

Crazy Ant-scale associations on Christmas Island, Indian Ocean: Scaling Ant Invasion Upward

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Ants are acknowledged as among the most potent invaders, and some repeatedly become pests of natural environments, often leading to ecosystem degradation and loss of native species. Invasive ants form close associations with honeydew-producing homopterans, which may be key to ant population build-up and impacts. Nowhere is this better illustrated than on Christmas Island where supercolony formation of the introduced yellow crazy ant (*Anoplolepis gracilipes*) is associated with increased populations of the cryptogenic lac scale insect (*Tachardina aurantiaca*). This mutualism is a forest-wide phenomenon, and both the study and analysis of this association at an appropriate spatial scale can be difficult but may be critical to understanding invasion dynamics and management options. Mutualisms occur across a range of 'strengths', or a continuum of just how dependent each mutualist is upon the other partner for survival. I was interested in understanding the 'strength' of the mutualism between *Anoplolepis gracilipes* and *Tachardina aurantiaca* at a relatively large scale – in the canopy of Tahitian Chestnut (*Inocarpus fagifer*) on Christmas Island, for incorporation into future supercolony management strategies.

I used a before-after, control-impact design to experimentally assess the effects of crazy ants on scale insect populations on a forest-wide scale by dissolution of their association in canopy trees. Ants were eliminated from forest plots by broadcasting toxic bait on the forest floor. Within 11 weeks, baiting had reduced ant activity on ground and on trunks by 98-100%, while control plot ant activity remained unchanged. Following ant exclusion, adult scale insects declined by 62% in 11 weeks, and 100% in 12 months with no difference in control plot scale numbers. Furthermore, the elimination of ants reduced the dispersal of mobile scale crawlers from the canopy by 98% in 11 weeks, and 100% in 12 months. The strength of the mutualism between crazy ants and the lac scale on Christmas Island was proven to be such that 12 months after ant exclusion, scale populations collapsed.

This disruption to the mutualism between crazy ants and scale insects on Christmas Island means good news for the prevention of further supercolony expansion and formation in uninvaded rainforest, decimation of red crabs and further dieback of the rainforest canopy through the deleterious effects of scale insects.



photo by Mike Piper (FOX studios, NZ)