Using Rainforest Research

Rainforest beetles in dead wood Could logging be their downfall?

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Forget about tigers and elephants. If we're serious about sustaining biodiversity, then we should be concerned about the little creatures that run the world. One in every five species known on Earth is a beetle, with many more still to be described. Beetles live in every conceivable environment, but dead wood is a firm favourite, being home to more species than any other habitat. Indeed, dead wood may even be the ancestral home of the entire beetle lineage. So in an age where more and more forests are being logged worldwide, studying dead wood and its dependent beetles can reveal a great deal about the magnitude of the general impact of logging on nature.

Deadwoodology

Simon Grove developed an interest in dead wood dependent (*saproxylic*) insects while working with forest managers in the UK in the 1980's. Centuries of intensive forest use and abuse have sent many saproxylics to the brink of extinction, and left little room for the large old trees that generate most of their dead wood habitat.

For his doctoral research at James Cook University, Simon set out to discover whether logging tropical rainforests need have similar effects. His findings offer insights into how forests can be managed sustainably throughout the tropics.

Below: Simon Grove emptying a flight intercept trap - insects fly into the vertical clear plastic sheet and drop into the trough below

A natural laboratory

Logging no longer takes place in the Queensland Wet Tropics World Heritage Area, but the legacy of past land use enabled selection of study sites in the Daintree lowlands that had been subjected to various intensities of management. Three undisturbed old-growth sites were chosen, along with three sites that had been selectively logged up until the 1980's and three regrowth sites that had developed on previously cleared land. Nine 625 m^2 plots were established at each site. The volumes and sizes of all pieces of dead wood on the ground were measured, along with the basal area and diameter of living trees. A single flight intercept trap was set up at the centre of each plot, to continuously sample the beetles flying through each piece of forest over several months.

Winners and losers

Simon encountered over 17,000 individual beetles comprising 500 saproxylic species. From this mass of data, the following patterns emerged:

- Old-growth, logged and regrowth forests hardly differ in the numbers of species they support.
- Old-growth forests yield twice as many individuals per trap as logged and regrowth.
- Old-growth, logged and regrowth forests support different combinations of species: there are winners as well as losers.

Providing science for the conservation and management of Australia's World Heritage tropical rainforests.

The Rainforest CRC is a research partnership involving the Commonwealth and Queensland State governments, the Wet Tropics Management Authority, the tourism industry, Aboriginal groups, CSIRO, James Cook University, Griffith University and The University of Queensland

- Old-growth forest shows most variation in species composition amongst plots, and logged forest the least.
- Logged forest supports communities that are intermediate in composition between old-growth and regrowth. This pattern remains clear whether species are grouped by larval habitat or by feeding type.

Diversity in maturity

Several other patterns emerged during the course of the research that have a direct bearing on how saproxylic beetles could be expected to cope with changes brought about by long-term forest management.

These changes include a reduction in basal area, and especially the loss of large trees. Such trees are important providers of dead wood habitats, even while still alive, so their loss would have knock-on effects on the ability of the forest to produce a continuous supply of dead wood in all its natural variety.

A typical sample of saproxylic beetles - most are under 2 mm long

In particular, Simon found that:

- more dead wood means more species caught per site
- sites with more large trees have more species caught per trap, and
- community composition is closely linked to the basal area of living trees in the vicinity.

Old trees as indicators for sustainable forestry

What does this mean for forestry in tropical rainforests? This study demonstrates that logging is a relatively benign activity when compared to total clearance, yet its ecological impacts clearly run deep as they are still apparent two decades after logging ceased. Sustaining healthy communities of saproxylic insects in the long term clearly requires sustaining a continuous supply of large old trees. The basal area of such trees through time could be usefully adopted as an indicator of sustainability without the need to record dead wood or the beetles for which dead wood is home.

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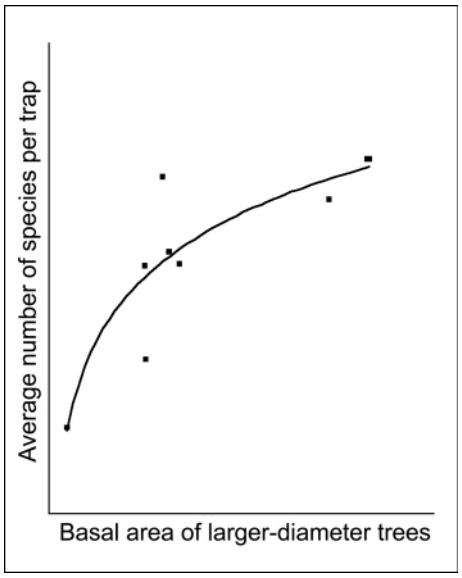
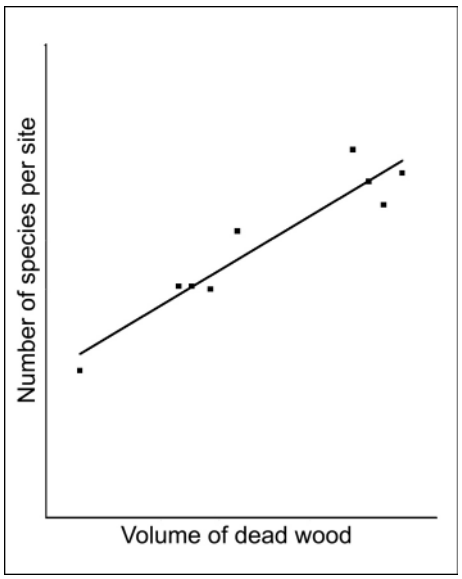
For further information:

Dr Simon Grove, School of Tropical Environment Studies and Geography (TESAG), James Cook University, PO Box 6811, Cairns, Qld 4870. Tel. (07) 40421441. Fax (07) 40421247. Email: simon.grove@jcu.edu.au.





Charts showing how the number of saproxylic beetle species increases with the amount of dead wood and the basal area of living trees in the vicinity

P.O. Box 6811, Cairns, Queensland, Australia 4870 • PHONE: (07) 4042 1246 • FAX: (07) 4042 1247
EMAIL: rainforestcrc@jcu.edu.au • WEBSITE: rainforest-crc.jcu.edu.au