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INSIDE JEB

Wings make queens of Indian jumping ants

A queen Indian jumping ant (*Harpegnathos saltator*) whose wings have been removed (bottom) and a worker (top). Photo credit: Jürgen Liebig.

Families are complicated – ask any ant. Embarking on a new life, the females of many ant species take to the wing before establishing themselves as queen of their own colony populated with their worker offspring, which provide care and labour. But these hierarchical divisions are not so clear cut in all ant species. 'The association of some behaviours with the queen and others with the worker morph is not universal', says Benjamin Pyenson from Arizona State University, USA, explaining that Indian jumping ant (*Harpegnathos saltator*) queens can take on roles usually associated with workers, while the workers are also capable of producing eggs – usually the preserve of ant queens – in specific situations. Pyenson, Christopher Albin-Brooks and Jürgen Liebig, also from Arizona State University, wondered whether the loss of the queen's wings might have something to do with their ability to straddle the boundaries that usually differentiate queens from their worker offspring.

However, as Indian jumping ant founding queens naturally perform many of the duties of workers – foraging and caring for brood and defending the nest – simply monitoring the caring responsibilities of the queen ants after they had lost their wings was not going to be sufficient to determine whether wingless queens transition to behaving like workers. Fortunately, winged queens never duel with workers to establish where they reside in the colony's two-tier hierarchy, whereas wingless queens do. So, Pyenson, Albin-Brooks and Corinne Burhyte (Arizona State University), set out to discover whether queen ants that had lost their wings tussled more with their colony mates than queens that still had their wings. Sure enough, after watching hours of ant interactions, the researchers saw that queens that had naturally shed their wings duelled more than winged queens and Pyenson says, 'One clue that the queen and worker ants might not be all that different was that the stings I received from both of them seemed equally painful!'. In addition, all the colony residents duelled more when the researchers removed some queen's wings.

The team also kept track of the fertility of several queens, discovering that the wingless queens produced fewer yolky eggs – which could go on to produce young. The wingless queens were becoming more like worker ants, losing their fertility. Also, some of the females whose wings had been removed by the scientists mated with males from their own colony, something that winged and naturally wingless queens never do, to avoid inbreeding and ensure that they find new nests with unrelated males. Finally, the researchers checked the oily waterproof coating covering the ants' exterior to find out how appealing the winged and wingless queens smelled to mates, as winged females produce more alluring oily scents to attract males. However, 2 months after losing their wings, the now flightless females had lost their attractive aroma. Without wings, Indian jumping ant queen ants shift to behaving like workers and their bodies also adjust to become more worker-like.

The discovery that Indian jumping ant workers and queens are equally capable of taking on each other's roles could help scientists understand how the sophisticated hierarchical colony structures favoured by other ant species have evolved. 'Our results tell us that the ant queen's ability to fly away from the nest probably evolved before the ability to lay a lot of eggs, because in some species the workers can also lay eggs and the queens and workers are similar sizes', Pyenson explains.

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