. The Fauna of Mayfield's Cave. Carnegie Inst. Wash., Publ. 67: 1-114.
- BÖRNER, C. 1901. Zur Kenntniss der Apterygoten-Fauna von Bremen. Abh. Nat. Ver. Bremen, 17: 1-141.
- . 1902. Die Gliederung der Laufbeine der Atelocerata Heymons. Sitz. Ber. Ges. naturf. Fr. Berlin: 205-229.
- . 1906. Das System der Collembolen. Mitth. Naturh. Mus. Hamburg, 23: 147-188.
- . 1909. Japans Collembolenfauna. Sitzb. Ges. naturf. Fr. Berlin: 99-135.
- BROOK, G. 1883. Notes on Some Little-known Collembola, and on the British Species of the Genus *Tomocerus*. Journ. Linn. Soc., 17: 19-25.
- CARL, J. 1899. Ueber Schweizerische Collembola. Rev. suisse Zool., 6: 273-362.
- . 1901. Zweiter Beitrag zur Kenntniss der Collembolafauna der Schweiz. Rev. suisse Zool., 9: 243-278.
- CARPENTER, G. H., and EVANS, W. 1899. The Collembola and Thysanura of the Edinburgh District. Proc. Roy. Phys. Soc. Edinb., 14: 221-266.
- DALLA-TORRE, K. W. v. 1888. Die Thysanuren Tirols. Ferd. Zeits., ser. 3, 32: 147-160.
- . 1895. Die Gattungen und Arten der Apterygogenea (Brauer). Sep. 46 Prog. Staats. Gym. Innsbruck: 1-23.
- FOLSON, J. W. 1902. Papers from the Harriman Alaska Expedition, XXVII. Apterygota. Proc. Wash. Acad. Sci., 4: 87-116.
- FRAUENFELD, G. R. v. 1854. Ueber *Tritomurus scutellatus*, Poduride aus den Krainer Grotten. Verh. Wien. zool.-bot. Ver., 4: 15-17.
- GUTHRIE, J. E. 1903. The Collembola of Minnesota. Rept. Geol. Nat. Hist. Surv. Minn., Zool. Ser., No. 4: 1-110.
- KRAUSBAUER, T. 1901. Beiträge zur Kenntniss der Collembola in der Umgegend von Weilburg a. Lahn. Sond. 34 Ber. Oberhess. Ges. Nat. Heilk. Giessen: 29-102.
- LIE-PETTERSEN, O. J. 1897. Norges Collembola. Bergens Mus. Aarbog, 1896, No. 8: 1-24.
- . 1898. Apterygogenea in Sogn und Nordfjord 1897 u. 98 eingesammelt. Bergens Mus. Aarbog 1898, No. 6: 1-18.
- LINNANIEMI (AXELSON), W. M. 1907. Die Apterygoten-fauna Finlands. I. Allgemeiner Teil. Helsingfors.
- . 1909. Zur Kenntniss der Collembolen-fauna der Halbinsel Kanin und benachbarter Gebiete. Acta. Soc. F. F. Fenn., 33, No. 2: 1-17.
- . 1911. Zur Kenntniss der Apterygotenfauna Norwegens. Bergens Mus. Aarbok, 1911, No. 1: 1-28.
- . 1912. Die Apterygotenfauna Finlands. II. Spezieller Teil. Acta Soc. Sci. Fenn., 40: 1-361.
- LUSBOCK, J. 1862. Notes on the Thysanura. Part II. Trans. Linn. Soc. Lond., 23: 589-601.
- . 1873. Monograph of the Collembola and Thysanura. London.
- MEYER, J. C. H. DE. 1901. Ueber das letzte Glied der Beine bei den Arthropoden. Zool., Jahrb., Abt. Anat. Ont., 14: 417-476.
- NICOLET, H. 1841. Recherches pour servir à l'histoire des Podurelles. Nouv. Mém. Soc. Helv. Sci. Nat., 6: 1-88.
- PACKARD, A. S. 1873. Synopsis of the Thysanura of Essex County, Mass. Fifth Ann. Rept. Trust. Peabody Acad.: 23-51.
- . 1877. On a New Cave Fauna in Utah. Bull. Hayden's U. S. Geol. Geogr. Surv., 3: 157-169.
- . 1888. The Cave Fauna of North America. Mem. Nat. Acad. Sci., vol. 4, pt. 1: 1-156.

- POPPE, C. A., and SCHÄFFER, C. 1897. Die Collembola der Umgegend von Bremen. *Abh. Naturw. Ver. Bremen*, 14: 265-272.
- REUTER, O. M. 1876. *Catalogus præcursorius Poduridarum Fenniae*. *Medd. Soc. F. F. Fenn.*, 1: 78-86.
- . 1891. Podurider från nordvestra Sibirien. *Öfv. Finak. Vet. Soc. Förh.*, 33: 226-229.
- . 1895. Apterygogenea Fennica. *Acta Soc. F. F. Fenn.*, 11, No. 4: 1-35.
- SCHÄFFER, C. 1896. Die Collembola der Umgebung von Hamburg. *Mitt. Naturh. Mus. Hamburg*, 13: 149-216.
- . 1897. Apterygoten. *Hamb. Magalh. Sammel. Hamburg*.
- . 1900a. Ueber württembergische Collembola. *Jahresh. Ver. Naturk. Würt.* 56: 245-280.
- . 1900b. Die arktischen und subarktischen Collembola. *Fauna Arctica*, 1, Lief. 2: 237-258.
- SCHERBAKOW, A. 1898a. Einige Bemerkungen über Apterygogenea, die bei Kiew 1896-1897 gefunden waren. *Zool. Anz.*, 21: 57-65.
- . 1898b. (Materials for the Apterygogenea-fauna of the vicinity of Kiew.) Kiew. [In Russian.]
- SCHÜTT, H. 1894. Zur Systematik und Verbreitung palaearctischer Collembola. *K. Sv. Vet.-Akad. Handl.*, 25, No. 11.
- . 1896. North American Apterygogenea. *Proc. Cal. Acad. Sci.*, ser. 2, vol. 6: 169-196.
- . 1902. Études sur les Collembes du Nord. *Bih. Sv. Vet. Akad. Handl.*, 28, No. 2.
- SKORIKOW, A. 1900. Eine neue Tomocerus-Art (Collembola) aus Ost-Russland. *Ann. Mus. Zool. Acad. Imp. Sci. St. Pétersbourg*, 1899: 473-480.
- TULLBERG, T. 1871. Förteckning öfver Svenska Podurider. *Öfv. K. Vet.-Akad. Förh.*, 28: 143-155.
- . 1872. Sveriges Podurider. *K. Sv. Vet.-Akad. Handl.*, 10, No. 10.
- . 1876. Collembola borealia. *Öfv. K. Vet.-Akad. Förh.*, 33: 23-42.
- UZEL, J. 1890. *Thysanura Bohemiae*. *Sitzb. k. böhm. Gesell. Wiss.*, 2: 1-82.
- VOIGTS, H. 1902. Verzeichnis der i. J. 1901 um Göttingen gesammelten Collembolen. *Zool. Anz.*, 25: 523, 524.
- WAHLGREN, E. 1906a. Apterygoten aus Ägypten und dem Sudan. *Results of Swedish Zool. Exp.*, No. 15.
- . 1906b. Svensk insektfauna. *Ent. Tidsk.*, 27: 233-270.
- WILLEM, V. 1900. Recherches sur les Collembes et les Thysanoures. *Mém. cour. Mem. sav. étr. Acad. roy. Belgique*, 58: 1-144.
- . 1902. Note préliminaire sur les Collembes des Grottes de Han et de Rochefort. *Ann. Soc. ent. Belg.*, 46: 275-283.

EXPLANATION OF PLATES.

PLATE 40.

- Fig. 1. *Tomocerus flavescens*, var. *separatus*, claws, $\times 290$.
2. *Tomocerus flavescens*, var. *separatus*, spines of left dens, $\times 190$.
3. *Tomocerus flavescens*, var. *americanus*, claws, $\times 440$.
4. *Tomocerus flavescens*, var. *americanus*, spines of right dens, $\times 214$.
5. *Tomocerus flavescens*, var. *arcticus*, claws, $\times 440$.
6. *Tomocerus flavescens*, var. *arcticus*, spines of left dens, $\times 223$.
7. *Tomocerus bidentatus*, claws, $\times 514$.
8. *Tomocerus bidentatus*, spines of right dens, $\times 223$.

PLATE 41.

Fig. 9. *Tomocerus vulgaris*, claws, $\times 290$.

10. *Tomocerus vulgaris*, spines of left dens, $\times 275$.

11. *Tomocerus vulgaris*, right mucro, $\times 275$.

12. *Tomocerus minor*, claws, $\times 308$. An accessory tooth is shown on the unguiculus.

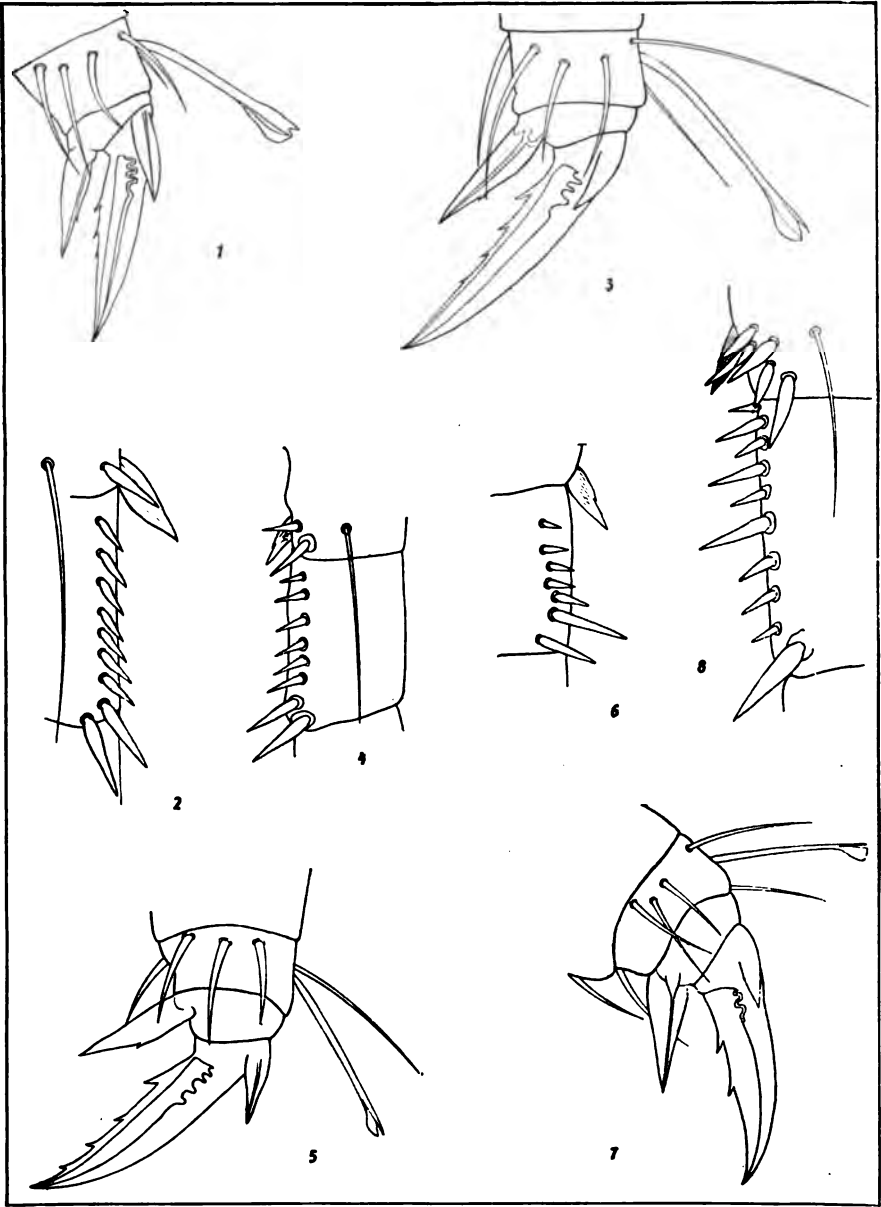
13. *Tomocerus minor*, spines of left dens, $\times 214$.

14. *Tomocerus minor*, spines of right dens, $\times 223$. Accessory spines are shown.

15. *Tritomurus californicus*, claws, $\times 398$.

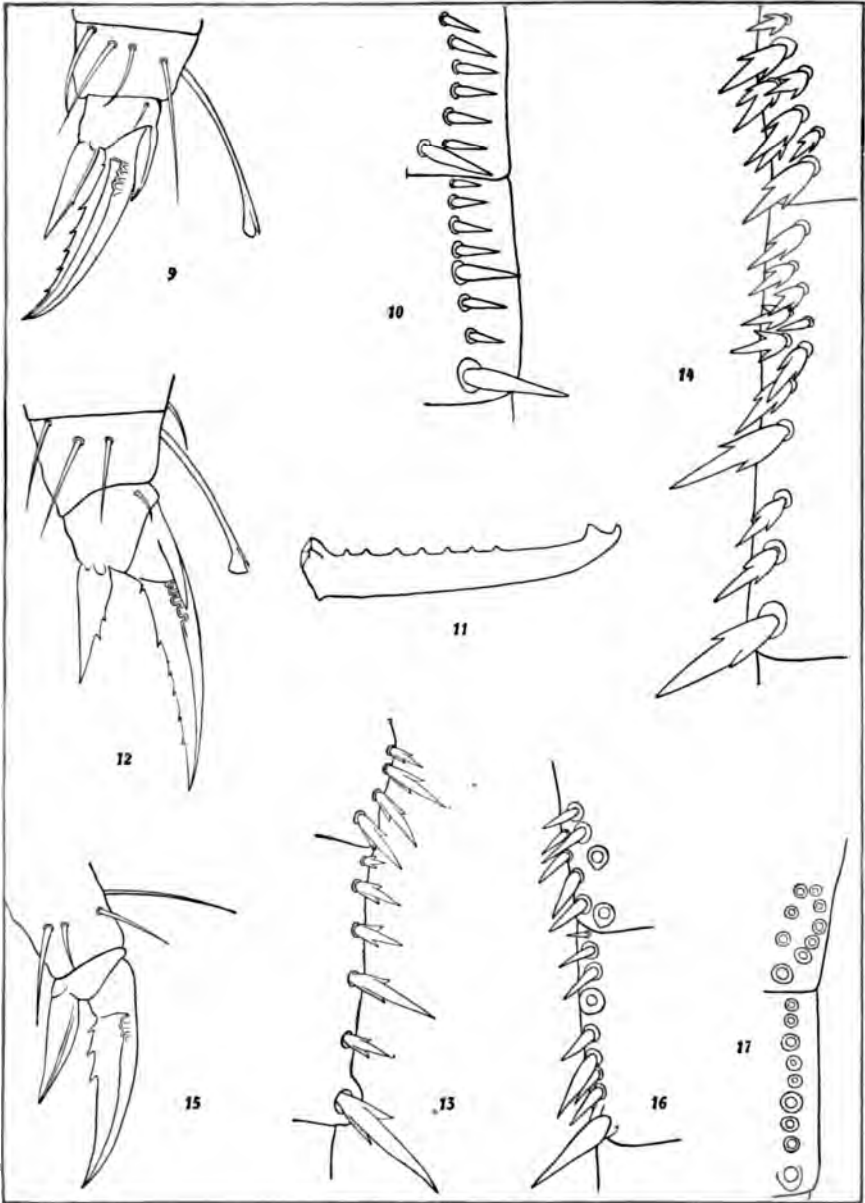
16. *Tritomurus californicus*, spines of right dens, $\times 248$. Three of the spines are wanting.

17. *Tritomurus californicus*, arrangement and relative sizes of dental spines as indicated by their sockets, $\times 248$.



NORTH AMERICAN SPRING-TAILS OF THE SUBFAMILY TOMOCERINÆ.

FOR EXPLANATION OF PLATE SEE PAGE 471.



NORTH AMERICAN SPRING-TAILS OF THE SUBFAMILY TOMOCERINÆ.

FOR EXPLANATION OF PLATE SEE PAGE 472.

NOTES ON THE FOSSIL CRINOID GENUS HOMOCRINUS. HALL.

By EDWIN KIRK,
Of the United States Geological Survey.

The genus *Homocrinus* was defined by Hall in the second volume of the Paleontology of New York. At that time the structure of the type-species, *H. parvus*, was incorrectly given and, furthermore, species representing two other genera were referred to *Homocrinus*. It would appear that the genus *Homocrinus* as there defined by Hall was intended as a sort of "catchall" for practically any Silurian or Ordovician Inadunate. The idea seems to have been to erect a genus comparable in spacious capacity to *Poteriocrinus* and *Cyathocrinus* as they were loosely used at that day. In the third volume of the Paleontology of New York, Hall referred still another species, *scoparius*, to the genus. This species is probably generically distinct from any hitherto called *Homocrinus* by Hall. Under such conditions it is no wonder that the greatest confusion has prevailed in regard to the exact status of the genus. The confusion has not been lessened by the work of subsequent authors, who instead of maintaining the first species described as the type have chosen genotypes from among the other species at one time or another referred to *Homocrinus* by Hall.

As matters stand, we apparently have a choice between no less than three type species. There is the original genotype (first species) *H. parvus*; *H. scoparius*, which was chosen by Wachsmuth and Springer (1879, p. 77); and, finally, *H. cylindricus*, which was made the type species by Bather (1893, p. 101). It is possible, if not probable, that these three species belong to as many genera. Under the circumstances our conception of the genus *Homocrinus* depends entirely upon the choice of the genotype.

Wachsmuth and Springer in their "Revision," because of the supposed unsatisfactory nature of the two Niagaran species referred to the genus, refused to consider either as the type species, choosing *scoparius* which was described by Hall (1859, p. 102) instead. Bather (1893, p. 101) objects to the choice of *scoparius* as the type-species on the ground that the date of the genus under these circumstances

would have to be altered from 1852 to 1861, "thus predating the name by Eichwald's application of it to *Hoplocrinus dipentus*, a consequence that Wachsmuth and Springer seem to have overlooked." It is to be noted that the other two species referred to *Homocrinus* by Hall in his original description of the genus are ignored by Wachsmuth and Springer when choosing their genotype. These two species are *Poteriocrinus alternatus* Hall and *P. gracilis* Hall, which were described in the first volume of the Paleontology of New York. They have since been referred to the genus *Dendrocrinus* by Wachsmuth and Springer. An examination of Hall's diagnosis of *Homocrinus* makes it evident that the two species cited above were definitely provided for in the new genus. This is clearly shown in the description of the arms, which are stated to be "simple or bifurcating," the arms of *parvus* being simple. If *Homocrinus parvus* and *H. cylindricus* were to be eliminated as unsatisfactory, the other species could not. This would make the genotype of *Homocrinus* an Ordovician Inadunate now referred to the genus *Dendrocrinus*. If the Ordovician species be congeneric with the typespecies of *Dendrocrinus* this genus must fall into synonymy with *Homocrinus*, as the description of the latter genus precedes the diagnosis of the former in the second volume of the Paleontology of New York.

Bather in choosing *cylindricus* as the type species set aside *parvus*, the first species described by Hall under his new genus, as being based on unsatisfactory material and having been insufficiently described; *cylindricus* and *scoparius* he considers congeneric. As a matter of fact, the structure of *parvus* may be worked out in great detail. *H. cylindricus*, on the contrary, is represented by a not overly well preserved dorsal cup. This does not permit of exact determination, and although its genetic affinities are fairly clear, its use as a genotype is bound to result in uncertainty of generic definition. As regards the accuracy of the original descriptions of the two species there is little choice.

Such a case brings home to us most forcibly the necessity of a definite ruling restricting the powers of subsequent writers in revising the original author's conception of his genus. The question, after all, should be quite as much one of fairness to the original author as one of convenience to subsequent workers. In formulating such a rule it seems to me that paleontologists need not be governed by exactly the same regulations as other zoologists and botanists. In paleontology the type material under normal conditions is indestructible, and in the majority of cases has been preserved. So, too, as a rule, have the descriptions and figures been adequate, and the geological horizons and localities noted with a sufficient degree of accuracy. Generally the original material is to be had if one be willing to spend the time looking for it. If it be not accessible, authentic material is frequently at hand coming from the same locality and horizon. Such being

the case, paleontologists may well be bound by more exact and rigid rules than workers in recent forms. In paleontology no hardship would be wrought, I think, if the first species described were always to be held as the genotype. This ruling, of course, should be effective only in those cases where the original author's choice of a genotype is not specified or indicated. In the very nature of things it is evident that an author, unless giving his species an arbitrary arrangement, tends to place his most characteristic species first. The choice of the first species as genotype is the only wholly satisfactory method of procedure, and obviates much of the confusion that is almost sure to follow the application of any other method. A number of cases might be adduced where the choice of a second type-species by subsequent authors has resulted in an absolute misconception of the true character of a genus.

It seems to me that in no case is the changing of the type-species from the one specified by the author of the genus, or if not definitely specified, the first species described, justified. In case such a species be unrecognizable, and the type material certainly destroyed, the genus should lapse, as in the case of a species under similar conditions. When, as frequently happened in former times, no species was chosen as the type of the genus, it might seem that one should seek the intent of the author, as expressed by his choice of species referred to the genus, and pick out a species other than the first described, for the reason perhaps that better material of that particular form has since become available, or for some other reason. Such reasoning is inadmissible, however. In case a genus were described and the first species is represented by such poor material that its structure could not and can not accurately be determined, the chances are that the other species referred to the genus are not congeneric.

In the present case *Homocrinus parvus*, as the first species defined under the genus, will be held as the type. No excuse is required for this action. This is peculiarly an instance that shows the impropriety of allowing a subsequent writer a voice in the delimitation of a genus by permitting him the choice of the type-species. *Homocrinus parvus* may have been incorrectly defined—as were the types of most of the early genera. The figures and analysis of the cup as given by Hall (1847, pl. 41, figs. 1c-d) and partially reproduced in this paper, surely give a present-day worker an inkling as to the true structure of the animal, however. The figure here copied from Hall is fairly accurate. The analysis of the cup is inaccurate in that the brachials are indicated as arising between the radials. A compound radial is unmistakable in both instances, however. Moreover, the types of *Homocrinus parvus* have been at all times accessible in the American Museum of Natural History and a fair amount of authentic

material has always been available. Under such conditions the elimination of *Homocrinus parvus* as type of the genus seems unjustified.

An examination of several specimens of *H. parvus*, including the types, convinced me that the species was a monocyclic Inadunate and bore not the slightest relationship to the forms commonly referred to the genus. In order completely to clear up the matter, it was necessary to have a specimen showing all the plates of the cup. A specimen was kindly placed at my disposal by Mr. Frank Springer, and by the use of specially ground needles and working under a Zeiss binocular the minute theca was finally freed from the matrix. When cleaned and examined in a cell of glycerin the specimen showed all the plates clearly. From this specimen figures 1-4, plate 42, and the analysis of the cup given as figure 8, were made. The outline figure of a crown and portion of column given as figure 5, plate 42, is approximately accurate—as nearly so, perhaps, as a pen-and-ink drawing of this magnification may well be. Exact proportions and details of structure are not to be expected, however. For such particulars and for exact measurements, reference should be made to the text. From these figures it will be seen that the crinoid is a monocyclic Inadunate of a rather unusual type.

A description of the species *Homocrinus parvus*, the only known representative of the genus, may serve equally well as a description of the genus.

The form is minute, the crown of an individual of average size¹ giving a length over all of but 12 mm. In this specimen the height of the dorsal cup is 1.6 mm. Despite their small size the maturity of these crinoids may not be questioned. The specimens show none of the signs of immaturity, either in structure or preservation. Furthermore, the large number of *Homocrinus parvus* that have been found are of essentially the same size, which in itself is strong evidence in support of the assumption that we are dealing with adult forms. Not only must one admit that this material consists of adult specimens, but also that there is no chance of its representing dwarfed individuals. The stratum in which *Homocrinus* is found indicates normal conditions of deposition, while associated fossils show no diminution in size.

The cup is fusiform, slender, and so closely affixed to the tapering column that it is difficult on casual inspection to determine where the theca ends and the column begins. A difference in the clearness of the calcite indicates the line of demarcation with exactness, however. The calcite of the basals is notably more translucent than that of the column. A dorsal cup 1.6 mm. in height has a breadth at the arm bases of 0.95 mm. and a breadth at the junction with the column of 0.65 mm.

¹ The measurements given here and elsewhere of various portions of the crinoid are all taken from one individual.

The basals are five in number, narrow, and unusually long. Their height is a little more than one-half that of the cup, measuring 0.9 mm. in a specimen having a total height of but 1.6 mm.

The radials consist of two simple and three "compound" plates. As usual in such forms, the simple radials are located in the anterior and left posterior rays. The various views of the theca, and the analysis of the cup given in plate 42, clearly show the shape, arrangement, and relative proportions of the plates. The r. post. Rs is hexagonal, resting below on the r. post. Ri and the r. ant. Ri, abutting laterally against l. post. R and r. post. Rs, and supporting on its left shoulder the anal x. r. post. Ri is pentagonal, resting upon the basals, and between r. ant. Ri and l. post. R. It agrees in shape with the l. ant. Ri. r. ant. Rs is quadrangular as is also l. ant. Rs. r. ant. Ri differs from the other inferradials in that it is hexagonal instead of pentagonal, joining as it does with r. post. Rs. The two simple radials are of equal height with each pair of "compound" radials, giving the cup a symmetrical outline. l. post. R supports on its right shoulder the anal x.

Of the anal structures nothing is known other than plate x. This is a small pentagonal plate which rests below equally on the right posterior superradial and the left posterior radial. Laterally it abuts against and is of equal height with the adjacent first primibrachs. It seems probable that x supported a single series of tube plates after the manner of *Ectenocrinus*.

The arms are long, slender, and nonbifurcating. One arm is borne by each ray. There is no evidence of pinnulation. The ventral furrow, as is indicated by a portion of an arm a few millimeters in length, seems to be closed by a double series of alternating covering plates. The first primibrachs are very short and occupy practically the entire breadth of the radial. Measurements in different individuals give a height of 0.35 mm. for this ossicle. The next succeeding brachial and those following up to fully one-half the length of the arms have a practically constant length of 1 mm. In the distal portion of the arms the ossicles tend to shorten very slightly. An ossicle which probably next preceded the terminal has a length of 0.9 mm. The arms are comparatively tenuous, at about one-half the height of the arm the breadth of an articulation being but 0.25 mm. Each ossicle is widest at its extremities, narrowing slightly toward the middle. The shortness of the first primibrachs in cases where the arms are proportionally long or heavy or composed of unusually long ossicles is a feature to be noted in other genera. The first primibrachs of adjoining rays of *Homocrinus* are but slightly separated, and probably when bent inward were in contact laterally.

The column is round. In its proximal portion and for a distance of about 0.6 mm. it tapers rapidly, maintaining the angle of the lower portion of the dorsal cup. Distad from this point the column main-

tains a fairly uniform diameter. At about 5 mm. from the theca the column has a diameter of 0.3 mm. In the sharply narrowing portion of the stem the ossicles are comparatively low and apparently not differentiated into nodals and internodals. In the next millimeter there are alternating wide and narrow ossicles of about the length of those noted above. Distad from this area the columnals are considerably longer and of approximately equal size. From these facts it may be inferred that in adult specimens at any rate increase in the length of the stem by the intercalation of new columnals took place chiefly in that portion of the column lying immediately distad to the proximal group of tapering ossicles. The column attained a length of perhaps five or six times that of the crown. The extreme distal portion of the stem has not been observed.

The geological horizon of *Homocrinus parvus* is at the top of the lower third (lower 17 feet) of the Rochester shale (Niagaran), according to Ringueberg (1888, p. 269). It has only been recorded from Lockport, New York, where it is found associated with characteristic Niagaran fossils.

It is difficult exactly to establish the relationships of *Homocrinus*. On the whole, the affinities of the genus seem to be closest to the Heterocrinidæ, and the genus might well be placed here were it not for its simple, nonbifurcating arms. The simplest type of arm among the Heterocrinidæ is isotomous. It is obviously impossible to derive *Homocrinus* from any known form referred to the family on this account. *Ectenocrinus*, which precedes *Homocrinus* by a considerable period of time, is the form to which *Homocrinus* is most closely comparable structurally. Indeed the arrangement of cup plates in the two genera is essentially identical. The later form, however, has the more simple arms. We may postulate a common ancestor for *Ectenocrinus* and *Homocrinus*. Such a form would probably partake more nearly of the nature of *Homocrinus* than any other known genus. Were the geological positions of the two genera reversed one might well consider *Homocrinus* not far out of the ancestral line which evolved *Ectenocrinus*. We have illustrated here a case of the primitive ancestral type surviving with perhaps few marked modifications long after the extinction of more complex derivatives of the parent stock.

Among the genera of contemporaneous and subsequent geological occurrence *Homocrinus* occupies a somewhat anomalous position. The genus has a similar arm structure to that of the Pisocrinidæ and Haplocrinidæ. The cup has the essential arrangement of plates of *Haplocrinus* as well, with the exception of x reaching down into the cup, as in the Heterocrinidæ. This indicates the presence of an anal tube and a type of tegmen quite at variance with that of *Haplocrinus*. Under the circumstances it has seemed best to establish a new family Homocrinidæ for the reception of the genus. This family may be defined as follows:

HOMOCRINIDÆ, new family.

Monocyclic Inadunata, with 5 B B, 5 R R (3 compound) and an anal x in the cup. The l. post. R and ant. R are large and undivided. In the other three rays the radials are compound. x enters into the composition of the cup, resting equally on the right shoulder of l. post. R and the left shoulder of r. post. R. The presence of an anal tube is predicated. The arms are nonpinnulate and do not bifurcate.

The family as here defined includes but the one genus *Homocrinus*.

Whether *Homocrinus* itself ever gave rise to a line of descendants is a question at present impossible of solution. The Homocrinidæ or forms of very similar structural character might perhaps serve as the ancestral stock for the Pisocrinidæ, Haplocrinidæ, and similar types. A crinoid not widely divergent from *Homocrinus* might, on the other hand, have formed the radicle from which sprung the Heterocrinidæ. Such modifications as are to be observed in these genera are no greater than one might reasonably expect, and indeed the only types from which the Pisocrinidæ and Haplocrinidæ could be derived would partake very largely of the nature of *Homocrinus*. One can but hope that future collections will make it possible to work out in some detail the evolution of this or similar minute forms. With this data in hand the bearing such types have on the evolution of the Crinoidea in general will become more obvious. Until such time our conclusions though apparently logically sound can be but speculative at best.

The existence of such a form as *Homocrinus parvus* causes one to wonder if during Paleozoic time, and perhaps later, there did not live many equally minute crinoids. We know in the Mississippian for example, that there was a species of *Allagecrinus* quite as small as *Homocrinus parvus*. Such types were not derived from crinoids larger than themselves. In the development of any group of invertebrates the trend of evolution is from the small to the large, and never the reverse except in special cases of degeneracy or dwarfing. *Homocrinus* though showing no positive tendencies in any direction, owing to our lack of knowledge relative to its ancestors or descendants, certainly shows no signs of degeneracy. The improbability of its having been dwarfed has been noted elsewhere. Such being the case we may postulate for *Homocrinus* ancestors of similar size or even smaller.

If we assume the existence of such a practically unknown congeries of microscopic crinoids, as we well may be justified in doing, it seems possible that these small types at various times may have furnished points of inception for evolutionary lines among the Crinoidea. Certain it is that the maintenance of such a basic stock would serve to explain the presence of many otherwise anomalous forms in our Paleozoic rocks. Many of our Inadunata might be cited as examples. Some of these types appear quite suddenly, and though frequently

of wide geographic range and of notable strength numerically, are without known antecedents. As an instance of this sort, we have *Haplocrinus*, a form curiously primitive in many respects despite its Middle Devonian occurrence. This genus has a known range from Germany to New York State. As elsewhere suggested, this genus may well have been derived from a form not greatly dissimilar to *Homocrinus*. One or two such cases of apparently isolated types might be explained on the assumption of sudden introduction into a given area of hitherto excluded faunas. To attempt to explain all such cases and the related phenomena on such a basis would involve an unnecessary assumption of unstable seas and barriers.

The importance of such a simple group in determining or influencing the evolution of the Crinoidea is largely dependent upon the ability of its constituent members under the impetus of changed conditions or for other cause, to vary and give rise to sturdy lines in which the tendency toward mutation is perpetuated. One must predicate such power as latent in these minute forms, else their interest and importance lies solely in their existence. As is well known, a type that persists for a long time apparently loses its power to vary, at least fundamentally. So it is in the case of many long-lived brachiopods. Such instances are those preeminently of genera and species. It probably is true that in larger groups much the same condition of affairs obtains, though in a less marked degree. With them the tendency toward variation is arrested rather than destroyed, however, and though somewhat impaired in vigor may be revived by the application of competent stimuli. Subsequent to such stimulation it may well be that the resultant lines do not have the inherent strength of those evolved earlier in the history of the stock, but such differences tend to be quantitative rather than qualitative. Such limitations necessarily apply only to the minute primitive forms of the later Paleozoic. The status of such forms in the early history of the Pelmatozoa is probably quite different. Here there existed anything but a condition of stagnation. In their small way mutations doubtless were of frequent occurrence and of appreciable weight.

How very acceptable such an hypothesis will prove may readily be seen. Given a persistent stock of primitive character and one may predicate offshoots in the evolution of which convergence and parallelism will generate types strikingly similar in many respects and yet incapable of derivation one from the other. That conditions exist among the Crinoidea explicable only on the assumption of the existence of numerous polyphyletic strains seem capable of demonstration. Indeed it is probable that few of the groups into which the Crinoidea have been subdivided are monophyletic—unless such groups be comparatively small and closely circumscribed.

The existence of a potent primitive stock among the Crinoidea is of large importance as determining evolution within that group. If we extend our horizon the bearing of such a stock on the *Pelmatozoa* as a whole presents features of even greater consequence. The inter-relationships of the classes of the *Pelmatozoa* have always been a matter of no little uncertainty—even to the extent of establishing plausible connections between the classes. The solution of the matter lies, I think, in the acceptance of a minute stock in which fundamental modifications may well have taken place and from which the various classes diverged more or less independently. There is no reasonable objection to such an hypothesis and it has much of the available evidence in its favor.

It has generally been conceded that the Crinoidea have been derived from the Cystidea, perhaps through the mediation of the Blastoidea. Such may be the case—but not from the Cystidea or Blastoidea as we know them. As we trace back any given crinoid line, at least in that portion of the line antecedent to the acme of the group, we find a uniform decrease in the size of the organisms. Eventually we come to the small simple Inadunata. To evolve these simple forms from the Cystidea as we know them is a contravention of the fundamental laws of evolution. If we admit these facts we must look elsewhere than among the known Cystidea for the ancestors of the Crinoidea. The ancestors no doubt may have had much the same structure as the Cystidea and evolved their comparatively simple arrangement of plates by much the same process that we may more or less readily trace in the elimination of plates among the Cystidea. The whole evolution, however, was on an infinitesimal scale. Did such types exist, as seems to be the logical conclusion, one could style them perhaps "Cystidea", as that term might broadly be defined. That there should be minute Cystidea is no more improbable than that there should be minute Crinoidea—which we know exist. Such minute "Cystidea" might well precede and give rise to the known Cystidea, as well as to the other classes of the *Pelmatozoa*.

Having shown *Homocrinus* to be a monocyclic Inadunate of quite different affinities than has hitherto been supposed, it becomes necessary to define a new genus for the reception of such forms as "*H. scoparius*". For this genus I here propose the name *Lasiocrinus*, taking *scoparius* as the type of the genus. For the time being but two species will be referred to the genus, *scoparius* and *tenuis*. The systematic position of the other species called *Homocrinus* by Bather (1893, p. 101) is doubtful. I have examined the types of *ancilla* and *cylindrica* and at present feel disinclined to include them in the same genus with *scoparius*. In a future more extended discussion

of *Lasiocrinus* the possible affinities of the forms hitherto called *Homocrinus* will be treated at length. Inasmuch as this genus is composed of forms that are so well known, and the characters upon which it is founded are those upon which the genus "*Homocrinus*" has hitherto been maintained, it is scarcely necessary to describe the genus in any considerable detail.

LASIOCRINUS, new genus.

1852. ? *Homocrinus* HALL part, Paleontology of New York, vol. 2, p. 185.

1859. *Homocrinus* HALL, Paleontology of New York, vol. 3, p. 102.

1879 and 1886. *Homocrinus* HALL part, Wachsmuth and Springer, Revision of the Palæocrinoidea (Author's Edition), pt. 1, p. 77; pt. 3, p. 220.

1893. *Homocrinus* HALL part, Bather, Crinoidea of Gotland, p. 101.

I B B 5, pentagonal, equal. B B 5, hexagonal, with the exception of post. B and r. post. B which are heptagonal. R R relatively small with the arm facets occupying practically the entire width of the upper faces of the plates. R A rhomboidal, small, resting below on the left shoulder of r. post. B and the right shoulder of post. B. Above it supports x and r. post. R. Anal x rests below on post. B and R A. Laterally it meets l. and r. post. R R, and above it supports two plates of the anal tube. The anal tube is long and after a point a short distance above its base is composed of a somewhat variable number of parallel rows of small hexagonal plates. The arms are long and in the type species divide by bilateral heterotomy at regular intervals. The arms of earlier species are apparently dichotomous, as might be expected. The column is round. In plate 42, figures 10-12 are given to show the essential features of the type species *Lasiocrinus scoparius*. Figure 10 gives an excellent idea of the structure of the ventral sac, and figure 11 shows the method of division of the arms and general proportions of the crown. Figure 12 is an analysis of the dorsal cup. The figure of *Lasiocrinus tenuis* (fig. 9) is given to show the structure of the earlier, Silurian member of the genus.

Lasiocrinus has a vertical range from the Silurian of Gotland apparently to the Onondaga of New York. Besides the species already noted there are new species probably referable to this genus in the Manlius, New Scotland, Oriskany, Schoharie, and Onondaga formations. The genus is characteristically a Devonian one, with the exception of the Manlius and the Gotland Silurian forms.

Type of the genus.—*Homocrinus scoparius* Hall.

BIBLIOGRAPHY.

1893. BATHER, F. A. The Crinoidea of Gotland, pt. 1, K. Svenska Vet.-Akad. Handl., vol. 25, No. 2, 200 pp., 10 pls.
1847. HALL, JAMES. Natural History of New York, pt. 6, Paleontology, vol. 1, 23+338 pp., 99 pls.
1852. ——— Natural History of New York, pt. 6, Paleontology, vol. 2, 8+362, pp. 99 pls.
1859. ——— Natural History of New York, pt. 6, Paleontology, vol. 3, pt. 1, text, 12+532 pp., 1859, pt. 2, 143 pls., 1861.
1888. RINGUEBERG, E.N. S. The Niagara Shales of Western New York; a study of the origin of their Subdivisions and their Faunæ: The American Geologist, vol. 1, No. 5, pp. 264-272, May 1888.
1879. WACHSMUTH and SPRINGER. Revision of the Palæocrinoidea: Pt. 1, Proc. Acad. Nat. Sci. Philadelphia for 1879, pp. 226-378, pls. 15-17. Author's edition, 153 pp. pls. 1-3.
1886. ——— Revision of the Palæocrinoidea: Pt. 3, sec. 2, Proc. Acad. Nat. Sci. Philadelphia for 1886, pp. 64-226. Author's edition, pp. 139-334.

EXPLANATION OF PLATE 42.

Homocrinus parvus Hall.

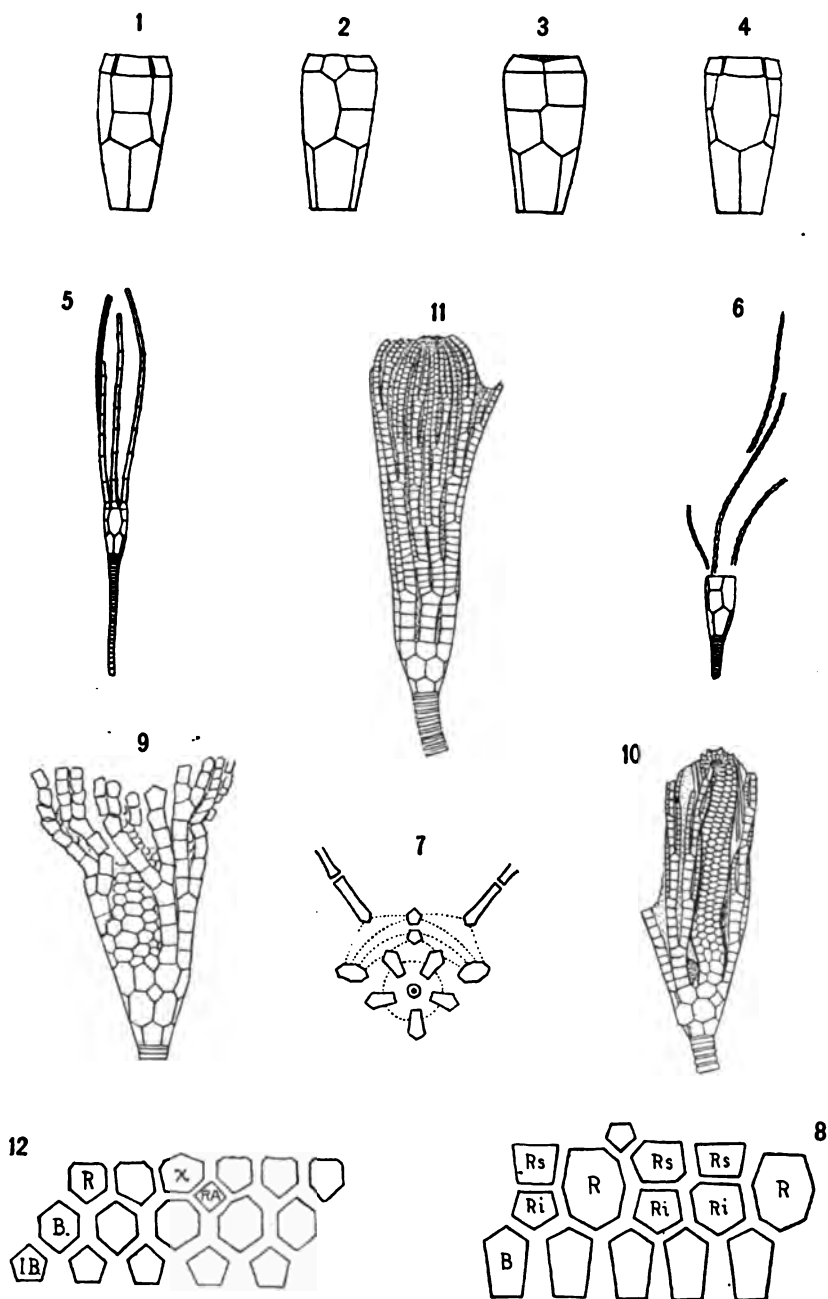
- Fig. 1. View of left anterior radius of dorsal cup, and first primibrachs. $\times 8$.
2. View of posterior interradius. $\times 8$.
3. View of right posterior interradius. $\times 8$.
4. View of anterior radius. $\times 8$.
5. View of another specimen showing crown and portion of column. $\times 3$.
6. View apparently of left anterior radius $\times 3?$ after Hall, Pal. New York, vol. 2, pl. 41, fig. 1c.
7. Analysis of dorsal cup, copied from Hall, Pal. New York, vol. 2, pl. 41, fig. 1d.
8. Analysis of the dorsal cup. $\times 8$.

Lasiocrinus tenuis (Bather) new combination.

- Fig. 9. Posterior interradius $\times 3$, after Bather, Crinoidea of Gotland, pl. 4, fig. 144.

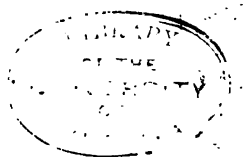
Lasiocrinus scoparius (Hall) new combination.

- Fig. 10. Posterior interradius of one of the type specimens. $\times 2$.
11. View of crown $\times 2$, probably of anterior radius.
12. Analysis of dorsal cup. $\times 4$.



CRINOIDS OF THE FOSSIL GENERA HOMOCRINUS AND LASIOCRINUS.

FOR EXPLANATION OF PLATE SEE PAGE 483.



NEW SPECIES OF NOCTUID MOTHS FROM TROPICAL AMERICA.

By WILLIAM SCHAUSS.

The descriptions of the following 136 species of Noctuidæ are from specimens in my collection, now deposited in the United States National Museum. With the exception of three species, they were all taken by myself and Mr. J. Barnes in British, Dutch, and French Guiana. They have been carefully compared with the described species in the great European collections and are undoubtedly new.

ERIOPTYGIA DROMAS, new species.

Female.—Body and fore wings lilacine ochreous; abdomen with grayish brown irrorations. Fore wings: Some scattered fuscous scales; lines faint; a subbasal line; antemedial geminate, inbent in cell; orbicular and reniform faintly darker, outlined in a slightly paler shade than ground color; an outcurved medial shade, interrupted by reniform; postmedial outcurved, punctiform, black; subterminal line pale, straight; terminal dark spots on interspaces. Hind wings grayish white, shaded with fuscous gray on termen. Wings below paler; a dark postmedial line, and interrupted terminal line; hind wings with fuscous gray shadings on either side of discocellular.

Expanse.—30 mm.

Habitat.—St. Laurent, Maroni River.

Type.—Cat. No. 16525, U.S.N.M.

ARGYROSTROTIS EURYSACES, new species.

Male.—Palpi fuscous brown, the third joint whitish gray. Head white mottled with brown. Collar and thorax very dark brown. Abdomen above deep yellow; a medial transverse fuscous brown shade; the two terminal segments similar; anal hairs yellow. Fore wings: Basal half dark steel color, shaded with dark brown on inner margin and crossed by a similar outbent antemedial line; postmedial space rich dark brown, edged by fine darker lines; a triangular space on costa indicated by fine white lines, the apex entering reniform, which

is whitish and upbent on outer side of triangle; the outer line edges the postmedial space, and is followed by a steel gray shade; subterminal line dark brown, partly edged with white; outer margin pale brown; a dark terminal line. Hind wings deep yellow to beyond middle; the outer margin broadly purple brown. Fore wings below purple brown; a yellowish shade at end of cell; a darker straight postmedial line. Hind wings below yellow, the costal and outer margins broadly purplish; a dark spot on discocellular; a wavy postmedial line.

Expanse.—16 mm.

Habitat.—Geldersland, Surinam River.

Type.—Cat. No. 16526, U.S.N.M.

ERIOPUS ORSES, new species.

Female.—Palpi, head, collar, and thorax brown, mottled with lilacine white. Abdomen gray brown; whitish segmental lines; dorsal tufts bright brown. Fore wings brown; base darker shaded limited by a fine white subbasal line; antemedial and postmedial lines fine, fuscous brown, dividing rather broad pinkish lilacine shades; the postmedial lilacine shade inwardly darker edged; an inbent dark brown line on discocellular preceded by a white line, followed by a lilacine shade, also crossed by a fine brown line; subterminal fine, whitish near costa, dentate, preceded by triangular darker brown shades; a white oblique shade from vein 5 to termen at vein 4; terminal line, fine, white, interrupted from vein 4 to tornus. Hind wings grayish brown, below whitish, irrorated with brown on costa and subterminally; a small spot on discocellular; a lunular postmedial line.

Expanse.—25 mm.

Habitat.—Rockstone, Essequibo River.

Type.—Cat. No. 16527, U.S.N.M.

PHUPHENA SUBVENATA, new species.

Male.—Head, collar, thorax and fore wings bright brown; some white on frons, vertex, and thorax. Abdomen lilacine brown; dorsal and lateral darker lines; vertical white segmental lines. Fore wings: Extreme costa, subcostal, median and submedian veins white; an antemedial white line inbent from subcostal to submedian at base; a broad inbent white line from vein 2 at cell to near base of inner margin; a horizontal white streak at end of cell; a white shade from vein 8, inbent to lower angle of cell, crossed by some brown scaling on discocellular; two postmedial white lines, chiefly noticeable from below vein 4, the inner line slightly incurved; a subterminal white line from costa to vein 5, then sharply outbent to termen, close to vein 4, joining a terminal white line from apex; below vein 4 a terminal white

line, and another from termen slightly incurved. Hind wings bright brown shading to white at base. Fore wings below duller brown; a white subterminal line from costa to vein 5, then outbent. Hind wings below brown, shading to white on inner margin; a white streak from base, through cell and between veins 4 and 6 to termen; a white line below vein 8; a dark point on discocellular; a faint post-medial and subterminal line.

Expanse.—21 mm.

Habitat.—Rockstone, Essequibo River, British Guiana.

Type.—Cat. No. 16528, U.S.N.M.

PHUPHENA COSTATA, new species.

Female.—Palpi brown. Head buff brown. Collar buff shaded with brown, tipped behind with white. Thorax dark brown. Abdomen grayish brown. Fore wings brown, and purplish brown; costal margin broadly buff in front, whitish behind; some fuscous scaling on brown space, forming indistinct fine lines; orbicular large outbent, outlined in roseate white, the inner edging continued below cell to fold; reniform broad, similarly outlined and containing a white spot behind; a minutely lunular fuscous brown outer line; some darker subterminal shading outwardly followed by lilacine brown. Hind wings dark grayish brown; a fuscous spot on discocellular. Hind wings below whitish irrorated with brown; a fuscous discal spot; a post medial line, and terminal shading.

Expanse.—21 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16529, U.S.N.M.

CHYTONIX COMMIXTA, new species.

Male.—Palpi and head mottled brown and white, the joints of palpi tipped with white. Collar and thorax similar, but also mottled with dull green. Abdomen above lilacine brown. Fore wings lilacine gray; a green shade at base of cell, along submedian, between veins 3 and 4 close to cell, and terminally, also a green streak beyond cell; a subbasal black line across costa, and a short streak on median; the green shade in cell limited by a creamy buff lunule; antemedial line indicated by some black scaling and a whitish shade from median to inner margin; orbicular oblique across cell, touching a round spot at vein 3, both creamy buff and containing some dark green scaling; reniform white, linear at middle, containing dark green lines in ends, suffusing with a white line on costa; a fuscous shade from costa medially, outbent across orbicular, outcurved between veins 5 and 3, then wavily inbent; postmedial line black, deeply lunular dentate, shaded with white outwardly, especially from below vein 3; the subterminal lilacine gray shade partly interrupted by the terminal green

shading, which is irrorated with white; black streaks on veins terminally, except vein 2 and submedian; a terminal black line interrupted by white points. Hind wings purplish, the inner margin paler shaded. Fore wings below purplish; costa and termen green irrorated with white; inner margin white. Hind wings below white; the costal margin thickly irrorated with purple and brown, the outer margin less so; traces of an interrupted outer dentate line; a dark line on discocellular.

Expanse.—27 mm.

Habitat.—St. Laurent, Maroni River.

Type.—Cat. No. 16530, U.S.N.M.

CHYTONIX CHLOR, new species.

Female.—Head, collar, and thorax mottled light and purplish brown with some fuscous irrorations; front of collar green. Abdomen grayish brown. Fore wings brown tinged in places with lilacine; a basal curved black line, on costal margin outwardly edged with white, and a similar inbent line below cell, separated by a green shade on subcostal; antemedial line fine, black, inwardly edged with white on costa, deeply incurved in cell, outcurved below cell; a small black orbicular spot, followed by an oblique green spot; inner margin medially green mottled with white; a medial fuscous shade, outcurved, touching reniform; reniform long and narrow, dark green edged with whitish green; postmedial from costa before reniform, fine, black, deeply outcurved, somewhat lunular, outwardly edged with white on margins; veins beyond shaded with fuscous and with some white points; a large white apical spot partly irrorated with green; termen greenish, the dark shades on veins expanding into spots; a terminal velvety black line, interrupted by white points on veins; cilia crossed by fuscous mottling. Hind wings fuscous brown tinged with purple; cilia roseate brown tipped with white. Fore wings below mostly fuscous gray, the costal margin purple brown irrorated with white; a white apical shade. Hind wings below white, the costa, and apical half of outer margin heavily irrorated with roseate brown and fuscous; a dark spot on discocellular; a postmedial lunular-dentate black line.

Expanse.—27 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16531, U.S.N.M.

CHYTONIX PYRRHA, new species.

Male.—Palpi brown, the tips of joints white. Head whitish green; collar and thorax similar with some brown mottling. Abdomen brown; dorsal tufts white tipped with dark brown. Fore wings pale green, the markings fuscous brown; a large spot on costa near base;

base below cell to inner margin brighter brown; a small black spot below cell followed by a white line and a large spot suffusing with brown shade on inner margin; a small antemedial spot on costa, and an outcurved series of black points on interspaces, followed in cell by a small orbicular spot; a medial spot on costa with a line to reniform; a spot on costa above reniform which is finely edged with white; small postmedial spots on interspaces, the one below vein 2 much larger followed by a white shade; small subterminal spots followed by a dark brown shade to termen, narrow at apex; terminal spots on interspaces. Hind wings dark brown. Wings below brown; a post-medial white spot on costa of fore wings; hind wings more whitish at base; a fuscous discal spot, postmedial line, and fainter subterminal line.

Expanse.—24 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16532, U.S.N.M.

CHYTONIDIA, new genus.

Proboscis fully developed; palpi upturned, the second joint reaching vertex, moderately scaled; the third short, smooth; frons smooth; eyes large; antennæ of female smooth; thorax chiefly clothed with spatulate scales; metathorax with long tuft; a small dorsal crest at base of abdomen; tibiae roughly scaled, spurs moderate. Fore wing: Outer margin rounded, slightly crenulate; veins 3 to 5 from lower angle equally apart; 6 from below upper angle; 7 from upper angle; 8, 9, 10 stalked from cell; 11 free. Hind wing: Veins 3 and 4 from angle of cell; 5 obsolescent from middle of discocellular; 6 and 7 from upper angle; 8 anastomosing with cell near base.

Type of genus.—*Chytonidia chloristis* Schaus.

Near *Chytonix* Grote.

CHYTONIDIA CHLORISTIS, new species.

Female.—Head, collar, thorax, and fore wings brown tinged with lilacine, some green mottling on collar; abdomen brown above, laterally shaded with white. Fore wings: Subbasal line inangled at cell, fine, black, outwardly shaded with pale green; subcostal streaked with green to antemedial, which is fine, black, deeply inangled in cell, outcurved below cell, preceded on submedian by a white point and angled black line; orbicular small, round, partly outlined in black, followed by an outbent green shade across cell, suffusing with the reniform which is also green, long, narrow, vertical, finely edged with white and suffusing with a white line on costa; postmedial fine, black, outcurved and dentate, followed by a series of black and white points on veins; veins terminally irrorated with black and gray; a faint subterminal wavy green line; an apical white and green shade; a

terminal wavy black line; inner margin from before antemedial to postmedial mottled white and green; cilia dull green mottled with fuscous. Hind wings fuscous brown; cilia roseate brown tipped with white. Fore wings below fuscous brown; inner margin whitish; costal margin roseate brown, irrorated with white and black; outer margin shaded with roseate brown; apical spot green irrorated with white. Hind wings below white; the costal margin and apex more broadly irrorated with roseate brown and black; a black medial line on costa to irrorations on discocellular; a deeply dentate postmedial line.

Expanse.—24 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16533, U.S.N.M.

SPODOPTERA EVANIDA, new species.

Male.—Head ochreous brown. Collar and thorax dull grayish brown. Abdomen whitish ochreous; a small brown dorsal tuft at base. Fore wings dull grayish brown, darker shaded at base and postmedially; antemedial line limiting basal space, fine, fuscous, irregularly outcurved; on paler medial space, the orbicular is faintly indicated by fine brown edging, and is slightly yellowish; a fine and faint fuscous line edges a paler brown shade on discocellular; postmedial similar, outbent along costa; subterminal fine, pale, inwardly darker shaded; traces of a fine pale marginal line; base of cilia pale. Hind wings white. Wings below white, the costal margins tinged with yellow and irrorated with brown.

Expanse.—30 mm.

Habitat.—Cayenne, French Guiana.

Type.—Cat. No. 16534, U.S.N.M.

GONODES ECHION, new species.

Male.—Palpi: Second joint dark brown; third joint mottled whitish and brown. Head whitish. Collar, thorax, and fore wings brownish ochreous; abdomen brownish gray; dorsal tuft near base fuscous. Fore wings: A fine antemedial dark line, outset below cell; a triangular brownish gray shade on costa about middle, edged with fuscous brown and then finely with white, its apex within end of cell; a fine dark gray line on discocellular; a fine fuscous brown streak along vein 5 to outer line, then upbent to termen at vein 6; traces of a fine postmedial shade; outer line very fine; deeply outcurved and lunular opposite cell; a subterminal fuscous spot between veins 4 and 5, black and white points at vein 2 and submedian; a fine lunular dark terminal line. Hind wings brownish gray; a dark spot on discocellular. Fore wings below brownish gray; costal margin whitish ochreous; a black postmedial line on costa. Hind wings

below whitish with dark irrorations; a black discal spot; a fine post-medial line and some subterminal shadings.

Expanse.—23 mm.

Habitat.—Rockstone, Essequibo River.

Type.—Cat. No. 16535, U.S.N.M.

MONODES IXION, new species.

Female.—Palpi dark brown, third joint grayish. Head, collar, and thorax white shaded with brown. Abdomen whitish irrorated with brown. Fore wings white to near middle, also beyond on costa to postmedial line, suffusing with the oblique white reniform; some brown spots on costal margin; pale brown shadings at base and a fine inbent antemedial line; space beyond dark brown, inwardly edged from subcostal to submedian fold by a black line, and a similar line along reniform; postmedial gray white finely edged with brown, followed by a fuscous brown streak between veins 5 and 6, and a dark brown shade above it to costa; outer space gray-brown; the subterminal white line minutely lunular dentate; an interrupted fuscous brown terminal line, inwardly finely edged with white. Hind wings dark gray brown. Hind wings below white, shaded with brown terminally; some brown irrorations on costa; a dark discal point and fine postmedial line.

Expanse.—17 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16536, U.S.N.M.

MONODES PHEGYAS, new species.

Male.—Palpi dull brown, fringed below with brownish white. Head brownish white, the frons darker shaded. Collar and thorax dark brown. Abdomen purplish brown. Fore wings whitish brown with pale brown shadings on costa; some dark brown at base of inner margin; an antemedial outbent dark brown line below cell, followed on fold by a dark brown spot, outwardly edged with white; orbicular large, white; reniform space pale brown edged on either side with white lines; space in cell between spots dark brown, and a similar shade beyond reniform; postmedial line fine, dark brown, edged with whitish, outangled below vein 6, joined at angle by a white streak from costa near apex; space beyond postmedial dark brown, becoming paler on termen; indistinct subterminal fuscous brown spots; an interrupted terminal fuscous brown line, inwardly edged with white. Hind wings dark brown; a fuscous shade on discocellular. Fore wings below brown, the costa paler; inner margin white. Hind wings below whitish irrorated with brown; a fuscous brown shade on discocellular; a fine brown postmedial line, and narrow subterminal shade.

Expanse.—18 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16537, U.S.N.M.

MONODES ISSE, new species.

Male.—Palpi dull brown, the third joint mottled with white. Head and abdomen whitish brown. Collar and thorax dark brown, the latter with a whitish transverse shade. Fore wings: Base mottled brown and white; a broad antemedial white shade crossed by a fine brown line and preceded below cell by an irregular black spot; medial space dark brown crossed by a black line outbent to reniform, then vertical; reniform oblique, white, mottled with pale brown, edged behind with fuscous brown; postmedial line white, outbent on costa, finely edged with brown, the inner edging alone separating it from reniform, the outer edging beyond cell fuscous with a short streak extending from it above vein 5; outer space whitish shaded with brown, from vein 6 to costa dark brown; the subterminal white line indicated by narrow brown shading preceding it and silvery gray shading following it; a terminal interrupted dark line; all the whitish portions somewhat silvery; cilia long, crossed by two dark lines and suffused with fuscous gray between veins 3 and 5. Hind wings whitish at base, shading to fuscous gray terminally. Hind wings below white irrorated with brown; a dark discal point, lunular postmedial line, and interrupted terminal line.

Expanse.—17 mm.

Habitat.—Geldersland, Surinam River.

Type.—Cat. No. 16538, U.S.N.M.

PERIGEA DRUSILLA, new species.

Female.—Head, collar, and thorax brown, mottled with ochreous. Abdomen dark gray with pale segmental lines; the dorsal tufts brown. Fore wings whitish ochreous, shaded with pale reddish brown; lines on costa dark brown, geminate; a fuscous streak from antemedial at median to base of inner margin; antemedial barely traceable, outcurved to orbicular, marked by white points on veins; orbicular small, outlined in dark gray brown; reniform indicated by darker edging and crossed by a broken dark line; postmedial outcurved, pale, inwardly edged with brown, outwardly with black and white points; space beyond to termen shaded with dark purplish brown to near costa, partly mottled with some pale subterminal shadings. Hind wings brownish gray. Fore wings below dark gray; hind wings whitish, the costal and outer margin shaded with reddish brown.

Expanse.—29 mm.

Habitat.—Maroni River, 60 miles inland.

Type.—Cat. No. 16539, U.S.N.M.

COLODES, new genus.

Palpi upturned, second joint reaching vertex, moderately scaled; third joint short. Antennæ minutely pubescent. Thorax clothed with scales, the tufts of metathorax and base of abdomen consisting of spatulate scales. Legs smooth; the medial spurs on hind tibiæ long. Fore wings: Outer margin faintly crenulate; vein 2 from well beyond middle of cell; 3 close to lower angle; 4 and 5 from lower angle; 6 from upper angle; 7 and 8 stalked; 9 absent; 10 and 11 from cell. Hind wings: Veins 3 and 4 from lower angle; 5 obsolete from middle of discocellular; 6 and 7 from upper angle.

Type of genus.—*Colodes selecta* Schaus.

Near *Neomonodes* Hampson.

COLODES SELECTA, new species.

Male.—Head mottled grayish green and brown. Collar and thorax mottled green and reddish brown. Abdomen above fuscous brown. Fore wings dark green, the lines fuscous brown; subbasal twice outcurved; antemedial wavy, dentate, vertical, outwardly edged with white irrorations on costa, cell, and inner margin; an outcurved medial shade touching reniform, not reaching inner margin; orbicular annular with a white point on hind edge; reniform outlined with a white point in front and a thick white crescent behind; postmedial outcurved beyond cell, white on costa, and with some white irrorations otherwise; a broad subterminal sinuous shade, followed by a similar shade opposite cell; terminal streaks on veins, and a terminal line with white points on veins. Hind wings dark bronze brown, almost purplish. Fore wings below dark grayish brown; a small white spot at apex. Hind wings below grayish thickly irrorated with brown; a black discocellular line followed and preceded by similar lines; a broad postmedial shade.

Expanse.—15 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16540, U.S.N.M.

NANAMONODES TRILINEATA, new species.

Male.—Head, collar, and thorax fuscous gray, the thorax edged behind with black. Abdomen above pale yellow brown. Fore wings: Costal half dark gray, posterior half whitish buff; base fuscous gray; lines fuscous, outcurved; antemedial straighter; medial inwardly edged with white to within cell; postmedial outwardly edged with white to reniform which consists of a fuscous half circle, the postmedial outwardly forming the other half; a subapical fuscous shade; terminal dark spots. Hind wings gray, darker shaded terminally; a dark shade on discocellular. Fore wings below dark gray, the inner

margin whitish. Hind wings below whitish, the costal and termen gray shaded; the discocellular shade broad.

Expanse.—13 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16541, U.S.N.M.

MICROMONODES LEUCOSTICTA, new species.

Male.—Head, collar, thorax, and fore wings bistre brown; a small lilacine white spot on thorax behind; markings consisting of small lilacine white spots, partly finely dark edged; a spot near base of costa; an antemedial vertical row of spots; a postmedial series of spots, well outcurved, inset opposite cell, incurved from below vein 4; some subterminal and marginal spots; reniform white, consisting of two superposed round spots. Hind wings dull brownish gray.

Expanse.—14 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16542, U.S.N.M.

MICROMONODES EXCELLENS, new species.

Male.—Head, collar, and thorax bistre. Abdomen grayish brown. Fore wings: Base bistre limited by an outcurved subbasal fuscous line; inner margin whitish bistre, more broadly so before antemedial line, wing otherwise to postmedial olive brown; a whitish bistre shade on subcostal to antemedial, and a similar medial spot on costa before line; antemedial fine, brown on costal and inner margins, from subcostal to submedian white finely edged with dark brown; medial space in cell and just below tinged with brighter brown, the medial line similar, minutely dentate and outcurved; postmedial deeply outcurved, fuscous brown, somewhat punctiform, outwardly edged with white from vein 7, from which point a broader white shade extends to apex; an incurved whitish subterminal shade from vein 7 to vein 4; a dark brown terminal line preceded by fine white shading. Hind wings lilacine brown, the base whitish; cilia grayish brown. Fore wings below silky brown; a dark terminal line. Hind wings below whitish, the costal and outer margins tinged with lilacine brown; a thick dark line on discocellular, a postmedial, and a terminal dark line.

Expanse.—15 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16543, U.S.N.M.

NEOLITA EPICASTE, new species.

Female.—Head, collar, thorax, and fore wings yellowish white with scattered brown irrorations. Abdomen grayish. Fore wings: The irrorations forming faint antemedial, medial, and postmedial lines, all outangled, the medial suffusing with dark brown edging of reni-

form, which is oblique, white; a marginal dark brown shade opposite cell and above tornus; a terminal fuscous brown line interrupted at veins 2, 3, and 4. Hind wings brownish gray; a terminal dark line. Fore wings below brownish gray. Hind wings below white; the costal and outer margins irrorated with brown, a small spot on discocellular.

Expanse.—14 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16544, U.S.N.M.

EROGA ALBIFERA, new species.

Male.—Palpi, head, collar, and thorax fuscous brown with some fine white irrorations. Abdomen above black; anal hairs, and a lateral tuft at base white; underneath orange, not reaching anal segment; a sublateral orange tuft. Fore wings dull purple brown, the lines rich fuscous brown; antemedial outcurved between veins, preceded from cell to inner margin by an olive green shade; orbicular round; reniform oblique, olive green edged with dark brown; above reniform a large white spot from costa to vein 4, its inner edge outbent, its outer edge slightly curved, limited by the postmedial line which is inangled at vein 2, and is followed by a broad olive green shade, crossed by a fine dark line, all obsolescent just above submedian; subterminal shade from costa to submedian fold; a narrow terminal dark shade and a few whitish irrorations. Hind wings black; an opalescent white spot from base in and below cell expanding and reaching just beyond middle of wing; cilia on inner margin white. Wings below black; white spot on fore wings narrower, not reaching costa, downbent to near vein 2; a white streak on costa of hind wings; the spot as above.

Expanse.—27 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16545, U.S.N.M.

EROGA DIPSAS, new species.

Male.—Palpi, head, collar, and thorax fuscous brown. Abdomen fuscous. Fore wings dark reddish brown; a fuscous streak below cell; a large white shade mottled with olive beyond cell, reaching from vein 2 to costa. Hind wings fuscous brown; a large yellow spot from base including costa to near termen at vein 2, its upper edge down curved, leaving the apical space very broadly dark. Wings below duller; the white space on fore wings without mottling, tinged with yellow, and shaded with deep yellow on costa; the spot on hind wings paler.

Expanse.—28 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16546, U.S.N.M.

TROGOBLEMMA SERICATA, new species.

Female.—Body and fore wings pale bistre, the latter tinged with lilacine and crossed by long paler striæ; some black irrorations on costa and lobe of inner margin; orbicular and reniform black points; marginal black points on interspaces; a postmedial pale line, out-angled below costa, and inbent to near middle of inner margin; base of cilia dark brown from apex to vein 4. Hind wings whitish, the outer margin shaded with brownish gray. Fore wings below dark grayish, the costa pale buff. Hind wings below whitish; the costa to beyond middle pale buff; a dark spot on discocellular; a faint postmedial line; terminal space darkly irrorated; terminal dark points on both wings.

Expanse.—16 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16547, U.S.N.M.

TROGOBLEMMA LUCENS, new species.

Female.—Head and thorax pale lilacine gray; some black irrorations on thorax. Abdomen whitish yellow. Fore wings pale bistre tinged with silky lilacine gray on terminal third; scattered black irrorations; black orbicular and reniform points; small marginal black spots on interspaces; traces of a fine lunular postmedial line, outangled below vein 8, marked by fuscous points at angle and at vein 6, terminating in fuscous brown scaling at middle of inner margin; cilia reddish brown, tipped with whitish gray. Hind wings white, the cilia and fringe on inner margin yellowish; terminal fuscous spots from vein 4 to apex. Fore wings below whitish, tinged with yellow on costa; a broad lilacine gray shade below costa. Hind wings below white; a dark postmedial line on costa; terminal dark spots on both wings on apical half.

Expanse.—16 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16548, U.S.N.M.

PHOBOLOSIA ATRIFRONS, new species.

Male.—Palpi pale brown, darker shaded above. Frons black. Vertex gray. Collar and thorax gray faintly tinged with brown. Abdomen and hind wings dull grayish brown. Fore wings ochre brown, with some brown transverse striæ; costal edge medially and toward apex fuscous; reniform small, narrow, oblique, white; a postmedial fine white line, oblique and straight on costa, inbent and finely wavy from vein 6, edged with fuscous brown on inner margin; a subterminal white shade to tornus; a terminal dark brown line preceded by paler brown shading and some black spots; the line terminating in a round black spot close to apex, which is marked by a

white spot; cilia brown with a whitish line at base. Fore wings below brown; a dark shade at end of cell, a spot on submedian fold below it, and a whitish streak on costa above it; inner margin whitish; the terminal dark line from vein 5 to apex. Hind wings below grayish white, partly irrorated with brown; a dark discal spot and postmedial line; an interrupted thick terminal line.

Expanse.—16 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16549, U.S.N.M.

PHOBOLOSIA ADMIRABILIS, new species.

Male.—Palpi and head black. Collar and thorax grayish white. Abdomen pale gray. Fore wings white; a few scattered brown-black irrorations; antemedial line brown, vertical, expanding below cell into a large brown black spot; a similar spot at end of cell, outwardly edged with white, followed by a blue-gray shade, downbent to submedian, expanding below spot to its inner edge; costa beyond antemedial shaded with pale brown; medial space above submedian, and entire inner margin so shaded; a fine dark-brown outer line, slightly outcurved on costa; two large marginal blue-gray spots, one from veins 4–7, the other slightly darker and triangular from below vein 4 to near tornus, the latter preceded by a pale brown shade; a terminal dark-brown line; cilia brown. Hind wings white, the apex and outer margin broadly fuscous to near anal angle; a terminal silvery shade. Fore wings below white; anterior half suffused with brown; a large fuscous spot over discocellular to below submedian fold; terminal bluish shading. Hind wings below similar to upper side.

Expanse.—20 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16550, U.S.N.M.

ORUZA DOTO, new species.

Female.—Body above dull purplish brown, the collar without purple tinge. Fore wings: Basal half dull purplish brown, limited by reniform and postmedial line which are yellowish white, the postmedial outcurved close to reniform with only a fine brown line between them, vertical on costa, slightly inbent below reniform; an antemedial pale line, outbent on costa, vertical from within cell, somewhat punctiform and not reaching inner margin; postmedial space pale bistre followed by an irregular purplish brown shade to subterminal which is fine, very irregular, grayish bistre; terminal space dark purplish gray; a terminal dark brown line; cilia bistre crossed by two fine fuscous lines. Hind wings: Base like fore wings, the lines limiting it somewhat incurved and downbent to inner

margin near angle; outer space bistre irrorated with brown, forming an irregular outer shade suffusing into spots near inner margin; outer margin tinged with lilacine gray; a terminal dark-brown line inwardly pale edged.

Expanse.—18 mm.

Habitat.—Geldersland, Surinam River.

Type.—Cat. No. 16551, U.S.N.M.

OENOPTERA LEDA, new species.

Male.—Head, collar, and thorax grayish, iridescent. Abdomen brown at base, terminally shaded with fuscous. Fore wings brown, paler shaded from cell to apex and termen at vein 2; dark silvery steel gray shadings on costa at base, and between lines, at base of cell and before lines, also terminally on interspaces; antemedial line remote from base, fine, fuscous brown, preceded by a pale brown shade on costa, and a fine silvery gray shade from costa to inner margin; an oblique fuscous brown line as reniform; postmedial outcurved pale brown with some fuscous brown shading, followed by a silvery gray shade, and some dark points towards costa; subterminal brighter brown shading on pale portion; some dark brown scaling from reniform, oblique to vein 2 and downbent subterminally to inner margin. Hind wings fuscous gray. Wings below dull grayish.

Expanse.—19 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16552, U.S.N.M.

OENOPTERA RHEA, new species.

Male.—Head and collar brown. Thorax and abdomen fuscous. Fore wings brown shaded with dark steel gray, slightly silvery; lines fine, pale brown; antemedial just before middle of wing, outwardly edged with fuscous brown, wavy, vertical; an oblique brown black streak as reniform, outwardly pale edged; postmedial outcurved, wavy, inwardly edged with fuscous brown; a pale brown subterminal line interrupted by a large pale brown spot from vein 5 to vein 3, extending to termen from vein 4 to just below 3. Hind wings gray faintly tinged with brown. Wings below grayish irrorated with brown.

Expanse.—13 mm.

Habitat.—Cayenne, French Guiana.

Type.—Cat. No. 16553, U.S.N.M.

PSEUDOCRASPEDIA ORMENIS, new species.

Male.—Body and fore wings whitish buff; some dark shading on abdomen dorsally. Fore wings: Costal margin shaded with brown, more intense from middle to near apex; some black scaling indicating an antemedial line, and an outangled postmedial line; a black point

on discocellular; a fine brown shade on inner margin near tornus. Hind wings whitish faintly shaded with pale grayish brown scaling. Wings below whitish; fore wings with a dark brown shade from base of inner margin, including cell and costa to near apex; hind wings with brownish shading on costa and a dark discal point.

Expanse.—11 mm.

Habitat.—Cayenne, French Guiana.

Type.—Cat. No. 16554, U.S.N.M.

PARANGITIA ATYS, new species.

Male.—Palpi buff. Frons buff brown. Vertex, collar, and thorax grayish brown irrorated with black. Abdomen above dull dark brown, underneath white. Fore wings light brown, the lines deeply outcurved, wavy, darker brown on costa, otherwise fuscous; a black shade from middle of cell to near termen; a similar shade below cell from base to middle; a yellow brown shade at base; antemedial and medial lines geminate; a broad light gray shade on inner margin to middle; postmedial geminate, followed by a fuscous shade from vein 3 to inner margin; subterminal dark streaks between veins 6-9; marginal fuscous shades from below cellular streak to tornus. Hind wings fuscous brown; cilia spotted and tipped with pale buff. Fore wings below fuscous gray, the termen paler. Hind wings below dark grayish; medial and postmedial fine outcurved dark lines, the former suffusing with fuscous spots on discocellular.

Expanse.—31 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16555, U.S.N.M.

PARANGITIA CHLOROSTICTA, new species.

Female.—Palpi and head brown irrorated with white. Collar fuscous brown crossed by a green line. Thorax whitish behind, otherwise fuscous brown mottled with green in front, medially, and on patagia. Abdomen dorsally bright green, laterally gray brown. Wings dull brown. Fore wings: Base partly brilliant green followed by darker brown shading, forming three lines on costa, divided by green scaling; a velvety fuscous brown spot below cell, and a fine outcurved line on inner margin; some dull green scaling antemedially and on costa; three green lines across cell; a small green spot on discocellular with two white points above and below it; a fine darker brown shade outcurved close to cell; an outer fine pale line, dark-edged and minutely lunular; subterminal dark brown streaks on interspaces; cilia bright green from vein 3 to inner margin before tornus, and between veins 5 and 6, otherwise fuscous brown. Hind wings: A darker terminal line, and minute white points at veins; a short white streak near angle on inner margin; cilia bright green from angle to vein 6, above 6 dark brown. Wings below paler, the hind

wings partly white irrorated with brown; an antemedial line, spot on discocellular, and lunular dentate postmedial line.

Expanse.—24 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16556, U.S.N.M.

PARANGITIA JAPYX, new species.

Male.—Palpi fuscous brown fringed below with pale brown. Head, collar, and thorax dark brown mottled with ocher and whitish gray. Abdomen bistre brown. Wings silky fuscous brown. Fore wings: The inner margin broadly tinged with dark gray; antemedial and postmedial lines, fine, fuscous brown, barely traceable on dark ground color; cilia white at apex. Hind wings: Cilia at anal angle, and a small spot above angle whitish gray. Fore wings below slightly paler, the postmedial line more distinct. Hind wings below faintly tinged with gray, except on basal third; a fine lunular postmedial line.

Expanse.—31 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16557, U.S.N.M.

ANGITIA THACIA, new species.

Female.—Palpi lilacine, the joints tipped with white. Body and wings brown. Head, collar and thorax mottled with white; dorsal white spots on basal segments of abdomen. Fore wings: Markings white; basal spots; a broken subbasal line; antemedial line incurved in cell, outbent below it, preceded on inner margin by an elongated white shade; orbicular small, darker edged; a faintly darker medial line; reniform outlined in white, interrupted across middle by a pale brown shade extending to postmedial; postmedial fuscous brown, outbent along vein 8, wavy, outwardly partly edged with white, followed by fuscous brown streaks between veins 4 and 6, and 7 and 8; some subterminal white scaling, forming geminate spots between veins 6 and 7, and 3 and 4; terminal white points. Fore wings below fuscous brown with a few bluish white irrorations; a white spot on costa at postmedial line. Hind wings below paler, with traces of antemedial and postmedial lines; a dark line on discocellular edged with bluish white.

Expanse.—28 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16558, U.S.N.M.

ANGITIA ORESTES, new species.

Male.—Head light brown, the vertex mottled with fuscous brown. Collar divided by a fuscous brown line, the anterior portion light brown, the posterior portion pale gray. Thorax mottled gray, brown, and fuscous; the tufts behind crossed by a black and white

line, terminating in glossy purplish brown downcurled scales. Abdomen above dark gray brown, underneath yellow brown. Fore wings: Base pale brown, partly darker mottled, limited by the inbent, wavy, black antemedial line, followed in cell by a slate gray orbicular shade, outwardly edged with white; wing otherwise mostly slate gray; costa irrorated with white between lines; inner margin medially irrorated with dark gray; a fuscous shade from submedian to end of cell; a white line on inner side of discocellular; some dull roseate brown irrorations beyond cell; postmedial line black, oblique on costa, then wavy, incurved below 4; a broad fuscous downbent shade from postmedial at vein 6 extending on cilia below 5; a circular patch of white and brown scales from vein 4 to vein 2; subterminal whitish shading before apex. Hind wings thinly scaled, brown; tinged with lilacine: termen broadly fuscous.

Expanse.—29 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 10559, U.S.N.M.

ANGITIA ONEROSA, new species.

Male.—Palpi, vertex, and collar dull dark brown; frons paler. Thorax pale brown, edged in front with dark brown. Abdomen dull dark brown. Fore wings dull brown; some whitish scaling at base of subcostal, and subbasal fuscous brown spots in cell, and above submedian; antemedial fine, dark, barely traceable, but well marked on costa; reniform large, oblique, fuscous brown, heavily irrorated with white, outwardly edged by a fine dark shade; postmedial outcurved, minutely wavy, more heavily and darker marked on costa and just below it, followed by a dark shade to vein 5, and a more distinct darker spot between veins 5 and 4; subterminal apparently paler, inwardly preceded by dark spots, and outwardly edged by a fine dark line, expanding into a larger darker spot from vein 5 to below vein 4; an interrupted terminal dark velvety line, expanding at middle of interspaces. Hind wings dull dark brown; terminal fuscous spots. Wings below fuscous gray.

Expanse.—26 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16560, U.S.N.M.

ANGITIA HERMIONE, new species.

Female.—Palpi and frons buff. Vertex and collar fuscous brown streaked with white. Thorax buff medially, behind, and patagia mottled lichen gray and brown. Abdomen pale brown. Fore wings buff tinged with pale olive brown; subbasal line brown on costa, fuscous below; antemedial line gray brown edged with black, with a short outbent grayish shade on inner margin; orbicular and reniform outlined in creamy buff, the former crossing cell, inbent; a

fine outcurved postmedial line, almost obsolescent from vein 7 to vein 3; subterminal line creamy buff, deeply outcurved, below vein 4 preceded by a broad similar shade crossed by some olive brown shading, mottled with fuscous near inner margin; apex to vein 5 broadly fuscous mottled with dull olive; below vein 5 an interrupted terminal black line, preceded by a narrow fuscous and brown shade below vein 3. Hind wings dark brown, shaded with fuscous on outer margin; a pale marginal line from vein 5 to anal angle, and some slight yellow brown shading above angle. Wings below silky brown; darker discal shades and a postmedial faint line; hind wings slightly shaded with whitish brown.

Expanse.—26 mm.

Habitat.—St. Laurent, Maroni River.

Type.—Cat. No. 16561, U.S.N.M.

OZARBA ANGULILINEA, new species.

Female.—Palpi dark gray brown. Frons whitish crossed by a reddish brown line. Collar and thorax reddish brown. Abdomen and hind wings fuscous brown. Fore wings brown; base of inner margin fuscous brown; antemedial line pale, inbent, preceded by a reddish brown shade, outwardly darker edged; a pale roseate brown line on discocellular inwardly edged by a fuscous line; a black postmedial line, very fine, outangled just beyond cell and slightly wavy, inbent and angled below cell, followed by a well-defined pale roseate brown line, outangled at vein 7, vertical below vein 3, finely edged with fuscous; a pale irregular subterminal line, inwardly darker shaded; a terminal dark brown line. Fore wings below fuscous, the margins roseate brown. Hind wings below shaded with roseate brown; traces of antemedial and postmedial lines, also dark subterminal streaks on veins.

Expanse.—13 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16562, U.S.N.M.

OZARBA ONYTES, new species.

Female.—Palpi fuscous, the joints tipped with white. Frons whitish; vertex gray mottled with brown. Collar, and thorax lilacine brown; a fuscous line on collar, and spots on patagia behind. Abdomen fuscous with faint pale segmental lines. Fore wings brown; a black point near base of cell; a black shade on inner margin; antemedial line grayish, finely edged with light reddish brown, on extreme costa with black, inbent in cell, well outcurved across submedian fold; an orbicular minute black point; a medial fine brownish line outbent, faintly lunular, separated from reniform space and postmedial line below vein 3 by a fine black line; reniform space large, whitish, extending to costa, crossed by a pale brown line on disco-

cellular, followed by a round black spot with which a fine postmedial line suffuses. This line crosses the white costal space and is outwardly edged with lilacine white, and continues vertical below vein 3 as a pale line; space beyond shaded with pale olive brown and lilacine; a deeper brown shade beyond cell, upbent to costa at subterminal line, which is whitish, partly tinged with lilacine, and slightly sinuous; a terminal brown black line; cilia pale shaded at apex. Hind wings fuscous brown; cilia unevenly tipped with white. Hind wings below whitish, irrorated with dull brown; the termen broadly shaded with roseate brown; a dark discal point; traces of a postmedial line, and broad dull brownish outer shade.

Expanse.—19 mm.

Habitat.—Cayenne, French Guiana.

Type.—Cat. No. 16563, U.S.N.M.

LITHACODIA FOLIUM, new species.

Female.—Palpi dark brown, the joints tipped with white. Frons brown; vertex, collar, and thorax pale green, with some fuscous and brown scattered scales. Abdomen grayish brown, the dorsal tuft black tipped with white. Fore wings pale green; fuscous and brown shading at base of inner margin, on costa near base, and medially, beyond cell broadly to costa, and on outer margin between veins 4 and 6; a fine antemedial olive green line; orbicular olive green containing a few black scales; a curved dark brown line at end of cell; a similar small curved spot below cell medially; postmedial brown, suffusing with a shade beyond cell, wavyly inbent, expanding on inner margin, followed by a punctiform fuscous brown line; a wavy whitish green subterminal line; an interrupted terminal fuscous line. Hind wings fuscous brown. Wings below dark grayish brown, the hind wings shaded with white; a dark shade on discocellular, and faint postmedial line.

Expanse.—17 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16564, U.S.N.M.

NEOSTROTIA ALBESCENS, new species.

Male.—Palpi light brown, the third joint white with a brown ring. Body white, the collar tinged with yellow; some dark brown irrorations on collar and abdomen; the basal dorsal tuft fuscous brown. Fore wings white, the shadings yellow brown; some shading at base of costa followed by a clear white line; antemedial line white, slightly curved, indicated by irregular shadings preceding it, and slightly darker shadings following it, the latter with a few black irrorations; a black point as orbicular; two black points on discocellular; medial space irrorated with yellow brown, and a similar broad shade across end of cell, narrowing on inner margin; postmedial line fine, yellow

brown, outcurved beyond cell, heavily shaded on costa; subterminal shading followed by some fuscous scaling opposite cell, and below vein 3; traces of a terminal dark line. Hind wings whitish gray, darker shaded on termen. Wings below white, the costal margin broadly irrorated with brown; a postmedial dark line on costal margins; a small yellowish discal spot edged with brown on hind wings.

Expanse.—12 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16565, U.S.N.M.

EUSTROTIA OLENOS, new species.

Male.—Palpi fuscous irrorated and tipped with white. Head, and collar brownish gray tinged with roseate. Thorax and abdomen dark gray. Fore wings slate brown, the interspaces terminally streaked with reddish brown; antemedial line whitish, darker edged, from subcostal to submedian geminate, below submedian shaded with dark red; reniform pale gray irrorated with white, partly dark outlined, preceded by a darker line; postmedial fine, fuscous brown, inwardly edged with white on costa above reniform, outbent along costa, then angled and slightly inbent to inner margin, outwardly edged with whitish, and inwardly so edged from below vein 3, this portion inwardly dark shaded; a fine whitish subterminal line, inwardly darker shaded; marginal white points on interspaces. Hind wings dull grayish faintly tinged with brown. Fore wings below dark grayish; inner margin white; costal margin irrorated with dull roseate brown; traces of medial, postmedial, and subterminal lines. Hind wings below whitish; costal and outer margins irrorated with dark gray and shaded with roseate brown; a faint postmedial line.

Expanse.—18 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16566, U.S.N.M.

HELIOCONTIA BASIPUNCTA, new species.

Male.—Head, collar, and thorax bistre, the latter shaded behind with yellow brown. Abdomen above fuscous, the dorsal tufts at base yellow brown; anal tufts whitish mottled with orange brown. Fore wings pale yellow; the base broadly orange, its outer edge outwardly oblique from costa; a large cluster of black scales below cell; a minute black point on discocellular. Hind wings fuscous gray; the costa whitish to near apex; a fuscous point on discocellular. Wings below pale grayish, the margins yellowish; some postmedial dark irrorations.

Expanse.—20 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16567, U.S.N.M.

YPSIA GLYCON, new species.

Female.—Head, collar, and thorax brown-black, the patagia tinged with dark steel blue; abdomen dark steel blue, the dorsal crests brown-black. Wings dark reddish brown almost entirely obscured by the black lines and steel-blue shading between them; cilia fuscous tipped with brown; a wavy terminal line; a more diffuse marginal line. Fore wings: Indistinct basal and subbasal lines; antemedial line geminate; medial line geminate, suffusing in cell, forming a black shade before reniform, which is indicated by brown shading; a fine wavy line beyond cell, followed by the more heavily marked postmedial, which is lunular-wavy; subterminal shade black, broad below costa and below vein 3. Hind wings: Costal margin light brown without markings; three medial lines, followed by a fine line, and heavier postmedial as on fore wings; subterminal line parallel with postmedial, and a fainter line between them. Wings below dull dark brown; a fuscous brown outer line, partly lunular, outwardly edged with lighter brown; a fuscous brown terminal line; a dark postmedial line on hind wings.

Expanse.—38 mm.

Habitat.—St. Laurent, Maroni River.

Near *Ypsia lineata* Druce.

Type.—Cat. No. 16568, U.S.N.M.

YPSIA EXAGGERATA, new species.

Male.—Palpi mottled ochreous and fuscous brown. Head, collar, and thorax brown, also dorsal tufts on abdomen; some ochreous shading on collar in front; abdomen fuscous. Wings brown; cilia fuscous gray, with pale line at base; a terminal dark-brown crenulate line; a straight interrupted marginal line. Fore wings: Subcostal, median, and veins from cell to subterminal dark-bluish slate color; lines fuscous brown; basal line inbent; antemedial lunular, interrupted; orbicular small, annular; medial line geminate, inangled on subcostal, outangled at reniform, and wavily inbent; reniform paler brown, inwardly edged by a fuscous brown line, containing some bluish slate mottling; postmedial pale brown partly edged with fuscous brown, outcurved around cell, followed by a dull slate-brown shade to subterminal, which is fine, paler, and very irregular. Hind wings: Antemedial line straight, fuscous brown; medial wavy marked by a white point at end of cell; postmedial somewhat lunular, partly geminate, fine, fuscous brown, followed by a fuscous shade, darkest just below vein 6. Wings below pale grayish brown; a fine postmedial darker line; a faint paler subterminal indicated by darker shading preceding it; discocellular pale lines, darkly edged; a faint marginal and terminal line.

Expanse.—35 mm.

Habitat.—Rockstone, Essequibo River.

Type.—Cat. No. 16569, U.S.N.M.

ENCROUPHION, new genus.

Palpi upturned, second joint reaching vertex, moderately scaled, smooth; third joint as long as second, slender, smooth, the tips dilated. Antennæ smooth, slightly minutely serrate terminally with short cilia. Legs hairy. Fore wings long; outer margin well rounded; vein 3 near lower angle; 4 from angle; 5 above lower angle; 6 from upper angle; 7, 8, 9 stalked from areole; 10 from end of areole; 11 free. Hind wings narrow, small in proportion to fore wing; costal margin arched at base; veins 3, 4, 5 equally apart from lower angle; 6 and 7 from upper angle; vein 8 curved, approximating 7 to near end of cell, inclosing on costal margin a large elliptical fovea, clothed above with an exceptionally thick mass of scales, overlapped with long fringe from costa.

Type of genus.—*Encruphion porrima* Schaus.

ENCROUPHION PORRIMA, new species.

Male.—Head grayish. Collar, thorax, and fore wings gray tinged with brown; front of collar black; a few black scales on patagia. Abdomen duller brown-gray. Fore wings: A broad dark-brown shade near base from costa to near submedian, crossed by a darker line and edged with black, outwardly expanding into a black spot below fold, the whole closely followed by a fine, fuscous, interrupted antemedial line; orbicular round pale olive brown; traces of a medial black line, on costa outbent and well marked; medial space to post-medial line tinged with pale olive brown; reniform indicated by lilacine gray mottling; postmedial line outbent, white, outwardly edged with black to vein 4, then obsolescent, indicated by cuneiform black spots above and below fold, and a spot on inner margin; a triangular dark brown shade on costa beyond postmedial, its apex formed by a black spot between veins 6 and 5; a subterminal olive brown shade tinged with fuscous between veins 4 and 5; termen narrowly white; black marginal spots on interspaces connected by a black terminal line interrupted by white points at veins. Hind wings gray-brown; the termen as on fore wings but not so clearly marked. Fore wings below brownish gray; inner margin broadly white; the cell and just below it clothed with long dark olive-brown hairs. Hind wings below white, irrorated with brown forming an outer line and marginal shade.

Expanse.—39 mm.

Habitat.—Omai, British Guiana.

Type.—Cat. No. 16570, U.S.N.M.

ENCROUPHION PHALEREUS, new species.

Male.—Body and wings brown. Fore wings: A broad black-brown shade beyond base outbent from costa to submedian where

it is widest; a dark-brown shade between postmedial and subterminal on costa, terminating in a black-brown shade between veins 6 and 4; the two lines fine, yellow brown, faintly indicated; the subterminal followed by a small black shade between veins 4 and 5, and darker shade across submedian fold; marginal whitish linear spots on interspaces, outwardly dark shaded and suffusing with a dark terminal line. Hind wings: Terminal markings as on fore wings but fainter. Wings below dark-gray brown; the inner margin of fore wings broadly white on basal half; a faint darker outer line on hind wings. Abdomen below whitish irrorated with gray-brown.

Expanse.—43 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16571, U.S.N.M.

HERMINODES ALBISTRIGA, new species.

Female.—Palpi brown, fringed below with gray. Head, collar, and thorax bistre white. Abdomen above pale gray brown. Fore wings grayish bistre tinged with roseate brown; a white streak below cell from base to postmedial; lines fine fuscous brown; antemedial wavy, outbent, angled on submedian fold; postmedial deeply outcurved beyond cell, lunular dentate; a black point as orbicular, and one at end of cell; marginal black points on interspaces; some brown irrorations on costal margin; cilia tipped with dark-brown spots. Hind wings: Base white shading to gray brown terminally. Fore wings below grayish brown. Hind wings below white; the costal margin tinged with pale yellow brown.

Expanse.—32 mm.

Habitat.—Cayenne, French Guiana.

Type.—Cat. No. 16572, U.S.N.M.

HERMINODES UMBRATA, new species.

Male.—Palpi light brown, with short fringe below. Head, collar, and thorax whitish, the latter shaded with gray behind; abdomen above grayish brown. Fore wings buff white; the costal margin and the inner margin medially shaded with lilacine gray, irrorated with dark purple brown; the wing otherwise thinly irrorated with brown, more so on inner margin, between veins 2 and 3, and medially above submedian; a faint postmedial shade, outangled beyond cell, slightly outcurved between discocellular and submedian; traces of a subterminal brownish shade; terminal dark olive brown spots on interspaces. Hind wings fuscous gray, the costa and cilia pale shaded. Wings below whitish; fore wings with some brownish irrorations below costa, and a dark shade on discocellular.

Expanse.—33 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16573, U.S.N.M.

HERMINODES HEBES, new species.

Male.—Palpi dark brown, edged with whitish above. Head, collar, thorax, and fore wings buff white. Abdomen and hind wings whitish thickly irrorated with dull brown; pale segmental lines on abdomen. Fore wings thinly irrorated with black; a black point near base of subcostal, and a point on reniform; a very faint pale brown outer line, marked by a small spot between veins 5 and 6, and on submedian fold; faint brownish subterminal spots between 6 and 7, and 3 and 4; small terminal black spots. Wings below whitish. Fore wings: Costa, cell, and postmedial space to fold shaded with dull brown. Hind wings: The costal margin shaded with dull brown; traces of terminal points.

Expanse.—31 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16574, U.S.N.M.

HERMINODES PARCA, new species.

Female.—Palpi dark brown tipped above with whitish. Head and collar buff white irrorated with brown; the neck dark brown. Thorax lilacine buff. Abdomen fuscous brown with paler segmental lines. Fore wings dull lilacine, the terminal half tinged with brown; base of costa finely fuscous; an orbicular black point; black brown irrorations forming a curved line on discocellular, and a similar fine outcurved postmedial line, expanding into a large spot between vein 2 and submedian; terminal triangular spots. Hind wings dull dark brown. Wings below pale grayish brown.

Expanse.—29 mm.

Habitat.—Rockstone, Essequibo River, British Guiana.

Type.—Cat. No. 16575, U.S.N.M.

HERMINODES REGIA, new species.

Male.—Palpi fuscous streaked with buff white above. Head, collar, thorax, and fore wings buff white; a fuscous medial line on collar and thorax. Abdomen and hind wings dull fuscous brown. Fore wings: Some fuscous brown irrorations; a pale brown shade in cell along median; median white; a thick velvety black streak below cell and vein 4 to outer line, crossed by a pale streak at end of cell, its hind edge inbent near middle of cell, then expanding to end of cell, much narrower where cut, and terminating in a point; a black orbicular point and smaller reniform point; a grayish shade between veins 5 and 6 from cell to termen; outer line dark brown, lunular, inbent below vein 2; small terminal spots on interspaces. Wings below pale grayish brown; the disk of fore wings darker shaded, with a

black orbicular and reniform point. Hind wings below with some brownish irrorations and a faint discal point.

Expanse.—35 mm.

Habitat.—Geldersland, Surinam.

Type.—Cat. No. 16576, U.S.N.M.

HERMINODES LONGISTRIATA, new species.

Male.—Palpi fuscous brown tipped with white. Head, and collar mottled white and dark brown. Thorax dark brown, streaked with dull lilacine. Abdomen fuscous, mottled with pale gray on two basal segments. Fore wings: A broad streak on costal margin, and one below cell to termen, fuscous brown; a white streak along subcostal, shaded with gray beyond middle and with a few dark irrorations; cell grayish with a brown streak above median; a black orbicular and reniform point; veins from cell broadly shaded with lilacine gray, except where interrupted by subcellular streak; a fuscous streak from cell to termen between veins 5 and 6; finer dark terminal streaks on other interspaces; submedian fuscous; a lilacine gray streak above and below it. Hind wings dark brown. Wings below brownish gray without marking except a terminal fine darker line.

Expanse.—32 mm.

Habitat.—Cayenne, French Guiana.

Type.—Cat. No. 16577, U.S.N.M.

HERMINODES INCULTA, new species.

Male.—Body and fore wings dull dark gray. Fore wings: Some brownish irrorations; the lines faintly indicated, rust brown; a black point at base of cell; antemedial wavy, barely traceable; orbicular small, dark brown; reniform fuscous gray edged with rust brown except in front; postmedial outcurved, partly punctiform; traces of a fine parallel outer line; black terminal spots on interspaces. Hind wings similar, pale shaded at base and on inner margin; a dark discal spot; a faint, fine, fuscous postmedial line. Wings below slightly paler; round fuscous spots on discocellulars; an outer fuscous line.

Expanse.—32 mm.

Habitat.—St. Laurent, Maroni River.

Type.—Cat. No. 16578, U.S.N.M.

HERMINODES PILOSA, new species.

Male.—Palpi fuscous brown, streaked above with lilacine gray. Head grayish tinged with lilacine. Collar, thorax, and fore wings purplish gray, the latter irrorated with reddish brown, a fuscous line on shoulders. Abdomen brown, the two basal segments buff. Fore wings: Lines brown; antemedial fine, inbent, from subcostal to inner margin; a line on discocellular; postmedial broader, outwardly

pale edged, imbricate, very faint on costa; a fine wavy marginal line, slightly thickened at middle of interspaces. Hind wings dark brown; a fuscous shade on discocellular. Wings below dull brown; a faint darker postmedial line; a fuscous brown streak on discocellular of hind wings. The legs very hairy.

Expanse.—40 mm.

Habitat.—Geldersland, Surinam River.

Type.—Cat. No. 16579, U.S.N.M.

LEPTOCTENISTA GRANDIMACULA, new species.

Male.—Body brown; a fuscous tuft at base of palpi; abdomen dorsally thickly irrorated with dark brown; lateral tufts luteous. Fore wings brown, paler shaded toward apex; the veins terminally light brown; a black basal line across costa and cell, thickest on costa; a fine brown antemedial line, geminate, slightly outcurved, followed on costa by a black brown spot, in cell by the large black orbicular, and some black brown scales close below median; reniform light brown, finely edged with whitish, preceded by a few black scales in cell, and followed by a large dark brown spot from vein 4 to costa, outwardly edged by a wavy white line; traces of a geminate dark brown line from this spot to inner margin on interspaces; some grayish white and dark brown irrorations on interspaces beyond, limited by a fine and indistinct subterminal line, preceded on costa by a small fuscous brown spot; a wavy terminal dark brown line. Hind wings fuscous brown; cilia buff brown. Hind wings below brownish white; a dark discal spot; a postmedial dark line interrupted between veins 4 and 2; dark terminal points.

The tarsi with long fringe above to near ends.

Expanse.—32 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16580, U.S.N.M.

LEPTOCTENISTA HADENOIDES, new species.

Male.—Palpi, head, collar, thorax, and basal tuft on abdomen dark brown; abdominal tuft followed by a small grayish white dorsal tuft; abdomen dull fuscous brown. Fore wings dark brown; fuscous brown shades at base; an indistinct paler brown antemedial line defined by irregular fuscous brown shadings on either side; orbicular fuscous brown partly edged with whitish scales; a fuscous brown curved line on discocellular inwardly edged by a fine white line, and followed by a buff brown shade; postmedial interrupted, vertical below discocellular, shaded with lighter brown; some white irrorations medially above submedian; subterminal buff brown, vertical from costa to vein 4, outcurved between 4 and 3, then incurved, edged with fuscous brown shades, and partly with white scales; termen lighter brown with a marginal, lunular, fuscous brown line; cilia

spotted with buff. Hind wings fuscous brown; cilia tipped with grayish buff. Wings below dark brown, the termen dark grayish; a faint fuscous brown postmedial shade.

Expanse.—27 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16581, U.S.N.M.

LEPTOCTENISTA OREAS, new species.

Male.—Palpi fuscous brown. Head, collar, and thorax dark brown. Abdomen dull brown. Fore wings brown, the lines fuscous brown; a basal line; antemedial fine, angular; orbicular small, fuscous brown; a curved buff line on discocellular, the middle of its inner edge with a small fuscous spot; postmedial slightly outcurved, finely dentate, outwardly finely edged with light brown; subterminal fine, indistinct, light brown, followed by darker shadings; terminal triangular dark spots on interspaces; cilia fuscous brown, with a basal interrupted pale line, and light brown spots. Hind wings fuscous brown; cilia grayish white with a crenulate dark brown shade at base. Fore wings below buff brown; a dark discal point, postmedial line, and broad terminal shade. Hind wings below pale buff; a brown discal point, postmedial line, subterminal, and terminal shades; cilia spotted with brown.

Expanse.—30 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16582, U.S.N.M.

LEPTOCTENISTA FUNEBRIS, new species.

Male.—Body fuscous brown above, the head and collar mottled with lighter brown. Fore wings dark brown, the base of costa and cell still darker to a light brown shade preceding the antemedial, which is fuscous, inangled in cell, on fold, and on submedian; orbicular small, fuscous; a small fuscous spot on discocellular preceded by a few grayish scales; postmedial poorly defined, fine, fuscous, inangled on fold, irregularly outbent below it; a lighter brown shade beyond postmedial, followed by a dark brown dentate shade inwardly edging the light brown subterminal; terminal semilunar velvety brown spots preceded by a lunular pale line mottled with lilacine gray; cilia fuscous gray brown, divided by a paler line, and paler tipped. Hind wings fuscous brown. Fore wings below dull brown; a dark postmedial line, and straight subterminal shade; terminal dark brown spots. Hind wings below grayish buff, the costal and outer margins tinged with brown; a fuscous line on discocellular; a dark postmedial and subterminal line; the termen narrowly darker shaded.

Expanse.—24 mm.

Habitat.—Cayenne, French Guiana,

Type.—Cat. No. 16583, U.S.N.M.

LEPTOCTENISTA MALONIA, new species.

Male.—Palpi: Second joint fuscous brown, fringed with lighter brown; third joint whitish buff. Head, collar, and thorax brown; some buff mottling on head. Abdomen above fuscous brown. Fore wings: Costal margin, cell, and termen light brown; inner margin whitish buff; an elongated black brown space between cell and submedian from base to middle; a similar space between veins 2 and 5 to near termen, subterminally upbent to costa; base of costa dark brown; an antemedial black brown line, expanding on costa, traceable across cell, and on inner margin; orbicular small, fuscous; a large fuscous spot at end of cell, preceded by a whitish line suffusing behind with dark outer space; postmedial fine, fuscous brown, dentate, traceable on pale portions; an outbent pale fascia from median below vein 2, separating the two dark spaces; some light reddish brown and fuscous irrorations on pale portions; terminal triangular lunate dark spots; cilia fuscous gray. Hind wings fuscous brown; a terminal darker line; a darker shade on discocellular. Wings below buff irrorated with brown; fuscous discal spots and postmedial shade; a broad subterminal shade. Fore wings shaded with fuscous except on margins.

Expanse.—32 mm.

Habitat.—Rockstone, British Guiana.

Very similar to *L. pretiosa* Schaus; veins 3 and 4 on hind wings are from angle of cell; the postmedial shade below is nearer cell, whereas in *pretiosa* it is remote and linear.

Type.—Cat. No. 16584, U.S.N.M.

LEPTOCTENISTA LIGNEA, new species.

Male.—Palpi dark brown. Head, collar, and thorax reddish brown; collar tipped with white; some whitish mottlings on vertex. Abdomen dark brown. Fore wings brown; a black brown shade below cell from base to beyond middle at submedian, in front reaching below orbicular, edged with whitish brown; a dark streak at base of inner margin; base of costa and antemedial streaks dark brown; orbicular small, beyond middle of cell, reniform larger, both fuscous brown; postmedial remote from cell, fine, fuscous brown, deeply lunular on costa, preceded below vein 6 by broad darker brown shadings, below vein 3 only indicated by shadings, followed above vein 6 by a broad subterminal dark brown shade; terminal triangular fuscous brown spots. Hind wings dark brown. Wings below brown; fuscous discal points, and a dark outcurved postmedial line; no terminal spots.

Expanse.—35 mm.

Habitat.—Omai, British Guiana.

Type.—Cat. No. 16585, U.S.N.M.

LEPTOCTENISTA CRINIPES, new species.

Male.—Head, collar, thorax, and wings dark brown. Abdomen fuscous. Fore wings: Lines fuscous brown; antemedial almost vertical, slightly inset in cell, outset on inner margin, closely followed by a small black orbicular spot; reniform small, round, yellow brown edged with fuscous brown; postmedial outcurved beyond cell, wavy, vertical below reniform; small terminal fuscous spots on interspaces. Hind wings without markings. Wings below uniform fuscous brown. Fore legs hairy. Hind tibia fringed above and below with long fuscous brown hairs.

Expanse.—26 mm.

Habitat.—St. Laurent, Maroni River.

Type.—Cat. No. 16586, U. S.N.M.

ANORENA, new genus.

Male.—Palpi short; second joint obliquely ascending, broader at end; third joint smooth, very short, downturned. Antennæ pubescent, ciliate. Fore tibiae hairy; hind tarsi heavily fringed above. Fore wings narrow at base, expanding terminally; outer margin obliquely rounded; vein 3 from before lower angle; 4 and 5 from lower angle; 6 from upper angle; 7, 8, 10 from areole; 9 on long stalk with 8; 11 free. Hind wings: Outer margin oblique; veins 3 and 4 from lower angle; 5 well above angle; 6 and 7 from upper angle.

Type of genus.—*Anorena hyrtacides* Schaus.

ANORENA HYRTACIDES, new species.

Male.—Body and wings brown faintly tinged with lilacine; two small white points on abdomen towards base. Fore wings: Lines dark brown, fine; antemedial line inset in cell, twice outcurved below it; orbicular and reniform black points; a faint medial line outcurved at end of cell, inbent from vein 3; postmedial outcurved around cell, lunular dentate; a subterminal dentate shade, slightly darker than ground color; a terminal dark line, interrupted by pale points at veins; costa at base and medially narrowly dark yellow with small black spots. Hind wings: Costal margin broadly duller without markings; a dentate postmedial line on inner half of wing; faint traces of subterminal shade; terminal line as on fore wing. Hind wings below paler, shaded with gray; a dark discal point; a medial and postmedial brown line.

Expanse.—25 mm.

Habitat.—Geldersland, Surinam River.

Type.—Cat. No. 16587, U.S.N.M.

ATENERIA, new genus.

Male.—Palpi obliquely ascending; second joint broad, thickly scaled; third joint short, smooth, downbent. Antennæ pubescent. Fore legs hairy. Fore wings: Apex acute; outer margin obliquely rounded; vein 3 well before lower angle of cell; 4 and 5 from lower angle; 6 from upper angle; 7 from areole; 8, 9, 10 on long stalk from areole; 11 free. Hind wings: Outer margin rounded; cell short, narrow, upcurved; vein 3 much closer to vein 2 than to vein 4; 5 equally distant from 4; 6 and 7 from upper angle; 8 anastomosing with 7 to beyond middle of cell.

Type of genus.—*Ateneria crinipuncta* Schaus.

ATENERIA CRINIPUNCTA, new species.

Male.—Body buff irrorated with light brown; second joint of palpi terminally dark brown. Fore wings buff thinly irrorated with fuscous brown; a small tuft on costa near base; some dark brown scaling forming an indistinct fine antemedial line; orbicular round, covered with long black hairs; a black point at end of cell; postmedial line fine, vertical on costa above discocellular, deeply outcurved around cell, fuscous brown, slightly lunular; subterminal fuscous scaling forming an irregular shade; marginal black points on interspaces. Hind wings shaded with smoky brown, the cell and costa whitish; terminal dark points; the subcostal from near base to end of cell fringed with long downturned yellow buff hairs. Wings below whiter; a postmedial dark line on costal margin of fore wings, and a faint subterminal shade; a black discocellular spot and postmedial line on hind wings; terminal spots on both wings.

Expanse.—23 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16588, U.S.N.M.

SINOSIA, new genus.

Male.—Palpi obliquely ascending, less than twice the length of head; second joint thickly scaled with curved fringe above; third joint fringed below. Antennæ pubescent. Tibiæ hairy. Fore wings narrow; outer margin sinuous; vein 3 before lower angle; 4 and 5 apart from lower angle; 6 from upper angle; 7, 8, and 9 stalked; 10 from areole; 11 free. Hind wings: Veins 3, 4, and 6 and 7 shortly stalked, 5 from near lower angle.

Type of genus.—*Sinosia inornata* Schaus.

SINOSIA INORNATA, new species.

Male.—Palpi fuscous brown tipped with roseate brown. Head roseate buff. Collar, thorax, and fore wings roseate buff thinly irrorated with brown. Abdomen fuscous brown with pale segmental

lines. Fore wings: Some black irrorations on basal area; a broad reddish brown medial shade, widest on inner margin, its outer edge outbent from costa; extreme costa reddish brown; a large similar spot on discocellular with some black irrorations; a streaky post-medial shade outcurved beyond cell; a faint subterminal shade. Hind wings fuscous brown. Wings below brownish gray; faint discal points; the costa of fore wing reddish brown.

Expanse.—24 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16589, U.S.N.M.

NEOPTODES, new genus.

Male.—Palpi obliquely ascending, short; second joint moderately scaled; third joint very short, slender. Antennæ pubescent. Fore legs hairy; tibiæ slightly dilated. Fore wings narrow; vein 3 before lower angle; 4 and 5 from lower angle; 6 below upper angle; 7, 8, 9 stalked from upper angle; 10, 11 free, 11 approximated to 10. Hind wings: Veins 3 and 4 well stalked; 5 close to lower angle; 6 and 7 shortly stalked.

Type of genus.—*Neoptodes caicus* Schaus.

NEOPTODES CAICUS, new species.

Male.—Palpi buff brown. Head and collar dark brown; thorax brown. Abdomen dull smoky brown. Fore wings: Inner margin broadly buff brown, otherwise fuscous brown, with buff brown shadings preceding subterminal line; a broad antemedial darker shade; orbicular indistinct, large, round, irrorated with dark gray scales; reniform brown, edged with fuscous, preceded by two small grayish spots, and followed by some dull gray shading; postmedial line very indistinct, lunular, partly geminate; subterminal grayish, inbent opposite cell, and below vein 2, faintly edged with fuscous brown; outer margin clearer brown; fuscous streaks on interspaces, cut by small marginal grayish spots; terminal buff brown points at veins. Hind wings smoky brown. Hind wings below grayish white shaded with brown; a dark discal spot; a faint postmedial line; subterminal shades at costa, opposite cell, and near inner margin.

Expanse.—22 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16590, U.S.N.M.

OSTEA OENOPION, new species.

Male.—Body dark purplish brown above, dull brown below. Wings dull brown; very faint terminal whitish points; a few pale scales indicating a subterminal line. Fore wings: Medial space darkest; markings dull lilacine gray, fine; antemedial line barely indicated; an orbicular point; two incurved lines on discocellular;

postmedial from a white spot on costa above reniform, outbent along costa, wavy, incurved and lunular below vein 4. Hind wings: A darker shade on discocellular; postmedial line upcurved below vein 3. Wings below dull fuscous gray with some lilacine irrorations; darker lines on discocellular; a postmedial line outwardly pale edged.

Expanse.—22 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16591, U.S.N.M.

OSTHA OFELLA, new species.

Male.—Body and wings above purplish brown. Vertex lilacine gray. Wings: Small subterminal clusters of whitish scales forming an indistinct line; some white irrorations on outer margin; terminal white points at veins. Fore wings: Some whitish irrorations on costa; a fine antemedial white line, outangled on costa, slightly incurved across cell, outwardly darker shaded; an irregular yellowish white spot on discocellular; postmedial fine, white, inbent on costa, outcurved beyond cell, wavy, inwardly dark shaded. Hind wings: A fine lilacine streak on discocellular; postmedial as on forewing, upcurved below vein 3. Wings below whitish gray; a dark streak on discocellular, fine postmedial line, and subterminal shade cut by veins; cilia dull fuscous brown.

Expanse.—16 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16592, U.S.N.M.

OSTHA? CYBELE, new species.

Female.—Head, collar, and abdomen except basal segment dark gray. Thorax, basal segment of abdomen, and wings cinnamon brown. Wings: Cilia fuscous with cinnamon spots at veins; a faint subterminal fuscous gray shade, and similar faint postmedial line. Fore wings: A fine wavy fuscous-gray antemedial line; a white orbicular point circled with fuscous; similar white points on discocellular in front and behind. Hind wings: A fuscous-gray shade on discocellular and two white points. Wings below dull grayish brown.

Expanse.—28 mm.

Habitat.—Rockstone, Essequibo River.

Type.—Cat. No. 16593, U.S.N.M.

AZATHA? PULCHRA, new species.

Male.—Palpi gray brown edged below with black. Frons white; vertex and body above grayish brown; some darker dorsal tufts on abdomen. Body below white. Fore wings narrow, outer margin oblique; the base narrowly whitish buff with some small black spots, followed by a dark reddish brown shade, sharply outbent below cell and vein 2, but not reaching postmedial line; this reddish brown space

is partly paler mottled, its outer edge incurved and followed in places by bluish white scaling; medially the costa is fuscous brown; the cell space, between veins 2 and 3 to postmedial and inner margin, lilacine gray crossed by fine darker lines of scales, paler on inner margin than in cell; a purple gray line on discocellular, inwardly edged by a straight fuscous line, outwardly by a similar inangled line, which is followed by a dark purple brown shade; postmedial outcurved, whitish and buff on costa, lilacine from vein 6 to submedian, lilacine white on inner margin, edged throughout with dark brown; this line is somewhat broken between vein 2 and submedian; veins 2, 3, 4, and all the veins beyond postmedial buff white; outer space shaded with dark gray on interspaces; an outbent pale line from costa close to postmedial, finer, and incurved from vein 3, partly preceded by small fuscous spots, and a larger dark brown spot on inner margin; two inbent lines from costa towards apex, and a straight subterminal pale line from vein 6 to tornus; terminal dark spots. Hind wings: Costa whitish; base lilacine with coarse brown irrorations below cell; three postmedial reddish brown lines, divided by paler lines, all slightly upbent at vein 2, the last line followed by a broad brown shade, limited by a grayish white subterminal line; outer margin buff white irrorated with fuscous gray, thickly towards anal angle; a terminal interrupted brown line, expanding towards apex. Wings below whitish. Fore wings: The inner margin fuscous, upbent subterminally; dark terminal spots. Hind wings: A dark streak on discocellular; a faint geminate postmedial line; a broad fuscous marginal shade.

Expanse.—32 mm.

Habitat.—Feldersland, Surinam River.

Type.—Cat. No. 16594, U.S.N.M.

ORTHOGRAMMA MODESTA, new species.

Male.—Body and wings above brownish gray, slightly paler beyond line. Fore wings: Antemedial white points on veins; orbicular and reniform faintly indicated by slightly paler shadings; outer line brown, fine, outangled just above vein 7, followed by a broader dark brown line which diverges to apex at vein 7; on hind wings this line is straight to inner margin beyond middle, and is preceded by a broad yellow brown shade; subterminal black points, and a faint paler marginal line on both wings. Wings below duller, paler, the hind wings almost white on basal half; darker lines on discocellulars; a fine postmedial line; an antemedial line on hind wings.

Expanse.—40 mm.

Habitat.—Geldersland, Surinam River.

Type.—Cat. No. 16595, U.S.N.M.

PANGRAPTA? SUBGEMINATA, new species.

Male.—Palpi whitish gray, the second joint terminally shaded with fuscous. Body above, and wings dark slate brown; a fine interrupted darker terminal line; cilia tipped with pale brown; the lines darker. Fore wings: Antemedial line forming three curves, inwardly pale shaded; orbicular small, fuscous, edged with white; medial line slightly outcurved in cell; reniform long and narrow, white, cut by a vertical and horizontal brown lines; postmedial slightly outcurved, wavy, outwardly faintly paler edged, and followed by a fine, less distinct line; subterminal linear on costa, macular from below vein 6. Hind wings: A faint antemedial line; white spots on discocellular; postmedial as on fore wings, lunular dentate; subterminal spots outwardly shaded with bluish gray; similar shading on termen between veins 2 and 5. Wings below whitish gray irrorated with dark brown. Fore wings: Orbicular spot velvety black; medial line outangled in cell; a white shade on discocellular crossed by a fuscous line with points; postmedial distinctly geminate; subterminal line followed by a small black spot on costa; a terminal line cut by veins. Hind wings tinged with brown, darkest on termen; antemedial line preceded by a spot in cell; a dark line with points on discocellular, outwardly white shaded; postmedial geminate; subterminal line partly edged with white outwardly; inner margin whiter.

Expanse.—26 mm.

Habitat.—St. Laurent, Maroni River.

Very similar above to *P. minuta* Druce., but quite different below.

Type.—Cat. No. 16596, U.S.N.M.

PANGRAPTA? DILUCIDA, new species.

Male.—Palpi whitish, the second joint banded with brown at base and end. Body and wings pale buff, the thorax tinged with gray. Wings: Lines fine, dark brown. Fore wings: Base of costa dark brown; antemedial, and medial lines outbent, wavy; orbicular whitish buff edged with pale brown; reniform large, whitish, broken into spots by fine brownish lines, and similarly edged; postmedial outbent to vein 4, then irregularly incurved; a subterminal brownish line before apex; below vein 5 small fuscous spots, some cut by a white line, the largest spot between veins 2 and 3. Hind wings: Medial and postmedial lines, the latter outcurved beyond cell; subterminal spots as on fore wings. Wings below shaded with light brown, the inner margins, and the costa of fore wings whitish; some brown irrorations; the lines straighter. Fore wings: Orbicular dark brown edged with white; medial line outbent preceded by some dark brown points on submedian fold; reniform white with three dark points; subterminal spots between veins 2 and 5, the

largest below vein 3; a dark terminal line. Hind wings: A dark point in cell; medial line outcurved; a white shade on discocellular with dark points at ends and middle; postmedial wavy between veins 5 and 2; a dentate subterminal whitish line, partly finely dark edged, shaded with fuscous between veins 2 and 4.

Expanse.—24 mm.

Habitat.—Cayenne, French Guiana.

This species, *P. subgeminata* Schaus, and *P. minuta* Druce, require a new genus.

Type.—Cat. No. 16597, U.S.N.M.

THERMESIA OCRESIA, new species.

Female.—Palpi, and head gray brown, the vertex mottled with whitish. Collar brown. Thorax, abdomen, and wings grayish, faintly tinged with lilacine; abdomen with darker irrorations and whitish segmental lines. Wings: A straight subterminal brown line, inwardly edged with white; an interrupted terminal fine dark line, expanding at middle of interspaces, other lines very fine, wavy. Fore wings: Antemedial line double, well apart, the inner line less distinct; a fine line on discocellular followed by a fainter incurved line, forming a narrow reniform; postmedial outcurved, touching reniform behind, followed by a fainter, finely lunular, line, broadly shaded with pale brown on inner margin; termen slightly shaded with brown. Hind wings: A fine line on discocellular; postmedial followed by a second line, the entire space to subterminal shaded with brown; termen slightly shaded with brown. Wings below buff white, with some grayish irrorations; dark discal points; traces of postmedial lines; terminal line as above.

Expanse.—28 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16598, U.S.N.M.

THERMESIA GLYCERA, new species.

Female.—Palpi brown irrorated with fuscous brown. Body dull brown, the thorax slightly paler. Fore wings: Basal half olive brown limited by the postmedial whitish buff line, which is deeply outcurved below costa, and inbent to middle of inner margin; the costa pale shaded beyond the line; antemedial line fine, fuscous brown, outcurved on costa, and below subcostal; traces of a fine medial line; outer space slightly paler; a dark brown subterminal shade almost straight; termen narrowly paler, with an interrupted fine dark line. Hind wings: The base brown shading to fuscous brown before the pale postmedial line; a few dark irrorations beyond the postmedial; the subterminal shade less distinct; the terminal dark line more continuous. Fore wings below brown; postmedial

fine, fuscous; subterminal shade black, broad, expanding near inner margin. Hind wings below: Base grayish brown with dark irroration; postmedial line fuscous, heavily marked toward inner margin; space beyond brownish buff; subterminal black shade, broad, expanding to apex on costa; some marginal darker shading.

Expanse.—29 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16599, U.S.N.M.

APISTIS ONEROSA, new species.

Male.—Antennæ ciliate. Palpi dark brown, irrorated with white, fringed below with reddish. Head and thorax dark purplish, mottled with grayish hairs. Collar tinged with dull, dark, reddish brown. Abdomen fuscous gray, anal hairs whitish. Tarsi whitish. Fore wings dark brown glossed with lilacine, crossed medially by dark brown striæ; lines fine, dark brown; antemedial vertical, outangled in cell, more deeply outangled on submedian; orbicular round, indistinct, paler brown, glossed with lilacine; reniform large, paler brown; a fuscous brown shade in cell between the spots; postmedial fine, outcurved on costa, outwardly edged by a pale shade and light brown points on veins; subterminal fuscous points on interspaces; termen irrorated with lilacine; a terminal fine line, expanding at middle of interspaces. Hind wings more grayish brown, the termen as on fore wings; a postmedial fine brown line, angled on inner margin. Fore wings below grayish brown, the costa deep yellow; a pale line on discocellular; a fuscous postmedial line. Hind wings below whitish lilacine irrorated with brown; a dark spot on discocellular, and finely wavy postmedial line.

Expanse.—50 mm.

Habitat.—Peru.

Type.—Cat. No. 16600, U.S.N.M.

EROMIDIA, new genus.

Male.—Antennæ almost as long as fore wing. Palpi obliquely ascending, moderately scaled, the third joint one-third as long as second. Legs long and slender; fore legs slightly fringed, the tarsi with small tuft at base; hind legs smooth, the inner medial spur long. Fore wings narrow, the apex acute, the outer margin oblique, less so in female; vein 3 from lower angle of cell; 4 and 5 above and apart; 6 from upper angle; 7, 8, 10 from areole which is narrow, 8 and 9 on long stalk; 11 from cell approximating 10. Hind wings broad; costa straight, outer margin slightly rounded; cell short; 3 and 4 from lower, 6 and 7 from upper angle; 5 above lower angle.

Type of genus.—*Eromidia clotho* Schaus.

EROMIDIA CLOTHO, new species.

Male.—Palpi brown, the third joint darker with white ring at base and white tip. Body and wings yellow brown; vertex behind shaded with white. Fore wings: Costa to postmedial thickly irrorated with black; antemedial line faintly indicated, whitish; orbicular small, black, pale edged; reniform irregular, brown, edged with fuscous, and then with whitish; postmedial close beyond cell, faint, whitish, inwardly edged with fuscous on costa; outer space with fine fuscous striæ; a marginal and a terminal fine white wavy line, the former partly obsolete and preceded by small fuscous spots, the latter followed by fuscous points. Hind wings: A white line on discocellular; a fine white outer line; the space beyond with fuscous striæ; a terminal lunular white line, outwardly filled in with black. Fore wings below brownish with darker striæ, the inner and outer margins grayish; traces of an outcurved medial line; orbicular and reniform black spots edged with whitish. Hind wings below grayish, tinged with pale brown, and with some brown striæ; the terminal line as above. The female is browner, faintly tinged with lilacine, the lines more distinct; the cilia brown tipped with white; also with dark spots on fore wings. Underneath the wings are darker than in the male, with a black discal spot on hind wings and a white outer line.

Expanse.—23 mm.

Habitat.—St. Laurent, Maroni River.

Type.—Cat. No. 16601, U.S.N.M.

BENDIS? NIGRILUNATA, new species.

Male.—Body and wings above dark gray, the head and collar faintly tinged with brown. Fore wings: Costa narrowly brown; antemedial line brown, fine, wavy, vertical; orbicular a small brown spot edged with paler gray; a narrow medial brown shade; reniform large, outlined in dark brown, its outer edge inangled; postmedial line brown, fine, lunular, outcurved, followed between veins 4 and 6 by a narrow brown shade; subterminal black points, the one above vein 5 shaded with brown; small marginal spots and an irregular terminal dark line. Hind wings shaded with brown to just beyond postmedial line, which is fine, dark brown, lunular, and is followed close to inner margin by a large velvety brown black lunule; terminal space as on fore wings. Wings below duller, paler gray; hind wings from base to beyond postmedial whitish; whitish lines on discocellular edged with dark gray; the postmedial less lunular, especially on fore wings.

Expanse.—35 mm.

Habitat.—St. Laurent, Maroni River.

Somewhat like *B. gentilis* Schaus.

Type.—Cat. No. 16602, U.S.N.M.

OLYMPIS PARVIPUNCTA, new species.

Male.—Palpi and frons fuscous. Body and wings light cinnamon brown. Fore wings: Antemedial and postmedial lines pale, darker edged on medial side, straight, almost vertical; a black point on discocellular; traces of an irregular pale subterminal line; terminal dark brown spots. Hind wings: Costa pale shaded; traces of a straight postmedial line; an interrupted dark brown terminal line. Wings below paler, the hind wings whitish irrorated with brown; dark discal spots; a curved postmedial line on hind wings.

Expanse.—21 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16603, U.S.N.M.

DAGASSA DEUCALION, new species.

Male.—Palpi brown irrorated with white, fringed below with gray; the tips of joints white. Body and wings grayish brown; head and collar dark brown; front of thorax white. Fore wings: Costa yellowish to beyond middle; lines fine, darker; antemedial outcurved, inwardly partly shaded with white; an orbicular white point; medial line outbent to near end of cell; a curved line on discocellular edged with white; postmedial outcurved, outwardly finely edged with whitish, and followed by a fine parallel shade; subterminal indicated by faint whitish shading; cilia grayish crossed by a dark line, and dark spotted. Hind wings: A fine medial line; postmedial geminate divided by a whitish line; traces of subterminal spots; a marginal dark brown spot at anal angle; cilia white crossed by a brown line. Fore wings below pale olive brown crossed by dark strizæ, except on outer margin, which is pale grayish; fine medial and postmedial lines; a dark orbicular point, and line on discocellular; subterminal dark spots in a straight line. Hind wings below whitish gray crossed by dark strizæ, except on termen; a dark spot on discocellular; a medial line, and fainter postmedial line; a subterminal brown shade, partly interrupted; a terminal brown line.

Expanse.—27 mm.

Habitat.—Geldersland, Surinam.

Type.—Cat. No. 16604, U.S.N.M.

DAGASSA? PYRRHA, new species.

Female.—Palpi light brown, irrorated with fuscous brown; tips of joints white. Head and collar brown. Thorax slate color tinged with lilacine. Abdomen above dull brown with fuscous gray segmental lines. Wings brown crossed by fine darker strizæ; costa finely yellowish to beyond middle, more densely striated; lines darker brown; antemedial evenly outcurved; medial outcurved in cell; postmedial outcurved on costa, outwardly paler shaded, followed by a

darker shade to termen, almost fuscous from vein 5 to inner margin; dark points at ends of discocellular, connected by a fine line; subterminal whitish points on interspaces preceded by fuscous shades; cilia fuscous tipped with white at tornus and near apex. Hind wings with finer striæ; a dark brown antemedial line; a small round spot on discocellular; postmedial line bright brown, geminate, divided by a whitish lilacine line; traces of faint fuscous subterminal spots; cilia tipped with white, except near vein 3, where it is grayish. Fore wings below buff gray striated with fuscous, the disk of fore wings to apex tinged with pale roseate brown; a terminal dark line. Fore wings: A medial spot on fold; a black orbicular point, and line on discocellular; subterminal pale points preceded by fuscous shadings between veins 6 and 7, and 2 and 5. Hind wings: A spot on discocellular, and a line from it to inner margin; a faint medial line on costa; postmedial macular, outwardly pale shaded; some subterminal fuscous spots.

Expanse.—25 mm.

Habitat.—Rockstone, Essequibo River, British Guiana.

Type.—Cat. No. 16605, U.S.N.M.

ORSA OCULATA, new species.

Male.—Palpi dark brown, fringed below with gray, the joints tipped with white. Frons mottled white and gray. Body and wings above slate brown; thorax whitish below collar; body below white, legs creamy white. Fore wings: The costa finely yellow with black spots at lines; lines slightly darker; antemedial outcurved, inwardly edged with some whitish scales on costa, and just below cell; medial line out-angled in cell, orbicular and reniform defined by some whitish scaling; postmedial outcurved, outwardly pale edged and followed by a narrow parallel shade; subterminal defined by small whitish spots; cilia partly whitish at apex and tornus. Hind wings: A faint medial line, followed by a large round white spot from vein 3 to costa, its outer edge wavy; a dark lilacine postmedial line, dark edged, spotted with white opposite cell, and at anal angle; cilia partly white. Fore wings below lilacine gray crossed by dark striæ; cell and space beyond to apex fuscous gray; tornus and termen near apex whitish, with few striæ; medial, and postmedial geminate lines; an orbicular point and dark line on discocellular. Hind wings below: Base and inner margin lilacine white, with darker striæ except on inner margin; medial line distinct; the large white spot diffuse, its margins striated; postmedial line partly interrupted; outer margin broadly fuscous gray with a few whitish striæ.

Expanse.—27 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16606, U.S.N.M.

OROSCOPA BELUS, new species.

Female.—Palpi and frons whitish gray with some fuscous spots; vertex brownish gray. Collar whitish, crossed by a fuscous line in front. Thorax pale gray; abdomen slightly darker with some brown irrorations, and paler segmental lines; a fuscous and brown transverse line at base. Wings pale gray; a few brown irrorations; terminal brown points; cilia yellow brown. Fore wings: Lines fine, brown, darker on costa and inner margin; antemedial line outangled below vein 2, deeply indented to inner margin; orbicular minute, whitish; reniform white, finely edged with dark gray and brown, containing inwardly a small semihyaline indistinct spot, and crossed by some grayish and yellow brown scaling, followed by a white shade; postmedial geminate, deeply outcurved beyond cell, and indented to inner margin close to antemedial line, followed by a third line, slightly wavy, and more remote on costa; a white shade above vein 6 from postmedial to apex; subterminal indicated by dark shading forming spots between veins 5 and 7, preceded on inner margin by a fuscous shade. Hind wings: A geminate fuscous line at base; an outer white line, outcurved below costa, partly finely edged with dark brown. Wings below grayish white, some scattered fuscous irrorations; suffusing fuscous lines at base of fore wings, and antemedially on hind wings, not reaching inner margin; a similar cluster of lines on fore wings medially below cell, joined by a geminate line from costa across end of cell; a point on costa beyond it; subterminal fuscous spots toward costa and at inner margins; some olive gray shading on fore wing postmedially; termen of hind wings more thickly irrorated with dark scaling.

Expanse.—35 mm.

Habitat.—Bejuco River, Panama.

Type.—Cat. No. 16607, U.S.N.M.

EREBOSTROTA ALBIPICTA, new species.

Male.—Palpi and frons gray mottled with fuscous brown; vertex dark brown. Collar white; thorax and abdomen pale brown, the thorax behind and abdomen at base white. Wings pale brown with a few scattered black scales. Fore wings: Costal margin white, expanding to vein 6 subterminally; a basal and a subbasal white point below cell; a round antemedial white spot below cell, and another on inner margin; a small white spot on discocellular containing some black scales; a postmedial outcurved lunular line, defined by the white markings on costa, and followed from vein 4 to termen by a white space, crossed by a subterminal pale brown shade, and similar terminal shadings between veins 2 and 3; small subterminal white spots above vein 4 and above vein 6; marginal black points. Hind wings: Base white; a white point on discocellular; an outer broad

white shade from above vein 4 to inner margin; smaller spots from vein 6 to costa; some subterminal white spots; anal angle white; marginal black points. Wings below whitish with some brownish strise and irrorations; a black point on discocellular of fore wings.

Expanse.—45 mm.

Habitat.—St. Laurent, Maroni River.

Type.—Cat. No. 16608, U.S.N.M.

TRIOMMATODES AGENOR, new species.

Male.—Antennæ pectinated. Palpi fuscous gray mottled with white. Body and wings above light brown; collar fuscous brown in front edged with a white line. Fore wings: Antemedial white points on veins, partly edged with fuscous purple; a dark orbicular point; a faint wavy, purplish, medial line; postmedial fine, purplish, deeply outcurved beyond cell, marked with white points and dark streaks on veins, followed by some dark scaling between vein 2 and submedian; subterminal and terminal fuscous-purple spots. Hind wings: The anal angle lobed; inner margin buff white; a black discal point, followed by a wavy line; postmedial consisting chiefly of white points, and a line from vein 2, followed by a silvery white spot on inner margin; subterminal and terminal spots as on fore wing. Fore wings below dull brown; a black orbicular point; subterminal and terminal points. Hind wings below yellow brown; a fuscous discocellular line, heavy postmedial line, and broad terminal shade.

Expanse.—40 mm.

Habitat.—Rockstone, Essequibo River.

Type.—Cat. No. 16609, U.S.N.M.

TRIOMMATODES CANIDIA, new species.

Male.—Antennæ pectinated. Head and collar brown. Thorax, abdomen, and wings lilacine slate color; lines brown tinged with olive. Fore wings: An antemedial, medial, and postmedial vertical line; orbicular and reniform indicated by faint brownish lines; terminal space brown shaded, leaving a subterminal lilacine shade out-angled between veins 3 and 4, and marked with dark points on interspaces; traces of a marginal pale line. Hind wings: A fine line on discocellular; a faint medial line; postmedial line distinct, vertical to inner margin above angle, then marked by a short white line, followed otherwise by some white points; subterminal dark points on a lilacine shade; traces of a marginal lilacine line. Wings below dull grayish brown; a postmedial dark line more distinct on hind wings; a whitish line on discocellular of same wings.

Expanse.—36 mm.

Habitat.—St. Jean, Maroni River

Type.—Cat. No. 16610, U.S.N.M.

TRIOMMATODES PYGMALION, new species.

Male.—Antennæ pectinated. Palpi olive brown, third joint gray tipped with white. Body and wings above olive brown; subterminal black spots on interspaces; a fine, slightly darker terminal line. Fore wings: An antemedial, and a medial darker line, the former with minute whitish points on veins; postmedial line finer, outcurved, indistinct with minute whitish points on veins. Hind wings: A medial and postmedial darker shade, the latter with a few white points; a round white spot on inner margin between the lines; anal angle well produced; veins 2 and 3 approximated for more than half their length, then diverging. Wings below dull grayish brown, the base of hind wings paler with a fuscous line on discocellular; a fine postmedial line; traces of subterminal spots.

Expanse.—41 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16611, U.S.N.M.

TRIOMMATODES ABERRANS, new species.

Female.—Antennæ pubescent, ciliate. Palpi fuscous gray, third segment white at base and tips. Body and wings cinnamon brown, the thorax tinged with gray. Wings: Postmedial line finely lunular, darker brown with white points on veins; small subterminal fuscous spots outwardly pale shaded; a fine terminal brown line interrupted by pale points on veins. Fore wings: Antemedial line fine, darker, preceded by whitish points on veins; orbicular small, fuscous, edged with yellowish brown; a wavy medial line; some fuscous points on discocellular surmounted by a buff shade; postmedial edged by a white line on inner margin. Hind wings: A dark line across discocellular with fuscous spots. Wings below pale buff irrorated with brown; dark discocellular and postmedial lines. Fore wings: A black orbicular point; subterminal fuscous spots. Hind wings: A dark terminal shade.

Expanse.—35 mm.

Habitat.—Cayenne, French Guiana

Type.—Cat. No. 16612, U.S.N.M.

TRIOMMATODES PYLADES, new species.

Male.—Antennæ pectinated. Body dull dark brown; abdomen with whitish segmental lines. Fore wings dull dark brown; traces of a whitish antemedial line; orbicular, and reniform indicated by whitish edging; postmedial indicated by white points and edging, preceded from vein 2 to inner margin by a broad greenish gray shade; some outer grayish scaling from veins 2-6; subterminal grayish spots, lunular toward costa; marginal spots on interspaces, and whitish terminal points at veins. Hind wings dark grayish brown; a broad medial

yellow brown shade crossed by a fine postmedial dark line, and a small spot on discocellular; small subterminal and marginal whitish spots. Fore wings below dark grayish with traces of a darker medial and postmedial line. Hind wings below grayish buff; a medial and postmedial fine line; the termen broadly dark grayish.

Expanse.—28 mm.

Habitat.—Omai, British Guiana.

Type.—Cat. No. 16613, U.S.N.M.

TRIOMMATODES BELUS, new species.

Male.—Antennæ pubescent, ciliate. Palpi grayish brown. Head brown, the collar and thorax slightly paler. Abdomen grayish brown shaded with dull yellow at base. Wings brown; an irregular pale terminal fine line, followed by black points on interspaces. Fore wings: Base shaded with rust brown and a few black scales; antemedial line fine, vertical, yellowish, edged with rust brown, and followed by a yellow shade from fold to near inner margin; orbicular and reniform large, outlined by fine pale lines; postmedial dull lilacine, fine, outangled at vein 7 where it is joined by another line from costa near apex; a faint pale subterminal line, defined by black spots on interspaces. Hind wings: A dark pale edged spot on discocellular; postmedial straight to inner margin near angle; subterminal round black spots from below vein 5; termen yellowish white from vein 2 to inner margin. Fore wings below dull brownish gray; dark orbicular, reniform, and subterminal spots; a postmedial outcurved line. Hind wings below yellowish white, the outer margin dark shaded from costa to vein 2; a dark shade on discocellular; a minutely lunular postmedial line; a dark terminal line expanding at middle of interspaces on both wings; the anal space on hind wings only spotted.

Expanse.—28 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16614, U.S.N.M.

MULELOCHA ALBIBASALIS, new species.

Female.—Body brown mottled with white, the thorax behind chiefly white. Fore wings: Base to medial line white; a fine subbasal dark brown line, and a large similar spot from costa to just below cell, from the outer edge of which the antemedial line diverges at subcostal, and is inwardly broadly dark shaded on inner margin; medial line wavyly outbent to near median, then vertical; wing beyond middle lilacine brown, partly darker shaded; reniform space large, white, on which the reniform is partly outlined in dark brown, the white shading inbent at median to medial line; postmedial from costa above reniform where it is white edged, and followed by a dark shade, deeply outcurved, fuscous brown, macular from vein 7 to vein 2, outwardly finely edged and connected by a paler line; subterminal

shade broad, irregular, fuscous brown, outwardly edged by a white line on costa, otherwise by a paler lilacine brown shade; darker terminal shading at apex and between veins 2 and 5; a wavy terminal fuscous line, shaded with white between veins 5 and 7, and below vein 2. Hind wings: The base white; a fine medial line, interrupted by a large spot on discocellular, outwardly shaded with white; wing otherwise lilacine brown; postmedial broad, deeper lilacine, divided on costal half by a dark line, its inner edge lunular, whitish, preceded by a fuscous brown shade from vein 3 to costa, its outer edge followed by triangular fuscous brown spots; a subterminal fuscous brown shade from cell to vein 3; the marginal white shading more extended toward anal angle. Wings below slate brown; some marginal small white shades; cilia white and fuscous. Fore wings: A white spot in cell; the reniform space as above; a faintly darker postmedial line. Hind wings mottled with whitish at base; dark shade on discocellular large, containing a white spot; a medial and postmedial line, both faintly edged with whitish.

Expanse.—25 mm.

Habitat.—St. Laurent, Maroni River.

Type.—Cat. No. 16615, U.S.N.M.

MULELOCHA EREBEA, new species.

Female.—Body purplish brown, the base of abdomen shaded with lighter brown; palpi and frons mottled with white. Fore wings brown shaded with slate color; a dark brown spot at base of inner margin, and one above submedian outset; antemedial line faintly indicated, marked by a dark brown spot from median to submedian; medial line faint on costa, angled at reniform, vertical, and dark brown to inner margin, followed in cell below angle by a small light brown spot; reniform narrow, white, incurved, dark edged, followed by a small light brown shade; postmedial fine, light brown, outcurved beyond cell, inwardly shaded with dark brown from vein 8 to inner margin, broadly so from below vein 8; subterminal similar, but vertical to vein 3, the brown shading broad from costa to vein 3, then narrow; a lunular marginal fuscous line, outwardly finely pale edged. Hind wings lighter brown at base and along inner margin; a dark line on discocellular; postmedial broad, dull lilacine, crossed by a dark brown line from costa to vein 2, inwardly broadly shaded with dark brown, outwardly so shaded, but chiefly opposite cell; a broad subterminal dark shade, narrowing toward anal angle; terminal line as on fore wings, preceded by some dull lilacine shading. Fore wings below dark gray brown, striated with yellowish white on costal margin, in cell, and just below it; reniform white; a dark postmedial shade just beyond cell; a marginal white spot above vein 5, and smaller streaks above 6, and on inner margin; traces of a

fine terminal white line. Hind wings below brown striated with yellowish white to beyond the postmedial dark line; a dark spot on discocellular crossed by a fine white line; some marginal white shadings.

Expanse.—18 mm.

Habitat.—Geldersland, Surinam River.

Type.—Cat. No. 16616, U.S.N.M.

CAPNODES BACCATA, new species.

Male.—Palpi dull roseate; a white spot at end of second joint above; third joint streaked below with fuscous, the tip white. Head, thorax, and base of abdomen brownish red, the abdomen otherwise grayish brown. Wings brownish red, the markings white; cilia spotted; marginal spots divided by small fuscous spots; subterminal spots slightly larger, preceded and followed by fine dull brown shades; postmedial spots small, outcurved, paired, followed by a large white shade on inner margins. Fore wings: Three small subbasal spots; an antemedial spot on costa, and an inset outcurved row of spots from below subcostal; orbicular small, round; reniform larger, round, small spots encircling it except on outer side; postmedial originating from a large spot on costa. Hind wings: Some small spots at end of cell. Fore wings below roseate brown; a small fuscous spot on discocellular; marginal fuscous spots followed by buff points interrupting a dark terminal line. Hind wings below whitish buff, shaded with roseate brown postmedially; a small fuscous spot on discocellular; marginal spots as on fore wing.

Expanse.—32 mm.

Habitat.—St. Laurent, French Guiana.

Near *Capnodes stellifera* Schaus.

Type.—Cat. No. 16617, U.S.N.M.

CAPNODES CALAIS, new species.

Male.—Palpi buff banded with fuscous brown, the third joint terminally hairy. Body and wings bistre brown; some scattered black irroration on patagia and wings; outer margins finely crenulate. Fore wings: A faint medial darker line, outangled on discocellular; a faint postmedial outcurved line, broad and fuscous below vein 2, marked by small silvery white spots on vein 2 and fold, preceded below fold by a larger semilunar silvery spot edged with fuscous, terminating on inner margin in a curved silvery line; these spots are followed by subterminal and marginal fuscous shadings; traces of subterminal black points otherwise; terminal points on interspaces. Hind wings: A darker medial line; postmedial fine, indistinct, surmounted by a triangular silvery white spot on inner margin, and followed by fuscous mottlings near inner margin. Wings below

dull light brown; medial and postmedial dark lines better defined on hind wings, where there is also a dark subterminal shade.

Expanse.—88–42 mm.

Habitat.—St. Laurent, Maroni River.

Type.—Cat. No. 16618, U.S.N.M.

CAPNODES BARINE, new species.

Male.—Body above brownish; four white points on frons; some dorsal white segmental spots on abdomen. Wings light brown with a few darker irrorations; lines consisting of small white spots; postmedial and subterminal inwardly shaded with dark brown. Fore wings: A subbasal, and a geminate antemedial line, the latter not paired; a white spot on discocellular closely followed by some small spots; postmedial line outcurved from subcostal; marginal spots faintly connected with terminal points on veins, other terminal points on interspaces. Hind wings: A darker shade on discocellular edged with whitish points; the marginal spots forming a more distinct wavy line. Wings below whitish brown; a white discocellular shade on fore wings; a dark spot on hind wings, and traces of a postmedial line and darker marginal shade.

Expanse.—21 mm.

Habitat.—Geldersland, Surinam River.

Type.—Cat. No. 16619, U.S.N.M.

CAPNODES PHAEDRA, new species.

Male.—Palpi brown, fringed with fuscous below, the third joint blunt. Head, collar, and thorax brown, with faint darker irrorations; abdomen brownish gray, irrorated with fuscous gray; a pale dorsal line from vertex to anal segment. Wings brown more darkly irrorated except on outer margins; lines pale brownish yellow; a slightly lunular marginal pale line, and a pale terminal line, the space between them darker brown; cilia light gray, more darkly irrorated, crossed by two fine dark lines. Fore wings: Antemedial line outangled on subcostal, vertical below it; orbicular small, pale, containing a brown point; reniform large edged with dark brown and then brownish yellow; postmedial slightly outcurved; subterminal finely wavy, irregular, inbent opposite cell, and at vein 2. Hind wings: A large dark spot on discocellular, pale edged; postmedial straight, inwardly edged with darker brown; subterminal lunular. Fore wings below brownish, the costa and termen shaded with dark gray; a dark streak on discocellular; a terminal dark brown line. Hind wings below brownish white; a dark discal spot and heavily marked postmedial line; the outer margin broadly dark shaded, except at tornus.

Expanse.—18 mm.

Habitat.—Geldersland, Surinam River.

Type.—Cat. No. 16620, U.S.N.M.

CAPNODES PARTITA, new species.

Male.—Palpi brownish buff, the third joint terminally grayish. Body grayish brown. Fore wings: Base grayish brown, limited by a vertical broad fuscous brown line; a fine wavy subbasal black line, not reaching costa; a coarse antemedial black line vertical on costa and crossed by a fine white line, inbent from subcostal to submedian, outer space whitish brown; a broad terminal brown shade, inangled opposite cell; an outbent postmedial white line on costa, followed by a grayish brown shade, and some fuscous brown shading on vein 8, from vein 8 to below vein 6, consisting of a geminate dark brown line; subterminal black points on interspaces; marginal black points connected by a fine lunular line. Hind wings browner, paler shaded on postmedial toward costa; a fine black medial line; a broad fuscous brown postmedial shade, somewhat outbent to vein 3, below 3 consisting of a fuscous line with white points; subterminal points and terminal line as on fore wings. Wings below brownish white. Fore wings: Orbicular and reniform points; a fuscous medial line, heavy on costa; a very fine outcurved postmedial line; a dark subterminal point on costa. Hind wings: A well-marked medial and postmedial line; subterminal dark shading chiefly near costa.

Expanse.—42 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16621, U.S.N.M.

CAPNODES PELOPS, new species.

Male.—Palpi fuscous gray, the third joint white at base and tips. Head, collar, and thorax dark brown, the latter behind and tips of patagia shaded with fuscous. Abdomen above dark gray, underneath luteous. Fore wings: Base to antemedial fuscous brown, inclosing a lighter brown basal shade from subcostal to submedian; antemedial white, broad on costa and in front of cell, then partly interrupted to fold, with only a small spot above and below median, below fold expanding into a large spot to submedian, and below submedian reduced to a small spot crossed from subcostal by two fine orange brown lines; cell medially and below it to fold brownish; costal margin fuscous brown; reniform very large, dark grayish brown edged with fuscous; a brown space beyond reniform crossed by an interrupted white streak from costa to vein 6, edged with bright brown; inner and outer margin dark gray; a vertical fuscous medial line from fold to inner margin; an irregular outer fuscous shade, inbent to fold near medial line, angled and slightly outbent to inner margin; the tornal space largely paler gray; an interrupted subterminal fine fuscous shade; marginal black spots on interspaces. Hind wings light brown, the base and apical area darker; a medial fuscous line; fine darker brown postmedial, outer, and subterminal

lines, all very confused; marginal black linear spots. Hind wings below dull whitish yellow; a black discal spot crossed by a pale line; traces of postmedial and subterminal lines; apical half of outer margin shaded with fuscous.

Expanse.—29 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16622, U.S.N.M.

CAPNODES HANNIBAL, new species.

Male.—Palpi brown with white rings. Head, collar, and thorax buff brown mottled with dark brown. Abdomen grayish brown; a black dorsal spot on third segment. Fore wings dull brownish gray; costa spotted with yellow brown; some dark brown irrorations at base; antemedial line yellowish, partly edged with dark brown and spotted with white on costa, in cell from fold to near submedian, and on inner margin; an orbicular fuscous point; reniform large, brown, edged with fuscous, its outer edge deeply inangled; postmedial outbent on costa, dark reddish brown, followed by a white streak and small white spot above vein 6, vertical opposite cell, then inbent, fuscous gray, indistinct; a large triangular yellowish space on costa beyond white line, not reaching apex, crossed by brownish stræ and suffusions; a fuscous brown shade from veins 6-4, before the indistinct pale yellowish subterminal shade; small marginal black spots on interspaces. Hind wings similar; the base, costa, and base of inner margin whitish; a dark brown antemedial shade near inner margin; a fuscous shade on discocellular; a fine postmedial line; a dark brown outer line to near anal angle, irregular, and partly dentate; marginal black points. Fore wings below mostly grayish brown; the subterminal shade fuscous, well marked toward inner margin; traces of yellowish costal space. Hind wings below whitish yellow, the outer margin broadly fuscous; a black point and streak on discocellular; postmedial line faint, better marked on costa.

Expanse.—26 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16623, U.S.N.M.

CAPNODES AESON, new species.

Male.—Palpi brown, the third joint white at base and tips. Head and collar brown; thorax and abdomen whitish brown, the latter darker terminally; underneath whitish. Wings light brown tinged with opalescence to subterminal, except on costa of fore wings; a subterminal darker blotchy line; terminal dark brown triangular spots on interspaces. Fore wings: Antemedial line fine, darker brown, slightly outcurved crossing a dark orbicular point; reniform large, linear, inwardly straight heavily marked, outwardly wavy, incurved,

less distinct; postmedial line outcurved, finely lunular, followed by a fine brownish shade. Hind wings: A black discal spot, and faint line above it; postmedial also followed by a brown shade. Fore wings below brownish, the inner margin yellowish white. Hind wings below yellowish white; discocellular markings as above; a faint postmedial line; a faint brownish marginal shade; the terminal spots on both wings distinct; cilia with darker spots.

Expanse.—22 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16624, U.S.N.M.

CAPNODES ARAS, new species.

Male.—Palpi brown, the joints tipped with white, the third also ringed with white at base. Body above grayish brown, underneath whitish. Wings grayish brown, faintly tinged with lilacine; some scattered fuscous irrorations; brown spots edged with black on discocellular; two subterminal dentate darker lines; terminal black points on interspaces, paired at submedian fold. Fore wings: Antemedial and postmedial lines, fine, brown, darkest on costa, the antemedial outcurved on costa, and lunular, the postmedial incurved on costa and finely wavy. Hind wings: A postmedial finely wavy line, down bent toward anal angle. Fore wings below dull grayish brown; a fuscous spot near base of subcostal, an orbicular point and shadings on discocellular; fine postmedial and subterminal lines. Hind wings below whitish yellow; a dark discal point and fine postmedial line; the outer margin broadly grayish brown.

Expanse.—22 mm.

Habitat.—Geldersland, Surinam River.

Type.—Cat. No. 16625, U.S.N.M.

CAPNODES DEOIS, new species.

Male.—Body above gray, darkest on head and collar; a fine brownish line across thorax in front; body below white. Fore wings gray, the medial space almost whitish irrorated with gray; antemedial and postmedial lines fine, brown, edged with whitish on medial side; a round fuscous spot on discocellular; behind and above it a large oval oblique linear spot; subterminal fine, brownish, inwardly edged with white, lunular below costa, outset and inwardly oblique from vein 5 to submedian fold, then outcurved; a terminal dark line, expanding on interspaces, inwardly edged with whitish. Hind wings similar, paler on basal half; a black point on discocellular; postmedial line straight to near inner margin above angle; inner margin grayish white; subterminal line vertical to vein 5, inbent, angled at vein 2 and downbent to anal angle; cilia pale yellow tipped with white. Fore wings below dull gray, paler on costa and termen; an orbicular fuscous point and geminate lines on discocel-

lular; postmedial finely wavy; subterminal whitish. Hind wings below white; a black line on discocellular; postmedial lunular on costa; a narrow subterminal and marginal gray shade, terminal line as above.

Expanse.—25 mm.

Habitat.—Geldersland, Surinam River.

Type.—Cat. No. 16626, U.S.N.M.

CAPNODES ACRON, new species.

Male.—Body and wings dull grayish brown. Wings: Lines fine, paler, faintly darker edged on medial sides; an irregular faint darker subterminal line, marked by small whitish points on interspaces. Fore wings: Antemedial line vertical; postmedial line outcurved around cell and then vertical; a faint darker line on discocellular. Hind wings: A black point on discocellular; medial line vertical to inner margin near anal angle. Wings below paler, grayer. Fore wings: A dark orbicular point; a fine line on discocellular. Hind wings: A black discal point, a faint darker medial line; a darker marginal shade.

Expanse.—26 mm.

Habitat.—Geldersland, Surinam River.

Type.—Cat. No. 16627, U.S.N.M.

CAPNODES HAMILCAR, new species.

Male.—Palpi fuscous brown. Body and wings dull brown. Legs mostly white; tarsi brown with white rings. Fore wings: An antemedial silvery white fascia, edged and divided by bright brown lines, followed between fold and submedian by another white spot; a similar spot beyond cell from vein 5 to costa, its outer edge oblique and angled close above vein 6; some white and brown small spots beyond it from vein 6 to costa near apex; marginal black points on interspaces. Hind wings: A fuscous line on discocellular; fine outcurved medial and postmedial lines; the marginal points as on fore wings. Wings below: Outer margins broadly dull fuscous gray; fore wings dark grayish with paler shadings corresponding to white markings above; black points on either side of discocellular; hind wings brownish white with a black discal point.

Expanse.—25 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16628, U.S.N.M.

CAPNODES BARCAS, new species.

Female.—Palpi fuscous gray. Head, collar, and thorax brown. Abdomen dorsally fuscous gray. Hind wings brown, the outer margin tinged with fuscous gray; an antemedial yellowish band edged with brighter brown, inversely lunular lines, divided by a

fine brown line and out by a brown line in cell, one below it and the grayish submedian; this band is shaded with silvery white on costa, above and below submedian, being followed above submedian by a similar silvery white spot, also brown edged, in and below cell by a yellow shade, the cell shade containing a faint brownish orbicular spot; reniform large, brown, edged with fuscous; a large yellow spot beyond cell reaching costa, crossed by an outcurved fine postmedial line, and a dentate line, the triangular spots thus formed more whitish; a fuscous brown outer line curved around this spot, then inbent to near middle of inner margin; a few yellowish spots beyond from vein 5 to costa; marginal black points on interspaces. Hind wings brown, the termen shaded with dark gray; fuscous shading on discocellular; a medial fuscous line; marginal black points. Fore wings below brownish; the inner margin white; an outer finely wavy fuscous line beyond which the outer margin is dark gray. Hind wings below more whitish; a black discal point, fine medial line, and brownish subterminal line; marginal black points on both wings.

Expanse.—21 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16629, U.S.N.M.

CAPNODES CERES, new species.

Male.—Palpi brown, the third joint gray. Body above gray, the collar mottled with reddish brown; some similar shading on abdomen terminally. Wings gray; faintly darker subterminal lines and marginal shades; terminal black points. Fore wings: A broad antemedial, dull reddish brown fascia, vertical, marked with some grayish spots; a similar postmedial spot on costa reaching vein 5, its edge irregular, and also containing some gray mottling, followed and preceded by fine, faintly darker, grayish lines which can be traced to inner margin. Hind wings: Some antemedial reddish brown scaling near inner margin; a similar fascia from cell and beyond it to inner margin near angle, containing some gray spots. Wings below dull gray with a few fuscous irrorations; a small pale centered discal spot on fore wings; hind wings slightly paler with discal point, and fine medial and outer lines; terminal points on both wings.

Expanse.—24 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16630, U.S.N.M.

CAPNODES ACCUMULATA, new species.

Female.—Palpi and thorax grayish brown. Abdomen gray with fuscous segmental lines terminally. Wings bistre brown; lines fuscous or fuscous brown. Fore wings: A subbasal annular line on costa and broken lines below it, followed by two interrupted lines; the antemedial and medial lines heavier, inversely lunular, almost

meeting below subcostal and on median, connected below cell by a streak; reniform a large broken annulus; postmedial finely lunular, broken in places, followed by some gminate spots, except opposite cell, and by a single spot on costal margin; terminal points on interspaces. Hind wings: A linear spot on discocellular, and line above it; three postmedial broken lines not reaching inner margin; a subterminal fuscous line on a dark brown shade; terminal points. Wings below paler, markings indistinct, except a black discal spot on hind wings; a fine postmedial line and subterminal shade.

Expanse.—30 mm.

Habitat.—Omai, British Guiana.

Type.—Cat. No. 16631, U.S.N.M.

CAPNODES TYROE, new species.

Male.—Body and wings grayish, the collar and thorax somewhat darker. Wings: A terminal fuscous brown line, the inner side wavy edged with whitish, outwardly edged with yellow; cilia paler crossed by two dark lines; a subterminal brownish shade, outwardly edged by a faint whitish line. Fore wings: Antemedial and postmedial lines fine, fuscous brown, edged with yellow white on costal margin, the former inwardly, the latter outwardly; antemedial inset on subcostal, vertical to submedian, then inbent; postmedial outbent and angled at vein 7, and inbent; reniform brown outlined in fuscous brown. Hind wings: Some antemedial darker scaling; a dark line on discocellular; postmedial fine fuscous brown. Wings below dull grayish; terminal line fuscous, expanding on interspaces; dark spots on discocellulars; postmedial and subterminal lines more distinct on hind wings, which are also paler.

Expanse.—16 mm.

Habitat.—Cayenne, French Guiana.

Type.—Cat. No. 16632, U.S.N.M.

CAPNODES GLADYSIA, new species.

Female.—Palpi, vertex, and collar lilacine brown. Frons brown. Thorax dark brown. Abdomen gray brown. Wings gray brown, tinged with purplish. Fore wings: Base darker shading to reddish brown at the antemedial line, which is thick, white, almost vertical, and is followed by a yellow brown shade; reniform oval, linear, slightly darker; postmedial thick, white on costal margin, slightly outbent, then slightly inbent, yellow brown, crossed by a minutely lunular brown-black line; subterminal darker shading, chiefly near costa; terminal small dark spots on interspaces. Hind wings: A postmedial minutely lunular and interrupted, brown black line, slightly shaded with yellow brown; subterminal shading brownish, with some darker spots; an interrupted terminal black line. Wings below grayish. Hind wings: Fuscous scaling on discocellular; traces

of a postmedial fuscous line, broadly shaded with orange brown near inner margin.

Expanse.—16 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16633, U.S.N.M.

CAPNODES ANTHEA, new species.

Male.—Head, collar, and thorax dull grayish brown. Abdomen dark gray above, whitish underneath. Fore wings dull brownish gray, except a broad subterminal whitish gray shade, its outer edge well defined by the dark terminal shade, and outcurved between veins 5 and 3, lines fine, bright brown, slightly wavy and inbent, consisting of a subbasal, antemedial, medial, and postmedial line, the medial close to two white points on discocellular; terminal dark spots at veins. Hind wings similar with only a faintly indicated fine subterminal paler line; the base whitish followed by some black irrorations; some fuscous scaling on discocellular; postmedial and outer lines fine, fuscous, shaded with brown; an interrupted terminal fuscous line. Wings below dark gray with some whitish irrorations; the inner margins white; fuscous spots on discocellular; traces of a postmedial and outer line, better defined on hind wings.

Expanse.—17 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16634, U.S.N.M.

CEROMACRA CEBRENIS, new species.

Male.—Antennæ whitish, dark shaded at base. Body and wings dark olive brown. Fore wings: Lines darker; antemedial vertical; postmedial outcurved beyond cell; a dark spot on discocellular. Wings below paler; dark discocellular lines; a faint postmedial shade.

Expanse.—47 mm.

Habitat.—Paraguay.

Like *C. fuliginosa* Butler but without the white tips.

Type.—Cat. No. 16635, U.S.N.M.

ANTARCHAEA POLLA, new species.

Male.—Head, thorax, and fore wings olive bistre. Abdomen and hind wings brownish buff. Fore wings: Some scattered black irrorations; a broad fuscous gray shade from middle of inner margin to costa before apex, darkest from above vein 2, somewhat interrupted on submedian fold; antemedial line very faint, deeply out-angled; a faint medial line to reniform, which is round surmounted by a smaller spot, both pale yellow circled with brown; postmedial line fine, fuscous, downcurved to vein 6, then inbent, lunular, on inner margin changing to brown; outer margin shaded with brown; a faint darker brown subterminal shade; marginal black points connected

by a fine line. Hind wings: Outer and inner margins darker shaded; an indistinct terminal fuscous line. Wings below paler; the marginal spots larger, especially on hind wings; costa of hind wings irrorated with brown; a paler shade at end of cell on fore wings.

Expanse.—20 mm.

Habitat.—Cayenne, French Guiana.

Type.—Cat. No. 16636, U.S.N.M.

METALECTRA ALCIS, new species.

Male.—Palpi black, tipped with dark brown. Head, collar, and thorax white with a few gray irrorations. Abdomen dorsally roseate brown with darker irrorations and grayish segmental lines. Wings white. Fore wings: A grayish outcurved antemedial fascia; two fine medial fuscous brown lines, slightly outcurved, inclosing the brown reniform spot, joined by grayish and pale reddish irrorations; a fine black postmedial line, minutely dentate, outangled at vein 4, followed by a dull reddish fine shade, and large fuscous brown shades on costal and inner margins; a wavy subterminal, and a fine terminal black line; the termen broadly shaded with fuscous and brown between veins 3 and 6; the costal margin tinged with pale bistre. Hind wings: Costal and inner margin grayish; medial and postmedial fuscous lines, the disk between them irrorated with dark brown, and a fuscous streak on discocellular; terminal space between veins 2 and 6 dark reddish brown; anal angle bistre; a subterminal, and a terminal fuscous line; cilia crossed by two broken reddish brown lines. Fore wings below brown, the termen shaded with dark slate color; inner margin white to beyond middle; traces of lines; some yellowish spots on costa. Hind wings below white, with dark irrorations, except on inner margin; antemedial and postmedial lines; a fuscous line on discocellular; outer margin broadly dark grayish brown; some terminal pale spots.

Expanse —14 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16637, U.S.N.M.

METALECTRA CEYX, new species.

Male.—Palpi grayish white, ringed with fuscous. Head grayish white. Collar and thorax similar irrorated with lilacine and pale reddish brown. Abdomen shaded with yellow green; some reddish scaling at base; some fuscous shading terminally. Wings whitish, the lines and shadings pale olive; marginal fuscous spots connected by a fine terminal wavy line. Fore wings: Extreme costa irrorated with black, especially medially where two fine black lines suffuse with a velvety black line on discocellular; traces of antemedial and medial lines; postmedial fine, wavy dentate, preceded by a pale shade and fol-

lowed by a broad darker shade, interrupted beyond cell, bifurcating on inner margin; a fine subterminal shade. Hind wings: Base of costa shaded with gray; a similar streak near inner margin; antemedial, medial, and postmedial lines with some fuscous and reddish brown scaling; a fine brownish line on discocellular; outer and subterminal brownish shades. Wings below whitish, irrorated with grayish brown, on fore wings chiefly around discocellular space, and subterminally; on hind wings fine antemedial, medial, and postmedial lines.

Expanse.—19 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16638, U.S.N.M.

METALECTRA ASTYLOS, new species.

Male.—Body and wings brown, glossed with purple; some scattered black and dark brown irrorations; large round velvety black spots on discocellulars. Fore wings: Antemedial fuscous spots on costa, below cell, and on inner margin; a black orbicular spot; medial spots below cell and submedian fold; a darker brown postmedial shade, interrupted by veins; subterminal brownish shades below costa, and between veins 5 and 3. Hind wings: Postmedial, and subterminal spots beyond cell; a medial spot near inner margin. Wings below pale grayish brown; fuscous shades on discocellulars; some scattered brownish irrorations; a faint subterminal shade.

Expanse.—21 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16639, U.S.N.M.

METALECTRA AGRIODOS, new species.

Male.—Palpi brown, streaked below with fuscous gray, and with a lateral pale shade. Head whitish; collar and thorax whitish shaded with lilacine, and irrorated with brown and black. Abdomen whitish buff, thickly irrorated with brown and black; curved fuscous shading on third and fourth segments. Wings lilacine gray thickly irrorated with dark brown. Fore wings: A buff white shade above subcostal interrupting lines, which are fine, brown, forming on costa broader fuscous spots; antemedial slightly outbent; medial line wavy; a dark brown shade on discocellular; an outer fine dentate whitish line, followed from below vein 6 to costa by a large fuscous brown spot; a terminal lunular line. Hind wings: Costa grayish; a gray streak near inner margin; a velvety black line on discocellular, slightly lunular; a fine, irregular postmedial line, coarser on inner margin; faint subterminal spots on interspaces. Fore wings below grayish; inner margin white to beyond middle; a postmedial line followed by a yellow white spot on costa. Hind wings below pale gray, mottled

with white near inner margin; discocellular spot thick; a faint medial line; a well-marked postmedial line.

Expanse.—16 mm.

Habitat.—Cayenne, French Guiana.

Type.—Cat. No. 16640, U.S.N.M.

METAELECTRA FURVA, new species.

Male.—Palpi dull fuscous. Head, collar, and thorax brown irrorated with fuscous brown. Abdomen dark grayish brown, with some paler segmental lines; anal hairs tipped with whitish yellow. Fore wings dark purple brown; subbasal and antemedial lines lilacine, the former outwardly shaded with black on costa and below cell; inwardly so shaded on cell, the latter outwardly shaded with black, and preceded by a yellow brown shade below cell; medial line outcurved, geminate, darker shaded and partly irrorated with reddish brown; an orbicular black point; reniform small, dark edged, interrupting the outer medial line, followed by a lilacine shade; postmedial consisting of small bright brown spots on a lilacine shade, preceded by fuscous spots, the largest between vein 2 and submedian; a subterminal lilacine shade, suffusing with postmedial at vein 5; marginal fuscous brown spots connected by a deeply lunular similar terminal line. Hind wings dark brown; cilia mottled with grayish. Wings below brownish gray. Fore wings: Traces of lines from black costal spots, the postmedial followed by a white spot. Hind wings: Antemedial and postmedial lines distinct, outwardly paler shaded; a fainter medial line and dark streak on discocellular; some subterminal dark spots.

Expanse.—27 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16641, U.S.N.M.

METAELECTRA VARIATA, new species.

Male.—Palpi dull brown. Head, collar, and patagia fuscous brown; thorax white; abdomen dark gray with a yellowish white transverse line near base. Fore wings dull fuscous brown; antemedial line broad, white, outbent, curved below cell, outwardly edged by a fine dark line from subcostal to inner margin, followed by a small whitish shade in cell, and a white point beyond; medial space below cell to close to inner margin mottled white and yellowish brown; reniform space large, almost suffusing with the medial yellowish space, the large reniform indicated by some dark lines, and crossed by a broken dark line, which is followed by some yellowish shading; postmedial line wavyly outcurved, white, inwardly edged by a dark line separating it from the reniform space; termen broadly white from vein 5 to costa, inwardly produced between 5 and 6; a terminal line, and cilia

fuscous interrupted by white points at veins; a small whitish shade at tornus. Hind wings gray, darkest on outer margin; an outer whitish shade, darker edged, and slightly upcurved at vein 3; terminal white points. Wings below whitish irrorated with gray and with darker postmedial and subterminal shades.

Expanse.—21 mm.

Habitat.—Geldersland, Surinam River.

Type.—Cat. No. 16642, U.S.N.M.

CORNA OENONE, new species.

Male.—Head, collar, and thorax dark brown; some white scales on vertex and thorax. Abdomen fuscous gray; the dorsal tufts at base dark brown. Wings not quite so dark as thorax; a white point at base of median; some white irrorations on costa near base; a white line on costa above orbicular, which is small, white, finely edged with brown black; reniform outlined in fuscous brown, irrorated behind with white; a fine white line on costa above it; some marginal whitish scaling, very indistinct; terminal fuscous spots on interspaces; cilia finely white basally at middle of interspaces. Wings below grayish, the fore wings shaded with brown except on inner margin; hind wings with a discal spot, fine wavy postmedial line, and broad terminal brown shade; a whitish terminal shade at anal angle.

Expanse.—31 mm.

Habitat.—Geldersland, Surinam River.

Type.—Cat. No. 16643, U.S.N.M.

POLYGNAMPTIA, new genus.

Male.—Antennæ bipectinate. Palpi upturned, straight, the tips level with frontal tuft, the second joint slightly fringed below, the third very short. Fore tibiæ and base of tarsi hairy; legs otherwise moderately scaled. Fore wings broad; costa arched at base; the outer margin outbent to vein 3, incurved below it; cell long, two thirds the length of wing; vein 2 nearer angle than middle of cell; 3 and 4 apart from lower angle; 5 slightly above 4; 6 below upper angle; 7, 8, 10 from areole, 8 and 9 stalked; 11 from cell approximating areole. Hind wings: Costa straight; termen produced before anal angle; cell a little more than half the length of wing; veins 3 and 4 well stalked; 5 above angle; 6 and 7 from upper angle.

Type of genus.—*Polygnamptia chloristicta* Schaus.

POLYGNAMPTIA CHLORISTICTA, new species.

Male.—Palpi yellow brown. Head, collar, and thorax whitish gray, the collar shaded behind with brown; patagia lilacine brown irrorated with white. Abdomen pale buff, with light brown dorsal tufts. Fore wings pale buff-gray, thickly irrorated with dull brown;

an outcurved subbasal line, yellowish above median, green below it; antemedial pale yellow brown, outbent to orbicular, then vertical; orbicular bright green containing a whitish streak; a white incurved line on discocellular broadly edged with bright green; a fine brownish line from costa above orbicular, outbent along costa to beyond reniform; this line is followed on costa by a similar shorter line, which is down bent, very faintly indicated as a subterminal line, and is marked by some minute dark points; a brown terminal shade from vein 4 to apex, a short black streak on vein 5; cilia with black spots at veins 3, 4, and 5. Hind wings yellowish white; the inner margin from beyond base, and anal space darkly irrorated; some greenish scaling postmedially near inner margin; two dark spots on inner margin near angle; a narrow terminal brown shade. Wings below yellowish white; faint discal points; some marginal brown shading on hind wings toward anal angle.

Expanse.—28 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16644, U.S.N.M.

BANIANA GULUSSA, new species.

Male.—Antennæ pubescent, ciliate. Palpi, collar, and front of patagia bright vermilion brown. Head and thorax buff white. Abdomen pale brown. Fore wings buff white with a few brownish irrorations; extreme costa pale yellow; antemedial and postmedial lines brown, almost vertical; a small black spot near base on subcostal; a brown line on discocellular, interrupted medially; a brownish shade following postmedial; a subterminal dull brown line, inangled opposite cell, outangled between veins 3 and 4, incurved below 3; terminal fuscous brown spots on interspaces. Hind wings pale yellow; terminal dark points. Wings below yellowish; traces of a postmedial macular dark line; terminal spots; a line on discocellular of fore wings, a discal point on hind wings.

Expanse.—25 mm.

Habitat.—St. Jean, Maroni River.

Near *B. tincticollis* Walker.

Type.—Cat. No. 16645, U.S.N.M.

BANIANA ATHAMAS, new species.

Male.—Antennæ pubescent, ciliate. Palpi brownish buff. Head, collar, and thorax pale olive brown; abdomen darker with pale anal hairs and ventral streak. Fore wings buff brown irrorated with darker brown; base faintly tinged with lilacine; a small fuscous spot on costa, and one on inner margin; antemedial and postmedial lines fine, bright brown, vertical; an irregular dark brown shade on discocellular; a subterminal dark brown shade, incurved opposite cell and below vein 3; terminal dark spots on interspaces. Hind wings gray-

ish brown, darker on outer margin; a small dark discal spot; an interrupted dark terminal line. Fore wings below pale grayish, the costa broadly yellowish with some brown irrorations; a fine darker shade on discocellular; a dark postmedial line, outcurved, well marked below costa and cut by veins; a terminal dark line, its inner edge wavy. Hind wings below whitish, the costa slightly yellowish with brown irrorations; a fuscous spot at end of cell; a macular postmedial line, heaviest near costa; terminal dark spots.

Expanse.—28 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16646, U.S.N.M.

BANIANA HELLE, new species.

Female.—Palpi brown. Frons and vertex in front creamy buff; vertex otherwise, collar, and front of thorax velvety black brown. Thorax otherwise pale buff. Abdomen irrorated with brownish gray. Fore wings pale buff irrorated with coarse brown scales; antemedial line dark brown wavyly outbent to median between veins 3 and 2, below 2 forming an incurved lunule, inwardly edged with a clear pale shade; reniform consisting of two pale spots containing dark points; a vertical pale outer line outwardly edged with bright brown; marginal dark grayish lines, deeply inbent, forming cuneiform spots on interspaces; dark terminal points. Hind wings dull grayish brown. Wings below paler with dark terminal points; traces of a paler postmedial shade, and a dark discal point on hind wings.

Expanse.—28 mm.

Habitat.—St. Jean, Maroni River.

Near *B. percara* Walker.

Type.—Cat. No. 16647, U.S.N.M.

BANIANA CRUCILLA, new species.

Male.—Antennæ bipectinate. Palpi and collar light brown. Head and body grayish. Fore wings grayish, thinly irrorated with brown; a fine antemedial brown line crossing a velvety brown black spot below cell, and marked by a small fuscous spot on costa; a black point as orbicular; a fine black line on discocellular terminating in points; postmedial starting on costa from a small fuscous spot, outcurved beyond cell and slightly incurved below vein 3, broadly shaded with dark brown, especially opposite cell and between vein 2 and submedian; an irregular darker subterminal shade; dark terminal spots somewhat lunular. Hind wings brownish gray. Wings below duller with traces of a postmedial darker shade, and a discal point on hind wings.

Expanse.—27 mm.

Habitat.—Cayenne.

Type.—Cat. No. 16648, U.S.N.M.

BANIANA GYAS, new species.

Male.—Antennæ pubescent, ciliate. Palpi and frons brown; frons above and vertex grayish buff; vertex behind and collar dark brown. Thorax grayish brown. Abdomen above fuscous; underneath and anal hairs buff. Fore wings: Base brown, limited by an outbent roseate buff broad line, outwardly shaded with dark brown, becoming paler medially and suffusing with the postmedial roseate buff shade, which is limited by a dark brown vertical shade; the outer margin broadly olive brown; terminal dark brown spots on interspaces; a fine incurved dark line on discocellular, expanding slightly at lower end. Hind wings dull fuscous brown. Wings below dull grayish brown; costa of forewings tinged with buff; hind wings with a dark discal point and postmedial line; small terminal dark spots on interspaces.

Expanse.—27 mm.

Habitat.—St. Laurent, Maroni River.

Type.—Cat. No. 16649, U.S.N.M.

BANIANA HERCEUS, new species.

Male.—Antennæ pubescent, fasciculate. Body brown, the thorax slightly shaded with fuscous. Fore wings: Base of costa gray, the basal space otherwise rich brown, limited by a fine white antemedial line, wavily outbent and curved above submedian near middle of wing; medial space grayish irrorated with black, limited by a straight outbent fine white line from below subcostal to inner margin; orbicular a dark brown point circled with whitish; space beyond to subterminal rich brown, except on costa postmedially, and just beyond cell, which is grayish, crossed by a fine postmedial line, outcurved, upangled below reniform, then outbent and barely traceable on brown ground; reniform spot small, white, broadly circled with brown, which is outwardly edged by a fine whitish line; subterminal line fuscous, slightly sinuous, inwardly edged with buff; termen grayish shaded with brown from near vein 2 to near vein 5; a terminal brown line; inner margin with tuft before antemedial line. Hind wings brown; a darker terminal line; cilia bistre brown. Wings below paler brown, with darker discocellular spots.

Expanse.—27 mm.

Habitat.—St. Laurent, Maroni River.

Type.—Cat. No. 16650, U.S.N.M.

BANIANA SERPENS, new species.

Male.—Palpi dark brown outwardly. Vertex in front and thorax pale-buff brown. Head behind, and collar velvety brown black. Abdomen grayish brown. Fore wings: A fine whitish line from inner margin antemedially, upbent, and angled in cell, down curved

below cell beyond, upbent to middle of discocellular and again slightly curved and upbent toward costa divides the color of the wings; the space above the line whitish buff, partly irrorated with fuscous gray; the base below cell and incurve beyond tinged with lilacine brown; a small black spot at base of cell; the orbicular and a spot on discocellular in front, round, fuscous brown circled with white; a small dark postmedial spot on costa; the space below the line velvety-brown black, becoming paler and of a browner tinge toward the dark subterminal line, with which it partly suffuses; outer margin whitish gray; terminal fuscous spots. Hind wings gray brown. Hind wings below yellowish white; a fuscous discal spot.

Expanse.—32 mm.

Habitat.—Geldersland, Surinam River.

Type.—Cat. No. 16651, U.S.N.M.

BANIANA PERUXUS, new species.

Male.—Palpi, head, and collar cinnamon brown. Thorax, abdomen, and fore wings lilacine gray; the abdomen thickly irrorated with fuscous brown, the fore wings with only a few irrorations. Fore wings: A dark line across base of cell; a fine antemedial line, outcurved across submedian; a medial oblique fuscous spot on costa; two dark brown points on discocellular; an outer dark-brown vertical line, sharply outbent on costa, outwardly shaded with cinnamon brown and then with fuscous scalings; a fine, indistinct, fuscous subterminal line; terminal black spots. Hind wings fuscous gray. Fore wings below fuscous gray, the costal margin yellowish irrorated with brown; a dark shade on discocellular; a postmedial line on costa. Hind wings below yellowish white irrorated with brown; a dark line on discocellular; a fine subterminal line; terminal fuscous spots almost forming a line.

Expanse.—21 mm.

Habitat.—St. Jean, Maroni River.

The female differs in having the outer line obsolete except on costa. Near *B. helicon* Druce.

Type.—Cat. No. 16652, U.S.N.M.

BANIANA NEPHELE, new species.

Female.—Head, collar, thorax, and fore wings pale-lilacine buff; front of thorax dark brown. Fore wings: A dark-brown basal, antemedial and medial spot on costa; traces of a fine antemedial line; a dark-brown point in cell and two on discocellular; a dark-brown vertical postmedial line from vein 8 to inner margin, thickest opposite cell, followed by a broad paler brown shade, extending to

costa; a pale brown, deeply wavy, subterminal line; terminal fuscous, linear spots. Abdomen and hind wings dark-gray brown; an interrupted darker terminal line. Fore wings below fuscous gray, the costa tinged with buff; a medial small dark spot. Hind wings below dirty white, the costa irrorated with brown; a dark discal point, and postmedial line.

Expanse.—27 mm.

Habitat.—St. Laurent, Maroni River.

Type.—Cat. No. 16653, U.S.N.M.

FOCILLA GRADIVUS, new species.

Male.—Palpi orange brown. Head, collar, and thorax dark-reddish brown, with a few white irrorations. Abdomen fuscous. Wings brown; a marginal fuscous line broken into spots opposite cell. Fore wings: Base tinged with olive and irrorated with white between cell and submedian; antemedial fuscous brown, lunular, inset in cell; the orbicular indicated by a white edging on outer side; a wavy medial line touching antemedial line below submedian, followed by a parallel line, interrupted by reniform, which is light brown edged with white except in front, and contains a roseate buff line; costa shaded with roseate brown between lines, but not at base or apex; postmedial fuscous, outcurved, wavy angular, outwardly edged with whitish on costal margin; a black shade from postmedial at vein 6 to termen at vein 4, inbent and broader at vein 2, preceded by some grayish scaling below vein 4; traces of a paler subterminal line above vein 6, terminating in a whitish costal spot. Hind wings: Space above cell to subterminal, and a streak below cell and vein 2 tinged with slate color; antemedial and medial fuscous lines; a postmedial finer black line; a heavy subterminal black shade from vein 5 to inner margin, outwardly edged with a pale line; the subterminal less distinct on costa. Fore wings below: Inner margin light brown; cell and just below steel gray; an antemedial line on costa, which is mottled brown and gray; a fuscous outcurved medial line, preceded by another line from cell; reniform and postmedial as above, the latter followed by whitish buff shadings; outer margin paler, the subterminal reduced, faintly marked; markings otherwise as above. Hind wings below brown, irrorated with white; a large pale lunule on discocellular; a fuscous shade between medial and postmedial lines, the latter outwardly pale edged; subterminal angular, finer, outwardly pale shaded.

Expanse.—38 mm.

Habitat.—St. Laurent, Maroni River.

Wings crenulate and angled.

Type.—Cat. No. 16654, U.S.N.M.

POCHILLA? MASGABA, new species.

Male.—Head, and collar dull grey brown. Thorax and wings greyish brown, tinged with lilacine and thinly irrorated with black. Abdomen dark greyish. Fore wings: A small darker orbicular spot; reniform large, outbent from subcostal to between veins 2 and 3, faintly outlined in olive brown, and containing behind some yellow brown shading; a geminate dark olive brown line, out-angled at vein 7 near apex, with a paler brown line between, followed on costa by some whitish scaling, and at angle a fuscous shade to apex. Hind wings: The outer line straight to inner margin above angle. Termen of both wings crenulate and angled at vein 4. Wings below buff brown irrorated with black; traces of a post-medial line on hind wings.

Expanse.—37 mm.

Habitat.—St. Laurent, Maroni River.

Type.—Cat. No. 16655, U.S.N.M.

ELOCUSSA FUSCATA, new species.

Female.—Head and collar dark reddish brown. Thorax and abdomen purplish, the patagia faintly paler mottled. Wings fuscous brown; postmedial line rust brown; some subterminal velvety black spots, the largest between veins 3 and 4; a faint brownish streak on interspaces of outer margins; a fine darker terminal line. Fore wings: An antemedial rust brown vertical line, darker edged; orbicular and reniform buff brown, the latter containing two fine dark brown annuli. Wings below brown-grey, the hind wings with paler mottlings; dark discal points; a postmedial line and subterminal shade.

Expanse.—43 mm.

Habitat.—Omai, British Guiana.

Type.—Cat. No. 16656, U.S.N.M.

GONURIS LEONNATUS, new species.

Male.—Palpi and head grey brown, the head mottled with crimson. Body greyish, the collar darkest; a crimson line on shoulders; some black scales on thorax; abdomen irrorated with pale brown. Fore wings: Basal half pale brownish grey, with a few darker irrorations; a fine, brown, wavy antemedial line; postmedial line almost straight, lilacine, broadly edged with fuscous brown, inwardly still broader from vein 2 to inner margin; outer space reddish brown with some darker striæ; a subterminal black point near costa, and traces of a fuscous shade on inner margin. Hind wings: Basal half brownish tinged with lilacine and irrorated with a few darker scales; a small dark spot on discocellular; postmedial line straight to anal angle, inwardly edged with fuscous brown, outwardly by a

fine brown line, which is followed by a pale shade; outer space reddish brown with some darker irrorations. Wings below greyish with faint brown shadings; some dark strise and a few dark irrorations; discal spots; an orbicular spot on fore wings; the subterminal spot on costa larger with a small spot above it.

Expanse.—27 mm.

Habitat.—Cayenne, French Guiana.

In many ways similar to *G. flaminea* Möschler, but without the vesicle on fore wings, and the costa of hind wings is straight.

Type.—Cat. No. 16657, U.S.N.M.

ENSIPIA TRILINEATA, new species.

Female.—Palpi dark grayish brown. Head whitish. Collar, thorax, and fore wings whitish buff irrorated with pale olive brown. Abdomen pale buff. Fore wings: A fine antemedial olive brown line, angled on subcostal; a dark point as orbicular; a white streak on discocellular inwardly dark edged; postmedial, and subterminal lines oblique, nearly straight, fine, olive brown, outwardly edged with whitish; dark terminal spots; cilia darker shaded. Hind wings yellowish white; a yellow streak on inner margin; dark terminal points. Wings below buff white; black discal points; a postmedial darker line.

Expanse.—31 mm.

Habitat.—Cayenne, French Guiana.

Type.—Cat. No. 16658, U.S.N.M.

SANTYS PYRENE, new species.

Female.—Head, thorax, and wings brown. Abdomen brownish gray. Wings: Veins, irrorations, and lines yellow brown; subterminal finely lunular, inwardly edged with small fuscous spots; terminal line lunular, outwardly edged with brown. Fore wings: Antemedial slightly outbent from costa, faintly darker edged; a dusky medial line also outbent; orbicular and reniform very large, faintly darker, outlined with yellow brown; postmedial outangled just below vein 7. Hind wings: A fuscous discal spot circled with yellow brown; traces of a dusky medial line; postmedial straight. Wings below yellowish irrorated with dull brown; dark lines on discocellular; postmedial line minutely lunular; small subterminal spots; the terminal line expanding at middle of interspaces.

Expanse.—35 mm.

Habitat.—Geldersland, Surinam River.

Type.—Cat. No. 16659, U.S.N.M.

SANTYS BEBRYX, new species.

Female.—Palpi and head gray brown. Collar lilacine bistre irrorated with brown. Patagia paler, shaded with lilacine. Abdomen and wings bistre irrorated with brown, the abdomen with pale

segmental lines. Wings: The veins terminally paler, faintly tinged with roseate; subterminal fuscous spots outwardly pale edged; a fine terminal fuscous line; cilia shaded with roseate. Fore wings: A fine roseate shade along costa; antemedial line inbent, slightly curved, buff, faintly tinged with roseate, distinctly roseate on costa; orbicular annular; reniform large outlined in buff; postmedial out-angled between veins 6 and 7, bright roseate. Hind wings: A small dark discal spot; postmedial straight, bright roseate. Wings below yellowish white, irrorated with brown; dark lines on discocellulars; the termen shaded with gray, darker on hind wings; subterminal fuscous spots; cilia dark, tipped with roseate.

Expanse.—32 mm.

Habitat.—St. Jean, Maroni River.

Type.—Cat. No. 16660, U.S.N.M.

NOTES ON A VIVIPAROUS DISTOME.

By EDWIN LINTON,

Of Washington and Jefferson College, Washington, Pennsylvania.

During the summer of 1912, while engaged in work for the United States Bureau of Fisheries, in attempting to get some phases of the life history of certain trematode parasites of fishes, I examined a number of birds. Of the many interesting forms which were thus secured, one is, in a measure, unique in that not only are ciliated larvæ (miracidia) found in the uterus, but each miracidium was found to contain a well developed redia.

PARORCHIS AVITUS, new species.

Plate 43.

Miracidia in the ova of distomes have been recorded and larvæ containing rediæ have been noted in certain of the Monostomidæ, but so far as I am acquainted with the literature of the subject, this is the first record of such occurrence in a distome.

The distomes here described were obtained from the cloaca of a herring gull (*Larus argentatus*) at Woods Hole, Massachusetts, July 22, 1912. Ten specimens were found in one gull. Search was made for this interesting form by me during the remainder of the season of 1912 and again in the summer of 1913, also by Mr. Vinal N. Edwards in the interval between the two summers, but no more of these worms were found. In life they were leaf-like with outlines varying with the state of contraction, very different shapes being assumed by the same worm at short intervals (figs. 1 and 2). The color in general was white with a faint reddish-brown area toward the posterior end. This reddish-brown area is the region occupied by the posterior folds of the uterus in which the eggs are sufficiently colored to impart a color to the body at that point. The space in front of the brown ova, as far forward as the ventral sucker, is filled with large, thin-walled ova, each with a distinct spot of black pigment showing through the transparent shell of the ovum and the body wall. This is a conspicuous feature of the living worms when they

are flattened under a cover glass. The head is surrounded with a collar on which is a row of spines which vary but little in size from those which thickly beset the neck as far back as the ventral sucker.

Dimensions of a living specimen, in millimeters: Length, 6.2; breadth, 4; diameter of head 1.20, of oral sucker 0.42, of pharynx 0.22, of ventral sucker 1.18; small ova, i. e., those in posterior folds of uterus and not containing ciliated larvæ, 0.08 by 0.04; large ova, i. e., those in anterior folds of uterus, each containing a ciliated larva with a black pigment spot, 0.12 by 0.07.

Measurements of ova in another specimen yielded nearly similar dimensions, thus: Ovum not containing larva 0.085 by 0.041; ovum containing larva 0.136 by 0.071.

The following description is based, for the most part, on specimens stained with carmine and mounted in balsam.

General outline oval or pyriform, but more or less distinctly divided into head, neck, and body. Head differentiated from the neck by a muscular collar which projects distinctly laterally and apparently ends abruptly on the ventral side at the margins of the oral sucker, but really passes by a very indistinct fold across the ventral surface of the oral sucker (fig. 3).

A single row of small spines was seen on the collar of living specimens; spines of similar shape and slightly smaller are numerous on the neck but occur sparingly on the body back of the ventral sucker. The spines are short, round-pointed, and scalelike (fig. 6). They are not at all conspicuous in the mounted specimens. The neck extends to about the level of the ventral sucker. The body proper, that is the portion lying posterior to the middle of the ventral sucker, is round-oval and leaf-like. It is flattened or concave on the ventral surface and convex on the dorsal surface. The neck has a tendency to curve ventrally. Suckers nearly circular or a little broader than long with nearly circular apertures, oral sucker subterminal. Ventral sucker rather more than twice the diameter of the oral and situated at about the anterior third, the distance between the two suckers being approximately one-fifth of the entire length. Pharynx adjacent to the oral sucker oval, its length about half the diameter of the oral sucker. Pre-pharynx very short. Esophagus approximately twice the length of the pharynx, its walls more or less crumpled and irregular in outline (fig. 4). Intestinal rami beginning a short distance in front of the ventral sucker, slender and without diverticula, extending to near the posterior end of the body, where they lie close to the lateral borders of the testes. The reproductive aperture lies immediately in front of the ventral sucker, the space between the anterior border of the ventral sucker and the rami of the intestines being nearly filled by the prostate which surrounds the genital aperture. Testes two, deeply lobed, near the posterior end of the body, close together and

opposite, each lying between the median line and a ramus of the intestine. Cirrus short and spinous, surrounded by compact prostate. There is a small seminal vesicle on the postero-dorsal border of the ventral sucker from which a duct leads along the dorsal side of the sucker to the genital aperture. Ovary median, situated in front of testes and separated from them about as far as the diameter of a single testis, or a little less, oval, the transverse diameter greater than the axial diameter in my specimens. The vitellaria consist of two rather narrow rows of subglobular masses which extend from near the postero-lateral border of the ventral sucker nearly to the testes. Along the margins of the neck and body of living specimens which had been flattened under the cover glass numerous long-pyriform cells were seen (fig. 8). These are probably yolk-forming cells. The uterus is very voluminous, its folds occupying practically all the space between the testes and the ventral sucker and reaching nearly to the lateral margins of the body. It passes along the dorsal side of the ventral sucker to the right of the prostate and enters the ejaculatory duct from the antero-lateral side. In some cases ciliated larvæ (miracidia) and eggs were clustered on the right side of the genital aperture in the uterus (metraterm) (fig. 4m). The ova in the anterior half of the uterus have transparent walls and contain ciliated larvæ. These are readily recognized both in living and mounted specimens by the conspicuous spot of black pigment which is easily seen through the body wall. The posterior folds of the uterus are filled with reddish-brown ova in which larvæ have not yet developed. These ova are smaller than those in the anterior folds and the shells are thicker. Along with ova containing larvæ in the anterior folds of the uterus are miracidia which have escaped from their shells. In the living specimens they can be seen through the body wall moving about slowly in the uterus by means of their cilia. When they are removed from the uterus they retain their activity for but a short time in sea water, the cilia soon taking on a bristle-like appearance. The cilia cover the entire surface, being a little longer at the posterior end than elsewhere and most dense at the anterior end. The ciliated cells are relatively large and have rather large nuclei. Miracidia lying free in sea water measured from 0.12 to 0.16 millimeter in length and 0.08 millimeter in breadth. These measurements do not include the cilia, which are about 0.02 millimeter in length.

My attention was called to an interesting feature of these miracidia by my friend Doctor Coe, who chanced to be at the laboratory at the time that I was examining these distomes. Each of the ciliated larvæ was found to contain a single redia. These can also be made out not only in sections but in whole mounts stained with carmine. In all the living specimens observed the anterior end of the redia was

directed towards the anterior end of the miracidium. A redia in life measured 0.14 millimeter in length and 0.04 in breadth.

The excretory system of this distome was but imperfectly made out. What appear to be two rather ample vessels uniting near the posterior end at a terminal pore may be distinguished in the mounted specimens. In sections these appear only as irregular spaces whose connections are not clear. In a living specimen flattened under a cover glass freely moving fluid containing refractile globules was observed in branching vessels along the margins.

The musculature of the head and neck is peculiar in that there are strong muscle fibers connected with the spines. Thus in a tangential section of the neck the most conspicuous muscle fibers are those which run in a dorso-ventral direction. These fibers in the neck are straight while the corresponding fibers in the collar become more or less curved.

There can be no doubt but that these distomes belong to the same genus as the distomes from the herring gull described by Nicoll and placed by him in the genus *Parorchis*. It would be a satisfaction to me if I could refer them to Nicoll's species *P. acanthus*, but this seems to be inadvisable on account of certain constant differences. Furthermore the ova break open by a transverse fissure near the larger end instead of by a longitudinal fissure.

The differences between the adult specimens of the two species, being only in minor details, might possibly be ignored. On the other hand the miracidia of *P. avitus* appear to represent a different type from that figured by Nicoll.

In the internal anatomy my specimens resemble Braun's *Distomum pittacium* from *Tringa interpres* as closely as they do Nicoll's species, but there is the same objection to referring them to that species that Nicoll finds with respect to his *Z. acanthus*, namely, the absence of spines and of the characteristic collar in *D. pittacium*. The absence of spines, it is true, is of little importance since spines are easily lost, but the absence of the collar is significant inasmuch as that structure in both Nicoll's specimens and mine is conspicuous and contains characteristic muscle fibers, so that it is difficult to see how it could become so inconspicuous as to escape observation.

Dimensions of mounted specimens, in millimeters.

	4.69	3.96	3.96	5.88
Length.....	.88	.70	.72	.81
Breadth at oral sucker.....	1.33	1.21	1.23	1.68
Breadth at ventral sucker.....	2.10	2.10	2.10	2.66
Greatest breadth.....	.36	.35	.30	.44
Length of oral sucker.....	.42	.36	.39	.49
Breadth of oral sucker.....	.18	.18	.22	.24
Length of pharynx.....	.22	.15	.14	.24
Breadth of pharynx.....	.42	.36	.42	.52
Length of esophagus.....	.84	.78	.71	1.26
Length of ventral sucker.....	.87	.78	.81	1.26
Breadth of ventral sucker.....	1.23	1.02	1.13	1.64
Distance from anterior end to ventral sucker.....				

The length of ova in the posterior folds of the uterus varied from 0.066 to 0.079; the breadth of each one measured was 0.040. The length of ova in the anterior folds of the uterus varied from 0.082 to 0.10 and the breadth from 0.046 to 0.060. Length of a miracidium 0.08, breadth 0.05. Length of a redia 0.06, breadth 0.03.

Type-specimen.—Cat. No. 7377, Helminthological Collections, U.S.N.M.

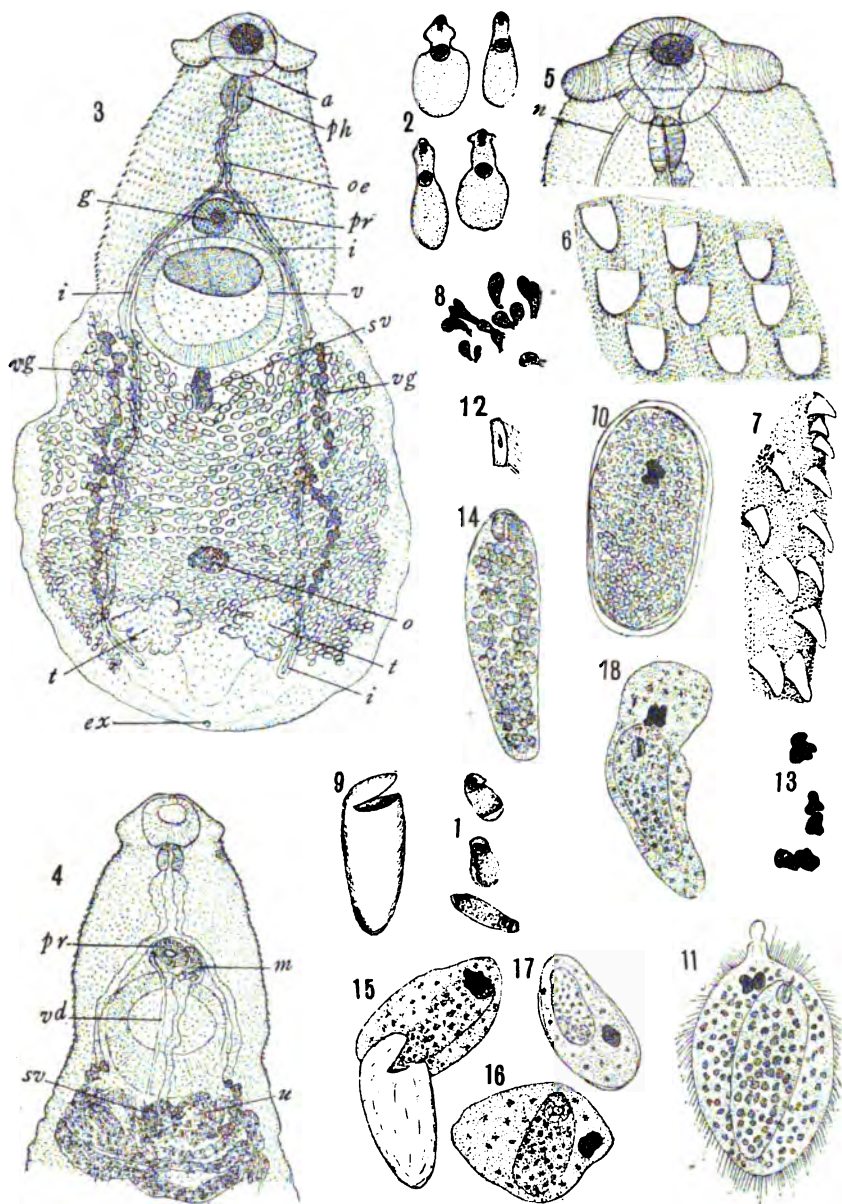
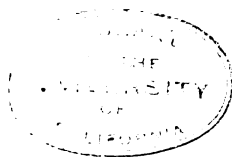
REFERENCES.

1902. Fascioliden der Vogel. Braun, Zool. Jahrb., vol. 16, p. 146, fig. 89.
 1906. Some New and Little-known Trematodes. Nicoll, Ann. Mag. Nat. Hist., ser. 7, vol. 17, p. 519, pl. 12, figs. 4 and 5; pl. 13, figs. 6 and 7.
 1907. *Parorchis*, n. nom., for *Zeugorchis*. Nicoll, 1906. Nicoll, Ann. Mag. Nat. Hist., ser. 7, vol. 19, p. 128.
 1907. *Parorchis acanthus*, the type of a new genus of trematodes. Nicoll, Quart. Journ. Micr. Sci., vol. 51, pp. 345-355, pl. 21, figs. 1-6.

EXPLANATION OF PLATE 43.

a. oral sucker.	ph. pharynx.
ex. excretory pore.	pr. prostate.
g. genital pore.	sv. seminal vesicle.
i. intestine.	t. testis.
m. metraterm.	u. uterus.
n. nerve.	v. ventral sucker.
o. ovary.	vd. vas deferens.
oe. esophagus.	vy. vitellaria.

- FIG. 1. Three specimens lying in sea water, ventral view.
 2. Outlines of four mounted specimens.
 3. Ventral view of specimen mounted in balsam. Length 3.75 mm.
 4. Dorsal view of anterior portion of another specimen. Diameter of head 0.7 mm.
 5. Ventral view of anterior end of specimen, optical section; n. nerve. Breadth of head 0.7 mm.
 6. Spines of neck, surface view, life; length 0.022 mm.
 7. Same, marginal view.
 8. Yolk-forming cells, along margins of neck and body, life.
 9. Egg shell with transverse fissure at larger end from which the miracidium has escaped.
 10. Egg containing a ciliated larva, life.
 11. Ciliated larva with single redia, liberated from egg.
 12. Ciliated cell from crushed miracidium, life.
 13. Pigment spots of miracidia, sketched from living specimens.
 14. Redia removed from miracidium, life; length 0.14, breadth 0.04; length of pharynx 0.017, breadth 0.020 mm.
 15. Miracidium with contained redia just escaped from egg; sketched from mounted specimen.
 16, 17, 18. Miracidia with rediae from specimens mounted in balsam.



PARORCHIS AVITUS, NEW SPECIES.

FOR EXPLANATION OF PLATE SEE PAGE 555.

A CONTRIBUTION TOWARD A MONOGRAPH OF THE HOMOPTEROUS INSECTS OF THE FAMILY DELPHACIDÆ OF NORTH AND SOUTH AMERICA.

By DAVID L. CRAWFORD,
Of Stanford University, California.

INTRODUCTION.

The family Delphacidæ was until quite recently and, in fact, by some authors, is yet considered as a subfamily of the larger group Fulgoridæ. By most students now, however, it is separated from its near relatives as a distinct family, chiefly on account of the large, movable spur, or calcar, at the base of the posterior tibiæ.

The most noticeable characteristic of the group as a whole is its homogeneity in general aspect and appearance. There are a few characters which are constant enough in subgroups to serve as diagnostic characters, and there are others which are too variable to serve that purpose. Some of the latter have, however, been used by many of the previous students with the result that genera and species have multiplied beyond reason and confusion has more and more crept in. This latter fact has been realized more strongly as my work on the group has progressed, and it has at last become necessary to rearrange the classification of the genera to some extent in order to avoid much of the prevalent confusion.

At the suggestion of Prof. C. F. Baker, of Pomona College, Claremont, California, the task of working over several collections of specimens of this family and naming the species was undertaken some months ago. His own collection of over 2,000 specimens, together with the United States National Museum collection of a still larger number, many of which, also, had been collected by Professor Baker, were placed before me for study. My original purpose, of course, was to classify the specimens before me according to the then accepted basis of classification. Much of the material had already been named authentically or else placed in the genus or subfamily where it would naturally fall. In the United States National Museum material were some paratypes and cotypes.

As the work progressed it became more evident that many of the characters used diagnostically were very superficial and subject to considerable variation. In many instances very closely related individuals had to be placed in widely distinct genera, and, again, several specimens placed in as many different genera by whomever had worked on the collection before me were found to belong without a doubt to the same species. Such instances as these naturally forced me to the conclusion that other characters must be found which are more constant.

I suppose that every careful student of this and related groups has been impressed with the same fact and several have attempted a solution of the difficulty, but most have merely followed along the same ruts and expressed the hope that somebody would take the time to work out the true relationships. Having these very extensive collections, which included many known and new species from North, South, and Central America, as well as a considerable number of determined species from Europe, I have been able to work out the relationships a great deal more accurately than one could with only a small collection representing a less extensive distribution. In view of this fact, I have ventured to rearrange the grouping of genera and species to a considerable extent, in the hope that it will prove to be more usable both by the expert and the beginner.

As was stated above, there is great homogeneity in the family and it is, therefore, difficult to find characters which are both constant in subgroups and at the same time usable generally. The trend of the lateral keels of the pronotum, for instance, has been used extensively to separate two large groups of genera, but this trend is variable in a great many of the species, and certainly in many genera at least, and, moreover, is very difficult to appreciate. At one angle they appear to have one trend and at another they have another trend. James Edwards, Mr. Distant, and the late Mr. Kirkaldy, I believe, were right in disregarding this as a good character. Again the shape of the outline of the vertex and frons has been used very extensively, but this, also, is difficult both to describe and to appreciate. The last-named characters, while they are in the main unsuited to generic separation, may in many cases be good secondary specific characters. The venation of the forewings (elytra) is so variable, even in the two wings of the same insect, that it can not be used with any certainty at all.

The object in view, of course, is to find characters which are constant within certain reasonable limits, and, also, may be appreciated by other students besides the one who first uses them. The form and relative lengths of the two antennal segments afford, within certain limits, a usable character. To distinguish genera, however, on a small difference in length of similarly shaped antennæ is wholly without

reason. In all this the personal element is very strong in deciding *what* constitutes a genus and what a species. The number of keels present on the head and thorax is a very reliable character. The form of the hind tibial spur (calcar) is also a constant and easily appreciated character, but unfortunately it has been overlooked by many and not described. The relative lengths of the tibiae and tarsi was used by Ashmead as a generic character, but this is impossible. The number of lateral spiniform spurs or spines on the hind tibiae, however, does afford a good character for separating some genera.

The female genitalia are very similar throughout the group, except in one genus, *Stenocranus*, but the genitalia of the male present good specific characters. No doubt the latter might be used for generic diagnosis, as Kirkaldy has done quite extensively, but I have hesitated to use them for such simply because of the difficulty of identifying an isolated female.

Coloration, when rightly used and ample allowance made for variation, is a good *accompanying* specific character, useful more for final identification than for synopses. Unfortunately, it has been used too commonly as an unaccompanied specific character, the result of which has been confused synonymy.

In the large group of genera more or less closely related to the old genus "*Delphax*" or *Liburnia* we find it still more difficult to discover good usable generic criteria. There are plenty of good variational characters which will distinguish species, but it is very difficult to resolve these into generic groupings. If one were working with a more limited collection, I have no doubt that he would easily be able to separate and relate subgroups, as has, in fact, been done already. But with a collection large both in species and in number of specimens in a species one is sure to find species and individuals which fall between two established genera in this group. The cause of this is evident. Genera have been established on characters which completely intergrade, and the dividing line has depended solely on the personal judgment of the various students. Furthermore, it is impossible for one man to convey to another, either by writing or illustration, exactly what he has in mind by such arbitrary ideas as "keels distinct" or "keels evanescent," and where he draws the line between the two.

There is such a thing, too, as "splitting hairs" when it comes to classification, that is, drawing the confining lines of generic groups and species so narrow that it precludes any variation and results in numerous genera and species with the minutest and often absurd differences separating them.

After a very careful study of the large series before me, and with the above ideas in mind, I have arrived at the only logical conclusion, namely, that many of the established genera are not warranted and

should be merged. The most important instance of this is the group of closely related genera *Liburnia*, *Kelisia*, and a few other smaller ones, which have been merged into one, *Megamelus*. True, this makes a very large number of species in one genus, but I maintain that it is easier to identify an unknown individual when these are all in one genus and fully keyed than when they are scattered through a number of genera which overlap and intergrade and only serve to confuse the student. It is true, also, that between the extremes of this large genus there is considerable variation, but unless satisfactory and appreciable lines of separation into genera can be drawn it is far better to consider the group as a whole a genus and treat it as such. A more detailed treatment of this matter will be found under the heading of *Megamelus*.

A description of a new species without figures to illustrate the more important details of structure is in most cases almost worthless—often worse than none at all. It seems to me that it would be better to let a Delphacid go undescribed until somebody could figure it as well as describe it, instead of publishing an inadequate description which might fit several species as well as the one for which it was intended, and thus establish a name of uncertain identity. Words may mean several things and may be interpreted in several ways, but an accurate figure can convey only the one image. Especially is this true of the male genitalia.

Accompanying and supplementing the following descriptions I have added many figures to illustrate exactly what was intended to be conveyed by the wording. These figures have mostly been drawn to scale, and will show the relative size of the insects. In most cases these are merely outline drawings.

In the collections are a number of female specimens which apparently belong to undescribed species, but I have chosen to leave most of these unnamed for the present until their males are found, for the description of a new species based only on the female is usually very unsatisfactory in many groups of the Homoptera.

EXPLANATION OF TERMS.

Perhaps a brief explanation of certain terms employed in the following descriptions would not be amiss here, especially of the male genitalia. *Pygofers* refers to the genital segment which usually is in the form more or less of a cylinder; the *anal tube* is the circular piece surrounding the *anal style*, which is usually the most posterior organ; the *genital styles* are the paired claspers within the aperture of the pygofers and are very variable in shape; the *penis* (so called), when visible, projects ventrad from below the lower margin of the anal tube. The other terms are easily understood.

I desire here to acknowledge with hearty thanks the constant assistance and advice which Prof. C. F. Baker has given to me in this work, as well as his kindness in placing all his collections before me. My thanks are, also, due to Dr. V. L. Kellogg, under whose supervision this work has been done at the university, and to Prof. R. W. Doane, also of this university. I wish to acknowledge, also, my thanks to Dr. L. O. Howard for his kindness in procuring for me the material from the United States National Museum for study.

DESCRIPTION OF FAMILY.

The following is a brief description of the principal characters of the family Delphacidae:

Small insects, varying from about 2 to 10 or 12 mm., rather elongate; eyes large, hemispherical, usually deeply emarginate below at base of antennæ; head and thorax conspicuously keeled, keels variable in number, extent, and prominence; frons usually longer than broad; clypeus triangular; rostrum long; antennæ always two-jointed, variable in form and length, with a long seta at tip of II; ocelli two, at base of each gena near lower margin of eye. Pronotum tricarinate, about as long as vertex, extending down on each side almost to base of forecoxae; scutellum longer, acute between elytra, three to five carinate. Legs rather long and slender; fore and middle coxae long, almost as long as femora; hind coxae large, stout, with a small tooth posteriorly; hind tibiæ with two to five lateral spiniform spurs or spines, and a large, movable spur (calcar) at apex; latter variable in form from spiniform or cultrate to tectiform with margin dentate; tarsi three, basal one the longest. Elytra of two types, brachypterous and macropterous; former may reach less than halfway to tip of abdomen or more, truncate at apex, obscurely veined; latter longer than abdomen, often setigerous on veins, venation variable; clavus with two veins joined apically; corium with three at base, all but one usually branched apically; membrane with four to seven more or less branched veins. Wings sometimes wanting or reduced, usually nearly as long as elytra, hyaline and folded once. Abdomen about as long as thorax; male genital segment usually more or less cylindrical, truncate at apex, with a pair of claspers (genital styles) and anal tube within aperture. Female genitalia ventral, consisting of a long, usually cylindrical, acute, ovipositor sheath which reaches to the tip of the abdomen; anal tube at tip of abdomen.

The following synopses are not as complete and satisfactory as they ought to be, but in many cases I have had only the inadequate descriptions to base them on, and consequently they may be more or less imperfect. Some of the American species I have not been able

to see and the descriptions of some of them are so inadequate that they can not be included in the synopses. These, however, I have listed where they probably belong. It might be well to suggest that in using these keys it will be necessary to run down in both subheads where the characterization is rather variable or intergrades. In several cases the same species has been included in two places in the synopsis.

KEY TO THE AMERICAN GENERA.

- a¹. Post-tibial spur (calcar) not foliaceous or bilaminar, usually spiniform or cultrate.
 b¹. Calcar without teeth, terete, spiniform, acute at tip.
 c¹. Antennæ very long, flattened, foliaceous, I nearly as long as II; scutellum tricarinate; elytra very conspicuously asperose; frons tricarinate.
Copicerus Swartz.
 c². Antennæ shorter, terete, I distinctly shorter than II; frons with two median carinæ.
 d¹. Body large; frons very broad; scutellum 5-carinate; male genitalia terminal instead of subventral.....*Pentagramma* Van Duzee.
 d². Body slender, smaller; frons narrow, elongate; scutellum tricarinate.
Lepticus, new genus.
 b². Calcar not spiniform, with or without teeth; frons tricarinate.
 c¹. Antennæ terete.
 d¹. Calcar subcultrate, triangular prismatic, without teeth, acute at tip; scutellum 5-carinate; elytra very asperose; hind tibiæ with 4 lateral spines.
 e¹. Elytra with a large stigma on margin of corium; frons rather narrow; eyes not emarginate beneath.....*Eucamya*, new genus.
 e². Elytra without stigma; frons conspicuously broadened at clypeus.
Epibidis Fowler.
 d². Calcar with a row of teeth posteriorly; hind tibiæ with less than 4 lateral spines; scutellum tricarinate; elytra without stigma.
 e¹. Antennæ very short, segments subequal; calcar with 3 long teeth, apparently trifid; hind tibiæ trispinose.....*Dichoneura* Lethierry.
 e². Antennæ longer, as long as frons, I shorter than II; calcar with a row of about 8 teeth; hind tibiæ bispinose; vertex produced in front.
Proteronydne Kirkaldy.
 c². Antennæ compressed; head very broad, sometimes broader than thorax.
 d¹. Antennæ seldom longer than width between antennal insertions; median frontal carina forked at apex of head; calcar long, cultrate, with a row of 7 to 11 coarse teeth on margin.....*Stobaera* Stål.
 d². Antennæ distinctly longer than width between bases, carinately foliaceous; median frontal carina forked below apex of head, branches widely separated; genæ almost obsolete; calcar large and broad, three-sided, each side flat, not foliaceous, with a number of very minute spines, scarcely visible, on one edge.....*Cochise* Kirkaldy.
 r². Calcar bilaminar or tectiform, more or less foliaceous, with one face more or less concave, posterior margin usually finely or coarsely dentate.
 b¹. Basal antennal segment compressed, second compressed or terete; antennæ long, prominent; head transverse, at least as broad as pronotum.
 c¹. Basal antennal segment longer than second; anterior femora compressed; head not broader than prothorax; clypeus normal; frons tricarinate.
Delphax Fabricius.

- c². Basal antennal segment shorter than second; anterior femora normal; head broader than prothorax; clypeus with a cone-shaped process in front; frons with two median carinae.....*Bostera* Ball.
- b². Both segments of antennae terete, I shorter than II.
- c¹. Frons, notum and abdomen with prominent pits.
- d¹. Frontal carinae forked near clypeus.....*Achorotile* Fieber.
- d². Frontal carinae forked at apex of head.....*Laccocera* Van Duzee.
- c². Pits wanting, except obscurely present in some species of *Phyllodinus*.
- d¹. Frons with two median carinae over entire length, usually separating at or near clypeal margin, roundly arcuate outward; carinae sometimes evanescent; head broad.....*Jassidaeus* Fieber.
- d². Frons with one median carina, forked, if at all, at or somewhat below apex of head.
- e¹. Anterior and intermediate femora and tibiae greatly compressed and foliaceous; head broad; frontal carina forked a little below apex of head.
Phyllodinus Van Duzee.
- e². Anterior and middle femora and tibiae normal.
- f¹. Frontal carina percurrent to posterior margin of vertex without oblique transverse carinae connecting it to lateral carinae.
Liburniella, new genus.
- f². Frontal carinae forked at or below apex of head and connected obliquely with lateral carinae of vertex.
- g¹. Carinae of head subobsolete, often scarcely discernible; vertex very broad, rounded in front; frons broad.....*Kormus* Fieber
- g². Carinae of head always visible, usually rather strong and prominent, sometimes evanescent on apex of head.
- h¹. Vertex elongate, often twice as long as wide or more, produced at least one-third before eyes, sometimes greatly so; calcar seldom spoon-shaped, with margins usually rather close together and dense pubescence between; female ovipositor sheath often conspicuously broadened.....*Stenocranus* Fieber.
- h². Vertex less or not elongate, produced only a little before eyes; calcar usually spoon-shaped, with margins more or less separated, with or without pubescence between.
- i¹. Frons and vertex meeting at an acute angle at apex of head with a semblance of a transverse carina on apex...*Megamelanus* Ball.
- i². Head dorso-ventrally rounded, not acutely angled as above; carinae sometimes evanescent on apex of head.
- j¹. Median carina of frons forked distinctly below apex of head, from one-fourth to one-half its length below; vertex usually moderately broad.
- k¹. Frons almost circular, short; genae not plane, ridged transversely below ocelli; antennae exceedingly short, stout; calcar very short, thick.....*Bakerella*, new genus.
- k². Frons elongate, more or less rectangular, longer than broad; genae plane; antennae longer; calcar normal.
Dicranotropis Fieber.
- j². Median carina forked at or near apex of head (except in *L. albolineosa* often below); vertex usually rather narrow, sometimes broad; carinae variable from very conspicuous and sharp to evanescent.....*Megamelus* Fieber.

DESCRIPTION OF GENERA AND SPECIES.

Genus COPICERUS Swartz.

Jeralia GUERIN.*Holatus* WALKER.

Body relatively large. Cephalic and thoracic carinæ not very strong; frons tricarinate, moderately broad between eyes; clypeus tricarinate; eyes deeply emarginate beneath. Antennæ very large, long, foliaceous, and thin, thinner on superior margin than below, coarsely pubescent; second segment longer than first; flagellum long. Pronotum moderately long. Scutellum tricarinate, long. Legs long; femora scarcely enlarged; calcar long, spiniform, terete, acute at tip, slightly pubescent; hind tibiæ with three lateral spines. Elytra long, more or less maculate, veins darkly setigerous on black tubercles; venation variable, with more veins in membrane than in most other genera.

Type of genus.—*Copicerus irroratus* Swartz.

This genus is easily distinguishable by its unusually large and foliaceous antennæ and large elytra. Its distribution seems to be entirely southern.

COPICERUS IRRORATUS Swartz.

Plate 44, figs. A-F, H-K.

Copicerus irroratus SWARTZ '02: 81.—STÅL '57: 338.—VAN DUSEE '97: 230.—SWEZEY '04: 31.—FOWLER '81: 130.

Jeralia singula WALKER '85: 85.

Copicerus swartzii STÅL '57: 339.

Length of body 4.7 mm.; width of vertex between eyes 2.5; greatest width of frons 3.5; length of antennæ: I, 1.3; II, 1.8. General color brown to dark brown; frons with several black spots; antennæ and legs spotted with black; elytra black, setigerous-punctate.

Head moderately large, carinæ rather inconspicuous; vertex rather broad; frons broadest at apex; clypeus long. Eyes large, black, deeply emarginate beneath. Antennæ long, very prominent, more than half as long as entire body; I constricted at base and apex, II narrower apically, a little longer than I; flagellum almost as long as I.

Thorax broad, punctate; pronotum long with a shallow fovea on each side; lateral carinæ short, inconspicuous; scutellum long, more deeply and closely punctate laterad than dorsad. Legs long, banded with black; calcar long, very acute at tip, slightly pubescent. Elytra very long, large, brownish, with an oblique brown macula over apical cells and lighter area on costal margin midway between base and apex; veins set closely with setigerous tubercles and a small brown spot around each tubercle; corium lighter in color.

Abdomen long, depressed, oval.

Male pygofers large, aperture rather circular; anal tube enlarged apically; genital styles contiguous, or nearly so, on enlarged basal portion, apically slender, arcuate, acuminate, almost touching at tip.

Redescribed from numerous males and females from the following localities: Jamaica (Van Duzee), Mexico (Baker), Jalapa, Vera Cruz, Chiapas, Guadalajara, Mexico (Crawford), Belize, British Honduras (J. D. Johnson), Nicaragua (Baker), and St. Louis, Mo., (Baker). The specimens from Nicaragua had been determined by Melichar as *C. swartzii*. The specimens from Mexico are uniformly much darker than the rest, both on body surface and elytra. Throughout the series there is a gradual variation in the coloration of the frons from brownish with black dots and spots to entirely black with perhaps a few lighter spots very small in extent. The body surface, also, is widely but gradually variable, so that neither of these characters can be used to separate species, as was done by Stal in describing his species *swartzii*. This species, both according to authentically determined specimens and the original description, is not distinct in any way, and therefore becomes a synonym. The species is apparently limited to the Tropics and the southern portion of this country. In all the series there are no brachypterous specimens.

COPICERUS IRRORATUS THORACICUS Guérin.

Copicerus thoracicus GUÉRIN in literature.

Seven specimens from Havana and Cayamas, Cuba (Baker), have been determined as *C. thoracicus* Guérin, but are not specifically distinct from the above species. The following differences are constant enough to warrant its separation as a varietal form, however. Body uniformly smaller, more slender; median frontal carina rather conspicuously raised, much more so than in species.

COPICERUS INSIGNICORNIS Lethierry.

Asiraca insignicornis LETHIERRY '90: 150.

This species was described as belonging to the genus *Asiraca*, but by the description it is easy to recognize it as a *Copicerus*. Perhaps it is the same species as the tropical *irroratus*, but until further evidence is obtainable it will remain as a distinct species.

Locality: Venezuela, South America.

Genus PENTAGRAMMA Van Duzee.

Body robust, very large. Head large, broad, about as broad as prothorax; vertex longer than broad, produced a little before eyes, sides rather straight, subparallel, rounded in front; frons broadly ovate, broadest at ocelli, with two median carinæ over entire length passing separately onto vertex, diverging and following the curve of frontal sides; carinæ not sharp; apex of head tumid; face convex; clypeus long, large, convex; genæ large. Eyes large, not deeply

emarginate below. Antennæ rather long, terete, II much longer than I. Pronotum tricarinate, laterals extending outward behind eyes, not reaching hind margin; scutellum 5-carinate, carinæ not prominent. Legs large, long; hind tibiæ with three lateral spines; calcar terete, spiniform, acute at tip; hind tarsi long. Elytra reaching at least to tip of abdomen. Male genital segment elongate; genital styles peculiarly ventral instead of terminal, as in most genera; anal style in both sexes very elongate.

Type of genus—*Pentagramma vittatifrons* Uhler.

This genus differs markedly from the others of the subfamily in regard to the male genital characters. In the other genera the tip of the abdomen is broadly truncate vertically with the genital styles and other organs subvertical; in this genus the abdomen is not truncate but converges to the anal tube in a straight line, with the genital styles inferior and directed backward instead of upward.

PENTAGRAMMA BIVITTATA, new species.

Plate 44, figs. L, M, O.

Length of body, female 6.8 mm.; male 5.6; width of vertex between eyes 0.53; greatest width of frons 0.69; length of antennæ, I, 0.23; II, 0.55. General color green; frons greenish brown, with a light green band across clypeal margin and another arcuately across middle; inner face of forecoxae and mesopleuræ with a black spot; a small brownish area sometimes present between antennæ and frons; antennæ and legs lineated with black.

Head very broad, slightly broader than prothorax; vertex very slightly longer than broad, produced slightly beyond eyes, rather straight in front, tumid; frons about one and a third times as long as broad, convex; median carinæ moderately prominent, not sharp, indistinct at apex of head, parallel with sides, a little broader at apical margin than at base. Eyes large, long, scarcely emarginate beneath but facets wanting on corresponding area. Antennæ terete, slightly pilose, I more than one-third as long as II.

Thorax very large, broad; pronotum rather deeply and angularly emarginate behind, straight in front, lateral carinæ not prominent; scutellar carinæ indistinct; tegulæ large, prominent. Legs long, large; tibial spines large, black; calcar long, acute. Elytra reaching slightly beyond tip of abdomen, especially in female, subhyaline, not maculated; outer cubital not forked at apex.

Abdomen long in both sexes, tapering uniformly to apex.

Male pygofer long, converging evenly to tip; anal tube long, open beneath; anal style long, acute; genital styles simple, stout, large at base, not very acute at apex, arched.

Described from 7 males and 18 females from Managua, Nicaragua (Baker). This species is closely allied to the more northern *vittati-*

frons Uhler, differing in the width of the head, the relative lengths of the antennal segments, the banding of the frons, etc. The geographical distribution seems to indicate a distinct species, also.

Type-specimen.—In collection of Pomona College.

PENTAGRAMMA MINORE, new species.

Plate 44, figs. P, Q.

Length of body, female 6.3 mm.; male 5.3; width of vertex 0.62; width of frons 0.75; antennæ, I, 0.16, II, 0.41. General color green, male lighter than female; black spots and lineations as in *bivittata*; frons with two narrow darker bands above middle, more conspicuous on male, with a prominent black spot between antennæ and frons as in *vittatifrons*.

General characters similar to *bivittata*, differing as follows: Body smaller; head not broader than pronotum; vertex somewhat longer than broad, more so than in related species; median carinæ less conspicuous at apex of head, almost obsolete; frons almost circular, as broad as long, clypeal margin but slightly broader than basal; antennæ, I about one-fourth as long as II. Pronotum almost half as long as scutellum; scutellar carinæ moderately prominent. Elytra relatively shorter, scarcely reaching to tip of abdomen, venation similar. Anal tube differing slightly in structure; anal style very long; genital styles smaller, more slender, acute at tip, smaller at base. Female ovipositor sheath more densely pubescent; anal tergite of abdomen conspicuously broader than genital segment.

Described from one male from Sheridan, Wyoming, and one female from Banner, Wyoming, coll. C. W. Metz.

Type-specimen.—In collection of Pomona College.

PENTAGRAMMA VITTATIFRONS Uhler.

Pentagramma vittatifrons VAN DUZEE '97:260.—SWEZEY '04:42.

Locality.—New Jersey, New York, Maryland, Illinois, Dakota, Montana.

Genus **LEPTICUS**, new genus (?)

Head long, about as broad as prothorax, quite strongly carinate; vertex very slender, at least twice as long as broad, narrowed in front, produced greatly beyond eyes; frons very broad in proportion to vertex and abruptly broadened, with two median carinæ subparallel to rounded sides and close above; eyes large, not emarginate below; antennæ moderately long, reaching beyond clypeal margin, terete, II at least three times as long as I. Thorax moderately broad, quite long; lateral carinæ of pronotum curved out, not reaching hind margin; legs moderately long; calcar rather short, terete, spiniform. acute; hind tibiæ with three lateral spines.

Type of genus.—*Lepticus oculatus*, new species.

This genus is erected, provisionally, for a species of which only one immature male is known. Although this may not ordinarily be good policy, yet in this instance it is justifiable for the reason that the specimen at hand is a nymph of a very late instar, and also because the principal generic characters used here happen to be about the same for adult and late nymph. This is made a doubtful genus because it is based upon an immature specimen.

LEPTICUS OCULATUS, new species.

Plate 45, fig. A.

Length of body, 3.5 mm.; width of vertex, 0.22; width of frons, 0.5; antennæ, I, 0.13; II, 0.28. General color light brown, eyes darker; frons dark reddish brown with a white band across clypeal margin and an arcuate band across midway; antennæ light brown with dark longitudinal stripes; legs lighter.

Head long, fully as broad as prothorax, strongly carinate; vertex about two and a half times as long as broad, apical half converging narrowly, nearly one-third its length beyond eyes; frons abruptly broadened, easily visible from above on each side of vertex, with two median carinæ well separated, close together above, parallel with sides; about two and a third times as long as broad, equally broad above and below, ovate; genæ small; clypeus large; eyes very large, long, bulging with no emargination nor absence of facets beneath; antennæ moderately long, terete, I short, about one-fourth as long as II.

Thorax quite long; pronotum extending well forward between eyes. Legs moderately long; hind tibiæ with three very short lateral spines; calcar a little more than half as long as basal tarsus. Abdomen long, genitalia immature.

Described from one male in a late nymphal instar, from Managua, Nicaragua (Baker). Being immature, it has numerous pits on the frons, notum, and abdomen, as in many immature Fulgorids, but whether or not the mature forms retain these is not known.

Type-specimen.—In collection of Pomona College.

After the last nymphal moult the thorax takes on a totally different aspect, so that the description of that had to be omitted from the above. The head, however, remains approximately the same, hence these characters are valid. In most nymphs of Delphacidae the tarsi are all three-segmented as in the adults; in this species the first two pairs are two-segmented.

Genus EUCANYRA, new genus.

Vertex narrow, protruding beyond eyes; frons not broad, tricarinate, rather long; rostrum long; eyes large, entire, not emarginate beneath, but some facets wanting above antennal insertion; antennæ long, prominent, terete, second segment longer than first, often tuberculate. Prothorax short, tricarinate; scutellum large, broad,

5-carinate. Elytra large, often maculate, with a large black stigma between corium and membrane in front. Legs long; calcar very long, slender, triangular-prismatic, slightly pubescent, acute at tip; hind tibiae with four lateral spines.

Type of genus.—*Eucanyra stigmata*, new species.

This genus is easily distinguishable by the large size and entire eyes, the terete antennae, and stigmatic elytra.

EUCANYRA STIGMATA, new species.

Plate 44, figs. G, N, R, S.

Length of body, 3.4 mm.; length of elytra, 6.6; width of vertex, 0.26; width of frons, 0.60; antennae, I, 0.65; II, 0.97. General color brown, usually dark, more or less variegated with yellowish brown on pleura. Body very large.

Head quite large, broad, carinae very conspicuous; vertex narrow between eyes; frons long, narrowed above, broadest at apex; clypeus long; eyes very large, prominent; antennae long, II about one and one-half times as long as I, very much roughened.

Thorax large, robust; pronotum short, especially so behind eyes, lateral carinae flexed out behind eyes and extending nearly to hind margin; scutellum broad, long. Hind legs very long; calcar elongate. Elytra large, broad, somewhat coriaceous, rounded at apex, veins setigerous, maculate; membrane with eight veins, the third, fifth, and sixth once forked; with a large triangular pterostigma on front margin between corium and membrane.

Abdomen depressed, large.

Male.—Anal segment long, slender, cylindrical; anal tube tapering to apex; genital styles simple, arched laterally, subacute at tip, divergent somewhat.

Described from one macropterous male collected at Belize, British Honduras, by J. D. Johnson.

Type-specimen—In collection of Pomona College.

Genus EPIBIDIS Fowler.

This genus was described by Fowler as follows:

Body somewhat elongate, subparallel, with vertex narrow, distinctly longer than broad and produced in front of eyes (anterior margin viewed from above seems to be notched); forehead and clypeus long and narrow, broadest about the middle, carinate and plainly margined; antennae elongate, with first joint long and smooth, second scarcely longer than first, asperate, with warty, white excrescences and very short and strong thick setae; last joint setiform, longer than I and II together; pronotum obtusely produced between the eyes, carinate. Scutellum large, three times as long as pronotum, 5-carinate. Elytra rather long, veins rather fine, more or less strongly granulate, claval vein not reaching apex of clavus, but joining suture before it. Legs long, posterior tibiae with 4 or 5 spines, 1 near the base.

Type of genus.—*Epibidis godmani* Fowler.

This genus, according to Fowler, comes near *Bidis* Walker (*Hygops* and *Ugyops*). The new genus *Eucanyra* is rather closely related to

this, but differs in the points mentioned in the synopsis of the genera. After an examination of the original specimens in the United States National Museum, I would add the following to the above description: Frons distinctly broadened above clypeus; median carinæ forked a little below apex of head. Calcar long, triangular-prismatic, faces flat, acute at tip, finely pubescent; hind tibiæ with four lateral spines. Male genitalia resembling somewhat *Eucamya*, but narrower and longer.

EPIBIDIS GODMANI Fowler.

Epibidis godmani FOWLER '81: 131.

Locality.—Panama.

EPIBIDIS BRUNNEA Fowler.

Epibidis brunnea FOWLER '81: 132.

Locality.—Panama.

Genus DICHONEURA Lethierry.

Lethierry described this genus as follows:

Vertex triangular, as long as broad, produced in front before eyes, base and sides carinate, elevated, apex obtusely angled; frons three times as long as broad, tricarinate; lateral carinæ slender, sharp, median broad, convex. Antennæ very short, joints equal in length, each as thick as long, not extending beyond lateral frontal carina; terminal seta long. Elytra long, much longer than abdomen, apex rounded. Hind tibiæ trispinose and numerous setæ and spines between; calcar double, inner one small, trifid; the outer, simple and terminal.

Type of genus.—*Dichoneura simoni* Lethierry.

According to Lethierry this genus is "near *Delphax* Fabr." It differs sharply in the hind tibiæ, however, from *Liburnia*, having three lateral spines instead of two, and the calcar, according to the description, is quite unique. It is probably cultrate with three large teeth on hind margin, giving the appearance of being trifid. For the present, at least, I have related it to *Proterosydne*, another tropical genus.

DICHONEURA SIMONI Lethierry.

Dichoneura simoni LETHIERRY '90: 152.

Locality.—San Esteban, Venezuela.

Genus PROTEROSYDNE Kirkaldy.

Head rather narrow, more or less produced before eyes; vertex square or elongate, concave, median carina wanting or indistinct, laterals high; frons sometimes narrowed above, tricarinate; antennæ longer than frons, terete, I much longer than II. Pronotum long, lateral carinæ straight; scutellum tricarinate; legs long; hind tibiæ bispinose; calcar subterete, cultrate, with a row of about eight teeth on hind margin; basal tarsus very long. Elytra long, rather narrow.

Type of genus.—*Proterosydne arborea* Kirkaldy.

The one Hawaiian species, the type, does not agree in all details with the American species which I include in the genus, but there is such a marked relationship between the two that it does not seem necessary to erect a new genus for our species.

PROTEROSYDNE PICTIFRONS Stål.

Plate 45, figs. D-H; plate 49 M.

Delphax pictifrons Stål '64: 50.—VAN DUZEE '97: 261.

Hygyops pictifrons Stål '70: 747.

Length of body 4.8 mm.; width of vertex 0.25; width of frons 0.36; antennæ, I, 0.19, II, 0.45. General color light fulvous; frons with a broad white band, surrounded by red, very conspicuous; a similar spot on each side of pronotum just above base of coxæ.

Head with eyes fully as broad as prothorax; vertex elongate, narrow, subrectangular, produced two-sevenths of its length beyond eyes, with lateral carinæ strong behind eyes; median carina almost wanting; frons tricarinate, moderately long, narrow above, conspicuously broadened midway, somewhat bell-shaped, almost twice as broad at apex as at base; sides parallel on lower half; clypeus large, convex, weakly carinate. Eyes large, not deeply emarginate below. Antennæ at least as long as width of head between antennal sockets, I almost half as long as II.

Thorax rather slender; pronotum slightly more than one-third as long as scutellum, broadly emarginate behind; scutellum rather weakly carinate. Hind tibiæ with two short lateral spines; calcar half as long as elongate basal tarsus, coarsely 8-dentate, acute at tip. Elytra very elongate, narrow, subhyaline, veins somewhat setigerous but not conspicuously so.

Male genital segment large; viewed laterally, constricted midway and long above and below; with a tubular epiphysis at base of genital styles produced upward into a short acute style; sides of pygofer produced above into long, posterior projections more or less encircling anal tube; anal tube and style long; genital styles not long, stout, simple, acute, and incurved at apex.

Redescribed from one female from Belize, B. Honduras (Johnson), and a pair from Managua, Nicaragua (Baker). This was placed by Van Duzee¹ as a species of unknown position.

Genus STOBAERA Stål.

Goniolcium FOWLER, Biol. Centr. Amer., 1881, p. 132.

Head about as broad as pronotum, sometimes considerably broader or somewhat narrower, rather strongly carinate; vertex broad, seldom longer than broad, straight on front margin, slightly produced before eyes; frons longer than broad, sides straight or rounded, tricarinate; eyes deeply emarginate below; antennæ compressed, rather

¹ See 97: 261.

short, seldom longer than width of head between antennal sockets. Pronotum tricarinate, lateral carinæ flexed out behind eyes and abruptly angulate apically and reaching hind margin; scutellum tricarinate; elytra setigerous on veins, large, broad at apex. Legs long; calcar cultrate, with a row of 6 to 10 teeth on hind margin.

Type of genus.—*Stobaera tricarinata* Say.

Stal erected this genus in 1859 for the species *Delphax concinna*,¹ a Mexican species. This is beyond doubt identical with *Delphax tricarinata* Say (1829) and therefore, the type of *Stobaera* must be *tricarinata* Say. Van Duzee, in describing this genus, ascribed to it the character of the head being narrower than pronotum which is seldom the case in the type species and almost never in the southern forms previously known as *concinna* Stal. Stal's African genus, *Amblycotis*, is apparently closely related to some of the members of this genus, notably *S. pallida* Osborn.

Fowler's Central American genus, *Goniolcium*, is apparently identical with *Stobaera*, judging from his description.

KEY TO THE SPECIES.

- a¹. Frons rectangular, sides subparallel; vertex only slightly broader than long or square; antennæ compressed; carinæ strong; frons usually dark above and below, light between, markings variable.
- b¹. Elytra long, pale, with a brown, crescent-shaped band apically...*tricarinata* Say.
- b². Elytra short, entirely brown, except anterior margin narrowly hyaline.
nigripennis, new species.
- a². Frons not rectangular, broadened midway; vertex broader than long.
- b¹. Antennæ compressed, short; frons considerably broadened, narrowed below, with numerous short, transverse, white markings; vertex much broader than long; head sometimes broader than mesothorax; carinæ strong; elytra long, square at apex.....*pallida* Osborn.
- b². Antennæ only slightly compressed, almost terete; frons not greatly broadened, pale; vertex broader than long, weakly carinate; fourth abdominal tergite with two black tubercles on each side; elytra short, not covering abdomen.
quadripustulata Van Duzee.

STOBAERA TRICARINATA Say.

Plate 45, figs. I-K, O; plate 49, fig. K.

Delphax tricarinata SAY '26: 337.—LECONTE '59: 255.—UHLER '75: 352.—VAN DUZEE '90: 389.—OSBORN '92: 127.

Conomelus tricarinatus VAN DUZEE '97: 191.

Stobaera tricarinata VAN DUZEE '97: 245.—SMITH '99: 89.—OSBORN '00: 64.—FORBES '00: 413.

Stobaera bifasciata PROVANCHER '90: 337.—VAN DUZEE '97: 244.

Stobaera concinna STÅL '59: 327.—VAN DUZEE '97: 246.

Stobaera minuta OSBORN '05: 376.

Stobaera affinis VAN DUZEE '08: 99.

Average length of body 3.4 mm.; width of vertex, 0.31; width of frons 0.26; length of antennæ, I, 0.22, II, 0.42. General color

¹ Berl. Ent. Zeit., vol. 3, 1859, p. 237.

variable from light brown to very dark brown or piceous; vertex, pronotum, scutellum between lateral carinae usually lighter brown; frons brown above ocelli, light to whitish on middle third, usually brown or blotched on lower third, often whitish; genae variable from mostly brown to blotched or almost white; abdomen dark; legs light, banded with black; elytra brownish, with a semicircular macula on posterior half of membrane, usually an oblique band on anterior half of membrane, and several spots extending obliquely across clavus and corium; this maculation is within certain limits rather constant and characteristic. Body moderately large, rather broad, variable from 3 to 5 mm. to tip of folded elytra.

Head rather short, with eyes about as broad as prothorax, sometimes slightly or distinctly narrower, oftener as broad or broader, strongly carinate; vertex as long as pronotum or slightly longer, as broad or broader than long, usually narrowed between eyes and somewhat produced before them; lateral carinae often very much elevated with sharp carina behind eyes; front margin of vertex variable from almost straight to angulate; frons long, usually rather slender, varying from two to two and three-fourths times as long as broad, sometimes slightly broadened between eyes, converging slightly to apex; median carina forked at apex of head; eyes large, deeply emarginate beneath. Antennae varying in length from one-half to one and a fourth times as long as width of head between antennal sockets; I compressed, broader than II, or fully as broad, from two-thirds to three-fourths as long; II subterete, somewhat compressed basally, very rough.

Thorax rather long, strongly carinate; pronotum from more than one-third to one-fifth as long as scutellum; posterior margin emarginate and sharply angled at center; lateral carinae angled sharply apically and extending to posterior margin; scutellum long, acute; forefemora slender, subterete to angled; hind tibiae slender, long; calcar from one-half to two-thirds as long as basal tarsus, hind margin coarsely 7 to 10 dentate. Elytra long, maculate, somewhat squared at apex.

Male pygofers broad, short; anal tube with an acute, recurved process on ventral margin, variable in length from one-third the diameter of anal tube to twice that length, and from slender to board and stout; anal style moderately long; genital styles variable in length, sinuate, usually enlarged subapically and often more or less compressed, constricted beyond subapical enlargement, apex broadened, compressed, produced on each side into an acute tooth; sometimes pulverulent; with a slender process at base of each style.

Redescribed from more than 200 males and females from the following widely separated localities: In the United States—Pennsylvania (Wirtner); Virginia, Illinois, Minnesota (Baker); Kentucky (Riley)

on *Monophylla* sp.; Arkansas (Hubbard); Missouri (Brown); Alabama (Baker); Colorado (Baker); Arizona (Baker); California (Baker). South of United States—Habana, Cuba (Baker); Guadaluajara, Jalapa, Orizaba, Puebla, Oaxaca, Cuernavaca, all Mexico (Crawford); Guatemala (Baker); and Nicaragua (Baker).

Apparently this species has a very wide distribution, and, as might be expected, more or less variation occurs within the species. Van Duzee retains as valid Stal's species *concinna* as distinct from the more northern form *tricarinata* Say. A careful and minute study has been made of the above series of over 200 specimens from the many and varied localities enumerated above, and curves plotted for all the variation characters, namely, the variations in the genital styles, the calcar, relative length and size of frons, vertex, pronotum, scutellum, and antennæ. If one were to study the forms from Pennsylvania and those from Nicaragua they would probably be separated as two distinct, though similar, species. With all the intermediate localities represented in the series, however, the curves become continuous, and it is at once impossible to recognize the southern forms as distinct.

There seems to be a general division, not at all sharp, of the series as represented here into three groups, falling geographically into the faunistic regions of the North and West of the United States and northern Mexico, the extreme Southeast of the United States and Cuba, and southern Mexico and Central America. In a very general and loose way it may be said that the individuals of the first region show a tendency toward the following groups of characters: Short-petioled, smaller, pulverulent genital styles, relatively longer pronotum, longer frons, long or short antennæ, larger calcar; those in the second region: styles as above, pronotum shorter, frons intermediate, antennæ shorter, calcar shorter; those in the far south region (formerly known as *concinna* Stal): longer-petioled, larger, nonpulverulent styles, shorter pronotum and frons, longer antennæ, smaller calcar. These divisions shade into each other very intricately and can not be called even varietally distinct. In the study of specimens in the future these geographic divisions may be borne in mind to some advantage. The most characteristic mark of the species is the maculation of the elytra, although to a certain extent this also is variable, and the form of the male genitalia.

The largest percentage of the specimens studied are macropterous; fourteen specimens from Kentucky (collected in May) and several from California are semibrachypterous, having the membrane about half the normal length and reaching only slightly beyond the anus. In these forms the relative measurements are slightly different, as is usually the case in brachypterous specimens. The scutellum is relatively shorter, vertex broader, head often a little narrower than prothorax. The short membrane may or may not be maculate. There are no really brachypterous specimens in the whole lot.

Previous students in this group have used coloration very largely in drawing the specific lines. As a matter of fact, this character is useless for that purpose, since any variation of pigmentation may be found among the immense series of specimens. The frons varies from almost entirely brown or dark colored with at least a narrow band across the middle lighter than the rest, through a long and gradual series in which the dark area is more and more replaced by light, often with the effect of blotching, to a condition wherein all the brown below the ocelli has disappeared, leaving the lower two-thirds and most of the genæ creamy white. I have no doubt that *S. bifasciata* Provancher is a part of this series, since it was separated chiefly on "the pale front."

Among the series is a lot of a score or more specimens collected in California (exact locality unknown) which, considered alone, might be placed in a distinct species because of the smaller size of the body, the shorter antennæ, and the absence of the lower band of brown on frons. But here, again, there is no possible line of division, as the curves show.

STOBAERA PALLIDA Osborn.

Plate 47, fig. C.

Stobaera pallida OSBORN '05:375, 47.—VAN DUZEE '08:200.

Length of body, 2.8 mm.; width of vertex, 0.38; width of frons, 0.38; antennæ, I, 0.16, II, 0.27. General color light brown; frons with several short white transverse markings; elytra light brown, maculated in male somewhat similarly to *tricarinata*. Body robust. Head very broad, sometimes broader than entire thorax, strongly carinate; vertex broader than long, square at apex, sides narrowed between eyes; frons widened to ocelli, then abruptly narrowed considerably to apex, narrower below than above, more than half as broad as long; antennæ reaching to clypeus, broad, II a little longer than I; eyes deeply emarginate beneath.

Pronotum moderately long, angulation of lateral carinæ rather prominent; hind margin crispate or crimped on lateral half of each side; scutellum broad. Legs rather short, stout; calcar more than half as long as basal tarsus. Elytra somewhat convex, square at apex.

Male pygofer similar to *tricarinata*; styles long, slender, acute, apex curved in sharply and hook shaped, with an inner needlelike process below hook.

Described from two males and two females, all macropterous, one female from Nassau, Florida (E. A. Schwarz), and the others from Bayville, New York, on *Baccharis halimifolia*. Osborn's specimens were from Delaware and Maryland on the same plant. This suggests somewhat Stal's African genus, *Amblycotis*.

STOBAERA NIGRIPENNIS, new species.

Size and general appearance similar to the smaller individuals of *tricarinata*; coloration of body and legs quite similar; elytra short, reaching a little beyond tip of abdomen, dark brown or black, except on a narrow strip along anterior margin and on anterior half of membrane. Male genital styles relatively rather stouter; ventral process of anal tube scarcely acute.

Described from one male from Argus Mountains, California (Koebele). This may be only a varietal form, but it differs so sharply from the hundreds of other specimens that I choose to consider it another species.

Type-specimen.—Cat. No. 15975, U.S.N.M.

STOBAERA QUADRIPUSTULATA Van Duzee.

Stobaera quadripustulata VAN DUZEE, '08: 200.

Locality.—Estero, Florida (Van Duzee).

STOBAERA GRANULOSUM (Fowler).

Goniolcium granulorum FOWLER '81: 132.

Probably this is identical with the southern form of *tricarinata*.

Locality.—Orizaba, Vera Cruz, etc., Mexico (Fowler).

STOBAERA TESTACEUM (Fowler).

Goniolcium testaceum FOWLER '81: 133.

The exact relationship of this species to the other members of the genus is difficult to state at present.

Locality.—Guatemala, etc. (Fowler).

Genus COCHISE Kirkaldy.

Kirkaldy's original description is as follows:

Vertex very transverse, keels obsolescent, impressed transversely on the basal margin, about one-fifth wider than the eye; with the eyes distinctly wider than the pronotum. Frons medianly impressed by a transverse line, the basal part with two widely separated keels (a puncture between them in the middle), uniting on the middle of the apical part, which narrows concavely toward the apex, where it is truncate. Genæ almost obsolete. Antennæ arising almost at the exterior apical ocular angle, flattened and carinately foliaceous, one-third longer than the maximum width of the frons, first segment wider apically than basally, second five-eighths longer than first. Clypeus rather swollen, carinate medianly. Pronotum scarcely longer medianly than the head, hind margin obtuse-angularly emarginate, median keel entire, a puncture on each side; lateral keels distant laterally and basally, arising anteriorly at the interior margin of the eye, curving at an acute angle near the hind margin to meet the eye again, inclosing a puncture. Scutellum with the lateral keels obsolescent. Legs simple. Tegmina with the radial forked nearer the base than is the brachial; 7 apical cells; the second and third apical veins have a common base, the third rejoining near the apex. Hind tibiae with a small spine near the base, 4 uneven large spines at the apex; the spur large and broad, three-sided, each side flat, not foliaceous; there are a number of very minute spines, scarcely visible, on one edge. The first segment of the hind tarsi is longer than the others together and has about 6 spines.

COCHISE APACHEANUS Kirkaldy.

Cochise apacheanus KIRKALDY, Bull. Hawaiian Sugar Planters Association, vol. 4, 1907, p. 64.

Locality.—Arizona, Nogales (Koebele).

Genus DELPHAX Fabricius.

Syn. *Araeopus* SPINOLA.

Body large, stout; head large, about as broad as prothorax, rather weakly carinate; vertex broad, as broad as long, rounded in front, scarcely produced before eyes; frons broad, sides rounded or angulate longer than broad, tricarinate; antennæ long; I foliaceous, not flat, rounded outward along center, thin above and below; II nearly terete, asperose, a little shorter than I. Eyes large, deeply emarginate below. Pronotum long, lateral carinæ usually flexed outward; scutellum tricarinate. Elytra setigerous. Legs very elongate; fore-femora compressed; hind tibiæ long, bispinose; calcar very large, tectiform, deeply concave on one surface, margin finely dentate.

Type of genus.—*Delphax crassicornis* Fabricius.

In the form of the antennæ this genus resembles *Asiraca*, but it is very distinct in the form of the calcar, as well as in some other characters. It is very apparent from the original description of this genus by Fabricius that his type-species is not congeneric with the large group of species which have been for a long time erroneously called *Delphax*, or *Liburnia* by others.¹ In 1839 Spinola erected a new genus, *Araeopus*, and indicated as its type-species Fabricius's old species, *Delphax crassicornis*. His species happened to be the type of *Delphax*, however, and therefore the latter must replace the other as the accepted name for those species related to *crassicornis*.²

The only American representative of this genus was described very briefly by Lethierry from South America. The description is so inadequate that it is impossible to determine with what genus it can be associated if it is not *Delphax*; therefore it must be retained here for the present.

DELPHAX CONSPERSINERVIS Lethierry.

Delphax conspersinervis LETHIERRY '90: 151.

Locality.—Caracas, Venezuela.

Genus BOSTAERA Ball.

According to Ball this genus has the following characteristics:

Resembling *Stobaera*, but a much broader vertex and front; vertex and front broader than in *Laccocera*, front bicarinate; head transverse, wider than pronotum; vertex

¹ See heading *Megamelus*.

² See Fabricius—Supplementum Ent. Systematicæ, 1798, p. 523.

parallel-margined, over three times as wide as long, not extending in front of eyes; front six-angled, widest at lower corner of eye, where it is a trifle wider than its median length, two and a half times as wide as at apex, median carina forking at one-fourth its length from apex and regularly diverging until its forks include over half the width at base; clypeus bearing an acutely tipped, cone-shaped tubercle in front; pronotum transverse, slightly angularly excavated behind; lateral carinae curving around behind eyes, not reaching hind margin. Elytra about as in *Stobaera*, obliquely truncate behind, nervures with setigerous tubercles; tarsal spur broad, short, almost spoon shaped.

Type of genus.—*Bostaera nasuta* Ball.

The remarkably broad head, bicarinate front, and the "nose" on the clypeus render this a very distinct and easily recognized genus.

BOSTAERA NASUTA Ball.

Bostaera nasuta BALL '02:266.—SWEZEY '04:37.—VAN DUZEE '08:200.

Locality.—Holly, Antonito, and Fort Collins, Colorado (Ball).

Genus ACHOROTILE Fieber.

Frons, notum, and abdomen with numerous round pits; head about as broad as prothorax or slightly narrower, quite strongly carinate; vertex almost square, slightly broadening toward the front (in type species); frons with two median carinae parallel with sides and percurrent through apex of head; eyes moderately large, not deeply emarginate below; antennae short, terete, II at least twice as long as I. Pronotum quite long, lateral carinae curved outward behind eyes, not reaching hind margin. Calcar foliaceous, stout; hind tibiae bispinose.

Type of genus.—*Achorotile albosignata* Dahlbaum.

ACHOROTILE ALBOSIGNATA Dahlbaum.

Plate 45, figs. L, M, W.

Delphax fuscinervis SCOTT '71:196.

Ditropis albosignata SAHLBERG '71:472.

Achorotile albosignata EDWARDS '85:87.—VAN DUZEE '97:259.—SWEZEY '04:42.—OSHANIN '07:334.

Length of body 3.2 mm.; width of vertex 0.24; width of frons 0.41; antennae, I, 0.14; II, 0.28. General color shining black; vertex, dorsum of thorax medially and abdomen on two basal tergites and along median line yellowish brown; sternum slightly lighter in color. Body not large.

Head slightly narrower than prothorax, strongly carinate; vertex slightly broader than long, a little broader in front than behind, projecting a little before eyes, with one or two pits near front margin outside of median carinae; frons oval, almost as broad below as above with median carinae well separated, parallel with sides, confluent at clypeus; with seven pits in each lateral compartment; clypeus convex. Antennae short, not reaching to clypeus, I slightly less than half as long as II, very short.

Thorax short, broad; pronotum about half as long as scutellum, not deeply emarginate behind, with about six pits on posterior incline of lateral carinæ. Legs rather stout; calcar about half as long as basal tarsus, stout, briefly pubescent.

Abdomen pitted dorsally irregularly; median line almost carinal in prominence.

Male pygofer with aperture margin elongate-ovate, with sides protruding a little below middle; anal tube short, with two very long ventral processes; anal style short; genital styles short, simple, largest at base.

Redescribed from one male and two females from Finland (Reuter), determined by the latter as *Ditropis albosignata*.

Reported from Buffalo, East Concord, and New York (Van Duzee).

ACHOROTILE FOVEATA Spooner.

Achorotile foveata SPOONER '12:241.

This is very closely related to *albosignata*, but seems to be distinct in a few minor characters. I have examined the type-specimen, a macropterous female, and believe it to be distinct, although I have seen only two specimens of *albosignata* and both of those European. More specimens should be compared before a final judgment is made. Spooner says, "This species may be told from *A. albosignata* by the deeper vertex, the different coloration, and by the presence of four instead of two pustules on each side of the abdominal segments." The latter character in *albosignata* is not constant, however.

Locality.—Felton, Santa Cruz Mountains, California; May, 1907.

Genus LACCOCERA Van Duzee.

Head large, about as broad as prothorax, more or less angulate dorso-ventrally at apex; vertex relatively quite broad, more or less pentangular or quadrangular, with anterior margin roundly convex; several pits (pustula of some authors) near eyes; frons large, broad, more or less obcordate, narrower below than above, with median carina forked at apex of head, several pits in each lateral fovea. Pronotum shorter than vertex, deeply excavated behind, with lateral carinæ curved outward, and several pits on posterior incline, as in *Achorotile*; scutellum tricarinate, somewhat pitted. Elytra often brachypterous; anterior and middle tibiae slightly flattened. Abdomen pitted on the sides.

Type of genus.—*Laccocera vittipennis* Van Duzee.

The peculiar pitted surface of the head, thorax, and abdomen of this genus and *Achorotile* has been believed to indicate that these genera are at the bottom of the scale of development, since this same character is common among nymphs. However that may be, the genera in question are very easily distinguished from the others by

this character. Cross sections were made of the pits and the sections examined microscopically, but they seem to be only simple pits without any glandular connection.

KEY TO THE SPECIES.

- a¹. Legs lineated with black or brown.
 - b¹. Vertex considerably broader than long; genital styles of male long, as long as to processes of anal tube, rather slender, pygofer with a carina below and between styles.....*vittipennis* Van Duzee.
 - b². Vertex only slightly broader than long or square; genital styles about half as long as above, stout; pygofers without carina.....*obesa* Van Duzee.
- a². Legs not lineated, unicolorous; vertex nearly square.
 - b². Anal tube of male with ventral processes very short; clypeus and labrum black or brown; legs brown to flavous.
 - c¹. General color yellow and black rather sharply contrasted...*sonata* Van Duzee.
 - c². General color dull flavous, abdomen with brown markings.
 - sonata flava*, new variety.
 - b². Anal tube of male with two very long, horn-like processes on ventral margin; clypeus and labrum yellow; legs yellow.....*bicornata*, new species.

LACCOCERA VITTIPENNIS Van Duzee.

Plate 45, figs. N. Q.

Laccocera vittipennis VAN DUZEE '97:242.—SWEZEY '04:36.

Delphacinus vittatus GILLETTE and BAKER '95:69.

Length of body 3 mm.; width of vertex 0.38; width of frons 0.38; antennæ, I, 0.17, II, 0.28. General color brown, variable in shade; vertex and tergum between lateral carinæ yellowish; frons brownish or brown with yellow intermixed to some extent, with carinæ always yellow; clypeus dark brown to black with carinæ pale; eyes brown to black; genæ and antennæ dark brown; pleura brown and yellow; elytra pale brown, with darker brown vitta on each margin; legs yellow, banded with black; abdomen dark, with yellow on dorsal portion of first three segments and narrower area along dorsum of rest of segments, and on lateral margin of tergites; ovipositor sheath more or less yellowish brown.

Head broad, with eyes fully as broad as or broader than prothorax, very broad between eyes, relatively short; vertex subrectangular, considerably broader than long, converging a little toward front, produced a little beyond eyes; with two small pits in each lateral fovea; frons large, rather six-sided, broadest about at ocelli, broader above than below; with four pits on each side of median carina and three (or more) next to each lateral carina on inside. Antennæ moderately long, slender, terete, I not quite half as long as II.

Thorax broad; pronotum considerably shorter than vertex, deeply and broadly emarginate behind; lateral carinæ prominent, extending to lateral margin, pitted closely on posterior incline for fully two-thirds its length from apex. Legs long, slender; anterior and middle femora and tibiæ very slightly compressed; calcar thick at base, not

very large. Elytra long, slender; brachypterous forms predominate in both sexes.

Abdomen large, broad.

Male genital segment large, conspicuous, margin of aperture deeply emarginate at base of styles; anal tube short, with two short processes on ventral margin; genital styles long, strongly diverging, straight, three-faced, acute at tip, about as long as to tip of anal tube processes.

Redescribed from one macropterous female from Mount Washington, New Hampshire (a paratype of the original specimen?), 5 macropterous females, 19 brachypterous males and over 50 brachypterous females all from Colorado (Baker), and several from Ormsby County, Nevada (Baker).

LACCOCERA ZONATA Van Duzee.

Laccocera zonata VAN DUZEE '97:243.—SWEZEY '04:36.

Delphacinus zonatus GILLETTE '95:69.

Length of body, female, 4 mm.; male, 2.9; width of vertex, 0.35; width of frons, 0.39; antennæ, I, 0.10, II, 0.22. General color yellow and black; head except clypeus, prothorax and scutellum entirely bright yellow; elytra, clypeus, venter, and abdomen shining black except a conspicuous yellow spot on base of abdomen above extending to tip in a more or less continuous stripe; legs flavous brown throughout.

Quite similar in general characters to *vittipennis*, differing as follows: Head not broader than prothorax, sometimes slightly narrower; vertex more nearly square, not broader than long or even slightly longer than broad, pitted as in *vittipennis*; frons similar in shape, basal and clypeal margins subequal; eyes quite compressed anteriorly; first antennal joint relatively shorter, only about one-third as long as II. Pronotum longer, not so deeply emarginate behind; legs not striped; hind tibiæ very stout, especially distad; male genital segment similar; processes of anal tube longer; genital styles equally long, large at base, abruptly slender and flexed inward midway, quite different in appearance from *vittipennis*.

Redescribed from many brachypterous specimens of both sexes from Ormsby County, Nevada (Baker); one macropterous female from Nevada, but elytra broken.

LACCOCERA ZONATA FLAVA, new variety.

Very similar in all characters, except color, to the species. Color almost uniform light flavous, with faint brown markings on abdomen and venter. Three females out of more than 100 specimens show this character with almost no intergradation. Very probably this is not more than a varietal form of the species—scarcely a seasonal variation, however, as all the specimens were apparently taken at the same time of the year.

Type-specimen.—In collection of Pomona College.

LACCOCERA OBESA Van Duzee.

Plate 45, figs. R, V.

Laccocera obesa VAN DUZEE '97:244.—SWEZEY '04:36.*Delphacinus obesus* GILLETTE '95:69.

Very similar in general size and proportions to *zonata*; color characters similar but less marked, yellow more flavous, and black often reduced to brown or even light brown; clypeal carinæ often yellow, as in *vittipennis*. Head relatively short, with eyes almost or quite as broad as prothorax, occasionally slightly broader; vertex almost square, very slightly broader than long, sides quite parallel, produced somewhat before eyes, less pitted than in congenors; frons similar in shape, scarcely angulate; roundly obpyriform, narrower below than above. Thorax similar in structure to *vittipennis*. Legs somewhat striped brown and light flavous. Male pygofers shorter, margin but slightly emarginate at base of genital styles; processes of anal tube exceedingly short; genital styles very short and stout, scarcely half as long as in *vittipennis* without median carina below and between styles which is present in other two species.

Redescribed from two macropterous and many brachypterous females from Ormsby County, Nevada (Baker), and Colorado (Baker), and one brachypterous male from Nevada. This species is quite closely related to its congenors, but differs markedly in male genital characters and to a less extent in cephalic characters; the coloration is more or less a combination of the two species.

LACCOCERA BICORNATA, new species.

Plate 45, fig. P.

Size and general proportions similar to *zonata*; black and yellow, as in that species, but clypeus and labrum, also, bright yellow; legs yellow instead of flavous. Principal differences are in color and male genitalia; head and thoracic structure similar.

Genital segment similar; anal tube very large, projecting caudad more than in *zonata*, with ventral processes extremely long and acute, resembling two recurved horns, extending fully two-thirds of distance toward base of genital styles; styles shorter and much stouter, more terete than in *vittipennis*, not flexed as in *zonata*, longer than in *obesa*, with carina very conspicuous below and between styles.

Described from two males (brachypterous), from Colorado (Baker). The female is unknown or else indistinguishable from *zonata*, although the color should be rather constant.

Type-specimen.—Cat. No. 15976, U.S.N.Mus.

Genus JASSIDAEUS Fleber.

Syn. *macrotomella* VAN DUZEE.

This genus, not represented in the material before me, is characterized by the two median carinæ of the frons; vertex and frons broad, latter more or less pentagonal; antennæ reaching about to

clypeus, sometimes slightly compressed. Pronotum moderately long; lateral carinæ straight or more or less curved outward behind eyes. Scutellum tricarinate.

Type of genus.—*Jassidaeus lugubris* Signoret.

Van Duzee's genus, *Macrotomella*, seems to be so similar to this European genus that it ought to be merged into it. The differences upon which it was erected are not constant enough and of sufficient generic value to warrant its maintenance as a distinct genus.

JASSIDAEUS CARINATUS Van Duzee.

Macrotomella carinata VAN DUZEE '07:44.—'08:197.

This species apparently belongs to the European genus *Jassidaeus*, although there are a few minor differences.

Locality.—Jamaica and Florida (Van Duzee).

JASSIDAEUS INCONSPICUUS Uhler.

Stiroma inconspicua UHLER '77:458.—VAN DUZEE '97:260.

This apparently belongs in the genus *Jassidaeus*, although I have not seen specimens of the species.

Locality.—Colorado (Uhler).

Genus PHYLLODINUS Van Duzee.

Head about as broad as pronotum, or narrower, carinæ moderately distinct; vertex rather broad, scarcely produced before eyes; frons longer than broad, tricarinate, sides straight or rounded, sometimes indistinctly pitted as in *Achorotile*; antennæ rather long, I shorter than II. Pronotal carinæ usually curved out behind eyes, sometimes with indistinct pits behind. Fore- and middle femora and tibiæ conspicuously compressed and foliaceous; calcar tectiform, margin coarsely or finely dentate; hind tibiæ bispinose.

Type of genus.—*Phyllodinus nervatus* Van Duzee.

The occasional pits on the frons and pronotum suggest a possible relationship with *Laccocera* and *Achorotile*, but apparently all the species with the flattened femora and tibiæ are not so pitted.

KEY TO THE SPECIES.

- a¹. Head about as broad as prothorax; frons and pronotum with indistinct pits; elytra without white apical margin.....*nervatus* Van Duzee.
- a². Head distinctly narrower than prothorax; frons and pronotum without pits; elytra margined apically with white.
- b¹. Frons with transverse white bands; tibiæ and femora of equal width; scutellum and part of pronotum white.
- c¹. Frons with a very indistinct carina between median and each lateral.
boesbelei Osborn.
- c². Frons without intermediate carinæ.....*fabellatus* Ball.
- b². Frons unicolorous, without white bands; foretibiæ wider than femora; scutellum not white.....*nitens* Van Duzee.

PHYLLODINUS NERVATUS Van Duzee.

Plate 47, fig. F.

Phyllodinus nervatus VAN DUZEE '97: 241.—WIRTNER '04: 215.—SWEZEY '04: 36.
Euryea nervata VAN DUZEE '94: 191.

Average length, 2.3 mm.; width of vertex, 0.29; width of frons, 0.33; antennæ, I, 0.18, II, 0.29. General color brown to dark brown; vertex pale, dark apically in middle and dark spotted next to eyes; frons dark with a double row of light spots on each side (pits); clypeus black; pronotum pale between lateral carinæ and at lateral margins; scutellum yellow on carinæ, dark between; antennæ brown; legs dark, hind legs more or less banded with yellow; elytra (brachypterous) smoky brown, veins lighter. Body stout.

Head about as broad as prothorax, seldom broader; vertex square in front, broader than long, scarcely produced before eyes; frons a little broader than long, sides rounded, with a double row of indistinct pits on each side appearing as yellow spots; median carina forked at apex of head; antennæ reaching considerably beyond clypeus, I more than half as long as II.

Pronotum moderately long, with a row of indistinct pits behind lateral carinæ; fore and middle tibiæ and femora of about equal width; hind legs rather long; calcar thick, stout, not very long, margin scarcely dentate.

Male pygofer moderately broad, aperture elliptical, long, sides quite regular; anal tube large, produced ventrad into two stout acute processes; styles slender, arched apically, tips narrowed, slightly flattened, scarcely acute.

Redescribed from eleven brachypterous males and females from Colorado (Baker).

PHYLLODINUS FLABELLATUS Ball.

Plate 47, fig. G.

Phyllodinus flabellatus BALL '02: 232.—SWEZEY '04: 36.—WIRTNER '04: 216.

Length of body, 2.7 mm.; width of vertex, 0.20; width of frons, 0.28; antennæ I, 0.17, II, 0.33. General color reddish brown; posterior half of pronotum and all of scutellum white; vertex dark with narrow posterior margin, a long transverse band subapically and a shorter one at apex white; frons reddish, with four white transverse bands, two white spots midway on each side, and apical margin white; abdomen with white spots; elytra black, except apical margin broadly white, band broadest on costal margin; legs brown; tarsi white except at tip.

Head small, considerably narrower than prothorax; vertex a little longer than broad, somewhat rounded in front; frons twice as long as broad, sides subparallel, without pits; median carina forked at apex of head; antennæ reaching beyond clypeus; pronotum without pits. Elytra short, broad. Legs as in *nervatus*.

Male pygofers large, aperture very small, narrow, with a pair of long, slender processes ventrally; margin of aperture sinuate, with a prominent fossa ventrally on each side; anal tube large, open below, produced ventrally into two acute teeth; genital styles very slender, scarcely visible below ventral processes of pygofers.

Redescribed from five males and females from Greensburg, Pennsylvania (Wirtner), and one female from Alabama (Baker). Reported from Washington, District of Columbia, and New Jersey (Ball).

PHYLLODINUS KOEBELEI Osborn.

Phyllodinus koebelei OSBORN '03:46, 100.

Very similar in all respects to *P. flabellatus* and reported also from Washington, District of Columbia. Probably this is identical with *flabellatus*, and I would not hesitate to make it synonymous except for the fact that Osborn mentions the presence of a very indistinct carina between the median frontal carina and the laterals. It was described only a short time after *flabellatus*, and perhaps Osborn had not been aware of the latter description. For the present it is included in the synopsis, as a distinct species.

Locality.—Columbus, Ohio (Osborn).

PHYLLODINUS FUSCUS Osborn.

Phyllodinus fuscus OSBORN '03:46, 100.

Very similar to the foregoing species, and Osborn states that it may be a variation form of it. Probably both of these should be synonyms of *flabellatus*.

Locality.—Columbus, Ohio (Osborn).

PHYLLODINUS NITENS Van Duzee

Phyllodinus nitens VAN DUZEE '07:198.

Locality.—Jamaica (Van Duzee).

LIBURNIELLA, new genus.

Similar in the general aspect of the individuals to *Megamelus*; head rather strongly carinate; median carina of frons percurrent to base of vertex unforked except a slight furcation on vertex, the branches of which diverge slightly and very soon reunite, thus enclosing a small areolet on vertex; transverse carinæ of vertex wanting, as in *Tropidocephala*. Antennæ rather long. Lateral pronotal carinæ usually forked, one branch curving out behind eyes. Elytra maculate. Legs as in *Megamelus*.

Type of genus.—*Liburniella ornata* Stål.

This genus is related somewhat to *Tropidocephala* but is distinct both from that and from *Megamelus*, also.

LIBURNIELLA ORNATA Sm.

Plate 45, fig. T.; plate 47, fig. E; plate 49, fig. N.

Delphax ornata Stål '62:315.*Liburnia ornata* Osborn '92:127.—Van Duzee '94:191; '97:247.—Smith '39:89.—

Forbes '00:413.—Osborn '01:36.

Average length of body 2.1 mm.; to tip of folded elytra 3.9; width of vertex 0.19; width of frons 0.20; antennæ, I, 0.15, II, 0.31. General color light brown, abdomen dark brown to black with whitish markings; frons and clypeus between carinæ and breast black or dark, frontal carinæ pale; with a conspicuous white stripe along median carina of vertex, pronotum and scutellum lineated on each side narrowly with black; legs and antennæ pale brown, latter black at tip of I and a black stripe above on II; elytra ornamented conspicuously with brown maculæ across apex of corium and around posterior portion of membrane. Body slender.

Head about as broad as prothorax, strongly carinate; vertex slightly longer than broad, slightly narrowed anteriorly; frons elongate, narrow, sides subparallel; antennæ longer than to clypeus, I half as long as II. Pronotum moderately long, roundly emarginate behind, carinæ strong; legs typical; hind tibiæ longer than femora; calcar small, margin scarcely dentate.

Male pygofers somewhat compressed, aperture elliptical; anal tube large, short; genital styles rather long, approximate at base, then slightly divergent, acute at tip, cultrate.

Redescribed from numerous specimens of both sexes from Mississippi (Weed), Alabama (Baker), Louisiana, Texas (Tucker), Missouri (Baker), Kansas, Pennsylvania, Washington, District of Columbia, Massachusetts, Nebraska, Iowa.

Genus KORMUS Fieber.

Related to *Megamelus* at the "*Kelisia*" end of the series. Head as broad as prothorax; with all carinæ and thorax obsolete, or scarcely visible; vertex broad, rounded in front, slightly produced before eyes; frons broad; antennæ terete, as long as to clypeus, I shorter than II. Thorax broad. Calcar thick, tectiform, margin scarcely dentate.

Type of genus.—*Kormus artemisiæ* Fieber.

Some species in *Megamelus* at one end of the series resemble somewhat this genus, but they have the carinæ still easily visible.

KORMUS CALIFORNICUS, new species.

Length of body 3.1 mm.; width of vertex 0.36; width of frons 0.50; antennæ, I, 0.11; II, 0.23. General color dark chocolate brown; apex of head, tip of abdomen, legs and breast paler; brachypterous elytra dark brown. Body robust.

Head about as broad as prothorax, rounded in front; vertex as broad as long; frons a little longer than broad, convex, sides evenly

rounded, broadest midway; antennæ reaching to clypeus, I scarcely half as long as II. Lateral carinæ of pronotum very slightly visible, flexed out behind eyes. Legs stout; hind tibiæ slightly longer than femora; calcar pubescent, more than half as long as basal tarsus.

Described from one brachypterous female from Claremont, California (Baker).

Type-specimen.—In collection of Pomona College.

Genus STENOCRANUS Fieber.

Body slender, rather long; head with eyes narrower than prothorax, sometimes greatly so; vertex more or less elongate, slightly converging to apex, somewhat rectangular, projecting from one-third to two-thirds its length beyond eyes; median carina strong or weak; frons long and narrow, slightly broader at apex than at base, tricarinate. Eyes more or less compressed, not deeply emarginate below; antennæ rather short, terete, I much shorter than II. Thorax slender; lateral carinæ usually reaching hind margin; scutellum tricarinate. Calcar tectiform, the margins usually rather close together with pubescence between. Female ovipositor sheath often broadened or foliaceous and appressed to genital segment.

Type of genus.—*Stenocranus minutus* Fabricius (probably).

KEY TO THE SPECIES.

- a¹. Calcar unusually large and foliaceous; vertex rather long in front of eyes; frons pale, with a brown band below antennæ; basal antennal joint only a little shorter than II. *palaetus* Van Duzee.
- a². Calcar not unusually large, seldom foliaceous, margins usually close together and pubescent; antennæ with I much shorter than II.
- b¹. Female ovipositor sheath broadened conspicuously, not styliform or cylindrical.
 - c¹. Frons narrowed above, sides subparallel from odelli to apex; vertex not produced more than one-third its length beyond eyes.
 - d¹. Vertex not more than one and a half times as long as broad posteriorly; frons usually less than three times as long as broad.
 - e¹. Female ovipositor sheath broadly elliptical, broadest midway, usually black between carinæ. *dorsalis* Fitch.
 - e². Female ovipositor sheath broadest apically, pyriform; frons pale brown between carinæ; vertex and frons relatively shorter. *felli* Van Duzee.
 - d². Vertex at least twice as long as broad; frons narrow, fully three times as long as broad, or more, black between carinæ. *angustus*, new species.
- c². Frons broadest at apex, sides uniformly diverging from base; female ovipositor sheath less foliaceous, narrower.
 - d¹. Vertex produced nearly one-half its length before eyes, narrow, about two and a half times as long as broad. *saccharivorus* Westwood.
 - d². Vertex produced considerably more than half its length before eyes, beak-shaped, fully four times as long as broad. *rostrifrons*, new species.
- b². Female ovipositor sheath cylindrical at least on apical three-fourths.
 - c¹. Ovipositor sheath broadened somewhat at base; vertex produced about one-third its length before eyes; antennæ with II four times as long as I.
 - similis*, new species.
 - c². Ovipositor sheath only slightly broadened at base; vertex produced less than one-third its length before eyes; antennæ with II less than four times as long as I.
 - croceus* Osborn and Ball.

STENOCRANUS DORSALIS Fitch.

Plate 46, figs. C, E, F, O; plate 49, fig. J.

Delphax dorsalis FITCH '51 : 46.—LINTNER '93 : 386.*Delphax unipuncta* PROVANCHER '89 : 244.*Liburnia dorsalis* VAN DUZEE '90 : 28.*Stenocranus dorsalis* VAN DUZEE '90 : 390.—OSBORN '92 : 127.—VAN DUZEE '97 : 231.*Stenocranus lautus* VAN DUZEE '97 : 231.—OSBORN '00 : 64.

Length of body 4 mm.; width of vertex 0.29; width of frons 0.31; antennæ, I, 0.08, II, 0.28. General color light yellowish brown to brown; dorsum usually with a long whitish vitta extending from vertex to tip of scutellum and appearing to be continued on to the whitish margin of clavus when elytra are closed; vitta variable in distinctness, often rather broad; frons and clypeus usually black between carinæ; femora and tibiæ striped with black; elytra usually light brown, occasionally darker, with a more or less prominent brown macula along membrane slightly behind middle and often extending somewhat on to corium.

Head narrower than prothorax, strongly carinate, projecting beyond eyes at apex for about one-third its length; vertex long, narrow, about one and a half times as long as broad posteriorly; frons narrowed above, slightly but quite abruptly broadened to ocelli, thence parallel to apex; median carina sometimes forked a little below apex of head. Antennæ rather short, II three times as long as I.

Thorax long; pronotum moderately long, scarcely as long as vertex, lateral carinæ arcuate. Legs slender; calcar large, half as long as basal tarsus, pubescent. Elytra narrow, long, subhyaline.

Male pygofer large; anal tube with two long, acute processes on ventral margin; genital styles large at base, abruptly narrowed midway, thence deeply emarginate, sinuate, acute at tip.

Female ovipositor sheath greatly broadened, foliaceous, closely appressed to and entirely covering genital segment, elevated on margins, and often covered with floccose secretion.

Redescribed from numerous males and females, from the following localities: Michigan; Polk County, Wisconsin (Baker); Illinois; Pennsylvania (Wirtner); Massachusetts; Maryland; Virginia (one of the two type-specimens of Van Duzee's species *lautus*); Canada and Colorado (Baker).

Stenocranus lautus was separated by Van Duzee from the present species entirely on color characters, all of which are variable and completely intergrade when a large series is examined. The type male of this species from Virginia, in the United States National Museum, is identical with the numerous specimens of *S. dorsalis*. The name *S. lautus* Van Duzee, therefore, becomes synonymous with *dorsalis*.

This species is distributed over the north and west of the United States, and in the south another species occurs, quite distinct from the northern form.

STENOCRANUS ANGUSTUS, new species.

Length of body, 3.1 mm.; width of vertex, 0.20; width of frons, 0.22; antennæ, I, 0.05; II 0.22. General color brown or dark brown, dorsum with conspicuous white vitta; frons black between carinæ; femora striped black; elytra mostly dark brown except outer antepical and costal cell and small part of membrane light.

Vertex about as long as in *dorsalis*, projecting about one-third its length before eyes, about twice as long as broad; frons one-third as broad as long, slightly narrowed at ocelli.

Thorax slender; prothorax not much broader than head; scutellum long. Calcar slender. Elytra long and very slender.

Male genitalia somewhat similar to *dorsalis*; styles more slender and delicate, very acute and slender distad.

Described from one male, taken at Belize, British Honduras, by J. D. Johnson. This species is similar in many respects to the northern *S. dorsalis*.

Type-specimen.—In collection of Pomona College.

STENOCRANUS SACCHARIVORUS Westwood.

Plate 46, figs. G, I; plate 49, fig. L.

Delphax saccharivora WESTWOOD '83: 413.

Stenocranus? *saccharivorus* VAN DUZEE '97:232; '07:43; '08:196.—KIRKALDY '06:409.

Length of body, female 3.8 mm.; male, 2.7; width of vertex, 0.18; width of frons, 0.18; antennæ I, 0.09; II, 0.24. General color yellowish orange, head occasionally darker; antennæ with black stripe longitudinally. Body very slender.

Head moderately long, narrower than prothorax; vertex long, slightly narrowed at apex, projecting at least two-fifths of its length beyond eyes, median carina almost wanting, laterals high; frons elongate, narrow above, diverging to apex, not strongly carinate. Eyes moderately large, somewhat emarginate below; antennæ similar to *rostrifrons*.

Thorax long, narrow, somewhat compressed, not strongly carinate; pronotum short, quite deeply emarginate behind; scutellum almost four times as long as pronotum; calcar as in *rostrifrons*. Elytra long, slender, attenuate at base, not maculate.

Male genital segment moderately broad; anal tube without ventral processes; anal style long, slender, concave beneath; pygofer produced caudad somewhat below anal tube; genital styles stout, simple, widespread, apex constricted slightly, recurved, acute.

Female ovipositor sheath somewhat similar to *rostrifrons*, narrower than in *dorsalis*.

Redescribed from three males and four females from Habana and Cayamas, Cuba (Baker). This species in some respects resembles *S. rostrifrons*. They correspond very closely with Westwood's original description.

STENOCRANUS ROSTRIFRONS, new species.

Plate 46, fig. J; plate 49, fig. P.

Length of body, 3.6 mm.; width of vertex, 0.20; length to apex of head, 0.72; width of frons, 0.21; antennæ I, 0.07; II, 0.21. General color yellowish orange; frons with a slender black stripe near apex of head above; antennæ lineated narrowly with black beneath or in front.

Head long, narrower than prothorax, strongly carinate between eyes, produced almost two-thirds of its length beyond eyes, curved down somewhat and resembling very closely a bird's beak, acute at apex; vertex very elongate, narrow, about four times as long as broad, narrowed anteriorly; median carina almost wanting; frons elongate, broadest below, not strongly carinate; eyes rather small; ocelli conspicuous. Antennæ not as long as width of head between antennal sockets, II about three times as long as I.

Thorax slender, long, not strongly carinate; pronotum about two and a half times as long as scutellum, broadly emarginate behind. Calcar typical, pubescence slight. Elytra long, strongly attenuate at base, more rhomboidal apically than in congenors, maculate on membrane veins; venation somewhat different from that of congenors.

Female ovipositor sheath somewhat broadened, about midway between foliaceous and cylindrical.

Described from one female from Habana, Cuba (Baker).

Type-specimen.—In collection of Pomona College.

STENOCRANUS SIMILIS, new species.

Plate 46, figs. D, H.

This species is about the same size throughout as *S. dorsalis*, and superficially resembles it very closely. The dorsal white vitta is seldom or indistinctly present; general color similar; frons less black between carinæ.

Vertex relatively shorter than in *dorsalis*, projecting a little less before eyes; antennæ longer, II almost four times as long as I. Prothorax about as long as vertex; calcar large; elytra similar except that macula covers posterior half entirely or nearly so, not extending on to corium.

Male pygofer large; anal tube long; produced ventrad into two much longer processes than in *dorsalis*; anal style short; genital styles large, constricted one-third of length from base, distal third converging to acute apex.

Female genital segment longer and narrower than in *dorsalis*; ovipositor sheath not foliaceous, cylindrical and extending almost to tip of abdomen.

Described from one female and four males from Alabama (Baker), labeled *S. lautus* Van Duzee. These are entirely distinct from the type-specimen of this species. The characters most widely differing from the other species are the genitalia of both sexes.

Type-specimen.—Cat. No. 15977, U.S.N.M.

STENOCRANUS CROCEUS Osborn and Ball.

Plate 46, fig. M; plate 49, fig. O.

Stenocranus croceus OSBORN and BALL '96:233.

Kelisia crocea VAN DUZEE '97:233.—OSBORN '97:235.

Length of body, 3.4 mm.; width of vertex, 0.24; width of frons, 0.28; antennæ, I, 0.06, II, 0.22. General color light yellow, with some whitish areas; vertex and dorsum between lateral carinæ whitish, venter pale. Body rather large.

Head moderately long, relatively quite broad, distinctly narrower than prothorax, rather strongly carinate; vertex broad, subrectangular, produced only about a fourth of its length before eyes, distinctly longer than broad; frons long, narrowed between eyes, sides subparallel below ocelli; antennæ rather short, II three times as long as I, or more.

Thorax long, not broad; pronotum two-thirds as long as vertex, one-third as long as scutellum, long behind eyes, rather strongly carinate; calcar typical, rather large, finely dentate. Elytra long, subhyaline, quite broad.

Female ovipositor sheath cylindrical, not expanded.

Redescribed from three females, two from Kansas and the other from Massachusetts. This species was placed in the genus *Kelisia* by Van Duzee, but I can see no justification for such a disposition of it, since it is manifestly more closely related to members of the genus *Stenocranus* than to *Kelisia*, although the vertex is rather broader than usual in the genus.

STENOCRANUS FELTI Van Duzee.

Stenocranus felti VAN DUZEE '10:88.

Locality.—New Hampshire (Van Duzee), New York (Felt).

STENOCRANUS PALAETUS Van Duzee.

Stenocranus palaetus VAN DUZEE '97:232; '08:196.

Locality.—Florida (Van Duzee).

STENOCRANUS MACULIPES Berg.

Stenocranus maculipes BERG '79:223; '84:142.

Locality.—Argentina, South America.

I have been unable to include this species in the foregoing synopsis.

STENOCRANUS VITTATUS Stål.

Delphax vittata Stål '62:315—VAN DUZEE '97:261.

This is apparently identical with *S. dorsalis* Fitch, but it is hardly advisable to make it synonymous until further evidence is obtainable. It is without doubt a *Stenocranus*.

Locality.—Carolina and Pennsylvania.

Genus MEGAMELANUS Ball.

Similar in general appearance to *Megamelus*, differing chiefly in cephalic characters. Head scarcely narrower than pronotum, sharply angled dorso-ventrally at apex at union of vertex and frons, produced distinctly beyond eyes; vertex rather pentangular, appearing often to be triangular because of prominent lateral carinæ, with an oblique carina (or semblance of one) on extreme apex extending from median carina toward eyes; frons as broad above as below, sides arcuate; clypeus convex, not or very feebly carinate; antennæ usually shorter than frons, terete; eyes emarginate beneath. Lateral carinæ of pronotum extending to hind margin or nearly so. Legs rather short; hind tibiæ usually about as long as femora; calcar thicker and less foliaceous than in *Megamelus*.

Type of genus.—*Megamelanus bicolor* Ball.

This genus differs from *Delphacinus* in having the notum and frons strongly carinate, while in the type species of *Delphacinus*, *D. mesomelus* Boheman, the carinæ are almost obsolete.

KEY TO THE SPECIES.

- a¹. Vertex very long, length beyond eyes greater than long diameter of eye; apex of head very acute. *elongatus* Ball.
- a². Vertex acute at apex, but not extending beyond eyes to such a length.
 - b¹. Dorsal surface of body with a red stripe on each side outside of lateral carinæ, extending entire length of body; body very long, more than 4 mm. *rufivittatus* Ball.
 - b². Body without red stripes on dorsal surface.
 - c¹. Frontal carinæ margined with brown; clypeus with traces of median carina. *frontalis*, new species.
 - c². Frontal carinæ without brown margins; clypeus without carinæ.
 - d¹. Head, pronotum, scutellum and elytra yellowish, abdomen and venter black; body small. *bicolor* Ball.
 - d². Color mostly black, not white as above. Body not small. *spartini* Osborn.

MEGAMELANUS BICOLOR Ball.

Plate 45, figs. S, U; plate 46, fig. A.

Megamelanus bicolor BALL '02: 265.

Length of body, 2 mm.; width of vertex, 0.21; length to apex, 0.27; width of frons, 0.24; antennæ, I, 0.05, II, 0.13. General color black and yellowish white, as follows: Frons, vertex, antennæ, eyes, pronotum, scutellum, and elytra (brachypterous), yellow; clypeus, venter, abdomen, legs (except tarsi and tips of femora and tibiæ), black. Body small.

Head almost as broad as pronotum; vertex longer than pronotum, pentangular, with the prominent lateral carinæ giving it the appearance of being triangular. acutely angled at apex; frons about twice as long as broad, sides arcuate, broadest across middle; antennæ about half as long as frons, I half as long as II. Pronotum as long as scutellum; latter small. Legs short; hind tibiæ about as long as femora; calcar short, thick, finely pubescent.

Male pygofer moderately large, subglobular, excised sinuately beneath; genital styles short, cultrate, rather spatulate; anal style scarcely exerted.

Redescribed from one brachypterous male from Arizona (Baker).

MEGAMELANUS FRONTALIS, new species.

Length of body, 2.9 mm.; width of vertex, 0.24; length to apex of head, 0.32; width of vertex, 0.29; antennæ, I, 0.07, II, 0.15. General color, soiled yellowish brown throughout; frontal carinæ margined with brown; elytra yellowish; body moderately long.

Head a little narrower than prothorax, longer than pronotum; vertex similar in appearance to *bicolor*; frons a little more than half as broad as long, sides arcuate, acutely angled above; clypeus with median carina feebly present; antennæ slightly more than half as long as frons. Thorax typical; legs short, stout; calcar thick, finely pubescent. Elytra long, rather slender, finely pulverulent-yellow.

Described from one macropterous female from Colorado (Baker).

Type-specimen.—Cat. No. 15978, U.S.N.M.

MEGAMELANUS ELONGATUS Ball.

Megamelanus elongatus BALL '05: 118.—VAN DUZEE '08: 196.

Locality.—Florida.

MEGAMELANUS RUFIVITTATUS Ball.

Megamelanus rufivittatus BALL '05: 119.

Locality.—Thompsonville, Georgia (Ball).

MEGAMELANUS SPARTINI Osborn.

Megamelanus spartini OSBORN '05: 375.—VAN DUZEE '08: 197.

Locality.—Ohio, Florida.

Genus DICRANOTROPIS Fieber.

Pissonotus VAN DUZEE.—*Peregrinus* KIRKALDY.

Head not as broad as prothorax, strongly to weakly carinate; median carina forked distinctly below apex of head, from one-fourth to one-half its length below, branches usually well separated, sometimes closely approximated; antennæ as in *Megamelus*, usually a little longer. Lateral carinæ of pronotum usually straight, sometimes curved out behind eyes, often not reaching hind margin. Legs and elytra as in *Megamelus*. Body often robust.

Type of genus.—*Dicranotropis beckeri* Fieber.

This genus is related rather closely in many respects to *Megamelus*. I include in it Van Duzee's genus *Pissonotus*, which has some fairly good group characters but not enough to warrant the erection of a separate genus. *Peregrinus* Kirkaldy, erected for *maidis* Ashmead, is not maintained but merged into this genus, which formerly contained that species.

KEY TO THE SPECIES.

- a¹. Frons and clypeus similar in color, or nearly so, latter not darker; usually macrop-
terous.
 - b¹. Body large; vertex rather broad; branches of frontal carina well separated;
membrane veins maculated at apex; male genital styles large, hook-shaped.
maidis Ashmead.
 - b². Body smaller, slender; vertex narrow; branches of frontal carina rather close
together; elytra maculate at apex; genital styles short, cultrate.
cubanus, new species.
- a². Clypeus and forecoxae black, making a dark band across breast; brachypterous
forms common; antennae rather elongate.
 - b¹. Branches of median carina well separated from point of furcation.
 - c¹. General color black or very dark.
 - d¹. Carinae almost obsolete on apex of head; frons moderately broad.
marginatus Van Duzee.
 - d². Carinae distinct on apex of head; frons narrow.
 - e¹. Pronotum entirely black; elytra brown.....*ater* Van Duzee.
 - e². Pronotum white posteriorly; elytra whitish hyaline.
delicatus Van Duzee (dark form).
 - c². General color brown to light brown or honey yellow; genital styles very small,
slender; anal tube with two long ventral processes.
 - d¹. Frons with more or less conspicuous white, transverse markings, otherwise
brown; body brown.
 - e¹. Genital styles broadened, flexed and square at apex; frontal markings
obscured.....*frontalis*, new species.
 - e². Genital styles linear, slightly arched, acute at apex; anal tube processes
very long; frontal markings conspicuous.....*aphidioides* Van Duzee.
 - d². Frons without such transverse markings, flavous except apically white;
body honey yellow to brown, sometimes black; genital styles as in
aphidioides.....*delicatus* Van Duzee.
 - b². Branches of frontal carina closely approximated, sometimes almost contiguous.
 - c¹. Lateral carinae of pronotum extending to hind margin or very nearly so.
 - d¹. Pronotum usually more or less white posteriorly, often almost entirely so;
carinae distinct at apex of head; head very narrow.
 - e¹. Body not large; vertex narrow; pronotum seldom entirely white.
bakeri, new species.
 - e². Body rather large, broad; vertex broader than above species; pronotum
often almost entirely white; genital styles smaller.
bakeri abdominalis, new variety.
 - d². Pronotum not whitish posteriorly; carinae indistinct on apex of head; head
broader.....*pallipes* Van Duzee.
 - c². Lateral carinae of pronotum becoming obsolete before reaching hind margin,
often considerably before; clypeus and frons only slightly differentiated in
color.
 - d¹. Color piceous brown throughout.....*brunneus* Van Duzee.
 - d². Color soiled yellowish brown throughout.....*dorsalis* Van Duzee.

DICRANOTROPIS MAIDIS Ashmead.

Plate 47, figs. A, B.

Delphax maidis ASHMEAD '90:323.*Dicranotropis maidis* VAN DUZEE '97:240.—VAN DINE '11:34.*Peregrinus maidis* KIRKALDY '06:407; '07:132.—VAN DUZEE '07:43; '08:197.*Pundaluoya simplicia* DISTANT '06:468.

Average length of body, 3.2 mm.; width of vertex, 0.22; width of frons, 0.26; antennæ I, 0.15, II, 0.26. General color light yellowish brown to brown; frons, both antennæ joints apically, femora and venter brown to black; venter of abdomen black, connexivum whitish; tibiæ pale; elytra hyaline, maculate apically on membrane veins. Body moderately large.

Head small, considerably narrower than prothorax, rather strongly carinate; vertex moderately broad, almost square, produced a little before eyes; frons rectangular, median carina forked about opposite ocelli. Antennæ rather long, stout, I more than half as long as II; II rather asperose. Pronotum rather long, broad, lateral carinæ straight, often not reaching hind margin; scutellum long; legs long, hind tibiæ longer than femora; calcar about half as long as basal tarsus, margin very finely dentate.

Male pygofer moderately large, aperture relatively small, margin sinuate; genital styles occupying most of aperture, hook-shaped, acute, and almost touching at tip.

Redescribed from numerous males and females from Habana, Cuba (Baker); Alabama, Acapulco, Mexico (Baker), Chiapas, Mexico (Crawford); Nicaragua (Baker); Campinas and Para, Brazil (Baker); and Kohala, Hawaii (Van Dine).

DICRANOTROPIS CUBANUS, new species.

Average length 2 mm.; width of vertex, 0.15; width of frons, 0.18; antennæ I, 0.09, II, 0.18. General color brown, with whitish vitta on dorsum between lateral carinæ; pronotum and scutellum darker outside of lateral carinæ, sometimes almost black; lateral margin of pronotum whitish; vertex whitish; frons brown between carinæ, latter white or pale; abdomen usually light brown; legs and antennæ light brown; elytra hyaline, black at tip of clavus and with a brown crescent-shaped macula on apical margin. Body slender.

Head short, narrower than prothorax, moderately produced before eyes; vertex about square, narrow; frons about twice as long as broad, or more, narrowed between eyes, sides nearly straight or slightly diverging; median carina forked at or slightly above ocelli; antennæ reaching about to clypeus, I half as long as II, or less.

Thorax rather slender; lateral pronotal carinæ usually flexed outward or subobsolete before hind margin, sometimes percurrent to margin. Legs rather long; hind tibiæ longer than femora; calcar long, large, thin, margin finely dentate. Elytra rather long.

Male genitalia similar to *Megamelus approxima*, but genital styles about half as long, scarcely divergent.

Described from more than 150 specimens of both sexes, macropterous and brachypterous, from Habana, Cuba (Baker).

Type-specimen.—In collection of Pomona College.

Paratype.—No. 15979, U.S.N.M.

DICRANOTROPIS MARGINATUS Van Duzee.

Plate 46, figs. P, Q.

Pissonotus marginatus VAN DUZEE '97:236; '08:198.—OSBORN '97:235.

Length of body, 2.6 mm.; width of vertex, 0.21; width of frons, 0.26; antennæ I, 0.13, II, 0.37. General color dark, abdomen and notum black, elytra (brachypterous) red with apical margin white, vertex and frons red, clypeus black, pleura brown to black, sternum yellowish, legs brown.

Head narrower than prothorax; vertex a little longer than broad, weakly carinate; frons subrectangular, twice as long as broad, slightly narrowed above; median carina forked a little below apex of head; genæ broad; antennæ about as long as frons, I fully one-third as long as II. Lateral carinæ of pronotum extending to hind margin. Legs rather stout; foretibiæ somewhat compressed; hind tibiæ longer than femora; calcar half as long as basal tarsus.

Male genitalia somewhat obscured; genital styles short, appressed to pygofer; with a yellow ellipse near base of pygofer beneath.

Redescribed from two males and two females (brachypterous) from Greensburg, Pennsylvania (Wirtner). The male genital segment is somewhat different from that of the other species, being more evenly rounded and the styles less conspicuous.

DICRANOTROPIS DELICATUS Van Duzee.

Pissonotus delicatus VAN DUZEE '97:237; '07:44; '08:198.

Pissonotus basalis VAN DUZEE '97:238; '08:198.

Length of body, 2.7 mm.; width of vertex, 0.23; width of frons, 0.26; antennæ I, 0.20, II, 0.38. General color reddish brown to dark reddish brown; brachypterous elytra margined apically with white more or less completely; pronotum occasionally with a narrow white margin posteriorly; frons narrowly margined with white at apex; clypeus and forecoxae black; tarsi and basal antennal joint black; legs reddish with black stripes. Body rather small.

Head smaller, narrow, short, not strongly carinate; vertex short, slightly longer than broad; frontal carina forked a little below apex of head, indistinct at apex; antennæ about as long as frons, I half as long as II. Lateral carinæ of pronotum percurrent to hind margin. Elytra usually truncate, short, sometimes macropterous. Legs rather short, hind tibiæ scarcely longer than femora, calcar a little more than half as long as basal tarsus.

Male genitalia similar to *bakeri*, with genital styles smaller, less prominent, more slender; processes of anal tube very small, blunt, not prominent.

Redescribed from three macropterous females from Alabama (Baker), one macropterous male from Columbus, Texas, 46 brachypterous males and females from Colorado and Alabama (Baker), and one brachypterous female from Mexico (Baker).

The one male from Columbus, Texas, is one of the two specimens upon which Van Duzee based his original description of *Pissonotus basalis*. *P. delicatus* he first described from a single brachypterous female, so that it is not surprising that he did not recognize the two as identical, as they surely are.

DICRANOTROPIS FRONTALIS, new species.

Plate 46, fig. L.

Length of body, 2.6 mm.; width of vertex, 0.22; width of frons, 0.27; antennæ I, 0.18, II, 0.32. General color brown; abdomen brown, with light blotches, lighter at base; elytra light brown, veins light; scutellum brown, pronotum dirty white with brown blotches; vertex dirty white with a black spot in each fovea; frons light brown with several transverse white bands, as in *aphidioides*; clypeus black; forecoxae black, femora and tibiæ light brown striated with black.

Somewhat similar to *aphidioides*. Head short; vertex weakly carinate, rather broad in female, as broad as long, but in male slightly longer than broad; frontal carina forked well down from apex of head, indistinct on apex; antennæ as long as frons, I half as long as II. Lateral carinæ of pronotum disappearing near hind margin. Hind tibiæ longer than femora (one abnormal tibia has three lateral spines); calcar more than half as long as basal tarsus, margin finely dentate. Male genitalia in general similar to *bakeri*, but with genital styles sinuate, clavate-spatulate at tip; pygofer at base of styles with one pair of short, rounded processes; anal tube produced ventrad into a pair of very long, acute processes, extending almost to base of styles.

Described from one brachypterous pair, the male from Claremont, California, and the female from Oregon (Baker).

Type-specimen.—Cat. No. 15980, U.S.N.M. (female); (male), in collection of Pomona College.

DICRANOTROPIS APHIDIOIDES Van Duzee.

Pissonotus aphidioides VAN DUZEE '97:239.—OSBORN '97:235; '04:100.

Average length of body, 2.9 mm.; width of vertex, 0.20; width of frons, 0.30; antennæ I, 0.12, II, 0.34. General color dull brown, rather conspicuously blotched with white and black; sides of abdomen irregularly black; pronotum and scutellum pale between lateral carinæ, brown outside; frons and apex of vertex mottled, dark brown

except a broad white band across apex of frons and genæ and several partially transverse white bands on frons—two near base, one midway, another not continuous near margin of apical white margin; several white spots besides on vertex and frons; clypeus and forecoxae black; antennæ black at base, paler apically; legs pale, lineated with brown; elytra (brachypterous) brown, veins whitish. Body stout.

Head almost as broad as prothorax, carinæ rather weak; vertex longer than broad, rounded in front; frons subrectangular, median carina forked about opposite ocelli. Antennæ rather long, I less than half as long as II. Lateral carinæ of pronotum often curved out behind eyes, not reaching hind margin. Elytra reaching to second abdominal segment, veins prominent. Male genitalia similar to *bakeri*; styles blunt at tip; anal tube processes very long.

Described from one male and five females (brachypterous) from Massachusetts and one macropterous male from Arizona, one macropterous female from Colorado (Cockerell), and two brachypterous females from Santa Clara County, California (Baker). The genital characters of the western forms are slightly different from the eastern specimens, but I believe it is all the same species nevertheless. The frons in the two California specimens is uniformly lighter in color, though somewhat obscured. In most respects this corresponds very closely with Van Duzee's brief description and I have no doubt it is the same.

DICRANOTROPIS BAKERI, new species.

Plate 46, fig. N.

Very similar to *D. delicatus* in proportions and color, differing chiefly in male genitalia; processes of anal tube rather long, thick, rounded at tip, directed outward; with a pair of slender acute stylets between processes; genital styles larger and thicker than in *delicatus*.

Described from a brachypterous pair from San Marcos, Nicaragua (Baker), and seven brachypterous females from Habana, Cuba (Baker). This is very closely related to *delicatus* and further collecting in intermediate localities may show that it is not specifically distinct.

Type-specimen.—In collection of Pomona College.

DICRANOTROPIS BAKERI ABDOMINALIS, new variety.

Body a little larger than in species; vertex a little broader; frontal carinæ more distinct on apex of head; pronotum often nearly entirely white or whitish, with median portion of scutellum concolorous with it; elytra (macropterous) with a small black or brown area near tip of clavus. Abdomen large, with a lighter and variegated area on median two-thirds of dorsum, the rest brown. Male genitalia as in species, except genital styles distinctly smaller and shorter, more slender and acute.

Described from two brachypterous males and one brachypterous and four macropterous females from Belize, British Honduras (Johnson), and three macropterous and seven brachypterous females from Managua, Nicaragua (Baker).

Type-specimen.—In collection of Pomona College.

DICRANOTROPIS PALLIPES Van Duzee.

Plate 46, fig. R.

Pissonotus pallipes VAN DUZEE '97:238.—SWEZEY '04:35.

Length of body, 3.1 mm.; width of vertex, 0.20; width of frons, 0.28; antennæ I, 0.18, II, 0.36. General color black or dark reddish brown, front, vertex, legs, and sternum reddish. Body surface polished.

Similar to *marginatus* in vertex and frons; head relatively a little narrower in brachypterous forms; macropterous form with thorax longer and narrower; scutellum more than twice as long as pronotum; carinæ more distinct on apex of head than in brachypterous forms; basal joint of antennæ half as long as II. White bands on elytra and pronotum wanting. Pygofer of male excavated on each side for reception of the anal tube processes; genital styles broad, short, cultrate, finely toothed on inner margin, without median ridge.

Redescribed from four females and one male, all brachypterous, from Greensburg, Pennsylvania (Wirtner), one macropterous male from Colorado (Baker) and one macropterous female from Alabama. The macropterous forms approach more closely to *Megamelus*.

DICRANOTROPIS BRUNNEUS Van Duzee.

Plate 46, fig. K.

Pissonotus brunneus VAN DUZEE '97:237; '08:198.—SWEZEY '04:35.

Length of body, 2.4 mm.; width of vertex, 0.18; width of frons, 0.24; antennæ, I, 0.24, II, 0.25. General color dark; head and thorax brown to reddish brown, lighter on frons; elytra with veins whitish or yellowish; abdomen black; legs brown.

Very similar to *pallipes*; carinæ on apex of head not entirely obsolete; basal antennal joint less than half as long as II; male genitalia similar to *pallipes*, but genital styles longer, more deeply sinuate on inner margin.

Redescribed from two males and one female (brachypterous) from Greensburg, Pennsylvania (Wirtner). This is very close to *pallipes*, and may best be distinguished from it by the male genitalia.

DICRANOTROPIS DORSALIS Van Duzee.

Pissonotus dorsalis VAN DUZEE '97:239.

Length of body, 3 mm.; width of vertex, 0.21; width of frons, 0.27; antennæ, I, 0.13, II, 0.30. General color dirty brown, vertex somewhat blotched, frons lighter, clypeus dark, elytra brown with veins light, legs brown with lighter areas. Body stout.

Vertex broad, relatively short, weakly carinate; frontal carina forked well below apex of head, subobsolete on apex; clypeus weakly carinate; antennæ not quite as long as frons, I nearly half as long as II. Thorax broad; lateral carinæ of pronotum disappearing before reaching hind margin. Legs long; hind tibiæ distinctly longer than femora; calcar about half as long as basal tarsus.

Redescribed from one female from Long Island, New York (Zabreske).

DICRANOTROPIS ATER Van Duzee.

Pissonotus ater VAN DUZEE '97:237; '08:198.—OSBORN '97:235; '00:65.

One female in the collection is labeled as this species, but it does not correspond with Van Duzee's description very closely.

Locality.—New York (Van Duzee), Washington, District of Columbia, Ohio (Hine), Iowa (Osborn).

After the preparation of this manuscript had been completed a paper by C. S. Spooner appeared,¹ describing several new species in this genus, as well as one species of *Liburnia* and one of *Achorotile*. There are no illustrations with the descriptions and, since there is such a variation in coloration of these insects and color characters are the ones given most fully by Mr. Spooner, I have not wished to attempt to include these in the synopsis of the species. These will be treated in a subsequent paper on the same group.

DICRANOTROPIS GUTTATUS Spooner.

Pissonotus guttatus SPOONER '12:233.

This is apparently a dark form of *D. delicatus*. The range of color in this species is quite large, as shown by the examination of a large series. A description of a species in this group based only on one female is not very satisfactory.

Locality.—Ithaca, New York, August, 1896.

DICRANOTROPIS FOVEATUS Spooner.

Pissonotus foveatus SPOONER '12:234.

This appears to be somewhat similar to *aphidioides* or *frontalis*.

Locality.—Corpus Christi, Texas, May, 1907.

DICRANOTROPIS VARIEGATUS Spooner.

Pissonotus variegatus SPOONER '12:235.

This, also, is described from a single female. Female characters alone are very inadequate for the determination of species.

Locality.—Corpus Christi, Texas, June, 1907.

DICRANOTROPIS DIVARICATUS Spooner.

Pissonotus divaricatus SPOONER '12:236.

D. basalis, which Mr. Spooner says this resembles, was merged with *delicatus*. Perhaps this is distinct, however.

Locality.—Middletown, New York, July, 1910.

¹ Can. Ent., vol. 44, Aug., 1912, pp. 222-242.

DICRANOTROPIS BINOTATUS Spooner.

Pissonotus binotatus SPOONER '12:239.Close to *D. marginatus*, according to Mr. Spooner.*Locality*.—De Witt, Mitchell County, Georgia, April, 1912.

DICRANOTROPIS(?) PICEUS Spooner.

Pissonotus piceus SPOONER '12:238.

This may not belong to this genus, because of the foliaceous tibiæ. Judging from the description it seems to belong to *Phyllodinus*. Only the female is described.

There seems to be close relationship between the two genera, *Phyllodinus* and *Dicranotropis* in some characters, especially the male genitalia and the head. The foliaceous condition of the legs is variable in degree. It may be that further study will relate them even more closely.

BAKERELLA new genus.

Allied to *Dicranotropis* and *Megamelus* but distinct from both. Head as broad as prothorax, strongly carinate, vertex rather broad, about square, slightly produced before eyes; frons very short and broad, almost round; median carina forked slightly above ocelli, strongly divergent; clypeus small, tricarinate; genæ following curve of frontal margin, abruptly angled below ocelli. Antennæ very short, not reaching to clypeus, I much shorter than II. Lateral carinæ of pronotum curved out, not reaching hind margin. Legs very short; calcar very short, thick, margin scarcely dentate. Elytra maculated.

Type of genus.—*Bakerella maculata*, new species.

I take pleasure in naming this genus for Prof. C. F. Baker.

BAKERELLA MACULATA, new species.

Plate 47, fig. D.

Length of body, 2.4 mm.; width of vertex, 0.27; width of frons, 0.34; antennæ, I, 0.05, II, 0.15. General color dark brown, carinæ slightly pale, connexivum of abdomen white; frons with several white spots. Body medium in size.

Head broad; vertex strongly carinate, nearly square; frons only a little longer than broad, sides strongly rounded; lateral carinæ terminating well within laterals of clypeus; antennæ stout, I less than one-third as long as II. Pronotum moderately long; carinæ of scutellum evanescent. Legs very short; hind tibiæ scarcely longer than femora; calcar only slightly longer than breadth at base; margin not dentate. Elytra typical, long, maculated dark brown quite similarly to *L. ornata*.

Male pygofer and apertures resembling *ornata*, latter elliptical, broadest sub-basally; anal tube projecting rather prominently, small,

with two elongate, very slender approximate processes on ventral margin; styles short, pincer-like, scarcely divergent, roundly acute at apex.

Described from a macropterous pair from Acapulco, Mexico (Baker). One broken female from Texas, in the United States National Museum collection, may belong to this genus, but it is too far gone to identify with certainty.

Type-specimen.—Cat. No. 15981, U.S.N.M.

Genus MEGAMELUS Fieber.

Delphax AUTHORS (Part).

Liburnia STÅL.

Kelisia FIEBER.

Chloriona FIEBER.

Euidella PUTON (*Euides* FIEBER).

Prokelisia OSBORN.

Body rather small to medium in size, seldom large; head with eyes usually narrower than prothorax, sometimes almost or quite as broad; vertex usually about as long as broad, more or less variable in shape, usually rather quadrate, seldom very broad, produced before eyes a little (sometimes almost one-third its length before, in which case it is longer than broad); carinæ variable in distinctness from very strong to rather evanescent, sometimes almost obsolete on apex of head; median carina of frons forked at or very near apex of head (below in *M. albolineosa* sometimes); frons variable in shape from one and a half to two and a half times as long as broad, usually narrowed between eyes; clypeus usually tricarinate. Antennæ terete, seldom longer than to clypeus, often shorter, I usually distinctly shorter than II. Eyes deeply emarginate beneath; ocelli near to or touching lower corner of eye.

Pronotum straight or slightly rounded on anterior margin; lateral carinæ variable in trend from straight and reaching hind margin to more or less curved out behind eyes and not reaching margin, sometimes straight and becoming obsolete before hind margin, or bifurcate with one branch extending to or toward hind margin and the other curved outward. Scutellum tricarinate. Legs variable in length; hind tibiae usually a little longer than femora; calcar from one-half to fully as long as basal tarsus, more or less foliaceous, with posterior margin finely or coarsely dentate. Elytra (macropterous) longer than body; venation somewhat variable. Male genitalia variable; female genitalia quite constant throughout the group; ovipositor sheath cylindrical, extending to or nearly to tip of abdomen.

Type of genus.—*Megamelus notulus* Germar.

The generic name, *Megamelus* Fieber, is used here for the large group of species heretofore placed in several closely related genera, the largest of which was *Liburnia*, or *Delphax* of several authors.

These "genera," *Delphax*, *Liburnia*, *Megamelus*, *Kelisia*, *Chloriona*, *Euidella*, and *Prokelisia*, are so closely related and intergrade so completely that it is quite impossible to draw any generic line between the species constituting these groups. The principal characters heretofore used for this purpose have been the relative distinctness and the trend of the cephalic and notal carinæ, the shape of the vertex and frons, and the form of the forewings. All of these characters are very variable and inconstant, and any generic distinction between species based on them is purely arbitrary and very confusing, and, moreover, it is quite apparent that no two students would agree on the lines of division.

To a certain extent, however, these characters may be employed to divide very loosely the large genus *Megamelus* into a number of subgroups (not subgenera), which will intergrade and overlap to a certain extent. The recognition of these subgroups is solely for convenience in synoptical keys to the species, and in order to avoid error in the use of these keys, allowance must be made for a possible difference in the point of view between the author and the student.

Since there has been confusion existing so long in regard to the priority of generic names in this group, it seems necessary to present the entire case in order to clear it up:

Delphax was first used by Fabricius in 1798,¹ with a brief description as follows:

Os labio brevi conico. Antennæ compressæ, marginatæ, inocularum cantho inferiore insertæ.

This characterization could not include the species of the group with which we are dealing now, because of the form of the antennæ. The only two species mentioned under *Delphax* in this original description were *D. crassicornis* and *D. clavicornis*, in the order named, neither of which is congeneric with the species under our consideration. It is evident, therefore, that *Delphax* must be restricted to *crassicornis* and its cogenors, and can not be used for the present group of species, as has been most persistently done by several students. Spinola, in 1839, used this same species, *D. crassicornis* Fabricius, as the type for a new genus, *Araeopus*. This, of course, was impossible, and the latter must become a synonym of *Delphax*. Further reference is made to this under *Araeopus*.

In 1866 Stål² further complicated matters by restricting the name *Delphax* to *D. clavicornis*, which he erroneously supposed to be the type, and erected a new genus, *Liburnia*, for a number of species more or less related to the generic group in hand. Strangely enough, Stål used as the type of his genus *Liburnia* a species which in 1853³ he

¹ Supplementum Ent. Systematicæ, p. 522.

² Hemipt. Africana, vol. 4, p. 178.

³ I have not seen this original description. Stål treats the matter, however, in Hemiptera Africana, vol. 4, p. 179.

had used as the type of another new genus, *Embolophora monoceros*, an African species. Therefore *Liburnia* must be a synonym of *Embolophora*, and the present wide usage of the former for the large group of species is impossible.

Moreover, *Embolophora monoceros* is not congeneric with the group of species in hand, as is readily seen by a study of the description of the former. This name also must be dropped from our consideration as a possible name for this genus.

Among the names of the other "genera" merged with "*Liburnia*," the oldest tenable name is *Megamelus*, which Fieber erected in 1866 for a group of species which, in the estimation of some others besides myself, are not generically distinct from the "*Liburnia*" species. *Megamelus*, therefore, must become the name of the great group of species formerly known under the name of *Liburnia* or *Delphax*, and the type of the genus is *M. notulus* Germar, which Fieber considered the type of his genus.

Even supposing that *Liburnia* were not a synonym of *Embolophora*, it would be an open question whether or not it antedated *Megamelus*. The only known date of Stal's *Hemiptera Africana*, volume 4, in which he described *Liburnia*, is 1866, with no month given. The date of publication of the description of *Megamelus* is June 6, 1866. Perhaps the latter antedates the former, but the settlement of this point is wholly unnecessary.

The following keys are based on rather variable characters often and are intended only as guides in identification. Both alternatives in many cases should be followed through in order to avoid any error. Because of the meagerness of some descriptions and the lack of figures it is impossible to include all the described species in the keys. Those which are not included are, however, listed at the end of the descriptions, together with their bibliographical references.

KEY TO THE SPECIES.

- a¹. Lateral carinæ of pronotum rather straight, extending toward and usually to hind margin.
- b¹. Carinæ distinct on apex of head, not or scarcely evanescent; vertex somewhat produced before eyes.
- c¹. Frontal carinæ whitish or yellowish, more or less completely margined with black or brown.
- d¹. Notum brown, with a whitish median vitta extending to base of elytra; latter with a brown area above apically; frontal black markings sometimes not prominent, or even subobsolete; median carina sometimes forked a little below apex of head.....*albolineosus* Fowler.
- d². Notum without median vitta; elytra (macropterous) without brown area apically; color pale.
- e¹. Frons conspicuously constricted above.
- f¹. Frons very narrow, angulate at apex of head, diverging uniformly toward clypeus, three times as broad below as above; body rather large, elongate, whitish.....*marginatus* Van Duzee.

- f*². Frons about twice as broad below as above, sides not straight, bulging roundly.
- g*¹. Hind wings not aborted, normal.
- h*¹. Body moderately large, very light brown...*constrictus*, new species.
- h*². Body rather small, slender, almost white.
constrictus minutus, new variety.
- g*². Hind wings aborted; elytra narrow, somewhat shortened.
setigerus Osborn.
- e*². Frons scarcely constricted above; abdomen of female light, dark in male.
salina Ball.
- c*². Frons of uniform color, carinae not margined with black.
- d*¹. Body at least above brown to black; genital styles of male not bifid.
- e*¹. Frontal carinae very sharply distinct at apex of head.
- f*¹. Frons somewhat sinuate apically; elytra hyaline, brown at tip of clavus.....*scutellaris* Berg.
- f*². Frons not sinuate at apex.
- g*¹. Genital styles of male styliform, very slender, incurved, acute at tip.
- h*¹. Calcar normal; ventral fossae of pygofer very deep; macropterous elytra smoky with granulate nervures.....*piceus* Van Duzee.
- h*². Calcar unusually large, foliaceous; ventral fossae of pygofer shallow, nearly filled by processes of anal tube; elytra white.
davisii Van Duzee.
- g*². Genital styles of male cultrate, short, stout, straight on inner margin; vertex very narrow at apex.
- h*¹. Body brown to dark brown; male pygofer only moderately stout; styles not prominent.....*notulus* Germar.
- h*². Body light brown, abdomen light colored, broad; male pygofer broader transversely; genital styles rather prominent.
notulus flavus, new variety.
- e*². Frontal carinae more roundly protruding at apex of head, not sharp in outline, pygofer of male short, broad, bulging on outside of ventral fossae; genital styles very short, inconspicuous.....*metzaria*, new species.
- d*². Body light brown to yellow.
- e*¹. Male pygofer not bifurcate or abnormal; styles simple, cultrate, arched, not much divergent; body rather large; vertex and frons rather broad.
rectangularis, new species.
- e*². Male pygofer rather abnormally developed, produced conspicuously or bifurcate.
- f*¹. Pygofer produced caudad on each side of anal tube into a very slender, long, bifurcate, process; styles linear, long, bifurcate at tip; notum with a light median vitta.....*bifurcatus*, new species.
- f*². Aperture of pygofer with a long, incurved, spiniform process on margin on each side midway; styles slightly divergent, acute at tip; notum without vitta; color orange yellow.....*aurantis*, new species.
- b*². Carinae of head more or less evanescent, quite indistinct or subobsolete on apex; vertex often rather broad, rounded in front, only slightly produced before eyes.
- c*¹. Elytra hyaline, or not maculated.
- d*¹. Color dark reddish brown, pronotum white; antennae longer than frons.
albicollis Melichar.
- d*². Color straw yellow, abdomen of male brown; antennae shorter than frons.
parvulus Ball.
- c*². Elytra more or less extensively maculated.

- d*¹. Elytra short, mostly brown, hyaline on both margins; body rather small, brown..... *axialis* Van Duzee.
- d*². Elytra long, maculate only on part of membrane; body rather large, reddish..... *apicimaculatus* Fowler.
- a*². Lateral carinae of pronotum curved outward behind eyes, not reaching hind margin; curving often indistinct.
- b*¹. Carinae rather evanescent on head, indistinct or subobsolete on apex; vertex often rather broad, rounded in front, only slightly produced before eyes.
- c*¹. General color brown to yellowish.
- d*¹. Vertex and frons very broad, weakly carinate, approaching *Kormus*; genital styles relatively rather short, very stout, acute.
- e*¹. Margin of pygofer aperture sinuate; ventral notch deep; styles bifurcate at apex..... *kormusi*, new species.
- e*². Margin of aperture with a large, broad, subacute protuberance on each side near base of styles; styles very slightly bifurcate.
magnifrons, new species.
- d*². Vertex and frons not unusually broad, sometimes weakly carinate.
- e*¹. Genital styles of male more or less acute at apex, simple.
- f*¹. Frontal carinae pale; anal tube without processes; margin of pygofers not sinuate.
- g*¹. Body rather large, over 2 mm.; frons black between carinae; genital styles lanceolate..... *obscurulus* Boheman.
- g*². Body about half as large; frontal carinae brown margined; styles claw-like..... *lutulentus* Van Duzee.
- f*². Frontal carinae concolorous with foveae; anal tube with one ventral process; margin of pygofers deeply sinuate..... *analis*, new species.
- e*². Genital styles of male not acute, broad at least apically; frontal carinae concolorous.
- f*¹. Scutellum brown or black outside of lateral carinae, pale between.
- g*¹. Genital styles broad, spatulate, short, square at tip, roundly divergent above..... *campestris* Van Duzee.
- g*². Genital styles arched, conspicuously constricted midway, apex broad and rounded; pronotum brown outside of lateral carinae.
cayamensis, new species.
- f*². Dorsum entirely pale whitish; styles slender basally, broadened at apex; carinae on head weak..... *rotundatus*, new species.
- c*². General color black or very dark brown over most of body surface.
- d*¹. Macropterous elytra mostly black or brown; genital styles flat, spatulate, square at tip..... *teapæ* Fowler.
- d*². Elytra hyaline or scarcely browned.
- e*¹. Genital styles broadened and square at apex; vertex and pronotum much lighter than scutellum and abdomen..... *indistinctus* new species.
- e*². Genital styles acute at tip, simple; vertex and pronotum not lighter.
- f*¹. Frons more than half as long as broad, sides rounded, carinae pale; male pygofers normal, margin pilose; styles rather short, lanceolate.
occlusus Van Duzee.
- f*². Frons twice as long as broad, sides straight, somewhat constricted above, carinae not pale; male pygofers very large, margin produced outward on each side broadly; styles very long, acuminate, twisted.
nigridorsum new species.
- b*². Carinae distinct over apex of head; vertex usually rather narrow, sometimes broader.
- c*¹. Frons not unicolorous, carinae white or pale more or less broadly, brown or black between.

- d*¹. Genital styles of male simple, acute to subacute at tip.
- e*¹. General color brown to dark brown or black.
- f*¹. Legs more or less distinctly lineated with brown or black.
- g*¹. Genital styles of male long, extending nearly to anal tube; color of male black.
- h*¹. Carinae of head and dorsum broadly white, and quite prominent in spots; styles rather slender, straight.....*gillettei* Van Duzee.
- h*². Carinae of head and dorsum less conspicuously white; styles very long, large, pubescent; female brown....*lineatipes* Van Duzee.
- g*². Genital styles of male very short, tip remote from anal tube; abdomen black, thorax lighter with carinae white; lineation of legs brown.
nigrigaster, new species.
- f*². Legs not lineated with brown or black.
- g*¹. Genital styles widely divergent; notum without median white vitta.
- h*¹. Margin of pygofer aperture regular.
- i*¹. Aperture large, broad; styles almost horizontal, sinuate, and flexed at tip.....*pellucidus* Fabricius.
- i*². Aperture rather small, circular; styles smaller, more slender, straight, not horizontal.....*consimilis* Van Duzee.
- h*². Margin of pygofer aperture irregular, with a white, rounded protuberance on each side of base of styles; styles slender, flexed out at tip.....*albidens*, new species.
- g*². Genital styles scarcely divergent, tips close together; notum with a broad white vitta between lateral carinae.
approximatus, new species, and *sagatus* Fowler.
- e*². General color light brown to yellow.
- f*¹. Frons conspicuously narrowed between eyes, sides nearly straight below.
- g*¹. Frons black with carinae white; genital styles rather broad, narrowed suddenly at tip; anal tube with two ventral processes.
foveatus, Van Duzee.
- g*². Frontal carinae pale, margined broadly with brown or black; styles slender; anal tube without processes.....*constrictus*, new species.
- f*². Frons only slightly narrowed between eyes, sides not straight below.
- g*¹. Styles long, sinuate, very horizontal; aperture of pygofers broad.
pellucidus Fabricius (light form).
- g*². Styles arched, divergent in basal half, then convergent, apex flexed and subparallel; color whitish; frons yellow, slightly darker inside of lateral carinae.....*osborni* Van Duzee.
- d*². Genital styles not acute at tip, but broadened or bifurcate.
- e*¹. General color whitish or light yellow; frontal carinae margined with black or brown; vertex rather long; pronotum unusually long; styles stout, broadened and truncate at apex.....*circumcinctus* Van Duzee.
- e*². General color brown to black, not whitish.
- f*¹. Antennae short, not reaching to clypeus; genital styles broadened and square at apex; color brown.....*vanduzeei*, new species.
- f*². Antennae longer, reaching at least to clypeus.
- g*¹. Male pygofer deeply notched above and produced caudad more or less slenderly around anal tube.
- h*¹. Antennae a little longer than to clypeus.
- i*¹. Caudal prolongation of pygofers often more or less bifurcate at tip; styles stout, rounded or square at tip....*terminalis* Van Duzee.
- i*². Caudal prolongation less slender, rounded apically; styles very broad, flat, rounded or angulate on apical margin, inner margins arcuate, not far separated; with a light dorsal vitta on notum between carinae.....*laminalis* Van Duzee.

- h². Antennae reaching only to clypeus; caudal prolongation square at tip, never bifurcate; styles slender, broadened at tip, apical margin straight or a little concave *erectus niger*, new variety.
- g². Male pygofer not deeply notched above and not conspicuously produced caudad.
- h¹. Color black; frons narrow, sides rather straight; frontal carinae white.
- i¹. Pronotum mostly white, scutellum dark; styles with a tooth on inner margin near apex *puellis* Van Duzee.
- i². Pronotum white between carinae, black without, and white on lateral margin; scutellum white between lateral carinae; styles produced on inner margin into a long acute prolongation.
puellis mexicanus, new variety
- h². Color brown, often rather light brown; pronotum very rarely lighter; carinae very narrowly pale.
- i¹. Median frontal carina often forked below apex of head; carinae sometimes scarcely lighter than foveae; dorsum with median light vitta *albolineosus* Fowler.
- i². Median frontal carina forked at apex of head; styles broadened suddenly at apex *pacificus*, new species.
- c². Frons unicolorous, carinae not or scarcely differentiated in color from foveae.
- d¹. Genital styles simple, acute at tip.
- e¹. Color brown to black; body rather small; frons narrow, black.
- f¹. Carinae prominent on vertex and frons; color fuscous to dark brown.
basivitta Van Duzee.
- f². Carinae rather weak, not prominent; color shining black, clypeus and venter yellow; styles arcuated at apex *andromedus* Van Duzee.
- e². Color yellowish to light brown, abdomen darker.
- f¹. Elytra black; styles slender, acuminate *kilmansi* Van Duzee.
- f². Elytra pale, hyaline; styles very stout and thick, suddenly narrowed and flexed out at apex *magnus*, new species.
- d². Genital styles not acute at tip, rounded or bifurcate.
- e¹. Styles broad at least apically, rounded or square at apex.
- f¹. Color light brown to yellowish.
- g¹. Frons rather narrow; pygofer of male with prominent tooth above in profile; styles broad, rounded at apex; calcar normal.
lateralis Van Duzee.
- g². Frons moderately broad; pygofer without dorsal process; styles broad; calcar very large *humilis* Van Duzee.
- f². Color mostly brown to black; male pygofer deeply notched above, produced caudad around anal tube.
- g¹. Frons conspicuously narrowed above, sides straight; styles long, broadened and spatulate at apex.
- h¹. Elytra slightly browned; color of body sometimes light brown.
erectus, new species.
- h². Elytra glossy black; head and thorax yellowish.
erectus nigripennis, new variety.
- g². Frons not conspicuously narrowed above; styles slender, dilated at apex, enclosing an oval space; color fuscous black.
basifuscatus Fowler.
- e². Styles large, conspicuously bifurcate at apex; anal tube toothed on ventral margin.
- f¹. Color shining black; styles rather straight, dilated and broadly bifurcate at apex; anal style large *atrior* Fowler.
- f². Color reddish brown to dark; styles arcuate, stout, apex deeply bifurcate, with inner process again bifurcate; anal style short.
magnistylus, new species.

MEGAMELUS NOTULUS Germar.

Plate 46, fig. B; plate 47, figs. H-J.

Delphax notulus GERMAR '30 : 57.*Liburnia notula* EDWARDS '86 : 62; '96 : 38.—SCOTT '71 : 25.*Megamelus notulus* VAN DUZEE '97 : 233.—OSBANIN '07 : 300 (complete bibliography).*Delphax truncatipennis* BOHEMAN.*Delphax lineola* STÅL.

Length of body, 2.7 mm.; width of vertex, 0.18; width of frons, 0.20; antennæ I, 0.19, II, 0.32. General color dark brown to brown; vertex, pronotum, and scutellum between carinæ lighter than outside of carinæ; frons blotched; legs and venter lighter brown; abdomen lighter on median dorsal half.

Head narrow; vertex rather rectangular, distinctly longer than broad, strongly carinate; median carina of frons prominent on apex of head; frons narrowed above, about two-thirds as broad above as below; clypeus not strongly carinate; antennæ nearly as long as frons, I more than half as long as II, II thick. Scutellum a little longer than pronotum; legs stout; hind tibiæ a little longer than femora; calcar large, more than half as long as basal tarsus. Elytra (macropterous) somewhat smoky. Abdomen broad.

Male pygofer rounded caudad, with ventral fossa deep; anal tube not dorsal, rather large; genital styles short, inconspicuous, cultrate, blunt at tip, finely serrate on inner margin; not visible in profile (what appears to be the styles in the figure is one of the ventral processes within the fossæ).

Redescribed from one brachypterous pair from England and one macropterous female from Winchendon, Massachusetts. Reported from Ontario, Canada, New York, and New Hampshire.

MEGAMELUS NOTULUS FLAVUS, new variety.

Similar to species in form and size; lighter in color, less blotched, median dorsal area of abdomen lighter relatively. Male pygofer very broad and thick transversely, more swollen laterad than in species; genital styles larger, rather prominent; anal tube larger, ventral process longer.

Described from three males and nine females, all brachypterous, from Colorado (Baker).

Type-specimen.—Cat. No. 15982, U.S.N.M.

MEGAMELUS MARGINATUS, Van Duzee.

Plate 47, fig. Q.

Megamelus marginatus VAN DUZEE '97 : 234; '08 : 197.

Length of body, 3.2 mm.; width of vertex, 0.20; width of frons, 0.26; antennæ I, 0.08, II, 0.18. General color whitish to yellowish brown, usually the former; frontal carinæ margined with black or brown; pleuræ tinged with brown. Body rather long.

Head long, narrow; vertex converging to front, about a half longer than broad, strongly carinate; frons about half as wide above as below, with median carina distinct on apex of head, sides diverging rather evenly to near apex; eyes narrow; antennæ short, slightly more than half as long as frons, I scarcely half as long as II. Pronotum long, roundly excavate behind. Legs short; hind tibiæ not longer than femora; calcar large, nearly as long as basal tarsus. Elytra whitish, much longer than body.

Redescribed from six brachyopterous females from Massachusetts.

MEGAMELUS CONSTRICTUS, new species.

Plate 48, figs. M, R.

Size a little smaller than *M. marginata*, but proportions similar. General color very light brown; frontal carinæ margined with black; pleuræ and venter of abdomen more or less brown.

Similar in most respects to *marginatus* and closely related to it, differing as follows: Frons more than half as broad above as below, sides roundly bulging midway instead of straight; antennæ a little more than half as long as frons. Legs more slender, shorter; hind tibiæ a little longer than femora; calcar small, scarcely more than half as long as basal tarsus, very finely dentate on margin. Elytra hyaline, scarcely white. Pygofers of male truncate, with a simple excision ventrad, without fossæ on each side of genital styles; latter long, slender, sinuate, not concealed as in many species; anal tube subdorsal, directed upward.

Described from four males and three females, macropterous, from Colorado (Baker). This species, though very similar to *marginatus*, seems to be distinct, without doubt.

Type-specimen.—Cat. No. 15983, U.S.N.M.

MEGAMELUS CONSTRICTUS MINUTUS, new variety.

Distinctly and uniformly smaller than species, but proportions similar; color as in *marginatus*, whitish, elytra whitish. Legs smaller, more slender and delicate. Male genitalia similar.

Described from ten macropterous males and females from California (Baker).

Type-specimen.—Cat. No. 15984, U.S.N.M.

MEGAMELUS ALBOLINEOSUS Fowler.

Plate 48, fig. N.

Megamelus albolineosus FOWLER '81 : 135.—VAN DUZEE '07 : 47; '08 : 203.

Length of body, 1.9 mm.; width of vertex, 0.12; width of frons, 0.19; antennæ I, 0.08, II, 0.19. General color brown; pronotum and scutellum between lateral carinæ, vertex, clypeus, lateral portion of pronotum, antennæ, and legs light yellowish brown; the rest

brown; frons brown between carinæ, latter usually yellowish, sometimes light brown. Body medium to small.

Head narrow; vertex very narrow, almost rectangular, carinæ not very prominent at apex of head; frons narrowed above, about one-third broader below than above; median carina forked usually below apex of head, sometimes at apex. Antennæ not as long as frons, I nearly half as long as II; eyes relatively large. Lateral carinæ of pronotum percurrent almost to hind margin or more or less curved out behind eyes and not reaching margin. Legs slender, rather short; hind tibiæ a little longer than femora; calcar delicate, more than half as long as basal tarsus. Elytra slender, brown apically. Male pygofers somewhat similar to *M. constrictus*; genital styles distinctly different in shape, with two teeth on inner margin, stout, subcultrate.

Described from numerous males and females from many parts of Mexico (Crawford, Baker), Nicaragua (Baker), and Habana, Cuba (Baker). The Nicaragua specimens are somewhat lighter than the Mexican forms, but structurally are identical, except that the lateral pronotal carinæ are deflexed outward before reaching the hind margin, while in the Mexican forms they are to a less extent. There is more or less variation, too, in the point of furcation of the median frontal carina. Both of these latter facts have led to considerable confusion in classifying the specimens. Two of the Nicaragua specimens bore the name of *M. albolineosa*; the other Nicaragua specimens had been determined as a species of *Dicranotropis*, while the Mexican specimens were named *Megamelus* sp. This is one of the many illustrations of the superficiality of the former system of classification.

MEGAMELUS METZARIA, new species.

Length of body, 2.8 mm.; width of vertex, 0.19; width of frons, 0.23; antennæ, I 0.18, II 0.34. General color dark brown or black; vertex, frons, and pronotum reddish brown; clypeus black, margined with white above; forecoxae black; antennæ and legs brown. Body medium to rather large.

Vertex rather rectangular, distinctly longer than broad, with carinæ not very distinct at apex, but not evanescent; frons long, narrow, diverging to apex; median carina forked slightly below apex of head; clypeus slender; antennæ about as long as frons, I half as long as II; eyes large. Thorax moderately broad. Legs rather short; hind tibiæ longer than femora; calcar not large. Elytra long, hyaline, transparent, with a brown spot at apex of clavus. Male pygofers broad, of typical shape, with ventral fossæ deep, and processes between fossæ and genital styles long, rather slender, and rounded at apex; genital styles short, styliform, inconspicuous, as in *Dicranotropis delicatus*.

Described from one macropterous male collected in Banner, Wyoming, by C. W. Metz, for whom the species is named. This resembles more or less certain species of *Dicranotropis*, and possibly additional material will show that it should be included with that genus instead of *Megamelus*.

Type-specimen.—In collection of Pomona College.

MEGAMELUS BIFURCATUS, new species.

Plate 47, fig. 8.

Length of body, 2.2 mm.; width of vertex, 0.19; width of frons, 0.24; antennæ, I 0.08, II 0.20. General color light brown or yellowish brown throughout, with a lighter vitta on median portion of notum; elytra brownish. Body rather small.

Head almost as broad as prothorax; vertex almost rectangular, moderately broad, longer than broad, not strongly carinate; frontal carinæ indistinct on apex of head, though not greatly so; frons narrowed above distinctly; antennæ not as long as frons, I scarcely half as long as II. Thorax not broad; legs slender; hind tibiæ a little longer than femora; calcar more than half as long as basal tarsus, margin finely dentate. Elytra rather short, narrow.

Male pygofer unique; ventral pygofer produced laterally on each side into a slender process, bifid at apex; dorsal pygofer spatulate, apex broadly rounded, extending beyond and much outside of ventral plate; genital styles long, sinuate, bifid at tip; anal tube large, apical, and slightly subdorsal.

Described from seven macropterous males and one female from Para, Brazil (Baker). The genitalia of this species are very remarkable, and in some other respects also it differs from the typical *Megamelus* species.

Type-specimen.—In collection of Pomona College.

Paratype.—No. 15985, U. S. Nat. Mus.

MEGAMELUS RECTANGULARIS, new species.

Plate 48, fig. 8.

Length of body, 2.6 mm.; width of vertex, 0.20; width of frons, 0.26; antennæ, I 0.07, II 0.22. General color orange-yellow, whitish on scutellar carinæ. Body medium in size.

Head narrower than prothorax, moderately long, rather strongly carinate; vertex longer than broad, rectangular, produced somewhat before eyes; carinæ distinct at apex; frons somewhat hexagonal, broadest at ocelli; genæ slightly pubescent; antennæ about reaching to clypeus. Lateral pronotal carinæ rather straight, almost reaching hind margin; scutellum long. Elytra flavous, with tips of membrane veins browned broadly. Legs typical.

Male pygofers long, somewhat pubescent, produced caudad roundly on each side of anal tube, apices close; styles cultrate, arched, tips acute, close together; aperture of pygofers elliptical.

Described from one male from Chinandega, Nicaragua (Baker).

Type-specimen.—In collection of Pomona College.

MEGAMELUS AXIALIS Van Duzee,

Plate 49, fig. A.

Kelisia axialis VAN DUZEE '97:232.—OSBORN '97:235; '04:100.

Length of body 2.4 mm.; width of vertex 0.22; width of frons 0.25; antennæ, I, 0.05, II, 0.21. General color brown to dark brown; dorsum and vertex between lateral carinæ whitish with vitta apparently extending onto anal angles of folded elytra; frons reddish brown; pronotum black at each lateral extremity; tarsi black. Body rather small.

Head broad, with eyes about as broad as prothorax, broadly rounded in front; vertex a little longer than broad, weakly carinate, slightly produced in front of eyes; frons roundly hexagonal, less distinctly so than in *guttula*; median carina almost obsolete at apex of head; clypeus small, flat; antennæ very short, II about four times as long as I.

Thorax short, broad; pronotum moderately long behind eyes; legs rather short; calcar typical, large. Elytra short, narrow, reaching a little beyond tip of abdomen, brownish except on both margins subhyaline; membrane small. Hind wings very small, vestigial.

Male pygofers rather short, typical; styles moderately stout, less acuminate and needle-like distally than in *guttula*.

Redescribed from one male and four females from Greensburg, Pennsylvania (Wirtner). This species in some respects is quite similar to the European *guttula* (*Kelisia*).

MEGAMELUS ALBICOLLIS Melichar.

Megamelus albicollis MELICHAR '03:99.—DISTANT '06:483.

Length of body 2.7 mm.; width of vertex 0.18; width of frons 0.23; antennæ, I, 0.26, II, 0.32. General color black with reddish tinge; pronotum wholly or partially white, vertex and frons reddish, clypeus black, tibiæ apically and tarsi basally whitish, rostrum light. Body moderately large, macropterous form predominating.

Head rather short, narrow; vertex narrow, a little longer than broad, carinæ indistinct on apex of head; frons variable, sides sometimes diverging toward apex, sometimes parallel on apical third or half, whitish on apical margin. Antennæ longer than frons, I almost as long as II, slender, terete. Thorax long; lateral carinæ of pronotum percurrent to hind margin. Legs long slender; hind tibiæ longer than femora; calcar long. Elytra longer than body, subhyaline.

Redescribed from nine females from Nicaragua—San Marcos, Granada, and Chinandega (Baker). It is possible that the male of this species will show it to be distinct from the oriental species to which I have referred it. Melichar considers it the same species.

MEGAMELUS CAYAMENSIS, new species.

Plate 49, fig. C.

Length of body 2.3 mm.; width of vertex 0.23; width of frons 0.26; antennæ, I, 0.09, II, 0.22. General color brown, with broad white vitta along median carina of pronotum and scutellum; elytra brown on posterior half of membrane and tip of corium. Body moderately small.

Head fully as broad as prothorax, weakly carinate; vertex about square, moderately broad; carinæ evanescent at apex; frons rectangular, not strongly carinate; antennæ reaching fully to clypeus; eyes large. Lateral carinæ of pronotum flexed out behind eyes. Elytra long, slender. Legs typical.

Male aperture of pygofers rather circular; anal tube large; styles arched, constricted midway, broadened and rounded at apex.

Described from one male from Cayamas, Cuba (Baker).

Type-specimen.—In collection of Pomona College.

MEGAMELUS KORMUSI, new species.

Very similar in size and general color and appearance to *M. magnifrons*, differing chiefly in the male genitalia, which resemble more *M. magna*. Margin of pygofer aperture less sinuate, lateral protuberances less marked, more rounded; styles not black, apex bifurcate, points rather acute; anal tube with two very long processes ventrally, reaching almost to tip of styles.

Described from one brachypterous pair from Ormsby County, Nevada (Baker). This species is very closely related to *M. magna*, and to *M. magnifrons*, but seems to be quite distinct from both in the male genitalia.

Type-specimen.—In collection of Pomona College.

MEGAMELUS MAGNIFRONS, new species.

Plate 48, figs. J, O.

Length of body 3.2 mm.; width of vertex 0.36; width of frons 0.40; antennæ, I, 0.10, II, 0.26. General color soiled yellow, with longitudinal brown markings on dorsum of abdomen; frontal carinæ narrowly margined with brown; pronotum with a brown spot on lateral margin; venter somewhat browned. Body large, robust.

Head about as broad as prothorax, rather weakly carinate; vertex broader than long, rounded in front, carinæ almost obsolete at apex of head; frons broadest above, sides not arcuate, considerably longer

than broad; carinæ moderately distinct; antennæ reaching about to clypeus, I nearly half as long as II. Eyes large.

Pronotum moderately long, straight in front, scarcely emarginate behind; lateral carinæ curved outward, not reaching hind margin. Legs rather stout, hind tibiæ a little longer than femora; calcar about three-fourths as long as basal tarsus, pubescent. Male abdomen stout, broad; pygofer large, aperture irregular on margin, produced on each side of base of styles into a large process, acute at tip; anal tube very large, produced ventrad into a pair of very long and acute processes, with the serrate tip of penis between them; genital styles stout, cultrate, roundly acute at tip, divergent strongly.

Described from one brachypterous male from Colorado (Baker).

Type-specimen.—Cat. No. 15986, U.S.N.M.

MEGAMELUS PELLUCIDUS Fabricius.

Plate 47, figs. N, O; plate 49, fig. I.

Fulgora pellucida FABRICIUS.

Delphax pellucida FABRICIUS '03:84.—FIEBER '66: fig. 8.—OSHANIN '07:342.

Liburnia pellucida FIEBER '71:5.—EDWARDS '96:58.—VAN DUZEE '97:247.—OSBORN '04:100.

Liburnia arvensis FITCH '93:386 (Lintner).—VAN DUZEE '97:248.

Liburnia furcata PROVANCHER '89:225.—VAN DUZEE '97:248.

Liburnia detecta VAN DUZEE '97:248.

Length of body, 2.9 mm.; width of vertex, 0.24; width of frons, 0.26; antennæ, I, 0.10, II, 0.24. General color black to brown, sometimes pale yellowish brown, males usually darker than females.

Male.—Frontal carinæ, most of pronotum, margin of scutellum, connexivum whitish or yellowish white; frons deep black; second antennal segment (sometimes part of I), tibiæ, tarsi, and sometimes femora light brown; elytra slightly browned, veins black, apical margin heavy, black.

Female.—Often pale yellowish brown, more variable than male.

Head narrower than prothorax; vertex short; frons subrectangular, broadest at middle, slightly constricted above, a little more than twice as long as broad; antennæ reaching about to clypeus, I nearly half as long as II. Scutellum long; hind tibiæ scarcely longer than femora; calcar large, often nearly as long as basal tarsus, margin finely but distinctly dentate. Macropterous forms predominating.

Male genital segment moderately large, rather broad, subcylindrical; aperture broad, pentagonal, broadest sub-basally, with a fossa beneath genital styles; ventral notch deep, prominent; styles long, simple, acuminate, inflexed at apex to fit angle of aperture; anal tube dorsal or subdorsal, with two short, slender, approximate processes on ventral margin; anal style short.

Redescribed from numerous specimens of both sexes from the following localities: Several males and females from Austria, deter-

mined by Melichar; in the United States: Pennsylvania (Wirtner), Massachusetts, New Hampshire, Wisconsin (Baker), Michigan, Illinois, Wyoming (Metz), Nevada (Baker), Colorado (Baker).

Megamelus detectus Van Duzee is apparently only a light-colored form of this species.

MEGAMELUS CONSIMILIS Van Duzee.

Plate 47, fig. M.

Liburnia consimilis VAN DUZEE '97:249.

Average length of body, 2.6 mm. General color black to light yellowish brown or even yellow; carinæ of head and pronotum whitish or yellowish; frons variable in color from almost uniform dark brown between carinæ (with a slightly lighter streak in each compartment) to yellow or yellowish brown between the brown or black margins of carinæ; apex of head usually entirely yellowish brown, giving frons the appearance of being more oval than it really is; antennæ light brown, with apex of I and base of II dark; pronotum more or less whitish; legs light brown, usually lineated with brown or black.

Very similar to *M. pellucida*, differing as follows: Vertex a little longer; frons relatively broader, more oval, often about twice as long as broad or even less; carinæ less distinct on apex of head, sometimes quite indistinct. Legs longer; hind tibiæ longer than femora; calcar shorter, less distinctly dentate. Male genital segment similar; aperture of pygofer distinctly smaller, more circular; styles shorter, more slender, not flexed at tip, less divergent.

Redescribed from more than 200 specimens of both sexes, about half of the macropterous, from Colorado, Nevada, and California (coll. Baker), and two females from Washington, District of Columbia. Since there are no males from the latter locality, the identity can not be certain, but the two specimens correspond very closely in all respects to the western forms.

MEGAMELUS GILLETTEI Van Duzee.

Plate 47, fig. L.

Liburnia gillettei VAN DUZEE '97:258.

Average length and proportions similar to *M. pellucida*, vertex and frons a little broader. General color black to brown or very light brown; carinæ of head and notum whitish or yellowish white; frons deep black between carinæ; vertex and pronotum blotched irregularly brown and yellowish; scutellum similarly blotched or often almost entirely black between carinæ; abdomen blotched, connexivum white; antennæ black to light brown, in latter case apex of I and base of II black; legs lineated with black or brown; elytra slightly browned.

Similar to *pellucida* but vertex and frons broader; latter rather conspicuously reticulate. Legs stout; hind tibiae a little longer than femora; calcar a little more than half as long as basal tarsus, marginal dentation scarcely visible.

Male genitalia similar to *pellucida*, but styles shorter and more slender, not flexed at tip, much less divergent, parallel at base.

Redescribed from numerous males and females from Colorado and Nevada (Baker), and Wyoming (Metz). This species bears a close resemblance to both *pellucida* and *consimilis*, but seems to be quite distinct in the characters enumerated above.

MEGAMELUS CAMPESTRIS Van Duzee.

Plate 47, fig. P.

Liburnia campestris VAN DUZEE '97:254.

Length of body, 2.7 mm.; width of vertex, 0.26; width of frons, 0.28; antennae, I, 0.09, II, 0.20. General color yellow to light brown; frons brown next to carinae, lighter discally; genae black; pronotum sometimes slightly brown; scutellum brown or black outside of lateral carinae; meso and metapleurae brown; venter of abdomen brown; legs light; elytra subhyaline or slightly brown.

Head almost as broad as prothorax; vertex moderately broad; carinae indistinct on apex of head; frons subrectangular, less than twice as long as broad, not strongly carinate; antennae reaching to clypeus, I half as long as II. Legs moderately long; hind tibiae longer than femora; calcar thin, more than half as long as basal tarsus, margin very minutely dentate.

Aperture of male pygofer irregular, rather broad; genital styles approximate at base, in form of horseshoe, rather flat, broad, and truncate at tip.

Redescribed from numerous males and females (about 100) from New York, Pennsylvania (Wirtner), Washington, District of Columbia (Riley), Michigan, Colorado, Nevada, Arizona, California (coll. Baker and others). Some of the specimens were labeled *M. laminalis*, but that species is quite distinct from *campestris*.

MEGAMELUS LUTULENTUS Van Duzee.

Plate 49, fig. D.

Liburnia lutulenta VAN DUZEE '97:252.

Average length 2.4 mm.; width of vertex 0.26; width of frons 0.32; antennae, I, 0.08, II, 0.19. General color dull brown, abdomen darker, often black; frontal carinae obscurely margined with brown; elytra light brown to fuscous. Body small, robust.

Head almost as broad as prothorax; rather weakly carinate; frons suboval, carinae almost obsolete above; eyes large. Dorsum moderately broad, not strongly carinate. Elytra short. Legs rather short;

hind tibiae longer than femora; calcar small, marginal dentation indistinct. Abdomen short, carinate along median dorsal line.

Male pygofer short, more or less covered dorsally by pre-anal segment; aperture irregular in outline, somewhat triangular, ventral notch slight; styles short, slender, approximate at base, divergent apically, acute at apex; anal tube short.

Redescribed from two males from Chicopee, Massachusetts, one male from Minnesota, one female from Canada, and one male from Colorado (Baker).

MEGAMELUS ROTUNDATUS, new species.

Plate 48, figs. T, U.

Average length of body 2.3 mm.; width of vertex 0.18; width of frons 0.21; antennae, I, 0.10, II, 0.19. General color soiled whitish on head, pronotum and scutellum; abdomen dark brown except rufous dorsad on middle of last three segments and pygofer; pleurae and metanotum brown; legs, antennae and venter of thorax light to whitish.

Head almost as broad as prothorax, somewhat roundly produced between eyes, indistinctly carinate at apex; vertex moderately broad, sides straight; frons at least twice as long as broad, narrowed above, broadest (about one-half broader than base) at apex, not strongly carinate; antennae reaching a little beyond clypeus, I half as long as II. Pronotum moderately long, broadly emarginate behind. Elytra subhyaline, not reaching to tip of abdomen. Legs rather slender, hind tibiae a little longer than femora; calcar rather thin, large, margin distinctly dentate.

Male pygofer rather long, horizontal; aperture irregularly circular or nearly so; styles broad, constricted midway, somewhat divergent, apex broad, spatulate, arcuate, square at tip; anal tube large, without processes, subhorizontal.

Described from one brachypterous male from Alabama (Baker).

Type-specimen.—Cat. No. 15987, U. S. Nat. Mus.

MEGAMELUS TEAPE Fowler.

Plate 49, fig. E.

Liburnia teape FOWLER '81:135.—VAN DUZEE '07:46.

Average length 2.4 mm.; width of vertex 0.17; width of frons 0.20; antennae, I, 0.09, II, 0.19. General color glossy black to dark brown over entire body surface; genae pale; antennae and legs yellow; elytra black, except anterior corner of corium and anterior third of membrane yellow to hyaline.

Head short, narrower than prothorax, rather weakly carinate; vertex short; frons rather long, sides almost straight, rectilinear, more than twice as long as broad, rather weakly carinate; antennae reaching to clypeus, I about half as long as II. Dorsum weakly car-

nate; elytra rather glossy, veins distinctly setose, typical in venation. Legs moderately long, slender; hind tibiae longer than femora; calcar long, acute at tip, margin finely dentate.

Male pygofer rather long, aperture subcircular or elliptical, not sinuate; styles short, flat, spatulate, apical half arcuate, broadened and square at tip; anal tube subdorsal, not projecting above dorsal notch of pygofer.

Described from about 90 specimens of both sexes from the following localities: Nicaragua (Baker), Belize, British Honduras (Johnson), Para, Brazil (Baker), Guadalajara and Jalapa, Mexico (Crawford), and Habana, Cuba (Baker). The latter, from Cuba, seem to be more uniformly brown rather than black, with the elytra correspondingly brown.

MEGAMELUS TEAPE ALBINOTATUS, new variety.

Differs from the species only in the pronotum being whitish at least on posterior half or more, male genital styles slightly longer and less spatulate at apex.

Described from two males from Jalapa, Mexico (Crawford).

Type-specimen.—Cat. No. 15988, U.S.N.M.

MEGAMELUS INDISTINCTUS, new species.

Plate 49, fig. B.

Average length 2.2 mm.; width of vertex 0.20 m.; width of frons 0.23.; antennæ, I, 0.08, II, 0.19. General color dark brown to black on scutellum and abdomen; pronotum and vertex light brown to yellow; frons brown; antennæ and legs yellow.

Head a little narrower than prothorax, carinæ not strong, evanescent at apex in brachypterous forms; vertex rather broad; frons more than half as broad as long, a little narrowed between eyes; antennæ reaching to clypeus, I half as long as II. Dorsal carinæ not strong, laterals of pronotum somewhat curved out behind eyes. Legs stout; hind tibiae longer than femora slightly; calcar not large, marginal dentation fine. Elytra typical, hyaline.

Male pygofer typical, aperture somewhat five-sided, rather irregular; styles long, broadened and somewhat clavate-spatulate at apex; anal tube with two long processes ventrad outside of genital styles.

Described from two males (one brachypterous) and three females from Pagosa Springs, Colorado (Baker).

Type-specimen.—Cat. No. 15989, U.S.N.M.

MEGAMELUS OCCLUSUS, Van Duzee.

Plate 48, fig. Q.

Liburnia occlusa VAN DUZEE '97:256.

Length of body 2.1 mm.; width of vertex 0.28; width of frons 0.33; antennæ, I, 0.10; II, 0.18. General color black; carinæ of head, tip of antennæ, tibiae and tarsi light brown to yellowish brown. Body rather small in both sexes, robust.

Head relatively rather large, fully as broad as prothorax, weakly carinate at apex; frons broad, oval, usually about two-thirds as broad as long (may be more or less than that), sometimes pale at base; antennæ reaching at least to clypeus, I scarcely half as long as II. Dorsum moderately broad, short, with a slight foveal impression between median and lateral carinæ of pronotum and scutellum; former only slightly concave behind. Legs typical; hind tibiæ only slightly longer than femora, large at tip; calcar small, margin indistinctly dentate. Elytra (brachypterous) black, usually glossy, not attaining to tip of abdomen; macropterous elytra brown to black, moderately long. Abdomen carinate along median dorsal line.

Male pygofers notched deeply and broadly above; ventral notch rather deep, narrower; aperture subcircular, margin pubescent; styles rather long, lanceolate, acute at tip, pubescent apically; anal tube obscurely bi-dentate ventrally.

Redescribed from 24 males and females from California, Nevada, Colorado, and Mexico (Acapulco), collection C. F. Baker. In the aspect of the frons this species bears some resemblance to *M. consimilis*.

MEGAMELUS ANALIS, new species.

Plate 49, fig. Ha.¹

Length of body 1.9 mm.; width of vertex 0.21; width of frons 0.23; antennæ, I, 0.07, II, 0.20. General color orange yellow, abdomen brown to dark brown, or often light brown in female; legs and antennæ yellowish.

Head rather weakly carinate; vertex moderately broad, about square, scarcely produced in front before eyes; rounded in front; frons more than half as broad as long, broadest a little above ocelli. Antennæ reaching a little beyond margin of clypeus, II about three times as long as I. Thorax rather broad; lateral carinæ of pronotum flexed out behind eyes; legs short, rather stout; calcar very small. Elytra typical.

Male pygofers relatively large, aperture large; margin of aperture sinuate, with an acute prolongation over base of styles; dorsal notch slight; anal tube large, with one ventral process; styles short, cultrate, inner margin slightly sinuate, apex roundly acute.

Described from three brachypterous males and many brachypterous and macropterous females from Polk County, Wisconsin (Baker).

Type-specimen.—In collection of Pomona College.

MEGAMELUS NIGRIDORSUM, new species.

Plate 48, figs. A, I.

Length of body 2.7 mm.; width of vertex 0.19; width of frons 0.21; antennæ, I, 0.09, II, 0.21. General color black, usually glossy;

¹ See footnote beneath explanation of plate in Explanation of Plates, on page 637.

tips of pronotum laterad, antennæ, legs and rostrum light brown; posterior margin of two last tergites of abdomen white; elytra subhyaline, veins brown.

Head rather short, almost as broad as prothorax, weakly carinate at apex; vertex moderately broad, sides straight; frons subrectangular, slightly constricted above, about twice as long as broad; antennæ reaching about to clypeus, I half as long as II. Elytra typical. Hind tibiæ longer than femora; calcar rather small, scarcely more than half as long as basal tarsus, margin very finely dentate.

Male genital segment large, prominent; aperture of pygofer elongate, irregular, with a prominent, rounded flap projecting outward and back on each side; styles long, acuminate, stout and broad (in profile) basally, acute at apex, somewhat twisted, with a slender process at base of each; anal tube large, produced greatly ventrad and terminating in two long teeth which overlap styles; anal style horizontal.

Described from four males, one semibrachypterous, from Colorado (Baker). The genitalia of this species are very remarkable and easily recognizable at a glance.

Type-specimen—Cat. No. 15990, U.S.N.M.

MEGAMELUS NIGRIGASTER, new species.

Plate 47, fig. U.

Average length 2.8 mm.; width of vertex 0.25; width of frons 0.30; antennæ, I, 0.09, II, 0.19. General color abdomen black, thorax brown, lighter on dorsum between carinæ; frons and clypeus between carinæ black; carinæ of head and notum white, median scutellar carina broadly white; abdomen with several elongate rufous marks laterad on dorsum, and connexivum and margin of ventral preanal segment white; antennæ, I brown to black, II light; legs light brown, with more or less distinct brown lineations.

Head narrower than prothorax, rather strongly carinate; vertex rather broad, sides straight; frons less than twice as long as broad, constricted above and at apex, sides slightly sinuate; antennæ scarcely reaching to clypeus, I almost half as long as II. Notum broad; elytra subhyaline. Legs stout; hind tibiæ scarcely longer than femora; calcar robust, rather thick, dentation fine, obscured by pubescence.

Male pygofer moderately long, aperture rather elongate-ovate, irregular, deeply notched above; styles very short, thick, flexed outward and acute at tip, reaching scarcely one-third of length of aperture; anal tube large, subhorizontal; anal style very thick.

Described from two brachypterous males from Colorado (Baker).

Type-specimen.—Cat. No. 15991, U.S.N.M.

MEGAMELUS ALBIDENS, new species.

Plate 49, fig. H.

Length of body 2 mm.; width of vertex 0.21; width of frons 0.20; antennæ, I, 0.09, II, 0.19. General color black, brown on dorsum of thorax; carinæ of head and pronotum pale; frons dark brown between carinæ; antennæ (except tip of I) and legs light; a white rounded process on each side of pygofer aperture at base of styles; elytra pale, nerves broadly brown on membrane. Body rather small, slender.

Similar to *M. puella* superficially in head and thorax. Veins of membrane broadly browned. Male pygofers moderately long, aperture subcircular, margin irregular and sinuate; with a conspicuous process outside of styles at base; anal tube short, subdorsal; genital styles long, acuminate, divergent, flexed out and acute at tip.

Described from one male from Campinas, Brazil (Baker).

Type-specimen.—In collection of Pomona College.

MEGAMELUS ALBIDENS HAVANENSIS, new variety.

Similar in size and general appearance to the species, but distinctly lighter in color throughout, light brown; elytra slightly less browned on membrane veins. Male genital styles shorter, scarcely acuminate, flexed outward at tip but not acute.

Described from one male from Habana, Cuba (Baker). Perhaps this is a distinct species, but on account of its close resemblance to *albidens*, it seems more natural to consider it a varietal form only.

Type-specimen.—In collection of Pomona College.

MEGAMELUS APPROXIMATUS, new species.

Plate 49, fig. F.

Size and general proportions very similar to *M. teapæ*. General color black, with a broad white vitta on dorsum between lateral carinæ from vertex to tip of scutellum and continued on to clavus; extreme lateral portion of pronotum also white; legs and antennæ yellow; frons black; elytra as in *teapæ*.

All variations from *teapæ* are slight, except male genitalia. Styles longer, simple, slightly arched and a little divergent, apices close.

Described from two males from Managua, Nicaragua (Baker). This species appears to be very similar to *M. sagata* Fowler, and may be only the macropterous form of it. Because of some apparent differences, however, it is described as a distinct species.

Type-specimen.—In collection of Pomona College.

MEGAMELUS VANDUZEEI, new species.

Plate 48, fig. H.

Average length 2.5 mm.; width of vertex 0.21; width of frons 0.27; antennæ, I, 0.09, II, 0.18. General color brown to light brown; vertex,

pronotum, tip of scutellum, frontal carinæ, connexivum, femora (mostly) and antennæ light brown; frons dark between carinæ, often lighter on a discal streak; tibiæ lineated with brown.

Head as broad as prothorax, produced before eyes, strongly carinate; vertex straight behind, hind margin anterior to midpoint of eyes; frons fully twice as long as broad, broadest at ocelli, somewhat hexagonal, strongly carinate; antennæ short, not reaching to clypeus, I half as long as II. Pronotum rather long, with a foveal impression on each side of median carina. Elytra long, hyaline, sometimes faintly fumate, apical margin slightly darkened. Legs rather short; hind tibiæ slightly longer than short femora; calcar broad, nearly as long as basal tarsus, margin with a double row of teeth.

Male pygofers moderately long, aperture broad, transversely ovoid; styles rather long, approximate at base, divergent in apical two-thirds, broadened and square at tip, produced more outwardly than in; anal tube short, mostly covered by anal tergite, with two slender teeth on ventral margin.

Described from two males (one brachchypterous) and eight females (three brachchypterous) from Massachusetts.

Type-specimen—Cat. No. 15992, U.S.N.M.

MEGAMELUS TERMINALIS Van Duzee.

Plate 48, figs. F, K.

Liburnia terminalis VAN DUZEE '07:49.

Average length 2.5 mm.; width of vertex 0.18; width of frons 0.22; antennæ, I, 0.11, II, 0.22. General color light yellowish brown to brown, abdomen almost black except connexivum and preanal tergite white; dorsum light; frons brown between carinæ; antennæ brown, black at base of II and tip of I; legs light; elytra subhyaline, slightly browned. Body moderately large.

Head short, narrower than prothorax; vertex small, rather square, narrow; frons long, narrow, more than twice as long as broad, sides constricted a little between eyes, below subparallel, carinæ distinct. Antennæ reaching a little more than to clypeus, I fully or over half as long as II, sometimes three-fourths. Pronotum moderately long, dorsal carinæ not prominent. Legs moderately long, hind tibiæ longer than femora; calcar rather long, margin finely dentate.

Male pygofers rather long, produced caudad on each side of anal tube, as in *M. erecta*, but apex somewhat bifurcate, bifurcation more or less variable in extent; styles short, stout, ligulate, not divergent or scarcely so, blunt at apex; relative size of styles somewhat variable.

Described from 30 males and females from San Marcos, Nicaragua (Baker). It is possible that this is not identical with Van Duzee's West Indian species.

MEGAMELUS LAMINALIS Van Duzee.

Plate 47, figs. R, T.

Liburnia laminalis VAN DUZEE '97:251; '08:201.

Length of body 2.8 mm.; width of vertex 0.20; width of frons 0.23; antennæ, I, 0.12, II, 0.25. General color soiled yellow to yellowish white; frons transversely blotched with brown, clypeus brown; pronotum and scutellum light brown laterad; mesopleuræ brown; legs light; elytra slightly brown; male pygofers whitish except laterally brown.

Vertex short; frons almost twice as long as broad, broadest a little above ocelli, slightly constricted between eyes; antennæ reaching beyond clypeus, I half as long as II. Legs moderately long; hind tibiæ longer than femora; calcar typical, marginal dentation scarcely visible; brachypterous elytra reaching almost to tip of abdomen. Male pygofers deeply notched above, produced on each side caudad; genital styles large, spatulate, not plane, apex rather angulately rounded; anal tube dorsal.

Redescribed from 4 males and 12 females from Pennsylvania (Wirtner) and Illinois.

MEGAMELUS ERECTUS, new species.

Plate 48, figs. D, E.

Average length 2.1 mm.; width of vertex 0.16; width of frons 0.19; antennæ, I, 0.2, II, 0.23. General color light flavous to brown, darker on abdomen (often almost black), scutellum and metasternum.

Head short, not as broad as prothorax, distinctly carinate at apex; vertex small, narrow; frons over twice as long as broad, almost twice as broad at apex as base, sides nearly straight; antennæ reaching at least to clypeus, I half as long as II. Pronotum rather short; scutellum long; elytra typical, slightly browned; legs long; hind tibiæ considerably longer than femora, apical spines long; calcar moderately long, large, margin finely dentate.

Male pygofers broad, often erect, largely concealed in profile by pre-anal segment, produced dorsally caudad on each side of anal tube; styles long, divergent, enlarged and spatulate at tip, either square or slightly rounded on apical margin.

Described from 23 males and females from Jalapa, Mexico (Crawford), a pair from Acapulco, Mexico (Baker), four from Managua, Nicaragua (Baker), and over 100 from Habana, Cuba (Baker).

Type-specimen.—Cat. No. 15994, U.S.N.M.

MEGAMELUS ERECTUS NIGER, new variety.

Similar to species in most characters, but differing in color and slightly in male genitalia. Color uniformly darker than average for species, scutellum, abdomen, frons between carinæ, antennæ except apex of II dark brown or black; remainder light brown; pronotum

lightest. Male genital styles more slender, not broad and truncate at tip but with a small tooth on inner margin near apex, giving the appearance of being slightly bifurcate.

Described from two males and one female from Acapulco, Mexico (Baker), one male from Jalapa, Mexico (Crawford), and one pair from Habana, Cuba (Baker).

Type-specimen.—Cat. No. 15993, U.S.N.M

MEGAMELUS ERECTUS NIGRIPENNIS, new variety.

Similar to species, except elytra (brachypterous) black, glossy, reaching to tip of abdomen, pale at extreme base; thorax yellowish; male genitalia similar, styles relatively a little stouter, apex somewhat rounded.

Described from one brachypterous male from Managua, Nicaragua (Baker). The specimen bears a label "*M. nigripennis* Mel.," apparently a manuscript name.

Type-specimen.—In collection of Pomona College.

MEGAMELUS PUELLIS Van Duzee.

Plate 47, fig. K.

Liburnia puella VAN DUZEE '97:250; '08:202.—OSBORN '97:235; '00:65.

Average length of body 2.2 mm.; width of vertex 0.15; width of frons 0.21; antennæ, I, 0.09, II, 0.20. General color black to brown; carinæ of head and pronotum white or pale; frons usually black between carinæ, sometimes brown or light brown; tip of scutellum and connexivum white; antennæ and legs light brown to yellowish; femora more or less brown; elytra transparent, with a brown spot at tip of clavus; body rather slender.

Similar in aspect to *M. pellucida*, but body more slender; frons narrow, more than twice as long as broad, sides nearly straight; antennæ reaching to clypeus, I nearly half as long as II; legs slender; hind tibiæ a little longer than femora; calcar thin, not as long as basal tarsus, margin finely dentate, black. Elytra similar to *pellucida*.

Male genital segment similar to *M. consimilis*; genital styles not simple, broadened at tip or with a tooth on inner margin near tip; with a process at base between styles.

Redescribed from about 40 specimens of both sexes from Pennsylvania (Wirtner, Klages); Massachusetts; Maryland; Illinois (Knab); Mississippi (Weed); Louisiana; Alabama; Habana; Cuba (Baker); Jalapa, Mexico (Crawford); and one male from Para, Brazil (Baker). The latter differs slightly in the shape of the genital styles, the inner tooth being longer and more acute than usual, but it seems to belong to this species nevertheless.

MEGAMELUS PUELLIS MEXICANUS, new variety.

Similar in general size and appearance to the species, differing in color as follows: Pronotum and scutellum white between lateral carinæ, and former white on lateral margin behind eyes. Male genitalia similar but styles broadened at apex and extending on inner margin into a long acute prolongation.

Described from one male from Jalapa, Mexico (Crawford).

Type-specimen.—Cat. No. 15995, U.S.N.M.

MEGAMELUS PACIFICUS, new species.

Plate 48, fig. I.

Proportions and size similar to *M. puellis*; general color light brownish to dark brown, abdomen darker; scutellum black or dark brown outside of lateral carinæ, latter pale yellowish; antennæ and legs yellowish; elytra brown.

Head narrow, short; vertex small, with a black fovea in each compartment; frons narrow, sides subparallel; carinæ of head and thorax moderately pronounced. Legs long, slender; hind tibiæ considerably longer than femora; calcar rather large, margin finely dentate. Elytra typical.

Male pygofers somewhat similar to *M. puellis*; styles stouter, broadened at apex, divergent; apical margin slightly concave.

Described from about 70 specimens, both sexes, from California (Baker), 2 males from Arizona (Baker), and 1 male from Mexico (Baker).

Type-specimen.—Cat. No. 15996, U.S.N.M.

MEGAMELUS BASIVITTA Van Duzee.

Plate 49, fig. G.

Liburnia basivitta VAN DUZEE '09:202.

Average length 1.9 mm.; width of vertex, 0.15; width of frons, 0.20; antennæ, I, 0.08, II, 0.19. General color dark brown (sometimes black) to light brown; frons always a little darker than remainder of body, often black, with carinæ narrowly pale; second antennal segment usually lighter except at base; legs pale, abdomen often darker than thorax. Body rather small, slender.

Head distinctly narrower than prothorax; vertex narrow; nearly square; frons long, a little more than twice as long as broad, sides nearly straight, slightly constricted above; antennæ reaching to clypeus, I scarcely half as long as II. Pronotum moderately long; elytra (macropterous) heavily margined apically; (brachypterous) reaching nearly or quite to tip of abdomen, fulvous. Legs rather slender; hind tibiæ slightly longer than femora; calcar not long, margin very finely dentate, black.

Male pygofers moderately long, aperture ovoid; ventral notch not very deep; styles slender, divergent, curved outwardly near tip, acute; anal tube with two teeth ventrad, moderately close together.

Redescribed from about 25 males and females from Alabama, Mississippi (Weed), California, Colorado (Baker). Most of the specimens are from Alabama. The distribution is probably rather general throughout the Southern and Southwestern States.

MEGAMELUS MAGNUS, new species.

Plate 48, fig. P.

Average length, 3.4 mm.; width of vertex, 0.23; width of frons, 0.34; antennæ, I, 0.12, II, 0.25. General color soiled yellowish, abdomen brown on sides of tergum; a spot on metapleuræ and tips of tarsi black. Body large, robust.

Head a little narrower than prothorax, carinæ distinct but not sharp; vertex rather broad, about square; frons rather hexagonal, broadest at ocelli, about one and a half times as long as broad, carinæ rather distinct at apex of head; antennæ reaching about to clypeus. Lateral carinæ of pronotum flexed out quite strongly behind eyes. Legs stout; hind tibiæ a little longer than femora; calcar stout, pubescent.

Male pygofers large; margin of aperture sinuate, with a rounded protuberance about opposite tips of styles; latter large, black, stout, apex sharply flexed out and acute; anal tube large, without ventral processes; anal style thick.

Described from one brachypterous pair from Colorado (Baker).

Type-specimen.—Cat. No. 15997, U.S.N.M.

MEGAMELUS MAGNISTYLUS, new species.

Plate 48, fig. B.

Length of body, 2.6 mm.; width of vertex, 0.20; width of frons, 0.26; antennæ, I, 0.15, II, 0.26. General color reddish brown to brown; abdomen and mesopleuræ black or dark brown; legs lighter brown; elytra somewhat fumate.

Head short, broad, not quite as broad as prothorax; vertex moderately broad; sides straight; frons distinctly constricted above, broadest near apex, not quite twice as long as broad, strongly carinate; antennæ rather long, reaching beyond clypeus, I about two-thirds as long as II. Pronotum rather deeply emarginate behind. Elytra moderately long, veins dark. Legs stout; hind tibiæ a little longer than femora; calcar large, broad, as long as basal tarsus, margin with numerous rather large teeth.

Male pygofers long, aperture subcircular, broadest above, deeply notched above; styles long, prominent, arcuate, inner margin rather plane, apex deeply bifurcate with inner branch again bifurcate; anal

tube large, produced on each side ventrad into a long tooth, anal style small, short.

Described from four males and one female; one from Acapulco, Mexico (Baker), Arizona (Baker), and three from Jalapa, Mexico (Crawford). In some respects this resembles *M. atrior*, also a Mexican species, but it differs sharply in several characters from Fowler's description of that species.

Type-specimen.—Cat. No. 15998, U.S.N.M.

MEGAMELUS AURANTII, new species.

Plate 48, figs. C, G.

Average length, 2.4 mm.; width of vertex, 0.16; width of frons, 0.19; antennæ, I, 0.09, II, 0.20. General color orange yellow throughout, pronotum lighter; ocelli black; elytra flavous with tips of membrane veins brown. Body rather slender.

Head almost as broad as prothorax, carinæ rather pronounced; vertex slightly broader at base than beyond; frons rather narrow, constricted between eyes, sides subparallel, about twice as long as broad; antennæ reaching about to clypeus, I scarcely half as long as II, latter somewhat pubescent. Lateral carinæ of pronotum straight, usually extending nearly to hind margin. Legs moderately slender, hind tibiæ longer than femora; calcar rather long, thin, margin black, finely dentate. Elytra slender, typical in venation.

Male pygofer rather long, aperture elliptical, with a long, acute, spiniform process on each side a little basal of midpoint and curved inward over aperture; styles long, slender, enlarged at apex, not strongly divergent; anal tube prominent, protruding caudad, with one process on ventral margin.

Described from one male and six females from Para, Brazil (Baker). This is readily distinguished from related species by the long spiniform processes on the margin of the pygofer aperture.

Type-specimen.—In collection of Pomona College.

MEGAMELUS ANDROMEDUS Van Duzee.

Liburnia andromeda VAN DUZEE '07:46; '08:203.

One female of this species was collected in Belize, British Honduras, by J. D. Johnson. Since there is no male before me I will not redescribe the species.

Locality.—Jamaica, Florida (Van Duzee).

MEGAMELUS CULTUS Van Duzee.

Liburnia culta VAN DUZEE '07:47.

This appears to be identical with *pellucidus*, but it is rather difficult to be sure until the specimens have been examined. There is such a wide variation in this species that it is scarcely advisable to create a new species for two females only.

Locality.—Jamaica (Van Duzee).

MEGAMELUS REDUCTUS Van Duzee.*Liburnia* (?) *reducta* VAN DUZEE '07:49.

Apparently this is close to *M. albolineosa* Fowler, but only the female is known. The straight lateral carinae are not uncommon in the specimens before me of *albolineosa*.

Locality.—Jamaica (Van Duzee).

MEGAMELUS ANGULATUS Osborn.*Megamelus angulatus* OSBORN '05:274.

This has not been included in the foregoing synopsis. It is probably most nearly related to *M. marginatus* Van Duzee, or *piceus* Van Duzee.

Locality.—St. Georges, Delaware (Osborn).

MEGAMELUS LINEATIPES Van Duzee.*Liburnia lineatipes* VAN DUZEE '97:255.—OSBORN '04:100.

Locality.—Ontario, New York (Van Duzee), Ohio (Swezey).

MEGAMELUS FOVEATUS Van Duzee.*Liburnia foveata* VAN DUZEE '97:257.

Locality.—Ontario, New York (Van Duzee).

MEGAMELUS LATERALIS Van Duzee.*Liburnia lateralis* VAN DUZEE '97:253.

Locality.—New York (Van Duzee).

MEGAMELUS OBSCURELLUS Boheman.*Delphax obscurella* BOHEMAN.—FIEBER '66: fig. 7.

Liburnia obscurella SCOTT '71:28.—EDWARDS '86:80; '96:60.—VAN DUZEE '97:252.

Locality.—New York (Van Duzee).

MEGAMELUS OSBORNII Van Duzee.*Liburnia osborni* VAN DUZEE '97:250.—OSBORN '03:100.

Locality.—New York (Van Duzee), New Jersey (Smith), Michigan (Davis), Indiana, Ohio, Illinois (Swezey).

MEGAMELUS KILMANI Van Duzee.*Liburnia kilmani* VAN DUZEE '97:253.—OSBORN '03:100.

Locality.—New York (Van Duzee), Ohio (Swezey).

MEGAMELUS HUMULIS Van Duzee.*Liburnia humulis* VAN DUZEE '07:48; '08:202.

Locality.—Florida, Jamaica (Van Duzee).

MEGAMELUS CIRCUMCINCTUS Van Duzee.*Liburnia circumcincta* VAN DUZEE '08:203.

Locality.—Florida (Van Duzee).

MEGAMELUS BASIFUSCATUS Fowler.

Liburnia basifuscata FOWLER '81:134.

Locality.—Guerrero, Mexico (Fowler).

MEGAMELUS ATRIOR Fowler.

Liburnia atrior FOWLER '81:134.

Locality.—Teapa, Tabasco, Mexico.

MEGAMELUS APICIMACULATUS Fowler.

Liburnia apicimaculata FOWLER '81:136.

Locality.—Guatemala.

MEGAMELUS SAGATUS Fowler.

Liburnia sagata FOWLER '81:136.

Locality.—Vera Cruz, Mexico. May be identical with *M. approximatus*, which see on page 622.

MEGAMELUS PALUDATUS Fowler.

Liburnia paludata FOWLER '81:137.

Locality.—Guatemala.

This seems to resemble in some respects *M. pellucidus*. Its real relationship with the other species is difficult to state with only the brief description and small figures by Fowler. Perhaps it may be close to *Dicranotropis bakeri abdominalis* Crawford.

MEGAMELUS MARGINICORNIS Fowler.

Liburnia marginicornis FOWLER '81:135.

Locality.—Guerrero, Mexico (Fowler).

Judging from the shape of the head, the form of the antennae and the elytra, this appears to be a *Stobaera*. I do not wish to place it with that genus, however, until I have further evidence.

MEGAMELUS STEJNEGERI Ashmead.

Delphax stejneri ASHMEAD '99:340; '10:130.

I have not been able to see the original description of this species, but probably it must be included in the genus *Megamelus*.

Locality.—Bering Island, Sitka, Alaska.

MEGAMELUS DOLERUS Spooner.

Liburnia dolera SPOONER '12:240.

This is closely related to *M. lineatipes* (See remarks under *Dicranotropis ater* on page 600).

Locality.—Ithaca, New York, 1908.

MEGAMELUS DAVISI Van Duzee.

Megamelus davis VAN DUZEE '97:235.

Locality.—Michigan (Davis).

MEGAMELUS PICEUS Van Duzee.

Megamelus piceus VAN DUZEE, Exp. Sta. Record, 1894:792; '97:234.

Locality.—New York (Van Duzee), Michigan (Davis).

MEGAMELUS SCUTELLARIS Berg.*Megamelus scutellaris* BERG '84: 141.*Locality*.—Argentine Republic.**MEGAMELUS SEMINEGRA** Stål (not Melichar).*Delphax seminegra* STÅL '58: 276.—VAN DUZEE '07: 45; '09: 208.*Locality*.—Jamaica, Florida (Van Duzee).**MEGAMELUS SLOSSONI** Ball.*Liburnia slossoni* BALL '08: 231.—VAN DUZEE '08: 201.

Locality.—Florida (Slosson). This and the following species are quite closely related, perhaps the same species. Both were described from females only and their relation to other species is rather difficult to state.

MEGAMELUS DORSILINEA Van Duzee.*Liburnia* (?) *dorsilinea* VAN DUZEE '07: 50.*Locality*.—Jamaica.**MEGAMELUS NIGRIFRONS** Van Duzee.*Chloriona nigrifrons* VAN DUZEE '07: 45.*Locality*.—Jamaica (Van Duzee).

This apparently belongs to the genus *Megamelus*; described from a single brachypterous female.

MEGAMELUS SETIGERUS Osborn.*Prokelisia setigera* OSBORN '05: 373.*Locality*.—Cameron, Louisiana (J. S. Hine).**MEGAMELUS PARVULUS** Ball.*Kelisia parvula* BALL '02: 264.*Locality*.—Kansas, Iowa (Ball).

As nearly as can be determined from Ball's description of this species it is most nearly related to *M. axialis*. I have seen no specimens of it; except one female from Maryland which corresponds to the description to a considerable extent.

MEGAMELUS SALINA Ball.*Kelisia salina* BALL '02: 264.*Locality*.—Colorado (Ball).

The following species of *Megamelus* have been too inadequately described to be included in the synopses.

MEGAMELUS BERGI Scott.*Liburnia cognata* BERG '79: 224.*Liburnia bergi* SCOTT '81: 156.—BERG '84: 143.*Locality*.—Buenos Ayres (Berg).

MEGAMELUS FUSCO-IRRORATUS Blanchard.

Liburnia fusco-irrorata BLANCHARD, Berg, Anal. de Soc. Cient. Argentina, vol. 12, p. 266, 1881.

MEGAMELUS FUSCO-TERMINATA Berg.

Megamelus fuscoterminata BERG '79: 296.

MEGAMELUS NIGRICULA Berg.

Megamelus nigricula BERG '79: 226.

MEGAMELUS PATRUELI Berg.

Megamelus patruelis BERG '79: 223.

MEGAMELUS UNIVITTATA Berg.

Megamelus univittata BERG '79: 224.

MEGAMELUS FUCATUS Berg.

Eurides fucata BERG, An. Soc. Cient. Argentina, vol. 16, 1883, p. 236.

MEGAMELUS FUSCO-VITTATA Scott.

Eurides fusco-vittata SCOTT '81: 155.—BERG, An. Soc. Cient. Argentina, vol. 16, 1883, p. 236.

UNCERTAIN GENERA.

The following genera I have been unable to include in the foregoing synopses because of incomplete descriptions:

Genus **BERGIA** Scott.

Scott in 1881 described this genus as follows:

Head: Crown barely twice as long as broad, with a longitudinal central and two short keels in front, the latter almost joined in the middle of the anterior margin; face nearly equal in length to the width between antennæ, with two longitudinal keels slightly widening from the lower margin of the frons to the apex; clypeus about as long as broad, measured across the base, without a central longitudinal keel. Antennæ: First joint about half the length of second; eyes somewhat large. Pronotum with a central longitudinal and two side keels, posterior margin concave across the scutellum. Scutellum triangular, apex acute, with five longitudinal keels, the central one not reaching to the apex, and the side ones vanishing before reaching the side margins. Elytra as in *Cixius*, *Oliarus*, etc., but the furcate apical areas are longer than in these genera. Legs: Tibiæ, third pair with three spines on outer margin, nearly equidistant from each other, placed, one at the base, another before, and another beyond the middle; tarsi, third pair, first joint almost as long as the second. (Ent. Mon. Mag., vol. 18, 1881, p. 155.)

According to Scott it is somewhat related to *Ugyops* Stål.

BERGIA NIMBATA Berg.

Liburnia nimbata BERG '79: 226.

Bergia nimbata SCOTT '81: 155.

Locality.—Buenos Ayres (Gunther).

Genus **IDIOSYSTATUS** Berg.

Idiosystatus BERG, '84: 138.

This is apparently not distinct from *Bergia*. Berg separates it only on the following characters:

Body narrower; vertex longer and more triangular; frons broader; clypeus with a median carina; antennæ shorter. Carinæ of pronotum and scutellum stronger; two lateral carinæ on scutellum on each side, united posteriorly.

IDIOSYSTATUS ACUTIUSCULUS (*Spinola?*) Berg.*Idiosystatus acutiusculus* BERG '84: 134.*Locality*.—Rio Santa Cruz, Patagonia.

Genus IDIOSEMUS Berg.

Idiosemus BERG '84: 140.

Berg's description is as follows:

Body elongate, attenuate at both ends; vertex produced triangularly in front of eyes; vertex plane, twice as wide at base as length, acuminate, margins sharply carinate; median percurrent to base undivided; posterior margin sinuate; frons lanceolate, convex; median carina reduced, apex truncate, margins elevated sharply; clypeus tricarinate. Antennae medium in length, terete, II four times as long as I. Eyes deeply emarginate beneath. Scutellum 4-carinate. Elytra oblong, apex scarcely rounded, venation as in *Bergia*. Legs short; hind tibiae trispinose; tarsi much shorter than tibiae.

Type of genus.—*Idiosemus xiphias* Berg.

IDIOSEMUS XIPHIAS Berg.

Idiosemus xiphias BERG '84: 140.*Locality*.—Uruguay and Patagonia, on *Baccharis cordifolia*.

This genus, Berg says, resembles *Trepidocephala*, but differs in the scutellum and hind tibiae, and the absence of the median frontal carina. The genus seems to be quite distinct, but I have not placed it in the synopsis of genera because the form of the calcar is not given. All three of these last-named genera probably belong in the first group of genera with the spiniform or cultrate calcar.

UNCERTAIN SPECIES.

DELPHAX PRODUCTA Walker.

Delphax producta WALKER '50: 353.*Locality*.—Jamaica.

DELPHAX LUTEIVITTA Walker.

Delphax luteivitta WALKER '50: 354.*Locality*.—United States.

DELPHAX UNICOLOR Walker.

Delphax unicolor WALKER '50: 354.*Locality*.—Hudson Bay.

DELPHAX HEMIPTERA Germar.

Delphax hemiptera GERMAR, Stett. Ent. Zeit., vol. 19, p. 192.—ASHMEAD '10: 131.*Locality*.—Sitka, Alaska.

DELPHAX SENILIS Scudder.

Delphax senilis SCUDDER, Tert. Ins. N. America, vol. 2, p. 295.*Locality*.—White River, Colorado (?), or Utah (fossil).

BIBLIOGRAPHY.

The following is a list of the most important papers treating the American species of Delphacidae, but it is not intended to be exhaustive. A complete bibliography of Fulgoridae, including the Delphacidae, up to 1904, may be found in Swezey '04. An even more complete bibliographical list for each species may be found in Oshanin '07.

- '89—ASHMEAD, WILLIAM H.—A Generic Synopsis of the Fulgoridae. *Ent. Amer.*, 5: 25-28, 1889.
- '90—Psyche, 5: 323, 1890.
- '99—Fur Seals and Fur Seal Islands, 4: 340, 1899.
- '10—Harriman Alaska Series, 3: 130, 1910.
- '02—BALL, E. D.—Canadian Ent., 34: 259-266, 1902.
- '03—Same 35: 232, 1903.
- '05—Proc. Biol. Soc. Washington, 18: 118-119, 1905.
- '79—BERG, CARLOS—Hemiptera Argentina, 1879.
- '84—Addenda et Emandanda ad Hemipt. Argentina, 1884.
- '94—DAVIS, G. C.—Celery Insects. *Mich. Agr. Exp. Sta. Bull.*, 102: 8, 1894.
- '81—DISTANT, W. L. and FOWLER—Biologia Centr. Americana, Homoptera, 1881.
- '06—Hemipt. Fauna India, 1906.
- '85—EDWARDS, J.—Ent. Mon. Mag., 22: 67, 1885.
- '86—Synopsis of British Homoptera-Cicadina. *Trans. Ent. Soc. London*, 1886: 55-96.
- '96—Hemiptera-Homoptera of the British Isles, 1896.
- '98—FABRICIUS—Entomologica Systematica, Supplementum, 1798.
- '03—Systema Rhynchatorum, 1803: 84.
- '66—FIEBER, F. X.—Grundzuge zur Generische Teilung der Delphacini. *Verh. k. k. Zool. Bot. Ges. Wien*, 16: 517-534, 1866.
- '71—Catal. Cicadina, 1871: 5.
- '51—FITCH ASA—Catalog Homoptera of New York, 1851: 46. Reprinted in Lintner's 9th Report N. Y. Insects, 1893: 336.
- '00—FORBES, S. A. and HAERT—Illinois Agric. Exp. Sta. Bull., 60: 413, 1900.
- '81—FOWLER—See Distant and Fowler '81.
- '30—GERMAR—Thon Arch., 2: 57, 1830.
- '95—GILLETTE, C. P. and BAKER, C. F.—Colorado Exp. Sta. Bull., 31: 68-70, 1895.
- '06—KIRKALDY, G. W.—Hawaiian Sugar Planters' Ass'n. Bull., 1: 1906.
- '07—Same, Bull. 3: 1-186, 1907.
- '59—LECONTE, J.—Say's Complete Writings, 2: 255, 1859.
- '90—LETHIERRY, L.—Hemipt. Homoptera de Venezuela. *Ann. Soc. Ent. France*, 1890: 147-159.
- '02—MATSUMURA, S.—Allg. Zeit. f. Ent., 7: 44-47, 1902.
- '03—MELICHAR, L.—Homopt. Fauna Ceylon, 1903.
- '92—OSBORN, HERBERT—Proc. Iowa Acad. Sci., 1 (pt. 2): 127, 1892.
- '96—OSBORN, H. and BALL, E. D.—Same, 4: 233, 1896.
- '97—OSBORN, H.—Same, 5: 235, 1897.
- '00—Ohio Acad. Sci., 1900: 64.
- '01—Same, 1901: 36.
- '03—Ohio Naturalist, 4: 46 and 100, 1903 and 1904.
- '05—Same, 5: 373-376, 1905.
- '07—OSHANIN, B.—Verzeichniss der Palaearktischen Hemiptera. *Ann. Mus. Zool. Acad. Imp. Sci. St. Petersburg*, 12: 297-337, 1907. (A catalogue with complete bibliography and synonymy of each species.)

- '89—PROVANCHER, L.—Pet. Faune Ent. du Canada, 3 (Homopt.), 1889.
 '71—SAHLBERG, J.—Cicadinas, 1871: 471.
 '25—SAY, THOMAS—Journ. Acad. Nat. Sci. Philadelphia, 4: 337-340, 1825.
 '71—SCOTT, JOHN—Ent. Mon. Mag., 1871: 196.
 '81— Same, 1881: 156.
 '99—SMITH, J. B.—Cat. New Jersey Insects, 1899: 89.
 '12—SPOONER, C. S.—Canadian Ent., 44: 233-242, 1912.
 '57—STÅL, CAROLUS—Ann. Soc. Ent. France, 1857: 337-339.
 '58— Hemiptera Fabriciana, 1858.
 '59— Berliner Ent. Zeit., 3: 327, 1859.
 '62— Same, 6: 315, 1862.
 '64— Stettiner Ent. Zeit., 25: 1864.
 '66— Hemiptera Africana, 4: 175-190, 1866.
 '70— Hemiptera Insul. Philippinarum, 1870: 747.
 '02—SWARTZ—Kong. Vet. Nya Handl., 23: 181, 1802.
 '04—SWEENEY, O. H.—Preliminary Catalogue of N. American Fulgoridæ. Ohio Dep't. Agric. Bull. 3: 31-43, 1904. (A good bibliographical list to this date, for the American species.)
 '75—UHLER, P.—U. S. Geol. and Geog. Survey, 1: 352, 1875.
 '77— Same, 3: 458, 1877.
 '11—VAN DINE, D. L.—Sugar Cane Insects of Hawaii. U. S. Dep. Agr., Bur. Ent. Bull. 93.
 '90—VAN DUZEE, E. P.—Psyche, 5: 389, 1890.
 '94— Bull. Buffalo Soc. Nat. Sci., 1894.
 '97— Preliminary Review of N. American Delphacidæ. Bull. Buffalo Soc. Nat. Sci., 5: 251-261, 1897.
 '07— Notes on Jamaican Hemiptera. Bull. Buffalo Soc. Nat. Sci., 3: 43-50, 1907.
 '09— Florida Hemiptera. Bull. Buffalo Soc. Nat. Sci., 9: 196-204, 1909.
 '10— Some New or Unfamiliar N. American Hemiptera. Trans. Amer. Ent. Soc., 36: 88, 1910.
 '50—WALKER, F.—Catalogue of the British Homoptera, 1851: 290-361.
 '58— List of Homeptera in the British Museum, Suppl., 1858.
 '33—WESTWOOD—Ann. and Mag. Nat. Hist., 1833: 413.
 '04—WIRTNER, P. M.—Preliminary List of Hemiptera of West Pennsylvania. Annals Carnegie Museum, 3: 215-216, 1904.

EXPLANATION OF PLATES.

PLATE 44.

- Fig. A. *Copicerus irroratus*, elytra.
 B, C, D. Same, showing variation in venation.
 E. Hind wing of same.
 F. Female, abdomen, ventral view.
 G. *Eucanyra stigmata*, antenna.
 H. *Copicerus irroratus*, antenna.
 I. Same, head and prothorax laterally.
 J. Same dorsally.
 K. Male genitalia ventrally.
 L. *Pentagramma bivittata*, head and thorax.
 M. Male genitalia, laterally.
 N. *Eucanyra stigmata*, head and thorax.
 O. *Pentagramma bivittata*, male genitalia ventrally.
 P. *Pentagramma minore*, genital styles.
 Q. Male genitalia laterally.
 R. *Eucanyra stigmata*, elytra.
 S. Male genitalia ventrally.

PLATE 45.

- Fig. A. *Lepticus oculatus*, head and prothorax.
B. Spiniform type of calcar (*Copicerus*).
C. Tectiform type of calcar (*Megamelus*).
D. Cultrate type of calcar (*Proterosydne*).
E. *Proterosydne pictifrons*, genital styles.
F. Male genital segment laterally.
G. Antenna of same.
H. Head and thorax dorsally.
I, J. *Stobaera tricarinata*, male genitalia ventrally, showing variation.
K. Same, antennae.
L. *Achorotile albosignata*, frons and clypeus.
M. Head and thorax.
N. *Laccocera vittipennis*, head and thorax.
O. *Stobaera tricarinata*, head and thorax.
P. *Laccocera bicornata*, male genitalia ventrally.
Q. *Laccocera vittipennis*, frons.
R. *Laccocera obesa*, head and thorax.
S. *Megamelanus bicolor*, head and thorax.
T. *Liburniella ornata*, male genitalia ventrally.
U. *Megamelanus bicolor*, male genitalia.
V. *Laccocera obesa*, male genitalia.
W. *Achorotile albosignata*, male genitalia.

PLATE 46.

- Fig. A. *Megamelanus bicolor*, head and pronotum.
B. *Megamelus notulus*, same view.
C. *Stenocranus dorsalis*, antenna.
D. *Stenocranus similis*, male genitalia.
E. *Stenocranus dorsalis*, genitalia.
F. Head and thorax.
G. *Stenocranus saccharivorus*, head and thorax.
H. *Stenocranus similis*, male genital segment laterally.
I. *Stenocranus saccharivorus*, genitalia.
J. *Stenocranus rostrifrons*, head and thorax.
K. *Dicranotropis brunneus*, genital style.
L. *Dicranotropis frontalis*, genital styles.
M. *Stenocranus croceus*, head and thorax.
N. *Dicranotropis bakeri*, genitalia.
O. *Stenocranus dorsalis*, male genital segment laterally.
P. *Dicranotropis marginatus*, head and thorax.
Q. Male genitalia.
R. *Dicranotropis pallipes*, genitalia.

PLATE 47.

- Fig. A. *Dicranotropis maidis*, head and thorax.
B. Male genitalia.
C. *Stobaera pallida*, head and thorax.
D. *Bakerella maculata*, male genitalia.
E. *Liburniella ornata*, head and thorax.
F. *Phyllodinus nervatus*, genitalia.
G. *Phyllodinus flabellatus*, genitalia.
H. *Megamelus notulus*.
I. Genitalia of same.
J. Same laterally.

- Fig. K. *Megamelus puellii*, genital styles.
 L. *Megamelus gillettei*, styles.
 M. *Megamelus consimilis*, genitalia.
 N. *Megamelus pellucidus*.
 O. Male genitalia.
 P. *Megamelus campestris*, genitalia.
 Q. *Megamelus marginatus*.
 R. *Megamelus laminalis*, genital segment laterally.
 S. *Megamelus bifurcatus*, genitalia.
 T. *Megamelus laminalis*, genital styles.
 U. *Megamelus nigrigaster*, genitalia.

PLATE 48.

- Fig. A. *Megamelus nigridorsum*, genital segment laterally.
 B. *Megamelus magnistylus*, genitalia.
 C. *Megamelus aurantii*, genital segment laterally.
 D. *Megamelus erectus*, genitalia.
 E. Genital segment laterally.
 F. *Megamelus terminalis*, genital segment laterally.
 G. *Megamelus aurantii*, genitalia.
 H. *Megamelus vanduzeei*, genitalia.
 I. *Megamelus nigridorsum*, genitalia.
 J. *Megamelus magnifrons*, genital segment laterally.
 K. *Megamelus terminalis*, genitalia.
 L. *Megamelus pacificus*, genital styles.
 M. *Megamelus constrictus*, genital segment laterally.
 N. *Megamelus albolineosus*, genital style.
 O. *Megamelus magnifrons*, genitalia.
 P. *Megamelus magnus*, genitalia.
 Q. *Megamelus ocellus*, genital styles.
 R. *Megamelus constrictus*, genitalia.
 S. *Megamelus rectangularis*, genitalia.
 T. *Megamelus rotundatus*, genital segment laterally.
 U. Genitalia ventrally.

PLATE 49.

- Fig. A. *Megamelus azialis*, head and thorax.
 B. *Megamelus indistinctus*, genitalia.
 C. *Megamelus cayamensis*, genitalia.
 D. *Megamelus luteiventris*, genitalia.
 E. *Megamelus teapæ*, styles.
 F. *Megamelus approximatus*, styles.
 G. *Megamelus basivitta*, styles.
 H. *Megamelus albidens*, genitalia.
 Ha. *Megamelus analis*, genitalia.¹
 I. *Megamelus pellucidus*, elytron.
 J. *Stenocranus dorsalis*.
 K. *Stobaera tricarinata*.
 L. *Stenocranus saccharivorus*.
 M. *Proterosydne pictifrons*.
 N. *Liburniella ornata*.
 O. *Stenocranus croceus*.
 P. *Stenocranus rostrifrons*.

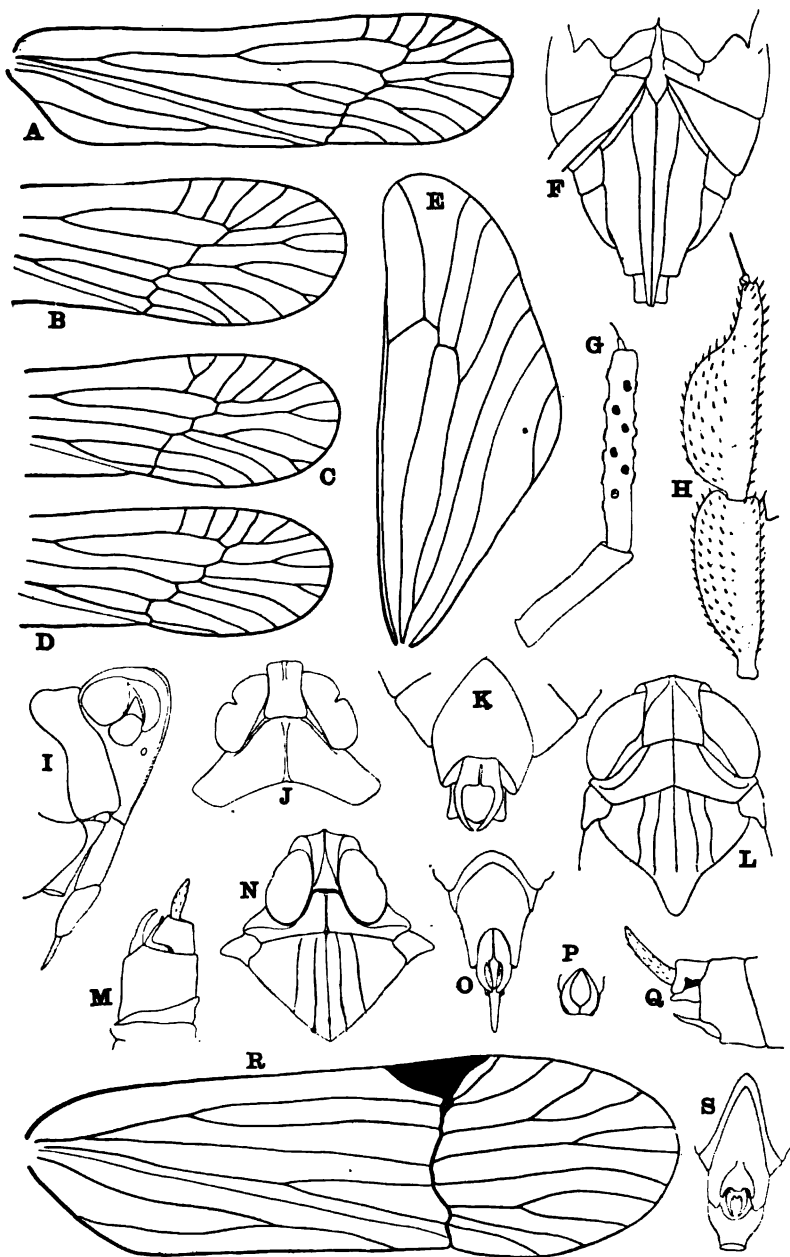
¹ By an unfortunate error this figure was not lettered. It is the one immediately to the right of the one designated as H.

INDEX OF GENERIC AND SPECIFIC NAMES.

	Page.		Page.
abdominalis (<i>bakeri</i>).....	594, 598	consperisnervis.....	577
Achorotile.....	563, 578	constrictus.....	605, 607, 610
acutiusculus.....	633	Copicerus.....	562, 564
<i>affinis</i>	572	croceus.....	587, 591
albicollis.....	605, 613	cubana.....	595
albidens.....	607, 622	cultus.....	628
albinotata (<i>teapae</i>).....	619	davisi.....	605, 630
albolineosus.....	604, 608, 610	delicatus.....	596
albosignata.....	578	Delphax.....	562, 577, 602
Amblycotis.....	575	<i>detecta</i>	616
analis.....	620	Dichoneura.....	562, 570
andromeda.....	608, 628	Dicranotropis.....	563, 593
angulatus.....	629	divaricatus.....	600
angustus.....	587, 589	dolerus.....	630
apacheanus.....	577	dorsalis, Dicranotropis.....	599
aphidioides.....	594, 597	dorsalis, Stenocranus.....	588
apicimaculatus.....	606, 630	dorsilinea.....	631
approximatus.....	607, 622	elongatus.....	593
<i>Araeopus</i>	577	Epibidis.....	562, 569
<i>arvensis</i>	615	erectus.....	608, 624
ater.....	594, 600	Eucanyra.....	562, 569
atrior.....	608, 630	<i>Eusidella</i>	602
aurantii.....	605, 628	<i>Evides</i>	602
axialis.....	606, 613	felti.....	591
Bakerella.....	563, 601	flabellatus.....	584
<i>bakeri</i>	594, 598	flava (notula) Megamelus.....	605, 609
<i>basalis</i>	596	flava (zonata), Laccocera.....	581
basifuscatus.....	608, 630	foveata, Achorotile.....	579
basivittata.....	608, 626	foveatus, Dicranotropis.....	600
bergi.....	631	foveatus, Megamelus.....	607, 629
Bergia.....	632	frontalis, Dicranotropis.....	597
bicolor.....	592	frontalis, Megamelanus.....	593
bicornata.....	580, 582	fucatus.....	632
<i>Bidis</i>	569	<i>furcata</i>	615
<i>bifasciata</i>	572	<i>fuscinervis</i>	578
bifurcata.....	605, 612	fusco-irrorata.....	632
binotatus.....	601	fuscoterminata.....	632
bivittata.....	566	fuscovittata.....	632
Bostaera.....	563, 577	fuscus.....	585
brunnea, Epibidis.....	570	gillettei.....	607, 616
brunneus, Dicranotropis.....	599	godmani.....	570
californicus.....	586	<i>Goniolcium</i>	571, 572
campestris.....	606, 617	granuloseum.....	576
carinata.....	583	guttatus.....	600
cayamensis.....	606, 614	havanensis (albidens).....	632
<i>Chloriona</i>	602	hemiptera.....	633
circumcinctus.....	607, 629	<i>Holatus</i>	564
Cochise.....	562, 576	humilis.....	608, 629
<i>cognata</i>	631	Idiosemus.....	633
<i>concinna</i>	572, 574	Idiosystatus.....	632
consimilis.....	607, 616	inconspicuus.....	583

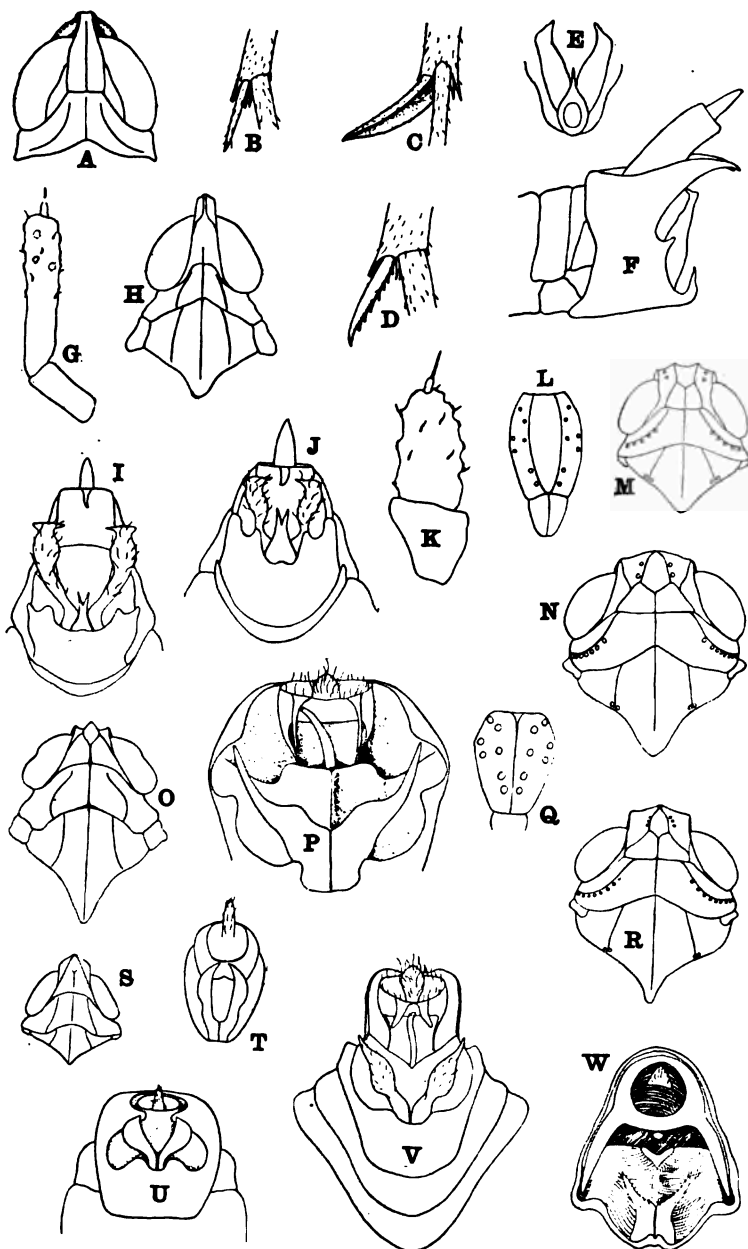
	Page		Page
<i>indistinctus</i>	606, 619	<i>occlusus</i>	606, 619
<i>insignicornis</i>	565	<i>oculatus</i>	568
<i>irroratus</i>	564	<i>ornata</i>	586
<i>Jassidaeus</i>	563, 582	<i>osborni</i>	607, 629
<i>Jerahia</i>	564	<i>pacificus</i>	608, 626
<i>Kelisia</i>	602	<i>palaetus</i>	591
<i>kilmani</i>	608, 629	<i>pallida</i>	575
<i>koebelæi</i>	585	<i>pallipes</i>	599
<i>Kormus</i>	563, 586	<i>paludatus</i>	630
<i>kormusi</i>	606, 614	<i>parvulus</i>	605, 631
<i>Laccocera</i>	563, 579	<i>patruelis</i>	632
<i>laminalis</i>	607, 624	<i>pellucida</i>	607, 615
<i>lateralis</i>	608, 629	<i>Pentagramma</i>	562, 565
<i>lautus</i>	588	<i>Peregrinus</i>	593
<i>Lepticus</i>	562, 567	<i>Phyllodinus</i>	563, 583
<i>Liburnia</i>	602	<i>piceus, Dicranotropis</i>	601
<i>Liburniella</i>	563, 585	<i>piceus, Megamelus</i>	605, 630
<i>lineatipes</i>	607, 629	<i>pictifrons</i>	571
<i>lineola</i>	609	<i>Pissonotus</i>	593
<i>luteivitta</i>	633	<i>producta</i>	633
<i>lutulentus</i>	606, 617	<i>Prokelisia</i>	602
<i>Macrotomella</i>	582	<i>Proterosydne</i>	562, 570
<i>maculata</i>	601	<i>puellis</i>	608, 625
<i>maculipes</i>	591	<i>quadripustulata</i>	576
<i>magnus</i>	608, 627	<i>rectangularis</i>	605, 612
<i>magnifrons</i>	606, 614	<i>reductus</i>	629
<i>magnistylus</i>	608, 627	<i>rostrifrons</i>	590
<i>maidis</i>	595	<i>rotundatus</i>	606, 618
<i>marginatus, Dicranotropis</i>	596	<i>rufivittatus</i>	593
<i>marginatus, Megamelus</i>	604, 609	<i>saccharivorus</i>	589
<i>marginicornis</i>	630	<i>sagatus</i>	607, 630
<i>Megamelanus</i>	563, 592	<i>salina</i>	605, 631
<i>Megamelus</i>	563, 602	<i>scutellaris</i>	605, 631
<i>metzaria</i>	605, 611	<i>seminegra</i>	631
<i>mexicanus (puellis)</i>	608, 626	<i>senilis</i>	633
<i>minore</i>	567	<i>setigerus</i>	605, 631
<i>minutus (constrictus), Megamelus</i>	605, 610	<i>similis</i>	590
<i>minuta, Stenocranus</i>	572	<i>simoni</i>	570
<i>nasuta</i>	578	<i>simplicia</i>	595
<i>nervatus</i>	584	<i>singula</i>	564
<i>niger (erectus)</i>	608, 624	<i>slossoni</i>	631
<i>nigricula</i>	632	<i>spartini</i>	593
<i>nigridorsum</i>	606, 620	<i>stejnegeri</i>	630
<i>nigrifrons</i>	631	<i>Stenocranus</i>	563, 587
<i>nigrigaster</i>	607, 621	<i>stigmata</i>	569
<i>nigripennis (erectus), Megamelus</i>	608, 625	<i>Stiroma</i>	583
<i>nigripennis, Stobæra</i>	576	<i>Stobæra</i>	562, 571
<i>nimbata</i>	632	<i>swartzii</i>	564
<i>nitens</i>	585	<i>teape</i>	606, 618
<i>notulus</i>	605, 609	<i>terminalis</i>	607, 623
<i>obesa</i>	582	<i>testacium</i>	576
<i>obscurellus</i>	606, 629	<i>thoracicus</i>	565

	Page.		Page.
<i>tricarinata</i>	572	<i>variegatus</i>	600
<i>truncatipennis</i>	609	<i>vittata</i> , <i>Stenocranus</i>	592
<i>Ugyops</i>	632	<i>vittatifrons</i>	567
<i>unicolor</i>	633	<i>vittatus</i> , <i>Delphacinus</i>	580
<i>unipuncta</i>	588	<i>vittipennis</i>	580
<i>univittata</i>	632	<i>xiphias</i>	633
<i>vanduzeei</i>	607, 622	<i>zonata</i>	581



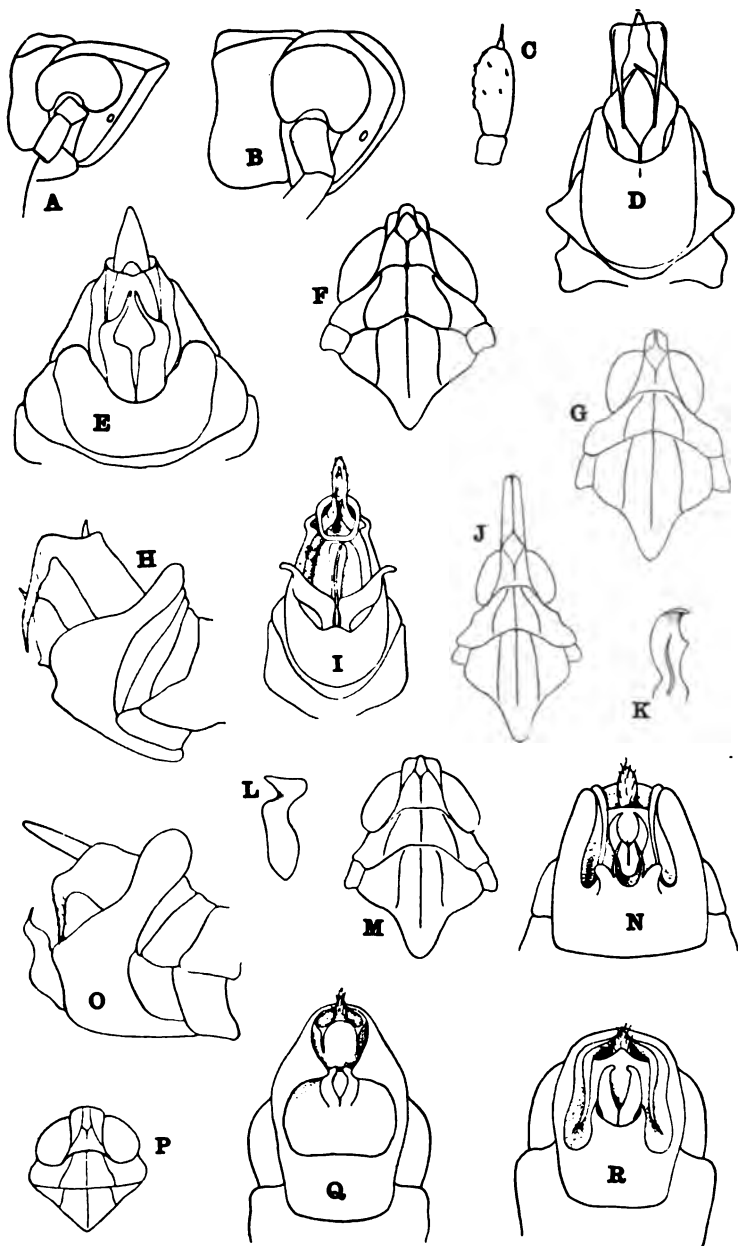
DETAILS OF DELPHACIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 635.



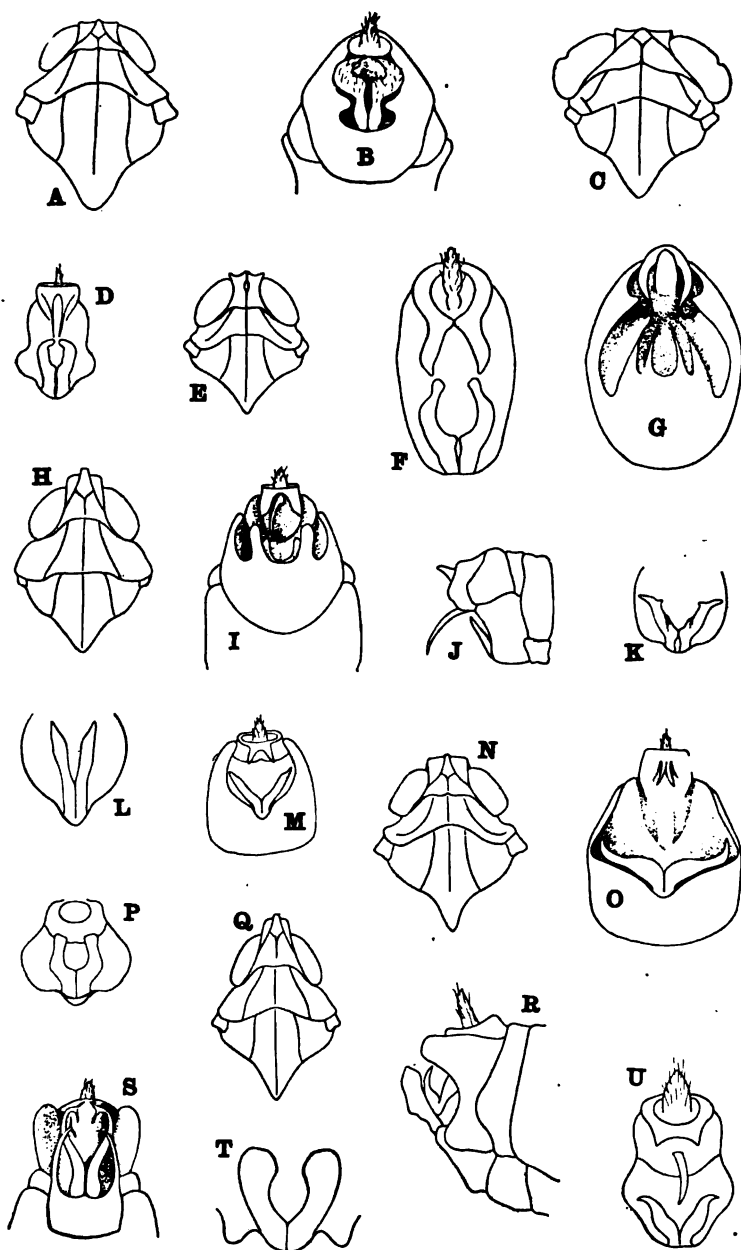
DETAILS OF DELPHACIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 636.



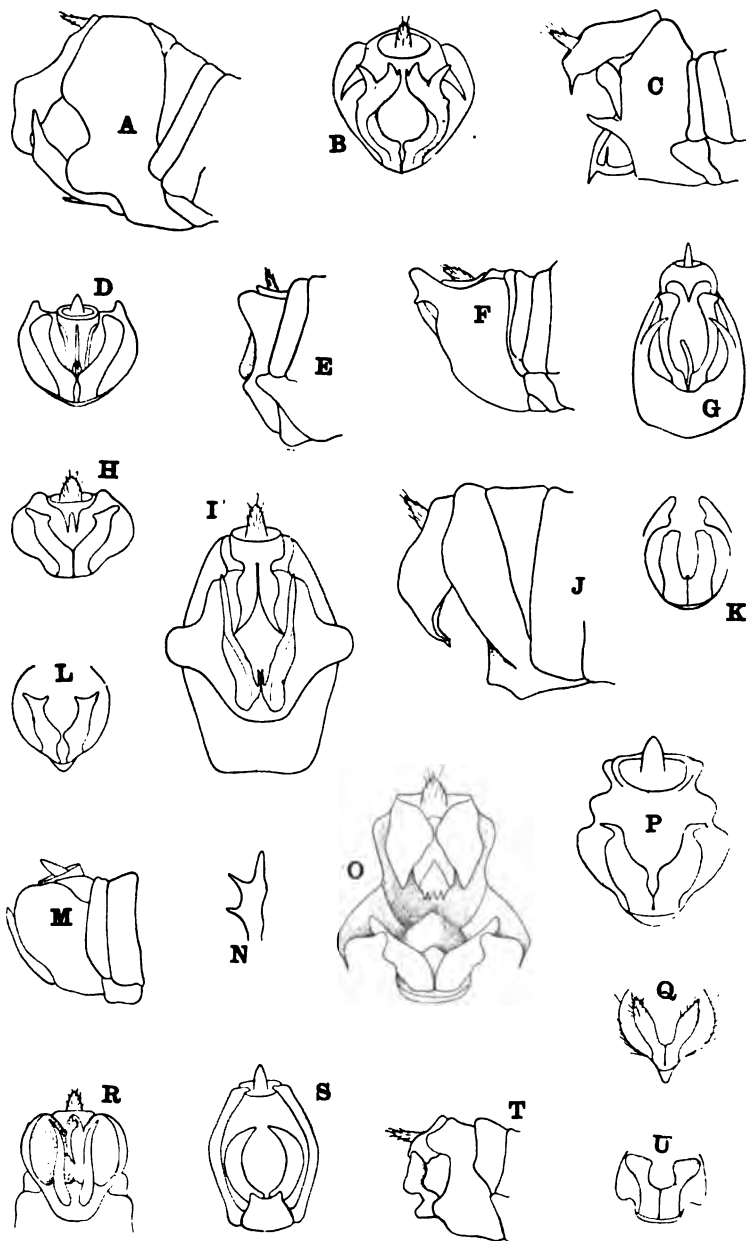
DETAILS OF DELPHACIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 636.



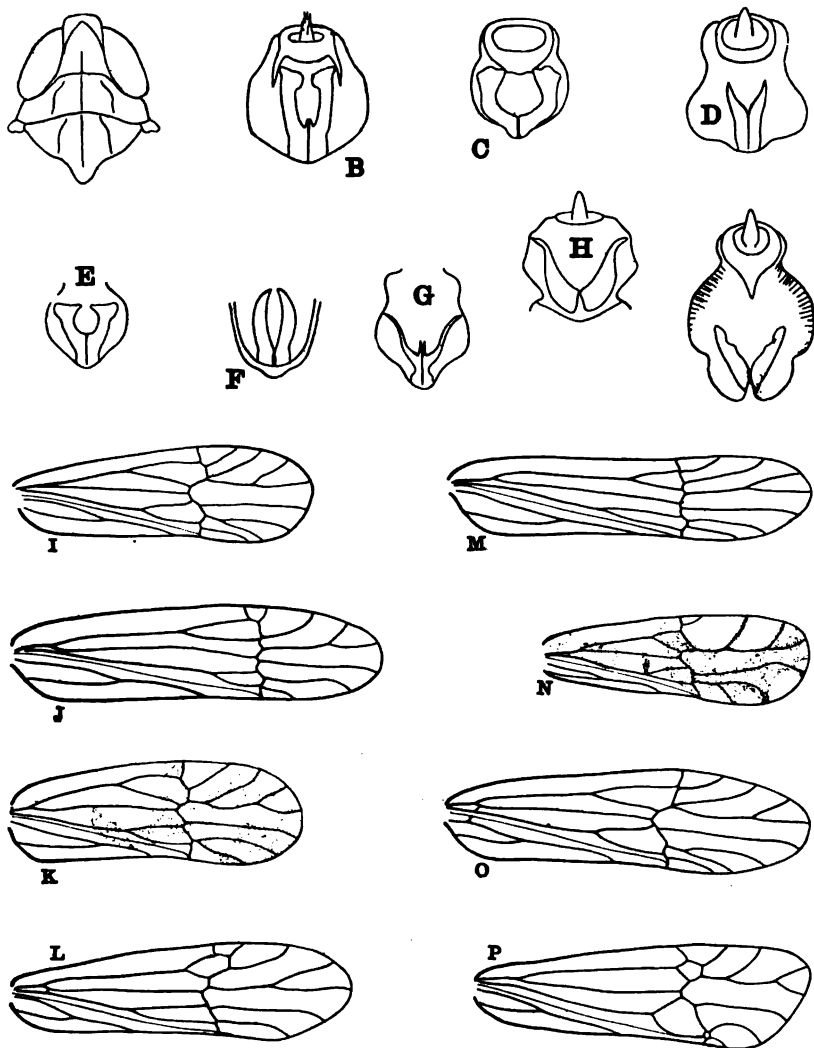
DETAILS OF GENITALIA AND HEAD OF DELPHACIDÆ.

FOR EXPLANATION OF PLATE SEE PAGES 636 AND 637.



DETAILS OF MALE GENITALIA OF DELPHACIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 637.



DETAILS OF DELPHACIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 637.

ARCHEOLOGICAL INVESTIGATIONS IN STE. GENEVIEVE COUNTY, MISSOURI.

By DAVID I. BUSHNELL, Jr.
Of the Bureau of American Ethnology.

HISTORICAL.

Bordering on the eastern shore of the Mississippi, and extending from a point about opposite the mouth of the Missouri on the north, to the Kaskaskia on the south, is a rich alluvial plain, often designated by the name "American Bottom." This is bounded by a line of bluffs which touches the river at the north and south. When first visited by the French this area was claimed and occupied by the Illinois Indians. At the north, some 20 miles below the mouth of the Missouri, were the villages of the Cahokia and Tamaroa. Later, during the year 1703,¹ the Kaskaskia moved southward from the Illinois River, and reared their wigwams near the mouth of the stream now bearing their name. These settlements were often mentioned by the early writers, but no account is to be found of villages on the opposite or right bank of the Mississippi between these points.

On the map of Pierre van der Aa (about 1720), two small streams are shown entering the Mississippi from the west, a short distance below the Missouri, and about equidistant between this river and the Saline. The more northerly of these is probably intended to represent the Meramec. A dot at the mouth of this stream, on the north side, bears the legend: "*Village des Illinois et des Caskoukia.*" Probably the Cahokia. On the eastern side of the Mississippi is indicated the "*Village des Tamaroa.*" On the d'Anville map of 1755, an "Ancien Village Cahokias" is placed on the right, or western shore of the Mississippi about midway between the mouth of the "R. de Maremac" on the south, and that of the "Petite R. des Cahokias," entering from the east, on the north. At the mouth of this small stream is the legend: "*Cahokias et Tamaroas le Fort et la Mission.*" The position of the "Ancien Village Cahokias" corresponds with

¹ Shea, John Gilmary, *The Catholic Church in Colonial Days*, New York, 1886, p. 544.

that of the mouth of the *Rivière des Pères*, a small stream flowing through the western part of St. Louis, and, at its junction with the Mississippi, forming the southern boundary of the city. Until a few years ago many small mounds were visible on the lowland at the mouth of the stream, objects of stone were numerous, and stone graves were met with on the near by hills; all indicative of an aboriginal settlement. Numerous groups of stone graves exist in the valley of the Meramec, and the site of an extensive village is located on the right bank of the stream a short distance above its mouth. About 4 miles below the Meramec, and one mile west of the town of Kimmswick, is a small saline, and near by a site bearing evidence of long occupancy. This I shall have occasion to mention more fully at another time.

By the close of the eighteenth century the Illinois tribes had become greatly reduced in numbers, and had lost their former power. In the year 1802 it was written: "At St. Genevieve, in the settlement among the whites, are about thirty Piorias, Kaskaskias, and Illinois, who seldom hunt, for fear of the other Indians. They are the remains of a nation, which fifty years ago, could bring into the field one thousand and two hundred warriors."¹

Below the town of Ste. Genevieve "there was formerly a village of Piorias, * * * but they abandoned it some time ago."² This was prior to the year 1810.

The Shawnee and Delaware village on Apple Creek, about 40 miles below Ste. Genevieve, dates from the year 1793. Bands of the former tribe evidently traversed the surrounding country. About 1 mile southwest of Ste. Genevieve is a large spring, known as Vallé Spring. The water issues from beneath a mass of limestone and is of sufficient quantity to form a stream 10 feet or more in width. Brackenridge visited this spot about the year 1810 and "found a party of about sixty Shawanese warriors encamped near it; after some conversation with the chief, a good old man, and of a remarkable fine figure; why said he, does not some white man build a house and settle himself near this place? but, continued the old chief, seemingly recollecting himself, perhaps some Manitou (spirit) resides here, and will not permit it!"³ And as yet no house has been erected near the spring: the site has remained unoccupied.

As has been said, no references occur in the works of early writers to villages on the western bank of the Mississippi, between the Missouri on the north and the Saline on the south. It is evident, however, that at some early day the Illinois had occupied certain sites. Therefore it is quite probable that the signs of former occu-

¹ Davis, John, *Travels in Louisiana and the Floridas*, in the year 1802, New York, 1806, p. 99.

² Brackenridge, H. M., *Views of Louisiana*, Pittsburg, 1814, p. 126.

³ Brackenridge, *Idem.*, p. 126.

pancy in the vicinity of the Meramec, and the stone graves, the village site, and the traces of work in the area adjacent to the salt spring near the mouth of the Saline, should be attributed to the Illinois tribes, whose principal villages were on the eastern side of the Mississippi.

Père de Charlevoix arrived at Kaskaskia October 19, 1721. While there he wrote of the surrounding country, of the native tribes, and of the French settlement and Mission, but he failed to mention the existence of the salt spring a few miles above, on the opposite side of the Mississippi. Nevertheless, there is little doubt of its having been the source whence the early French colonists secured their supply of salt, as it was at a later day, when it was written: "The salines just below St. Genevieve are productive. The inhabitants on both sides of the Mississippi derive most of their supplies from them; and no small proportion of the salt is boated up the Ohio. The salines on the Merimak are also valuable: They supply in part the settlers on the east side of the Mississippi."¹

On the map of Pierre van der Aa, dating from the early part of the eighteenth century, the Saline Creek is correctly placed and bears the name "la Saline." On the Bellin map of 1744 the "R à la Saline" is indicated, and on the north side, near its mouth, is "la Saline." The area is more clearly and accurately delineated on the d'Anville map of 1755. Here the name "Ste. Genevieve" is applied to the settlement on the Mississippi north of the "Saline," which is accurately placed a short distance from the left bank of the "R. à la Saline." The Ross map of 1765, a section of which is reproduced in plate 50, indicates the positions of the French and Indian villages. Ste. Genevieve here bears the name of "Misere," and Saline Creek that of "Salt pans River." Near the mouth of the river is shown the position of "the Salt pans." It is quite probable that about this time the making of salt by evaporating the waters of the spring became a recognized industry, and this was evidently one of the places Bossu had in mind when he wrote: "*At the Illinois, the 15th of May 1753* * * * The *Illinois* country is one of the finest in the world; it supplies all the lower parts of *Louisiana* with flower: Its commerce consists in furs, lead and salt. There are many salt springs, that attract the wild oxen, and the roe-bucks."² A short time after the peace of 1763 a British officer visited the settlements of Upper Louisiana and left this brief reference to the saline: "Sainte Genevieve, or Misere. The first settlers of this village removed about twenty-eight years ago from Cascasquias. * * * The situation of the village is very convenient, being within one league of the salt

¹ Stoddard, Major Amos, *Sketches* * * * of Louisiana, Philadelphia, 1812, p. 401.

² Bossu, *Travels through that part of North America formerly called Louisiana* (Eng. trans.), London, 1771, vol. 1, p. 127.

spring, which is for the general use of the French subjects, and several persons belonging to this village have works here, and make great quantities of salt for the supply of the Indians, hunters, and the other settlements." ¹

Some years later "A grant of a tract of land, one league square, was here made by the Spanish government, in favor of a Frenchman named Pegreau, the founder of the deserted town called New Bourbon. The tract included a valuable brine spring near the mouth of the [Saline] creek. The proprietor built a house near the bank of the Mississippi, where he resided for some time, and carried on a manufacture of salt."² Soon after the transfer of Louisiana to the United States the tract was acquired by others. Salt is said to have been made here in large quantities as late as 1835, and even at this late day several of the old iron kettles are to be found near the spring, and many fragments lie scattered about on the surface.

THE SALT SPRING.

As has been shown in the preceding section, the area immediately surrounding the salt spring was occupied by the French colonists soon after the establishment of the European settlement at Kaskaskia, and the whites continued making salt at the spring until about the year 1835. As a result of these activities, covering a period of more than a century, a vast quantity of wood ashes and charred wood accumulated here, covering the traces of an earlier occupancy of the site by the Indians. A sketch of this area is reproduced in figure 2, being a more detailed plan of *A* on the map (fig. 1). The mass of ashes attains its greatest thickness just north of the spring, and at *B*, figure 2, an excavation was made which reached the undisturbed clay at a depth of about 6 feet. This was near the edge of the ash bank, which, a few feet west, was considerably higher than at this point.

Between the mass of ashes and the small branch, the stippled area on the plan, the ground is so impregnated with salt that it is barren of vegetation. The ground is saturated, and an excavation made at any point over the surface of this area will soon be filled with salt water. It is said that during the time the salt water was utilized by the whites, a large excavation made around the spring served as a reservoir in which the water, later to be evaporated by the salt makers, was collected.

Scattered over the surface of this area are many fragments of large pottery vessels of Indian make, and a great quantity of sandstone. The pieces of sandstone range from 1 inch to a foot or more in diameter, and practically all have been turned red by the action of fire.

¹ Pittman, Capt. Philip, *The present state of the European Settlements on the Mississippi*, London, 1770, p. 50.

² James, Edwin, *Account of an Expedition, under the Command of Major Stephen H. Long*, Philadelphia, 1823, vol. 1, p. 48.

These we may assume to have been the pieces of stone which were heated and placed in the large earthenware vessel containing the water from the spring, the primitive method followed by the Indian in evaporating the water to secure the salt. No other kind of stone found in this region would have served the purpose. Limestone and granite

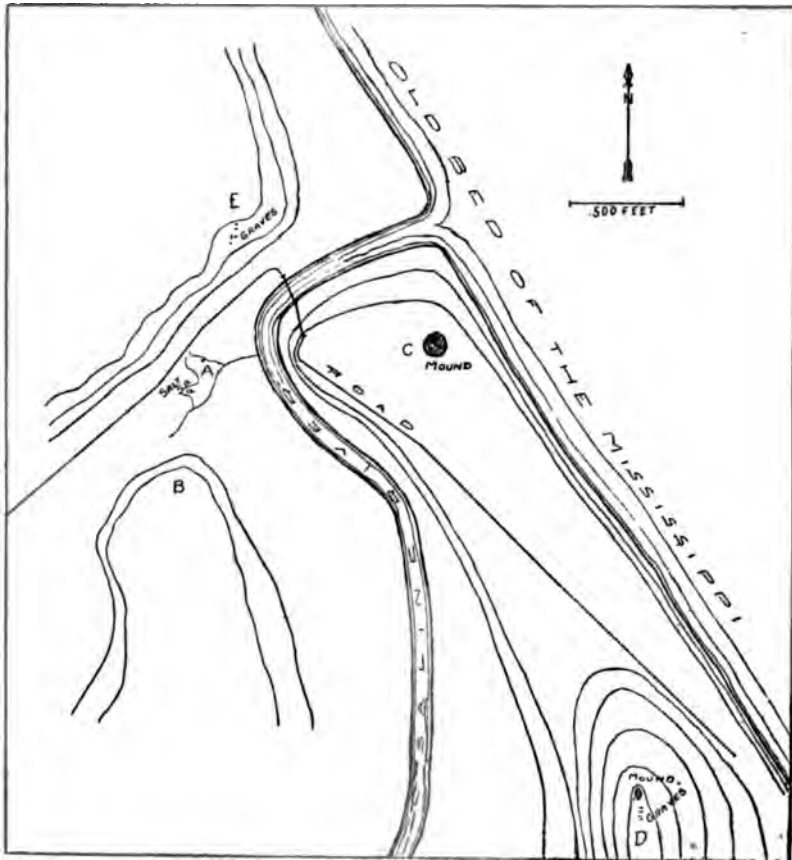


FIG. 1.—MAP SHOWING THE POSITION OF THE SALT SPRING A AND THE MOUTH OF THE SALINE.

would have fractured if placed in fire, and the pieces of sandstone met with on the site had been carried from a point several miles away. Sandstone had been similarly used at the site near Kimmswick, and there two pieces were discovered resting on the bottom of a large "salt pan."¹

¹ Kimmswick is a small town on the Mississippi, in Jefferson County, Missouri, about 4 miles below the mouth of the Meramec River. In the valley northwest of the town are many springs. About 1½ miles distant, near a spring, and rising above the left bank of a small stream, known as Rock Creek, was a level tract of several acres. This area had been occupied for a long period by the Indians. During the autumn of 1902 I examined this site in the interest of the department of anthropology of the University of California and the Peabody Museum, Harvard University. The work was described in two parts: *Primitive Salt Making in the Mississippi Valley*, I. *Man*, 13, London, 1907. II. *Man*, 35, London, 1908.

Many references will be found on the following pages to the Kimmswick site as it possessed many features similar to those encountered in the vicinity of the mouth of the Saline.

It is quite evident that much of the fragmentary pottery and sandstone now exposed on the surface was thrown out of the excavation when the reservoir was formed. And since that time, aided by the lack of vegetation, the rain has washed away the greater part of the earth and ashes, allowing the masses of stone and earthenware to remain uncovered.

A profile and section of the space extending from *A* to *B* on figure 2, is shown in figure 3. As stated above, the excavation at *B* reached the undisturbed clay at a depth of about 6 feet. Resting upon the clay were several pieces of "cloth marked" pottery, small fragments of large vessels. The excavation at *A* was carried down several feet below the surface of undisturbed clay. Resting upon the clay was a mass of broken pottery nearly 18 inches in thickness. The frag-

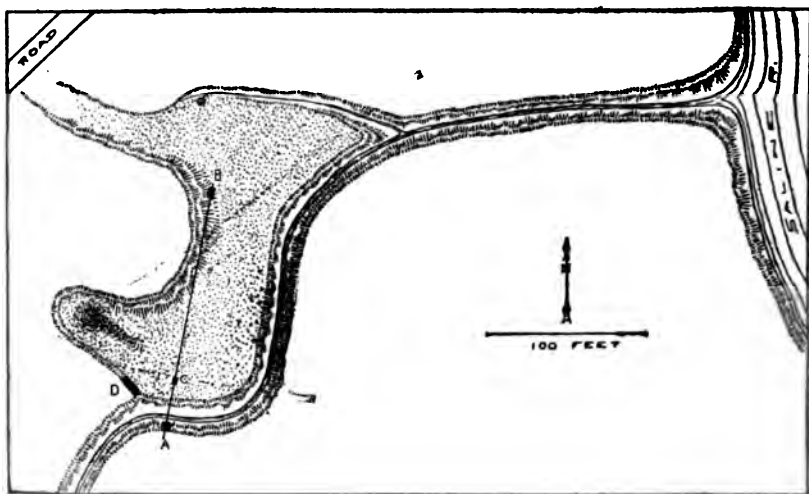


FIG. 2.—THE SALT SPRING A ON FIG. 1. THE STIPPLED AREA REPRESENTS THE GROUND IMPREGNATED WITH SALT AND BARREN OF VEGETATION.

ments were, for the most part, in a horizontal position, and rested one upon another in such a manner as to form practically a solid stratum. Above this was an accumulation of ashes, charcoal, and a few animal bones, many of the latter having been cracked, probably for the extraction of the marrow. An excavation *C* (fig. 2), on the line between *A* and *B*, reached the undisturbed clay at a depth of 2 feet 6 inches. The upper 6 inches consisted of soil, broken sandstone, etc., below which, to a depth of 2 feet, was a stratum of wood ashes, charcoal, and fragmentary pottery. Connecting the three points at which the undisturbed clay was encountered in the excavations at *A*, *B*, and *C*, the original surface of the site, before the periods of Indian and white occupancy, is clearly indicated. This is shown by a dotted line on figure 3.

The small branch, the bed of which is indicated on figure 3 between the excavations *A* and *C*, appears to have formed its present channel during comparatively recent years, otherwise the strata of ashes and pottery would not have been continuous on both sides. Many fire beds, masses of ashes, and accumulations of broken pottery, appear at different levels along the sides of the channel.

An excavation was made at the edge of the slightly elevated portion of the site, *D* (fig. 2), exposing a bank of ashes and charcoal, and two fire beds are distinctly visible at different levels. A fragment of pottery was met with near the lowest part of the excavation, but no traces of Indian occupancy were discovered in contact with the fire beds, it is therefore quite evident the ashes accumulated during the days the site was occupied by the whites. Several trenches were made a short distance from the right bank of the branch, directly east from the spring. These revealed accumulations of camp refuse, including ashes and charcoal, fragments of animal bones and pieces of broken pottery. This probably continued to the bank of the

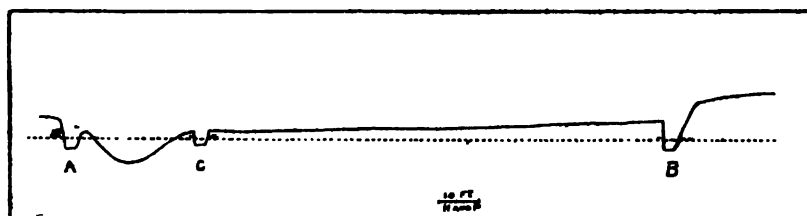


FIG. 3.—SECTION THROUGH A-B ON FIG. 2. THE DOTTED LINE INDICATES APPROXIMATELY THE ORIGINAL SURFACE. ABOVE THIS LINE IS THE ACCUMULATION OF ASHES, CHARCOAL, FRAGMENTS OF POTTERY, ETC.

Saline, and here was evidently a village or camp site. Just across the Saline was the site of the principal village; this will be mentioned later.

About 100 yards south of the salt spring the natural surface becomes more elevated and rises from a marshy tract on the west. This area is *B* on map (fig. 1). Several trenches dug along the northern extremity of the plateau revealed signs of Indian occupancy. At two points were numerous fragments of large earthenware vessels. These were not associated with refuse, as was those found nearer the spring, but appeared to have been used and abandoned here. They were probably broken, and some parts scattered, before the accumulation of the ashes and vegetable mold which now covers them to a depth of about 18 inches, was formed. Animal bones, a few chips of chert, and fragments of small pottery vessels, were intermingled in the mass surrounding and covering the parts of the large "pans." All fragments of large vessels discovered at this point were smooth on both the outer and inner surfaces—in

other words, no pieces of "cloth marked" pottery were found. Therefore, for reasons to be given on another page, it is evident this was a comparatively late Indian settlement, more recent than the camp between the salt spring and the Saline. A thorough examination of this site would probably prove of great interest.

The salt spring is on the flood plain of the Saline, or rather of the Mississippi, near the foot of the second terrace which here attains an elevation of about 30 feet. Before the space in the vicinity of the spring was modified by the accumulation of ashes, and before the wagon road was made, the surface sloped gradually from the brow of the higher land to the edge of the spring. Scattered over the surface of the sloping land are many fragments of small pottery vessels, some bearing traces of red pigment and others being pieces of a thin, black ware of superior quality. Numerous stone implements have been found here, and all signs point to this having been, at some former day, a favorite spot. No excavations were made here during the recent investigations, although the results would probably have been very interesting.

In making the road, less than 100 feet from the spring, the hillside was cut away to a depth of from 4 to 6 feet. Several fire beds were exposed by this cut, and may be traced on the side of the excavation. A curious pit was likewise cut through at a point almost due north of the spring. This is shown on plate 51. As will be seen, it has a circular bottom, and the excavation was probably circular in horizontal section. Its extreme width is about 4 feet 6 inches. It was filled with wood ashes, particles of charcoal, and pieces of large pottery vessels. Its sides could not be traced through the upper 18 inches of earth and mingled pottery, stones, and ashes, but this may be attributed to the use of the plow and the gradual accumulation of soil washed down from the higher ground. The sides and bottom of the pit did not show any evidence of the action of fire; there was no discoloration of the clay as would have resulted had this been a fire-place. This was probably a cache, or pit, where grain or other possessions of the tribe, were stored. The Kaskaskia, at their old village on the banks of the Illinois, followed this custom, and in describing their settlement as it appeared in 1679 it was written: "Every Cottage has two Apartments, wherein several Families might lodge, and under every one of them there is a Cave or Vault, wherein they preserve their *Indian-Corn*, of which we took a sufficient quantity, because we wanted Provisions." ¹

The camp or village sites already described are located on the left bank of the Saline, but the peninsula between this stream and the Mississippi, *C* on map (fig. 1), was evidently occupied by a com-

¹ Tonti, An Account of Monsieur de la Salle's Last Expedition and Discoveries in North America, London, 1698, p. 29.

paratively large settlement. This was a well-chosen position for a village, protected on three sides by water, and probably on the south by a line of palisades. Only during the greatest floods did the waters of the Mississippi cover the site, and probably at such times the near-by hills were occupied.

The site was partially examined, the principal excavation having been made at a point just west of the mound, about midway between the Saline and the old bed of the Mississippi. Here the surface was a few inches higher than that of the surrounding ground. At the present time the high, level portion of the peninsula is covered with old pecan trees, but it was plowed a few years ago, and in former years was cultivated every season, therefore the entire surface has been modified since an Indian village stood here, and consequently any slight inequalities of the surface are of no importance.

The principal excavation extended about 20 feet east and west, and a little less from north to south. The undisturbed clay was reached at an average depth of about 18 inches. This we may assume to have been the exposed surface when the site was first occupied. Two rather small fire beds were met with on the clay surface, and near one, resting upon the original surface, was an implement of the form usually described as a "notched hoe." This specimen measured a trifle more than $7\frac{1}{2}$ inches in length, being quite thin and having very narrow notches. The material was evidently derived from a quarry in Union County, Illinois. The stratum above the clay was composed of wood ashes and charcoal, vegetable mold and alluvium, the latter having been deposited during the floods of the Mississippi. Throughout the mass were many fragments of large pottery vessels, some animal bones, and a few mussel shells. Several broken bone implements were discovered, and also some chips of white and pink flint. The large "hoe" was the only perfect object found in the excavation. Many of the fragments of pottery bore the imprint of a well-made fabric. Smaller excavations made in other parts of the site discovered the original surface, but at a point about 100 yards southeast of the mound no signs of Indian occupancy were encountered.

From the mound to the mouth of the Saline the surface slopes gradually, but on the opposite side of the river the bank is very abrupt. Fragments of pottery and traces of fires are met with along the high bank, but all such remains which may have existed on the right bank have been covered or washed away by the action of the waters.

A single mound stands near the center of the village site. This, at the present time, is about 90 feet in diameter and less than 4 feet in height, but originally it must have been somewhat higher and of a lesser diameter; its change of form may be attributed to the action of

the plow and the trampling of cattle. The central part of the mound was examined, the excavation having been carried down to the undisturbed clay. It appears to have been formed of the surface soil, with a few particles of charcoal and a small quantity of ashes intermingled. The mass of camp refuse surrounding the mound had evidently accumulated after the construction of the mound, otherwise traces of it would have been encountered in the excavation. Three skeletons were found. The first to be met with was near the present surface of the mound, a few inches below the line of the plow. This was the skeleton of a male, extended, and with the head south. The skull was saved (Cat. No. 278698, U.S.N.M.). This burial presented one very unusual feature; the body had been placed in the grave, or rather on the surface, face down, and as a result the skull was entirely empty, and not a particle of earth had entered it. The body may have been wrapped at the time of burial, and accidentally deposited in this strange position. Just beneath the left shoulder, and extending a few inches beyond, were various small objects which rested upon one another, and which had probably been inclosed in a bag or pouch when they were placed in the grave with the body. These included: (1) A chipped celt about 7 inches in length, thin and well made, having a sharp cutting edge. (2) A pair of arrow-shaft rubbers with deep grooves, made of a very coarse-grained dark-brown sandstone, a material found in the western part of Ste. Genevieve County. (3) A hematite plummet. This had been broken, but even in this condition had been retained and used for some purpose. The fractured edges are smooth from contact with a softer material, and across the surface are several grooves which appear to have been worn by cords. (4) Three bone implements, all of which are broken. Two were pointed and one was flat, the latter having a gouge-shaped edge. (5) Small granite pebble. This is triangular in section; the three edges are much worn and bear evidence of having been struck against some hard substance. Other parts of the natural surface are smooth. (6) Three small pieces of gypsum; all are conical in shape, having been worked. The surfaces are greatly decomposed. All are shown in plate 52.

The skull of this skeleton was saved, and it has been identified by Doctor Hrdlička as being that of a male, probably between 35 and 40 years of age. One may, therefore, regard the different objects, enumerated above, as having been carried in a man's bag, together with substances of a perishable nature, all traces of which have disappeared. Of the various pieces the three gypsum specimens are the most unusual; these, as Mr. W. H. Holmes has remarked, "may have been charms or magic-working stones from the kit of a medicine man." The granite pebble, showing evidence of much use, may have served in striking a spark to produce fire. The purpose of the

hematite specimen is unknown, although it bears signs of use and was probably quite old when it was deposited in the grave. The other stone and bone objects do not present any unusual features.

A large quantity of flint chips were encountered on the same level and about 18 inches east of the preceding objects. They were scattered through a space less than 2 feet in diameter and were mingled with a large amount of charcoal. A tooth of a beaver was found in the same mass. A small black pottery vessel had been placed between the skeleton and the flint chips and some 6 or 8 inches higher, but its elevation had caused it to be hit by the plow and destroyed and only a few fragments remained.

Two skeletons were discovered resting upon the original surface of the ground. They were extended with the heads east. The feet were about under the first burial encountered. The remains were greatly decomposed and very soft. The ground was very damp, and the roots of a large pecan tree had reached the bones, and consequently their condition is no indication of great age. No objects of any sort were discovered with the burials.

The mound had, at some former day, been partially examined, and several pits and trenches had been opened at different points; but fortunately the central burials and the interesting group of objects had not been reached.

During the past few years innumerable stone implements, for the most part of ordinary forms and materials, have been found on the sites near the salt spring. These have been revealed by the plow, but are now becoming quite scarce. Undoubtedly these represent the work of the last occupants of the area, and were left scattered over the surface of the camps or villages. Probably very few entire objects of stone, bone, or shell are to be found beneath the surface in the mass of ashes and mold forming the stratum above the undisturbed clay. Any such specimens were lost by their owners and are, of course, few in number, but broken pieces are plentiful. Large "salt pans" may be hidden by the accumulated ashes and refuse, to be discovered, perchance, at some future time. Fragments of smaller vessels occur in quantities both on and below the surface. These were the utensils daily used in the wigwams, and were evidently similar to pieces placed in the stone graves.

Many large spades, made of the cherts from the Union County, Illinois, quarries, have been found on the surface of the high land beyond the village sites. Here were evidently the cornfields and gardens of the settlement, and judging from the large number of such objects found, and their distribution over a comparatively wide area, we are led to the belief that many acres were cultivated.

Very few ornaments of stone or shell have been discovered on the sites, and they appear to have been equally scarce in the stone graves.

Three shell beads were found near the spring, but nothing of the kind was met with in any of the excavations.

Shells of the river mussel were used as spoons; a fragment of one was obtained near the spring.

Pipes are seldom found. A small carving in limestone, representing a human head, which was found in the cultivated field across the road from the salt spring, is probably a part of a tobacco pipe (Cat. No. 278688, U.S.N.M.). (See B and C on pl. 53.) Objects of hematite have, from time to time, been found on the surface. Small chipped flints have been very plentiful.

The large number of specimens found in this section during the past few years have gone to enrich private collections, or have been acquired by dealers. Unfortunately no museum possesses a representative collection from the area circumjacent to the salt spring.

STONE GRAVES.

Stone graves existed in large numbers in the vicinity of the Saline, and every elevated point appears to have been occupied by a group. But at this late day it is quite difficult to discover any remaining in an undisturbed condition. The plow, and the seekers of buried treasure, are responsible for the destruction of a great majority of the ancient burials.

Many graves have, from time to time, come to light along the brow of the elevated land just across the present road from the salt spring. During the present investigation several were discovered on the summit of this ridge at a point just above the approach to the wagon bridge spanning the Saline. These, however, were entirely empty, and although the stones forming the sides, ends, and bottoms remained in place, not a vestige of bone was met with. The graves were of the ordinary form and the largest measured upward of 6 feet in length.

Several hundred yards below the mouth of the Saline, and midway between this stream and the former bed of the Mississippi, the highland terminates in an abrupt point which rises some 50 feet above the flood plain of the streams. The summit of this point is occupied by a small mound; of this we shall speak later. A single stone grave was encountered at the foot of the mound, on the west side. This was carefully examined, but not a trace of bone was found. It extended from north to south, and measured 4 feet 6 inches in length. One unusually large slab of limestone, the length of the grave, served as the eastern wall.

Four graves, undisturbed with the exception of the top stones having been removed by the plow, were discovered on the brow of the ridge about 50 yards south of the small mound previously mentioned. But for want of time it was not possible to determine the

extent of the cemetery of which these graves constituted a part; however, it would not be surprising to find it extending over a comparatively wide area. A plan of the four graves is shown in figure 4, and they may be described as follows:

1. This burial presented some very interesting and unusual features. The pieces of limestone used in forming the walls and bottom were rather smaller than were often employed. The extreme length was just 6 feet, and the width at the widest point 15 inches. This was divided into two compartments, the larger being 4 feet 6 inches in length. In this were the bones of a single skeleton, disarticulated before burial. Near the skull lay a small earthen vessel (Cat. No. 278697, U.S.N.M.), which was saved. The smaller compartment was occupied solely by a skull, facing upward, and resting upon the stone which formed the bottom of the grave. It was quite evident that both sections were constructed at the same time, as

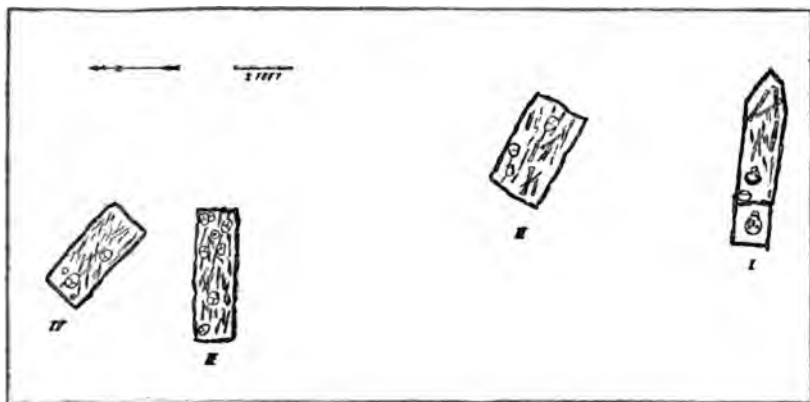


FIG. 4.—GRAVES SOUTH OF VILLAGE SITE. D ON FIG. 1. GRAVE I IS SHOWN ON PLATE 54 AND FIG. 5.

stones on the bottom extended on both sides of the partition, and likewise the stone on the north wall. Another curious feature of this grave was the converging of the north and south walls to complete the inclosure at the eastern end. Unfortunately the cover stones had been removed by the plow, and the remains were in a badly decayed and crushed condition, and consequently were not removed. (Shown on pl. 54 and fig. 5.)

2. Length, 3 feet 9 inches; width, 2 feet. Stones at sides, ends, and bottom. Contained the disarticulated bones of two skeletons. The skull resting against the north wall was saved (Cat. No. 278699, U.S.N.M.). Near this skull were fragments of a small earthen jar.

3. Length, 5 feet; width, about 18 inches. Stones forming the sides, ends, and bottom remained in place. As indicated on the plan, this grave contained seven skulls and a large number of separate bones, but all were greatly decomposed and could not be saved.

Near the eastern end was a small pottery vessel (Cat. No. 278696, U.S.N.M.), which was preserved.

4. Length, 3 feet 8 inches; width, 1 foot 8 inches. Stones on the sides, ends, and bottom. Contained two skulls and numerous other bones. Fragments of four small pottery vessels were met with; two of these had evidently been colored red. Nothing in this grave was saved.

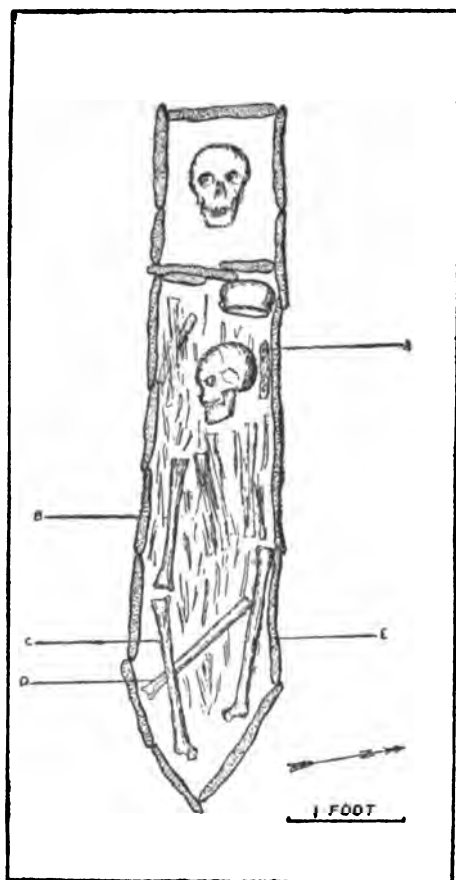


FIG. 5.—GRAVE I ON HIGH POINT SOUTH OF VILLAGE SITE.
SEE ALSO PLATE 54.

Although so few graves were examined, it is remarkable that all should have contained disarticulated skeletons. However, graves have been discovered in the valley of the Saline in which the skeletons remained entire and extended, showing conclusively that at the time of burial the bones were articulated, and that the flesh had not been removed.

Looking eastward from the site of the graves just described, across the former bed of the Mississippi and the lowland between it and the Kaskaskia, the field of vision is bounded by the line of bluffs bordering the left bank of the latter stream. Along this highland are various groups of stone graves similar to those near the Saline. Similar in construction, although the great majority contain entire skeletons. It

is quite evident that many, and probably all, were constructed by the Illinois tribes found occupying the area when it was first reached by the French colonists. Some appear to have been made within the past hundred years; this is certainly true of a group near the village of Prairie du Rocher, of which it has been written: "Mrs. Morude, an old Belgian lady, who lives here, informed Mr. Middleton that when they were grading for the foundation of their house she saw skulls with the hair still hanging to them taken from

these graves. It is therefore more than probable, and, in fact, is generally understood by the old settlers of this section, who derived the information from their parents, that these are the graves of the Kaskaskia and other Indians who resided here when this part of Illinois began to be settled by the whites." ¹ In a direct line Prairie du Rocher is less than 15 miles distant from the mouth of the Saline.

During the work in the vicinity of Kimmswick and other parts of Jefferson County some years ago, 16 distinct groups of stone graves were examined. A most interesting group was discovered immediately north of and adjoining the important village site near the spring, about $1\frac{1}{2}$ miles west of Kimmswick. This group included 22 graves, of which number, 8 contained extended skeletons. Ten graves contained from 1 to 3 skulls each, together with various bones. One contained 4 radii and 4 ulnæ and also 8 finely worked bone implements and a small perforated disk of wood, discolored by and showing traces of a thin sheet of copper. A few bones were found in another grave, and in the remaining two all traces of the burial had disappeared. Six graves of this group, three of which contained small extended skeletons, were lined with fragments of large earthenware vessels, smooth on both surfaces, and which, when entire, must have measured from 20 to 30 or more inches in diameter. Nothing was met with to suggest the possibility of one form of burial being older than the other; all were probably of approximately the same age, differing only by a few years. Several burials found here were similar to those discovered near the mouth of the Saline. Many graves were examined in the valley of Big River, in the vicinity of Morse Mill. In many cases all traces of the burials had disappeared, but in every grave where bones were met with the skeletons had been articulated at the time of interment. All graves were stone lined, and few groups consisted of more than 10 or 12. These small groups evidently indicate the sites of several wigwams, as signs of an encampment were often discernible. Nothing was met with in any graves of the small groups indicating the age of the burials.

In grave IV, below the mouth of the Saline, 4 small earthen bowls were encountered. All were in a fragmentary, disintegrated condition, and unfortunately could not be removed. Two pieces were small bowls, about 4 inches in diameter and a little less in depth. They were very thin and fragile, and were composed solely of clay, neither sand nor crushed shell having been used as an admixture. They differed materially from all vessels constructed for practical purposes. Several similar specimens were recovered from the graves near Morse Mill, and 10 or more were found associated with the

¹ Thomas, Cyrus, Report on the Mound Explorations of the Bureau of Ethnology, in the Twelfth Annual Report, p. 136.

burials in the cemetery near Kimmswick, previously mentioned. All examples, from the three localities, were of about the same size and form. For the reasons already stated these small vessels would have been of no use to the living, and we are therefore led to the belief they were made solely for use in connection with burial ceremonies. Finding examples of these small mortuary vessels at three distinct points, tends to prove the similarity of custom of the people by whom the stone graves were constructed.

The discovery of graves near Kimmswick, in which fragments of large pottery vessels had been used in the place of slabs of stone, suggested the possibility of these and other burials in the region having been made by the Shawnee. Similarly constructed graves have been met with in the vicinity of Nashville, Tennessee, and in other parts of the known Shawnee territory. The settlement of the Shawnee and Delaware on Apple Creek, some miles south of Ste. Genevieve, has already been mentioned, and it is not unlikely there were camping places between this and the village of the same tribes which was located a few miles south of the Missouri, a short distance northwest of St. Louis. "*Village a Robert, or Village du Marais des Liards*, is situated three or four miles west of St. Ferdinand [the present Florissant], and contains a few French families. It was formerly the residence of a part of the Delaware and Shawnee tribes of Indians." ¹

The two better preserved crania from Saline Creek are described hereunder.

Report on two crania from Saline Creek, Mo., collected by D. I. Bushnell, jr.

Of the skulls in question, one (Cat. No. 278698, U.S.N.M.) is that of a man of 35 or 40 years of age, while the other (Cat. No. 278699) is that of a young female not yet quite adult. Both specimens are normally developed and free from any deformation which would alter their form; nevertheless, the female presents a slight, but plainly perceptible, frontal flattening—probably an extension of the practice of such deformation from farther south. Both are of moderate size, but what is remarkable is that the cranial bones in both are unusually delicate, so that internal capacity, notwithstanding the moderate external dimensions, is fair, approximating about the average for both sexes in the Indian.

Both specimens are considerably damaged, which makes extended measurements and comparisons out of question, nevertheless their type is plainly discernible. The outline of the vault, when viewed from above, is in both cases handsomely elliptical. They were of medium height. In length and breadth they measure, respectively, in the case of the male, 17.3 and 13.9 cm., in the case of the female, 16.3 and 13.4 cm., which gives the cephalic indices of 80.4 for the male and 82.2 for the female. This type resembles more that of the more southern Choctaw, for instance, than the more long-headed and more strongly developed people of some other parts of Missouri. The weak development of the various ridges and muscular insertions on both specimens indicates that they belonged to individuals and probably a group of people of only moderate robustness and stature. Two or three specimens of much the same nature were found in the Fowke material.² ALEŠ HADLÍČKA.

¹ Beck, Lewis C. A Gazetteer of the States of Illinois and Missouri. Albany, 1823, p. 334.

² See Report on Skeletal Material from Missouri Mounds, Collected by Mr. Gerard Fowke in 1906-7. Bulletin 37, Bur. Amer. Ethn., pp. 103-112, Washington, 1910.

MOUNDS.

Two mounds have already been mentioned on the preceding pages, one on the village site at the mouth of the Saline, the second on the high point, *D* on figure 1, just south of the site. The latter occupies a very prominent position, and from its summit the view is one of great beauty and interest. The old bed of the Mississippi, its course until a few years ago, is visible for miles in both directions. Eastward across the low, bottom lands are the bluffs beyond the Kaskaskia, locally called the "Okaw." The French settlement of Kaskaskia and the sites of the villages of the Kaskaskia may also be distinguished in the distance.

As the mound crowns a high natural point it is difficult to ascertain the exact dimensions of the artificial work. It is, undoubtedly, to some extent artificial, but an excavation made on the west side, and extending beyond the center, failed to reveal any evidence. The stone grave discovered at the foot of the mound evidently extended below the base. No traces of fire were met with in the single excavation, and neither ashes nor charcoal had been brought to light by the plow; consequently the mound, although occupying such a prominent position, had not been used as a signal station.

About 300 yards south of this point, on the edge of the plateau, is another mound. Its surface has been plowed for many years, and as a result the work is reduced in height and spread. Like the preceding, it would be difficult to ascertain the dimensions of the artificial portion. The mound was partially examined some years ago, several pits were dug near the center, but nothing could be learned of the results and discoveries.

In the heavy timber, about 1 mile southward from the point and nearly midway between the Saline and the former course of the Mississippi, are three elongated mounds. These are approximately 75 feet in length and 12 feet in height. They are narrow and form a narrow ridge along the summit. No measurements were made.

Other mounds will be mentioned in the conclusion.

CAVES.

A short distance from the left bank of the Saline, in the limestone cliff, about one-half mile south of west of the salt spring, is a small cave of the greatest interest. It is scarcely 12 feet in width, while down the middle is a channel worn deep in the limestone. Water flowing through the cave falls into a narrow chasm, which extends nearly east and west. From the bottom of the channel to the top of the cavity is little more than 4 feet, but it is very irregular. The rock surface on both sides of the channel is quite level and on this

surface at the present time may be traced 13 petroglyphs, all of which are reproduced in figure 6, their relative positions being indicated on the plan (fig. 7). These include four bird forms, one hand, one small human footprint, six circles, and one small figure probably intended to represent the footprint of a large bird. Other figures were formerly to be seen on the eastern side of the channel, but they were removed many years ago and taken to St. Louis. It is known that two of the carvings represented human footprints. They were near the bird figure, on the edge of the channel, and a large block of stone was cut away, as is indicated by the dotted line.

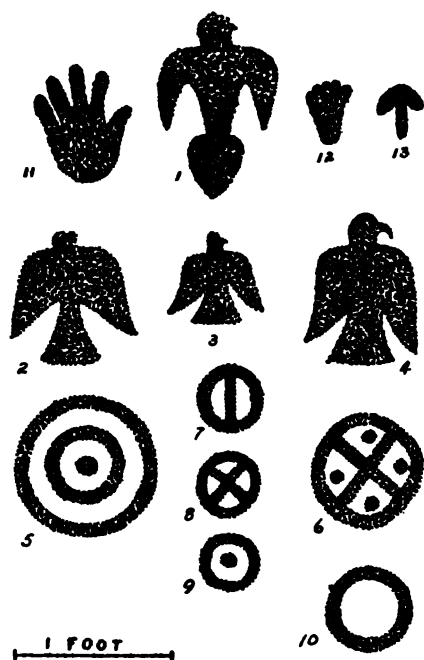


FIG. 6.—THIRTEEN PETROGLYPHS ON THE FLOOR OF THE CAVE. THEIR RELATIVE POSITIONS ARE INDICATED ON THE PLAN OF THE CAVE, FIG. 7.

Water to a depth of an inch or more is flowing down the channel at all times, but a rainfall of not to exceed one-quarter inch in several hours will cause the channel to overflow, and the grit carried down by the water scours the surface of the limestone. This readily explains the faintness of the petroglyphs at the present day. The high land a short distance from the cave is dotted with sink holes, and it is quite evident that one or more find an outlet through the cave, thus accounting for the great increase of the volume of water flowing through it after a slight rainfall in the vicinity.

Before mentioning the petroglyphs in detail, it will be of interest to compare an account of the cave written a little more than one-half century ago.

At a meeting of the American Ethnological Society, held in New York City during the month of January, 1861, "Mr. Squier read extracts from the *Ste. Genevieve County Plaindealer* (Mo.) of a recent date. * * * Higher up on the Saline is a cavern in which is a spring of water flowing over a large flat or table rock. The water has worn a little channel in the rock, through which it flows. In this flat rock are round holes, similar to mortars, about the size of a tin cup. These places were no doubt made by the ancients, as a place to pound with stones their corn into hominy or meal. Entering the mouth of the cave a short distance, we discovered footprints of a pappoose just

commencing to walk. There are three distinct marks. The child was walking, and the first step was with its right foot, the next with its left, then again came the right. There is near by a very large footprint of a man. Turkey tracks and several other very singular

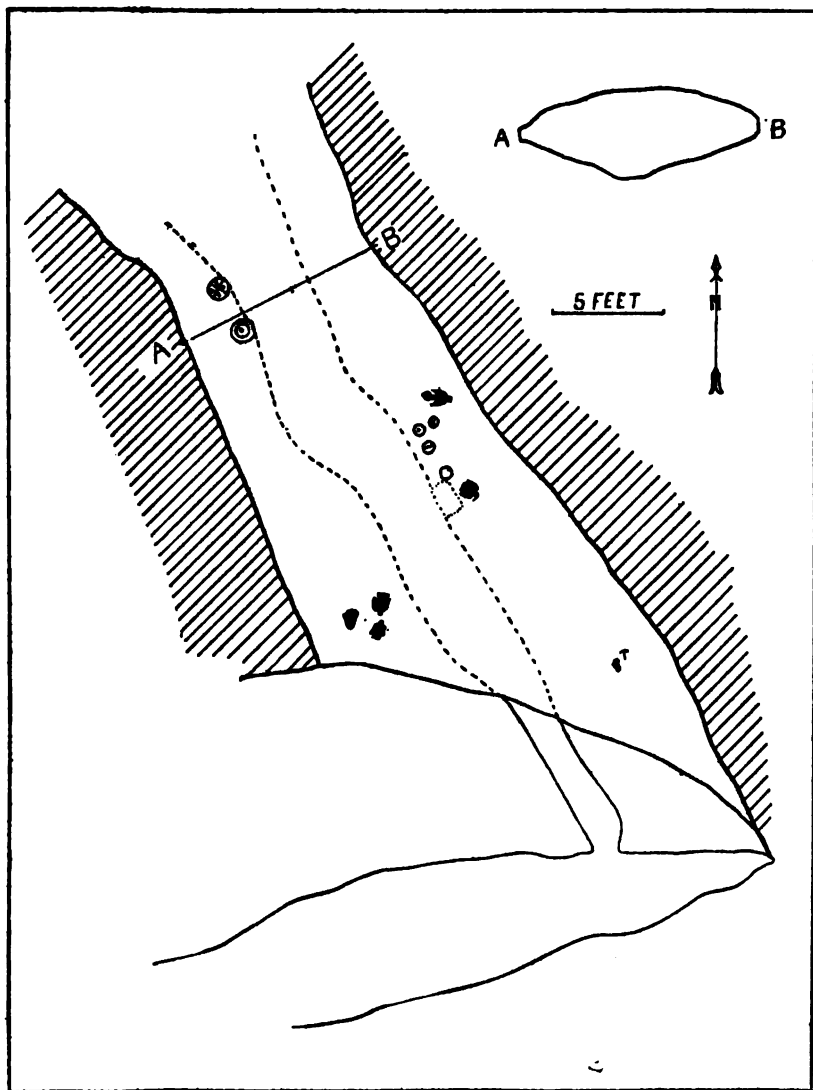


FIG. 7.—PLAN OF THE CAVE SHOWING THE PETROGLYPHS. THE DOTTED LINES INDICATE THE CHANNEL WORN IN THE FLOOR OF THE CAVE. THIS CHANNEL CONTINUES OUTSIDE THE CAVE AND CONNECTS WITH A NARROW CHASM EXTENDING EAST AND WEST.

things can be seen very distinctly. There is also the outline of an eagle cut into the rock. The work is neatly executed, and appears to have been done ages ago.”¹

¹ Bulletin of the American Ethnological Society, vol. 1, New York, 1861, pp. 46-50.

The "round holes, similar to mortars," mentioned in the preceding account, exist as described, but their origin may be attributed to the dripping of water from the top of the cave, rather than the work of man. The figures cut on this limestone surface have been met with in other parts of the Mississippi Valley, some being represented in thin copper, others serving as decorations on earthenware vessels.

1. A bird, showing the wings, body, and tail. Unfortunately the head can no longer be traced. The expanded tail is the most interesting feature of this figure, and this at once suggests the copper pendant recovered from a site in Cross County, Arkansas.¹ The pendant is a most unusual example of aboriginal art. It represents a bird highly conventionalized. The wings, body, tail, and claws are clearly shown. The head is crested and a small perforation represents the eye. The expanded tail is so similar to this peculiar feature of the petroglyph that little doubt remains that both figures were intended to represent the same bird. This may have been the large crested woodpecker, *Ceophloeus pileatus*. And in turn this suggests the gold object representing the head of a woodpecker which was discovered by Rau in a mound in Manatee County, Florida.

2, 3, and 4. Birds. The latter may be the "eagle cut into the rock," of the earlier description. The curved beak certainly resembles that of the eagle. In some respects this carving is similar to the figure in sheet copper found in a mound near Peoria, Illinois, figured by Thomas.²

5, 6, 7, 8, 9, and 10. Probably all have been found either alone or in combination with other figures or designs, on earthenware vessels recovered from mounds in the central portion of the Mississippi Valley. These are usually regarded as being cosmic symbols.

11. Representing the imprint of the left hand.

12. Representing the impression of a small human foot. As will be seen on the plan of the cave, this is near the opening, on the east side. It is the least distinct of the petroglyphs. This was probably one of the figures referred to in the earlier account, one of the "foot-prints of a pappoose just commencing to walk." Similar carvings have been found in many parts of the country.³

13. This may have been intended to represent the track or footprint of some large bird, evidently one of the "turkey tracks."

Contrary to the belief of the writer of the article in the *Plainedealer*, the petroglyphs must necessarily be of comparatively recent origin, otherwise they would have been more nearly obliterated by the

¹ Moore, Clarence B., *Antiquities of the St. Francis, White, and Black Rivers, Arkansas*, in *Journ. Acad. Nat. Sci. of Phila.*, 1910, pl. 10, p. 283.

² Thomas, Cyrus, *Report on the Mound Explorations of the Bureau of Ethnology*, in *Twelfth Rep. Bur. Amer. Ethn.*, p. 309.

³ Bushnell, D. I., Jr., *Petroglyphs Representing the Imprint of the Human Foot*, in *Amer. Anthr.*, vol. 15, pp. 8-15.

action of flowing water carrying a large amount of sand and soil. Persons who have seen the carvings at different times during the past 30 years say they are becoming less and less distinct, and that formerly the figures were more clearly defined than now. If such perceptible changes have occurred within so short a time, we must not regard the work as being very ancient, and probably two centuries would be a fair estimate of their age.

In speaking of the six circular figures, Dr. Walter Hough has suggested the possibility of their having been copied from shields—in other words, being heraldic symbols. The theory is plausible and would be equally applicable to all the petroglyphs in the cave. It would, therefore, be permissible to attribute their origin and presence in the cave to individuals who had such designs on their shields, and whose right it was to use the symbols. The carvings may have been left as records of visits made to the spring; this is suggested by the following passage, which, however, refers to a far western tribe:

“Mr. G. K. Gilbert discovered etchings at Oakley Spring, eastern Arizona, in 1878, relative to which he remarks that an Oraibi chief explained them to him and said that the ‘Mokis make excursions to a locality in the canyon of the Colorado Chiquito to get salt. On their return they stop at Oakley Spring and each Indian makes a picture on the rock. Each Indian draws his crest or totem, the symbol of his gens (?). He draws it once, and once only, at each visit.’”¹ The figures are described as having been made “by pounding with a hard point,” although some were “scratched on.” While some were quite fresh and of recent origin, others were old and weatherworn.

Caves are numerous throughout the southern part of Missouri, and scores are met with in the limestone bluffs along the Ozark streams and in the region eastward to the Mississippi. These, with few exceptions, bear evidence of long or frequent occupancy by the Indians, but I am unable to learn of any in which petroglyphs occur, and consequently the small cavern near the Saline is quite distinct from the others.

Other caves were visited in the vicinity of Sté. Genevieve. “Gilliam’s Cave” is several hundred yards distant from the left bank of the River aux Vases, and in a direct line about 3 miles northwest of the salt spring near the mouth of the Saline. The cave proper is only a few feet in height, and through it flows a small stream; it is of no special interest. Just above the cave the limestone formation forms a natural arch; the opening is about 70 feet in length, and the distance between the walls about one-half as great. The space beneath

¹ Mallory, Garrick, Photographs of the North American Indians, in Fourth Rep. Bur. Amer. Ethn., p. 29.

the arch was partially examined, and a few arrowheads and chips of flint were found together with some animal bones intermingled in a mass of wood ashes and charcoal. At one point the mass of ashes was some 18 inches in thickness.

"Saltpeter Cave" is a large cavity near the left bank of Little Saline Creek, about 12 miles southwest of Ste. Genevieve. No evidence of Indian occupancy was met with. Various caves are said to exist near the Establishment Creek, some miles north of Ste. Genevieve, but they were not visited.

THE "SALT PANS."

The fragments of large pottery vessels met with in vast quantities in the vicinity of the salt spring, and on the village site just below the mouth of the Saline, represent two distinct types of "pans." The first, and probably the more numerous, show the impression of woven or braided fiber or hair on the outer surface, the inner surface being smooth. In the second variety both the outer and inner surfaces are smooth. Careful search was made in all excavations to ascertain, if possible, whether the two forms occurred in distinct strata in the masses of ashes, burnt stone, etc., but at no point were such conditions met with. As has been mentioned in the description of the area immediately south of the spring, large "smooth" vessels were found here, and no pieces of "cloth marked" pottery were found in the excavation. This conforms with the evidence gathered at the site near Kimmswick. There on the high plateau above the spring, the site of the settlement or camps, not a single example of "cloth marked" ware was discovered in the excavation, which covered about one-third acre. Four large vessels, ranging from 21 to 32 inches in diameter, were discovered, in addition to vast quantities of fragments of similar vessels; but all were smooth. Similar fragments had been used in lining graves in a near by group. At the foot of the elevated ground, near the bank of a small creek, was a spring of salt water. An excavation made near the spring reached the undisturbed clay at a depth of about 3 feet. Resting upon the clay was a stratum, some 18 inches in thickness, composed of fragments of large pottery vessels, fresh-water shells, animal bones, ashes, and charcoal. Above this was a deposit of alluvium. Of the large number of fragments of vessels met with in this excavation all, without exception, bore the imprint of a woven or braided fiber. On the surface of the ground near the spring were a few pieces of smooth ware, similar to the many examples discovered on the plateau. Here we have conclusive evidence that the two varieties of vessels were made and used at different periods, also that of the two the "cloth marked" is the older.

Among the numerous pieces of fabric marked pottery found near the Saline were some showing the imprint of unusually fine and well-

made materials. A remarkable example is reproduced in plate 55c. The threads forming this piece were probably spun of the wool of the buffalo, an art practiced by various tribes,¹ and it is evident the work of the women of the Kaskaskia was not surpassed by any.

During the autumn of 1721, some 18 years after the removal of the Kaskaskia from their villages on the bank of the Illinois, Pere de Charlevoix reached their new towns near the mouth of the Kaskaskia, on the eastern side of the Mississippi, a short distance from the Saline. He was impressed with the skill of the women, and wrote: "Their women are very neat-handed and industrious. They spin the wool of the buffalo, which they make as fine as that of the English sheep; nay sometimes it might even be mistaken for silk. Of this they manufacture stuffs which are dyed black, yellow, or a deep red. Of these stuffs they make robes which they sew with thread made of the sinews of the roe-buck."² The piece of fabric which was impressed on the fragment of pottery already mentioned would be worthy of this description. The peculiar weave represented by this fragment has been met with in other parts of the Mississippi Valley and has been fully described.³ Other examples were discovered near the Saline in which the warp threads were as much as 1 inch apart; the threads were tightly twisted and the work neatly executed. Figure 8 represents a fabric impressed upon a small piece of pottery found near the spring. The fragment is very small and the entire impression is shown exact size. This is of special interest, as it shows two designs on the same piece of cloth. For the sake of comparison a section of a buffalo hair bag in the Pitt-Rivers Museum, Oxford, is shown in plate 56 *a*, while *b* represents a cloth derived from a fragment of earthenware from the Saline. It is quite evident the impression on *b* was made by a fabric similar to *a*. Both are enlarged one-half.

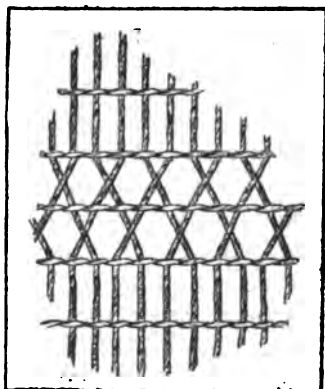


FIG. 8.—IMPRESSION ON A FRAGMENT OF POTTERY. EXACT SIZE.

An unusually interesting example is reproduced in plate 57 *a*. This shows two pieces of fabric neatly joined and impressed upon the surface of a large vessel. The specimen was probably not less than 30 inches in diameter. The fragment, which is a portion of

¹ Bushnell, D. I., Jr., *The Various Uses of Buffalo Hair by the North American Indians*, in *Amer. Anthr.*, vol. 11, p. 401.

² de Charlevoix, *Journal of a Voyage to North America*, London, 1761, vol. 2, p. 222.

³ Holmes, W. H., (A) *Prehistoric Textile Fabrics . . . derived from Impressions on Pottery*, in *Third Ann. Rep. Bur. Ethn.*, pp. 393-426. (B) *Prehistoric Textile Art of the Eastern United States*, in *Thirteenth Ann. Rep. Bur. Ethn.*, pp. 9-46.

the rim and extending down about 5 inches, is not more than one-half inch in thickness, although the rim itself is quite heavy and flaring. The coarser fabric extends from the rim downward, and evidently formed a band about 3 inches in width around the upper portion of the vessel. Unfortunately only a small part of the impression of the finer cloth remains, but it is clearly defined. The neatness with which the two pieces of fabric had been joined, the position of the border, and the clearness of the impressions of the fabrics on the outer surface of the vessel suggest the attempt on the part of the maker to make use of the impression as a means of decorating the large "salt pan."

Many fragments of large vessels found in the vicinity of the salt spring bear the imprint of a very coarse material. Examples are shown in plate 56, *a* and *b*. It has been a question whether this form of impression should be attributed to a piece of flat, woven matting, or to a shallow basket which had been used in forming the vessel. If a matting, it would be difficult to understand how it could be placed so as to conform with the convex surface of a vessel. For this and another reason about to be stated, it is evident that *b*, and possibly *a*, represents the imprint of the inner surface of a coarsely woven basket. In *b* the woof elements form distinct ridges a little less than 1 inch apart. If a surface of this nature had been covered with a thin fabric and impressed upon a mass of soft clay, the ridges of the woof would be clearly shown. This effect is produced in *c* of the same plate. Here is the imprint of a very fine fabric, but on the surface of the fragment may be traced four parallel ridges, corresponding with the woof elements in *b*. The natural conclusion is that a surface similar to that of *b* had been covered with the cloth, the imprint of which is so distinctly visible; the latter being thin and yielding had followed the rough, irregular surface beneath it.

A very interesting specimen is reproduced in plate 57 *b*. This small fragment bears the imprint of two pieces of cloth, one of which overlaps the other. The third example, *c*, on this plate shows the imprint of three distinct materials on the same piece of pottery. This is a portion of a large "salt pan," being a section of the rim. In the center, clearly defined, is the impression of a coarse material. On the right is the imprint of a fabric resembling plate 56 *b*. On the left is the impression of coarser fabric. Both fabrics had been placed over the surface of coarsely woven matting, or, more likely, the inner surface of a basket, an exposed section of which is visible between them.

This apparent use of baskets in the shaping of the large "salt pans" tends to verify a statement made many years ago: "Another method practised by them is to coat the inner surface of baskets made of rushes or willows with clay to any required thickness, and when dry,

to burn them. * * * In this way they construct large, handsome, and tolerably durable ware, though latterly, with such tribes as have much intercourse with the whites, it is not much used, because of the substitution of cast-iron ware in its stead."¹ This was written to apply to the region west of the Mississippi, and more especially to Missouri, as the author had been for many years a captive among the Osage. He might well have had in mind the area about the mouth of the Saline.

The large vessels were made of clay, to which a quantity of crushed shell had been added. The vessels had been burned, but, strange as it may appear, heat sufficient to burn the vessel was not intense enough to calcine the particles of shell, and many pieces retain their luster.

The use of baskets in this connection would not have resulted in their destruction and loss. The wet clay, spread over the inner or concave surface, would within a short time have dried and contracted sufficiently to have permitted the removal of the vessel without injury to it or the basket mold.

Several fragments of large pans, found near the spring, bore the impression of a coarse, loosely made net. An example is given in plate 56. This particular vessel had evidently been formed in a mold having a smooth surface, otherwise the spaces between the cords would have been irregular.

The use of these large vessels was not restricted to the area immediately surrounding the salt spring, where they had evidently been utilized as evaporating pans in the manufacture of salt. On the village site across the Saline fragments of similar vessels were met with. Here were examples of both the smooth and fabric marked varieties. These undoubtedly served as cooking utensils, in which food was prepared by boiling, the water being heated by placing hot stones in the vessel.

ADDITIONAL SITES.

The sites described on the preceding pages are in the immediate vicinity of the mouth of the Saline; the investigations were necessarily restricted to this area, but many other spots within a few miles of the salt spring bear evidence of Indian occupancy.

Following the course of the Saline to a point about 3 miles above its mouth a place known as the "rock cut" is reached. At the lower end of the "cut" is a small salt spring. It is in the low ground a few feet from the right bank of the river. Several fragments of large "cloth-marked" pottery vessels were found in small channel through which the water flows from the spring to the river. The

¹ Hunter, John D., *Manners and Customs of Several Indian Tribes Located West of the Mississippi*, Philadelphia, 1823, p. 297.

salt water had been utilized by the Indians, but to what extent was not ascertained. Stone graves have been met with on the near by hills, which, of course, indicate the presence of a village or camp. This may have been a small, outlying camp, belonging to the more extensive settlement near the mouth of the river. For quite a distance around the spring the ground is covered with a heavy growth of timber, and the graves are in a cedar thicket, consequently an investigation of the site would entail much labor. Higher up the Saline, on both banks, are other salt springs, but they were not visited.

A large village probably stood near the mouth of the River aux Vases, on the north or left bank. This would have been about 2 miles up the Mississippi from the mouth of the Saline. The land at this point is rather low and has often been overflowed by the Mississippi, and as a result all traces of a settlement are lost. The land rises as it recedes from the river, and on the slope are traces of many stone graves. These were quite near the surface, and many have been struck and destroyed by the plow. Various objects of stone and shell are said to have been found on this part of the site. These had probably been deposited in the graves. Along the crest of the bluff, immediately beyond the graves, are several small mounds. Mounds and stone graves have been encountered along the bluff extending for miles northward from this site.

The most important group of mounds in this section is located a few miles south of the town of Ste. Genevieve, in the "Big Field." The group is on the level bottom land, a short distance from the foot of the limestone bluff, and includes one large and seven small mounds. The large central mound is of oval form and rises about 15 feet above the plain. The seven low, circular mounds surround the large one. All have been cultivated for many years, and the attempt has been made to plow in such a manner as to cause them to spread and wash down more rapidly. No measurements were made. Various objects are said to have been discovered on the summit of the large mound a few years ago just after the spring plowing, but no definite information could be gained respecting them, nor could they be traced.

The bluffs extending southward from the mouth of the Saline are likewise occupied by groups of stone graves and low mounds. A small creek enters the old bed of the Mississippi about 2 miles below the Saline; this forms the boundary between Perry and Ste. Genevieve Counties. Just south of the creek the bluff rises abruptly and is visible from miles about. The highest point is capped by a conical mound, and on the slope below are many stone graves.

The many small groups of graves discovered in the eastern part of Missouri indicate a scattered population. The large cemeteries such as existed in the country south of the Ohio are unknown here.

Game was abundant and undoubtedly served as the principal food of the people, but by separating into small groups the hunters could more easily secure the necessary supply. This condition undoubtedly explains the occurrence of the many widely separated camps, as indicated by the small groups of graves. However, such would not have been possible in a country surrounded by enemies. There is little doubt but that the remains of camps and cemeteries met with in this section may be attributed to the Illinois tribes. Their nearest neighbors on the west were the Osage, whose chief towns were many miles away. The Kaskaskia and Osage were friends. Charlevoix ¹ wrote in 1721:

"The *Osages*, a pretty numerous nation settled on the banks of the river bearing their own name, which runs into the Missouri about forty leagues from its confluence with the Mississippi, depute some of their people once or twice every year to sing the calumet among the Kaskasquias, and they are now actually here at present."

This explains the possibility of having small, scattered settlements, and undoubtedly many were occupied during comparatively recent days.

EXPLANATION OF PLATES.

PLATE 50.

The northern section of the map of the "Course of the Mississippi . . . in the latter end of the year 1765. By Lieut. Ross . . . London . . . 1775." The position of the village of Ste. Genevieve, as it was before the year 1782, is indicated by the name "Misere." During the year 1782 the settlement was moved to the higher ground some 2 miles westward, above the flood plain of the Mississippi.

PLATE 51.

Section of the lower portion of a cache or pit which was probably used for the storage of grain. It is exposed on the side of the road immediately north of the salt spring. Width about 4 feet 6 inches.

PLATE 52.

Eleven objects, discovered beneath the left shoulder of the upper skeleton, near the center of the mound on the village site at the mouth of the Saline. Upper row, beginning at the left, 3 pieces of gypsum, 1 granite pebble. Second row, hematite plummet; 3 bone implements. Bottom row, chipped celt, length 7½ inches; pair of arrow-shaft rubbers.

PLATE 53.

A.—Scapula of an elk, probably hafted and used as a hoe. The flat surface is polished from use. Found on the high ground just south of the spring. (Cat. No. 278693, U.S.N.M.)

B and *C.*—Two views of a small carving in limestone, representing a human head. Probably a fragment of a tobacco pipe. Extreme height, 3 inches. (Cat. No. 278688, U.S.N.M.)

¹ Journal of a Voyage to North America, London, 1761, vol. 2, p. 224.

PLATE 54.

Photograph of the grave shown more clearly in figure 5. The camera was placed at the foot of the grave, looking almost due west. The smaller compartment, containing the single skull, is not visible.

PLATE 55.

Casts of fragments of pottery found near the large spring. The upper specimens (*a* and *b*) represent the inner surfaces of rather coarsely woven baskets. The lower example (*c*) shows basketry, similar to *b*, covered with a piece of cloth of remarkably fine texture.

All specimens are reproduced exact size.

PLATE 56.

a.—Detail of a bag, made of buffalo hair, now in the Pitt-Rivers Museum, Oxford, England. Enlarged one-half.

b.—Cast of a fragment of pottery from near the large spring at the mouth of the Saline. Enlarged one-half. Evidently the fragment *b* represents the imprint of a fabric similar to *a*.

c.—Cast of a fragment of pottery showing the impression of a very coarse, irregular net. Exact size.

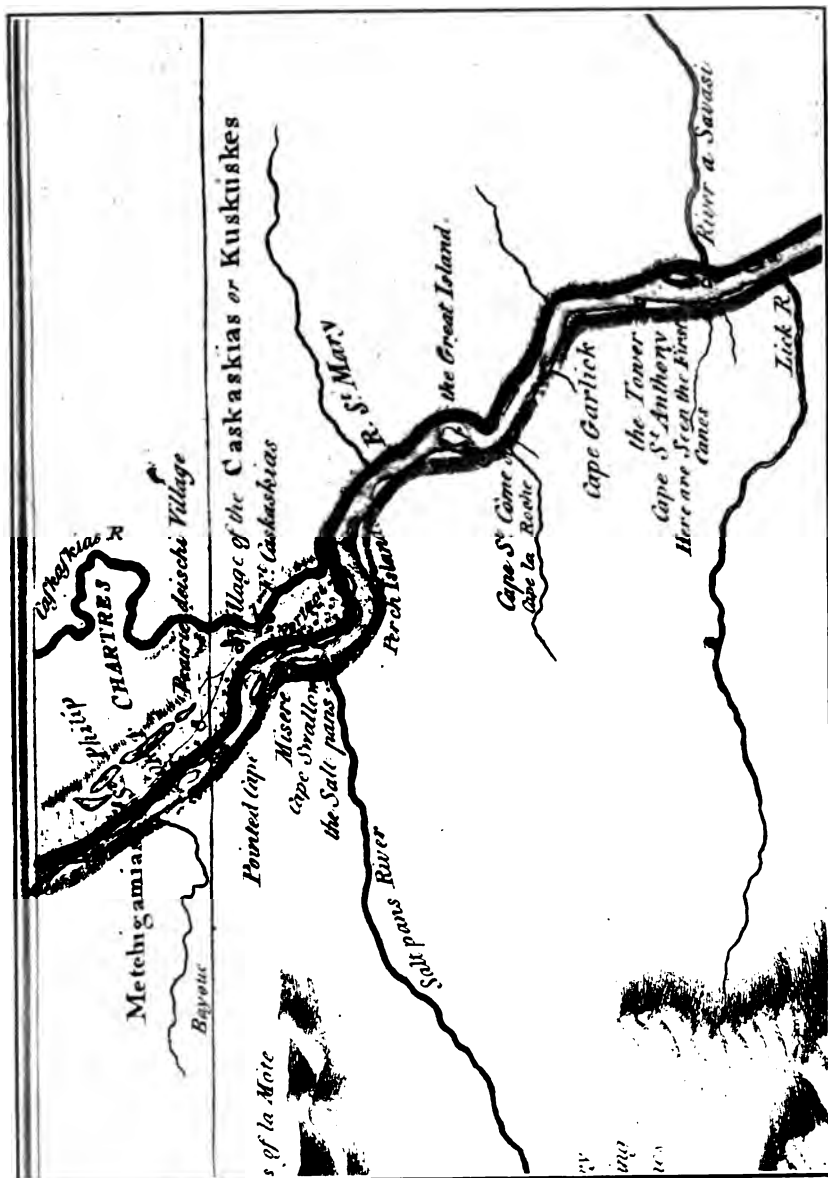
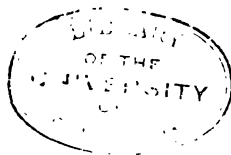
PLATE 57.

Casts of fragments of pottery, all shown exact size.

a.—This bears the imprint of two pieces of cloth, neatly joined.

b.—Two pieces of cloth are represented. The piece on the left overlaps the example on the right.

c.—Three distinct materials may be traced on this fragment. On the left is a coarse cloth; on the right is a fabric similar to *b*, plate 56. Between these is an exposed surface suggesting *b*, plate 55.

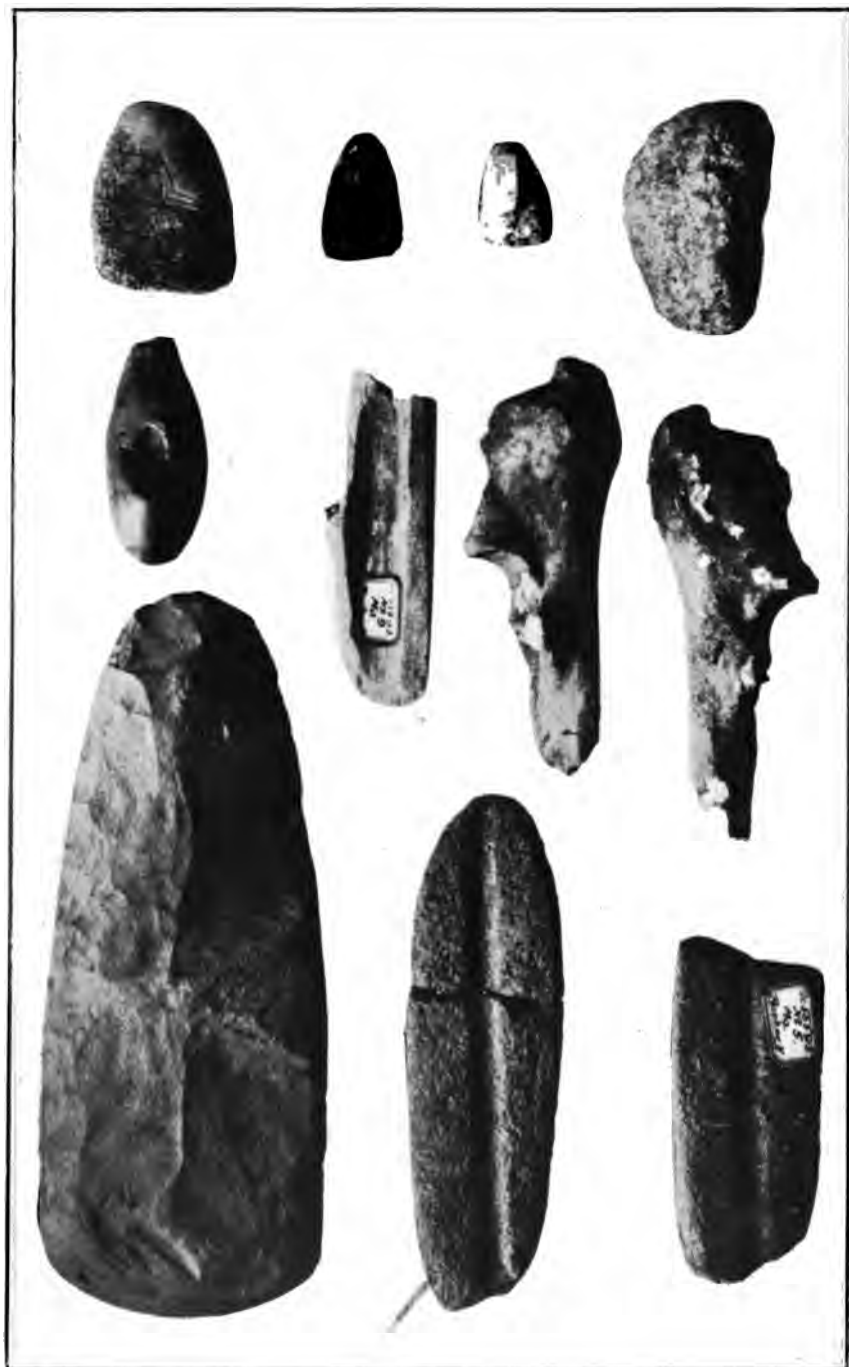


NORTHERN SECTION OF THE ROSS MAP, 1765. STE. GENEVIEVE IS DESIGNATED BY THE NAME "MISERE."

FOR EXPLANATION OF PLATE SEE PAGE 667.



CACHE EXPOSED ON THE SIDE OF THE ROAD NEAR THE SPRING.
FOR EXPLANATION OF PLATE SEE PAGE 667.



OBJECTS ASSOCIATED WITH BURIAL IN MOUNDS NEAR THE MOUTH OF THE SALINE.

FOR EXPLANATION OF PLATE SEE PAGE 667.



A. SCAPULA OF AN ELK USED AS A HOE.



B. SIDE.

C. FRONT.

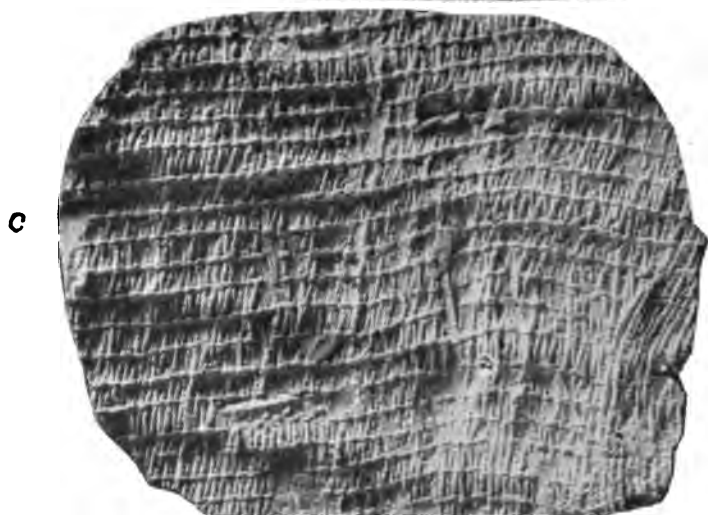
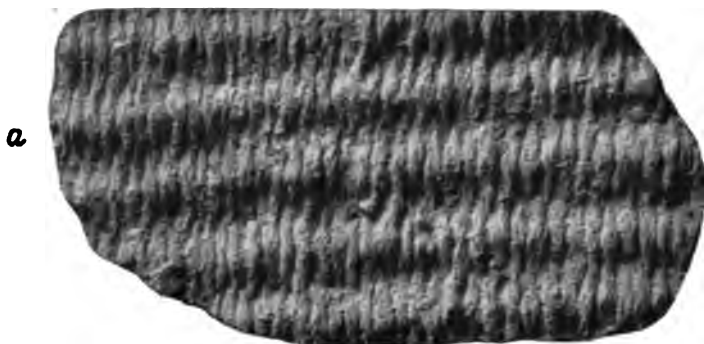
SMALL FIGURE IN LIMESTONE.

FOR EXPLANATION OF PLATE SEE PAGE 667.



GRAVE I. GROUP ON HIGH POINT SOUTH OF VILLAGE SITE.

FOR EXPLANATION OF PLATE SEE PAGE 668.



CASTS OF FRAGMENTS OF POTTERY.

FOR EXPLANATION OF PLATE SEE PAGE 568.



A. DETAIL OF A BUFFALO HAIR BAG.

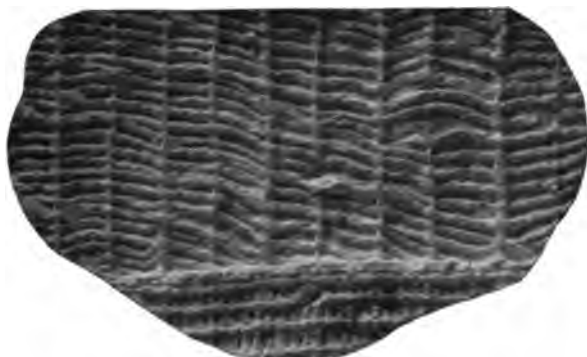
B. CAST OF A FRAGMENT OF POTTERY.



C. CAST OF A FRAGMENT OF POTTERY.

FOR EXPLANATION OF PLATE SEE PAGE 668.

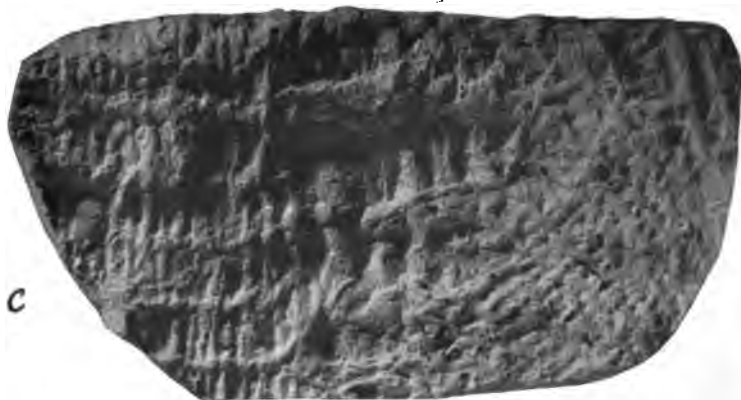
a



b



c



CASTS OF FRAGMENTS OF POTTERY.

FOR EXPLANATION OF PLATE SEE PAGE 668.

INDEX.

	Page.		Page.
<i>Acanthothrips magnafemoralls</i>	45	<i>Aonyx cinerea</i>	312
<i>Acerodon jubatus jubatus</i>	306	<i>Apanteles (Protopanteles) cacoeciae</i>	366
<i>mindanensis</i>	306	<i>iglesiasi</i>	365
<i>lucifer</i>	306	<i>Apistis onerosa</i>	520
<i>Achorotile</i>	578	<i>Apomys hylcoetes</i>	327
<i>albesignata</i>	578	<i>insignis bardus</i>	327
<i>foveata</i>	579	<i>insignis</i>	327
<i>Acrometopia maculata</i>	150	<i>major</i>	326
<i>punctata</i>	150	<i>microdon</i>	327
<i>Actinometra robustipinna</i>	279, 281, 282, 285, 286	<i>musculus</i>	327, 328
<i>Aeolothrips bicolor</i>	42	<i>petraeus</i>	327
<i>fasciatus</i>	42	Archeology, investigations in, in Ste. Gene- vieve County, Missouri.....	641
<i>Aekna multicolor</i>	112, 113	<i>Arctictis whitai</i>	336
<i>Aglaojoppides pictipennis</i>	369	<i>Argyrostroma euryaese</i>	485
<i>Agromyza flavitarsis</i>	136	<i>Asdraca insignicornis</i>	565
<i>infusata</i>	143	<i>Aspigonus (Baeacia) abietis</i>	359
<i>lactipennis</i>	144	<i>diversicornis</i>	359
<i>laterella</i>	136	<i>stramineicolor</i>	359
<i>morosa</i>	136	<i>Asplanchnopus hyalinus</i>	402
<i>obscurella</i>	143	<i>multiceps</i>	403
<i>pectinata</i>	143	<i>Asterodiscus elegans</i>	211
<i>scutellata</i>	136	<i>helonotus</i>	210
<i>securicornis</i>	136	<i>truncatus</i>	210
<i>tritid.</i>	143	<i>tuberculosis</i>	211
<i>vagans</i>	143	<i>Asthenactis medusa</i>	224
<i>Agromyzidae</i> , a synopsis of the genera of.....	127	<i>papyraceus</i>	224
<i>Aldrichiella agromyzina</i>	136	<i>Ateneria</i>	514
America, new Pycnodont fishes from.....	445	<i>crinipuncta</i>	513
<i>Amnicola saltillensis</i>	234	<i>Auchenia hesternia</i>	267
<i>Amphiagrion saucium</i>	112, 113	<i>huerfaniensis</i>	267, 269, 270, 271, 272, 276
<i>Amphimerus pseudofellineus</i>	82	<i>Azatha pulchra</i>	516
<i>Anaphoidea latipennis</i>	350	<i>Baccharis cordifolia</i>	633
<i>Anaphothrips arizonensis</i>	12	<i>Bahama Islands</i> , new mollusks from the.....	107
<i>striatus</i>	42	<i>Bakerella</i>	601
<i>Ancylocentrus ster</i>	363	<i>maculata</i>	601
<i>Ancylostoma caninum</i>	83	<i>Baniana athamas</i>	542
<i>Angitia hermione</i>	501	<i>crucilla</i>	543
<i>onerosa</i>	501	<i>gulfusa</i>	542
<i>oretes</i>	500	<i>gyas</i>	544
<i>thacia</i>	500	<i>hellae</i>	543
<i>Anomæodus latidens</i>	448, 449	<i>herceus</i>	544
<i>mississippiensis</i>	449	<i>nephela</i>	545
<i>phaeocolus</i>	448	<i>phruxus</i>	545
<i>robustus</i>	448	<i>serpens</i>	544
<i>Anorena</i>	513	Bartsch, Paul, New mollusks from the Ba- hama Islands.....	107
<i>hyrtacides</i>	513	Bassler, R. S., Notes on an unusually fine slab of fossil crinoids.....	57
<i>Anseropoda macropora</i>	219	<i>Batomys dentatus</i>	326
<i>Antarchaea polia</i>	537	<i>grantii</i>	328
<i>Antedon acuticirra</i>	280	Bats of the genus <i>Glossophaga</i> , revision of the.....	413
<i>bipartipinna</i>	280	Bats of the genus <i>Molossus</i>	85
<i>crassipinna</i>	280, 281	<i>Bendis gentilis</i>	521
<i>inopinata</i>	280, 281	<i>nigrilunata</i>	521
<i>kraepelini</i>	279, 280, 281	<i>Benthopten acanthonotus</i>	207, 208
<i>martensi</i>	279, 280, 286	<i>antarcticus</i>	207
<i>palmata</i>	281		
<i>Anthothrips niger</i>	45		
<i>verbaei</i>	45		

	Page.		Page.
<i>Benthopteron huddlestoni</i>	207	<i>Canis familiaris</i>	313
<i>moluccanus</i>	207	<i>occidentalis</i>	98
<i>mutabilis</i>	208	<i>Cepnodes abas</i>	533
<i>polyctenius</i>	208, 209	<i>accumulata</i>	535
<i>semisquamatus</i>	207	<i>acron</i>	534
<i>spinosus</i>	207	<i>aeon</i>	532
<i>styractus</i>	208	<i>anthea</i>	537
<i>violaceus</i>	208	<i>baccata</i>	539
<i>Bergia</i>	632	<i>barbinae</i>	530
<i>nimbata</i>	632	<i>barsas</i>	534
<i>Bison alleni</i> 182, 183, 184, 186, 187, 188, 189, 190		<i>calais</i>	529
<i>antiquus</i> 162, 164, 166, 169, 181		<i>ceres</i>	535
<i>bison</i> ... 169, 170, 171, 176, 178, 185, 188, 189, 190		<i>deois</i>	533
<i>bonasus</i> 162, 191		<i>gladysia</i>	536
<i>californicus</i> 164, 166		<i>hamlicar</i>	534
<i>crassicornis</i> 165, 176, 179, 180		<i>hannibal</i>	532
<i>europaeus</i> 191		<i>partita</i>	531
<i>lenensis</i> 163, 192		<i>pelops</i>	531
<i>latifrons</i> 161, 162, 164, 192, 195, 196		<i>phaedra</i>	530
<i>occidentalis</i> 165, 166, 167, 169, 173, 175,		<i>stellifera</i>	529
176, 177, 178, 181, 185, 191		<i>tyroe</i>	536
<i>primitivus</i> 163, 177		<i>Capromys elegans</i>	337
<i>priscus</i> 161, 162, 164, 178		<i>Carpomys melanurus</i>	326
<i>regius</i> 185, 187, 193, 192, 194, 195		<i>phaeurus</i>	328
<i>uniformis</i> 163		<i>Celanomys silaceus</i>	315
<i>Bisons</i> , extinct, of North America; with de- scription of one new species, <i>Bison regius</i> ... 161		<i>Celebes</i> , new starfishes from.....	201
<i>Bos primigenius</i> 164, 191, 192		<i>Cephalothrips yuccae</i>	45
<i>priscus</i> 162, 164, 166, 181, 190		<i>Cepolis maynardi</i>	109
<i>urus priscus</i> 163		<i>elevata</i>	109
<i>Bostaea</i> 577		<i>Cerion (Strophilope) pepperi</i>	108
<i>nasuta</i> 578		<i>Cerithiopsis ? burkevillensis</i>	231
<i>Botanobliinae</i> , the genera of flies in the sub- family..... 289		<i>Ceromacra cœrensis</i>	537
<i>Brachitriphosoma pyralidis</i> 61		<i>Cervus culionensis</i>	339
<i>Bracon interruptus</i> 363		<i>nigricans</i>	339
<i>semifasciatus</i> 361		<i>soloensis</i>	340
(<i>Tropidobracon</i>) <i>meromysae</i> 432		<i>steerii</i>	339
(<i>Brasema</i>) <i>Anastatus rugosicollis</i> 347		<i>Chærephon jobensis</i>	312
<i>Bregmatothrips venustus</i> 42		<i>lusonensis</i>	312
<i>Bromeliaceae</i> , new moth-flies bred from..... 103		<i>plicatus</i>	312
<i>Bubalus</i> 340		<i>pudillus</i>	312
<i>bubalis</i> 333		<i>Champeodon vorax</i>	67
<i>caffer</i> 196		<i>Chelaster gasellæ</i> 205, 206	
<i>mindorensis</i> 333		<i>granulatus</i>	206
<i>moellendorffi</i> 340		<i>ludwigi</i> 205, 206	
<i>Bullimus bagobus</i> 324		<i>subtuberculatus</i>	206
<i>lusonicus</i> 324		<i>triplicanthus</i>	206
<i>Bumping Lake</i> , Washington, notes on the Odonata or dragon flies of..... 111		<i>trullipes</i>	206
<i>Bushnell</i> , David I., Jr., Archeological Inves- tigations in Ste. Genevieve County, Mis- souri..... 641		<i>Chelonus (Chelonella) szepligetii</i>	360
<i>California</i> , coast of, fishes of the genus <i>Osmerus</i> from..... 261		<i>sobrinus</i>	360
<i>Camelops</i> , camels of the fossil genus..... 267		<i>Chliophylla hirsuta</i>	309
<i>californicus</i> 276		<i>Chirothrips crassus</i>	42
<i>hesternus</i> 269, 270, 275, 276		<i>manicatus</i>	42
<i>huerfaniensis</i> 269, 270, 271, 272, 275		<i>Chloriona nigrifrons</i>	631
<i>kansasus</i> 267, 268, 270, 275, 276		<i>Chryseida inopinata</i>	345
<i>macrocephalus</i> 276		<i>Chytonidia</i>	489
<i>niobrarensis</i> 276		<i>chloristis</i>	489
<i>vilcatus</i> 275		<i>Chytonix chloe</i>	488
<i>vitakerianus</i> 276		<i>commixta</i>	487
<i>Camels of the fossil genus Camelops</i> 267		<i>pyrrha</i>	488
<i>Canis armbrusteri</i> 98, 102		<i>Clark</i> , Austin Hobart, Revision of the crinoid genus <i>Himerometra</i> 279	
		<i>Cochise</i> 576	
		<i>apacheanus</i> 577	
		<i>Cockerell</i> , T. D. A., New parasitic hymenop- tera of the genus <i>Elphosoma</i> 61	
		<i>Cœlinidea ferruginea</i> 434	

	Page.		Page.
<i>Coelodus browni</i>	447, 448	Delphacidae of North and South America, a contribution toward a monograph of the homopterous insects of the family.....	557
<i>cantabrigiensis</i>	446, 448	<i>Delphacinus obesus</i>	582
<i>decatensis</i>	447	<i>vittatus</i>	580
<i>fabdens</i>	446	<i>zonatus</i>	581
<i>mantelli</i>	447	<i>Delphax</i>	577
<i>stantoni</i>	447	<i>clavicornis</i>	603
<i>Coeloptychium agarioides</i>	156	<i>conspersinervis</i>	577
<i>declininum</i>	156	<i>crassicornis</i>	577, 603
<i>jerseyense</i>	155	<i>dorsalis</i>	588
<i>princeps</i>	156	<i>fuscinervis</i>	578
<i>seebachi</i>	156	<i>hemiptera</i>	633
<i>Colodes</i>	493	<i>lineola</i>	609
<i>selecta</i>	493	<i>luteivitta</i>	633
<i>Comanthus bennetti</i>	281	<i>makis</i>	596
<i>Comomelus tricarinatus</i>	573	<i>notulus</i>	609
<i>Copeus pachyurus</i>	392	<i>obscurella</i>	629
<i>triangulatus</i>	392	<i>ornata</i>	586
<i>Oeplocerus</i>	564	<i>pellucida</i>	615
<i>insignicornis</i>	565	<i>producta</i>	633
<i>irroratus</i>	564	<i>seocharivora</i>	569
<i>thoracicus</i>	565	<i>seminegra</i>	631
<i>swartzii</i>	564, 565	<i>sanfilis</i>	633
<i>thoracicus</i>	565	<i>stejnegeri</i>	630
<i>Corna cenone</i>	541	<i>tricarinata</i>	572
Coyote, a new nematode from the.....	73	<i>truncatipennis</i>	609
Crabs of the families Grapidae and Ocypodidae, new species of.....	353	<i>unicolor</i>	633
<i>Craspedometra acuticirra</i>	280	<i>unipuncta</i>	588
<i>Crateromys schadenbergi</i>	326	<i>vittata</i>	592
Crawford, David L., A contribution toward a monograph of the homopterous insects of the family Delphacidae of North and South America.....	557	<i>Dermacentor venustus</i>	53
Crawford, J. C., Descriptions of new Hymenoptera, No. 8.....	343	<i>Derostenus fullowayi</i>	348
Cretaceous, New Jersey, a new sponge from the.....	155	<i>punctiventris</i>	349
Crinoids, fossil, notes on a slab of.....	57	<i>Diaglyptidea roepkei</i>	372
<i>Crocidura beatus</i>	303	<i>Dibrachys metcalfi</i>	436
<i>edwardsiana</i>	303, 334	<i>Dichoneura simoni</i>	570
<i>grandis</i>	304	<i>Dicranotropis</i>	598
<i>grayi</i>	303	<i>aphidioides</i>	597
<i>halconus</i>	303	<i>ster</i>	600
<i>mindorus</i>	303	<i>bakeri</i>	598
<i>Crumomys fallax</i>	337	<i>abdominalis</i>	598, 600
<i>melanurus</i>	337	<i>basalis</i>	600
<i>Cryptanuridimorpha elegans</i>	369	<i>beckeri</i>	594
<i>Cryptophion strandi</i>	370	<i>bimotatus</i>	601
<i>Cryptopterigimorpha tubulifera</i>	371	<i>brunneus</i>	599
<i>Cryptothrips californicus</i>	38	<i>cubanus</i>	595
<i>rectangularis</i>	45	<i>delioatus</i>	596, 598
<i>Ctenothrips bridwelli</i>	42	<i>divaricatus</i>	600
<i>Culcita nova-guineae</i>	211	<i>dorsalis</i>	599
<i>schmidelliana</i>	211	<i>foveatus</i>	600
Cumberland, Maryland, Pleistocene cave de- posit near, report on.....	93	<i>frontalis</i>	597
<i>Cynopteris diversus</i>	361	<i>guttatus</i>	600
<i>Cynoccephalus volans</i>	304	<i>maida</i>	596
<i>Cynomolgus mindanensis</i>	329	<i>margatus</i>	596, 601
<i>mindanensis</i>	329	<i>pallipes</i>	599
<i>Cynopteris brachyotis brachyotis</i>	334	<i>(?) plicatus</i>	601
<i>luzonensis</i>	334	<i>variegatus</i>	600
<i>Dagassa deucalion</i>	522	<i>Diglena biraphis</i>	395
Dall, William Healey, On a brackish water Pliocene fauna of the southern coastal plain.....	225	<i>caudata</i>	395
		<i>ciastopis</i>	397
		<i>Digonocryptus bidens</i>	373
		<i>Disogones styracis</i>	212
		<i>Distome, viviparous, notes on a</i>	551
		<i>Distoma felineum</i>	82

	Page.		Page.
<i>Diotomum pttacium</i>	554	<i>Epimys tyrannus</i>	317, 337
<i>Ditropis alboignata</i>	578	<i>vigoratus</i>	321
<i>Diurella porcellus</i>	400	<i>vulcani</i>	321
<i>Doryptena tanegashimæ</i>	72	<i>vulcani</i>	321
Dragonflies, notes on the Odonata, or, of		<i>zamboanga</i>	319
Bumping Lake, Washington.....	111	<i>Equus caballus</i>	333
<i>Dysopes alecto</i>	88	<i>Erebostrota albipecta</i>	524
<i>amplexicaudus</i>	91	<i>Eriochair japonicus</i>	354
<i>olivaceofuscus</i>	91	<i>leptognathus</i>	353
<i>velox</i>	91	<i>rectus</i>	354
<i>Echinothrips americanus</i>	14	<i>sinensis</i>	354
<i>Eiphosoma</i> , new parasitic hymenoptera of		<i>Eriopelmidea erythrogastra</i>	374
the genus.....	61	<i>Eriopus orses</i>	496
<i>forte</i>	63	<i>Eriopyga dromas</i>	485
<i>lacteum</i>	62, 63	<i>Eristernaulax</i>	361
<i>montaguense</i>	63	<i>leucotænia</i>	362
<i>pyralidis</i>	61	<i>Erocha albifera</i>	495
<i>schwarzi</i>	62	<i>dipeas</i>	495
<i>septentrionale</i>	61	<i>Eromidia</i>	520
<i>Elaemus apantell</i>	438	<i>clotho</i>	521
<i>Elephas columbi</i>	189	<i>Eucanyra</i>	568
<i>imperator</i>	189	<i>stigmata</i>	569
<i>primigenius</i>	190	<i>Euchlorops similis</i>	140
<i>Ellis atriventris</i>	431	<i>vittata</i>	139
<i>Elocusa fuscata</i>	547	<i>Euides fucata</i>	632
<i>Emballonura alecto</i>	306	<i>fusco-vittata</i>	632
<i>discolor</i>	306, 307	<i>Eumicrosoma</i>	442
<i>monticola</i>	306, 307	<i>benefica</i>	442
<i>Embolophora monoceros</i>	604	<i>Eupelmimus meteori</i>	437
<i>Encentrum aper</i>	394	<i>Euphoriana</i>	433
<i>myriophylli</i>	395	<i>uniformis</i>	433
<i>riccio</i>	395	(<i>Euphoridea</i>) <i>ancylocentrus claripennis</i>	363
<i>Encruphion</i>	506	<i>Euphoridea claripennis</i>	362
<i>phalareus</i>	508	<i>Euryssa nervata</i>	594
<i>porrima</i>	508	<i>Eurythrips ampliventris</i>	45
<i>Enaipia triflvesta</i>	548	<i>hindsii</i>	27
<i>Eonycteris robusta</i>	305	<i>Eustrotia olenos</i>	504
<i>Epibidia</i>	569	<i>Euthrips floridensis</i>	5
<i>brunnea</i>	570	<i>fuscus</i>	1, 11, 43
<i>godmani</i>	570	<i>gossypii</i>	9
<i>Epimys albigularis</i>	316	<i>hawaiiensis</i>	3
<i>basillanus</i>	322	<i>helianthi</i>	10
<i>benguetensis</i>	323	<i>nervosus</i>	43
<i>calcis</i>	320	<i>occidentalis</i>	43
<i>coloratus</i>	317, 318	<i>phalerata</i>	1
<i>date</i>	323, 324	<i>pyri</i>	1
<i>everetti</i>	315	<i>runneri</i>	7
<i>gala</i>	316	<i>tritici</i>	1, 9, 10, 11, 43
<i>kelleri</i>	319	<i>var. bispinosus</i>	10
<i>leucophaæatus</i>	320	<i>ulicis californicus</i>	1
<i>lutelventris</i>	337	Fauna, Pliocene, of the southern coastal plain.....	225
<i>luzonicus</i>	324	<i>Felis minuta</i>	336
<i>magnirostris</i>	317	<i>Ferdina glyptodisca</i>	213
<i>mayonicus</i>	319	<i>offretii</i>	213
<i>mindanensis</i>	318	Fisher, Walter K., New starfishes from the	
<i>mindorensis</i>	319	Philippine Islands, Celebes, and the Moluc-	
<i>neglectus</i>	317	cas.....	201
<i>negrinus</i>	320	Fishes from Japan, with description of a new	
<i>norvegicus</i>	317	species.....	65
<i>ornatulus</i>	322	Fishes, new American Pycnodont.....	445
<i>pantarensis</i>	322	Fishes of the genus <i>Osmerus</i> of the California	
<i>quercetii</i>	319, 320	coast.....	201
<i>rattus</i>	318	Fisk, Mary, A review of the fishes of the genus	
<i>robiginosus</i>	318	<i>Osmerus</i> of the California coast.....	201
<i>tagulayensis</i>	316	Flies, the genera of, in the subfamily Botan-	
<i>todayensis</i>	321, 322	bimæ.....	239

	Page.		Page.
<i>Focilla gradivus</i>	546	<i>Heliocontia basipuncta</i>	504
? <i>maegaba</i>	547	<i>Heliothrips fasciapennis</i>	44
<i>Folsom</i> , Justus W., North American spring-		<i>fasciatus</i>	43
tails of the subfamily <i>Tomocerinae</i>	451	<i>hamorrhoidalis</i>	44
<i>Fromia armata</i>	214	<i>Hemeromyia nitida</i>	146
<i>balansea</i>	216	<i>obscura</i>	145
<i>eusticha</i>	213	<i>Herminodes albistriga</i>	507
<i>hemipha</i>	214	<i>hebes</i>	508
<i>influporella</i>	213, 214	<i>inculta</i>	509
<i>Fulgora pellucida</i>	616	<i>longistriata</i>	509
Gad-flies (<i>Tabanidae</i>) of the genus <i>Stibasoma</i>	407	<i>parca</i>	508
Gahan, A. B., New hymenoptera from North		<i>pilosa</i>	509
America.....	431	<i>regia</i>	508
<i>Gastrothrips</i>	35	<i>umbrata</i>	507
<i>ruficanda</i>	35, 45	<i>Heterodonax alexandria</i>	228
Gidley, James Williams, Preliminary report		<i>bimaculata</i>	228
on a recently dis-		<i>Heterothrips arisemae</i>	44
covered Pleisto-		<i>Hibakari</i> snake, variation exhibited by main-	
cene cave deposit		land and island specimens of the.....	157
near Cumberland,		<i>Himerometra</i> , revision of the crinoid genus.....	279
Maryland.....	93	<i>bartschi</i>	281, 282, 284, 288
Some new Amer-		<i>crassipinna</i>	281
ican <i>Pycnodont</i>		<i>magnipinna</i>	281, 282, 284, 285, 287
fishes.....	445	<i>martensi</i>	281, 285
<i>Gileschropus tylopus</i>	310	<i>persica</i>	281, 284, 289
<i>Glossophaga</i> , bats of the genus, revision of the.....	413	<i>robustipinna</i>	281, 285
<i>amplexicaudata</i>	418	<i>sol</i>	281, 284, 285, 288
<i>elongata</i>	423	<i>Hippelates apicata</i>	248
<i>longirostris</i>	413, 417, 421, 422, 424	<i>bicolor</i>	245
<i>longirostris</i>	422	<i>calcaratus</i>	245
<i>rostrata</i>	423	<i>capax</i>	261
<i>mutica</i>	420	<i>convexus</i>	249
<i>rostrata</i>	423	<i>dorsalis</i>	259
<i>soricina</i>	413, 414, 415, 421, 422	<i>dorsatus</i>	255
<i>antillarum</i>	414, 420	<i>equalis</i>	256
<i>leachii</i>	414, 419	<i>flavikula</i>	256
<i>microtis</i>	414, 419	<i>flavipes</i>	245
<i>mutica</i>	414, 420	<i>var. pusio</i>	246
<i>soricina</i>	414, 418	<i>genalis</i>	264
<i>valens</i>	414, 420	<i>impressus</i>	258
<i>truci</i>	418	<i>lituratus</i>	264
<i>villosa</i>	418	<i>longulus</i>	264
<i>Glympe parvipuncta</i>	532	<i>microcentrus</i>	252
<i>Gnathypops evermanni</i>	66	<i>nigricoxa</i>	250
<i>hopkinsi</i>	66	<i>nitidifrons</i>	243
<i>lyonis</i>	65	<i>nobilis</i>	254
<i>Gonatocerus anomocerus</i>	350	<i>nudifrons</i>	242
<i>eximius</i>	441	<i>pallidus</i>	260
<i>Goniololium granuloseum</i>	576	<i>partitus</i>	241
<i>Gonodes echion</i>	490	<i>peruanus</i>	244
<i>Gonuris leonatus</i>	547	<i>plebejus</i>	253
<i>Grapseidae</i> and <i>Ocyrodidae</i> , new species of		<i>proboscideus</i>	254
crabs of the families.....	353	<i>pusio</i>	245
<i>Halityle regularis</i>	211	<i>scutellaris</i>	246
Hall, Maurice C., A new nematode, <i>Rictularia</i>		(<i>Siphomyia</i>) <i>proboscideus</i>	254
<i>splendida</i> , from the coyote, with notes on		<i>splendens</i>	245
other coyote parasites.....	73	<i>stramineus</i>	259
<i>Harpionycteris whiteheadi</i>	335	<i>subaequalis</i>	257
Harring, Harry K., A list of the Rotatoria of		<i>subvittata</i>	251
Washington and vicinity, with descriptions		<i>tener</i>	255
of a new genus and ten new species.....	387	<i>texana</i>	251
Hay, Oliver P., Camels of the fossil genus		<i>truncata</i>	247
<i>Camelops</i>	267	<i>Hipposideros antricola</i>	309
The extinct bisons of North		<i>bicolor</i>	335
America; with description		<i>coronatus</i>	335
of one new species, <i>Bison</i>		<i>diadema griseus</i>	309
<i>regius</i>	161	<i>obscurus</i>	335
		<i>pygmaeus</i>	309

	Page.		Page.
Hollister, N., Review of the Philippine land mammals in the United States National Museum.....	299	Kormus.....	586
Holomeniscus sulcatus.....	267, 276	artemidis.....	586
Homocrinidae.....	479	californicus.....	586
Homocrinus Hall, notes on the fossil crinoid genus.....	473	Laccocera.....	579
Homocrinus cylindricus.....	473, 474	bicornata.....	582
parvus.....	473, 474, 475, 476, 478, 479	obesa.....	582
scoparius.....	473, 481, 482	vittipennis.....	589
Hoplichthys gilberti.....	67, 68, 69	zonata.....	581
langsdorffii.....	67, 69	flava.....	581
regani.....	67, 69	Lamprocryptidea magnifica.....	376
Hoplocrinus dipentus.....	474	Larus argentatus.....	561
Horistothrips.....	35	Lasiocrinus scoparius.....	483
australis.....	36	tenuis.....	483
Hyelaphus calamianensis.....	339	Lecane stichea.....	397
Hylobates funereus.....	338	Leiaster analogus.....	215, 216
Hymenoptera, descriptions of new, No. 8.....	343	callipeplus.....	216
new, from North America.....	431	coriaceus.....	215
new parasitic, of the genus Eiphosoma.....	61	glaber.....	216
Iohneumon-flies, descriptions of twenty-three new genera and thirty-one new species of.....	359	leachii.....	216
Ichnesutidea secunda.....	363	speciosus.....	216
Idiosemus.....	633	Lelognathus rivulatus.....	65
xiphias.....	633	Lepticus.....	567
Idiosystatus.....	632	oculatus.....	568
actinisculus.....	633	Leptinaria bahamensis.....	109
Idolothrips conferrarum.....	46	Leptoctenista crinipes.....	513
flavipes.....	46	funebis.....	511
Insects, homopterous of the family Delphacidae of North and South America, a contribution toward a monograph of.....	557	grandimacula.....	510
Isapis obsoleta.....	233	hadenoides.....	510
Japan, fishes from, with description of a new species.....	65	lignea.....	512
Jasidæus.....	582	malonia.....	512
carinatus.....	583	oreas.....	511
inconspicuous.....	583	pretiosa.....	512
lugubris.....	583	Leptothrips aspersus.....	38, 46
Jeralia singula.....	564	russelli.....	39
Joppocryptus egregius.....	375	Liburnia andromeda.....	628
Jordan, David Starr, and William Francis Thompson, Notes on a collection of fishes from the Island of Shikoku in Japan, with description of a new species, Gnathypops lyoni.....	65	apicmaculata.....	630
Kellisia axialis.....	613	arvensis.....	615
crocea.....	591	atrior.....	630
parvula.....	631	basifusca.....	630
salina.....	631	basivitta.....	626
Kennedy, Clarence Hamilton, Notes on the Odonata, or dragonflies of Bumping Lake, Washington.....	111	bergi.....	631
Kerivoula hardwickii.....	336	campestris.....	617
jagorii.....	336	circumcincta.....	629
pellucida.....	336	cognata.....	631
whiteheadi.....	336	constimilis.....	616
Kirk, Edwin, Notes on the fossil crinoid genus Homocrinus Hall.....	473	culca.....	628
Knab, Frederick, Gad-flies (Tabanidae) of the genus Stibasoma.....	407	delecta.....	615
New moth-flies (Psychodidae) bred from Bromeliaceæ and other plants.....	103	dolera.....	630
		dorsalis.....	588
		(?) dorsilinea.....	631
		foveata.....	629
		furcata.....	615
		fusco-irrorata.....	632
		gilletti.....	616
		humulis.....	629
		kilmani.....	629
		laminalis.....	624
		lateralis.....	629
		lineatipes.....	629
		lutulenta.....	617
		marginicornis.....	630
		nimbata.....	632
		notula.....	609
		obscura.....	629
		occlusa.....	619
		osborni.....	629
		paludata.....	630

	Page.		Page.
<i>Liburnia pellucida</i>	615	<i>Megamelanus bicolor</i>	592
<i>puella</i>	625	<i>elongatus</i>	593
<i>sagata</i>	630	<i>frontalis</i>	593
<i>slossoni</i>	631	<i>rufitatus</i>	593
<i>teapae</i>	618	<i>spartini</i>	593
<i>terminalis</i>	623	<i>Megamelus</i>	602
<i>Liburniella</i>	585	<i>albicollis</i>	613
<i>ornata</i>	586	<i>albicans</i>	622
<i>Limnomys lacinus</i>	325	<i>havanensis</i>	622
<i>mearnsi</i>	324	<i>albolineosa</i>	602, 629
<i>sibuanus</i>	324, 325	<i>albolineosus</i>	610
<i>Limothrips cerealium</i>	44	<i>andromedus</i>	628
Linton, Edwin, Notes on a viviparous di- tome	551	<i>analis</i>	620
<i>Liothrips citricornis</i>	46	<i>angulatus</i>	629
<i>mcconnelli</i>	38	<i>aplomaculatus</i>	630
<i>ocellatus</i>	46	<i>approximatus</i>	622
<i>Lithacodia folium</i>	503	<i>atrior</i>	630
<i>Lobloptera arcuata</i>	132	<i>aurantii</i>	628
<i>lactipennis</i>	133	<i>axialis</i>	613, 631
<i>Lophaster abbreviatus</i>	220	<i>basifuscatus</i>	630
<i>antarcticus</i>	220	<i>basivitta</i>	626
<i>fureifer</i>	220	<i>bergi</i>	631
<i>furelliger</i>	219	<i>bifurcatus</i>	612
<i>galmi</i>	220	<i>campestris</i>	617
<i>stellans</i>	220	<i>cayamensis</i>	614
<i>suluensis</i>	219, 220	<i>circumcinctus</i>	629
<i>Luidia africana</i>	203	<i>constrictus</i>	616
<i>asthenosoma</i>	203	<i>minutus</i>	610, 611
<i>avicularia</i>	203	<i>onitus</i>	628
<i>ciathrata</i>	202	<i>davisi</i>	630
<i>dendrata</i>	204	<i>dolerus</i>	630
<i>foliolata</i>	202	<i>dorsilinia</i>	631
<i>fordicifer</i>	202	<i>erecta</i>	623
<i>gymnochora</i>	204	<i>erectus</i>	624
<i>integra</i>	203	<i>niger</i>	624
<i>limbata</i>	202	<i>nigripennis</i>	625
<i>orientalis</i>	203	<i>foveatus</i>	629
<i>penangensis</i>	202	<i>fucatus</i>	632
<i>prionota</i>	202	<i>fusco-irroratus</i>	632
<i>quinaria</i>	202	<i>fusco-terminata</i>	632
<i>sarsi</i>	203	<i>fusco-vittata</i>	632
<i>Macroglossus lagochilus</i>	306	<i>gilletti</i>	616
<i>lagochilus</i>	306	<i>humilis</i>	629
<i>Macroneura rubobalteata</i>	363	<i>indistinctus</i>	619
<i>Macroneuroides erythropleura</i>	364	<i>kilmani</i>	629
<i>Macrotoma flavescens</i>	457	<i>kormusi</i>	614
<i>minor</i>	466	<i>laminalis</i>	624
<i>tridentifera</i>	466	<i>lateralis</i>	629
<i>vulgaris</i>	463	<i>lineatipes</i>	629, 630
Malloch, J. R., A synopsis of the genera of Agromyzidae, with descrip- tions of new genera and species	127	<i>lutulentus</i>	617
The genera of flies in the sub- family Botanoblinæ with hind tibial spur	239	<i>magna</i>	614
<i>Mammals</i> , land, from the Philippines, in the United States National Museum	299	<i>magnifrons</i>	614
<i>Manis javanica</i>	338	<i>magnistylus</i>	627
<i>Margmaster capreensis</i>	216	<i>magnus</i>	627
<i>fimbriatus</i>	216	<i>marginatus</i>	609, 629
<i>paucispinus</i>	216	<i>marginicornis</i>	630
<i>Megaderma spasma spasma</i>	308	<i>metzaria</i>	611
<i>Megalomyx niobrarensis</i>	267, 268	<i>nigricula</i>	632
		<i>nigridorsum</i>	620
		<i>nigritrons</i>	631
		<i>nigrigaster</i>	621
		<i>notulus</i>	602, 604, 609
		<i>flavus</i>	609
		<i>obscurellus</i>	629

	Page.		Page.
<i>Megamelus ocellus</i>	619	Miller, Gerrit S., Jr., Notes on the bats of the	
<i>osborni</i>	629	genus <i>Molossus</i>	85
<i>pacificus</i>	626	Revision of the bats of	
<i>paludatus</i>	630	the genus <i>Glossophaga</i>	413
<i>parvulus</i>	631	<i>Miniopterus australis</i>	311, 335
<i>patruelis</i>	632	<i>eschscholtzii</i>	311
<i>pellucida</i>	616, 625	<i>paululus</i>	311
<i>pellucidus</i>	615	<i>pusillus</i>	311, 336
<i>piceus</i>	630	<i>schreibersii</i>	311
<i>puella</i>	622	<i>tibialis</i>	336
<i>puellis</i>	625, 626	<i>tristis</i>	311
<i>mexicanus</i>	626	Missouri, Ste. Genevieve County, archeolog-	
<i>rectangularis</i>	612	ical investigations in.....	641
<i>reductus</i>	629	<i>Modiolokaria lateralis</i>	229
<i>rotundatus</i>	618	Mollusks, new, from the Bahama Islands.....	107
<i>sagata</i>	622	<i>Molossus</i> , bats of the genus, notes on.....	85
<i>sagatus</i>	630	<i>scuticandatus</i>	91
<i>salina</i>	631	<i>artecus</i>	91
<i>scutellaris</i>	631	<i>bondæ</i>	89
<i>saminegra</i>	631	<i>burnesi</i>	91
<i>setigerus</i>	631	<i>castaneus</i>	88
<i>slossoni</i>	631	<i>coibensis</i>	92
<i>stejnegeri</i>	630	<i>crassicaudatus</i>	91
<i>teapæ</i>	618, 622	<i>currentium</i>	89
<i>albinotatus</i>	619	<i>debilis</i>	90
<i>terminalis</i>	623	<i>fuminensis</i>	88
<i>univittata</i>	632	<i>fortis</i>	89, 90
<i>vanduzeei</i>	622	<i>fuliginosus</i>	90
<i>Melanaxis basillanensis</i>	332	<i>fusciventer</i>	86, 90
<i>breviceps</i>	339	<i>longicaudatus</i>	90
<i>elegans</i>	340	<i>major</i>	87, 90
<i>masbatensis</i>	340	<i>myosurus</i>	88
<i>Meoneura</i>	142	<i>nigricans</i>	88
<i>lactepennis</i>	144	<i>obscurus</i>	91
<i>obscuralla</i>	143	<i>currentium</i>	89
<i>vagans</i>	143	<i>pretiosus</i>	88, 89
<i>Metalectra agriodos</i>	539	<i>pygmaeus</i>	92
<i>alcis</i>	538	<i>rufus</i>	88
<i>astylus</i>	539	<i>sinaloe</i>	89
<i>ceyx</i>	538	<i>tropidorhynchus</i>	92
<i>furva</i>	540	<i>ursinus</i>	88
<i>variata</i>	540	<i>verrilli</i>	90
<i>Metastrongylidæ</i>	74	Moluccas, new starfishes from the.....	201
<i>Metastrongylinæ</i>	74	<i>Monodes isse</i>	492
<i>Meteorus mamestræ</i>	364	<i>ixion</i>	491
<i>vulgaris</i>	364, 365	<i>phlegyas</i>	491
<i>Microdon discoides</i>	445	<i>Monogonocryptus diversicolor</i>	377
<i>dumbell</i>	449	<i>Monophyllus leachii</i>	419
<i>elegans</i>	445	<i>Monostyla acus</i>	398
<i>texanus</i>	445	<i>crenata</i>	399
<i>Micromonodes excellens</i>	494	<i>syriatica</i>	399
<i>leucosticta</i>	494	Morgan, A. C., New genera and species of	
<i>Microthrips</i>	19	<i>Thysanoptera</i> , with notes on distribution	
<i>piercei</i>	19	and food plants.....	1
<i>Milichia aethiops</i>	133	Moth-flies, new, bred from Bromeliaceæ and	
<i>arcuata</i>	132	other plants.....	108
<i>indecora</i>	134	Moths, Noctuid, new species of, from tropical	
<i>leucogastra</i>	135	America.....	485
<i>longiseta</i>	135	<i>Mulelocha albibasalis</i>	537
<i>robertsoni</i>	135	<i>erebea</i>	538
<i>Milichiella arcuata</i>	132	<i>Mulinia congesta</i>	226
<i>bisignata</i>	132	<i>lateralis</i>	226
<i>cinerea</i>	132	<i>sapotilla</i>	228
<i>lactepennis</i>	133	<i>Multiceps multiceps</i>	82
<i>lucidula</i>	132	<i>serialis</i>	83

	Page.		Page.
<i>Mungos palawanus</i>	336	<i>Oreocopa bekus</i>	524
<i>parvus</i>	336	<i>Orsa oculata</i>	523
<i>Murina cyclotis</i>	336	<i>Orthogramma modesta</i>	517
<i>Mus castaneus</i>	337	<i>Oruza doto</i>	497
<i>commissarius</i>	325	<i>Oscinis ovalis</i>	259
<i>insonicus</i>	324	<i>pallipes</i>	245
<i>musculus</i>	325	<i>Osmerus</i> , fishes of the genus, of the California	
<i>vulcani</i>	321	<i>coast</i>	291
<i>apicis</i>	321	<i>attenuatus</i>	291, 292, 293, 294, 295
<i>Mydaus marchei</i>	312	<i>starksi</i>	291, 292, 293, 294, 295
<i>schadenbergii</i>	336	<i>thaleichthys</i>	291, 293, 294, 295
<i>Myotis formosus</i>	309	<i>Ostha? cybele</i>	516
<i>macrotarsus</i>	310	<i>oenopion</i>	515
<i>rufopictus</i>	309	<i>ofella</i>	516
<i>Mytilopsis leucophaeus</i>	229	<i>Ostrea elongata</i>	230
<i>Nanamonodes trilineata</i>	493	<i>virginica</i>	230
<i>Nannosciurus conchinnus</i>	313	<i>Ozarka anguillifinea</i>	502
<i>samaricus</i>	336	<i>onytes</i>	502
<i>surrutillus</i>	313	<i>Pachychellus anagrammatus</i>	232
<i>Natrix senteri</i>	160	<i>cancelloides</i>	232
<i>vibakari</i>	157	<i>suavis</i>	232
<i>Nematode</i> , new, from the coyote.....	73	<i>Pachysoma brachyotis</i>	334
<i>Neolita epicaste</i>	494	<i>luzonlense</i>	334
<i>Neomymar</i>	351	<i>Pachyura luzonlensis</i>	302, 303
<i>vierecki</i>	351	<i>occultidens</i>	303
<i>Neoptodes</i>	515	<i>Paludetrina aldrichi</i>	234, 235
<i>calicus</i>	515	<i>cingulata</i>	235
<i>Neorileya ashmeadi</i>	345	<i>curva</i>	235
<i>flavipes</i>	346	<i>milium</i>	235
<i>Neostrotia albesceus</i>	503	<i>plana</i>	234
<i>Nepanthia deloheri</i>	218	<i>satillensis</i>	234
<i>brachiata</i>	217, 219	<i>turricula</i>	235
<i>joubini</i>	218	<i>Pangrapta? dilucida</i>	518
<i>maculata</i>	219	<i>minuta</i>	519
<i>pedicellaris</i>	217	<i>subgeminata</i>	518, 519
<i>platydisca</i>	218	<i>Paradoxurus minax</i>	313
<i>Neritina pupa</i>	236	<i>philippinensis</i>	313
<i>sparsilineata</i>	236	<i>torvus</i>	336
<i>New Jersey</i> , a new sponge from the Cretaceous		<i>Paraleucopsis corvina</i>	149
<i>of</i>	155	<i>Paramadiza halteralis</i>	126
<i>Nomus</i>	377	<i>Paramyla nigra</i>	141
<i>North America</i> , extinct bisons of; with de-		<i>Parangitia atys</i>	499
<i>scription of one new species, Bison regius</i> ..	161	<i>chlorosticta</i>	499
<i>Notommata pachyura</i>	392	<i>japyx</i>	500
<i>Notope lofuana</i>	400	<i>Parorchis acanthus</i>	554
<i>Nyctalus stenopterus</i>	310	<i>avitus</i>	551, 554
<i>Nycticebus menagensis</i>	328, 338	<i>Pectinaster hylacanthus</i>	204
<i>philippinus</i>	328	<i>mimicus</i>	204
<i>Ocypodidae</i> and <i>Grapidae</i> , new species of		<i>Pentaceropsis obtusata</i>	209
<i>crabs of the families</i>	353	<i>tyloderma</i>	209
<i>Odonata</i> , notes on the, of Bumping Lake,		<i>Pentagramma</i>	565
<i>Washington</i>	111	<i>bivittata</i>	566
<i>Odontonycteris meyeri</i>	306	<i>minor</i>	567
<i>Oenoptera leda</i>	498	<i>vittatifrons</i>	567
<i>rhea</i>	498	<i>Peregrinus maidis</i>	565
<i>Onigocia macrolepis</i>	70	<i>Perigea drusilla</i>	492
<i>spinosa</i>	70	<i>Perlampidea</i>	346
<i>Ooencyrtus anasae</i>	347	<i>syrphi</i>	346
<i>chrysopa</i>	347	<i>Pezomachus (Pezomachus) apanteleicida</i>	373
<i>trinidadensis</i>	347	<i>Phanobrorhynchus anisot.</i>	379
<i>Opalinopsis nucleolobata</i>	82	<i>Phanerotoma albiscapa</i>	365
<i>Ophidiaster pusillus</i>	215	<i>humeralis</i>	365
<i>trychnus</i>	215	<i>straminea</i>	365
<i>tubertii</i>	215	<i>Phanerotomella albiscapa</i>	365
<i>Ophthalmomyia cinerea</i>	132	<i>Philippine Islands, Celebes, and the Moluccas</i> ,	
		<i>new starfishes from</i>	201

	Page.		Page.
Philippines, review of the land mammals from the, in the United States National Museum.....	299	Polyceyrtridea gracilis.....	333
Phloeomys cumingi.....	337	Polyceyrtrimorpha amoenus.....	333
pallidus.....	315	Polyceyrtrus.....	334
Phloeothrips pergandei.....	46	Polygnampsia.....	541
raptor.....	46	chloristicta.....	541
uzeli.....	46	Potamides cancelloides.....	232
Phobolosta admirabilis.....	497	matsoni.....	231
strifrons.....	496	var. gracilior.....	231
Pholeomyia indecora.....	134	saltillensis.....	232
leucogastra.....	135	Poteriocrinus alternatus.....	474
leucozona.....	135	gracilis.....	474
pseudodecora.....	135	Powers, Sidney, and Harvey W. Shimer, A new sponge from the New Jersey Creta- ceous.....	155
robertsoni.....	135	Prohippelates pallidus.....	260
Photocryptus photomorphus.....	380	Prokelisia setigera.....	631
Photoptera erythromota.....	381	Proteropsydne.....	570
Phauphena costata.....	487	plotifrons.....	571
subvenata.....	486	Psaidotus primus.....	142, 144
Phyllidinus.....	583	Pseudallinus.....	74
flabellatus.....	584	Pseudocraspedia ormenis.....	496
fuscus.....	585	Pseudohippelates capax.....	261
koebele.....	585	gracilis.....	262
nervatus.....	584	Pseudothrips inequalis.....	44
nitens.....	585	Psychodides, new moth-flies bred from Bro- mellaceæ and other plants.....	103
Phyllomyia approximata.....	138	Psychoda amplipenna.....	103
hirtipalpis.....	137	fumata.....	104
magnipalpis.....	138	incompleta.....	105
nitens.....	141	tricolor.....	105
securicornis.....	136, 142	Ptenochirus jagorii.....	334
Phyllophora nigra.....	418	Pterodina bidentata.....	403
Phytomyia lacteipennis.....	152	calcaris.....	404
major.....	150	emarginata.....	403
nitidula.....	151	parva.....	403
Pipistrellus imbricatus.....	310	Pterogobius dalmio.....	70, 71
irretitus.....	335	elapoides.....	70, 71, 72
tenulis.....	335	Pterois lunulata.....	67
Pisonotus aphidioides.....	597	Pteromalus euryml.....	435
atar.....	600	puparum.....	435
basalis.....	596, 597	Pteropoldes herzog.....	363
binotatus.....	601	Pteropus balutus.....	305
brunneus.....	599	cagayanus.....	305
delicatus.....	596, 597	hypomelanus cagayanus.....	305
divaricatus.....	600	hypomelanus.....	305
dorsalis.....	599	leucopterus.....	335
foveatus.....	600	mearnsi.....	305
guttatus.....	600	mimus.....	335
marginatus.....	596	pumilus.....	305
pallipes.....	599	speciosus.....	305
plocus.....	601	vampyrus lanensis.....	305
variegatus.....	600	Ptychognathus johanne.....	354
Pithecius cagayanus.....	330	riedelli pilosa.....	355
mindanensis.....	328, 329	Pundaluoya simplicia.....	595
mindanensis.....	329	Pycnodont fishes, some new American speci- mens of.....	445
mindorus.....	328	Pyrgulopsis? satilla.....	226
suluensis.....	330	Rangia cuneata var. solida.....	228
syrichta.....	328	Rathbun, Mary J., Descriptions of new spe- cies of crabs of the families Grapsidæ and Ocypodidæ.....	253
Planorbis antiquifus.....	237	Rhinoessa albul.....	147
ophis.....	236	texans.....	148
Pleistocene cave deposit near Cumberland, Maryland, report on.....	93	Rhinolophus anderseni.....	335
Pleurobema elava.....	230	arcuatus arcuatus.....	300
Podogymnura truel.....	302	exiguus.....	300
Pogonognathus plumbeus.....	457		
Polyandrea pretiosa.....	382		

	Page.		Page.
<i>Rhinolophus hirsutus</i>	308	<i>Solaster subarcuatus</i>	221
<i>inops</i>	309	<i>torulatus</i>	221
<i>philippinensis</i>	335	<i>tropicus</i>	221
<i>rufus</i>	335	<i>Somatochlora semiostris</i>	112, 113, 116
<i>subrufus</i>	309	<i>Sphyrias lofana</i>	400
<i>virgo</i>	308	<i>Spodoptera evanida</i>	490
<i>Rhipidaster polyctenus</i>	201	Sponge, a new, from the New Jersey Cretaceous.....	155
<i>vannipes</i>	222, 223	Spring-tails of the subfamily Tomocerinae from North America.....	451
<i>Rhynchomilchia pseudodecra</i>	135	Starfishes, new, from the Philippine Islands, Celebes, and the Moluccas.....	201
<i>Rhynchomys soricoides</i>	337	<i>Stenocranus</i>	587
<i>Rictularia</i>	75	<i>angustus</i>	589
<i>affinis</i>	77, 82	<i>crocus</i>	591
<i>cahrensensis</i>	77, 82	<i>dorsalis</i>	588
<i>cristata</i>	75, 77	<i>felti</i>	591
<i>splendida</i>	77, 82	<i>latus</i>	588, 591
<i>Rictularina</i>	75	<i>maculipes</i>	591
<i>Rotatoria</i> of Washington and vicinity, descriptions of a new genus and ten new species of the.....	387	<i>minutus</i>	587
<i>Rousettus emplexicaudatus</i>	305	<i>palatus</i>	591
<i>Rousselia corniculata</i>	393	<i>rostrifrons</i>	590
<i>Rusa alfredi</i>	332, 339	<i>saccharivorus</i>	589
<i>berandanus</i>	331	<i>similis</i>	590
<i>basilaniensis</i>	332	<i>vittatus</i>	592
<i>calamianensis</i>	339	<i>Stibasoma</i> , gad-flies of the genus.....	407
<i>culionensis</i>	339	<i>bicolor</i>	411
<i>francianus</i>	331	<i>dives</i>	411
<i>nigellus</i>	332	<i>dyridophorum</i>	410
<i>nigricans</i>	332, 333, 339	<i>festivus</i>	409
<i>philippinus</i>	331	<i>flavistigma</i>	409
<i>steerli</i>	339	<i>fulvohirtum</i>	411
<i>Saeny berbyx</i>	548	<i>fulvohirtus</i>	407, 408, 410, 411, 412
<i>pyrene</i>	548	<i>hemiptera</i>	407
<i>Sarcoptes scabiei lupi</i>	83	<i>mallophoroides</i>	409
Schaus, William, New species of Noctuid moths from tropical America.....	455	<i>pachycephalum</i>	411
<i>Sciropterus crinitus</i>	314, 337	<i>theotania</i>	409
<i>nigripes</i>	315	<i>tristis</i>	411
<i>Sciurus albicauda</i>	337	<i>willistonii</i>	408, 410
<i>juvencus</i>	314	<i>Stiroma inconspicua</i>	583
<i>mindanensis</i>	314	<i>Stobaea</i>	571
<i>mollendorfi</i>	337	<i>affinis</i>	572
<i>philippinensis</i>	314, 337	<i>bifasciata</i>	572
<i>samarensis</i>	314	<i>concinna</i>	572
<i>steerli</i>	337	<i>granulosum</i>	576
<i>Scotophilus temminckii</i>	310	<i>minuta</i>	572
<i>Sericothrips cingulatus</i>	45	<i>nigripennis</i>	576
<i>variabilis</i>	45	<i>pallida</i>	575
<i>Sesarma (Sesarma) tiomanense</i>	355	<i>quadripustulata</i>	576
Shikoku, Island of, Japan, fishes from, with description of a new species.....	65	<i>testaceum</i>	576
Shimer, Hervey W., and Sidney Powers, A new sponge from the New Jersey Cretaceous.....	155	<i>tricarinata</i>	572
<i>Signiphora giraulti</i>	348	<i>Strongyliidae</i>	74
<i>Sikelaphus soloensis</i>	340	<i>Strongyloidea</i>	73
<i>Sinostia</i>	514	<i>Sus ahoenobarbus</i>	338
<i>formata</i>	514	<i>barbatus balabacensis</i>	338
Snake, variation of the Hibakari.....	157	<i>palavensis</i>	338
<i>Solaster borealis</i>	221	<i>calamianensis</i>	331
<i>japonicus</i>	222	<i>cebibrons</i>	338
<i>papposus</i>	222	<i>domesticus</i>	331
<i>paxillatus</i>	221	<i>inconstans</i>	331
<i>penicillatus</i>	222	<i>minutus</i>	339
<i>regularis</i>	221	<i>philippensis</i>	331
<i>scotophilus</i>	222	<i>Sympetrum corruptum</i>	112, 118
		<i>Symplesis agromyza</i>	440
		<i>Syrnola thelma</i>	234
		Tabanidae (gad-flies) of the genus <i>Stibasoma</i>	407

	Page.		Page.
<i>Tabanus atratus</i>	413	<i>Tomocerus plumbeus</i>	454, 457, 460, 463, 466
<i>chlonostigma</i>	411	<i>tridentiferus</i>	466
<i>compactus</i>	411	<i>vulgaris</i>	451, 463, 466
<i>dives</i>	411	<i>Trachagathis taeniogaster</i>	386
<i>fenestratus</i>	408	<i>Tragus nigricans</i>	239
<i>festivus</i>	409	<i>Trichostrongylinae</i>	71
<i>fulvohirtus</i>	411	<i>Trichothrips amplipectus</i>	33
<i>mallophorides</i>	409	<i>flavicauda</i>	36
<i>theotaenia</i>	409	<i>fuscus</i>	39
<i>tristis</i>	411	<i>hoodi</i>	31
<i>Taenia hydatigena</i>	83	<i>Trichotria brevidactyla</i>	409
<i>pisiformis</i>	82	<i>poellum</i>	409
<i>Taphonycteris capito</i>	308	<i>similis</i>	409
<i>pluto</i>	307	<i>tetractis</i>	409
<i>Taphozous philippinensis</i>	307	<i>Tringa interpres</i>	554
<i>pluto</i>	307, 308	<i>Triommatodes aberrans</i>	526
<i>Tarachaster tenuis</i>	217	<i>agenor</i>	525
<i>Tarsius carbonarius</i>	328	<i>belus</i>	527
<i>fraterculus</i>	328, 338	<i>canidia</i>	525
<i>philippensis</i>	338	<i>pygmalion</i>	526
<i>Tarsomys apensis</i>	326	<i>pylades</i>	526
<i>Telenomus albitarsis</i>	345	<i>Trissolcus euschisti</i>	348
<i>meridionalis</i>	345	<i>trinidadensis</i>	344
<i>tabanocida</i>	344	<i>urichi</i>	343
<i>Testudinella bidentata</i>	404	<i>Tritomurus californicus</i>	451, 469
<i>parva</i>	403, 404	<i>Trogoblemma lucens</i>	498
<i>Tethina coronata</i>	147	<i>sericata</i>	496
<i>parcula</i>	147	<i>Trypomys adustus</i>	225
<i>rostrata</i>	147	<i>Tupaia cuyonis</i>	304, 334
<i>Tetrastichus brucophagi</i>	439	<i>everetti</i>	304
(Tetrastichodes) <i>dehmentosus</i>	439	<i>mollendormi</i>	304, 334
<i>Thecarus pumilus</i>	338	<i>palawanensis</i>	304, 334
<i>Thermesia glycera</i>	519	<i>Turritella satilla</i>	233
<i>ocresia</i>	519	<i>Tyromycteris pachypus</i>	310
<i>Thompson, J. C., The variation exhibited by</i> <i>mainland and island specimens of the Hiba-</i> <i>kari snake, Natrix vibakari (Bole)</i>	157	<i>Tympanomerus deschampsii</i> <i>stapletoni</i>	356, 357
<i>Thompson, William Francis, and David</i> <i>Starr Jordan, Notes on a collection of</i> <i>fishes from the Island of Shikoku in Japan,</i> <i>with description of a new species, Gnath-</i> <i>pops lyoni</i>	65	<i>Ucninaria trigonocephala</i>	83
<i>Thoopterus nigrescens</i>	334	<i>Unio (Lamprellis?) sandrius</i>	229
<i>Thrips abdominalis</i>	44	<i>obesus blandigianus</i>	229
<i>hellanthi</i>	23	(Pleurobema?) <i>alixus</i>	229
<i>madronii</i>	44	(Unio) <i>musius</i>	229
<i>perplexus</i>	44	<i>Urogaie cylindrus</i>	304
<i>quinciensis</i>	21	<i>everetti</i>	304
<i>spinosus</i>	25	<i>Ursus americanus</i>	97
<i>tabaci</i>	44	(Euarctos) <i>vitabilis</i>	96
<i>Thymalimorpha platygastra</i>	384	<i>Ussa ambrosianus</i>	339
<i>Thysanoptera, new genera and species of</i>	1	<i>atheneensis</i>	339
<i>Tomocerinae, spring-tails of the subfamily</i>	451	<i>berandanus</i>	331
<i>Tomocerus americanus</i>	458, 460	<i>baryceros</i>	339
<i>arcticus</i>	458, 460, 461, 462	<i>brachyceros</i>	339
<i>bidentatus</i>	451, 463	<i>chrysotrichos</i>	339
<i>flavescens</i>	451, 457, 458	<i>cinereus</i>	339
<i>var. americanus</i>	451, 460	<i>corteanus</i>	339
<i>arcticus</i>	451, 461	<i>crassicornis</i>	339
<i>separatus</i>	451, 460	<i>dalliardianus</i>	340
<i>minor</i>	451, 466	<i>elorzanus</i>	340
<i>niger</i>	457	<i>francianus</i>	331
<i>var. arcticus</i>	462	<i>garcianus</i>	340
<i>plumbeus</i>	460	<i>gonzallus</i>	340
<i>norvegicus</i>	466	<i>gorrichanus</i>	340
		<i>guevaranus</i>	340
		<i>guidoteanus</i>	340
		<i>hipolitianus</i>	340
		<i>longiceps</i>	340

	Page.		Page.
<i>Ussa macarianus</i>	340	<i>Vespertilio rufopictus</i>	309
<i>maraisianus</i>	340	<i>rufo-pictus</i>	309
<i>marianicus</i>	340	<i>soridicus</i>	413, 418
<i>michaelinus</i>	340	<i>Vesperugo (Oligochropus) tylopus</i>	310
<i>microdontus</i>	340	<i>stenopterus</i>	310
<i>nubianus</i>	340	Viereck, Henry L., Descriptions of twenty-three new genera and thirty-one new species of Ichneumonflies	359
<i>ramosianus</i>	340	<i>Viverra tangalunga</i>	312
<i>rosarianus</i>	340	Washington, a list of the Rotatoria of, and vicinity, with descriptions of a new genus and ten new species	337
<i>roxadanius</i>	340	Washington, Bumping Lake, notes on the Odonata or dragonflies of	111
<i>rubiginosus</i>	340	<i>Xenomymar</i>	349
<i>spatharius</i>	340	<i>urichi</i>	349
<i>telesforianus</i>	340	<i>Ypsia exaggerata</i>	505
<i>tuasoninus</i>	340	<i>glycon</i>	505
<i>versosanus</i>	340	<i>Zadilocogaster anomus</i>	366, 367
<i>vidalinus</i>	340	<i>Zaglyptomorpha attenuata</i>	335
<i>villmerianus</i>	340	<i>Zamastrus photopsis</i>	336
<i>Varicella gracillima</i>	109	<i>Zelomorpha arizonensis</i>	368
<i>bahamaensis</i>	109	<i>Zygothrips femoralis</i>	40
<i>Vespertilio aestivo-tail</i>	311		
<i>molossus</i>	86, 87		
<i>major</i>	86, 90		
<i>minor</i>	86, 90		
<i>(Nycticteus) alecto</i>	306		
<i>pachypus</i>	310		



UNIVERSITY OF CALIFORNIA LIBRARY BERKELEY

Return to desk from which borrowed.
This book is DUE on the last date stamped below.

5 May '49 ILJ

1 Apr '51 PM

REC'D LD

OCT 20 '64-10 PM

NOV 3 1971 44

Apr 3 '51 LU

8 Apr '65 J D

REC'D LD NOV 18 71-4 PM 35

29 Mar '52 ES

REC'D LD

JUN 4 1973

Apr 27/52

5 May '52 LU

JUN 3 '65-6 PM

FEB 7 1955

JAN 3 1955 LU

REC'D LD

JUN 30 1966

REC'D LD MAY 21 '73-1 PM 51

JUN 1 1964-4 PM

JUN 29 '66 X' RCD
RECEIVED

23 Oct '64 TC

MAY 1 1969-9 PM SEP 20 1980

LD 21-100m-9, '48 (B899s16) 476

LOAN DEPT.