

## LEAF GROWTH AND HERBIVORY IN AUSTRALIAN RAIN FOREST CANOPIES—HOW DOES IT COMPARE TO AFRICA?

MEG LOWMAN

Director of Research, Selby Botanical Gardens, Sarasota, Florida 34239

Leaf cohorts in the canopies of five Australian rain forest tree species were measured over 12 years using single rope techniques. These results were compared to a short-term study conducted on leaf cohorts in the canopies of equatorial forest canopies in Cameroon, Africa using a combination of canopy raft and dirigible on the expedition *Radeau des Cimes*. Leaf emergence, longevity, herbivory and foliage quality were examined for variability within and between several spatial scales: canopy heights, individual trees, species, and rain forest formations. Data collection was less extensive in Africa, but similar patterns of herbivory amongst age classes were observed, and canopies of both forests appear very heterogeneous in terms of foliage quality and herbivory distribution.

In Australian rain forest canopies, long term measurements of leaf emergence, herbivory, toughness, and senescence were made monthly on marked leaves replicated on branches at different heights, light conditions, individuals, and sites. Three leafing patterns were observed: seasonal (e.g., *Toona australis*, which was deciduous), intermittent (e.g., *Doryphora sassafras*, which leafed out during 10 months of the year albeit with two major peaks), and continuous (e.g., *Dendrocnide excelsa*, which leafed out during every month of the year). Leaf longevity ranged from 6 months (e.g., *Dendrocnide excelsa*) to over 12 years (e.g., some shade leaves of *Doryphora sassafras*). Significantly different annual levels of herbivory were measured, ranging from 4.5% to 32.5% leaf surface area lost. Shade

leaves, young leaves, and species bearing short-lived leaves were more extensively grazed than sun leaves, old leaves and canopies with longer-lived leaves, respectively.

In Cameroon, long term measurements were not possible, but different cohorts of leaves were destructively sampled on 30 species for herbivory, age class, toughness and water content among different heights, light conditions, species and individual trees. (See Lowman 1984 for description of long-term vs. short-term methods.) In addition, fogging of cohorts of leaves in the canopy was conducted to compare the relative distribution of herbivores. The African tree canopies showed similar patterns of herbivory between sun and shade leaves, and young and old leaves. The distribution of insects was also patchy, with some canopies having almost no insects and others having many insects (Lowman, Moffett & Rinker, unpubl. data). It is hypothesized that the patchiness of insects is related to the heterogeneous distribution of foliage of varying quality in the canopy.

Further field work is underway to examine the heterogeneity of foliage quality and insects in tree canopies, and to compare the canopies of paleotropical vs. neotropical rain forests, and temperate vs. tropical forests.

### LITERATURE CITED

- LOWMAN, M. D. 1984. Herbivory in the canopies of Australian rain forests—is it more intense than we thought? *Biotropica* 16: 264–268.