

non-invasive supercolonies can tell us about the evolutionary future of invasive supercolonies.

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The paradox of supercolonies in ant invasions

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The evolution of advanced eusocial insect colonies is based on kin-selected benefits from helping close relatives. Consequently, most ant, bee, wasp, and termite colonies are well-defined families competing against other such families. However, some ants seem to have secondarily abandoned the inclusive fitness laws of evolution to form large networks of interconnected nests whose individuals are unrelated but fail to show territorial aggression. This can lead to the emergence of massive supercolonies that may extend over hundreds or even thousands of kilometres as seen in the most successful and problematic species of invasive ants. The iconic pest species is the Argentine ant *Linepithema humile* that I will use to demonstrate the life-history characteristics that appear to define supercolony-forming ants, and to argue that supercoloniality is a distinct category of social organisation. However, recent studies in our group on other important pest species indicate that supercolonies may not always be as standardised as previously thought. The Pharaoh's ant *Monomorium pharaonis* has genetically extremely divergent colonies, even over a small spatial scale, suggesting that this species has efficient mechanisms to keep lineages of colonies separate. Nevertheless, after a brief initial aggression period, most colonies fuse readily in the laboratory. In contrast, the common red ant *Myrmica rubra* often forms populations with a mix of different colony types where local supercolonies may depend on recruiting new queens from isolated family-based colonies, and these may in turn expand to new supercolonies. These complexities suggest that there may be more than a single evolutionary route to the paradoxical state of supercoloniality. Importantly, the existence of alternative routes implies that the constraints from limited genetic diversity and dispersal faced by the 'standard' supercolony can be overcome, likely leading to increased invasiveness of supercolonial species.