



## Long-term Dynamics of Tropical Rainforest

The overall aim of the study has been to investigate some of the mechanisms responsible for both the high diversity of species, and the great variety of population structures among those species, in two rainforests in Australia. One in tropical rainforest at 17°S (at Davies Creek, one plot of 1.7 ha, 850 m elevation), the other in sub-tropical rainforest at 28°S lat. (near O'Reilly's Guest House in Lamington National Park, two plots of 1.0 ha each, 2 km apart, 850 m elevation).

### History

In 1963, all trees > 10 cm diameter at breast height (DBH, usually taken as 1.3 m above the ground), were mapped, tagged, measured and identified on both plots.

Smaller trees (2.5-10.0 cm DBH) and seedlings (<2.5 cm DBH, right down to tiny, newly germinated seedlings) were mapped, tagged and measured on permanently-marked belt transects extending throughout the mapped area.

At intervals of one to four years thereafter, all previously mapped and tagged individuals were censused, and in addition all newly recruited seedlings that had germinated and survived in the interval since the previous census, were mapped, tagged, measured and identified on precisely the same permanently-marked areas used in the original mapping.

These censuses were done 16 times between 1965 and 1999, and serve to indicate the temporal and spatial variation in seedling recruitment of all species of trees.

Joe Connell put in the plots in 1963, with the help of Len Webb and Geoff Tracey, both of CSIRO. Informal links were maintained with CSIRO from then until 1993, when this project established a permanent presence at the TFRC site.

Three major projects have been on-going during that time:

### **Continuation of the long-term dynamics project initiated in 1963**

From 1993, this has involved annual censuses for new seedling recruits at both sites, biennial surveys of mortality in all size classes, and remeasurement of stems every six years or so (Connell, Green, Debsky, Juniper, Lowman and many volunteer helpers).

### **Long-term studies of flowering fruiting and seedling recruitment at Davies Creek, 1955 to present**

In the last two years, we have increased the spatial extent of this work to include two sites at Robson Creek and Mt Lewis, where we use the CSIRO permanent plots. Each month, a large sample of trees at each site is scored for the abundance of flowers and fruits, from 0 (none) to 5 (heavy flowering or fruiting). This work is showing that unlike several lowland sites elsewhere, the majority of species at Davies Creek are masting species, in that they flower and fruit heavily every few years or so (Green, Debsky, Juniper).

### **An experimental assessment of the role of ground-dwelling vertebrates in generating and maintaining tropical tree diversity started in 1966**

In this large experiment, conducted at Davies Creek, 16 pairs of plots were constructed near the long-term dynamics plot. Each plot measures 6 m x 7 m, and within pairs, one plot is fenced to exclude ground-dwelling vertebrates (that would otherwise eat dispersed seeds or young seedlings, or disturb them), and the other plot is unfenced as a control. This work is showing that ground-dwelling vertebrates reduce seedling recruitment, increase seedling mortality, and promote seedling diversity. It has also shown that the abundance and diversity of mycorrhizal spores in the soil, another factor affecting seedling abundance and diversity, is lower in the absence of vertebrates (Gehring, Theimer).

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