

Oil palm plantations leave ants isolated

March 4 2013, by Tom Marshall



Polyrhachis (R) and Pheidole (L) worker ants on the Malaysian rainforest floor.

Cutting down rainforest to create oil-palm plantations causes canopy-dwelling ant populations to break up into mutually-exclusive territories with very little overlap, according to new research.

We already knew that these so-called 'ant mosaics' are found in plantations, but scientists weren't sure if they also happened in natural rainforest, or whether moving from one kind of landscape to another somehow created them. It now looks like the latter is the case, perhaps because plantations provide so few suitable ant habitats that the insects must compete much more fiercely.

It's just one example of the radical [ecological damage](#) caused by replacing the intricate, many-layered rainforest environment, which provides countless niches for many different species, with the much simpler architecture of a plantation.

It isn't that rainforest-dwelling [ants](#) are caring types who are happy to share. They also have their territories, and defend them fiercely against [intruders](#). But because the three-dimensional structure of the rainforest canopy is so much more complex, there are far more niches where ants can live and the resulting pattern of ant [habitation](#) looks vastly more complex when mapped in two dimensions.

'There is a far more complicated distribution of ants in the rainforest canopy,' says Dr Tom Fayle of the University of South Bohemia and Imperial College London, the paper's lead author. 'It has lots of layers and many connections between trees at different levels; even if a single species can dominate one tree, there may still be many small places for others to live in that tree. So we're not ruling out some kind of competitive mosaic in the rainforest, but we're saying it is far more complex and three-dimensional than in the plantation.'

The researchers investigated which insects were living where in two areas of Sabah in eastern Malaysia, one still covered in virgin rainforest and the other now used for oil palms. The field team, led by Dr Ed Turner of the University of Cambridge, fogged several small areas of canopy with insecticide and caught everything that fell out on plastic sheets. They also collected ants from ferns living in the trees and oil palms (epiphytes), and from leaf litter on the ground. They then recorded how many of each species were found in each place, and carried out statistical analysis on the results.

They found no trace of ant mosaics in the rainforest; everywhere they looked, different ant species were intermingled. By contrast, in the plantation each area of canopy was dominated by just one species.

The range of ants living there was also much narrower. 110 species turned up, compared to 309 in the rainforest, and many of them weren't rainforest species at all, but generalists drawn in from the surrounding

countryside. Fayle and his colleagues even wondered if these interlopers were behind the mosaic effect, but removing them from the analysis turned out to make the result even more pronounced.

This not the first attempt to find out how moving from rainforest to plantation affects the ecology of these insects, but previous studies looking for ant mosaics didn't use identical methods in both landscapes, so their results weren't directly comparable.

Fayle suggests that scarcity of prime ant-nesting sites in epiphytic ferns, which grow in the branches of trees, could be responsible for at least some of these effects. 'Plantation canopies are hotter and drier environments than rainforest canopies, so they are harder for ants to survive in,' he says. 'Epiphytes provide a cool, damp refuge for them. In a rainforest there are plenty of other good nest sites, but in the plantations these may be the only ones, so it's possible this makes the ants compete even more strongly for them.'

Vast areas of virgin rainforest across southeast Asia have already been cleared to make room for oil palms, and in many places this is still going on. From a conservation viewpoint, the results are catastrophic; only a tiny fraction of the vast range of species that live in a healthy rainforest can survive the transition. Rainforest also brings many other benefits to human society, including controlling floods and absorbing atmospheric carbon, and most of these are also lost as the rainforest is destroyed.

Fayle says that much of the primary rainforest that remains, in Malaysia at least, is now fairly well protected - the most vulnerable sites have already been converted to plantation, and much of the rest looks relatively safe. Concern is now moving onto forest that has already been logged but which hasn't been completely cleared. Research suggests these areas can still support considerable levels of biodiversity, but many are now threatened with being turned into plantation.

The paper appears in *Ecography*.

More information: Fayle, T. M., Turner, E. C. and Foster, W. A. (2013), Ant mosaics occur in SE Asian oil palm plantation but not rain forest and are influenced by the presence of nest-sites and non-native species. *Ecography*. [doi: 10.1111/j.1600-0587.2012.00192.x](https://doi.org/10.1111/j.1600-0587.2012.00192.x)

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