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Foraging in invasive species: evading the limitations of polydomy

Elva Robinson

Unicoloniality is characteristic of invasive ant species: in these species, colonies spread across many socially connected nests. Forming new, connected nests provides a low risk way to enter new territory, but splitting between multiple nests (polydomy) also impacts the way colonies forage. Polydomous colonies must trade-off the number of nests with the size of each nest. We developed a model of how colony success relates to the food environment under different forms of social organisation (from monodomy to extreme polydomy). The model predicts a potential cost of polydomy: constraints on exploitation of large resources. This is because in highly polydomous colonies, there is a limited pool of workers in each nest from which foragers can recruit. Empirically testing the predictions of this model, we show two ways in which successful invasive species can use their polydomous nest networks to evade this constraint. Firstly, we use data from radio-tagged foraging Pharaoh's ants (*Monomorium pharaonis*) to show very rapid cross-communication between nests during active foraging. Traditionally, in studies of ant foraging, we think of ants passing back and forth between their nest and the food. Our results challenge this 'linear' idea of ant foraging, suggesting that foraging and the redistribution of information or resources between nests can be concurrent processes. Secondly, the formation of a polydomous trail network is flexible and responsive to the environment. We show that yellow crazy ants (*Anoplolepis gracilipes*) spread into new areas by building networks centred around sources of food. These mechanisms allow invasive species to evade the limitations of the nest-number nest-size trade-off by forming large numbers of small nests, but maintaining rapid and effective communication between neighbouring nests, and siting them responsively in relation to the environment. Understanding the behaviours involved in the success of invasive species is essential for informing their control.