Proceedings of the Hawaiian Entomological Society 6:51-171.

A Review of the Hawaiian Cixiidae, with Descriptions of Species (Homoptera).

BY WALTER M. GIFFARD.

(Presented at meeting of December 4, 1924.)

The superfamily Fulgoroidea is represented by only two families in the native insects of Hawaii—the Cixiidae and the Delphacidae. The Cixiidae are represented by two genera—*Oliarus* and *Iolania.*

Oliarus Stål.

This genus is represented in Hawaii by fifty-two species and allied forms, in addition to numerous varieties within some of the species. The late G. W. Kirkaldy erected the sub-genus *Nesoliarus* [1] for these, a purely geographical sub-genus retained for convenience.

Muir [2] has recently dealt with this genus and retained Kirkaldy's two sub-genera, but altered the characters upon which one of them is based, viz.:

1. (2) Hawaiian species.....sub-genus *Nesoliarus* Kirk.
2. (1) Other than Hawaiian species.
3. (4) With two completely divided areolets.....*Oliarus* Stål (Typical)
4. (3) With a single complete or only partly divided fossette (without areolets).....sub-genus *Nesopompe* Kirk.

This paper deals with the examination and study of accumulated Hawaiian collections, numbering over two thousand specimens made by Perkins, Swezey, Timberlake and others during a period of twenty-eight years. These collections also include material studied, but not named by Kirkaldy, which had been deposited in the Bishop Museum as its share of the "Sandwich Island Committee" collections made by Dr. Perkins in 1892-1901.

Of the seven species described in 1902 in the Fauna Hawaiiensis,[3] three male and three female types are in the British

---

Proc. Haw. Ent. Soc., VI, No. 1, August, 1925.

[1] Proc. Haw. Ent. Soc., II, No. 2, September, 1909, p. 76.

[2] Pan-Pacific Entomologist, Vol. 1, 1925, pp. 106, 107, 161.

[3] Fauna Haw., III, Part II, December, 1902, pp. 120-124.

Museum, and one (a female) in the Cambridge University Museum. All seven types are so marked by Kirkaldy.

From a small amount of material in his hands in 1909, Kirkaldy erected and tabulated,[1] but never fully described, seventeen additional species. The types of three of these are in the Bishop Museum material with their names marked by Kirkaldy in pencil, and fourteen are in the British Museum, represented by either a male or a female selected and marked by Dr. R. C. L. Perkins. These selections by Dr. Perkins were made on the basis of characters given by Kirkaldy in his Table of Species,[2] but none bore the latter's type label nor were any otherwise marked in his handwriting. Altogether there are about thirty-six specimens of both sexes in the British Museum collection, a large number of which bear only a number without any locality label.

The Hawaiian Cixiid material Kirkaldy had for study was comparatively limited in quantity, and many of the species were scarce in individuals. Quite a few were founded on uniques, while some were erected on characters of the female sex alone. Unfortunately, during a protracted illness which culminated in his sad and unexpected death, most of Kirkaldy's personal and other insect material under his control was much neglected, and as a result a large proportion was damaged by insect attack. Furthermore, the Hawaiian material (including the Cixiids) which had been sent to him in England previous to his later residence in Hawaii, when shipped back to him in Honolulu, had been packed in a manner quite unsuitable for a varied and long journey by sea and rail, with the result that large numbers of specimens mounted on cards became loose on the way, injuring not only themselves, but playing havoc with the remainder. His prolonged absence through illness greatly added to the confusion above mentioned and went far to prevent his assembling the material and attaching the names and type labels to most of his new species, thereby making it extremely difficult after his death for Dr. Perkins to select specimens which might represent the species for the British Museum with any great degree of certainty.

[1] Proc. Haw. Ent. Soc., 1909, II, No. 2, pp. 77-80.

[2] Proc. Haw. Ent. Soc., 1909, II, No. 2, p. 77.

The material since collected, together with that left over by Kirkaldy, was large enough to assist in the study of variations in both structure and color. For a similar reason it has been, in a measure, possible to compare and judge of the insular varieties of certain of the commoner species, to separate these where necessary in order to save future confusion and to study characters of the male aedeagus when required for a confirmation of the determinations. The extreme sexual and other dimorphism involved, the similarity in structure, the uncertainties of some characters which have been extensively and satisfactorily used elsewhere, together with apparent drifts by certain transitions from one species or form to that of another, may at some later time necessitate closer study of more material and of larger series of some species than have so far been collected. As Dr. Perkins has most aptly stated,[1] "The separation of the numerous species is attended with considerable difficulty, very few apparently being notably distinct from their nearest congeners." The result of the present studies should, however, be of much assistance in the discrimination of our species and their allied insular forms, and to a very great extent also prevent further confusion in determinations because of the dimorphism and variability above referred to. While it has been convenient—in fact necessary under existing conditions—to give names to certain insular forms of one or more of the species, it is recognized that some of these would have no specific value elsewhere where characters are found to be more constant and reliable. These named forms, however, will be of local assistance, not only in determining, but also in tracing the drifts in transition from one true species to another.

The fairly large amount of material studied has been arranged into five divisions, viz.: A, B, C, D, and E. Division A consists of two species; B of eight species, one of which (*discrepans*) may not be endemic; C of nine species, included in which is the common *kaonohi* and three closely related island forms; D (an intermediate division) of five species, all of which appear to be drifting more or less into Division E, which contains twenty-eight species. In the latter division are included several groups,

[1] Fauna Haw., Introduction, Vol. I, Part VI, pp. cev (1913).

viz.: the *hevaheva* and *kanakanus* groups, each of six closely allied island forms; the *opuna* group of four island forms, and the common *inaequalis* group of four very closely related island forms. In all the divisions there are undoubtedly representatives of more groups, but until closer collecting is done and much more material of these than we now have can be studied, it were well to refrain from summarizing such.

Of the fifty-two species dealt with in this paper, all but six of Kirkaldy's have been redescribed, and of these six, three were erected from single male and three from single female specimens. In many instances Kirkaldy appears to have generally preferred females for his types because the tegmina were, as a rule, more ornamented than those of the males. Many such females were uniques, and as the males of these were very liable to be quite devoid of any ornamentation whatsoever, it was not always possible to discriminate between the sexes unless both were taken together "in situ." The variability in structural characters previously referred to tends to further complicate such instances as these. With the possibility of such sexual differences, the erection of species on the characters of the female sex alone (particularly in the maculate and semi-maculate forms) should be precluded unless obvious reasons are presented for doing otherwise.

The author has based his specific work upon what he considered the most reliable characters for use with this homogeneous race, as follows: (1) The structure of the vertex, including the fossette; (2) the structure of the frons, particularly at base; (3) the general appearance of the genae, particularly when abnormally lengthened or shortened between the anterior margins of the eyes and fossette, when viewed in profile; (4) the color and pattern of the tegmina, the color of the tegminal veins and of the wings; (5) the color of the mesonotum and mesonotal keels particularly, and to a lesser degree the color of other body structures; (6) the form and structure of the aedeagus. Another character in a few of the species has been the fore tibiae where these were much shorter than normal. The material studied, however, has not been sufficient to determine whether this particular character remains constant in the species.

In the material studied the extreme poverty of individuals

in some of the species (more particularly in the maculate forms), and occasional excessive variability in structure, pattern, and coloring of others of which there was a larger assemblage, caused the author more or less difficulty in discriminating between that which was of specific or merely of varietal value. The classification of all the material into divisions appeared to be the only systematic method by which species and forms could be differentiated with reasonable certainty. For this purpose the author has used the structure of the fossette of vertex, more particularly as to whether it was or was not divided by a median longitudinal carina. If divided, it formed two areolets which, depending on surrounding tumescence, were either sub-ovate or sub-quadrate in shape. If not divided, or else incompletely divided, these areolets were absent and the fossette was complete.

Divisions A, B, and C have the fossette completely divided by a median longitudinal carina, the anterior portion of which in some of the species is more or less very slightly, minutely and obscurely annulate or else forked. In Division A the areolets formed on either side of the median carina are acutely angulate. In Division B the area within the fossette is largely swollen, so that the areolets appear small, sub-ovate, and the apical carinae of vertex more or less obscure because of surrounding tumescence. In Division C this tumescent area is much modified, so that the areolets become larger and subquadrate in shape. Division D represents a single group of very closely related species or island forms which are apparently drifting into the following division (E) because in some examples the presence or absence of the median longitudinal carina is inconstant within the species. In Division E the carina of the fossette is either quite incomplete or altogether absent. If incomplete the carina, in some examples, terminates near middle. In most examples, however, the median carina of the fossette is altogether absent or else rudimentary, or perhaps only represented by a swelling of the structure posteriorly. In all the divisions there are species where tumescence at the anterior margins of the fossette gives that structure a more or less quadrate-rotundate appearance. This fact may occasionally cause a wrong interpretation of the apical carinae of vertex, particularly in species which have the angles at base of frons swollen or tumescent, so that these carinae are practically lost in the surrounding tumescence.

With perhaps the exception of *tamehameha,* all the species have the base of fork of the medio-frontal carina and the anterior margin of fossette coalescent or else the former is a trifle produced into the latter structure, thereby dividing the apex of vertex into "carinae." For that reason the author has pleuralized the term throughout the descriptions.

The transverse, the apical, and the lateral carinae of the vertex are of assistance in making determinations, but cannot always be relied on without reference to other structures.

The structure of the genae (when viewed in profile) and the length of the fore tibiae occasionally deviate from normal, and these characters have been found useful in a few of the species.

The color and pattern of the tegmina and tegminal veins have been used where possible as these characters, although variable within the species, can be relied on to a more or less extent in most forms. Among immaculate species there are, however, instances (especially with the females) where extreme variation is represented by forms having the tegmina more highly colored or more or less banded or maculate. In such cases it is most difficult to correctly discriminate the species unless both males and females are collected together "in situ." The coloration of the tegminal veins is an important character and of much assistance. The sexual dimorphism in this latter respect, however, is just as great as it is in the color and pattern of the tegmina.

In some of the species the color of the apical third of the wings is a very serviceable character, and the same may be said of the color of the mesonotum and mesonotal keels, all of which in most of the species are fairly constant. The size and shape of the yellowish macula at the lateral margins of the frons near the clypeal suture also assists materially when discriminating between some of the species. In some of the latter this macula is obsolete or, at most, very obscure.

The position of the tegminal veins and the structure of the legs (excepting the fore tibiae in one or two instances) have not been used in the descriptions. These characters are highly variable in the Hawaiian forms and quite unreliable for specific purposes. Elsewhere, specific value has been given to the position and number of spines on the hind tibiae, but in the Hawaiian forms there are hardly two specimens alike in this respect. The

position of these spines is very variable, the number also varying from one to three within the species. Instances have been found with one of the hind tibiae having either one or two fully developed spines and the other with none at all. Two or more minute or rudimentary spines (visible with strong lens) at extreme base of the hind tibiae appear, however, to be present in a large number of examples studied.

For obvious reasons the genitalia "in situ" are of little or no service in discriminating between the species. Even if dissected out, the pygofer, anal segment and genital styles add but little assistance, as these structures are much alike in all the species, and whatever differences are found are too slight to be of specific value. On the other hand, the aedeagus, when dissected out and examined under the binocular, presents features which are of great service, and it may be used to advantage not only in confirming a determination, but also in detecting a new species. The general structure is tubular, consisting in great part of membrane fused with the more or less chitinized walls of the periandrium and phallus. The apodeme of the phallus enters the tube at the base of the periandrium and continues to the conjunctiva. The ejaculatory duct appears to pass within or through the apodeme into the phallus, but it is quite possible that the apodeme may either be a chitinization of the ejaculatory duct or it may have some more obscure origin.[1] This question has yet to be elucidated. While the structure of the aedeagus of our Hawaiian *Oliarus* is somewhat perplexing, it is not nearly so complex as in the species found elsewhere, where both the periandrium and phallus are at most times surrounded with innumerable processes and spines, some of which are of specific importance because of their greater constancy in structural outline. In over two hundred dissections of examples in our own species studied by the author, there was found to be a great similarity in the general appearance of these, excepting the two species included in Division A, the most of those in Division D, and the *opuna* and *kaonohi* groups in Division E.

Generally speaking, the more important characters of the aedeagus in our Hawaiian forms are to be found (when viewed

[1] Muir, 1924, Phil. Jour. Sci., Vol. 24 (5), p. 511.

dorsally) in the apical third of the periandrium and in the shape and size of the spurs or processes at the base, middle or apex of the phallus. These latter generally consist of one spur or process of variable size at the base of the left dorsal margin, a much larger and stouter one at the middle of the right margin, and two of variable length at or near apex. The length, size and position of these when present, or the absence of one or the other, are of specific importance. The species placed in Division A revealed a lengthened and more or less membraneous basal process in lieu of the shorter "spur-like" appendage seen in all others studied. Most of the species in Division D, as well as the *inaequalis* group in Division E, are without spurs at all, basally or apically. In these, however, the right median spur is large and tusk-like. Intermediate forms, however, are to be found in Divisions C and E, in which the basal and apical spurs are more or less rudimentary, confirming the author's conclusion that some of the species in Division C and D are gradually drifting by certain transitions into species which come under Division E. In the *opuna* (E) group the phallus has an additional stout spur on the left margin at middle which has not been found in any other species. The ventral view of the aedeagus is of little interest structurally, except for the presence or absence of a blunt tooth-like process near middle or at basal third of the periandrium. This particular structure is best viewed laterally.

The similarity of structure of the species of Hawaiian *Oliarus,* especially the male genitalia, shows their close relationship to one another. That they have arisen from a single introduction, is the logical conclusion to draw. The line of evolution is apparently one of degeneration of such characters as the carinae of the vertex from the world-wide typical form with two complete areolets, through the incompletely divided to the single undivided fossette. All the New Zealand species of *Oliarus* have the undivided fossette and are closely related to one another, but apparently they are not related to the Hawaiian species. There is one species in Fiji, one in China, and a few in the Malays with the undivided fossette, but they are not closely related to our species or to one another. It would, therefore, appear as if this line of evolution has taken place independently in several

groups of the species of *Oliarus,* and, therefore, it would be illogical to place ours into a genus by themselves, even if the connecting forms did not prevent this. Isolation appears to have played an important part in the evolution of these endemic forms, as it has done in so many of the Hawaiian insects; the fact that they are good flyers may account for the ill-defined characters of many of the species, as the isolation would not be as complete as in such insects as the Delphacidae, where most of the species are entirely or nearly entirely brachypterous. The male of *O. tarai* has been taken "in copula" with the female of *O. neomorai,* which indicates how closely related the "species" are, and also may account for some other connecting forms. We know very little about the life history of the Hawaiian *Oliarus,* and the difficulty of breeding and rearing them under our local conditions makes any genetic work very difficult.

With very few exceptions, all dissections made of the genitalia have been mounted in Canada Balsam card-cells, which are attached to the pin holding the insect. Such as were not so mounted are attached to the card point.

Due to the nature of the structure on the ventral side of the periandrium, it has been found most difficult to mount the aedeagus in the strictly dorsal position, from which the characters are best studied. The chitinized tooth-like attachment on the ventral margin, previously referred to, has tended to tilt the example to one side or the other. This tilting, when it occurs, is most always to the right, because of the overhanging phallus, which gives additional weight to that side. It is, therefore, essential to study the characters of the aedeagus under the binocular while it is still in water, and to make any necessary drawings at that time and before the specimen has been further prepared for its final mount in balsam. In a few instances the thin membraneous nature of the apical third of the periandrium and of the phallus, when placed in alcohol to harden, has caused them to shrink, thereby distorting these characters.

In discriminating between the characters which represent each of the Divisions, a reasonable latitude should be allowed for variability. This also applies to other structures and to color when determining the species, as well as to certain of the charac-

ters outlined in the aedeagus, which may appear different when tilted slightly to the right or left from the true dorsal position.

The table of *Oliarus* species has been made purely for convenience. While it should be of great assistance, it must not be relied upon for the differentiation of species; resort must be had to the descriptions and to the remarks. The table separates some species by islands, and in such cases the descriptions and remarks must be studied. The genitalia have not been used in the table, but wherever possible external characters common to both sexes have been used.

The terminology used is, in most part, that employed by Muir and Kirkaldy. (See Plate II, figs. 14, 15, and 16.)

Medium power magnification by means of the binocular has been used for the study of the various structures referred to in all the descriptions, except where otherwise mentioned (e. g., in *Iolania*).

The types, paratypes and other specimens included in the descriptions have been, for the present, placed in the custody of the Hawaiian Entomological Society. Later they will form part of the collections of the Bishop Museum.

The figures submitted herewith were all drawn by the author, and for these, as well as all dissections and descriptions, he alone is responsible.

Acknowledgments for the loan of material are due to the Bishop Museum, the H. S. P. A. Experiment Station, Dr. R. C. L. Perkins, Messrs. O. H. Swezey, P. H. Timberlake, and others. To Dr. Perkins the author is especially indebted for information as to the localities representing the numbered specimens included in the Kirkaldy material, and also for valuable data furnished. Thanks are also due to Mr. O. H. Swezey of Honolulu and to Mr. E. P. Van Duzee of San Francisco for assistance rendered in comparing typed copy. To Mr. Fred Muir, however, the author is particularly indebted for the encouragement, advice and assistance rendered by him. To a very great extent Mr. Muir is responsible for the initiation and completion of this present work, as without his encouragement and advice the writer would never have undertaken it. Furthermore, when Mr. Muir was last in Europe he undertook to secure

and furnish the author with data in reference to type and other material of the Hawaiian Cixiidae in the British Museum. These data have in many ways proved invaluable, as up to that time no authoritative record was available here concerning the Kirkaldy type or other material in that institution.

Genus Oliarus Stål.

TABLE OF HAWAIIAN SPECIES *

1. (42) Fossette of vertex completely divided by a median longitudinal carina, forming two areolets.
2. (5) Areolets acutely angulate posteriorly, much longer at sides than at middle.

Division A (pp. 66-67).

3. (4) Vertex wide, tegmina clear hyaline. KAUAI.....1. *muiri*
4. (3) Vertex narrow, tegmina milky hyaline. KAUAI.....2. *swezeyi*
5. (2) Areolets much more obtusely angular posteriorly, length at sides not much greater than in the middle.
6. (23) Areolets sub-ovate, either base of frons or else edges of areolets (or both) more or less tumescent in great measure obscuring apical carinae of vertex, excavate area small.

Division B (pp. 68-80).

7. (10) Vertex wide.
8. (9) Tegmina milky hyaline; costa particolored; disc of vertex very shallowly excavate. OAHU. Length 4.5 mm. ....10. *discrepans* ♀
9. (8) Tegmina clear hyaline; costa unicolored; disc of vertex deeply excavate. OAHU. Length ♂ 6.75 to 7 mm.; ♀ 7.75 mm. .....9. *kirkaldyi*
10. (7) Vertex narrow.
11. (12) Costa particolored. OAHU. Length ♂ 6 to 7 mm.; ♀ 7 to 8 mm. .....3. *kaiulani*
12. (11) Costa unicolored.
13. (18) Tegminal veins particolored.
14. (15) Mesonotum pale castaneous. OAHU. Length ♂ 6 mm.; ♀ 7 mm. ..... 8. *kaumuahona* / 7. *wailupensis* ♀
15. (14) Mesonotum dark castaneous.

* Lengths are taken from apex of vertex to apex of closed tegmina. Unless otherwise specified, this table is based on male characters, but female characters opposite to those of the males have been noted where possible.

16. (17) Cross-veins seldom suffused; tegmina clear hyaline or not as distinctly milky, often maculate.
    a. HAWAII. Length 7 to 8 mm. .....5. *koanoa* ♀
    b. Males always immaculate; tegminal veins occasionally streaked fuscous.....5. *koanoa* ♂
17. (16) Cross-veins always suffused, tegmina milky hyaline; males immaculate; females, maculate. OAHU. Length ♂ 4.5 to 5.25 mm.; ♀ 6 mm. .....6. *myoporicola*
18. (13) Tegminal veins not particolored.
19. (20) Tegminal veins dark; tegmina cloudy or bronzy hyaline, immaculate. OAHU. Length ♂ 6.75 to 7 mm.; ♀ 7.5 to 8 mm. (Female with tegminal veins particolored).....4. *tantalus*
20. (19) Tegminal veins paler.
21. (22) Small species; OAHU. Length ♂ 4.5 to 5.5 mm. and ♀ proportional. Tegmina clear hyaline, immaculate.....
    .....7. *wailupensis* ♂ ♀
22. (21) Larger species. HAWAII. Length ♂ 6 to 7 mm. and ♀ proportional. Tegmina ♂ clear hyaline, immaculate; ♀ often maculate.....5. *koanoa* ♂ ♀
23. (6) Areolets sub-quadrate; base of frons and carinae not tumescent or but slightly so; excavate area larger.

Division C (pp. 81-94).

24. (25) Basal and apical third of tegmina darkly fuliginous, middle third clear or milky hyaline. OAHU. Length ♂ 5 to 5.5 mm.
    .....22. *neotarai*
25. (24) Tegmina not so colored, not divided into three color areas, generally much longer.
26. (37) Tegmina clear or else milky hyaline; males and females.
27. (30) Mesonotal carinae dark.
28. (29) Kauai species. Male. Tegmina immaculate. Female maculate. Length ♂ 7 mm.; ♀ 8 mm. .....12. *nubigenus*
29. (28) Hawaii species.....16. *filicicola*
30. (27) Mesonotal carinae pale.
30a. (32a) Hawaii and Kauai species.
31. (32) Kauai species. Male. Tegmina immaculate; female maculate. Length 10.5 to 11 mm. .....11. *tamehameha*
32. (31) Hawaii species. Male and female immaculate. Length ♂ 5 to 6.5; ♀ 7 to 7.25 mm. .....16. *filicicola*
32a. (30a) Oahu and Maui species.
33. (34) Cross-veins distinctly suffused. OAHU. Length ♂ 5.25 mm.
    .....14. *makaala*
34. (33) Cross-veins not suffused, or only slightly so.
35. (36) Larger species. Male, tegmina immaculate; female, tegmina maculate; particoloration of veins lighter. OAHU and MAUI. Length ♂ 6.5 to 7.5 mm; ♀ 7 to 9 mm. .....13. *pele*

36. (35) Smaller species; particoloration of veins darker. OAHU. Length ♂ 5.5 to 6 mm.; ♀ 7 mm. .....15. *likelike*
37. (26) Tegmina of males yellowish, ochraceous, or tawny hyaline; females with tegmina darker yellowish to fuliginous, immaculate. Length ♂ 5 to 6 mm.; ♀ 6.5 to 7.5 mm.
38. Oahu species. Mesonotum pale or dark castaneous...17. *kaonohi*
39. Lanai species. Mesonotum flavous to dark castaneous..18. *koele*
40. Maui species. Mesonotum flavous to fusco-piceus...19. *halehaku*
41. Hawaii species. Mesonotum flavous to dark castaneous.....
    ..... 16. *filicicola*
42. (1) Fossette of vertex either not divided or else incompletely divided by a median longitudinal carina.
43. (54) Fossette incompletely divided, the basal portion of the dividing carina more or less evident, but never reaching the apical carinae of vertex.

Division D (pp. 95-103).

44. (51) Tegminal veins dark.
45. (48) Tegmina with basal and apical thirds darkly fuliginous, middle third clear or milky hyaline.
46. (47) Small species. OAHU. Length ♂ 5 to 5.5 mm.; ♀ 6 to 6.5 mm.
    ..... 22. *neotarai*
47. (46) Larger species. HAWAII and OAHU. Length ♂ 6.5 to 7.25 mm.; ♀ 7.5 to 8 mm. .....21. *tarai*
48. (45) Tegmina not so colored, not divided into three color areas.
49. (50) Tegmina entirely dark fuliginous, opaque.
    a. MOLOKAI species; length ♂ 7.25 to 7.75; ♀ 8.5 to 9 mm.
    .....23. *morai*
    b. KAUAI species; length ♀ 8 mm. (color var.).....
    .....20. *immaculatus* ♀
50. (49) Tegmina yellowish or tawny, with apical third more or less fuliginous .....24. *neomorai* ♀
51. (44) Tegminal veins pale.
52. (53) Base of fork of medio-frontal carina open (obsolete); tegmina immaculately dark yellowish, semi-opaque. KAUAI. Length ♂ 7 mm.; ♀ 8 mm. .....20. *immaculatus* ♂ ♀
53. (52) Base of fork of medio-frontal carina closed; tegmina yellowish or tawny hyaline, with apical third more or less fuliginous. ON ALL ISLANDS. Length ♂ 7.5 mm.; ♀ 9 mm. .....
    .....24. *neomorai* ♂ ♀
54. (43) Fossette of vertex entirely undivided or only with a rudimentary basal portion of the dividing carina.

Division E (pp. 104-146).

55. (68) Costa notably thickened at base and in some notably arched.

56. (59) Costa notably thickened at base (less than in *hevaheva*), but not notably arched.

57. (58) Tegmina milky hyaline; wings hyaline; costa not so thick at base as in some other species; tegminal veins very dark. HAWAII. Length ♂ 6.5 to 7 mm. (immaculate); ♀ 7.5 to 7.75 mm. (maculate) .....44. *niger*

58. (57) Tegmina dark yellowish or tawny hyaline, maculate; wings apically fuliginous. MAUI. Length ♂ 9.25 mm. ..29. *haleakalae*

59. (56) Costa notably thickened and notably arched.

60. (64) Mesonotal carinae black or dark castaneous.

61. Lanai species. Tegmina maculate. Length ♂ 8.5 mm. ....26. *lanaiensis*

62. Oahu species. Tegmina maculate. Length ♂ 8 to 9 mm.; ♀ 10 to 11 mm. .....27. *olympus*

62a. Hawaii species. Tegmina maculate.....25. *hevaheva*

63. Kauai species. Tegmina maculate (costa less arched than in *hevaheva*). Length ♂ 7 mm.; ♀ 9 mm.....30. *montanus*

64. (60) Mesonotal carinae palish castaneous.

65. Hawaii species. Tegmina maculate. Length ♂ 8 to 9 mm.; ♀ 10 to 11 mm. .....25. *hevaheva*

66. Oahu species. Tegmina maculate.....27. *olympus*

67. Maui species. Tegmina immaculate; tegminal veins pale. Length ♂ 9 mm. .....28. *mauiensis*

68. (55) Costa not notably thickened nor notably arched at base.

69. (78) Tegminal veins particolored. Large species; length 7 to 12 mm. (including females).

70. Hawaii species. Tegmina maculate. Length ♂ 8 to 8.75 mm.; female 10 mm. .....31. *kanakanus*

71. Oahu species. Tegmina more or less maculate. Length ♂ 7 to 8 mm.; ♀ 9 to 10 mm. .....34. *kaohinani*

72. (75) Kauai species.

73. (74) Apical carinae of vertex distinct. Length ♂ 7 mm.; ♀ 9 mm. ..... *consimilis*

74. (73) Apical carinae of vertex indistinct, confluent with tumescent area at base of frons. Length ♂ 8 mm.; ♀ 10 mm..... ..... 35. *intermedius*

75. (72) Maui and Molokai species.

76. (77) Fossette of vertex a little longer than wide; base of fork of median frontal carina closed. MAUI and MOLOKAI. Length 8 mm. .....32. *kahavalu*

77. (76) Fossette of vertex a little wider than long; base of fork of median frontal carina open. MAUI. Length ♂ 10 mm.; ♀ 11.5 to 12 mm. .....33. *kulanus*

78. (69) Tegminal veins not particolored. Smaller species; length of males seldom more than 7 mm.

79. (90) Tegmina maculate (faintly so in some).

80. (85) Mesonotal carinae dark.

81. (82) Basal two-thirds of tegminal veins uniformly pale; darkly fuliginous over apical third of tegmina. KAUAI. Length ♂ 6.5 mm.; ♀ 7 mm. .....39. *lihue*

82. (81) Basal two-thirds of tegminal veins dark and pale, but not particolored; not darkly fuliginous over apical third of tegmina.

83. (84) Vertex wider and tegmina broader and less elongate. KAUAI. Length ♂ 6 mm.; ♀ 6.5 mm. .....38. *waialeale*

84. (83) Vertex narrower and tegmina not so broad and more elongate. KAUAI. Length ♂ 5.5 mm.; ♀ 6 mm. .....37. *kauaiensis*

85. (80) Mesonotal carinae pale.

86. Hawaii species. Vertex wide; tegmina clear to milky hyaline, granules very distinct. Length ♂ 5 to 6 mm.; ♀ 6.25 mm. ..... 40. *opuna*

87. Maui species. Tegmina milky hyaline, veins paler. Length ♂ 5 to 5.5 mm.; ♀ 6 to 6.5 mm. .....41. *euphorbiae*

88. Oahu species. Length ♂ 4.75 mm.; ♀ 5.75 to 6 mm. ..42. *acaciae*

89. Kauai species. Tegmina clear hyaline. Length ♂ 5.5 mm. .... 43. *koae*

90. (79) Tegmina immaculate.

91. (99) Mesonotum dark.

92. Oahu species. Length ♂ 6 to 7 mm.; ♀ 7 to 8 mm. ....51. *instabilis* *

93. Hawaii species. Length ♂ 6 to 7.75 mm.; ♀ 7 to 8 mm. ..... } 49. *inaequalis* * } 52. *inconstans* *

94. Maui and Lanai species. Length ♂ 6.25 to 7.5 mm.; ♀ 7.5 to 8 mm. .....50. *similis* *

95. (96) Mesonotal carinae pale; tegmina and wings very milky white. OAHU. Length ♂ 5.5 to 5.75 mm. .....48. *albatus*

96. (95) Mesonotal carinae darker; tegmina and wings otherwise colored.

97. (98) Yellowish macula at lateral margins of frons near clypeal suture distinct and elongate; tegmina hyaline; veins dark. KAUI. Length ♂ 7 mm.; ♀ 7.75 to 8 mm. .....45. *silvestris*

98. (97) Yellowish macula near clypeal suture either obsolete or very indistinct; tegmina yellowish hyaline; veins pallid. LANAI. Length ♂ 6 mm. .....47. *agnatus*

99. (91) Mesonotum pale. Tegmina broad; veins lightly particolored and medianly pallid. KAUAI. Length ♂ 5.25 mm..... ..... 46. *halemanu*

---

* With perhaps the exception of *inconstans*, all males in this group species have the tegmina immaculate and without particolored veins. On the contrary, the females of all four species, including *inconstans*, have examples with maculate as well as immaculate tegmina and with or without particolored veins.

Description of Species.

Division A.

Fossette of vertex completely divided by a median longitudinal carina forming two areolets. Areolets acutely angulate posteriorly, much longer at sides than in middle. (See Plate I, Fig. 7.)

1. **Oliarus muiri** sp. nov. Plate II, Figs. 19, 20, 21.

Male. Length, 5.25 mm.

Width of vertex at base one and three-tenths times the width at apex; width at apex equal to the width at origin of transverse carina; length one and eight-tenths times the width at base; carinae of apex curved; transverse carina (at origin) about one-third from apex, angulate, straightly converging from point of origin; fossette acutely angulate posteriorly, two and one-tenth times longer at the side margins than at the middle, completely divided into acuminately excavate areolets by a median longitudinal carina.

Frons and clypeus very moderately excavate, surfaces more or less wrinkled; basal angles of frons more or less tumescent; fork of mediofrontal carina narrow, elongate, the base level with apex of vertex; fronto-clypeal suture and median ocellus faintly visible. Fore tibiae of moderate length.

Tegmina hyaline, diffused light yellowish fuliginous immaculate; tegminal veins on the basal two-thirds fuscous more or less interrupted with whitish markings (particolored); apical one-third fuscous; commissure fusco-piceus; stigma light fuscous (in part); granules pale and dark, distinct. Wings hyaline, veins fuscous.

Mesonotum, vertex, frons and tegulae fuscous; mesonotal carinae castaneous; pronotum immaculately pale stramineous; carinae of vertex and frons (in part) light fuscous; inter-lateral margins of vertex widely stramineous; macula at lateral margins near fronto-clypeal suture, sordid yellow, distinct; legs testaceous and abdomen fusco-piceus.

Aedeagus with the periandrium apparently of normal length; apical half of the apodeme of the phallus, together with surrounding membrane, unusually prolonged; phallus more than twice the length of the periandrium, armed basally with a long membraneous process, medianly at right with a stout curved spur and apically with only one spur (the right) which is stout and well developed. In profile the ventral margin of the periandrium is not armed with either tooth or spine. Pygofer setigerous, the setae or hairs unusually long, when viewed in profile, along the lateral margins. Genital styles and anal segment of the same character as in all Hawaiian species.

Hab. Mountain regions of Kauai. Described from a single male (the type), labeled Alakai Swamp, August 22, 1921 (Swezey).

Obs. This unique species and the one following (*swezeyi*) are evidently the closest relatives, so far known, of the ancestral form from which all the Hawaiian species have descended. The structure of the vertex, particularly, presents the strongest evidence that it is congeneric with the genotype *Oliarus walkeri* Stål. (See Plate II, Fig. 17.) The aedeagus of this and the following species (*swezeyi*) is quite unlike that of any other Hawaiian forms.

I have named this species after Mr. Fred Muir, without whose assistance and co-operation his co-workers would have had much difficulty in the discrimination of many of our Hawaiian species of Homopterous insects.

2. **Oliarus swezeyi** sp. nov. Plate I, Fig. 7; Plate II, Figs. 15, 22, 23, 24, 25, 26.

Male. Length, 5.5 mm.

Width at apex of vertex about the same as the width at base and at origin of transverse carina; length three times the width at base; carinae of apex curved; transverse carina (at origin) about one-third from apex, angulate, roundly converging from point of origin; fossette similar to that of *muiri*, excepting that the median longitudinal carina is apparently longer than in that species.

Frons and clypeus same as *muiri*, but with the surfaces smooth (not wrinkled).

Tegmina milky hyaline, immaculate; tegminal veins on basal two-thirds diluted pale and dark (particoloration little apparent) with the apical one-third, the stigma, costa and commissure all dark fuscous; cross-veins within the apical margin suffused; granules dark and distinct. Wings milky hyaline, veins fuscous.

Piceus; pronotum and tegulae sordid fuscous, margins stramineous; carinae of vertex and frons, in part, fulvous; the flavid macula at lateral margins near fronto-clypeal suture distinct, attenuated basad; legs fusco-testaceous more or less longitudinally striped stramineous.

Aedeagus with the periandrium and the armature of the phallus quite unlike those of *muiri;* the process at the base of the phallus is also more sinuous and much shorter than in the latter species; pygofer comparatively small and the anal segment longish. The long hairs, which are present at

the lateral margins of the pygofer of *muiri*, are quite absent in the single example studied.

Hab. Island of Kauai. Described from one male (the type), labeled Olokele Canyon, September 5, 1920 (Swezey).

Obs. Aside from the structure of the aedeagus, the male of this species is easily separated from *muiri* by the much narrower width at the base of vertex, the longer median carina of the fossette, the roundly converging transverse carina, the apparently shorter pronotum, and the color and pattern of the tegmina.

In the material before me there is one female specimen from a nearby locality on Kauai which is closely associated with this species mainly because of the similarity in the structure of the vertex and in the appearance of the tegmina superficially. The example, however, appears to be too small (only 5 mm. long) and not altogether what one might expect in order to make a positive determination. Until the mountains of Kauai have been closely collected for more material, I consider it best to place this female here temporarily. Frons and mesonotum (in part) fusco-piceus, mesonotal keels fulvous with a spot of like color at basal angles; carinae of vertex and frons fulvous. Tegmina hyaline, immaculate; tegminal veins on basal two-thirds all pale except for remote dark particolorations on the Sc and Cl 1 + 2; veins on apical one-third more or less fuscous, and cross veins within the apical margin more or less suffused. One female labeled Waimea Canyon, September 4, 1921 (Swezey).

I have named this species after Mr. O. H. Swezey, to whom we are so much indebted for the larger proportion of the material before me, without which it would not have been possible to present this slight contribution to our knowledge of the Hawaiian Cixiidae.

Division B.

Fossette of vertex completely divided by a median longitudinal carina forming sub-ovate areolets. Areolets much more obtusely angular posteriorly than in Division A. Length at sides not much longer than in the middle. Base of frons or else edges of areolets (or both) more or less tumescent and in great measure obscuring apical carinae of vertex. Excavate area small.* (See Plate I, Figs. 1 and 2.)

3. **Oliarus kaiulani** sp. nov. (MS. name Kirk.). Plate III, Figs. 27, 28, 29, 30.

Male. Length, 6 to 7 mm.

Width of vertex at base one and two-tenths to one and four-tenths times the width at apex; width at apex equal to the width at origin of transverse carina; length two and one-tenth to two and four-tenths times the width at base; carinae of apex curved; transverse carina (at origin) about one-fourth from apex, sub-angulate, more or less roundly converging from point of origin; fossette angulate posteriorly, one and one-tenth times longer at the side margins than at the middle, completely divided into sub-ovate (more or less acuminately excavate) areolets by a median longitudinal carina, the anterior portion of which is minutely annulate.

Frons and clypeus very moderately excavate; basal angles of frons largely tumescent—level with apical carinae of vertex; fork of mediofrontal carina short, more or less narrow, with the base on a level with apex of vertex.

Tegmina hyaline, immaculate, basal third banded, middle diffusedly spotted and all the apical third, more or less yellowish fuliginous; tegminal veins on basal two-thirds (including costa) distinctly particolored whitish or yellowish and dark fuscous, with those on the apical third all of the latter color; stigma fuscous, dilute basally. Wings hyaline, veins light to dark fuscous.

Mesonotum, keels and tegulae fusco-piceus; hind margins of mesonotum (in most examples) narrowly and irregularly fulvous; pronotum (except for a small part of the lateral area) almost immaculately stramineous; inter-lateral margins of vertex, fossette and apical half (medianly) of frons and the clypeus, fusco-piceus; carinae of the vertex narrowly, and of the basal third of frons widely stramineous, the latter color extending along the lateral margins of the frons until it widens out near the clypeal suture; legs flavo-testaceous and abdomen fusco-piceus, with dorsal margins fulvous.

Female. Length, 7 to 8 mm.

Structurally the same as the male, excepting that the tumescent area at base of frons is generally more prominent and the vertex a little wider. The pigmentation of the tegmina is slightly variable, many of the examples having these as immaculate as those in the male, while others have faint and remote spots on the apical third. The tegminal veins are more darkly particolored, but otherwise the same as those in the male, excepting

* A number of species in all Divisions have the apical carinae of vertex more or less obscure. In most instances this is caused by a slight tumescent area at base of frons and anterior margins of fossette.

that the darker ones in the clavus are more or less suffused, sometimes giving these the appearance of being spotted. Some examples also have the apex of the apical third more or less particolored.

Types, male and female, labeled Halawa, Oahu, December 17, 1922 (Swezey).

Hab. Oahu Mountains at all elevations from 600 to 4000 feet. Described from eighteen males and twenty-three females collected in numerous localities on all the mountain ranges and slopes between 1900 and 1922: By Perkins, in 1900; Giffard, 1905-6; Swezey, 1908-22; Fullaway, 1909-19; Timberlake, 1916; Williams, 1919; Bryan, 1920, and Ehrhorn, 1910. In addition there are three undetermined females (on card) in the Perkins' collections marked "loc ? either Haw. ? or Molokai ?." These latter are, however, identical with females from Oahu. Notwithstanding the fairly large series in the collections, most of the examples are individual specimens (either male or female) from scattered localities; the only pairs labeled as collected on any one date are from Tantalus (two males and three females, May 16 and November 19, 1905, Giffard); Waiau (one male and one female, March 28, 1920, Bryan), and Halawa (one male and one female, December 17, 1922, Swezey). Only one male (No. 885), Honolulu Mountains, Perkins, November, 1900 (undetermined), was found in the Kirkaldy material.

Obs. In one of the collections before me there are single specimens of this species which at some time in the past were determined under the names of *kaiulani, kaohinani,* and *procellaris*. These names, however, are not in Kirkaldy's handwriting, and the only example in his material at the Bishop Museum was the undetermined male previously referred to. The remarks under *kaohinani* in Division E will explain the reason for the name *kaiulani*. The indefinite description of Kirkaldy's *procellaris,* as given by him in his preliminary tables, caused much of the confusion (above referred to) as to that species, the status of which is not improved by the fact that no specimens under that name exist in either of the museums where Kirkaldy's studied material was deposited. Later collectors evidently selected the smaller specimens of what I have named *kaiulani* as the nearest approaching the description of *procellaris,* but the decided dark

and pallid particolorations of the tegminal veins on the basal two-thirds of the former, the diffused pale yellowish fuliginous markings of the tegmina (so often referred to as good characters by Mr. Kirkaldy) and the similarity of structure and coloration in all, regardless of exact size, suggests that none of these were what Kirkaldy intended for his species *procellaris*.

The aedeagus of this species appears very variable, the apical third of the periandrium assuming several shapes, depending in most part, as usual, on the position from which it is viewed by the student. Differences also appear apparent because of the undeveloped membraneous structure of the whole apex of the periandrium, the outline of which was hardly distinguishable in several dissections. On the contrary, however, the phallus (including spurs) and the base of the periandrium were in all instances either fairly well chitinized or covered with well-developed membrane (as the case may be) and by no means variable in shape or size worth mentioning. In the illustrations I have figured two examples of the aedeagus of this species, showing variations in the apical third of the periandrium, but in which the external structures and colorations of each are identical. As a matter of fact, this species presented less variations in external characters than did most others of our endemic forms.

4. **Oliarus tantalus** sp. nov. Plate I, Fig. 1; Plate III, Figs. 32, 33.

Male. Length, 6.75 to 7 mm.

Vertex much the same as in the preceding species, excepting that the apical carinae, when at all distinct and not quite lost in surrounding tumescence, are more or less angulate and not curved, making the areolets of the fossette appear deeper and more acuminate anteriorly and the basal angles of the frons produced posteriorly.

Tegmina cloudy or bronzy hyaline, immaculate; tegminal veins on basal two-thirds either all dark fuscous or else these are shaded (in part) from fuscous into fusco-testaceous, the Cl and Sc apparently oftener of the latter color; veins on apical third and the costa all dark fuscous; granules dark and distinct. Wings hyaline, veins fuscous.

Mesonotum and mesonotal keels piceus; pronotum and tegulae sordid fuscous; vertex, frons, etc., much the same as in the preceding.

Female. Length, 7.5 to 8 mm.

Of much the same color and structurally like the male, excepting that the areolets of the fossette are larger, the hind margins of the mesonotum

are narrowly and irregularly light castaneous and the basal two-thirds of the tegmina are more or less particolored whitish or yellowish and fuscous.

Type male and holotype female, labeled Palolo, December 24, 1922 (Swezey).

Hab. Oahu, on both Koolau ranges, but seldom at the higher elevations. Described from twenty-eight males and twelve females collected by Swezey, Giffard, Fullaway, and Timberlake, in various localities between 1906 and 1922, viz.: Tantalus, Palolo, Maunawili, Punaluu, Kaumuahona, Waiahole, Manoa, Cooke trail and Nuuanu Pali, Olympus and Wahiawa. In the series are several pairs of both sexes, viz.: By Swezey: 2 males and 2 females, Palolo, December 24, 1922; 2 males and 1 female, Manoa, September 5, 1909; 1 male and 1 female, Tantalus, March 29, 1918. By Giffard: 1 male and 1 female, Maunawili, November 9, 1906. By Fullaway and Giffard: 2 males and 1 female, Nuuanu Pali, April 1, 1917. The rest of the series comprises single specimens of either sex taken at various dates.

Obs. Although this species may have many of the same characters as the preceding, it can easily be distinguished from the latter by the difference in the apical carinae of vertex, the color of the tegmina, and particularly the lack of particoloration in the tegminal veins and costa of the male. The material examined demonstrates comparatively little variation in this species. The large ovate areolets of the fossette in this and the preceding species suggests that they have partly drifted into Division C.

5. **Oliarus koanoa** Kirk. Plate I, Fig. 2; Plate III, Figs. 34, 35.

Male. Length, 6 to 7 mm.

Vertex much like in the preceding species, but much more variable in the width at base and in the length from base to apex. The fossette, however, is practically the same in all specimens examined, more or less tumid anteriorly when viewed laterally, the tumescence diminishing to a large extent the size of the acuminately excavated areolets, as well as widening out the median longitudinal carina; the apical carinae are mostly, if not altogether, lost in the tumescent area surrounding the anterior portion of the fossette and the basal angles of frons.

Fork of frons short, narrow, the carinae more or less swollen; basal angles of frons very largely tumescent.

Tegmina immaculate, hyaline, varying in color from more or less milky-white to slightly yellowish; tegminal veins on the basal two-thirds more or

less pallid, sometimes either flavescent or else flavo-testaceous and occasionally remotely streaked light fuscous; veins on the apical third and the costa vary from testaceous to light fuscous, not particolored.

The mesonotum varies in color from fusco-piceus to piceus and the mesonotal carinae from fuscous to castaneous; hind margins of the mesonotum in most examples slightly streaked castaneous; carinae of the vertex, the frons and the pronotum, etc., fulvous or stramineous.

Female. Length, 7 to 8 mm.

Structurally like the male, except for the wider fossette and base of frons which are more largely tumescent. There are as many as five variations in the coloration and pattern of the tegmina, some examples being immaculately hyaline, others sparsely spotted or else both spotted and obliquely and irregularly banded fuscous. Several examples from Kahuku, Kona and Kilauea, Kau, have dark fuscous longitudinal irregular bands extending from clavus to apical margin; tegminal veins on basal two-thirds more or less particolored whitish and fuscous, but there are occasional examples from Kona and other localities which have these particolorations more or less obscure and infrequently quite absent; costa and veins as in the male.

Hab. Island of Hawaii, mostly in the drier regions at moderately high elevations. Redescribed from one hundred and thirty males and eighty-five females as follows: *From the Kirkaldy material in the Bishop Museum:* One male and one female labeled No. 656 (i. e., Kilauea, August, 1896, Perkins), the male marked "koanoa" in Kirkaldy's handwriting; one damaged male, No. 532 (Kilauea, August, 1895); one male, Kona, 4000 feet, July, 1892 (Perkins); 1 damaged male, No. 650 (Perkins); one male, Hualalei (Kona), 5000 feet, August, 1892 (Perkins); one damaged male, Kona, 3000 feet, October, 1892 (Perkins); two females, No. 691 (Kilauea), July, 1895, and one female, Kona, 4000 feet, September, 1892 (Perkins).

From the Perkins private collection, viz.: Six males and four females, Kilauea, 1903-1906; two males and two females (no locality label); one male, Hilo district, 1800 feet (no date) and mounted on cardboard; two males and two females, labeled Blackburn, Hawaii.

From other collections, viz.: Forty-eight males and forty-seven females, Kahuku (a-a flows), on *Maba sandwicensis,* January 15, 1917 (Muir and Giffard); seven males and five females; Kilauea, "4" (no date), G. & M.; four males and two females, Kilauea, June 27, 1917 (Swezey); one male, Kilauea,

July 27, 1920 (Giffard); nine males, four females, dry forest, Kilauea, July 16, 1918 (Giffard); nine males, seven females, Puuwaawaa, North Kona, August 24, 1917; ten males, Kau Road, January 16, 1917; two males, North Kona Road, August 22, 1917; three males and one female, South Kona Road, August 1, 1922; eleven males and three females, Kau-Kona boundary, July 31, 1922 (Giffard); one male, Kona, 2500 feet, April 23, 1916 (Pemberton); four males, two females, South Kona, August, 1919 (Swezey), and same date and locality, five males and two females (Timberlake).

Obs. The type in the British Museum is a male from Kona, Hawaii. In the Kirkaldy material at the Bishop Museum there is a male from Kilauea, Hawaii, tagged *koanoa* in his handwriting. The latter example agrees with all the specimens referred to, excepting as to certain of the color variations noted in the above description. Although Mr. Kirkaldy had a comparatively small series of this species to study, it is quite evident that he was fully aware of its variability, particularly as to the pattern and coloration of the tegmina.* It would be impossible to discriminate between all these variations, because of slight differences in size and color without even larger series of each than those studied, and, so long as the structures of all are alike, it is well to lump them and save confusion. The highly tumescent area surrounding the fossette and base of frons, the very small ovate areolets and the coloration in general will easily separate it from all other species on the Island of Hawaii.

The aedeagus has the apical third of the periandrium as membraneous and apparently as variable as its ally (*tantalus*) from Oahu.

6. **Oliarus myoporicola** sp. nov. Plate I, Figs. 12, 13; Plate III, Figs. 37, 38, 44.

Male. Length, 4.5 to 5.25 mm.

Width of vertex at base one and one-tenth to one and two-tenths times the width at apex; width at apex about equal to the width at origin of transverse carina; length two and one-tenth to two and three-tenths times the width at base; carinae of apex obscured because of tumescent area surrounding anterior portion of fossette and base of frons; transverse

* See Remarks—Kirkaldy, 1902, Fauna Haw., III, p. 124.

carina (at origin) approximately one-fifth from apex, sub-angulate; fossette angulate posteriorly, as long at side margins as at middle, completely divided into sub-ovate acuminately excavated areolets by a median longitudinal carina. In lateral view the basal angles of frons, where these join the anterior area of fossette, appear more or less tumid.

Frons and clypeus very moderately excavate; basal angles of frons very largely tumescent, level with apex of vertex; fork of medio-frontal carina short and narrow, the base more or less obscure because of surrounding tumescence.

Tegmina milky hyaline, usually quite immaculate, infrequently sparsely maculate; tegminal veins on basal two-thirds more or less particolored whitish or yellowish and fuscous, sometimes with the darker coloration more or less suffused; color of veins on apical third variable, sometimes all fuscous, but more frequently particolored, as in the basal two-thirds, cross-veins dark fuscous, suffused; costa testaceous, not interrupted with particolorations. Wings hyaline, veins either testaceous or else light fuscous.

Mesonotum fuscous; mesonotal keels light castaneous; pronotum and tegulae sordid stramineous, sometimes sordid testaceous; vertex and frons more or less light fuscous, variable; carinae more or less flavid; macula at lateral margins near fronto-clypeal suture, distinct, wedge-like; legs either stramineous or else testaceous; pygofer more or less, and genital styles most always, sordid stramineous.

Female. Length, 6 mm.

The same as the male structurally and of similar coloration, excepting that the base of frons and the fossette in general are wider, the vertex, frons, clypeus, etc., invariably darker and the tegmina maculate, the latter having one or more fuscous transverse bands and spots on the basal two-thirds with the apical third more or less irregularly and largely spotted of the same color. Tegminal veins basally and apically more or less particolored whitish and fuscous with the cross-veins suffused.

Hab. Oahu, on the low-lying coral plains near the most southwesterly point of the island. Described from twenty-four males and seven females taken at Barber's Point, from *Myoporum sandwicense*, as follows: Two males, June 29, 1919; six males and three females, October 16, 1921; sixteen males and four females, December 23, 1923 (Swezey).

The types, male and female, are from the series dated October 16, 1921.

Obs. There is little variation in the structure of the vertex of this small and interesting species, but the coloration of the frons and the pattern of the tegmina are sometimes deceiving

because of differences in the density of the tegminal particolorations of the veins in the male, and of the size, shape, and number of the maculae in those of the female. Of three dissections made of the genitalia, the aedeagus also presented variations in the apical third of the periandrium, the right dorsal margin of which will be found occasionally more elongate than shown in the figure. In a measure, the character of the vertex, as well as the aedeagus, allies it to *koanoa* of Hawaii (a larger species) and to other small species in the same group from Oahu and other islands.

7. **Oliarus wailupensis** sp. nov. Plate III, Figs. 39, 40.

Male. Length, 5 mm.

Structurally the same as *myoporicola*, excepting as follows: Length of vertex three and one-tenth times the width at base; transverse carina about one-sixth from apex; base between lateral carinae narrower (carinae hardly converging); upper part of the genae between the anterior margins of the eyes and fossette (viewed in profile), longer and the base of fork of medio-frontal carina more distinct.

Tegmina hyaline, broader, immaculate; tegminal veins on basal and apical thirds flavo-testaceous, more or less suffused light fuscous; granules brownish, very distinct. Wings hyaline, veins light fuscous.

Testaceous: mesonotum sordid fuscous; mesonotal keels light castaneous; otherwise the coloration is much like the preceding, except paler; macula at lateral margins near fronto-clypeal suture pallid, more or less diffused. The aedeagus in this species differs but little from others in the same group.

Hab. Oahu, on the Koolau mountain range. Described from a single male (the type) labeled Wailupe, May 6, 1917 (Swezey).

Obs. The somewhat longer vertex, the lengthened distance of the upper part of the genae between the anterior margins of the eyes and of the fossette (when viewed laterally) the broader and non-particolored tegmina will easily distinguish this from other described small species in this group. I have seen no females which I can associate with this species, with any degree of certainty. It may be that some of the smaller-sized female examples which I have placed provisionally with *kaumuahona* are here referable.

8. **Oliarus kaumuahona** sp. nov. Plate III, Figs. 42, 43.

Male. Length, 6 mm.

Closely allied to and structurally like *wailupensis*, but of somewhat larger size and with the tegmina less broad.

Tegmina hyaline, immaculate; tegminal veins on basal two-thirds more or less lightly particolored flavo-testaceous and fuscous, more so obliquely on the middle third; veins on apical third dark fuscous more or less sparsely particolored testaceous.

The coloration is in general much more pallid than in the preceding species, with the mesonotum stramineous largely fused with castaneous, and the mesonotal keels flavid.

Female. Length, 7 mm.

Similar to the male, but brighter in coloration and with tegmina basally and apically more distinctly particolored yellowish and dark fuscous.

Hab. Oahu, on the Koolau mountain range. Described from four males and two females, as follows: Two males and one female, Kaumuahona plateau, June 4, 1916, and one male and one female, same locality, November 17, 1918 (Swezey); one male, Palolo, June 3, 1915 (Fullaway).

Types, male and female, are labeled Kaumuahona, O. H. S., June 4, 1916.

Obs. I have referred seven females of smaller size, but of similar structure and coloration, to this species, but it is quite possible that these, as well as two females of still smaller size, may be associated with *wailupensis*, although the shape and pattern of the tegmina do not warrant any such conclusion. All of these females are from Kaumuahona, excepting one each from Wailupe and Lanihuli, and were collected mostly by Swezey and Timberlake.

9. **Oliarus kirkaldyi** sp. nov. Plate III, Figs. 31, 36, 45, 46, 47, 49.

Male. Length, 6.75 to 7 mm.

Width of vertex at base one and two-tenths times the width at apex; width at apex about equal to the width at origin of transverse carina; length twice the width at base; carinae of apex almost obscured by tumescent area; transverse carina (at origin) about one-fourth from apex, subangulate more or less roundly converging from point of origin; fossette angulate posteriorly, largely tumescent (in profile tumid), completely divided into subovate areolets by a broad and flattened median longitudinal carina.

Frons and clypeus moderately excavate, more or less rugosely punctate with the punctures irregular in size and shape and sparsely distributed; basal angles of frons acutely produced, highly tumescent, almost obscuring base of fork of medio-frontal carina.

Tegmina clear hyaline, immaculate; tegminal veins testaceous shaded down to light fuscous at extreme apex of the apical third; costa ochraceous; stigma on the apical two-thirds fuscous, on basal third pallid; granules dark, very distinct. Wings hyaline, veins testaceous.

Mesonotum particolored (diffused) castaneous and flavo-testaceous with flavid keels; pronotum and tegulae stramineous; inter-lateral area of vertex castaneous; the fossette, all the carinae and the frons stramineous; frons and clypeus stramineous, more or less irregularly and sparsely spotted or mottled fuscous; all the carinae of vertex, the tumescent area of fossette and at base of frons, the pronotum, the tegulae and the legs, stramineous; macula at lateral margins near fronto-clypeal suture, whitish, large, but more or less diffused.

Female. Length, 7 to 7.5 mm.

Somewhat darker than the male in coloration, but structurally the same, except that the fossette of the vertex and the area between the lateral carinae are wider and the frons and clypeus smooth, without the puncturations and partly rugose surface seen in the male. Tegmina from clear to part milky hyaline, immaculate; tegminal veins basally and apically more or less particolored whitish and fuscous; cross-veins suffused, granules much less distinct than in the male, macrotrichia long, light brownish.

Hab. Oahu, at elevations between 2000 and 3000 feet. Described from one male and one female, labeled Waianae, 2400 to 2800 feet elevation, June 1, 1919 (Timberlake); one female, west side Mount Kaala (Waianae), June 1, 1919 (Swezey); two females, Waiahole, June 12, 1921 (Swezey).

The types, male and female, labeled Waianae, June 1, 1919 (Timberlake).

Obs. The wider fossette and base of frons, the highly tumescent area surrounding these structures, and the much greater width between the lateral carinae will easily separate this species from all others in Division B.

The scattered large punctures and the more or less rugose appearance of the frons and clypeus of the male described may be abnormal and not characteristic in a series. Without further material, these particular characters should not be considered quite dependable.

The aedeagus is not unlike that of all the other species attached to this division, but the example dissected is without the usual spur at the base of the phallus.

I have named this species after my friend, the late G. W. Kirkaldy, whose life work was devoted especially to the study of the Hemiptera, and to whom his fellow-workers in that Order are especially indebted for valuable data relative to the Cixiidae and other Hawaiian endemic forms.

10. **Oliarus discrepans** sp. nov. Plate III, Figs. 41, 48.

Female. Length, 4.5 mm.

Width of vertex at base one and one-tenth to one and two-tenths times the width at apex; area between lateral carinae shallow, much wider than the length of an eye; width at apex one and one-tenth times the width at origin of transverse carina; length the same as the width at base; carinae of apex curved; transverse carina (at origin) about one-third from apex, sub-angulate; fossette much wider than long, angulate posteriorly, more or less tumescent, completely divided into acuminately ovate areolets by a broad and flattened median longitudinal carina, the anterior portion of which is annulate; lower portion of genae between the side margin of the eyes and the lateral carinae of frons, very wide; antennae comparatively large, and the eyes small.

Frons and clypeus comparatively short and broad, slightly excavate; basal angles of frons wide and very largely tumescent, the tumescence obscuring to some extent part of the laterals and all the base of the fork of the medio-frontal carina; macula at lateral margins near fronto-clypeal suture wedge-shaped, whitish, distinct, very much longer than wide; fore tibiae comparatively short.

Tegmina more or less milky hyaline, immaculate; tegminal veins mostly whitish, except at middle third, where these are more or less suffused and sparingly particolored light fuscous, the suffusion sometimes giving the membrane in the cells the appearance of being very indistinctly maculate; veins at extreme apex and base very faintly particolored (sometimes hardly apparent) and the cross-veins altogether light fuscous; stigma pallid; costa particolored at middle third.

Coloration very variable. Mesonotum dark castaneous, sometimes diffused fulvous with the mesonotal carinae always of the latter color; pronotum and tegulae stramineous; area between lateral carinae of vertex, the areolets of fossette, and the frons and clypeus, mostly castaneous; one example, however, has the frons and a part of the vertex more or less testaceous; carinae of vertex, the genae and the tumescent area at base of frons either stramineous or fulvous; abdomen castaneous, widely margined fulvous; legs pallid.

Hab. Oahu, mostly at the lower elevations, from the coast to 1000 feet. Described from four females as follows: One at

Ewa Mill (on sugar-cane, accidentally) July 14, 1911 (Swezey); one at Manoa, Honolulu ("at light" in residential area), 1912 or 1913 ? (Muir); one at Upper Pauoa Valley Flats (sweeping), May 10, 1919 (Bryan); one on table in the University of Hawaii cafeteria, Manoa, October 11, 1922 (Swezey).

The type selected is the example labeled Ewa Mill, July 14, 1911, collected by O. H. Swezey.

Obs. No male of this rare and unique species has yet been collected. In all, five specimens (all females) have been taken in the thirteen years since the first was collected (accidentally on sugar-cane) at the Ewa Plantation by Mr. Swezey. Only four of these five specimens are included in the list above given, the fifth having by accident "flipped off" the card mount, where it was insecurely fastened. Unfortunately, it was not recovered. This last specimen was one taken at rest on a stone at Makapuu Point * by P. H. Timberlake, January 25, 1920.

The extreme widths of the base of frons, the base of vertex, the shortness of the latter, as compared with the width of the genae between the lateral carinae of frons, and the side margins of the eyes, as well as other features somewhat remote from other typical Hawaiian forms, is the writer's apology for a departure from his rule—not to erect species in this and similar groups from females alone. The characters above referred to permit the possibility that this particular species is of late introduction, but the writer for the present is inclined to the view that the nature and character of the fossette and the very tumescent area surrounding it and also the base of frons, as well as other typically Hawaiian characters associates it, to a more or less extent, with others in this particular division of our endemic species.

The male when collected will probably be found to be of smaller size than the female, with similar structures to the latter except that the fossette, the base of frons, and the area between the lateral carinae of vertex will be less wide and the tegminal veins either without any particolorations or, at most, with very

* On March 11, 1925, Mr. F. X. Williams captured a female of this species on the running-board of his automobile while it was parked on the belt-road near Haleiwa, Waialua, Oahu.

faint ones medianly. The character of the genitalia of the male when discovered will undoubtedly settle the question as to whether the species is endemic or a later introduction. If endemic it is more than likely attached to lowland native grasses or sedges.

Division C.

*Fossette of vertex completely divided by a median longitudinal carina * forming sub-quadrate areolets. Base of frons and carinae not tumescent as in Division B, or but slightly so. Excavate area larger.* (See Plate I, Fig. 3.)

11. **Oliarus tamehameha** Kirk. Plate I, Fig. 11; Plate IV, Figs. 50, 51.
Fauna Haw., III, Part 2, 1902, pp. 120 and 121.
Proc. Haw. Ent. Soc., II, No. 2, September, 1909, p. 77.

The type in the British Museum is a male specimen marked by Kirkaldy and bearing the number 509 (i. e., Kaholuamano, Kauai, 4000 feet, April, 1895, Perkins Coll.). Accompanying the type are a male and female numbered 409 (i. e., Kauai, high plateau, 4000 feet, July 1896, Perkins Coll.). Of the Kirkaldy material in the Bishop Museum, Honolulu, which was also collected on Kauai by Dr. Perkins, the following have been examined and studied: One male, numbered 509 (Kaholuamano, April, 1895); three males, numbered 648 (Waimea district, 2000 to 3000 feet, January to February, 1897), and three females, numbered 682, 631, and 640, respectively (Kauai, high plateau, July to August, 1896). In this same material there were also two specimens, numbered 682 and 631, with the abdomen off and otherwise damaged. These latter are undoubtedly this species, however. Other collections of more recent date include one male, Kaholuamano, Kauai, 4500 feet, May 8, 1920, and one male and one female from same locality, April, 1920 (Kusche).†

This species, conspicuous because of its size, is apparently confined to the high mountain regions of Kauai. It has not been seen or taken elsewhere. Kirkaldy no doubt used it as the type

* In some species the median longitudinal carina may be either forked or minutely annulate, anteriorly.

† The two latter have since been badly damaged.

species for his Hawaiian sub-genus *Nesoliarus* * because of its size and the prominence of the carinae of the vertex.

The measurements of the vertex are quite variable, particularly so in the width at base and at apex. The tegmina of the male are apparently immaculate; some examples have all the tegminal veins more or less flavescent, while others have these on the apical third light fuscous, and again others have the veins on the basal two-thirds more or less distinctly particolored light fuscous. The females have the tegmina more or less spotted light fuscous on the apical half, and the tegminal veins on the basal two-thirds always particolored pale and dark, much more distinctly so than in those of the male.

The appearance, in outline, of the apical third of the periandrium of the aedeagus varies more or less as in most other species, depending to a great extent on the position from which it is viewed. In one of the examples dissected, the small angular tooth on the ventral side of the periandrium (prominent, in profile, in other examples) was not present.

12. **Oliarus nubigenus** Kirk. Plate I, Figs. 3, 8; Plate IV, Figs. 52, 53.

Male. Length, 7 mm.

Width of vertex at base one and three-tenths to one and four-tenths times the width at apex; width at apex equal to width at origin of transverse carina; length twice, or else a little more than twice, the width at base; carinae of apex curved; transverse carina about one-fourth (variable) from apex, either rounded or more or less sub-angulate; fossette a little wider than long, shorter at the middle than at sides, completely divided into sub-quadrate excavate areolets with the median longitudinal carina forked anteriorly.

Frons and clypeus moderately excavate; basal angles of frons tumescent; base of fork of medio-frontal carina not produced beyond apex of vertex; fronto-clypeal suture more or less indistinct; median ocellus moderately distinct.

Tegmina hyaline, somewhat shining, yellowish (in certain light), immaculate; tegminal veins either piceous or else very dark fuscous, excepting the Sc, sometimes, and the Cl 1+2, sut. and cub. apically apparently always moderately particolored; veins on the apical third always dark; granules dark and distinct. Wings hyaline, veins either fuscous or piceous.

Aedeagus with apical third of the periandrium unusually wide for such a small species, the right margin bluntly produced basad; spurs of phallus all moderate in length.

Piceous; frons and vertex fusco-piceous; pronotum sordid fuscous; tegulae either piceous or dark fuscous; carinae of frons, vertex and pronotum

* op. cit., p. 76, 1909.

fulvous; macula at sides of frons near clypeal suture large and more or less elongate, legs fusco-testaceous.

Female. Length, 8 mm.

Structurally the same as the male. The carinae of frons, vertex, etc., are much more conspicuously fulvous than in the opposite sex. Tegmina more or less spotted or banded light yellowish fuliginous on basal two-thirds with scattered dark fuscous maculae on apical third; tegminal veins on basal two-thirds brightly particolored fulvous and dark fuscous; apical third all dark fuscous.

Hab. Island of Kauai: Redescribed from six males and one female, as follows: One male in the Bishop Museum (Kirkaldy material) tagged *"halemanu"* by him in pencil (without date or collector's label); one male, Waimea district, 2000 feet, 1902 (in Dr. Perkins' collection); one male, Kaholuamano, May 8, 1920, and another male from same locality, April, 1920 (Kusche); one female, Halemanu, August 31, 1921 (Swezey); one male, Kalalau, June 18, 1922 (Bryan), and one male, Lihue, 800 feet elevation May 12, 1922 (Swezey).

There are also two females of somewhat larger size from Kaholuamano, 4500 feet elevation, May 8, 1920 (Kusche), which I refer to this species. Both show variations, but in general have the tegmina more largely maculate, and the tegminal veins more closely particolored.

Obs. This species is represented in the British Museum by one male specimen labeled "Halemanu, Kauai."

13. **Oliarus pele** Kirk. Plate IV, Figs. 56, 57.

Male. Length, 6.50 to 7.50 mm.

Vertex variable; width at base one and two-tenths to one and three-tenths times the width at apex; width at apex equal to or a little wider than at origin of transverse carina; length twice the width at base; carinae of apex more or less curvate; transverse carina about one-sixth from apex, more or less curved, sometimes sub-angulate apically; fossette wider than long, completely divided into two sub-quadrate areolets with the median longitudinal carina complete, but minutely forked anteriorly.

Frons and clypeus excavate; tumescence at basal angles of frons, in some examples, more or less obscuring the apical carinae of vertex; base of fork of medio-frontal carina very slightly produced beyond the apical carinae of vertex; median ocellus more or less distinct; fronto-clypeal suture obsolete.

Tegmina slightly milky hyaline, more or less lightly spotted or tinged

yellowish fuliginous, sometimes with a fuscous spot near fork of Cl 1+2, a smaller one at apex of suture and one or more (mostly little apparent) near lower margin of apical third. Tegminal veins on basal two-thirds more or less particolored dark and pale; apical third, costal margin and stigma (in part) dark fuscous; cross veins very slightly, if at all, suffused; granules either pale or brownish, moderately distinct. Wings slightly milky hyaline, veins dark fuscous.

Aedeagus with the apical third of the periandrium more or less variable in outline; median right spur emanating at basal third of the phallus, quite short and more or less curved; left basal spur long, sometimes reaching middle third; apical spurs stout, of medium length and well developed.

The coloration of this species is very variable in all examples studied. In general most of the examples are either fusco-testaceous or flavo-testaceous with the genae, pronotum and tegulae more or less stramineous or else testaceous; mesonotum either dark or pale castaneous; mesonotal carinae and the area between these *always* pale castaneous.

Female. Length, 7 to 8 mm.

Allowing for proportions of size and length, there are no important structural differences between the sexes. The coloration of the body parts and of the tegmina is even more variable than that of the male. In some examples the tegmina may be more or less spotted light fuscous, while in others these may be immaculate. The tegminal veins are all more or less particolored pale and dark as in the males.

Hab. Oahu Mountains. Redescribed from eleven males and five females, viz.: One male each from Kaala Mountain, June 1, 1919; Wahiawa, May 31, 1909; Tantalus, August 4, 1912; Kaumuohona, October 26, 1913; Wahiawa, July 4, 1920; Kaala Mountain (found with nymphs in soil and fern-roots) July 19, 1916 (Swezey); Palolo, September 8, 1912 (Fullaway); one male, Palolo Crater, July 31, 1917, and two males, Olympus, July 18, 1916, and July 31, 1917, respectively (Timberlake); one male June 24, 1917 (Bridwell). One female each from Konahuanui, February 22, 1914 (Swezey); Tantalus, January 3, 1909 (Giffard); Palolo, May 13, 1917 (Bridwell); Kaala, July 4, 1916, and Palolo Crater (in moss and ferns), April 8, 1917 (Timberlake).

Var. a.

A Maui form presenting no special differences in either structure or coloration and apparently just as variable on that island as the one is from Oahu. I have examined three examples, viz.: One male, Keanae, June 15, 1920, and two males, July 2, 1920 (Bryan). The latter specimen was dirty and otherwise in bad condition. I have not seen the female of this form.

Var. b.

Male. Length, 7.25 to 7.5 mm.

Female. Length, 8 to 9 mm.

Superficially, two male Oahu examples appear to be different from the preceding. Examination presented no structural differences of importance. A more elaborately maculated tegmina in one example and the larger size of both, together with normal variations in the apical outline of the periandrium of the aedeagus, are not characters sufficiently important to warrant separating it, more particularly with only two male specimens before me, both being variable and from the same island.

In the material there are five females from various localities on Oahu which may be associated provisionally with the above males. One or more of these, however, have much more flavid carinae of the vertex and frons than what might be accepted as the normal coloration of the species. The external structures of all appear to be typical, and the tegmina are more or less spotted or else banded light yellowish fuliginous with scattered fuscous maculae. The tegminal veins are alternately dark and pale (particolored) on the basal two-thirds. All the examples are from scattered localities on Oahu, no two individuals having been captured on any one date, nor more than one in each of the years recorded.

Hab. Oahu Mountains. One male each, Punaluu, August 9, 1914, and Olympus, September 8, 1912 (Swezey); one female each, Wahiawa, March 6, 1921, Pacific Heights, October 20, 1905, and Punaluu November 6, 1911 (Swezey); one female each, Kaumuohona, October 15, 1916, and Mount Olympus, October 20, 1918 (Timberlake).

Obs. Kirkaldy's tabulated description of this species included a number of females from several islands, with no accompanying males. Many of these females presented such variations in structure and coloration as to make his brief description altogether insufficient for such a variable form. The part of his material selected for the British Museum consisted of five female examples from Oahu, Kauai, Molokai, and Hawaii, and that for the Bishop Museum at Honolulu of eight females from Oahu and Hawaii. Of these latter, five belong to the division having the carinae of the fossette and of the base of the frons tumescent or flattened, and three to the division having a complete

fossette, i. e., with no median longitudinal carina. All of these also differ, more or less, in other respects, which leads to the belief that, at some time in recent years, shifting of the specimens may have placed the group label denoting the species elsewhere than was intended.

Aside from the undesirability of erecting species from females in which the sexual dimorphism is so pronounced, we have also in this instance to contend with Kirkaldy's references and part tabulated descriptions * of possible varieties of this same species on several of the islands. Due to these apparent complications, I have (provisionally at least) used the name to include specimens of both sexes, some of which may have to be separated later on. Most of these vary, more or less, one from the other either as to size or coloration, all, however, having a complete median longitudinal carina in the fossette forming sub-quadrate areolets; the mesonotum (including carinae) and frons more or less pale castaneous; the tegmina varying from yellowish to spottedly fuliginous, and with the veins on basal two-thirds alternately dark and pale (particolored). These characters follow, in very great measure, Kirkaldy's description of the female. In the circumstances it would be unwise to erect one or more species for such a variable form, more particularly as the material studied represents more often single individuals of each variety taken in numerous localities and at various dates during a collecting period of many years.

14. **Oliarus likelike** sp. nov. Plate IV, Figs. 58, 59.

Male. Length, 5.5 to 6 mm.

A small species allied to, but having more stable characters than the preceding (*pele*). It may be separated by its size, the fuscous colorations of the frons and vertex, etc., the darker particolorations of the tegminal veins, the minute annulet in front of the median longitudinal carina of the fossette, the clearly developed carinae of the apex of vertex and the base of fork of medio-frontal carina, which is narrower and not at all produced beyond the apical carinae of vertex. In some examples the upper part of the genae between the anterior margins of the eyes and fossette, in profile, appears to be somewhat longer than in the preceding species.

Aedeagus in general very similar to that of *pele*, but the three examples dissected out have the extreme apical margin of the periandrium more uniformly curved and the left apical spur of the phallus shorter, at the most not as long as the right median spur.

* Proc. Haw. Ent. Soc., Vol. II, No. 2, 1909, p. 79.

Female. Length, 7 mm.

Similar to the male, but having middle third of the tegmina banded, and the apical third irregularly spotted fuliginous.

Hab. Oahu Mountains, at high elevations. Described from one male and one female from Konahuanui, February 4, 1906 (Swezey); one male, Kaumuohona, August 27, 1916 (Timberlake); one male, Konahuanui, October 12, 1919 (Williams); one male, Palolo, October 6, 1906, and one female, Lanihuli, November 24, 1918 (Swezey).

Types, male and female, labelled Konahuanui, February 4, 1906 (Swezey).

Obs. Although this species has such close affinities to *pele*, it may be easily separated by the much darker colorations and other differences above noted. The late Mr. Kirkaldy, while studying the Hawaiian Cixiidae, had attached in his own handwriting the MS. name of *"likelike"* to the Konahuanui male example, which I have selected as the type.

15. **Oliarus makaala** sp. nov. Plate IV, Figs. 54, 55.

Male. Length, 5.25 mm.

This may be an extreme form of one of the varieties of *pele*. It is much shorter in length, but the structure of the vertex is practically the same as in that species, excepting that the apical carinae are distinctly curved, the basal angles of frons more tumescent, and the fork of the medio-frontal carina is longer and narrower. The tegmina differ from those of *pele*, in having most of the basal third sordidly fuliginous and the middle third lightly tinged yellowish fuliginous; tegminal veins pale, transversely particolored fuscous on the middle third, with the apical third light fuscous; cross veins distinctly suffused. In color the mesonotum is dark fuscous, with the mesonotal keels light castaneous (much as in *pele*), but otherwise the coloration is much the same as in that species.

The structure of the aedeagus appears to be closer that of *likelike* (another close ally) than that of *pele* and its varieties, slightly differing from the former in the apical third of the periandrium.

Hab. Oahu, on the Waianae Mountain range. Described from two males labelled Kaala Mountains, September 7, 1913 (Swezey).

Obs. The type is the dissected example numbered Gen. 34.

I have seen no female in the material which I can in any way match with these males. Much more material of this and its close relatives *pele* and *likelike* is necessary before some of the varieties of either can be better differentiated.

16. **Oliarus filicicola** Kirk. Plate IV, Figs. 63, 64; Plate VIII, Fig. 140.
O. montivagus Kirk.
O. kaonohi var. **volcanicola** Kirk.

Male. Length, 5 to 6.5 mm.

Female. Length, 7 to 7.25 mm.

This is the Hawaii form of a group including the three following species. It exhibits the same variation in the color of the tegmina, mesonotum, and frons. The structure of the vertex presents but little difference from its close relatives from Oahu, Lanai, and Maui, excepting, perhaps, a greater tendency in the darker varieties towards a curved rather than angulate apical carina. This feature, however, is by no means constant, as examples examined show intermediate variations. The color of the tegmina of some of the males is nearer that of *kaonohi*, but less yellowish (more clearly hyaline), while others, on the contrary, have these more or less tawny. The tegmina of the female are strongly yellowish in most examples, occasional examples being fuliginous, but not as darkly so as some from Oahu and Maui. The granules on the basal two-thirds of the tegminal veins are pale, indistinct, but always present (never quite obsolete).

The most important difference between this species and the forms from Oahu, Lanai, and Maui lies in the aedeagus. Seven examples from remote regions on the island, after dissection of the genitalia, exhibited slight variations of outline in the apical third of the periandrium, but none at all in the phallus, the latter being armed basally and apically with all spurs of normal length.

Hab. Very common in the mountain regions of the Island of Hawaii, principally on ferns.

From a large series of one hundred and thirty-one males and sixty-six females collected in the districts of Kau, Kona, Puna, Hilo, and Kohala, the following were selected and studied: Four males, Naalehu, December 12, 1905 (Swezey); two males, Kilauea, July 1903, one male, No. 692 (Kilauea), and one male, No. 685 (Kilauea), September, 1906 (Perkins); one female, Kona, 2000 feet, December, 1892; one male, Kona, 4000 feet, 1896 (Perkins); one male, No. 656 (Kilauea), August, 1896, (Perkins); three males, and one female, Glenwood, Olaa, 2300 feet, August 27, 1917 (Giffard); one male, Glenwood, March 2, 1919; one male and one female, Kohala Mountains, May 24, 1917; one male and one female, Kaiwiki, September 22, 1918; one male, Kilauea, August 4, 1919; one female, Kilauea, May 15, 1911, and one male and one female, upper Hamakua Ditch trail, July 31, 1921 (Swezey); one male and one female, "Twenty-three Miles," Olaa, 2300 feet, September 9, 1919 (Fullaway); one male (5 mm.) Kealakakua, 3000 feet, August 8, 1919 (Timberlake), and one male, Kilauea (no date) (Kirkaldy).

Type, male, is labelled Naalehu, Hawaii, December 12, 1905, on ferns (Swezey).

Type, female, labeled Kona, 2000 feet, December, 1892 (Perkins).

Obs. Kirkaldy's *filicicola* is not represented in the collections of the British Museum, but his material in the Bishop Museum, Honolulu, contained a male example bearing a tag marked with that name, in pencil, in his handwriting, labelled "Naalehu, Hawaii, December 12, 1905, on ferns." Three more male specimens bearing same label were found among the Swezey material. In Dr. Perkins' personal collection there were two males (mounted on card) labelled from Kilauea, Hawaii, August, 1903, with a tag attached, "I have a note that these were compared with *filicicola* and are that species." Another specimen identical with the latter was found under the name of *kaonohi* in the Kirkaldy material (labelled 692, Kilauea, Hawaii, Perkins). These are of the variety with pale frons and mesonotum.

The lengths of the male and of the female are very variable and not to be relied upon as in some of the other species. There are in the collections many variable examples where both sexes (the tegmina of the male pale and that of the female dark yellowish) have been captured together in widely separated regions at the same time and apparently on the same host plant. The sexual dimorphism in all of these is such that it would confuse rather than help matters were the species divided into varieties. All are undoubtedly the Hawaii form of *kaonohi* of Oahu, *koele* of Lanai, and *halehaku* of Maui.

O. montivagus Kirk. comes after *filicicola* in his table, and is there tabulated * as a species with the mesonotum black, teg-

* Not otherwise described.

minal veins on the basal two-thirds sometimes with dark granules and with the exterior keels of the mesonotum straight. A single male specimen from Kilauea is in the British Museum to represent that species. The Kirkaldy material in the Bishop Museum has three male specimens determined as *montivagus,* one of which, No. 685 (i. e., Kilauea, September, 1906, Perkins), is tagged as such in pencil in his handwriting. The aedeagus of these was dissected out and found identical with that of the *filicicola* type. I have seen no examples of *montivagus* having dark granules on the tegminal veins, and any value attached as to whether the mesonotal keels are straight or sub-parallel to the interior ones will not hold in either this or other local species, at least not when there is an abundance of material to study. The darker color of the mesonotum and frons of some male examples is merely a modification of the color in that sex, some specimens when captured being dark, while others are pale. On the contrary, all females taken with the males are always pale, never dark. This sexual dimorphism of color in this species has heretofore caused much confusion in determinations, but the paired males and females taken at same time and place which have been selected among the paratypes are confirmative of the above fact. These paired examples should be kept together in the collection which contains the Holotype and Allotype. In all the circumstances I have deemed it best to consider *montivagus* as a synonym of *filicicola.*

Kirkaldy's Hawaii var. *volcanicola* of *kaonohi* is synonymous with *filicicola,* the Hawaii form of *kaonohi* from Oahu.

Referring to remarks (see Obs. under *kaonohi*) in regard to cross-breeding and to the drifts by transmission in this particular group, it might be well to further observe that *filicicola* should, perhaps, take precedence to *kaonohi,* the transitional stages beginning with *filicicola* from Hawaii, and then on to *halehaku* from Maui, *kaonohi* and *kocle* being intermediate forms from Oahu and Lanai, respectively. If *immaculatus* (placed provisionally in Division D) is accepted as the Kauai form, then the structure of the aedeagus would place it next to *filicicola.* This cannot be fully decided until Kauai has been more closely collected for further material.

17. **Oliarus kaonohi** Kirk. Plate IV, Figs. 61, 62.
Oliarus silvicola Kirk.

Male. Length, 5 to 6 mm.

The measurements of the vertex of this common species are very variable. Width at base one and one-tenth to one and three-tenths times the width at apex; width at apex one to one and one-tenth times the width at origin of transverse carina; length, one and seven-tenths to two and three-tenths times the width at base; carinae of apex slightly converging, very little curved, if at all; transverse carina about one-fifth from apex, curved; fossette very little wider than long, mostly shorter at the sides than at middle, divided into two sub-quadrate areolets by a median longitudinal carina. In odd examples this carina is more or less obsolete anteriorly, mostly due to the obscurity or absence of the annulus, which latter may or may not be present.

Frons and clypeus moderately wide and excavate; basal angles of frons not tumescent; base of fork of medio-frontal carina faintly, if at all, produced beyond apex of vertex, sometimes obscure; fronto-clypeal suture and median ocellus more or less obscure.

Tegmina immaculate, yellowish (sometimes, in part, milky) hyaline, with the clavus in most examples more or less yellowish fuliginous; tegminal veins on the basal two-thirds pale stramineous (more or less dilute in some examples), shading off into ochraceous on the apical third; granules more or less distinct, either partly or quite pale or else distinctly brownish. Wings hyaline, veins testaceous to light fuscous.

Color exceedingly variable. Frons, vertex, mesonotum, pronotum, and tegulae either pale or dark castaneous or else fusco-piceous; mesonotal keels variable, either pale or dark; macula at sides of frons near clypeal suture, always absent regardless of the color of the frons.

The structure of the aedeagus does not differ materially in the examples dissected out from eleven extreme and intermediate forms.

Female. Length, 6.5 to 6.75 mm.

Structurally the same as the male, but much more variable in color. The mesonotum and frons vary from pale castaneous to fusco-piceous, and the tegmina from yellowish hyaline to dark fuliginous, some examples of the latter having the costal cell dilute.

Hab. Distributed generally on ferns on all the mountain ranges of Oahu. Redescribed from twenty-two males and twenty-three females of extreme and intermediate color examples from Konahuanui, Olympus, Tantalus, Manoa, Maunawili, Nuuanu, Halawa, Waiahole, Wahiawa, and Mount Kaala, collected by Perkins (1900-1906), Kirkaldy (no date), Blackburn (no date), Swezey (1906-22), Giffard (1905-15), Kotinsky (no date), Timberlake (1916-20), Bridwell (1917), Fullaway

(1912-16), and Williams (1920). These were selected from a large series of three hundred or more males and females collected between 1900 and 1922 from the same or adjacent localities. Some of the older specimens were received either mildewed or otherwise damaged.

Obs. Kirkaldy, in his tables, divided this very common Oahu form into two species, viz.: *kaonohi* (with pale mesonotum) and *silvicola* (with dark mesonotum). The former is represented in the British Museum collection by a male and female (on same card) labelled "Honolulu," and marked by Dr. Perkins as *kaonohi*. *O. silvicola* is not represented at all in the British Museum, but the Kirkaldy material left with the Bishop Museum, Honolulu, had one specimen tagged in pencil *"silvicola"* by Kirkaldy in his own handwriting, this being, presumably, his type of the latter. As both are the same species, and as *kaonohi* was tabulated * first by Kirkaldy, it must take priority over *silvicola*, which latter is, in consequence, synonymized.

The granules on the basal two-thirds of the tegminal veins, while quite distinct in some examples, may be more or less obscure in others, but these are never quite absent. Examples of the species from various localities taken at one and the same time exhibit very much the same variation in distinctness and coloration of the granules as in many other of our local species. Probably because of the little material before him, Kirkaldy evidently found it convenient to stress this character in his tables in connection with one or more of his species, but large series of examples reveal that the distinctness and coloration of the granules on the tegminal veins cannot always be accepted as constant within a species.

The females of *kaonohi* and its insular forms with the dark fuliginous tegmina should not be confused with those of *morai*, notwithstanding the apparent similarity in coloration. Undoubtedly, both these species are close relatives, and were it not for the fact that the transitional stages between all our insular forms must be recognized in order to secure reasonably satisfactory results in their classification, *morai*, like many other of such insular forms, would not be given specific value. There are,

* Not otherwise described by Kirkaldy.

however, always more or less distinctive characters, although these in their turn may also be variable, which allow us to separate one form from the other and thereby prevent unnecessary confusion.

Occasional examples in both sexes of *kaonohi*, and similarly with *morai*, exhibit tendencies to drift into one or the other of the two divisions, C and D, not only because of either a complete or incomplete median longitudinal carina of the fossette, but also because of the great similarity in the dark fuliginous pigment covering the whole tegminal surface of some of the females. The aedeagus of the male in both species is of the same general form, although such characters as the presence or absence of one or both basal and apical spurs on the phallus are constant in all examples dissected, and quite sufficient to further differentiate the two species. It is suspiciously evident that either both forms are the result of cross-breeding, or that one of these is still evolving from the other.*

In the large amount of material before me I have seen no males of *kaonohi* or of its other insular forms which could be matched with the females which have very dark fuliginous tegmina. On the other hand, *morai* (a much larger species) has this dark coloration represented in both sexes.

18. **Oliarus koele** sp. nov. Plate IV, Figs. 70, 71.

Male. Length, 5 to 6 mm.

Female. Length, 7 mm.

Closely related to and structurally much like the preceding. It is also equally variable in the coloration of the frons and mesonotum. In all the male examples before me, the tegmina appear in general to be more clearly hyaline, with the yellowish fuliginous color of the clavus absent and the granules on the tegminal veins pale and less distinct.

The aedeagus is of the same character as the preceding, except that in all the examples dissected out the basal and the eight apical spurs of the phallus are longer and the left apical spur either quite absent or else rudimentary. The apical third of the periandrium is more or less variable in outline, but retains the general form of its ally.

In color the females are variable, but compare favorably with some of the lighter examples of the Oahu form. In the large series examined there

* See observations under *morai* relative to the dissection of a male and female taken in copula.

are no female specimens with dark fuliginous tegmina. Structurally it is like the male, but larger.

Hab. Island of Lanai at 2500 to 3400 feet elevation. Described from four males and six females selected from a series of eighty-three specimens of the former sex and sixty-three of the latter, all collected in 1916-17 by Munro and Gibson (labelled H. G.).

Type, male, labelled H. G. 54, 3000 feet elevation, January 12, 1917 (Gen. 18, A).

Type, female, labelled H. G. 29, 3000 feet elevation, December 18, 1916.

Obs. This species is as common on Lanai as *kaonohi* is on Oahu, and was reported as taken mostly on ferns. The remarks regarding *kaonohi* are also applicable to this species. Closer collecting will no doubt result in finding the female with the dark fuliginous tegmina, which is on both Oahu and Maui. Of the four examples of the aedeagus dissected out, one had the minute left apical spur of the phallus very membraneous and hardly perceptible, except under high power magnification, while the right apical spur was much better developed than that in *kaonohi*.

19. **Oliarus halehaku** sp. nov. Plate IV, Figs. 68, 69.

Male. Length, 5.5 to 6 mm.

Female. Length, 6 to 7.5 mm.

Structurally the same as the three preceding species. The coloration of the mesonotum and frons of the males is very variable as in the other insular forms, varying from pale stramineous to fusco-piceous, and the tegmina from stramineous to yellowish fuliginous. Like the Lanai form, the darker coloring of the clavus is seldom, if at all, noticeable. The pronotum of the male is consistently stramineous throughout the series, much lighter in shade than in the preceding insular forms, while in some of the darker examples there are evidences of a small but obscure yellow spot at sides of frons near fronto-clypeal suture.

The basal spur of the phallus is well developed and longer than that of *koele*, while the apex is quite devoid of spurs in all ten examples dissected. Like its three allies, the right median spur is long and stout, even more prominently so than in either of these.

The female is structurally the same as the male, but varies more as to length, the mesonotum and frons exhibiting the same extremes as in its

allies. The tegmina vary from yellowish hyaline to dark fuliginous, the latter color varieties having the costal cell strongly dilute.

Hab. Island of Maui at elevations up to 6000 feet. Described from twelve males and nine females (selected from the larger series) collected between 1908 and 1920 at Wailuku, Iao Valley, Nahiku, Waikamoe, Honomanu, Olinda, Halehaku, Kailua, Keanae, and Haleakala, by Swezey, Bryan, Timberlake, Giffard, and Fullaway. The large series, exclusive of the above, comprises forty-two males and sixty-three females collected, 1908-20, by the same individuals from the same localities and, in addition, from Hana, Haipuaena, Wailuanui and Wailuaiki. A number of the Haleakala specimens are labelled as taken from *Sadleria*, also *Pipturus*.

Type, male (light form Gen. 50), labelled Nahiku, September 1, 1908 (Swezey). Paratype, male (dark form Gen. 47), labelled Halehaku, June 24, 1920 (Bryan).

Type, female (light form), labelled Nahiku, September 1, 1908 (Swezey). Paratype, female (dark form), labelled Halehaku, June 24, 1920 (Bryan).

Obs. Commonly distributed in all localities on the island and, like the three preceding forms, exceedingly variable in color. West Maui examples appear to be generally paler in color than those on the windward side of East Maui, although there are intermediate color varieties in localities between these two regions. The structural outline of the apical third of the periandrium of the aedeagus shows a variation in some of the examples dissected, and in one of these the basal spur of the phallus is shorter than in all the others. The total absence of apical spurs on the phallus indicates that the transitional stages had approached the *tarai-morai* group. (See notes under *kaonohi*.)

Division D.†

*Fossette of vertex incompletely divided by a median longitudinal carina, the basal portion of the dividing carina more or less evident, but never reaching the apical carinae of vertex.** (See Plate I, Fig. 4.)

† An intermediate division.

* Within the species there are occasional examples in which the dividing median carina may be either almost complete or quite absent.

20. **Oliarus immaculatus** sp. nov. Plate I, Fig. 4; Plate IV, Figs. 60, 65; Plate VI, Fig. 106.

Male. Length, 7 mm.

Width of vertex at base one and two-tenths to one and four-tenths times the width at apex (at point of origin); width at apex equal to width at origin of transverse carina; length one and six-tenths to one and seven-tenths times the width at base; carinae of apex obliquely angulate, more or less coalescent with lateral carinae of the fork of the medio-frontal carina; transverse carina, about one-fourth from apex, more or less curvate; fossette angulate, excavate, apparently produced anteriorly into areolet of fork of medio-frontal carina; median longitudinal carina more or less developed, but not complete.

Frons and clypeus excavate; lateral carinae of fork of medio-frontal carina more or less coalescent with carinae of apex of vertex, base obsolete or at most very obscure. In profile the upper part of the genae between the anterior margins of the eyes and fossette more or less shortened.

Tegmina dark yellowish, clouded or sub-opaque, immaculate; tegminal veins immaculately pallid except at extreme apical third, where they become slightly flavo-testaceous; stigma light castaneous; granules mostly indistinct. Wings hyaline, veins light fuscous.

Mesonotum, vertex, frons, etc., sordidly light castaneous; pronotum, tegulae, and legs stramineous.

Female. Length, 8 mm.

The female is like the male in appearance and structure, the coloration of the body structures being, however, somewhat darker.

Hab. Kauai. Described from four males and two females, Kokee, June, 1919 (Osborn); three males, two females, and seven nymphs (ex fern), Lihue, March, 1912, and two males, Summit Camp, April, 1922 (Swezey); one male, Kaholuamano, April, 1920 (Kusche).

Types, male (Gen. 56c) and female are Kokee specimens labelled June 10, 1919 (Osborn).

Obs. In certain respects the external characters and the aedeagus of this aberrant species appear to have affinities to those of the *filicicola-kaonohi* group. The uniform absence of the base of fork of the median-frontal carina, the coalescence of the apical carinae of the vertex with the lateral carinae of the frontal fork gives an unusual appearance to the fossette. Whether or not the base of the medio-frontal fork is found later on to be distinct in some specimens among a larger series, the lengthened apical carinae of vertex and the angulate base of the

frons will quickly separate it from other species superficially resembling it. The present series was taken from four different mountain localities, all more or less isolated from each other by deep canyons.

One of the Kokee females studied is a very dark-colored form and presents the only color variation noted in the series. The lateral margins of the pygofer of the male are clothed with unusually long setae.

21. **Oliarus tarai** Kirk. Plate V, Figs. 72, 73, 74, 75.

Male. Length, 6.5 to 7.25 mm.

Width of vertex at base one and four-tenths to one and five-tenths times the width at apex; width at apex same as the width at origin of transverse carina; length one and two-tenths to one and three-tenths times the width at base; carinae of apex more or less curved (in some examples the carinae appear slightly oblique rather than curved); transverse carina about one-fourth from apex, more or less sub-angulate; fossette broader than long, rotundate and somewhat excavate anteriorly, the median longitudinal carina more or less produced into two very minute sharp keels which appear to completely divide the fossette medianly, space between the keels very narrow and shallow; lateral carinae, viewed in profile, arcuate.

Frons moderately excavate; fork at base of median carina rounded, sometimes flattened or quite obscure, produced but slightly, if at all, into the area of fossette of vertex.

Tegmina whitish hyaline at middle third; basal and apical thirds entirely dark fuliginous (very rarely light fuliginous). Tegminal veins testaceous at middle third, dark fuscous at basal and apical thirds. Stigma and costa dark to light fuscous. Wings dark fuliginous apically, veins fuscous.

Aedeagus with the right margin of the periandrium near apex more or less acutely produced (in somewhat immature examples this part of the structure is very membraneous, causing an abnormal lipping over of the apical margins); right median spur sinuous, ample, very broad at base; base and apex of phallus without spurs or spines; in lateral view the ventral margin near apical third has the tooth well formed and stout.

Piceus, pronotum, and tegulae most always immaculately yellow; interolateral margins, carinae of vertex, frons and clypeus fulvous; legs testaceous to fuscous; macula at lateral margins near base of clypeus moderately large, but variable.

Female. Length, 7.5 to 8 mm.

Structurally similar to the male. In coloration it differs from the male, as follows: Mesonotum and frons immaculately ferrugino-testaceous, sometimes fulvous, or else fused fulvous; legs either fulvous or flavo-testaceous;

pattern of tegmina more variable, the lighter fuliginous examples predominating.

Hab. Oahu, at various elevations from 1300 to 2500 feet. Redescribed from seventeen males and six females from Waianae, Honolulu Mountains, Palolo, Tantalus, Punaluu, Waialua Mountains, Konahuanui, Kaala Mountains, 1892-1922, by Perkins, Koebele, Swezey, Giffard, Timberlake, Fullaway, and Bryan.

Obs. There are five specimens under the name of *tarai* in the collections of the British Museum, but none marked *"type."* The figure in Fauna Hawaiiensis was made from a Waianae example. From Mr. Kirkaldy's material in the Bishop Museum, I have selected as the lectotype a Waianae male example collected by Dr. Perkins in April, 1892. It is quite typical of most examples of that sex which I have studied and included in the description.

A male (Kaala Mountain, July, 1916, Swezey) example was found to be abnormal. It is much smaller than the rest of the series, and dissection of the genitalia revealed the apex of periandrium of the aedeagus to be slightly different from others dissected. In all other respects the genitalia was found to be typical. It is evident that in this species the female is superficially very variable in color, and quite likely to cause errors in determinations.

Var. a.

There appears to be even greater plasticity in the structure of the fossette of vertex and in the general coloration of this Hawaii variety than in the Oahu form. Until more material is collected from other localities and regions of the island and studied, it would not be advisable, for the present at least, to give it more than varietal value.

Median longitudinal carina of fossette of vertex very variable, in some examples complete and in others incomplete. It appears to differ from the Oahu examples in coloration, as follows: Fuliginous area at basal third of tegmen extends more or less along Cl 1+2 to its junction with the commissure; center of apical third more or less irregularly hyaline with the anterior margin of the pigment extending across the costal cell to the costa; middle third clear hyaline with the veins and granules much darker. In general all the body parts are very much darker, and the pronotum and tegulae tend to be more sordidly yellow or else fused fuscous.

The female is structurally the same as examples from Oahu, but the pattern and coloration of the tegmina is in a measure more variable. There are examples which have the fuliginous band at apical third more or less

interrupted or entirely broken, and one or more others where this band is but little apparent. The fuliginous pigmentation extending across the costal cell is always present as in the male, but there are instances where this is less typical of the variety.

Hab. Island of Hawaii. Two males, Kohala Mountains (upper Hamakua Ditch Trail), September, 1919, and one male and three females, South Kona, August, 1919 (Swezey); one male and one female (no locality or date label) and one female (no date) labelled Kona (Perkins); two females, Kilauea, 4000 feet, July, 1918-20 (Giffard); one male labelled Waimea, Hawaii (no date), Perkins.

Obs. The example from Waimea is very much undersized, and the pattern of the tegmina follows precisely that of the Oahu examples, excepting that the coloration of the apical third is extended across the costal cell, as in all the other Hawaii varieties.

Of five dissections made of the male genitalia, there was only one which showed an appreciable difference in the aedeagus from that of the Oahu examples. This was in one of the two Kohala Mountain examples (Gen. 39F), which was found to have a very minute median spine or spur on the left side margin of the phallus, and another but larger one at the apex. A dissection of the other Kohala example (both taken in same locality within a day of each other) revealed the aedeagus to be typical.

The fact that occasional rudimentary spurs may be attached to the phallus, as previously mentioned, emphasizes the observations made in connection with the transitional stages of *kaonohi* into *tarai* and *morai*. It would not be surprising to find occasional "sports" of the Oahu form of *kaonohi* without any apical spurs at all on the phallus. The Lanai form of the latter species in all examples studied exhibits one very rudimentary spur (sometimes two), and the Maui form none at all—which, in the main, agrees with some of the *tarai* and *morai* examples.

22. **Oliarus neotarai** sp. nov. Plate IV, Figs. 66, 67.

Male. Length, 5 to 5.5 mm.

Width of vertex at base one and one-tenth times the width at apex; width at apex one to one and two-tenths times the width at origin of transverse carina; length one and seven-tenths to one and eight-tenths the

width at base; carinae of apex practically same as in *tarai*; transverse carina one-fifth to one-seventh from apex, more or less sub-angulate or else rounded; fossette much broader than long at middle, rotundate and moderately excavate anteriorly; median longitudinal carina almost complete with the minute and acutely ridged keels (plainly seen in *tarai* and its forms) little apparent or else very obscure.

Frons very moderately excavate; base of fork of the median carina rounded, more or less obscure and slightly produced into area of fossette of vertex.

Tegmina dark fuliginous at basal third, the pigment extending along the whole claval area to and including the apical third or more, middle third with a moderately large whitish hyaline area between cubitus and costa, but not including the extreme base of costal cell, which is always colored fuliginous. Tegminal veins light to dark fuscous, granules very distinct. Costa and stigma dark fuscous. Wings more or less fuliginous or fumose over the apical third, veins dark fuscous.

The aedeagus differs from that of *tarai*, in the following: Apical third of periandrium much less wide, more prolonged, converging toward the rounded apex and with the right margin more produced and acute; apical half of phallus more elongate and less wide, with a well-defined but moderately long and narrow spur at base, and one only (the right) at apex. The tooth on the ventral margin (viewed laterally) of the periandrium in this species is small and sub-acute.

Piceus, mesonotum and frons sometimes fusco-piceus; margins of pronotum, tegulae and lateral carinae of vertex, sordid yellow; carinae of frons more or less fulvous with the median carina quite often without coloring at all; the yellowish macula so often seen at lateral margins near base of clypeus, if at all present, is indeterminate; legs more or less dark fuscous.

Female. Length, 6 to 6.5 mm.

Same as the male structurally and in coloration, excepting for the usual sexual differences in length and size of the vertex. Several color varieties taken on Mount Kaala by Mr. Timberlake have the mesonotum sordidly castaneous and the tegmina fuliginous.

Hab. Oahu at elevations from 2000 to 4000 feet. Described from thirteen males and three females, as follows: One male, Kaala Mountain, 4000 feet, July 9, 1916, and two males, Kaala Mountain, July 4, 1916 (Timberlake); one male, Kaala Mountain, December 28, 1919 (Williams); four males, Mount Kaala, May 18, 1920, one male, July 4, 1916, and one male, July 9, 1916 (Swezey); two males, Konahuanui Mountain, July 25, 1920 (Bryan), and one male same locality, June 17, 1917 (Bridwell); one female, Lanihuli, May 25, 1919 (Swezey); one female, Kahuauli, July 16, 1922, and one female (less typical) from Mount Olympus, February 25, 1922 (Bryan).

Type, male, labelled Kaala Mountain, 4000 feet, July 9, 1916 (Timberlake).

Type, female, labelled Lanihuli, March 25, 1919 (Swezey).

Obs. This small species has close affinities to *tarai*, but is easily separated by the structure of fossette, the coloration of the tegmina, etc.

23. **Oliarus morai** Kirk. Plate V, Figs. 76, 77.

Male. Length, 7.25 to 7.75 mm.

Width of vertex at base one and two-tenths to one and four-tenths times the width at apex; width at apex same as the width at origin of transverse carina; length one and three-tenths to one and six-tenths times the width at base; carinae of apex same as in *tarai*; transverse carina about one-fourth from apex, more or less truncate; fossette transverse, quadrate-rotundate, slightly excavate anteriorly, median longitudinal carina more or less produced when at all present.

Tegmina entirely dark fuliginous or, at most, a little dilute medianly. Wings fuliginous apically, with the inner margins fumose; veins dark fuscous.

Coloration in general darker than *tarai*, one example being entirely piceus.

Aedeagus the same as in *tarai*, excepting that the right (dorsal) side margin at the apex of the periandrium is not acutely produced, but laps or folds over. This character is, however, liable to prove variable in some examples, due to the thin membranous nature of the structure at the apex in this as well as in the preceding species.

Female. Length, 8.5 to 9 mm.

Structurally, the female is very similar to the male. The immaculate dark fuliginous color of the tegmina is also the same, but the mesonotum is dark fuscous, with the mesonotal carinae pale to dark castaneous.

Hab. Molokai Mountains, at 4000 feet elevation. Redescribed from the following examples: One male and one female labelled 589 (Molokai, 4000 feet elevation, June, 1896); one male and one female, Molokai Mountains, 4000 feet, 1893. (These form part of the Kirkaldy material deposited at the Bishop Museum and collected by Dr. R. C. L. Perkins.) One male labelled Molokai, 4000 feet, February, 1902 (Perkins), and one male, Kamoku, Molokai, July 15, 1910 (Fullaway).

Obs. This species is represented in the British Museum collection by a female which Mr. Kirkaldy marked as the type (described and figured in F. H. as *tarai* var. *morai*). Later Kirkaldy raised it to a species by including it as such in his descriptive tables[1] of the Hawaiian Oliarus. The structures, including the aedeagus, are not much different from its close ally (*tarai*), but these differences, to which may be added the immaculate dark tegmina and much darker coloration of the body structure, are of sufficient importance to warrant their separation. The same may also be said of some other forms or species which neither Kirkaldy nor the present author has hesitated to separate by giving them specific value. As I have stated elsewhere, the lumping of such varied insular forms into a single species would simply add to the confusion which dimorphism, sexual and otherwise, has already caused workers in this homogeneous and purely geographic sub-genus.

Although the author has before him for examination and study all of the collections of Hawaiian Cixiids which have been made during the past thirty years or more, excepting only about two score specimens of the Kirkaldy material which are in the British Museum, only six individuals of this dark-colored form are available for study. It is apparently rare and restricted to the mountains of the Island of Molokai, as it has not been collected from elsewhere in the Territory during the above period. It is evidently one of the transitional forms of *kaonohi*.

24. **Oliarus neomorai** sp. nov.

Male. Length, 7.5 mm.

Structurally the same as in the preceding (*morai*), but quite different in coloration. Tegmina either immaculately yellowish hyaline or with a part of the apical third more or less suffused light fuliginous. Wings largely fuliginous apically. Mesonotum, vertex, and frons fusco-piceus. Mesonotal carinae more or less castaneous. Carinae of frons and vertex fulvous. Pronotum and tegulae typical. Legs more or less fusco-testaceous. All the examples studied have the fossette of vertex without any median longitudinal carina, or at most the latter is very rudimentary. Aedeagus the same as in *morai*.

Female. Length, 8.5 to 9 mm.

The female, except in proportion to size, is practically of the same structure as the male, but varies very largely in coloration. The tegmina of the Molokai and Maui forms have the same color appearance as in the male, excepting that the whole of the apical third is more or less yellowish fuliginous; others have the tegmina immaculately of the latter color, while the single Lanai example has them much darker than the others. None of those examined has the color of the tegmina typical of the species. Mesonotum with the discal portion, including carinae, either all pale castaneous or else fused with fuscous, sides always darker. Pronotum and tegulae immaculately stramineous, the latter sometimes sordid. Margins of vertex narrowly and of the frons widely (particularly at base) fulvous. Clypeus and legs largely fulvous. Inter-frontal and clypeal areas and the abdomen dark fuscous.

[1] Proc. Haw. Ent. Soc., II, No. 2, September, 1909, p. 77.

Hab. Male. Molokai Mountains. One male labelled 193 (Kalae, June 9, 1893), one male, No. 589 (4000 feet, June, 1896), and one male (damaged) 1896—all in the Kirkaldy material (Perkins); three males Kamoku, July, 1910 (Fullaway).

Female. Molokai, Lanai, and Maui Mountains. One female, Kamoku, Molokai, July, 1910 (Fullaway); one female, Lanai, 2500 feet, December, 1916 (Munro-Gibson); two females, Keanae, Maui, August, 1918 (Swezey), and one female, Honomanu, Maui, June, 1920 (Bryan).

The male type is the Kalae example.

Var. a.

Female. Length, 8 to 9 mm.

The Oahu females differ in the structure of the fossette and in the transvere carina of the vertex. In the fairly large series examined the median longitudinal carina of the fossette is either quite or almost complete, never quite absent. The transverse carina is less truncate and the coloration is exceedingly variable. Mesonotum, the vertex, frons and clypeus either immaculately testaceous, or a pale castaneous, or else the disc of the mesonotum is sordidly fused pale castaneous with fuscous, the sides of the latter never dark fuscous as in the typical *neomorai*. Pronotum, tegulae and legs as in typical *neomorai*. Tegmina very variable, no two, as it were, quite alike in color and pattern. This may most probably be due to the crossing of intermediate and extreme varieties. All in all the larger number of examples have the apical and basal thirds dark yellowish fuliginous and the middle third lighter and more hyaline. Wings more or less fuliginous or fumose over the apical third.

The one or two females of this variety labelled from "Hawaii," or else with "Hawaii ?" compare favorably with those described from Oahu.

Hab. Oahu and Hawaii, from 1300 to 4000 feet elevation.

Thirteen females from Oahu, as follows. Honolulu Mountains (Perkins); Tantalus, 1905-1907 (Giffard); Mount Kaala, 1916 (Timberlake), 1917 (Bridwell); one female, Waimea, Hawaii, October, 1906 (Swezey); one female, (a darker variety) Kilauea, Hawaii, June, 1908 (Giffard); one female labelled "Haw. ?" without date (Perkins), and one female labelled "Oahu ? Hawaii ?", *"taken in copula,"* 1897 (Perkins).

Obs. In the collections before me I have been unable to find any males which could be associated with the females placed under variety **a**, with any degree of certainty. I have little doubt but that the latter are merely varietal forms of either *morai* or *tarai* or of both. The female example above referred to as taken *"in copula"* by Dr. Perkins in 1897 (which I believe is the first and only one collected in Hawaiian territory in actual copulation) had the genital organs of a male still in contact, and with the aedeagus still "in situ" in the oviduct of the female. Unfortunately, no part of the male, other than the abdomen, remained attached to the specimen. Dissecting out the aedeagus revealed the structures to be typical of *tarai*. As the latter species is on both Oahu and Hawaii, the particular island on which this male and female were taken is still in question.

Division E.

*Fossette of vertex entirely undivided by a median longitudinal carina or, at most, the basal portion of the carina when present is rudimentary or obscure.** (See Plate I, Figs. 5 and 6.)

25. **Oliarus hevaheva** Kirk. Plate I, Fig. 5; Plate V, Figs. 84, 85.

Male. Length, 8 to 9.25 mm.

Width of vertex at base one and six-tenths to one and seven-tenths times the width at apex; width at apex one and one-tenth times the width at origin of transverse carina; length one and six-tenths times the width at base. Apex sub-truncate; transverse carina curvate, about one-third from apex; fossette complete, quadrate-excavate, very slightly tumescent posteriorly; lateral carinae—in profile—below origin of transverse carina, sub-arcuate.

Frons and clypeus excavate; base of fork of medio-frontal carina wide,

* In occasional examples, within some of the species, very obscure traces of the fork referred to in foot note under Division C, may be seen under the binocular.

either curved or else obscurely sub-angulate, slightly produced into the fossette of vertex.

Tegmina tawny hyaline, costal margins notably thickened and arched at base; immaculate on basal two-thirds, excepting for a dark brown spot on Cl 1 + 2, and another at apex of costal cell; apical third with an irregularly curved, and sometimes interrupted, dark brown band following (in most part) the extreme apical margin. Tegminal veins on basal two-thirds light to dark fuscous, and on apical third fusco-piceus. In some examples the suture is lighter in color, and others have the sub-costa faintly particolored. Stigma more or less pallid. Wings largely fuliginous apically, veins fuscous.

Mesonotum fusco-piceus, with the intermediate carinae more or less light castaneous. Pronotum, tegulae, vertex, and frons dark fuscous, margins flavescent. The flavid maculation at lateral sides near base of clypeus (present in most all Hawaiian species) large. Legs more or less testaceous.

Female. Length, 10 to 11 mm.

The female differs from the male mainly in size and in the coloration and pattern of the tegmina. Tegmina clear hyaline, sometimes suffused yellowish fuliginous. The curved dark brown band on the apical third of the male is replaced by sparse and more or less remote spots, and the middle third, sometimes, with one or more maculae. Tegminal veins on the basal two-thirds particolored dark brown and white or pale yellow, excepting the suture, which is mostly brown (one example has the larger part of the sub-costa and radius dark brown); on the apical third the veins are all dark and the cross veins more or less suffused.

Hab. Hawaii, Kona district. Redescribed from ten males and eight females, viz.: One male and one female, Kona, 2000 to 3000 feet elevation, 1892, in the Kirkaldy material in the Bishop Museum (Perkins); two males, South Kona road, 1600 to 1900 feet elevation, August, 1917, and one female, Kawaloa (Coast), May, 1912 (Giffard); five males and one female (Timberlake), and one male (Swezey) at various points along the North and South Kona roads, August, 1919; one male and one female, Hilo district, 1000 feet elevation, July, 1906 (Perkins); one female labelled "Haw. Isles," November 9, 1904 (Russel), and three females, South Kona, August 31, 1924 (Giffard).

Obs. Kirkaldy's type specimen in the British Museum is a male from Kona, Hawaii.

The Perkins' Hilo district examples have the tegminal veins on the basal third largely pallid and in other minor respects the venation differs from the specimens taken in the type locality.

The Russel example is much more typical in the coloration of the veins.

26. **Oliarus lanaiensis** sp. nov. Plate V, Figs. 80, 81.

Male. Length, 8.5 mm.

Structurally, like *O. hevaheva*, excepting that the apex of vertex appears to be more sharply truncate and that the base of the fork of medio-frontal carina is less wide than in that species.

Tegmina light yellowish hyaline, immaculate on basal two-thirds except for the typical brown spot at apex of costal cell; apical third sparsely maculate. Claval veins particolored light fuscous and fulvo-testaceous, with all the suture flavid; the cubitus light to dark fuscous, the media in part and the radius altogether fuscous, Sc + R and costal vein testaceous, sparsely particolored whitish; veins on apical third, the costa and stigma dark fuscous. Costal margin notably arched and much thickened at base as in *hevaheva*. Wings lightly fuliginous apically.

Piceus; margins of pronotum and tegulae very narrowly and sordidly testaceous; intero-lateral area of vertex at base and the fronto-clypeal carinae lightly castaneous; the pale area at lateral margins near base of clypeus small, sordid; legs sordidly fusco-testaceous.

With the exception of the apical third of the periandrium, which has the lower side margin longer and more acute, the aedeagus is the same as in *hevaheva*.

Hab. Lanai. A single male (the type) in the forest at 2000 feet elevation, December, 1916 (Giffard).

Obs. This is practically a color variety of *hevaheva*. Were it not for the lighter coloration and the different pattern of the tegmina and also the darker body characters, it might well be taken for that species.

27. **Oliarus olympus** sp. nov. Plate V, Figs. 78, 79; Plate VI, Fig. 109.

Male. Length, 8 to 9 mm.

Vertex twice the width at base as at apex; width at apex one to one and one-tenth times the width at origin of transverse carina; length almost twice the width at base; apex truncate; transverse carina almost one-fourth from apex, curved; fossette sub-quadrate, excavate, somewhat tumescent at sides, more so posteriorly at middle, where the median longitudinal carina is at most very rudimentary; lateral carinae of vertex and of the frons (seen in profile) moderately arcuate.

Frons and clypeus narrower than in *hevaheva* and more excavate; frontal fork at base more or less obscurely impressed, not produced into apex of vertex.

Tegmina light yellowish hyaline, two and a half times longer than broad at middle; costal margins slightly less, "notably arched and thickened at base" than in *hevaheva*; basal two-thirds immaculate except for the spot at apex of costal cell; apical third more or less broadly and irregularly spotted brown. Stigma light to dark brown. Tegminal veins generally as in *hevaheva*, but there are examples which, in great measure, are particolored on the basal two-thirds, as in *lanaiensis*. Wings hyaline, more or less fuliginous or else fumose apically, veins fuscous.

Mesonotum piceus with carinae more or less castaneous; inter-lateral area of vertex in part, the frons and clypeus sparingly, fusco-piceus; pronotum, genae, the larger part of the frons (the base always) and clypeus, the margins of abdominal segments (narrowly) and the legs, all brightly or dully fulvous, depending on the example; tegulae sordidly fused flavo-testaceous. In the series examined the tendency is to bright yellow coloration in all the body parts, excepting the mesonotum, the smaller area of the frons, clypeus and abdomen, all of which latter are either piceus or dark fuscous.

The general structure of the aedeagus is much the same as in *hevaheva*, excepting that the apical third of the periandrium is very much more elongate and curvate than in that species.

Female. Length, 10 to 11 mm.

Female much larger but structurally the same as the male, excepting that the lateral carinae of frons (seen in profile) appear to be less arcuate, the costa a little less arched and thickened at base and the fronto-clypeal area wider, with the base of frons somewhat tumescent. The difference between the sexes is mainly one of coloration, including, in particular, the tegmina and tegminal veins.

Tegmina clear hyaline, some examples being transversely suffused yellowish medianly, others also having the claval area wholly or partly similarly suffused; immaculate on basal two-thirds, excepting for one or more sparingly distributed light brown spots which, on most examples, are little if at all apparent. Examples which have the yellowish transverse suffusion give the tegmina, superficially, the appearance of being alternately pale and dark. Apical third irregularly banded or else more or less sparsely spotted light brown. Tegminal veins on basal two-thirds particolored fuscous and whitish or yellowish, excepting the costa, suture, cubital and radial, which are usually all fuscous. Beyond the base of Cl 1 + 2 fork the particoloration is sometimes darkly and more or less widely suffused fuscous. Veins on apical third all fuscous.

The coloration of the mesonotum, pronotum, vertex, frons, etc., is much darker than in the male, the variation, if any, leaning towards the dark. The mesonotal carinae in the examples studied are seldom castaneous, as is more often found in the opposite sex.

Hab. Oahu, in all the lower forest areas on both mountain ranges. Described from seventeen males and nine females from

various localities between 1916 and 1921, taken by Swezey, Timberlake, Bridwell, Giffard, Williams, and Bryan. Included in the above series are the following examples (without date) collected by Dr. Perkins some years ago, viz.: One male, Tantalus; one female, Waialua, 1500 feet, and one female, Nuuanu Pali, December.

Type, male, labelled Kuliouou, December 22, 1918, from Metrosideros sp. (Swezey).

Type, female, labelled Cooke trail, Nuuanu, October 15, 1916 (Timberlake).

Obs. Like *lanaiensis* this species is without doubt closely allied to *hevaheva*. The fairly large series studied indicates that it is very variable in size and coloration, and because of this the identity of specimens (the females in particular) may later prove perplexing. Notwithstanding these very apparent variations, I feel loath to separate any of them until further material of both sexes has been collected. Two of the larger male examples from Tantalus have the carinae of the apex of vertex obliquely converging from the lateral carinae, but very much less so than in the *kanakanus* group. All females examined, with one exception, have the position of the Cl f level or very near level with the Cu f. The exception is a Perkins Nuuanu Pali specimen which has the Cl f considerably below the Cu f. Such variations as this, however, occur in the venation of the tegmina of all the Hawaiian species or forms and, because of this fact, the position of the veins is of no specific value in our determinations. I have merely referred to the position of the veins in this particular species because it appears to be almost an exception to the rule.

Var. a.

There are three other females in the Oahu material studied which, for the present at least, I must refer to the above species. These have a dark fuliginous median transverse band on the basal two-thirds extending to the radius. It is quite possible that this pigmentation is merely a more highly colored representation of the yellowish transverse band referred to in the type series. With this exception, the structure and general coloration of these three specimens appear to be typical, but until a further series, including the males, is collected it is better to deal with them provisionally as varieties only.

Oahu. One female, Nuuanu Pali, November, 1904 (Swezey); one female, Kaumuohona, March, 1912 (Swezey), and one female, Manoa Valley, October, 1919 (Bryan).

Obs. These and smaller-sized female specimens from other islands have been mistaken for Kirkaldy's *orono* of Kauai because of the median transverse dark fuliginous band on the tegmina previously referred to.

28. **Oliarus mauiensis** sp. nov. Plate VII, Figs. 112, 113.

Male. Length, 9 mm.

Vertex much the same as in *olympus*. Width at base one and five-tenths times the width at apex; width at apex one and one-tenth times the width at origin of transverse carina; length one and nine-tenths times the width at base; apex truncate; transverse carina, about one-fourth from apex, curvate; fossette quadrate, anterior angles more or less tumescent, median longitudinal carina rudimentary.

Frons excavate; base of fork of medio-frontal carina short and wide, almost contiguous to the lateral carinae. Apical third of clypeus hardly excavate.

Tegmina immaculately dark yellowish hyaline on basal and middle thirds, except for a nebulous spot at apex of costal cell; apical third immaculate, fuliginous; costa fuscous, notably arched and much thickened at base. Stigma pale, with a fuscous spot at base. Tegminal veins pale yellow except on apical third, where they become dark fuscous. Wings yellowish basally, largely fuliginous apically; veins on basal third pale, and middle and apical thirds dark fuscous.

The aedeagus has affinities to both *olympus* and *lanaiensis*, the apical third of the periandrium being approximate to the former, although more excavate in the median area. The long basal spur of the phallus is similar to that of *lanaiensis*.

Fusco-piceus; mesonotal carinae castaneous; margins of frons, clypeus, vertex and the legs fulvous, and of the pronotum and tegulae very narrowly and sordidly flavous. The fulvous macula at lateral margins near base of clypeus large, very distinct, quite unlike the fused coloration of the clypeus in *oahuensis* or of the small and more or less indistinct macula in *lanaiensis*.

Hab. West Maui. A single male (the type) from the Waihee Valley, February 26, 1920 (Giffard).

Obs. This unique example is of more than ordinary interest as, unlike all the other *hevaheva* forms, it is quite free of picturation on the tegmina. It is, however, possible that with a

series the usual degree of variation in structure and coloration may be found.

29. **Oliarus haleakalae** Kirk. Plate V, Figs. 82, 83.

Male. Length, 9.25 mm.

Width of vertex at base one and five-tenths to one and six-tenths times the width at apex; width at apex one and two-tenths times the width at origin of transverse carina; length one and eight-tenths times the width at base; apex truncate; transverse carina one-third or more from apex, curved; fossette quadrate, deeply excavate anteriorly, without median longitudinal carina or, at most, with a very indistinct and obscure keel at middle of transverse carina.

Frons and clypeus deeply excavate; base of fork of medio-frontal carina curvate (sometimes slightly produced into the apex of vertex). In one example, the base of fork is somewhat obscure.

Tegmina dark yellowish or tawny hyaline, immaculate on basal two-thirds, excepting for a fuscous spot near apex of claval and one at apex of costal cells; claval and sub-costal cells slightly yellow fuliginous; apical third with an irregularly curved dark fuscous band as in *hevaheva*. Tegminal veins, including suture, fusco-piceus; costal margins thickened, but not so "notably" arched at base. Stigma fusco-piceus. Wings largely fuliginous on outer margin apically.

Piceus; margins of vertex, frons, etc., sordidly flavescent; legs more or less fusco-testaceous; macula at lateral margins near fronto-clypeal suture large, distinct, more or less flavous. Except for the longer basal spur of the phallus, the aedeagus has nearer affinities to that of *olympus* than to other preceding species.

Hab. East Maui. Redescribed from three males, as follows: Two from Mount Haleakala (not dated), 2000 feet (Perkins), and one from Ditch Trail, east of Keanae, on Cyrtandra sp., July 31, 1919 (Timberlake).

Female. In the material before me there are three specimens from East Maui, two from Haleakala (Perkins) and one from Olinda, 1200 feet, June, 1918 (Giffard and Fullaway), which are more or less associated with this species. Due to variations in the structure of the apex of the vertex and the coloration and pattern of the tegmina in each, as well as to the paucity of specimens for study, I prefer, however, for the present, not to include them in this species. One of the examples from Haleakala has the typical structure of the apex of the vertex, but the basal two-thirds of the tegmina, in addition to the spot on the claval cell, has one or more maculae medianly and sub-apically between the cubitus and the radius, together with four more in the costal cell. The apical third is largely but very irregularly maculate. The other Haleakala female has the apex of the vertex sub-truncate, and the basal two-thirds of the tegmina immaculate except for two very faintly apparent spots in the costal cell, in addition to those in the claval and costal areas referred to in the male. Both the above have the tegminal veins dark fuscous, and their coloration in general is the same as in the other sex. The third example (from Olinda) varies still further in the structure of the apex of vertex and has striking particolorations of the tegminal veins on the basal two-thirds and remote and sparse maculae on the apical third. The claval and costal spots are, however, present in this specimen as in others of the species.

Obs. This species is represented in the British Museum by a male specimen from Haleakala, labelled as the type by Dr. Perkins. The brief tabulated description of *haleakalae* by Kirkaldy includes the "clavus with three black spots." The male examples determined by me as this species have no markings on the clavus other than the one noted in the above description. The species, like many of the others, is undoubtedly very variable, and, as Kirkaldy had but the one example, it is more than probable that it was an extreme case of maculation of the tegmina. The size, the truncate apex of vertex, the black mesonotal keels and the tegminal veins, together with the suffused yellow fuliginous markings of the tegmina, all agree with Kirkaldy's abbreviated description.

Due to the absence of the "notably arched" base of the costa of the tegmen, this species, with one or more others, will have to pass as an "intermediate" between the *hevaheva* and the *kanakanus* groups.

Until more material is secured from the islands of Maui and Molokai, the females referred to cannot positively be determined as *haleakalae*. The two specimens from Haleakala may possibly be that species, but I suspect that the one from Olinda belongs to quite another species, males for which are at present wanting.

30. **Oliarus montanus** sp. nov. Plate V, Figs. 86, 87; Plate VIII, Fig. 125.

Male. Length, 7 mm.

Width of vertex at base one and four-tenths times the width at apex; width at apex one and one-tenth times the width at origin of transverse carina; length twice the width at base; apex slightly curved (carinae more or less obscured, due to a slight tumescence at angles); transverse carina one-fourth from apex, curvate or else sub-truncate (variable); fossette quadrate-rotundate, excavate anteriorly without median longitudinal carina or, at most, with a slight tumescence at middle of transverse carina.

Frons and clypeus very moderately excavate; base of fork of mediofrontal carina level with apical carinae of vertex, not produced beyond.

Tegmina yellowish hyaline, immaculate on basal two-thirds, except for a fuscous area along the inner basal margin of clavus; costal cell without the dark macula at apex, which is so noticeable in all the *hevaheva* and *kanakanus* group species; on the apical third a more or less large and irregular fuscous spot appears to be always present in the Cu and Sc cells, but between these, medianly, the cells may be either sparsely spotted or without spots, or else the cross veins may be or may not be largely suffused with same color. Costal margin arched (not as notably as in *hevaheva*) and much thickened at base. Stigma pallid internally, with a fuscous spot near base. With the exception of the media, radial, a part of the cubital, which are all more or less light brown, all the tegminal veins on the basal two-thirds are pallid; the apical third and the costa are all dark fuscous. Tubercles very distinct, brownish. Wings fuliginous or else fumose apically.

Piceus; pronotum and tegulae fusco-piceus; margins of the frons, clypeus, vertex, pronotum, etc., narrowly ochraceous; legs flavo-testaceous; a minute yellowish spot at lateral margins near fronto-clypeal suture (not always present).

Female. Length, 9 mm.

Structurally, like the male, but of a darker color. Tegmina clear hyaline sparingly suffused yellowish in spots, immaculate on basal two-thirds, except for the fuscous area seen in the male near base of claval area. Tegminal veins (except suture) particolored pale and dark on basal two-thirds, the dark particoloration in the middle third being more or less suffused; apical third maculated as in the male, with all the veins dark fuscous.

Coloration of the body parts much darker than in the opposite sex.

Hab. Kauai, in the mountains at high elevations back of Makaweli and the Waimea regions. One male, Olokele Canyon, September, 1920 (Swezey); two males and one female, Kalalau, June, 1922 (Bryan).

The type, male, is labelled Olokele Canyon, Kauai, September 5, 1920 (Swezey).

The type, female, labelled Kalalau, Kauai, June 19, 1922 (Bryan).

Obs. This appears to be another "intermediate" form partaking more of the *"hevaheva"* than the *"kanakanus"* group. The characters of the tegmina are closely allied to the former, while the fossette and aedeagus indicate closer affinities to the latter.

31. **Oliarus kanakanus** Kirk. Plate VII, Figs. 114, 115.

Male. Length, 8 to 8.75 mm.

Width of vertex at base one and three-tenths to one and four-tenths times the width at apex; width at apex one and one-tenth times the width at origin of transverse carina; length one and seven-tenths to one and nine-tenths times the width at base; carinae of apex obliquely converging from lateral margins of the fossette; transverse carina, about one-fourth from apex, sub-angulate or curvate (variable); fossette sub-quadrate-rotundate, mostly wider than long, excavate near anterior and side margins, more or less tumescent at anterior angles and without median longitudinal carina, or at most a slight tumescence at middle of transverse carina.

Frons and clypeus moderately excavate; base of fork of fronto-median carina very slightly produced beyond the carinae of apex of vertex, more or less curvate or else impressed or slightly obscure.

Tegmina yellowish hyaline or else spotted yellowish fuliginous, two and eight-tenths times longer than wide at the middle, costal margin not notably arched nor thickened at base, basal two-thirds immaculate, or, if at all maculate the Cl 1 + 2 has two or more fuliginous spots and a like number fused into costal margin, these latter sometimes little apparent. In lieu of the claval spots, one of the examples has all that area darkly pigmented. Apex of the costal cell always darkly spotted. Stigma and costa dark to light fuscous; apical third always more or less maculate with either large dark and irregular maculae or else with more or less sparsely distributed spots. Tegminal veins on basal two-thirds variable, more or less particolored fusco-piceus or fuscous with occasional pallid interruptions, these latter more evident (when at all present) on the basal third, the apex of the suture and the Sc; veins on apical third dark fuscous, except for pale particolorations on the Cu and Sc; cross veins more or less suffused. Wings more or less fuliginous apically.

Fusco-piceus, legs fuscous or fusco-testaceous; margins of pronotum, tegulae, base of frons narrowly, genae more or less, and intero-lateral margins of vertex more or less widely flavid; carinae of frons narrowly light castaneous; macula on lateral margins near fronto-clypeal suture large, fulvous.

Several dissections of the genital organs of extreme varieties present no differences, the aedeagus being alike in all. There appears to be a closer affinity to *montanus* in the general structure of the aedeagus than to *haleakalae*. Both of these latter species are intermediate forms between the *hevaheva* and *kanakanus* groups,

Female. Length, 10 mm.

Except in size and in the pattern of the tegmina, the characters and general coloration of the female are much the same as those of the male.

Tegmina variable, largely banded and spotted yellow fuliginous and with more or less sparsely distributed milky hyaline spots; largely pigmented light fuscous basally, or with two or more distinct and dark maculae in claval area; apical third largely and irregularly maculate, the extreme

apical veins particolored or pallid as in the male; tegminal veins fuscopiceus largely interrupted on the basal two-thirds by more or less long pallid particolorations; cross veins suffused fuscous; costal margins alternately particolored pale and dark, but variable, sometimes all fuscous.

Hab. Hawaii, region of Kilauea, near volcano, and in Olaa and Hilo districts. Redescribed from six males and four females as follows: Five males and three females, Kilauea and upper Olaa, June-August, 1918 (Giffard), and one male, Kamana (back of Hilo), March, 1918, and one female, Kilauea, June, 1917 (Swezey).

Var. a.

Male. Length, 7 mm.

Structurally like the preceding, except as to the following: Width of vertex at apex same as the width at origin of transverse carina; length two and one-tenth times the width at base; fossette quadrate.

Tegmina hyaline, largely suffused and spotted yellow fuliginous; basal two-thirds immaculate, except for spot at apex of costal cell; apical third irregularly maculate much as in some typical examples of *kanakanus*. Tegminal veins mostly pallid, with sparse dark-brown particolorations on basal half and more largely of the latter color on the sub-apical area; apical third in part pallid; cross veins slightly suffused; costa light fuscous, the margin showing darker suffused particolorations; stigma pale fuscous. Wings largely and darkly fuliginous apically.

Aedeagus of the same form and structure as *kanakanus*.

Hab. Hawaii: Lower forest zone in Puna, 750 feet elevation, two males, August, 1918 (Giffard).

Obs. This is a very variable species which in certain respects has a superficial resemblance to some of the *hevaheva* group, but is well separated, not only by the much less arched and less thickened base of the costal margin, but also by the structure of the apex and fossette of vertex. The structure of the aedeagus further separates it from *hevaheva* forms and passes it on to another group which, for convenience, I have called the "*kanakanus* group." It will be found, however, that the general structure of the aedeagus of *kahavalu* Kirk. and of *kulanus* sp. nov., both of which also belong to this section, has closer affinities (notwithstanding the absence of the right apical spur of the phallus) to those of the *hevaheva* forms, and that in consequence one of these should, perhaps, take hereditary precedence

to *kanakanus* as a group name. Because of this the question may arise why *kanakanus* and its close allies should be grouped under that name rather than that of *kahavalu*. I can only explain this because of sentimental reasons arising from the fact that *kanakanus* was the first and only species of this particular group described by the late G. W. Kirkaldy in his first paper on the Hawaiian Cixiidae,[1] while *kahavalu* (another of his species) was not described until years later,[2] and then only in his abbreviated tables.

The principal variations in *kanakanus* are in the pattern of the tegmina and in the coloration of the tegminal veins. Similar variations, however, will be found in all our maculate forms, more particularly so in the females. Kirkaldy, in his tabular description (not in Fauna Haw.) of this species, refers to "a narrow median transverse stripe" on the tegmina of a female from Oahu, but it is quite probable that the male of this, when collected on Oahu, will have other characters which will better distinguish it from *kanakanus* of Hawaii. This Oahu female referred to by Kirkaldy apparently is not in the type collection of the British Museum, and it is certainly not included in his Honolulu material. These remarks as to the dimorphic features of this species are stressed because of material in my hands consisting of a fair series of females (from Oahu) belonging to this division (fossette without median carina) with which I cannot at present associate males nearer than *kaohinani*, an Oahu species without any such median transverse stripe on the tegmen, but which, like *kanakanus* (to which it is related), is itself one of the most variable species of all. It is, therefore, quite possible that the Kirkaldy Oahu female example and the other Oahu specimens of the series above referred to are extreme varieties of *kaohinani* and, therefore, should not, because of the transverse coloring only, be determined as *kanakanus*.

The example of *kanakanus* in the British Museum, marked as the "type" by Kirkaldy, is a female labelled No. 656 (i. e., Kilauea, Haw., August, 1896). If his description in Fauna Haw. is carefully followed it will be evident that he used mainly, if

[1] Fauna Haw., Vol. III, Part 2, December, 1902, p. 121 (Hemiptera).

[2] Pro. Haw. Ent. Soc., II, No. 2, September, 1909, p. 77.

not altogether, the characters and coloration of the female in preference to those of any male which he may have had at the time. No males were found in his material in either museum. A badly damaged male (without the tegmina) from Molokai, and a female from Oahu, had been referred to this species in the Honolulu material, but both are lacking in certain dominant external and genital characters of the type. The dissection of the aedeagus of this damaged male places it as *kahavalu* of Molokai. The "fragment" from Molokai referred to by Kirkaldy, and included by him in his tables, is no doubt the same specimen.

32. **Oliarus kahavalu** Kirk. Plate VII, Figs. 116, 117.

Male. Length, 8 mm.

Closely related to *kanakanus* of Hawaii. It may be separated from that species by the color and pattern of the tegmina, which is more hyaline and more maculate; by the fossette of vertex, which is a trifle longer than wide, and by the median longitudinal carina of the fossette, which is more developed, but by no means complete.

Tegmina mostly clear hyaline, the corium spotted, and the clavus all yellow fuliginous; three or more fuscous maculae on the claval area, one at apex of costal, and another near the forks of the median cells; cross veins all largely suffused fuscous; apical third more or less sparsely and irregularly maculate. Tegminal veins particolored whitish and fuscous on basal half, becoming all dark apically except for faint pallid particolorations in the Cu 1 and Cu 1b area. Costal margins at base similar to those of *kanakanus*, middle third more or less particolored with suffused light and dark fuscous spots. Stigma light fuscous. Wings narrowly fuliginous apically.

(*Maui* var.). Piceus; legs dark fuscous; margins of intero-lateral area of vertex, pronotum and tegulae sordidly flavid.

(*Molokai* var.). Fusco-piceus; legs fusco-testaceous; margins of intero-lateral area of vertex, pronotum, frons, etc., more or less fulvous. Macula at lateral margins of fronto-clypeal suture fulvous and of medium size.

The aedeagus approaches nearer that of *haleakalae* than that of *kanakanus*, but differs from both by the total absence of the long left spur at the apex of the phallus.

Hab. Maui and Molokai. Redescribed from one male, Wailuku, West Maui, September, 1919 (Williams), and from one male (without tegmina) from the Kirkaldy material, No. 589 (Molokai, 4000 feet, June, 1896, Perkins).

Obs. This species was very briefly described by Kirkaldy in his tables and associated by him with *kanakanus* on the basis of tegminal coloration of a male (?) from Molokai. No specimen of that sex, however, is in the collection of the British Museum, the only representative of *kahavalu* being a female which is not labelled as the type by Kirkaldy. In the Bishop Museum (Kirkaldy material) there is a mutilated male (No. 589) specimen from Molokai (included in above description) which had been determined as *kanakanus*. I believe this to be the Molokai "fragment" referred to by Kirkaldy when he tabulated the latter species. Although the tegmina are off, the external structures and the aedeagus are the same as the Wailuku example, which latter I have used (in part) for redescribing *kahavalu*. There is a variation in the coloration of the body structures, but not any more so than one might expect to find in examples of the same species from two islands so close to each other as Molokai and Maui. Referring to the maculae on the tegmina of the single example before me, it may be expected that additional material from these two islands may vary more or less as to pattern and position, as is sometimes the case with other species, more particularly if the specimens have been collected in remote regions. In the material before me there is a single female labelled from Haleakala, April, 1920 (Forbes), which I rather hesitate to associate with this species without further material. The external structures place it in the "*kanakanus* group," but the maculated tegmina and coloration are somewhat too remote from the male to make a positive determination.

33. **Oliarus kulanus** sp. nov. Plate I, Fig. 6; Plate VII, Figs. 118, 122.

Male. Length, 10 mm.

Width of vertex at base one and five-tenths times the width at apex; width at apex about equal to the width at origin of transverse carina; length one and eight-tenths times the width at base; carinae of apex obliquely converging and coalescent with lateral carinae of fork of fronto-median carina; transverse carina, about one-fifth from apex, sub-truncate; fossette complete, quadrate, one and two-tenths times wider than long, excavate (much more so anteriorly) and without tumescence or visible sign of the rudimentary median longitudinal carina at middle of transverse carina as seen in preceding species; lateral carinae viewed in profile straightly produced from origin of transverse carina to two-thirds of their length, posterior third curvate.

Clypeus very moderately and frons deeply excavate. In profile the lateral carinae of frons sinuate; carinae of fork of fronto-median carina diverging and continuous with carinae of apex of vertex, forming no base to the fork; base of frons slightly tumescent, contiguous to lateral carinae of fork.

Tegmina clear hyaline, fuliginous at base, otherwise remotely spotted yellowish, two and six-tenths times longer than wide at middle, costal margin not "notably" arched nor thickened at base; basal two-thirds maculate, a blotch at apex of basal cell and base of Cu, and three spots on claval area, dark fuscous; costal cells with the usual macula at apex and two or more (more or less distinct) light fuscous spots fused into costal margin near middle, making it appear particolored; apical third sparsely and remotely maculate. All cross veins more or less suffused dark fuscous. Tegminal veins on basal two-thirds all largely particolored yellowish-white with dark fuscous; veins on apical third all dark fuscous, with the exception of those at extreme apex of Cu 1 to Cu 1b, which are pallid. Stigma dark. Wings narrowly fuscous apically.

Coloration of body structures much the same as in the preceding. The structure of the aedeagus very similar to that of *kahavalu*.

Female. Length, 11.5 to 12 mm.

Including the structure of the fossette, carinae of apex of vertex and the fork of fronto-median carina, the female is much the same as the male. One example has the base of the fork obscure, not quite obsolete. The lateral margins of the vertex viewed in profile are sub-arcuate instead of straight, as in the male.

With the exception that the margins of the pronotum, tegulae, frons, etc., are much more conspicuously flavid, the macula at lateral margins of fronto-clypeal suture larger and distinctly fulvous, and the hind margins of the mesonotum narrowly fulvous, the coloration of the female is the same as that of the male. Tegmina clear hyaline, fuliginous at base, banded and spotted yellowish fuliginous at middle and apical thirds. Color of tegminal veins and position of the maculae much the same as in the opposite sex. Cross veins suffused, except those on basal two-thirds.

Hab. East Maui, at an elevation of 5000 to 5300 feet on the slopes of Mount Haleakala. One male (the type) and three females, July, 1919 (Timberlake).

Obs. This species is closely allied to *kahavalu*, but the difference in size, the shape of the fossette, the lateral margins of the frons, viewed in profile, etc., will easily separate it from that species. There are one or more species peculiar to Kauai, belonging mostly to other groups, which have a very similar structure of the frontal fork and apex of vertex, but in these the base of fork is generally obscure, seldom obsolete. It is quite possible

that in a series both sexes may vary in this particular character, as it appears to be by no means either absolutely constant or reliable.

34. **Oliarus kaohinani** Kirk. Plate VII, Figs. 119, 120.

Male. Length, 7 to 8 mm.

A very variable species, in a measure allied to *kahavalu*. It may, in part, be separated from the latter species by the structure of the fossette of vertex, the castaneous mesonotal carinae, the less maculate tegmina, the more particolored tegminal veins, and the generally lighter colorations of all the carinae and of the legs.

The following variations will be found in this species, viz.: Vertex more or less wide; transverse carina of vertex curvate or sub-angulate; fork of medio-frontal carina sometimes impressed or obscure at base; angles at base of frons appearing more or less tumescent, but at most never obscuring the carinae of apex of vertex; fossette always wider than long, but quite variable as to width, more or less tumid medianly, with the tumescence sometimes extending halfway to the anterior margin, but never forming a complete median longitudinal carina; carinae of apex of vertex more or less obliquely converging from the lateral margins, as in its allies.

Tegmina clear hyaline, more or less banded and spotted yellowish fuliginous, always largely so on claval area, in particular; more or less sparingly maculate on basal two-thirds, often with three fuscous maculae on claval area and a spot at apex of costal cell (sometimes these are hardly apparent or else quite absent); rarely the maculae on clavus may be found to be fused, forming, as it were, a longitudinal band, and the costal cell may be very sparingly and very lightly spotted, or else all the basal two-thirds may be quite immaculate. Stigma light or dark fuscous, sometimes in part whitish internally. Base of costa structurally the same as in its close allies, excepting that the thickened portion appears to be less distinct. Apical third more or less sparsely and remotely maculate, sometimes with the maculae hardly apparent.

Tegminal veins all more or less particolored fuscous and whitish or yellowish; cross veins suffused; costal margins alternately pale and dark.

Wings more or less narrowly fuliginous apically, veins mostly fuscous.

Dark fuscous or fusco-piceus, mesonotal carinae castaneous; carinae of vertex, frons and clypeus more or less fulvous or ochraceous; basal angles of frons more or less fulvous; margins of pronotum and tegulae stramineous; maculae near lateral margins of fronto-clypeal suture fulvous, variable in shape, but always large; legs flavo- to fusco-testaceous.

The aedeagus in general has close affinities to that of *kahavalu*, but differs particularly, as follows: The inner margin of the apical third of the periandrium is more sinuate, and the single apical spur of the apex of the phallus is very much shorter.

Var.

Male. Length, 8 mm.

This variety has the right median spur of the phallus shorter and curvate, with a very rudimentary left spur or spine at the apex; the projection on the ventral surface of the periandrium, viewed laterally, is also larger than in the preceding; with these exceptions in the genital organs, there are apparently no constant characters to differentiate it from the type form above described.

Female. Length, 9 to 10 mm.

The females, like the males, are very variable in size and as to the pattern of the tegmina. The tegmina may either be almost or quite immaculate or else, more commonly, the pigmentation may follow that of most of the males, excepting that an additional macula may or may not be present in the sub-apical area near the forks of the media. The tegminal veins are more interrupted with dark and pallid particolorations, and the cross veins more largely suffused fuscous than in the male. The colorations of the mesonotum, frons, etc., are in general darker than in the latter sex. The castaneous mesonotal carinae and the pallid venation of parts of the apical third of the tegmina are, however, constant in both sexes and in all examples.

Hab. Oahu: On all mountain ranges and at various elevations from 1500 to 4000 feet. Redescribed from twenty-four males and twelve females from the following localities:

Varieties with tegmina almost immaculate.

Males. Length, 7.5 to 8 mm.

One male, labelled No. 885, Honolulu Mountains, September, and one female, No. 762, Waialua, March, 1901 (Perkins), from the Kirkaldy material in Bishop Museum.

One male, Waialua Mountains—not dated—(Perkins); one male, Alewa Heights, March, 1916 (Timberlake); one male, Lanihuli, October, 1919 (Williams); one male, Kalihi Ridge, Ap. 1920 (Bryan); one female, Kaumuohona (Muir); one female, Opaeula, March, 1913 (Swezey).

Males. Length, 7 mm.

One male, Makaleha Valley, December, 1919 (Swezey); one male, Tantalus, December, 1915 (Giffard).

Varieties with tegmina maculate.

Males. Length, 8 mm.

Seven males, Kalihi, Olympus, Mount Kaala, Lanihuli, and Palolo, 1914-1920 (Swezey, Timberlake, Bridwell, and Bryan), seven females, Olympus, Palolo, Nuuanu, Waialua, Waianae, and Kuliouou, 1913-1920 (Perkins, Swezey, Timberlake, Fullaway, and Bryan).

Males. Length, 7 mm.

Ten males and two females, Tantalus, Mount Kaala, Waianae, Kuliouou, Malamalama, 1906-1920 (Giffard, Swezey, Timberlake, and Bridwell).

Obs. The supposed type of this species in the British Museum is a male from the "Hon. Mts.," labelled by Kirkaldy in pencil with the manuscript name *"Kaiulani."* As with other of his tabulated species which were not described by him in the "Fauna Hawaiiensis," a specimen from his material was selected after his death as the type—in this instance the example above mentioned. A similar male and a female from the same locality—but not bearing any manuscript name—were retained by the Bishop Museum as a co-type. Both of these latter examples agree with the rest of the series above described. Although Kirkaldy's tabulated description is quite inadequate and somewhat misleading, it is obvious that the large series of both sexes before me refer to this maculate species. Any discrepancy as to size or other measurement as between his description of the male and those included in the above series can be attributed to the fact that he had but three or four specimens at most to study and, in consequence, had little opportunity, if any, to judge of the extreme and intermediate variations which occur in examples from various, and sometimes remote, localities on the island. It appears strange, however, that he omitted to note in his brief description the castaneous coloration of the mesonotal carinae, which in this species appears to be a constant character. His description of the female is that of a totally different species belonging to one of the "Divisions," which has the fossette completely divided by a median carina. The males of this latter species have the tegmina immaculate, while those of *kaohinani* are maculate as described by him. The females of both species have the tegmina more or less maculate, but are easily separated one from the other by the character of the fossette and of the basal angles of frons, as well as by the width of the vertex, which in *kaohinani* is wide and in the other very narrow.

The extreme and intermediate variations in *kaohinani*, as previously referred to, have heretofore caused much confusion in determination. In the circumstances it would be unwise to split these variations into species or sub-species, even though in some isolated examples there may be found a minor difference in the structure of some part of the aedeagus.

35. **Oliarus intermedius** sp. nov. Plate VII, Figs. 121, 126.

Male. Length, 8 mm.

Width of vertex at base one and two-tenths times the width at apex; width at apex one and one-tenth times the width at origin of transverse carina; length twice the width at base; carinae of apex hardly, if at all, apparent, confluent with tumescent area at base of frons; transverse carina, about one-fourth from apex, subtruncate; fossette quadrate-rotundate, wider than long, deeply excavate anteriorly, with the posterior margin swollen, the median longitudinal carina appearing more or less produced from middle of transverse carina and very faintly and narrowly furcate, but by no means forming a complete division. Frons and clypeus slightly excavate; basal angles of frons more or less tumescent.

Tegmina milky hyaline, banded and spotted yellowish fuliginous, largely so in clayal and sub-apical area; very sparingly when at all maculate on the basal two-thirds, the light fuscous maculae, if present, being either at apex of clavus or (hardly apparent) fused into margin of costa; apical third sparsely, remotely and irregularly spotted light fuscous. Tegminal veins largely particolored light fuscous and whitish on basal third, less so and darker on middle and apical thirds; costa alternately pale and dark; cross veins on apical third suffused; stigma dark fuscous, pallid at base. Wings narrowly fuliginous apically, veins dark fuscous.

Colorations much as in *kaohinani*, except that the mesonotal carinae are fusco-piceus and not castaneous.

The aedeagus differs from its close allies principally by the much longer and sharper spurs at apex of the phallus and the somewhat different structure of the apical third of the periandrium. The latter character, however, is variable within the species.

Hab. Kauai. One male, Kaholuamano, April, 1920 (Kusche), and one male, Summit Camp, April, 1922 (Swezey); one female from the Kirkaldy material labelled 640 (i. e., High Plateau, Kauai, July, 1896, Perkins).

The male type is the specimen labelled Kaholuamano.

Obs. This species is closely allied to but quite distinct from *kaohinani*. Of the two males referred to, both have slight differences in the coloration and pattern of the tegmina, as well as

in the aedeagus. I have no doubt but that a large series collected from various localities on Kauai would present further variations. The single female above referred to has the median longitudinal carina of the fossette more developed than in the male, and the tegmina are much more maculate basally and apically.

36. **Oliarus consimilis** sp. nov. Plate VII, Figs. 123, 124.

Male. Length, 7 mm.

Very similar in structure and coloration to *intermedius*, but distinguished by the less tumescent basal angles of the frons, the visible obliquely converging carinae of the apex of the vertex, the less excavate fossette, the more apparent and darker maculation of the basal two-thirds, and the less particolored apical third of the tegmina.

It may further be distinguished by a dissection of the aedeagus, the apical third of the periandrium of which is quite different in structure from its close relative (see figure).

Female. Length, 9 mm.

With the exception of the pattern of the tegmina the female is similar to the male in structure and coloration. Tegmina milky hyaline; the clavus, a transverse band at the middle and a large spot in the sub-apical area yellowish fuliginous; basal two-thirds maculate, a suffused area at extreme base, a macula at apex of clavus, two or more in costal area, and a large and very irregular area in the region of the forks of the media and radial cells extending to the apical third, all dark fuscous; apical third irregularly but largely maculate. Tegminal veins on basal two-thirds particolored dark fuscous and whitish; on apical third the veins are mostly dark with slight whitish particolorations near extreme apex. Wings in both sexes completely hyaline, except for a very narrow fumose apical margin; veins dark fuscous.

Hab. Kauai, in the lower forest above Lihue, at 800 feet elevation, four males and one female, May 13, 1923 (Swezey).

37. **Oliarus kauaiensis** Kirk. Plate VI, Figs. 90, 91.

Male. Length, 5.5 mm.

Width of vertex at base one and three-tenths to one and four-tenths times the width at apex; width at apex a little more than the width at origin of transverse carina; length one and six-tenths times the width at base; carinae of apex sub-curvate; transverse carina, about one-fourth from apex, curved; fossette sub-quadrate-rotundate, wider than long, deeply excavate anteriorly, posterior margin swollen, with the median longitudinal carina more or less developed, but never forming a complete division.

Frons and clypeus very moderately excavate, carinae and suture distinct, median ocellus obscure; basal angles of frons very slightly (sometimes not

at all) tumescent; base of fork of medio-frontal carina more or less impressed and very slightly produced beyond carinae of the apex. Fore tibiae short.

Tegmina more or less milky hyaline, with the basal third darkly fumose, a nebulose (sometimes light fuscous) transverse band at middle third, and one or more similar spots in the costal cell; apical third very sparingly and remotely, if at all, spotted. Tegminal veins on the basal two-thirds pale and dark (not particolored); apical third and the costa all dark fuscous; cross veins more or less suffused; stigma dark fuscous, pallid at base; granules brownish, moderately distinct. Wings clear hyaline, veins light to dark fuscous.

Aedeagus with the median right spur of the phallus short and curved and both apical spurs stout and of medium length.

Piceus; carinae of vertex narrowly and of frons more widely ochraceous or flavo-testaceous, the coloration of lateral carinae above and below fronto-clypeal suture widening out (wedge-shaped) without forming the macula usually present in other species; carinae of pronotum and tegulae stramineous; legs fusco-testaceous.

Female. Length, 6 mm.

With the exception of the pattern of the tegmina, the structure and coloration of the female are the same as those of the male. Tegmina slightly milky hyaline, more or less diffused yellowish fuliginous at the base, a similar band transversely at middle and more or less spotted the same sub-apically; tegminal veins on basal two-thirds, including the costa, mostly pale but somewhat darker at base, in the middle and on all of the apical third; cross veins more or less suffused; granules brownish, very distinct.

Hab. Kauai, in the lower forest zone, at 800 feet. Redescribed from seven males and four males, Lihue, May 13, 1923 (Swezey).

Obs. Kirkaldy has a very inadequate description of a female in his tables, but does not refer to the male. The species is not represented in the British Museum collections, nor were there any specimens in the balance of the Kirkaldy material at the Bishop Museum, Honolulu. A male and female from the above series have been selected as "lectotypes" of the species.

Among both males and females there is a tendency towards immaculacy, which fact will account for variations in the pattern and coloration of the tegmina.

38. **Oliarus waialeale** sp. nov. Plate VI, Figs. 92, 93.

Male. Length, 6 mm.

A variable species, but in general structurally similar to *kauaiensis* except for the broader tegmina, a somewhat wider vertex and a slight difference in the character of the fossette, which in some examples is shorter and less excavate, having the tumid area at middle of the posterior margin, together with the more or less produced median longitudinal carina, either obsolete or obscure.

Tegmina hyaline, broader and less elongate than in *kauaiensis*, more or less yellowish fuliginous and sparingly or faintly spotted light fuscous in the costal area. (In some examples these spots are hardly, if at all, apparent.) Tegminal veins more or less particolored testaceous and fuscous on the basal two-thirds (appearing alternately pale and dark); costa testaceous or fuscous, variable; granules very distinct.

The aedeagus differs from *kauaiensis* in the right median spur of the phallus, which is longer and stouter, and in the apical third of the periandrium, which is much more elongate.

Female. Length, 6.5 mm.

The two female examples before me appear to be very similar to the male in structure and coloration.

Hab. Kauai, on the mountains back of Waimea. One male, Waialeale trail, May, 1920, and one male, near Waialae River, January, 1920 (Kusche); three males and two females, Kokee, July, 1922 (Fullaway).

Type, male, labelled Waialeale trail, 5000 feet, May, 1920 (Kusche).

Type, female, labelled Kokee, July, 1922 (Fullaway).

Obs. This species, like its close relative (*kauaiensis*), is very variable, particularly as to the pattern of the tegmina and coloration of the tegminal veins. In the collection there is a female labelled "near Waialae River, March 29, 1920 (Kusche)," with a much darker pattern of the tegmina and veins which may possibly be refered to this species.

39. **Oliarus lihue** sp. nov. Plate VI, Figs. 94, 95.

Male. Length, 6.5 mm.

Width of vertex at base one and four-tenths times the width at apex; width at apex one and one-tenth times the width at origin of transverse carina; length one and six-tenths times the width at base; carinae of apex truncate, but appearing deflected or decurved in certain aspects, more or less obscure because of its coalescence with the tumescent area of the

anterior angles of the fossette and the basal angles of the frons; transverse carina, about one-third from apex, truncate; fossette complete, quadrate, very little wider than long, moderately excavate, anterior angles largely tumescent, giving that area a rotundate appearance; median longitudinal carina obsolete.

Frons and clypeus moderately excavate; basal angles of frons slightly tumescent; base of fork of medio-frontal carina impressed. Fore tibiae moderately short.

Tegmina hyaline, largely fuliginous on basal third and with fuscous maculae close to inner margin on apical third. Tegminal veins on basal two-thirds and the costa flavo-testaceous, apical third dark fuscous; cross veins lightly suffused; stigma dark fuscous, pallid basally. Wings clear hyaline, veins dark fuscous.

Piceus; carinae of vertex narrowly, the lateral margins at apex of frons and base of clypeus (macula absent) more widely, flavo-testaceous; pronotum (sordidly) and tegulae largely stramineous; legs testaceous.

Female. Length, 7 mm.

The female differs from the male, as follows: Fossette as wide as long, quadrate-rotundate, slightly tumescent posteriorly with the median longitudinal carina rudimentary; carinae of apex of vertex obliquely converging from lateral margins of fossette; transverse carina curvate.

Tegmina hyaline with the basal third all dark fuliginous and contiguous to same, an irregular and wide transverse dark fuscous band medianly; two or more darkish maculae in the costal cell, and the apical third with a wide and irregularly curved dark fuscous band following the sub-apical margin. Tegminal veins on basal two-thirds in part pale, and on apical third all dark fuscous; costa light fuscous; cross veins largely suffused and stigma dark fuscous. Wings clear hyaline, narrowly fumate apically, veins dark fuscous.

Hab. Kauai, in the lower forest zone, at 800 feet elevation. One male and one female (the types), Lihue, May 13, 1923 (Swezey).

Obs. Superficially, this species has somewhat the general appearance of some in the *tarai-morai* group, but the extreme difference in the character of the aedeagus places it elsewhere. The female, although taken at the same time and in the same place as the male, is suspiciously this species, the uncertainty being due principally to the difference in the structure of the vertex. Other characters associating it with the male have led me to refer it to this species until a larger series of the latter can be obtained.

40. **Oliarus opuna** Kirk. Plate I, Fig. 10.

Male. Length, 5 to 6 mm.

Width of vertex at base one and one-tenth to one and two-tenths times the width at apex; width at apex slightly more than width at origin of transverse carina; length one and five-tenths to one and six-tenths times the width at base; carinae of apex thickened, curved or else obliquely converging from lateral margins of fossette; transverse carina, about one-fourth from apex, truncate; fossette transverse, two and one-half times (somewhat more or less) wider than long, moderately excavate, the thickened carinae of apex giving it a rotundate appearance anteriorly, without median longitudinal carina.

Frons and clypeus moderately excavate; medio-frontal carina distinct with the base of the fork straight and more or less impressed; fronto-clypeal suture distinctly forming a ridge or keel almost straightly converging from the lateral margins of the frons to the median ocellus, which latter is more or less indistinct, due to the tumescent carina at the junction.

Viewed in profile the upper part of genae, between anterior margins of eyes and fossette, moderately lengthened, with the lateral carinae of frons and of the vertex sub-arcuate.

Tibiae and tarsi unusually short.

Tegmina clear to milky hyaline, maculate; basal third largely, a narrow and irregular transverse band at the middle (sometimes interrupted), a slightly undulate band from stigma to apex of clavus and two or more spots in the costal area, fuscous; tegminal veins on basal two-thirds pale sordid flavous; costal margins more or less suffused fuscous; veins on apical third light fuscous; cross veins nebulose or suffused fuscous; granules dark, distinct; stigma dark fuscous. Wings pale milky hyaline; veins light fuscous.

The aedeagus of the male is conspicuously different from all other groups, not only in the apical third of the periandrium, but also because of the addition to the left margin of the phallus, medianly, of a long, stout, and curved spur. The apical third of the phallus also differs in structure from other groups.

Fusco-piceus; mesonotal carinae castaneous; margins of pronotum and carinae of vertex and frons narrowly flavous; tegulae largely pale stramineous; macula at lateral margins near fronto-clypeal suture more or less indistinct. Legs more or less fusco-testaceous.

Female. Length, 6.25 mm.

The female is very similar to the male in structure and in the pattern of the tegmina, excepting that the fossette is wider, the tibiae and tarsi a little longer, and the maculae on the tegmina in general darker. The color of the mesonotum, frons, etc., and of the legs is somewhat variable, the former ranging from fusco-piceus to piceus, and the latter more pallid

than in the male. The margins of the pronotum, vertex, etc., also appear more flavid than in the latter sex.

Hab. Hawaii. Redescribed from four males and five females, as follows: Two females (paratypes) labelled 656 (Kilauea, Hawaii, August, 1896, Perkins); three males and one female, Kilauea, July, 1906, from *Astelia* sp. (Perkins); one male, Kilauea, August 5, 1919, from *Coprosma* sp. (Swezey); one female, August 2, 1919, from *Dubautia* sp. (Swezey), and one female, Kilauea, from *Nephrolepis exaltata* in steam fissure on lava flow close to crater, August 25, 1919 (Giffard).

Obs. It appears evident that when Kirkaldy wrote his description of this species in the Fauna Haw. he had no male specimens in his material. Both his description and the figure are from a female, and his later tables did not include the male. The only specimen in the British Museum is a female which is marked "type" by Kirkaldy, and it and the two female paratypes in the Bishop Museum are labelled No. 656 (i. e., Kilauea, Hawaii, August, 1896, Perkins). All the males and the other females in the material before me have since been collected by Dr. Perkins and others.

The quite different structure of the aedeagus, the unusual width of the fossette and other characters of the vertex, together with the shortness of the fore tibiae and tarsi, easily separate this and the following three species (all closely allied) from all other groups in this division.

41. **Oliarus euphorbiae** sp. nov. Plate II, Fig. 16; Plate VI, Fig. 102.

Male. Length, 5 to 5.5 mm.

Very like the preceding in general appearance and equally variable in the dimensions of the vertex, etc. It differs mostly in certain of the characters of the aedeagus and in the pattern of the tegmina.

Tegmina clear to milky hyaline, basal third immaculate; very light or faint fuscous spots more or less sparingly scattered on the middle and apical thirds, very rarely with an uninterrupted median transverse band and never with an apical undulate band between the stigma and apex of the clavus as in *opuna*; costal cell always spotted, the spots detached and not fused into the costal margin. Tegminal veins light flavous, slightly darker toward extreme apex; cross veins on apical third largely suffused or nebulose; granules dark fuscous and very distinct; stigma pale fuscous. Wings hyaline, veins light fuscous.

The coloration of the body structures is variable, but differs from the preceding species, as follows: Mesonotum, vertex, frons, etc., from fuscous to ferruginous, mesonotal keels more strikingly castaneous; margins of pronotum, etc., more flavid; legs paler and more or less striped fuscous. Lateral margins near fronto-clypeal suture more or less widely fulvous.

Female. Length, 6 to 6.5 mm.

Excepting for the difference in length, the corresponding difference in the dimensions of the vertex and the darker pattern of the tegmina, there is no appreciable difference between the female and the male.

Hab. West Maui. Described from eight males and eight females, as follows: Three males and three females, Iao Valley, July, 1920, from *Euphorbia* sp. (Swezey); two males and one female, Wailuku, September, 1919 (Williams); three males and four females, Waihee Valley, February, 1920 (Giffard).

The male and female types are specimens labelled from Iao Valley, July 8, 1920, on *Euphorbia* sp. (Swezey).

Obs. Due probably to greater isolation, the Waihee Valley examples show a tendency to more maculation of the tegmina and to darker coloration than do those from Iao and Wailuku. The species is undoubtedly a close relative of the preceding.

42. **Oliarus acaciae** Kirk. Plate I, Fig. 9; Plate II, Fig. 14.

Male. Length, 4.75 to 5 mm.

Extremely like the two preceding species in structure and in the color and pattern of the tegmina. Except for the fuliginous area at basal third, the maculation is nearer that of *euphorbiae* than that of *opuna*, but in some examples a modified and sometimes hardly apparent transverse median band replacing or joining the maculae, is evident, as in the latter named species. The undulate apical band between the stigma and the apex of the clavus always seen in *opuna* is quite absent, the same as it is in *euphorbiae*. Color of the body structures much the same and as variable as in the preceding. In some examples the mesonotal and other carinae appear to be more flavid.

The aedeagus of examples dissected is nearer that of *euphorbiae*. The small spur at extreme apex of the phallus may not be constant, as in one example it was either quite absent or else lost in the surrounding membrane.

Female. Length, 5.75 to 6 mm.

The female is similar to the male, except that the coloration appears in general much paler. This coloration, like that of the pattern of the tegmina, is, however, very variable and appears to depend upon locality, e. g.: the Kaala Mountain (Waianae range) examples have more and

darker maculae, while those from Niu (Koolau range) have these more sparse and lighter.

Hab. Oahu. Redescribed from five males and five females, as follows:

Waianae Range. Three males and two females, Kaala Mountains, from *Acacia koa*, August, 1912 (Swezey), and one female, Kaala Mountains, July, 1917 (Timberlake).

North Koolau Range (windward side). One male, Waiahole, December, 1919 (Swezey); (East, lee side) one male and one female, Niu, February, 1918 (Swezey), and one female, Niu ridge, February, 1918 (Timberlake).

Obs. There is a single male specimen in the British Museum labelled "Kaala Mts. from *Koa*," representing this species as the type. No specimens of either sex were in the Kirkaldy material in the Bishop Museum at Honolulu. Evidently, Kirkaldy had not seen the female, as that sex is not referred to by him in his tables.

43. **Oliarus koae** sp. nov. Plate VI, Fig. 103.

Male. Length, 5.5 mm.

Closely allied and very similar in structure and coloration to the preceding three species. It differs in structure in the width at apex of the vertex, which is one and two-tenths times the width at origin of transverse carina, in the wider and comparatively shorter fossette of vertex, and in the shortened and narrower genae between the margins of the eyes and the lateral carinae of the frons and of the vertex.

Tegmina sparingly and sparsely maculate; basal third in part fuliginous, with more or less irregular and interrupted light fuscous maculae medianly, and with scattered spots on the apical third; costal cells with three spots attached to but not fused into the costal margin as in *opuna*. Tegminal veins on basal two-thirds pale, but superficially they appear darker because of the closer and unusually distinct and prominent dark fuscous granules; costa pale, with the inner margins darker; veins on the apical third dark fuscous; cross veins nebulose, suffused; stigma dark fuscous. Wings hyaline, veins dark.

All the characters of the aedeagus are somewhat different from its allies (see figure).

I have not seen the female.

Hab. Kauai, on the high mountains back of Waimea. Described from a single male (the type) labelled Halemanu, August 26, 1921, from *Acacia koa* (Swezey).

Obs. As in other Kauai forms which are closely related to species from the other islands in the archipelago, the difference in structure and coloration in these are much more apparent. This Kauai form is no doubt one extreme and *opuna* of Hawaii the other in this particular group, the intermediates being *euphorbiae* of Maui and *acaciae* of Oahu.

44. **Oliarus niger** sp. nov. Plate VI, Figs. 88, 89, 96.

Male. Length, 6.5 to 7 mm.

Vertex variable, width at base one and four-tenths to one and five-tenths times the width at apex; width at apex equal to or a little wider than at origin of transverse carina; length about twice the width at base; carinae of apex more or less obscure because of surrounding tumescence, but appearing to curve from lateral margins of fossette to basal margins of fork of medio-frontal carina; transverse carina, about one-fourth from apex, sub-truncate; fossette variable, sub-quadrate, generally a little wider than long, anteriorly excavate with a slight tumescence at angles, giving the apical carinae of apex a more or less rotundate appearance, posteriorly tumid, but, at most, with only a rudimentary development of a median longitudinal carina.

Frons and clypeus excavate; basal angles of frons somewhat tumescent; base of fork of medio-frontal carina more or less developed, sometimes impressed, obscure, or else quite absent.

Tegmina milky hyaline, immaculate, about two and one-half times longer than wide at the middle, more or less arched at base, with the costa thickened (not as notably as in the species of the *hevaheva* group), claval area more or less nebulose, and apex of the costal cell slightly suffused fuscous. Tegminal veins, including costa, mostly piceus, but occasionally with those of the basal two-thirds fusco-piceus; granules indistinct; stigma fusco-piceus; cross veins not suffused. Wings hyaline, veins all dark.

Aedeagus with the basal spur of the phallus unusually elongate, the right median and apical spurs short; right margin of the apical third of the periandrium produced and acute. The anal and genital styles of this species are much broader than those seen in most of the other species.

Piceus with the margins of the pronotum, tegulae, vertex, and frons more or less flavous and with the flavid macula at lateral margins near fronto-clypeal suture prominent; legs fusco-piceus.

Female. Length, 7.5 to 7.75 mm.

Except as to size, the female is very similar to the male in structure. The posterior margin of the fossette, however, appears to have a more

tumid development. With exception of the tegmina, the coloration of the female is also the same as that of the male.

Tegmina milky hyaline, more or less maculate, and with the costa less arched than in the male. Claval area more or less fuliginous; an irregular, wide, and sometimes interrupted median transverse band, sparse spots on the sub-apical area, and two or more on the apical third, fuscous; tegminal veins fusco-piceus, more or less sparsely particolored whitish or yellowish on the Cl 1 + 2, the Cu (sub-apically) and the Sc. In some examples one or more, if not all, of these maculae and particolorations of the veins may be hardly apparent or quite absent.

Hab. Hawaii, in the forest along the South Kona Road, at an elevation of from 1500 to 2000 feet. Described from five males and four females, August, 1917-1922 (Giffard), and two males and one female, August, 1919 (Swezey).

Types, male and female, labelled South Kona Road, No. 9, 1900 feet elevation, August 22, 1917 (Giffard).

Obs. The vertex of the male and the pattern of the tegmina of the female of this species are quite variable. There are two female examples in the material taken at the same time and locality with males, one of which is obscurely maculate and the other quite immaculate, except for two spots on the apical third—one between Cu 1a and Cu 1b, and one between Sc1 and Sc2. How far such variations would extend in a larger series is impossible to say. The species, however, is quite unlike any other so far studied, and may be easily distinguished by the broader and more or less arched tegmina, the thickened (not notably) costa, together with the piceus appearance of the insect as a whole.

45. **Oliarus silvestris** Kirk. Plate VI, Figs. 97, 98, 101.

Male. Length, 7 mm.

Width of vertex at base one and four-tenths times the width at apex; width at apex a trifle more than the width at origin of transverse carina; length one and six-tenths times the width at base; carinae of apex obliquely curved and coalescent with basal sides of fork of medio-frontal carina; transverse carina, less than one-fourth from apex, truncate; fossette quadrate, about as wide as long, moderately excavate, posterior margin without any development of the median longitudinal carina; upper part of the genae between the anterior margins of the eyes and fossette, in profile, lengthened; lateral margins of frons (also in profile) subarcuate, and those of two-thirds of the vertex straight.

Frons and clypeus moderately excavate; fork of medio-frontal carina narrow, the base almost obsolete; median ocellus indistinct. Fore tibiae short.

Tegmina clear to cloudy hyaline, immaculate; tegminal veins on basal two-thirds pale fuscous in the clavus and Sc and R, and darker in the rest of the corium; veins on the apical third all fusco-piceus; stigma and costa fusco-piceus; cross veins not suffused; granules all dark. Wings clear hyaline.

Piceus; carinae of pronotum and tegulae narrowly, margins of lateral carinae of vertex more widely, and an elongate macula at lateral margins near fronto-clypeal suture, stramineous; legs fusco-testaceous.

Female. Length, 7.75 to 8 mm.

Excepting that the posterior margin of the fossette of vertex indicates a rudimentary development of the median longitudinal carina, and that the tegminal veins on the basal two-thirds are all pale fuscous instead of pale and dark, the female is the same as the male in structure and coloration.

Hab. Kauai. Redescribed from one male and three females, as follows: One male and one female, Summit Camp, April 23, 1922, and one female, Lihue, 800 feet elevation, May 13, 1923 (Swezey); one female labelled 640 (Kauai, July, 1896, Perkins).

Obs. In the Kirkaldy material there were two females, one of which (a damaged specimen) represents the species in the British Museum and the other, also damaged, is in the Bishop Museum, Honolulu. Both of them are labelled No. 640.

This species is easily distinguishable from most others by the lengthened upper part of the genae.

46. **Oliarus halemanu** sp. nov. Plate VI, Figs. 99, 100.

Male. Length, 5.25 mm.

Width of vertex at base one and two-tenths times the width at apex; width at apex a trifle more than the width at origin of transverse carina; length one and seven-tenths times the width at base; carinae of apex obliquely converging to the basal sides of the fork of medio-frontal carina; transverse carina, about one-fourth from apex, curved; fossette quadrate-rotundate, much wider than long (7 to 4), anteriorly deeply excavate with the angles more or less tumescent, median longitudinal carina slightly developed; median carina of vertex distinct.

Frons moderately excavate, base of fork of medio-frontal carina wide, impressed, more or less obscure; basal angles of frons more or less tumescent; fore tibiae short.

Tegmina clear yellowish-hyaline, immaculate, about one and a half times longer than broad at the middle; tegminal veins (including costa) pale

testaceous, moderately particolored fuscous, mediaaly; stigma pallid; cross veins (in part) more or less light fuscous; granules dark and very distinct. Wings clear hyaline, veins fuscous.

Sordid testaceous; mesonotal keels flavid; abdomen fuscous; macula at lateral margins near fronto-clypeal suture present, but very indistinct.

Hab. Kauai, on the mountains back of Waimea. Described from one male (the type) labelled Halemanu, August 29, 1921 (Swezey).

47. **Oliarus agnatus** sp. nov. Plate VI, Figs. 107, 108; Plate VIII, Fig. 139.

Male. Length, 6 mm.

Width of vertex at base one and two-tenths to one and three-tenths times the width at apex; width at apex one and one-tenth times the width at origin of transverse carina; length one and seven-tenths times the width at base; carinae of apex obliquely converging to the base of fork of medio-frontal carina; transverse carina, a little more than one-fourth from apex, curved; fossette quadrate, slightly longer (medianly) than wide, with the median longitudinal carina more or less developed, but not complete; in profile the upper part of the genae between the anterior margins of the eyes and of the fossette shortened, and the lateral carinae of vertex and of the frons almost arcuate.

Frons and clypeus very moderately excavate; fork of medio-frontal carina narrow with the base curved. Fore tibiae shortened.

Tegmina light yellowish hyaline, cloudy, immaculate. Tegminal veins (including costa and commissure) on basal two-thirds light stramineous, becoming fusco-testaceous at apical third; stigma and apical margin fuscous; granules pale, but fairly distinct.

Dark fuscous; margins of vertex, frons, etc., ochraceous; mesonotal keels more or less dark castaneous; pronotum and tegulae sordidly stramineous; macula at lateral margins near fronto-clypeal suture not at all apparent; legs fusco-testaceous.

Aedeagus with the median spur of the phallus stout and long, and the right and left apical spurs quite small, but distinct.

Hab. Lanai. Described from one male (the type), 3000 feet elevation, December 26, 1916, labelled H. G. (Gibson), No. 43, also from same region and elevation, one male, January 19, 1917, labelled H. G., No. 56.

Obs. Superficially like the typical form of *similis*, and might at first sight be mistaken for that species because of the clouded yellowish and immaculate tegmina and the similarity of color of

the veins. It is, however, quite distinct. The structure of the vertex, the very much shortened upper portion of the genae (in profile) and its smaller size will easily separate it from the *inaequalis-similis* group.

I have seen no female which I could positively associate with this species. It is to be presumed that the usual variations in color and in the proportions of the vertex will be observed, should a larger series be taken.

48. **Oliarus albatus** sp. nov. Plate VI, Figs. 104, 105.

Male. Length, 5.5 to 5.75 mm.

Width of vertex at base one and two-tenths to one and three-tenths times the width at apex; width at apex about the same as width at origin of transverse carina; length twice the width at base; carinae of apex apparently obliquely converging to basal margins of fork of medio-frontal carina, but more or less obscure, due to their coalescence with the tumescent anterior angles of fossette; transverse carina, about one-fourth from apex, curved; fossette quadrate-rotundate, almost as long as wide (4 to 5), anteriorly excavate, with the angles tumescent and median longitudinal carina rudimentary.

Frons and clypeus excavate; base of frons narrow and more or less tumescent; base of fork of medio-frontal carina obscure. Fore tibiae short.

Tegmina very milky-white hyaline, immaculate, about twice as long as wide at the middle; tegminal veins on the basal two-thirds whitish and on the apical third light fuscous; stigma fuscous; cross veins very lightly suffused, and the granules very indistinct. Wings milky-white, with the veins on the basal two-thirds whitish and on the apical third very light fuscous.

Fuscous; mesonotal carinae castaneous; pronotum and tegulae stramineous; legs, carinae of frons and vertex more or less fulvous, the macula at lateral margins near fronto-clypeal suture elongate.

Hab. Oahu. Described from one male (the Holotype), Hillebrand Glen, Nuuanu Valley, October 17, 1912, and one male, Hauula, Koolau district, August 2, 1914 (Swezey).

Obs. This small but unique species is easily separable from all other known Hawaiian species, due to the immaculate milky-white tegmina and wings and the whitish venation. The Hauulu example appears to have the transverse carina of the vertex somewhat sub-angulate, and the median carina of the fossette a little more developed than the type. A larger series may later present other variations in this as in other species. The phallus

of the aedeagus appears to have affinities to another species belonging to the Division with the median longitudinal carina of fossette completely developed, while the apical third of the periandrium is very similar in structure to species in the *taraimorai* group. I have no female in the material before me which can be positively associated with this species.

49. **Oliarus inaequalis** sp. nov. Plate VI, Figs. 110, 111.

Male. Length, 6.25 to 7 mm.

Light yellowish, clouded tegmina.

Vertex more or less wide; apical carinae very variable, either truncate, curved, or else very slightly converging; transverse carina sub-truncate; fossette quadrate, variable in length and width, but mostly wider than long, more or less excavate, sometimes with the anterior margin appearing more or less rotundate—at most with a very rudimentary development of the median longitudinal carina. In profile the upper part of the genae between the anterior margins of the eyes and the fossette, more or less lengthened, but not abnormally so.

Frons moderately excavate, basal angles slightly tumescent (sometimes little apparent); base of fork of medio-frontal carina more or less impressed, sometimes obscure or obsolete.

Tegmina from cloudy to almost clear yellowish hyaline (tawny in the dark-colored var. c, immaculate. Tegminal veins on the basal two-thirds very pale, but becoming darker toward the apical third, where they reach either a light or dark fuscous. Costa variable from flavo-testaceous to fuscous or castaneous, always more or less darker at basal and apical margins; commissure and stigma dark, but variable; granules distinct on or near apical third, indistinct on basal two-thirds, rarely colored, excepting on the darker colored varieties; cross veins not suffused. Wings either more or less milky or pale yellowish hyaline.

Mesonotum piceus, rarely light or dark fuscous; vertex, frons, clypeus and abdomen darkly, and pronotum and tegulae sordidly fusco-piceous, with all margins and carinae more or less flavous or else flavo-testaceous; macula near lateral margins of fronto-clypeal suture narrowly elongate; legs variable, from stramineous to fuscous.

Aedeagus of much the same character as in the two following species, excepting for a slight difference in the structure of the apical third of the periandrium; the apex of the phallus in this and the following closely related forms is without spurs or spines.

Female. Length, 7.75 mm.

The females which I have attempted to associate with the male have similar characters to, but are even more variable than in the latter sex.

Tegmina immaculate in some examples and maculate (sometimes hardly apparent) in others, more or less yellowish milky hyaline, but varying

according to locality, always more clearly transparent than those of the male, excepting in the darker variety (c) from the Kohala Mountains, which latter has the tegmina more or less diffused yellowish fuliginous. Tegminal veins on the basal two-thirds pale, commonly more or less sparsely particolored fuscous, the dark particolorations in some examples being also more or less suffused. This particoloration of the veins is, however, very variable, as there are examples without any such color interruptions, as well as intermediates between the extreme forms of these; on the apical third the veins are always darker and the cross veins sometimes more or less suffused. The coloration of the mesonotum, frons, legs, etc., is about the same and just as variable as in the male.

Hab. Hawaii. Described from a large series of both sexes, on miscellaneous vegetation principally in the forests along the Government road in North and South Kona, from 1917 to 1922, collected by Swezey, Giffard, and Timberlake; also two males labelled 691 (Kilauea, 1895), and one male labelled 635 (Olaa, 1896, Perkins) in the Kirkaldy material; two males, Kilauea, Kau, 1917 to 1918, and two males Olaa, Puna, 1912 to 1918 (Giffard); one male and one female, Kohala Mountains, 1917 (Swezey). There are also a number of females from the Kona region by the same collectors which have the middle and (sometimes) the apical third of the tegmina banded or spotted fuscous which appear to be extreme forms of this species. These are placed here provisionally.

Light yellowish clouded tegmina (not maculate). The male type is a specimen labelled South Kona Road, 1600 feet elevation, August 26, 1917 (Giffard), and the female labelled Kau Road, January 16, 1917 (Muir and Giffard).

Var. a.

Male. Length, 7.5 mm.

The male of this variety has the tegmina more clearly hyaline, but still retaining the yellowish appearance of the preceding. The female has the tegmina clear hyaline, with the veins largely pale on the basal two-thirds with sparse particolorations medianly; apical third dark, cross veins not suffused.

Hawaii. One male and one female (var. types), Puuwaawaa, North Kona, 3800 feet elevation, August 24, 1917 (Giffard).

Var. b.

Male. Length, 8 mm.

A larger and less typical variety with medium colored tegmina from the

high mountain region above the Kona district, Hawaii. Tegmina shining, clear yellowish hyaline, veins darker medianly and apically. Other characters, including the genitalia, typical.

Hawaii. A single male (var. type) in the woods above Dowsett ranch, Kona, at 7000 feet elevation, 1921 (Wilder).

The female of this variety may possibly be included among those associated with some of the other varieties.

Var. c.

Male. Length, 7 mm. (*Dark-colored tegmina.*)

Structurally much the same and as variable as in the preceding, but with the tegmina more or less dark or tawny yellowish, and the tegminal veins on the basal two-thirds pale or dark stramineous and on the apical third dark fuscous. Costa darker and thicker. Wings hyaline, with the apical outer margins largely fumose, veins fuscous. The female has the tegmina lighter yellow and more clearly hyaline. The type variety has hardly apparent suffused fuscous spots on the costal area and at extreme apex of the tegmina, but there are extreme varieties which are quite maculate, the middle third banded or spotted fuscous. The female also has the tegminal veins very variable with some of these suffused fuscous medianly, and with others very lightly (if at all) particolored.

Hab. Hawaii. Eight males and thirteen females from the Kohala Mountains along upper Hamakua Ditch Trail, 1917-1919 (Swezey). One male, labelled Kohala Mountains, May 24, 1917, I have not included in the series because of certain differences in structure of the genae.

The male and female types of this variety are labelled Kohala Mountains, upper Hamakua Ditch Trail, September 3, 1917 (Swezey).

Obs. This is one of the most variable species found on the island of Hawaii. The lighter colored forms are common in the Kona district on varied vegetation along the Government road, but apparently are scarcer in individuals in the Kau, Puna, and Hilo localities collected. The darker and more striking variety (c) from the Kohala Mountains is no doubt not uncommon in that region. Here and there in isolated regions on the island, unique examples of the species are found with the mesonotum, either dark or light fuscous, and having the tegmina more clearly hyaline, but still retaining the more or less yellowish

appearance, which is characteristic of this and some others of the group.

There is apparently but little difference in the structure or characters of the aedeagus of this species and of its varieties, and these indicate very close affinities to *similis* of Maui, as well as *inconstans* of Hawaii. Both of these latter species are undoubtedly extreme forms of *inaequalis*.

The type female of the species, which I have selected, has immaculate tegmina and is without the particolored venation seen in most of the specimens of that sex. It is by no means quite representative of all those studied. In the material before me there appeared to be so many intermediate forms in both sexes as to make it difficult to select from these with any great degree of certainty any one example which might be clearly typical. Among some of the questionable females are specimens which have the tegmina more or less maculate, the middle third having a fuscous band, the apical third more or less sparsely spotted, and the median tegminal veins suffused, appearing more or less particolored. I do not doubt, however, but that these are merely extreme variations within the species.

Some of the forms or varieties of this species, particularly those with the light colored tegmina, have been mistaken for Kirkaldy's *koanoa*, but this latter species is quite distinct and belongs to the division with the fossette completely carinate medianly and with small and ovate areolets. Superficially, however, there is a strong resemblance between *koana* and the light forms of *inaequalis* of Hawaii and of *similis* of Lanai, Maui, and Molokai. Besides the difference above noted, the character of the aedeagus of *koanoa* is quite different from the others above mentioned.

50. **Oliarus similis** sp. nov. Plate VIII, Figs. 127, 128.

A very variable species superficially and structurally like the preceding (*inaequalis*), to which it is very closely related.

The color of the tegmina varies from an almost clear to a tawny yellowish hyaline. The tegminal veins on the basal two-thirds, including the costa, are also very variable in coloration, partaking more or less of the color of the membrane in some and in others distinctly darkened.

The dissection of the aedeagus in eleven examples (including varieties) revealed in all of these a slight difference in the structure of the apical

third of the periandrium, and in three only did the apex of the phallus indicate rudimentary spines. In two of these latter instances there were present minute right and left spines, and in the other a minute left spine only. Normally, the apex of the phallus of this species has neither spines nor spurs. In all the examples dissected the ventral margin of the periandrium, viewed laterally, is armed near the middle with a distinctly longer and stouter tooth than in its allies. The structural outline beneath the tooth is also different.

In this species the color of the tegmina of the females follows, in most part, that of the males, but there are here and there exceptions which are more or less confusing. The tegminal veins in the females are also very variable, some having these particolored and others not. The tegmina of the extreme varieties may also be either immaculate or maculate.

Male. Length, 6.25 to 6.5 mm.

Mesonotum and frons fuscous; legs testaceous, but variable. Tegmina almost clear hyaline, immaculate; veins on the basal two-thirds pallid, and on apical third light fuscous; costa mostly pale, granules distinct, more or less colored; stigma from very light to a darker fuscous.

The females associated with this typical form are so variable as to the particoloration of the tegminal veins, that it is quite possible one or more may belong to the varieties which follow.

Hab. Lanai. Eleven males and five females, 2000 feet elevation November to February, 1916-1917 (Munro-Gibson—H. G.).

The male and female types are labelled Munro—H. G., No. 18, December 5, 1916.

Var. a.

Males. Length, 7 mm. Females. Length, 7.5 mm.

The same as the preceding, except that the mesonotum is more or less piceous and in some the mesonotal carinae are faintly castaneous. Tegmina clouded yellowish hyaline, immaculate; veins very pale on the basal two-thirds and dark fuscous on the apical third; granules more or less indistinct and pale.

The females which I have associated with this variety are very variable in the coloration and pattern of the tegmina and veins. In some the tegmina may be either quite immaculate or else may be spotted or banded fuscous on the middle third, and spotted, more or less, on the apical third. The tegminal veins may or may not be particolored on the basal two-thirds.

Hab. Maui, Lanai, and Molokai. Three males and two females, Wailuku, Maui, 2000 feet elevation, December 9, 1922 (Swezey); one male, Kailua, Maui, June, 1920 (Bryan); six males and seventeen females Lanai, 1916-1917 (Munro-Gibson);

one male (from Bishop Museum—Kirkaldy material) labelled Molokai Mountains, 4000 feet elevation, 1893 (Perkins).

The male and female types of this variety are immaculate examples from Wailuku, Maui, December 9, 1922 (Swezey).

Var. b.

Males. Length, 6.75 to 7 mm. Females. Length, 8 mm.

Mesonotum, frons, etc., piceus; margins of pronotum, tegulae and vertex and the carinae of the frons, more or less fulvous; legs flavo-testaceous.

Tegmina clouded yellowish hyaline, but of a somewhat darker shade than the preceding, immaculate; veins on the basal two-thirds pallid, and on the apical third fuscous; costa more or less fuscous; granules distinct, more or less colored. The females associated with this variety have the tegmina clear hyaline, but more or less suffused yellowish fuliginous, with the veins on the basal two-thirds more or less particolored fuscous and whitish or yellowish, and on the apical third dark fuscous. They appear darker and quite unlike the males.

Hab. Maui and Molokai. One male and three females, Olinda, Maui, 4200 feet elevation, May, 1918 (Fullaway and Giffard); four females, Haleakala, 5000 feet, July, 1919 (Timberlake); one male, Molokai Mountains, 4500 feet elevation, 1893 (Perkins).

The type, male and female, of this variety are Olinda, Maui, specimens labelled May 13, 1918 (Giffard and Fullaway).

Var. c.

Males. Length, 7 to 7.5 mm. Females. Length, 7.5 to 8 mm.

The same as preceding variety, but with the margins of the pronotum, tegulae, frons, etc., less fulvous, and the tegmina more clearly but more darkly yellowish hyaline on the basal two-thirds and becoming still darker on the apical third, with the extreme apex suffused fuliginous; the tegminal veins on the basal two-thirds partake of much the same color as the membrane, becoming dark fuscous on the apical third; costa and stigma from light to dark fuscous; granules more or less indistinct and pallid. Wings smoky hyaline, narrowly nebulose apically. The female is like the male, inclusive of the tegminal veins, which are immaculate.

Hab. Maui. Eleven males and seven females from various localities on the windward side of Haleakala, June, 1920 (Bryan).

The type, male and female, are specimens from Halehaku, Maui, June 24, 1920 (Bryan).

Obs. I have hesitatingly separated this species and its varieties from *inaequalis* of Hawaii because of the similarity in structure and color. With so many varieties and intermediates in both species, to have done otherwise than separate it might later have led to confusion in determinations through the further splitting into species of some extreme varieties, of which it is very doubtful that a reasonable series could be collected. The separation of these two island forms will at least assist not only in the differentiation of determinations, but will also lessen the possibilities of adding or duplicating innumerable and quite unnecessary varieties and intermediates to one or both of the species. The island and locality where collected, together with the difference in certain characters of the aedeagus which can be easily discerned by workers who will trouble themselves to study these, will, I am sure, materially assist in determining one from the other of two of the commonest, most variable and homogeneous species of Hawaiian Cixiids.

It may here be noted that males and females with or without maculate tegmina, have been taken together *in situ*. The labelled examples not only indicate this, but in the case of those from Lanai the writer can personally confirm the above fact from notes sent him at the time by the collector he had engaged to secure specimens on that island.

The above remarks are equally applicable to the other species or forms in this particularly variable group.

51. **Oliarus instabilis** sp. nov. Plate VIII, Figs. 129, 130, 131, 137.

Male. Length, 6 mm.

Width of vertex at base one and three-tenths to one and four-tenths times the width at apex; width at apex equal to width at origin of transverse carina; length one and seven-tenths to two times the width at base; carinae of apex more or less thickened, curved when at all apparent, but generally obscured by surrounding tumescence; transverse carina, about one-fourth from apex, sub-truncate; fossette sub-quadrate rotundate, a little wider than long (five to four), excavate, the posterior margin more or less tumid, but with no development of median longitudinal carina. (In some examples it may be very rudimentary.)

Frons and clypeus excavate; basal angles of frons more or less tumescent, base of fork of medio-frontal carina distinctly fused with apical carina of vertex, seldom impressed or obscure. Upper part of the genae between the anterior margins of the eyes and fossette (seen in profile) more or less (not abnormally) lengthened. Fore tibiae shortened.

Tegmina clouded, but more or less milky hyaline, immaculate, about two and three-quarters longer than wide at the middle (five to one and three-quarters). Tegminal veins on basal two-thirds all pale, more or less flavo-testaceous, the costa and apical third fuscous; granules dark, distinct; stigma fuscous. Wings clear hyaline, veins fuscous.

The structure of the apical third of the periandrium of aedeagus very variable in outline, depending greatly on the viewpoint when examined; apex of phallus generally without spurs or spines.

Fusco-piceus; mesonotal carinae more or less castaneous; margins of pronotum, tegulae, vertex and frons stramineous, the flavid macula near lateral margin of fronto-clypeal suture narrowly elongate; legs testaceous.

Female. Length, 7 mm.

Structurally, the female is very similar to the male, but is quite different in color and in the pattern of the tegmina.

Tegmina clear to milky hyaline, sometimes with a median obliquely transverse fuscous band (often interrupted) on the basal two-thirds from the clavus to the radius, or else with spots only on the Cl f and Cu f, or with one or all of these hardly apparent or quite absent; the apical third may or may not be spotted, but when at all, the spots are faint and sparsely distributed. Tegminal veins on the basal two-thirds more or less fulvous with fuscous particoloration (sometimes suffused) sparsely distributed medianly, but evidently always present on the Cl f and Cu f and the Sc; veins on the apical third fuscous; stigma light fuscous; cross veins more or less suffused, but variable.

Mesonotal carinae more strikingly castaneous than in the male; margins of pronotum, tegulae, vertex, and frons fulvous; legs more or less flavid.

Hab. Oahu, on the eastern mountain range. Described from two males and four females, Wailupe, May 30, 1919 (Swezey); four males, Niu ridge, February, 1918 (Timberlake); one female, Waialae Nui, April, 1916 (Swezey), and one female, Wailupe, April 21, 1918 (Timberlake).

The male and female types are labelled Wailupe, Oahu, May 30, 1919 (Swezey).

Var. a.

Male. Length, 6 mm.

The same as the preceding. I have separated it as a variety particularly because of the extreme structural form of the apical third of the periandrium of the aedeagus.

Oahu. One male, Kaala Mountain (Waianae mountain range), August, 1912 (Swezey).

Var. b.

Male. Length, 6 mm.

Typical, except that the tegmina are a little wider at the middle and that the mesonotal carinae are fuscous.

Oahu. One male, Olympus, June 18, 1916 (Timberlake).

Var. c.

Male. Length, 6.5 mm. Female. Length, 7.5 mm.

Also typical, except for its length and that the mesonotal carinae, like those in Var. b, are not castaneous.

Oahu, on both mountain ranges. One male and four females, Mount Kaala, May 18, 1920 (Swezey); one male, Palolo, June, 1917 (Bridwell); one male, Olympus, June 18, 1916; one male, Kaumuohona, July 16, 1916, and two males, Mount Kaala, July 9, 1916 (Timberlake); two males, Olympus, June to October, 1918-1921 (Swezey).

Var. d.

Male. Length, 6.5 mm.

Same as the last, but with mesonotal carinae castaneous.

Oahu. One male, Waialae Nui, April 22, 1917 (Swezey).

Var. e.

Male. Length, 7 mm. Female. Length, 7.5 mm.

Longer, with the mesonotal carinae piceus and the tegmina more cloudy hyaline; otherwise, there is no other difference in structure to warrant separating it. The tegmina, in what I take to be female examples of this variety, are not maculate, but appear to follow the extreme typical immaculate form of that sex.

Oahu. Two males and one female, May 18, 1920; one male, July 9, 1916, and one female, July 22, 1917, all from Mount Kaala (Timberlake); one male, July 4, 1916 (Mount Kaala, O. H. S.), and one female, Waiahole, August 13, 1916 (Swezey).

Var. f.

Male. Length, 7 mm. Female. Length, 8 mm.

Same as the preceding variety, excepting that the tegmina are of a yellowish hyaline and appear more shining.

Oahu. One male and two females, Punaluu, August 9, 1914 (Swezey); one male, Lanihuli, July 18, 1920 (Bryan); one male, Olympus, June 18, 1916 (Timberlake), and one male, June 11, 1916 (Timberlake).

Obs. This is a very variable species and no doubt represents the Oahu form of what I have called the *"inaequalis-similis"* group from Hawaii and Maui. As in that group, the structures and colorations are very unstable, the sexual dimorphism confusing, and the characters of the genitalia in a marked degree variable. Of the seven dissections made of the aedeagus, no two are quite alike as to the structural outline of the apical third of the periandrium, but all have a similarity in one aspect or another. In all of these the apex of the phallus was without spurs, but even this apparently constant character may vary to a slight degree, as one of the examples was found to have a very small and hardly visible spine on the right margin. The pale venation on the basal two-thirds of the tegmina is also variable, some examples having these somewhat darker than others, but, like the other various degrees of venation, all are within the species and there is no lack of intermediates to select from.

52. **Oliarus inconstans** sp. nov. Plate VIII, Figs. 132, 133.

Male. Length, 6 to 6.5 mm.

Width of vertex at base one and six-tenths times the width at apex; width at apex five-tenths to one time the width at origin of transverse carina; length one and six-tenths times the width at base; carinae of apex variable, more or less curvate or else sub-truncate; transverse carina, somewhat more than one-fourth from apex, curved; fossette quadrate, broader than long but variable, more or less excavate, posteriorly tumid, but without a median longitudinal carina.

Frons and clypeus moderately excavate; base of fork of medio-frontal carina more or less obscure. Viewed in profile the upper part of the genae between the anterior margins of the eyes and the fossette more or less lengthened, but not abnormally so.

Tegmina clear, but sometimes more or less milky hyaline, maculate but very variable; basal two-thirds with the claval area more or less clouded fuliginous, sometimes with an obliquely transverse, but faint median light fuscous band or macula, or else the tegmina may be more or less yellowish fuliginous, with the maculae little apparent or quite absent; inner margins of the apical third more or less suffused light fuscous. Tegminal veins on the basal two-thirds all pale yellowish, except for fuscous particolorations

medianly; on the apical third the veins are from light to dark fuscous; costa and stigma fuscous. Wings hyaline, veins light fuscous.

The characters of the aedeagus are the same as in the preceding.

Color variable, the maculate forms darker than the immaculate. Mesonotum, pronotum, vertex, frons, etc., generally piceus, but sometimes the mesonotum is dark castaneous; all margins and carinae of the head and thorax sordid yellow; macula at lateral margins near fronto-clypeal suture the same as in the preceding; legs fusco to flavo-testaceous.

Female. Length, 7 to 7.5 mm.

Same as the male with the structures of the vertex proportionately larger. The venations and pattern of the tegmina and particoloration of the veins are also proportionately greater and more striking than those of the males.

Hab. Hawaii, mostly in the vicinity of Kilauea. Described from four males and eight females, viz.: *Maculate* vars: Two males and one female, Kilauea, September, 1919; two females, Kilauea and Olaa, August, 1920; two females, Kilauea, August, 1917; one female, Glenwood, August, 1921 (Giffard); one female, Kau Road, January, 1917 (Muir and Giffard). *Immaculate* vars: One male, Kilauea, May, 1911 (Swezey); one male, Kilauea, September, 1919 (Giffard); one female, Kau Road, January, 1917 (Muir).

The male and female types are maculate examples labelled Kilauea, Hawaii, September 6 and 8, 1919 (Giffard).

Obs. This variable species is closely related to the preceding species, and may be more generally distributed over the island of Hawaii than the small series before me would indicate. It is more likely to be found in isolated areas on the more or less scrubby vegetation of ancient lava flows, while its closer relatives *inaequalis* and vars. are found to be common among the well-vegetated forests of Kona and the Kohala Mountains. The latter has been rarely found in the wet and dense forests around the Kilauea and Olaa regions. The maculate Kilauea examples of *inconstans*, with one exception, were taken by the author from mixed scrubby vegetation in an old crack or fissure in the arid desert hardly a stone's throw from the edge of the Halemaumau active crater. (This deep fissure was later filled up by the 1922 lava flow.) The female examples taken on the Kau Road and in Olaa, and one male from Kilauea, I have associated with the Kilauea types with some reservation.

While the type examples have the apex of vertex more or less curved, there are indications that this character (as well as the colorations in general) varies according to locality, as others apparently (particularly among the females) have the apex truncate.

The aedeagus indicates that this species is merely another form of *inaequalis* and its insular allies, and is equally as variable as these. As a general rule, among all such very closely related forms or varieties, the apical third of the periandrium, and in a measure the exact position of the spurs or spines of the phallus, varies more or less in each; but these variations are apt to be somewhat amplified, diminished, or otherwise modified according to the position in which the aedeagus is placed and viewed by the worker. This feature applies not only to the structures of the aedeagus, but also, in a way, to certain characters of the vertex in all the Hawaiian species.

The following six species in Kirkaldy's tables, five of which were not otherwise described by him, I have been unable to identify among the material studied:

Oliarus procellaris Kirk.

Oahu. Male. Length, 6 mm.

Synopsis. Mesonotum black; tegmina immaculate, short and broad; tegminal veins dark or partly pale.

Obs. No specimen bearing this name is in either of the museums. The summary of the tabular description is inadequate and, in some measure, confusing. One or more forms in the *kaonohi-filicicola* group appear synonymous.

Oliarus pluvialis Kirk.

Kauai. Male. Length, 8.5 mm.

Synopsis. Same as the preceding, with elongate tegmina.

Obs. This species is represented in the British Museum by one female labelled "Makaweli, Kauai." Neither sex is in the Kirkaldy material in the Bishop Museum.

Oliarus monticola Kirk.

Maui. Male. Length, 6 mm.

Synopsis. Vertex (transverse carina?) rounded or sub-angular apically; mesonotal keels black; tegmina maculate, scarcely more than twice as long as broad on basal half; tegminal veins particolored on basal half; costal margins pale brown.

Obs. This species is represented by one specimen (a male) in the British Museum, labelled "Haleakala, Maui, 5000 feet elevation." I have been unable to find any specimens from Maui which in any way agree with the above tabular description.

Oliarus paludicola Kirk.

Molokai. Female. Length, 10.5 mm.

Synopsis. Tegmina largely maculate with four black spots on the costal area, and the tegminal veins particolored on the basal two-thirds.

Obs. The four black spots on the costal area are, no doubt, as variable in this as in other similar maculate forms. The description indicates that it may possibly be the Molokai form of *haleakalae*. The species is represented in the British Museum by a single female from Molokai.

O. nemoricola Kirk.

Hawaii. Female. Length, 8.25 mm.

This may possibly be one of the variety forms of either the *kanakanus* or *hevaheva* groups. The black tegminal veins with the radial partly white and the apical third spotted, might well apply to varieties in either of these groups in one or more localities on Hawaii. Until closer collecting gives us more material for study, a large degree of uncertainty will remain as to the proper determination of the females of forms or species with maculate tegmina. There is no female of this species in either museum to represent the type and the single specimen selected for the British Museum was a male.

Oliarus orono Kirk.

Kauai. Female. Length, 8.5 mm.

Obs. This is one of the species described by Kirkaldy in the

Fauna Hawaiiensis. His original description and that given by him in his tables do not quite agree. Furthermore, the tables refer to the female only, while both sexes are included in the original description. I have seen no male specimens from Kauai which I can refer to this species with any degree of certainty. There are one or more females in the Kirkaldy material at the Bishop Museum which were determined as this species and which in a degree follow the characters stressed by Kirkaldy in his general description. There will, however, have to be much closer collecting done on Kauai and much more material obtained before a definite determination can be made as to what the male of the species may be like. Neither sex is represented in the British Museum, but according to my information there is a *female* example marked *"type"* by Kirkaldy himself in the University Museum, Cambridge. This latter specimen was used for the figure in the Fauna Hawaiiensis.

Var. *molokaiensis* and var. *oahuensis* (of *orono*) cannot be identified until we know positively what the male of *orono* is. The description of the species in the Fauna does not discriminate between the sexes, and no male type is known. The marked sexual color dimorphism in these forms, with maculate tegmina, is such that any descriptions based on the female tegminal color characters are not to be relied on as applicable to those of the male, which latter in many instances may have these quite immaculate. This will also be found to apply to the particolorations of the tegminal veins in a great many of our species.

IOLANIA * Kirkaldy.

Iolania appears to be an endemic genus related to *Cixius*. It is represented by five very closely related species, one each on Hawaii, Maui and Lanai, and two on Oahu. It is evidently derived from one ancestor, possibly a *Cixius*, which is now extinct.

A study of the male genitalia, through dissection, reveals the fact that the aedeagus is practically the only means of discrimi-

* The following remarks on *Iolania* were presented at meeting of Hawaiian Entomological Society, September 7, 1922, but subsequently withdrawn by the author.

nating the species in this genus. In 1902 [1] and again in 1909 [2] the late G. W. Kirkaldy, after a careful examination and study of a number of examples widely distributed in several regions of the islands of Hawaii, Oahu, and Lanai, could find no character to separate the insular forms, and as a result erected but one species, *perkinsi*, to represent the genus. Kirkaldy claimed not to have used the genitalia in the differentiation of the species, as the visible parts were unsatisfactory, and the others not evident without dissection.

From a fairly large series collected in several localities and at various elevations on the islands of Hawaii, Lanai, and Oahu, and a smaller one from the mountain region of Maui, the author has been able to continue Kirkaldy's studies and finds that the body characters and the venation of the tegmina present no variations of specific importance. The coloration of the tegmina, e. g., var. *notata* Kirk.[3] is very variable in all localities from the islands above named. In some the patterns or blotches on the tegmina are from pallid to a dark brown, or these may be very dark at either the base, middle or apex. All these color forms, however, unless supported by structural characters, should not be considered of importance, as, were varieties erected on such, each island would present at least two or more color varieties and eventually there would be no limit to such kind of discrimination. On the other hand, an examination of the male genital organs, including dissection of the aedeagus, presents what may appear to be the only method by which the species can be separated. As a result of the material studied, the author has been able to recognize five distinct species, viz.: One each from Hawaii, Lanai and Maui, and two from Oahu. The aedeagus of the Hawaii and Oahu species, strange to say, resemble each other much more than do those from Maui and Lanai, notwithstanding that these two latter islands form part of the central, or intervening insular, connections between Oahu and Hawaii. The species from the two last named islands are apparently very much more closely allied to each other than those from either Maui or Lanai. Examples in identical regions

[1] Fauna Hawaiiensis, III, Part 2, 1902, p. 119.
[2] Proc. Haw. Ent. Soc., II, No. 2, 1909, p. 75.
[3] Proc. Haw. Ent. Soc., 1909, l. c., 75.

on each island vary in size, although it would appear that those from Hawaii (*perkinsi*) are in general slightly larger and longer than others. In the latter species the fossette of vertex appears smaller, and the median longitudinal carina dividing it into areolets is shorter than that seen in other island examples, but there is no doubt that a large amount of material would reveal variations in this respect.

The pygofer and genital organs of the male, including the aedeagus, are of much the same general form in all the species, and, with the exception of the aedeagus present, no differences of specific importance. The upper half of the periandrium is very membraneous, the thin membrane being more or less produced in front from the conjunctiva downwards, forming, as it were, a hood. This very membraneous structure (the phallus), together with the conjunctiva and the position of the functional orifice, are very complex and will, no doubt, need further anatomical study before these parts can be positively placed or properly described. Furthermore, the periandrium and the phallus are so closely amalgamated that it is not possible, without such study, to decide their limits. The large processes at the sides, which I have called the *"phallus hooks,"* may pertain either to the periandrium or to the phallus—most probably to the latter. This arrangement of the aedeagus differs from that of the Hawaiian species of *Oliarus*, the latter having a phallus differentiated from the periandrium. Later on, the careful dissection of the aedeagus from freshly captured specimens may fully elucidate these questions, as well as throw further light on other anatomical features. For the present, however, it will suffice to mention that the dissections of the aedeagus (from old specimens) when these are underboiled in caustic soda and later viewed under high power magnification, apparently disclose characters which may not be revealed in fully boiled examples and by the use of lower power objectives. The author, as a result of this, has noticed that in the Oahu and Hawaii examples the somewhat nebulous appearance of the membraneous phallus, as seen through the binocular, is due to very minute but conspicuous hair-like spines diffused over most of its surface. In the three species from these two islands the phallus in front appears oblong-oval, somewhat narrowed anteriorly, the center

being more or less longitudinally depressed, widest at the apex, and narrowest at the base, where the membrane forms a "funnel-like" opening which apparently is the functional orifice. In the Lanai examples this membraneous structure appears almost circular in shape, the anterior portion at the sides forming a rounded surface which narrows downwards to two-thirds of its diameter. The central depression of this species, posteriorly, occupies more than half of the membrane, the anterior edge forming a hood-like protection to the opening beneath, which latter, apparently, represents the functional orifice. The paucity of material for dissection and study from the island of Maui has prevented further anatomical investigation of the aedeagus of that species, but from examples previously dissected, and now viewed under the compound microscope, the marginal and other outlines of the phallus are fairly well seen. In this Maui species the phallus is elongate, much wider at the apex than at the base, the sides at the lower portion forming lobes which curve upwards until they meet the "hood-like" protection to the functional orifice, as in the Lanai species.

The aedeagus of the Lanai and Maui species are without the conspicuous hair-like spines which are associated with those from Oahu and Hawaii.

It is to be regretted that as yet no material of this genus has been collected from either Molokai or from the most northern island, Kauai. It would be particularly interesting to know whether or not the genus is represented on Kauai, as if it is not that fact might indicate that the ancestor of *Iolania* originated in this territory after Kauai had become separated from the rest of the archipelago. There is but little doubt that the genus occurs on Molokai, as it already does on the quite adjacent islands of Maui and Lanai, and that, in order to secure examples, it merely needs closer collecting on that island. On the other hand, although Kauai has produced a number of species of the genus *Oliarus,* and has lately been fairly well exploited for insects, no specimens of *Iolania* have as yet been taken there.

The author's general remarks under *Oliarus* as to magnification, dissections, mounts, figures of the genitalia, and the depository of types are also applicable to the small amount of material of this genus he has had at his command for examination and study.

In addition, however, he has to thank Mr. Muir for special assistance in interpreting the taxonomic studies of the genitalia. Acknowledgments are also due to the Bishop Museum and to Messrs. Perkins, Swezey and others for the loan of their collections, with permission to dissect.

Description of Male Genitalia of Species.

(1) **Iolania perkinsi** Kirk. Plate VIII, Fig. 134.
Fauna Hawaiiensis, III, Part 2, 1902, p. 119.
Proc. Haw. Ent. Soc., II, No. 2, 1909, p. 75.

Aedeagus. The base of the periandrium on the ventral side and the phallus on its whole dorsal surface diffused with minute, but conspicuous spines.* The "phallus hooks" or chitinized side processes wide throughout their length, their inner and outer margins more or less sinuate, terminating gradually to a point.

Hab. Described from the dissections of thirteen examples, selected from series collected in widely distributed regions at various elevations in East and West Hawaii, as follows: One each from Olaa, 1500 feet, November, 1896 (Perkins), No. 635; Kilauea, 4000 feet, August, 1895 (Perkins), No. 568; "Twenty-nine Miles" Olaa, 3800 feet, October, 1916, "Twenty-five Miles" Olaa, 3000 feet, September, 1917, South Kona Road, 1600 feet, August, 1917, Glenwood Olaa, 2300 feet, September, 1917, Crater Road, Kilauea, June, 1918, and Middle Puna, 750 feet, August, 1918 (Giffard); Kohala Mountains, May, 1917, Kaiwiki (above Hilo), September, 1918, and Kaumana (above Hilo), April, 1920 (Swezey); Kealakakua, Kona, 3000 feet, August, 1919 (Timberlake); "Twenty-three Miles" Olaa, 2300 feet, September, 1919 (Fullaway).

Obs. Kirkaldy's type in the British Museum is a male specimen labelled No. 691 (i. e., Kilauea, Hawaii, July, 1895, Perkins Coll.). Among the series not above enumerated there

* Best viewed through the compound microscope with high power objective.

are a few males and a number of females in the Bishop Museum material, some being part of the Kirkaldy material (in more or less bad condition) and some collected by Perkins, Swezey, Giffard, Bryan, and others. The most of these latter are female specimens. The type of var. *notata* Kirk. was not found in either museum. I am informed by Dr. Perkins that an Olaa example was used for the figure in the Fauna Hawaiiensis.

(2) **Iolania oahuensis** sp. nov. Plate VIII, Fig. 138.

Aedeagus. Very closely allied to *perkinsi*, differing mainly in that the phallus hooks are less wide throughout their length than in that species, and that the sinuated inner margins terminate *abruptly* to a point. The minute spines on the phallus and at the base of the periandrium on the ventral side are also much more conspicuous and more numerous than in the preceding.

Hab. Described from the dissections of thirteen examples selected from a series collected in widely distributed regions on both mountain ranges on the island of Oahu, as follows: Two from Palolo, 1800 feet, August, 1906; one each from Manoa Cliffs, October, 1919, Tantalus, 1300 feet, October 1905 (Giffard); one each from Kaumuohona, 2500 feet, March, 1912, Kuliouou, June, 1916, Kaala Mountains, July, 1916 (Swezey); two from Olympus, 2500 feet, January, 1912 (Fullaway); two from Cook Trail, March, 1916 and 1917 (Timberlake); one each from Wahiawa (Swezey), and Waiahole, August, 1916 (Timberlake). I have selected a Palolo example as the type.

Obs. Because the aedeagus is superficially close to that of *perkinsi*, I have hesitated erecting this species. The fact, however, that the differences above described are constant in these Oahu forms leads me to believe that the two should be separated.

(3) **Iolania koolauensis** sp. nov. Plate VIII, Figs. 141, 142.

Aedeagus. In this species the apodeme of phallus is largely produced beyond the conjunctiva, which readily distinguishes it from its allies, *perkinsi* and *oahuensis*. The "phallus hooks" terminate gradually to a point as in *perkinsi*, and in this respect do not follow those of *oahuensis*. The form of the genital styles, apically, is much less rounded and stouter than in the two species above named.

Hab. Described from the dissections of six examples collected by O. H. Swezey, in the northwest Koolau region of

the island of Oahu, as follows: Waiahole, August 13, 1916, one specimen; Punaluu, June, 1911, and August, 1914, three specimens; Opaeula, April, 1921, two specimens. The type specimen is from Waiahole.

Obs. This species appears to be local to the windward side of the northwest Koolau Mountain range. I have not come across it among examples studied from the leeside, but it is most probably there, as well as on the Waianae range. On the other hand, the example of *oahuensis*, labelled Waiahole, August 13, 1916, by Timberlake, was captured on the same day and in the same locality as Swezey's example of *koolauensis*.

(4) **Iolania mauiensis** sp. nov. Plate VIII, Fig. 135.

Aedeagus. In this species the "phallus hooks" have their inner margins concave and the outer margins convex, narrow at base, and much wider near apex, where they terminate very abruptly in an acute point. The minute spines at the base of the periandrium and on the phallus are conspicuous by their absence in this species. The genital styles in this and the following are much more rounded apically and less stout than in the three preceding species.

Hab. Described from the dissections of two examples collected at Waialuaiki and Waialuanui, Maui, February to March, 1920, by E. H. Bryan and from the dissection of one example collected by P. H. Timberlake in Keanae Valley, Maui, July, 1919. These regions are situated on the windward side of Mount Haleakala. I have not had specimens from lower elevations on this island to examine. I have selected the Waialuaiki specimen as the type.

Obs. The aedeagus of this species is much smaller than either of the preceding, and the structure of the "phallus hooks" is altogether different, resembling no other thus far examined.

(5) **Iolania lanaiensis** sp. nov. Plate VIII, Fig. 136.

Aedeagus. Inner margins of "phallus hooks" concave, sinuate, widest at their basal two-thirds, and gradually narrowing to a point. Outer margin convex or nearly so. Like *mauiensis*, this species is devoid of minute spines at base of periandrium and on the surface of the phallus.

Hab. Described from the dissections of seven examples selected from a large series in the author's collection which

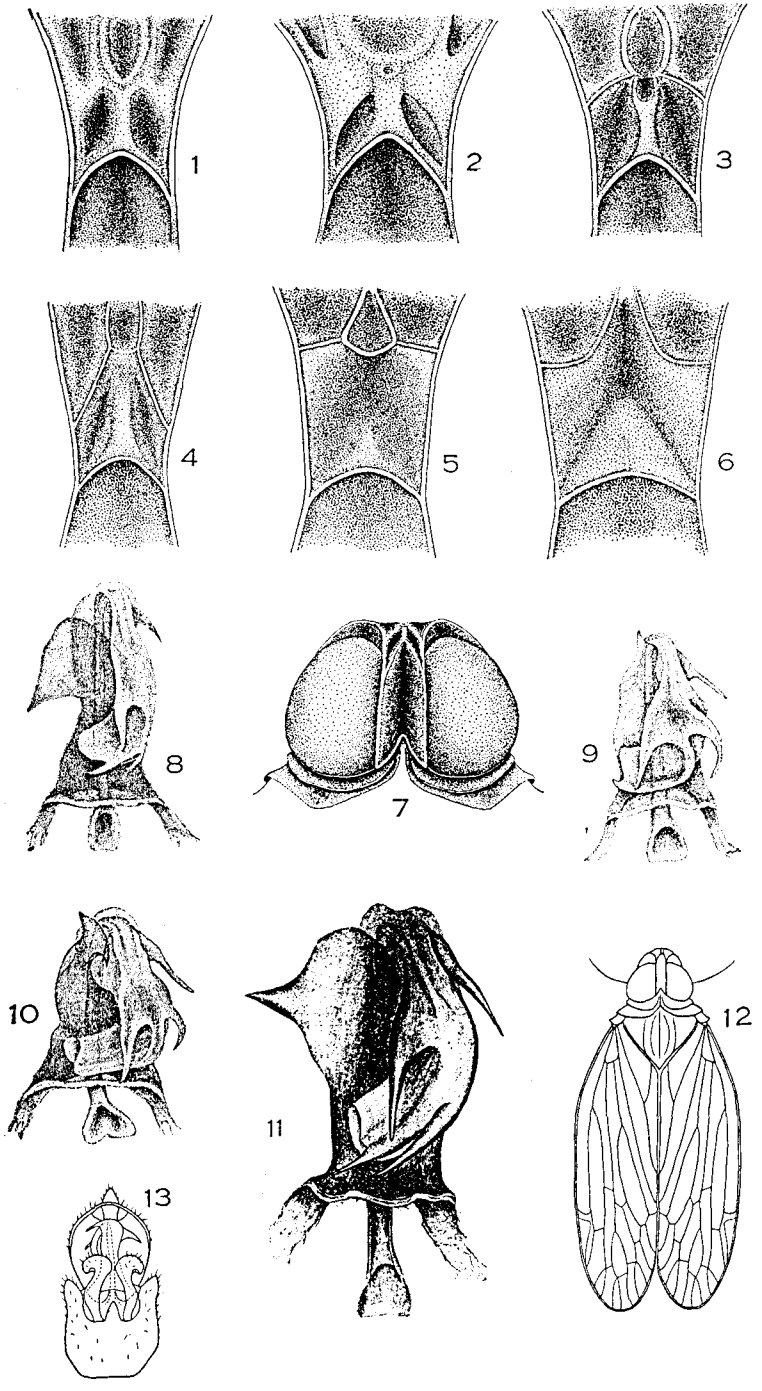
were collected in several localities in the mountain district of the island of Lanai. The type specimen selected is labelled 3000 feet elevation, December 18, 1916.

Obs. The aedeagus of this species is quite small, and the "phallus hooks" quite different in structure from any of the preceding. In the large series examined there are the usual two or more color variations of the tegmina with their intermediates. One or more fragments of specimens labelled from Lanai and collected by Dr. Perkins, which were in the Bishop Museum collections, are not recognizable, having been badly damaged at some time in the past.

PLATE I.

[Note: Unless otherwise designated, all figures are males.]

1. *Oliarus tantalus.* Fossette and base of frons (*Division B.*)
2. *Oliarus koanoa.* Fossette and base of frons (*Division B.*)
3. *Oliarus nubigenus.* Fossette and base of frons (*Division C.*)
4. *Oliarus immaculatus.* Fossette and base of frons (*Division D.*)
5. *Oliarus hevaheva.* Fossette and base of frons (*Division E.*)
6. *Oliarus kulanus.* Fossette and base of frons (*Division E.*)
7. *Oliarus swezeyi.* Vertex, fossette, and base of frons (*Division A.*)
8. *Oliarus nubigenus.* Dorsal view of aedeagus.
9. *Oliarus acaciae.* Dorsal view of aedeagus.
10. *Oliarus opuna.* Dorsal view of aedeagus.
11. *Oliarus tamehamcha.* Dorsal view of aedeagus.
12. *Oliarus myoporicola.* Dorsal view.
13. *Oliarus myoporicola.* Ventral view of pygofer, anal section and genitalia.



Hawaiian Cixiidae.

PLATE II.

14. *Oliarus acaciae.* Dorsal view of aedeagus showing:

a, periandrium; *a1*, apex of periandrium; *a2*, base of periandrium; *a3*, side margin of periandrium; *a4*, *a5*, *a6*, membraneous portion of periandrium; *b*, phallus (more or less chitinized); *b1*, apical portion of phallus (mostly thin membrane); *b2*, basal portion of phallus; *c* and *c1*, apodeme of phallus; *d*, entrance of ejaculatory duct (duct may be attached by thin membrane to apodeme ?); *e*, conjunctiva; *f*, functional orifice; *g*, basal spur of phallus attached to membrane (behind); *h*, left median spur; *i*, right median spur; *j*, right apical spur.

15. *Oliarus swezeyi.* Dorsal view of head showing:

a, vertex (which includes fossette); *b*, basal angles of vertex; *b1*, base of vertex; *c*, lateral carina of vertex; *d*, transverse carina of vertex; *e*, apical carina of vertex; *f*, median longitudinal carina of fossette; *g*, areolet (divided fossette); *h*, upper part of gena; *i*, eye.

16. *Oliarus euphorbiae.* View of frons and clypeus showing:

a, frons; *a1*, lateral carina of frons; *a2*, medio-frontal carina; *a3*, fork of medio-frontal carina; *a4*, areolet of fork; *b*, fenestre; *c*, median ocellus; *d*, fronto-clypeal suture (apex of frons and base of clypeus); *e*, macula; *f*, clypeus; *g*, median carina of clypeus; *g1*, lateral carina of clypeus; *h*, fossette of vertex; *i*, apex of vertex; *j*, transverse carina of vertex.

17. *Oliarus walkeri* Stål. ♀ Dorsal view of head.
18. *Oliarus walkeri* Stål. ♀ Lateral view of head.
19. *Oliarus muiri.* Dorsal view of aedeagus.
20. *Oliarus muiri.* Lateral view of aedeagus.
21. *Oliarus muiri.* Lateral view of head.
22. *Oliarus swezeyi.* Dorsal view of aedeagus, slightly tilted dextrad.
23. *Oliarus swezeyi.* Dorsal view of aedeagus, tilted sinistrad.
24. *Oliarus swezeyi.* Lateral view of aedeagus from the left.
25. *Oliarus swezeyi.* Lateral view of aedeagus from the right; *a*, ventral surface of periandrium in profile.
26. *Oliarus swezeyi.* Lateral view of head.

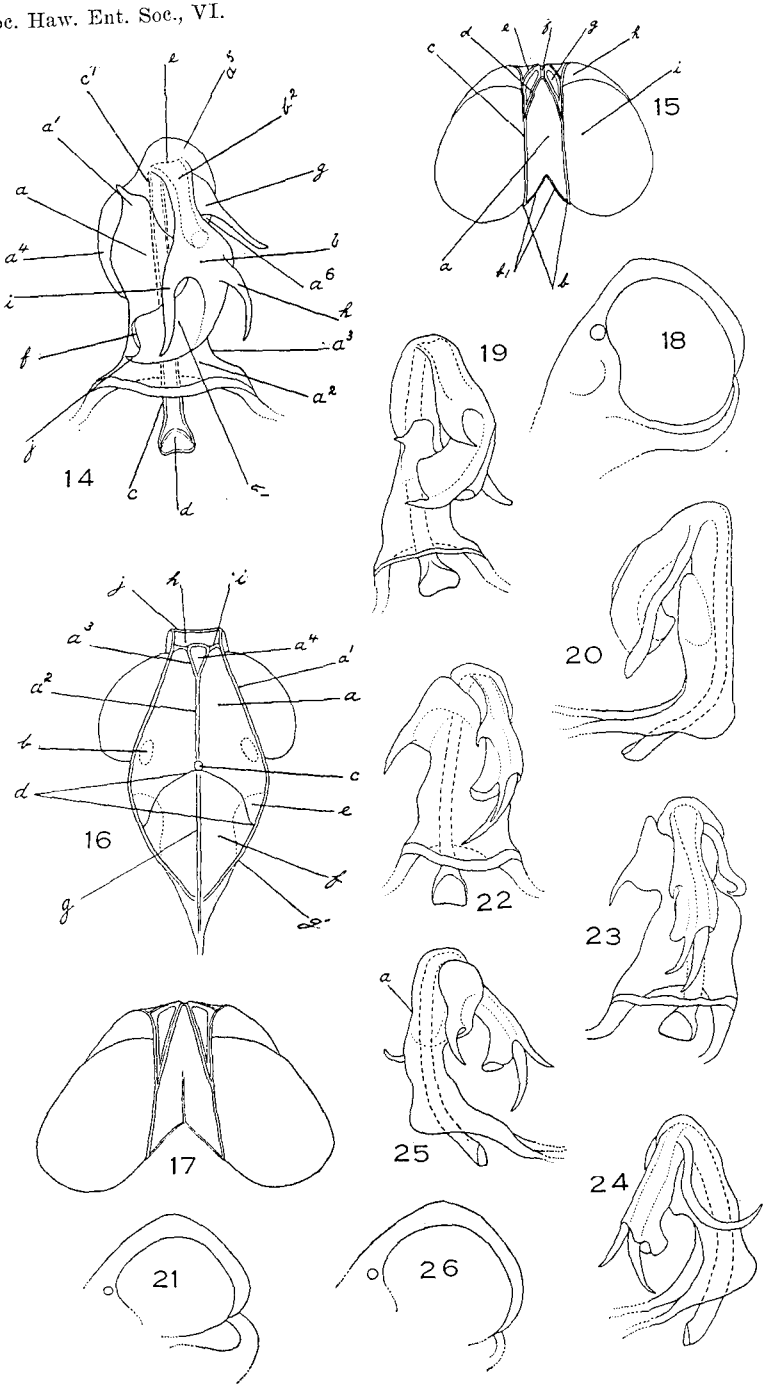


PLATE III.

27. *Oliarus kaiulani.* Dorsal view of aedeagus.
28. *Oliarus kaiulani.* Ventral surface of periandrium in profile.
29. *Oliarus kaiulani* var. Dorsal view of aedeagus.
30. *Oliarus kaiulani* var. Lateral view of periandrium.
31. *Oliarus kirkaldyi.* Right genital style (three-fourths lateral).
32. *Oliarus tantalus.* Dorsal view of aedeagus.
33. *Oliarus tantalus.* Lateral view of aedeagus.
34. *Oliarus koanoa.* Dorsal view of aedeagus.
35. *Oliarus koanoa.* Ventral surface of periandrium in profile.
36. *Oliarus kirkaldyi.* Right genital style (rear side).
37. *Oliarus myoporicola.* Dorsal view of aedeagus.
38. *Oliarus myoporicola.* Ventral surface of periandrium in profile.
39. *Oliarus wailupensis.* Dorsal view of aedeagus.
40. *Oliarus wailupensis.* Ventral surface of periandrium in profile.
41. *Oliarus discrepans.* ♀ Lateral view of head.
42. *Oliarus kaumuahona.* Dorsal view of aedeagus.
43. *Oliarus kamuahona.* Ventral surface of periandrium in profile.
44. *Oliarus myoporicola.* Apodeme of genital styles (note abnormal tumid projection).
45. *Oliarus kirkaldyi.* Dorsal view of aedeagus.
46. *Oliarus kirkaldyi.* Ventral surface of periandrium in profile.
47. *Oliarus kirkaldyi.* Dorsal view of head.
48. *Oliarus discrepans.* ♀ Dorsal view of head.
49. *Oliarus kirkaldyi.* Right genital style (front side).

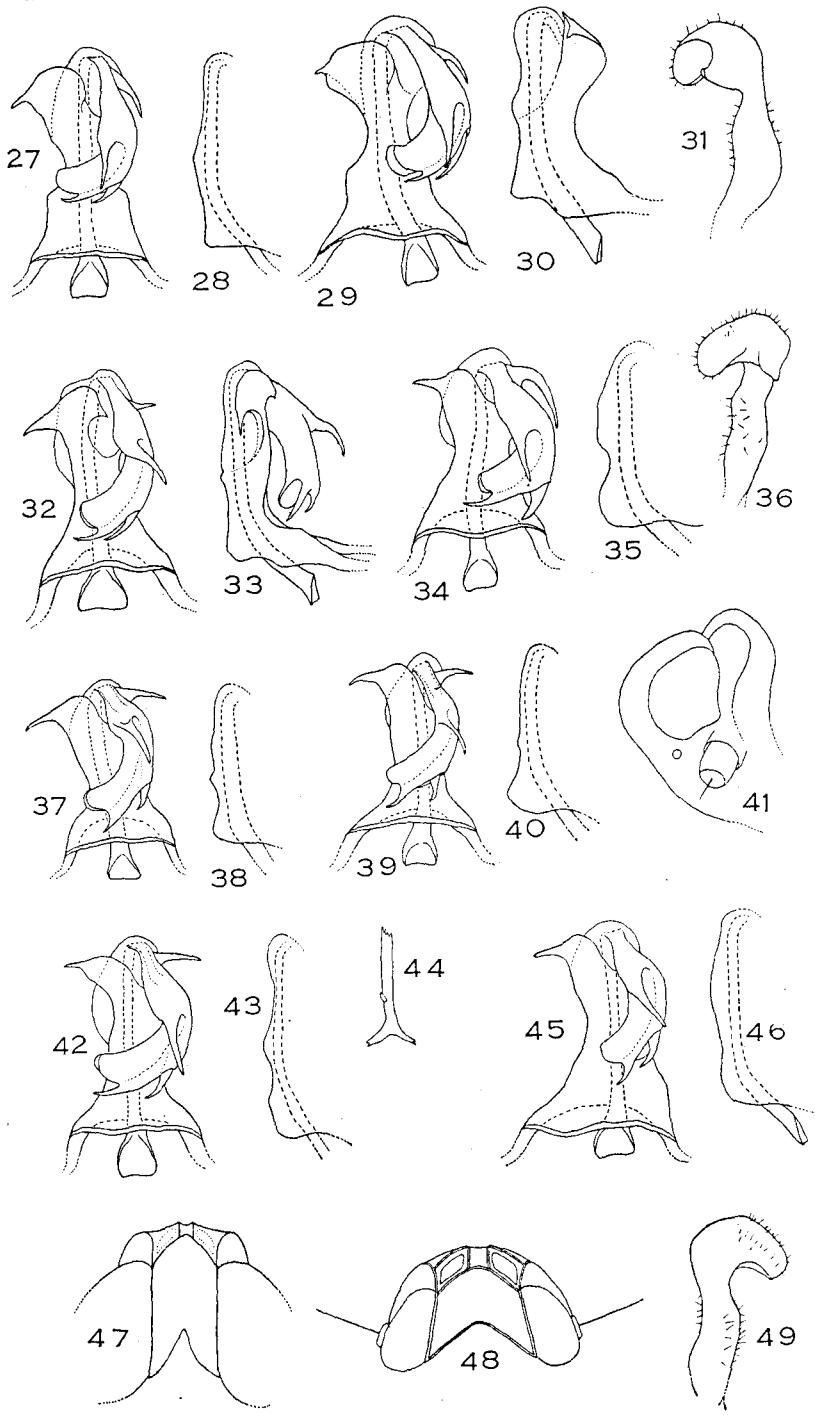


PLATE IV.

50. *Oliarus tamehameha.* Lateral view of head.
51. *Oliarus tamehameha.* Ventral surface of periandrium in profile.
52. *Oliarus nubigenus.* Dorsal view of aedeagus.
53. *Oliarus nubigenus.* Ventral surface of periandrium in profile.
54. *Oliarus makaala.* Dorsal view of aedeagus.
55. *Oliarus makaala.* Ventral surface of periandrium in profile.
56. *Oliarus pele.* Dorsal view of aedeagus.
57. *Oliarus pele.* Ventral surface of periandrium in profile.
58. *Oliarus likelike.* Dorsal view of aedeagus.
59. *Oliarus likelike.* Ventral surface of periandrium in profile.
60. *Oliarus immaculatus.* Dorsal view of aedeagus.
61. *Oliarus kaonohi.* Dorsal view of aedeagus.
62. *Oliarus kaonohi.* Ventral surface of periandrium in profile.
63. *Oliarus filicicola.* Dorsal view of aedeagus.
64. *Oliarus filicicola.* Ventral surface of periandrium in profile.
65. *Oliarus immaculatus.* Lateral view of aedeagus.
66. *Oliarus neotarai.* Dorsal view of aedeagus.
67. *Oliarus neotarai.* Ventral surface of periandrium in profile.
68. *Oliarus halehaku.* Dorsal view of aedeagus.
69. *Oliarus halehaku.* Ventral surface of periandrium in profile.
70. *Oliarus koele.* Dorsal view of aedeagus.
71. *Oliarus koele.* Ventral surface of periandrium in profile.

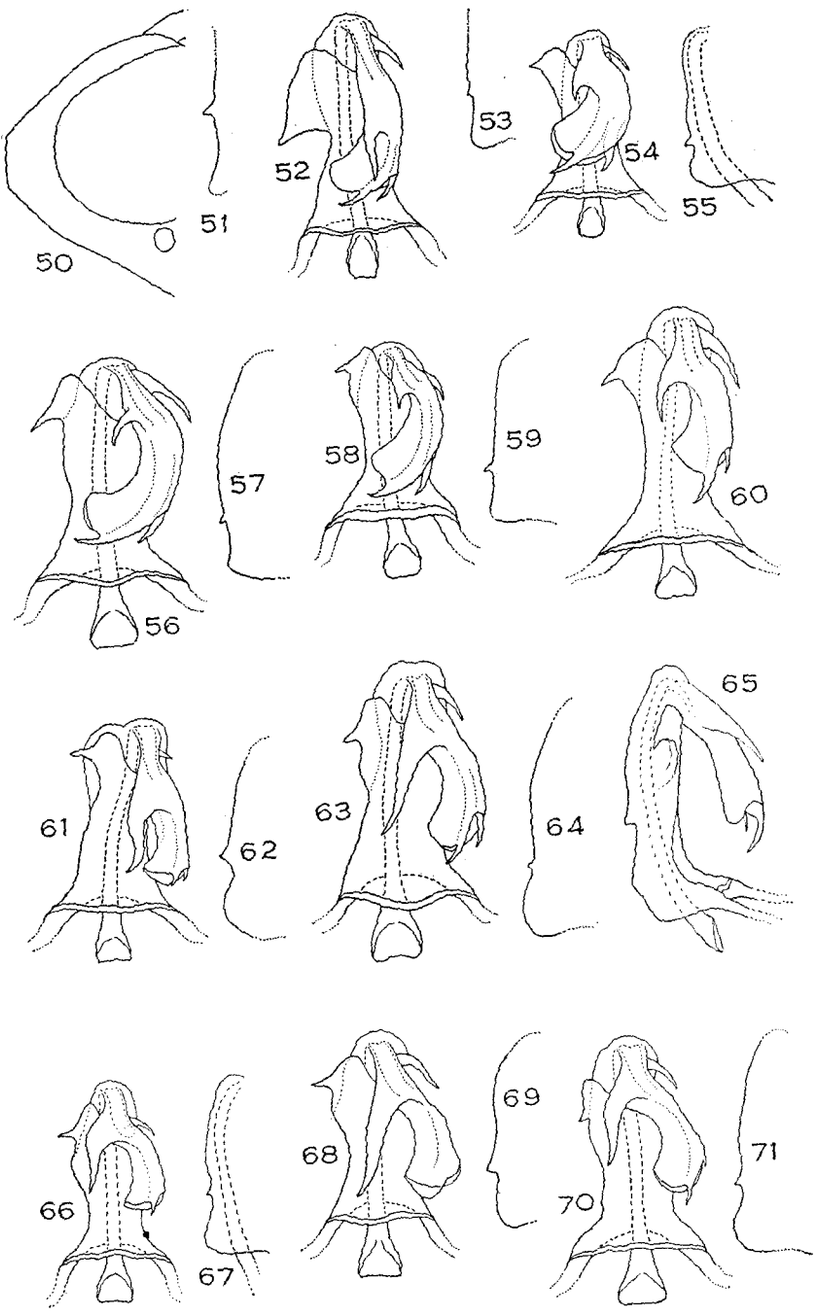
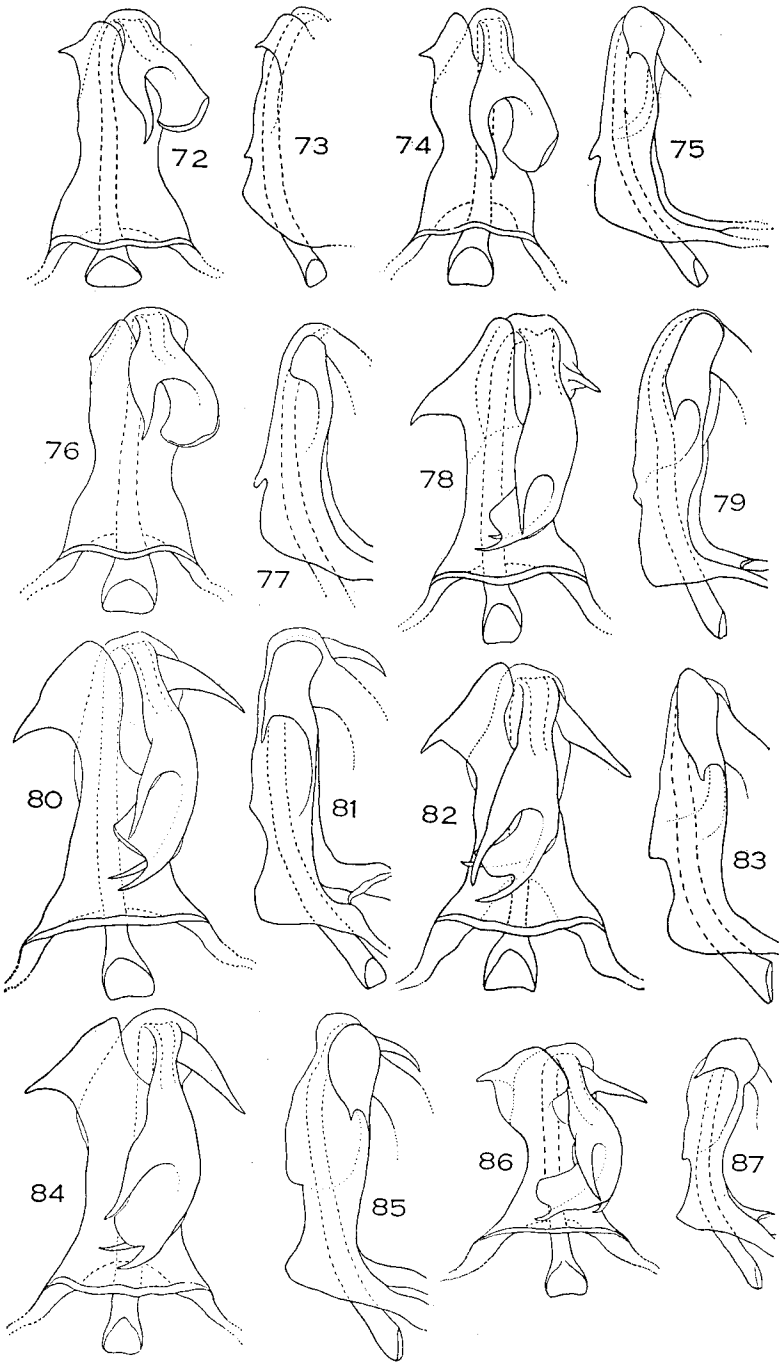


PLATE V.

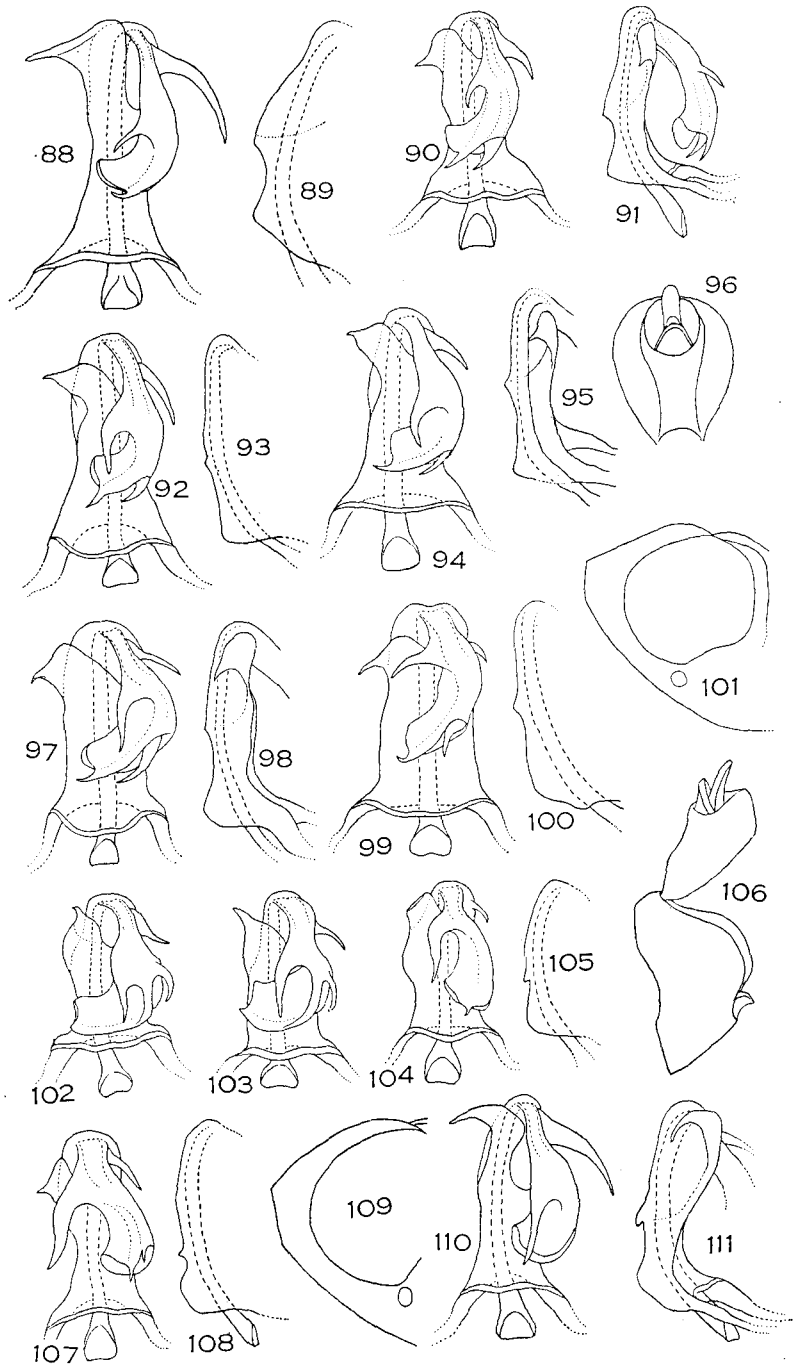
72. *Oliarus tarai.* Dorsal view of aedeagus.
73. *Oliarus tarai.* Ventral surface of periandrium in profile, slightly tilted to right.
74. *Oliarus tarai* var. Dorsal view of aedeagus.
75. *Oliarus tarai* var. Lateral view of periandrium.
76. *Oliarus morai.* Dorsal view of aedeagus.
77. *Oliarus morai.* Lateral view of periandrium.
78. *Oliarus olympus.* Dorsal view of aedeagus.
79. *Oliarus olympus.* Lateral view of periandrium.
80. *Oliarus lanaiensis.* Dorsal view of aedeagus.
81. *Oliarus lanaiensis.* Lateral view of periandrium.
82. *Oliarus haleakalae.* Dorsal view of aedeagus.
83. *Oliarus haleakalae.* Lateral view of periandrium.
84. *Oliarus hevaheva.* Dorsal view of aedeagus.
85. *Oliarus hevaheva.* Lateral view of periandrium.
86. *Oliarus montanus.* Dorsal view of aedeagus. (See Figure 125.)
87. *Oliarus montanus.* Lateral view of periandrium.



Hawaiian Cixiidae.

PLATE VI.

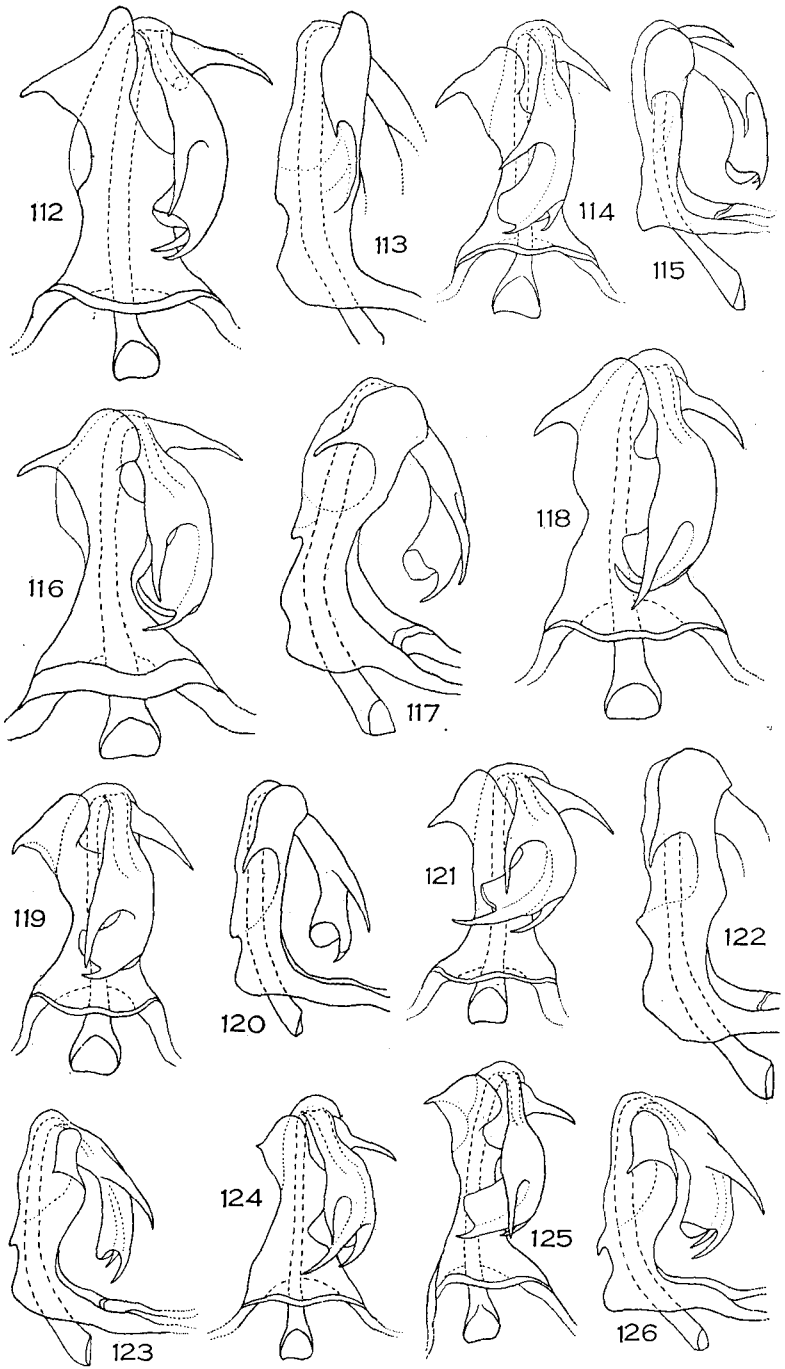
88. *Oliarus niger.* Dorsal view of aedeagus.
89. *Oliarus niger.* Ventral surface of periandrium in profile.
90. *Oliarus kauaicnsis.* Dorsal view of aedeagus.
91. *Oliarus kauaicnsis.* Lateral view of aedeagus.
92. *Oliarus waialeale.* Dorsal view of aedeagus.
93. *Oliarus waialeale.* Ventral surface of periandrium in profile.
94. *Oliarus lihue.* Dorsal view of aedeagus.
95. *Oliarus lihue.* Lateral view of periandrium.
96. *Oliarus niger.* Dorsal view of anal segment.
97. *Oliarus silvestris.* Dorsal view of aedeagus.
98. *Oliarus silvestris.* Lateral view of periandrium.
99. *Oliarus halemanu.* Dorsal view of aedeagus.
100. *Oliarus halemanu.* Ventral surface of periandrium in profile.
101. *Oliarus silvestris.* Lateral view of head.
102. *Oliarus euphorbiae.* Dorsal view of aedeagus.
103. *Oliarus koae.* Dorsal view of aedeagus.
104. *Oliarus albatus.* Dorsal view of aedeagus.
105. *Oliarus albatus.* Ventral surface of periandrium in profile.
106. *Oliarus immaculatus.* Lateral view of pygofer and anal segment.
107. *Oliarus agnatus.* Dorsal view of aedeagus.
108. *Oliarus agnatus.* Ventral surface of periandrium in profile.
109. *Oliarus olympus.* Lateral view of head.
110. *Oliarus inaequalis.* Dorsal view of aedeagus.
111. *Oliarus inaequalis.* Lateral view of periandrium.



Hawaiian Cixiidae.

PLATE VII.

112. *Oliarus mauiensis.* Dorsal view of aedeagus.
113. *Oliarus mauiensis.* Lateral view of periandrium.
114. *Oliarus kanakanus.* Dorsal view of aedeagus.
115. *Oliarus kanakanus.* Lateral view of aedeagus.
116. *Oliarus kahavalu.* Dorsal view of aedeagus.
117. *Oliarus kahavalu.* Lateral view of aedeagus.
118. *Oliarus kulanus.* Dorsal view of aedeagus.
119. *Oliarus kaohinani.* Dorsal view of aedeagus.
120. *Oliarus kaohinani.* Lateral view of aedeagus (smaller specimen).
121. *Oliarus intermedius.* Dorsal view of aedeagus.
122. *Oliarus kulanus.* Lateral view of periandrium.
123. *Oliarus consimilis.* Lateral view of aedeagus.
124. *Oliarus consimilis.* Dorsal view of aedeagus.
125. *Oliarus montanus.* Dorsal view of aedeagus slightly dextrad. (See Figure 86.)
126. *Oliarus intermedius.* Lateral view of aedeagus.



Hawaiian Cixiidae.

PLATE VIII.

127. *Oliarus similis.* Dorsal view of aedeagus.
128. *Oliarus similis.* Lateral view of aedeagus.
129. *Oliarus instabilis.* Dorsal view of aedeagus.
130. *Oliarus instabilis.* Lateral view of aedeagus.
131. *Oliarus instabilis* var. f. Dorsal view of aedeagus.
132. *Oliarus inconstans.* Dorsal view of aedeagus.
133. *Oliarus inconstans.* Ventral surface of periandrium in profile.
134. *Iolania perkinsi.* Dorsal view of aedeagus.
135. *Iolania mauiensis.* Dorsal view of aedeagus.
136. *Iolania lanaiensis.* Dorsal view of aedeagus.
137. *Oliarus instabilis.* Lateral view of head (typical).
138. *Iolania oahuensis.* Dorsal view of aedeagus.
139. *Oliarus agnatus.* Lateral view of head.
140. *Oliarus filicicola.* Lateral view of head.
141. *Iolania koolauensis.* Dorsal view of aedeagus.
142. *Iolania koolauensis.* Lateral view of aedeagus.

