of IEEM members are consultants - the obvious is to state that 60% are not. There is sometimes the impression that ecological consultancy is viewed as having something of a stigma attached to it. It is interesting to consider whether this attitude exists towards architects, landscape architects or planners.

For all information about the activities of the Institute please refer to our website or contact: **IEEM Office, 45 Southgate Street, Winchester, Hampshire, SO23 9EH. Tel: 01962 868626. Fax/Ans: 01962 868625. E-mail: Enquiries @ ieem.demon.co.uk. Website: www.ieem.org.uk.**

Jim Thompson
Executive Director

IBISCA 2003-2005, Panama: progress report

Long-term and wide-ranging studies of tropical ecosystems are few in number, and often concentrate around research stations with adequate infrastructure. Such examples include the Smithsonian Tropical Research Institute's studies on Barro Colorado Island, Panama, INPA's surveys at Manaus and the diverse range of projects at Danum Valley, Sabah funded by the Royal Society.

Despite these efforts, biologists have so far failed to answer one of the most fundamental questions in biology: 'How many species are there on Earth'? In many respects, knowing where the greater part of this biodiversity is distributed is just as vital (and perhaps of greatest interest to our readers) as knowing *how many* species there are. In recent years, there has been considerable debate as whether most of biodiversity (mainly arthropods) occurs either in the canopy or in the soil of tropical rainforests. This debate, largely devoid of sound data, matches an equally strong interest into the ecology of forest canopies, as evidenced by recent text books and compilations (Lowman & Nadkarni 1995, Basset *et al.* 2003).

Two significant, but poorly understood, aspects of the ecology of rainforest arthropods are beta diversity and vertical stratification. The study of both is at the core of the IBISCA project in Panama (Investigating the Biodiversity of Soil and Canopy Arthropods; Didham & Fagan 2003). This is a joint initiative of the Smithsonian Tropical Research Institute (STRI) and of the Canopy Raft Consortium, with its main funding from Solvin/Solvay, STRI and the Global Canopy Programme.

Fig. 1. A Malaise trap emplaced at one of the IBISCA sites (photo: Y. Basset).

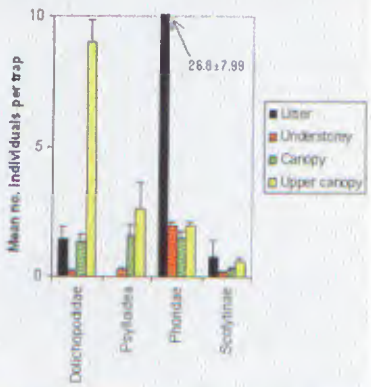

Fig. 2. Vertical distribution (mean no. of individuals per trap + 1 s.e.) of various groups well-represented in sticky traps samples of six of the nine study sites in San Lorenzo. Dolichopodidae = flies, predators; Psylloidea = bugs, herbivores; Phoridae = flies, mostly scavengers; Scolytinae = beetles, mostly wood-eaters. Number of traps surveyed: litter (0m), n = 15; understorey (1.3m), n = 165; canopy (1.3-35m), n = 53; upper canopy (> 35m), n = 152.

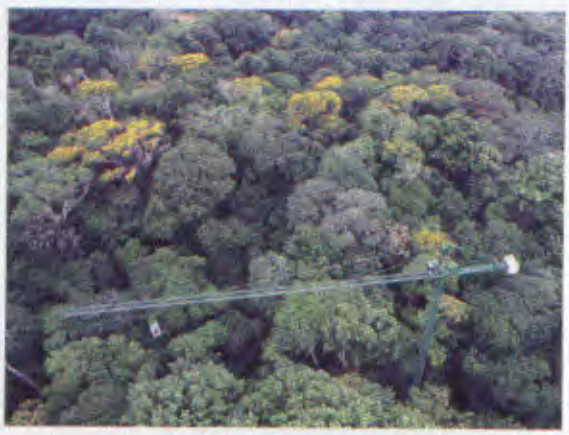

Fig. 3. The San Lorenzo canopy crane (photo M. Guerra).

Fig. 4. Sampling ants from the foliage using the crane's gondola (photo H.-P. Aberlenc).

IBISCA is sited within the tropical wet evergreen forest of the San Lorenzo Protected Area, Colón Province, and concentrates on 8 sites where a 20 x 20m quadrat of vegetation has been surveyed. The project employs state-of-the-art methods of canopy access and sampling, namely canopy raft and peripherals (the Solvin 'Bretzel': www.radeau-des-cimes.org/03/panama.htm), canopy crane (see picture), single rope techniques and canopy 'fogging'. These techniques complement each other for the entomological study of the rainforest canopy, and this project represents the first attempt to combine them in a large-scale study (Roslin 2003). The project IBISCA, co-ordinated by the second author, includes three major stages: spatial replication, mostly achieved by the raft peripherals and single rope techniques (September - October 2003); seasonal replication, mostly performed at the crane site (February, May and October 2004); and analytical workshop and dissemination of early results (2005). Prof. E.O. Wilson, Harvard University, is the official patron of IBISCA 2003-2005.

Fourteen methods are used to survey the arthropods of the litter, understorey and upper canopy at each site, thus permitting comparison of patterns of beta diversity between the canopy and soil fauna for a wide range of taxa of different phylogeny and ecology. The initial field work in 2003 was attended by 45 participants from 15 countries, including 23 professional entomologists, 5 professional botanists, 7 students and 10 technical staff, including professional tree climbers. Soil and litter surveys were performed using pitfall traps and litter sifting; those in the canopy and/or the understorey by 'fogging', composite flight interception traps, beating, light traps, sticky traps, ground-level flight interception traps, Malaise traps and baited traps and in both soil/litter and canopy by Berlese extraction, rearing from wood and hand-collecting. The second field period in February 2004 has been likewise performed successfully. The collective data matrix of IBISCA will summarise incrementally interactions at four forest strata at each of the 8 sites between 14 sampling methods, more than 4,000 samples, four seasonal replicates and an as yet undisclosed number of taxa and species.

In addition to the wide-ranging implications of IBISCA for rainforest conservation (Bradbury 2003), two cornerstones of the project are international collaboration and local training. During its initial survey fieldwork was supported by both volunteers and students from the Universidad Nacional de Panama's masters and graduate programmes in entomology and biological sciences. In 2004, two Papua New Guinean parataxonomists will continue their training in insect ecology

and identification (**www.entu.cas.cz/png/parataxoweb.htm**), funded via the Darwin Initiative, by aiding the continuation of IBISCA's surveys. Four Panamanians are being trained in specific aspects of survey and identification of specific families of Hymenoptera, Lepidoptera, Coleoptera and Hemiptera. This, combined with the 1-2 focal taxa studied by each of the international contingent, will enable between 30-40 groups to be studied in detail at a morphospecies level. The interpretation of results (vertical stratification and beta-diversity of the focal taxa) will be facilitated by several satellite studies that characterise the sites surveyed (e.g. vegetation characteristics, canopy openness, measurement of incident light, apparent leaf damage, etc.).

In 2004 the Society is making a direct contribution toward the repeat surveys and the training of Panamanians within IBISCA. Nine Malaise traps have been loaned by the present first author, one emplaced at each of the sub-sites (Fig. 1). These will operate during the 'dry' and 'wet' seasons for approximately nine months and should amount to 230-240 samples. Training is being given on the rapid 'breakdown' of the 'soups' and the removal of focal taxa and on the sorting of Braconidae (Hymenoptera) to sub-family and genus.

Interim results, such as those based on abundance data at a few sites and obtained with one particular sampling technique (Fig. 2), suggest a high turnover between the upper canopy and lower forest strata, but the full quantification of these complex data will take time. For example, whether the corresponding variance in species diversity may vary more between forest strata or among forest sites, or may vary more between canopy than understorey sites, are important questions from the perspective of forest conservation that may be answered with the IBISCA data-set. In addition, IBISCA will test the ideas that stratification has distinct effects on the observed diversity of any given taxon, and that stratification may be influenced by seasonality, particularly when the 'dry' season allows greater insolation of the field and soil layers.

So far, the success of the project has been attributed to a careful selection of dedicated, enthusiastic and experienced participants, who acted as a superb and professional group of experts, incorporating the help of Panamanian students. This team effort appears to be a robust alternative to more minimalist, taxa-dependent, studies for a sound understanding of the ecology of tropical rainforests.

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REFERENCES

Basset, Y., Novotny, V., Miller, S.E. & Kitching, R.L. (2003) *Arthropods of Tropical Forests. Spatio-temporal Dynamics and Resource Use in the Canopy.* Cambridge University Press, Cambridge.

Bradbury, J. (2003) Surveying Panama's treetops. *Frontiers in Ecology and the Environment* 9: 457.

Didham, R.K. & Fagan, L. (2003) Project IBISCA - Investigating the Biodiversity of Soil and Canopy Arthropods. *The Weta* 26: 1-6.

Lowman, M. D. & Nadkarni, N. M. (1995) *Forest Canopies.* Academic Press, San Diego.

Roslin, T. (2003) Not so quiet on the high frontier. *Trends in Ecology and Evolution* 18: 376-379.

The Forest Canopy Biology Programme, Smithsonian Tropical Research Institute

Two canopy cranes, each yielding access to 0.8 ha of forest, are at the core of this research programme in Panama. They are part of an international network of 10 construction cranes erected in forests and devoted to the study of forest canopies in temperate and tropical ecosystems. In Panama, one such crane is located on the Pacific side of the country, in a semi-deciduous dry tropical forest and the other, used extensively during the IBISCA project, is located on the Atlantic side, in a wet tropical forest (Fig. 3). The cranes are 70km distant from each other, within an interesting rainfall gradient that prevents coexistence of plant species at both. Via a gondola (Fig. 4), safe and convenient access to the upper canopy (30-35m), and the performance of a variety of observations, measurements and experiments *in situ*, is possible. The Panamanian cranes have been instrumental in a variety of studies, ranging from the investigation of gaseous exchange, forest physiognomy and structure, plant ecophysiology to biodiversity.

The Forest Canopy Biology Programme welcomes all researchers to perform innovative and/or collaborative research with its canopy cranes. For more information, see **www.stri.org/tesp/fts.htm** or contact the second author.