Editorial

Living the high life

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Recently I attended the Third International Canopy Conference in Cairns, Australia, 23 – 28 June 2002. What struck me was that since the first conference in Sarasota, Florida, in 1994, canopy biology has shaken off its sensationalist, 'frontier' mentality (Erwin 1983) and entered mainstream ecology (*cf.* Stork *et al.* 1997b). The names of the keynote speakers at the conference read like a who's-who of preeminent biologists (Stuart Pimm, Columbia University, New York; John Grace, University of Edinburgh; Robert Costanza, University of Maryland; William Laurance and Joseph Wright, Smithsonian Institute, Panama; Phyllis Coley, University of Utah; and others), that you might think would be more at home with their feet very firmly on the ground! Recently, however, there has been a strong surge of interest in the structure and functioning of forest canopies among researchers in disciplines as diverse as plant physiology, theoretical ecology, conservation biology and global atmospheric chemistry. The common theme uniting these fields is the growing recognition that forest canopies may be pivotal in addressing some of the most pressing questions about the impact of global change (*sensu lato*, land use change, climate change, nitrogen deposition, biotic exchange and atmospheric CO_2 increase; Sala *et al.* 2000) on terrestrial communities.

Canopy research is progressing along two largely dissociated and somewhat unrelated fronts. First, the 'biodiversity prospectors' who seek to understand, whether for knowledge or profit, the biological riches of forest canopy communities. This group includes most forest canopy ecologists and entomologists, and many of the 'traditional' (largely descriptive) studies of canopy communities (see references in Lowman & Nadkarni 1995, Stork *et al.* 1997a, Basset *et al.*, in press). However, new impetus to study these communities stems from recent analyses of the global distribution of species-rich 'hotspots' in areas of moist closed forest (Myers *et al.* 2000), the recognition that a large proportion of these species reside in forest canopies (Novotny *et al.* 2002) and increasing rates of species extinctions worldwide (Novacek & Cleveland 2001, Regan *et al.* 2001); all of which suggest that forest canopy communities may contribute disproportionately to the future 'casualty count'. Second, contributors to 'flux-net', a global network of scientists monitoring global carbon flux, climate change and CO_2 increase (http://daac.ornl.gov/FLUXNET/), who consider that the dynamics of carbon flux at the forest-atmosphere interface may

hold the key to modeling future impacts of global change on terrestrial communities. This second group of researchers broadly encompasses a range of different disciplines, including plant physiologists measuring photosynthetic rates, and even entomologists studying the impact of herbivorous insects on carbon mobilisation (as well as other important links in forest carbon cycles).

Unfortunately, the two groups of researchers use radically different sampling methodologies, work at different spatial and temporal scales, and do not integrate their findings. In order to address these problems and foster cross-discipline interaction among researchers, the Global Canopy Programme (GCP) was launched at the Cairns Conference by the director, Andrew Mitchell, Oxford University, UK (http://www.globalcanopy.org/). The GCP is a truly monumental undertaking, with stated goals to facilitate: "An integrated, coordinated study of canopies across major environmental and management gradients to investigate the role of forest canopies in maintaining global biodiversity, global environmental conditions, and the sustainability of forests." At the moment, forest canopy research in New Zealand is very much on the periphery of the international stage, but under the auspices of the GCP New Zealand scientists could develop more explicit links with an international network of canopy researchers.

An interesting counterpoint to the call for more forest canopy research is Stuart Pimm's pragmatic school of thought that the time for "tinkering" is very much at an end. Instead of measuring and cataloguing, we should just take practical measures to preserve what we have left, for example purchasing all of the remaining moist tropical forests (Pimm 2001)! While there is a lot of support, and some merit, in increased capital expenditure to purchase conservation lands, not all of the issues of sovereignty and volatile political instability have been adequately addressed in this neo-colonialist 'vision.' It has also been pointed out in New Zealand that passive protection of the conservation estate does not always ensure population viability for threatened species (Norton 1998). These factors not-withstanding, in order to balance the time taken to understand what it is that we are trying to conserve, against the need to act quickly, Robert Costanza makes the crucial point that we have to become more question-driven and less tool-driven.

These points were not lost on the small contingent of New Zealand canopy biologists at the conference, but it is notable that New Zealand entomologists have been slow to recognise the important role they can play in addressing global biodiversity issues through the study of forest canopies in their own back yard. After all, entomologists pioneered many of the early studies of forest canopies (e.g. references in Stork *et al.* 1997a, Basset *et al.*, in press). In a 1994 survey, entomologists made up over 50 % of all canopy biologists worldwide (Stork *et al.* 1997b). Today, the situation is very different, with massively reduced funding for insect systematics and less focus on descriptive, all-taxa surveys. This is somewhat ironic, when insects make up the

bulk of 'biodiversity' and it is 'biodiversity loss' that is at issue in much of global change biology. However, we should not lose sight of the fact that in order to provide the scientific foundations for practical conservation measures, we still have to know the fauna and flora we are dealing with. After all, new Orders of insects are still out there to be discovered in the world (Klass *et al.* 2002), new families of Hymenoptera (Early *et al.* 2001) and Diptera (Jaschhof & Didham, in press), and new genera and species are a 'dime-a-dozen' in all forest canopy samples so far collected from New Zealand (e.g. Didham 1997, Ewers *et al.* 2002). What is needed is more baseline research and funding for biodiversity and systematics in New Zealand, as well as more comparative analyses of faunal composition between ground and canopy assemblages (e.g. Ewers *et al.* 2002), addressing 'big questions' such as the effects of habitat loss and global climate change on terrestrial insect biodiversity.

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