Assessing impacts of yellow crazy ants on nesting seabirds

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The yellow crazy ant *Anoplolepis gracilipes* is a highly invasive ant species widespread through the tropical Pacific. Impacts of yellow crazy ants on a number of seabird colonies have been documented, but the traits that lead to seabird susceptibility are not well described. Understanding what seabird traits increase vulnerability to yellow crazy ants is important in order to better predict which seabird species may be more vulnerable. This is particularly important for endangered seabird species where protection from and response to yellow crazy ant invasion should have a higher priority. However, least concern species can often be used as functional surrogates to determine negative impacts before endangered species are put at risk.

Eradication of yellow crazy ants from small islands is now possible and such eradications provide an opportunity to rigorously document the mechanism of impact of yellow crazy ants, and benefits of their removal, through a rigorous before-after-control-impact design. This is the case on the French Polynesian atoll of Tetiaroa where yellow crazy ants are currently invading. Yellow crazy ants are present on four of twelve motu, although their slow invasion front means they have only completely invaded the smallest of these motu Aie (2.4 hectares). The Tetiaroa Society is currently trialling eradication methodologies on Aie, before scaling up to larger motu. We leveraged this opportunity to work with partners in French Polynesia to undertake seabird and invertebrate monitoring on Aie before and after the trialling of yellow-crazy any eradication, alongside control and impact monitoring at other uninvaded and invaded sites on other motu. We used brown noddies (*Anous stolidus*) as a surrogate species for assessing yellow crazy impact on seabirds and used their breeding site choice (ground or tree) as a trait for distinguishing impact strength. We also simultaneously monitored arthropods to determine impacts of both the yellow crazy ants, and the invertebrate toxin applied in the eradication, on invertebrate communities.

Yellow crazy ant eradication was undertaken, and is ongoing, with three motu-wide treatments on Aie of fipronil infused hydrogels, spaced three months apart. After two treatments, yellow crazy ants were reduced to undetectable levels in Aie. No significant effect of baiting on the non-target arthropod community and abundance was detected, although some individual coconut and hermit crab mortality was detected. Yellow crazy ants were found to prefer *Pisonia* forest over *Pemphis* scrub, and significantly excluded breeding brown noddies even at low abundances. This impact was strongest on ground-nesting behaviours in *Pisonia* forest while tree-nesting noddies in *Pemphis* scrub were less impacted by yellow-crazy ants. Nest presence and abundance was significantly lower on Aie than nearby ant-free motu. Nest presence and density on Aie increased by 200% following two bait applications, but at the same time decreased on nearby ant-free motu, possibly due to natural fluctuations or brown noddy recruitment back to Aie. While nesting success decreased post-treatment on nearby ant-free, untreated motu, it remained the same on Aie, possibly due to ant suppression compensating for extrinsic environmental impacts on breeding success. The third and final bait application was completed in August. These results will have application to other ground-nesting seabird species currently re-colonising Tetiaroa following ongoing rat eradication including masked boobies, wedge-tailed shearwater and white-tailed tropicbirds.