



The curse of invasive social insects

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Invasive insects represent dangerous threats to the delicate balance of natural ecosystems. Introduced insects can disrupt or exterminate native taxa (Bellard et al. 2016; Doherty et al. 2016). They also have severe effects on human food supplies and economies, costing billions of US dollars each year (Bradshaw et al. 2016). Unfortunately, the problems associated with invasive insects are only getting worse. Increased movement and trade coupled with effects of climate change are expected to provide new opportunities for non-native insects to invade new environments (Bertelsmeier 2021; Menzel and Feldmeyer 2021).

Social insects are notoriously destructive and problematic invaders (Hunt and Goodisman 2021). For instance, the dispersion of invasive Kalotermitidae and Rhinotermitidae termites has caused significant damage in countries across the globe (Evans et al. 2013). Tramp ant species, such as *Solenopsis invicta* and *Linepithema humile*, have also made their way around the world and represent ecological disasters to native environments (Holway et al. 2002). Invasive Vespidae social wasps are dangerous threats to ecosystems, and to humans who happen to disturb their aggressively defended nests (Wilson-Rankin 2021). Moreover, recent research has found that invasive social insects are very difficult to eliminate once they become ensconced in a new habitat.

In this issue, Howse et al. (2023) present evidence that social insects are more difficult to eradicate from newly invaded habitats than non-social insects. Complete elimination of an invasive species is difficult even under the best of circumstances. For example, eradication programs work best if the target species is easily detectable and has been in residence for only a limited amount of time. In addition, Howse et al. investigated whether ‘sociality’ may be a factor that affects the success of eradication attempts.

Howse et al. conducted a careful review of prior attempts at eradicating introduced arthropod pests. They considered a total of 227 reports of arthropod eradication attempts and then determined if ‘sociality’ was correlated with the success of eradication. Overall, Howse et al. found that eradication attempts succeeded ~75% of the time. This is a remarkably high success rate and offers hope that arthropod invaders can be eliminated at least some of the time.

However, eradication attempts were significantly less likely to succeed if the targets were social insects. Howse et al. found that eradication programs aimed at eliminating social arthropods had almost 80% lower odds of succeeding than eradication attempts aimed at eliminating non-social arthropods. Thus, social insects are particularly difficult to eliminate when they become entrenched in a new habitat. The authors also uncovered other interesting trends related to the eradication of invasive social insect pests. For example, eradication of social insect invaders from island habitats was much more likely to be successful than eradication from non-island habitats.

Overall, Howse et al. show that the introduction of a social insect propagule to a new habitat may start a ‘generational curse’, whereby the pioneering individuals will ultimately develop into a permanent population. The new invasive social insect population may forever alter the ecological landscape and the associated flora and fauna therein. Many investigators have considered why social insects are such damaging invaders and, consequently, so difficult to eliminate once they arrive in a new habitat (Manfredini et al. 2019). Howse et al. review some of these ideas and report that social insects may be better at handling environmental variation than non-social insects. In addition, social insects may also enjoy benefits by virtue of their greater reproductive capacity and buffering of environmental perturbations through their colonial lifestyle. Howse et al. also discuss a variety of other broader biological and political reasons why eradication attempts may fail. They conclude that to “substantially increase the success of future eradication attempts both technical and societal aspects of those attempts must be considered jointly”. The societal aspects they discuss

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include garnering adequate political and financial support for continuing the often-lengthy eradication programs. Otherwise, social insect invaders are likely to continue their march around the world and become permanent members of their newly invaded communities.

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