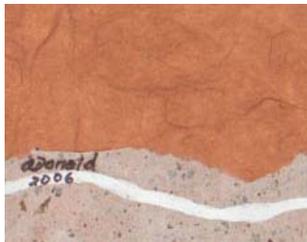


Alcoa Foundation Participant Contributes to Fourth Brazilian Tree Canopy Course, held in the Atlantic Rainforest

ALCOA FOUNDATION'S CONSERVATION AND SUSTAINABILITY
FELLOWSHIP PROGRAM



PROFESSOR JONATHAN MAJER
DR SERVIO PONTES RIBEIRO

Contents

THE ALCOA CONSERVATION AND SUSTAINABILITY FELLOWSHIP PROGRAM HAS FUNDED FIVE UNIVERSITIES THROUGHOUT THE WORLD TO CONDUCT RESEARCH ON CONSERVATION AND SUSTAINABILITY ISSUES. EACH UNIVERSITY HAS A DIFFERENT MISSION AND THAT OF ONE OF THE PARTICIPATING UNIVERSITIES, THE UNIVERSITY OF SAO PAULO (USP) IN BRAZIL, IS TO CONDUCT RESEARCH THAT IS AIMED AT CONSERVING AND ACHIEVING THE SUSTAINABLE USE OF ATLANTIC RAINFOREST.

RECENTLY, ONE OF THE CURTIN UNIVERSITY PARTICIPANTS IN THE PROGRAM, PROFESSOR JONATHAN MAJER, HAD THE OPPORTUNITY TO ASSIST WITH THE RUNNING OF A CANOPY ECOLOGY COURSE, WHICH TOOK PLACE IN AN AREA OF ATLANTIC RAINFOREST IN SOUTH EASTERN BRAZIL. THE ACTIVITIES THAT TOOK PLACE ARE HIGHLY RELEVANT TO CONSERVATION AND SUSTAINABILITY OF THIS FOREST ECOSYSTEM, AS OUTLINED IN THIS WORKING PAPER.



Professor Majer is an insect ecologist, with more than 30 years of research experience in Western Australian ecosystems. Since insects are exceptionally diverse, and are found in almost every situation, Professor Majer's research has involved him in a wide range of issues, including the ecological impacts of urbanisation, impacts of prescribed burning of forests and nature reserves, impacts of habitat fragmentation, and restoration of ecosystems following mining or agriculture. He is also developing ways to use insects as bio-indicators of environmental health.

His research interests will enable him to assess the likely impacts of increasing urbanisation and settlement of the south coast region on key ecosystems. In the light of these predicted impacts, plans will be drawn up, and recommendations made, for integrating development in this area with the conservation of the unique biota that still abounds there. He currently has students doing work in the region.

Sérvio P. Ribeiro is a lecturer at the Universidade Federal de Ouro Preto, Minas Gerais and has worked on insect-plant interactions for 20 years. More recently, his research has turned to canopy analysis, with interests in tree crown architecture and habitat emergent properties as factors capable of organizing forest insect communities.



He has focused on the biome level and has been working in many different ecosystems of the planet, looking for general patterns in insect herbivore and predator distribution in forest canopies. He is a permanent member of the IBISCA project (Investigating the Biodiversity of Insects in Soil and Canopy) and the BALA project (Biodiversidade de Artrópodes da Laurissilva dos Açores). He has worked for the preliminary sampling design of the TEAM project (Tropical Ecology, Assessment and Monitoring Initiative), funded by Conservation International, in the Rio Doce site. For several years, he has been running an International Canopy Training Course, in collaboration with the Global Canopy Programme and the Foreign and Commonwealth Office of the British Embassy in Brazil.

Sustaining Gondwana Working Paper

Issue 1

Alcoa Foundation Participant Contributes to Fourth Brazilian Tree Canopy Course, held in Atlantic Rainforest

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Photo on previous page – course participants and instructors. SPR fifth from left, JDM eighth from left. (photo by Alexandre Albuquerque Silva)

Introduction

The Alcoa Foundation's Conservation and Sustainability Fellowship Program has provided a grant of \$US8.7 million to three non-government organizations and five universities throughout the world to fund a series of lay- and post-doctoral fellows, each of whom will examine various issues relating to conservation and sustainability in their institution's sphere of interest. Curtin University of Technology, in Western Australia (WA), is one of these universities and its area of interest is the south coast of WA between Walpole and Esperance; the initiative has been named 'Sustaining Gondwana' in recognition of the Gondwanan links of this part of Australia's ancient landscape. One of the other participating universities is the Universidade de São Paulo (USP), which is adopting an ecosystem rather than geographical focus, by looking at issues relating to Atlantic rainforest. One of the objectives of the Alcoa Program is to encourage co-operation and interchange between participating organizations.

The Sustaining Gondwana initiative is run by four cabinet members, one of whom (JDM) is an author of this article. He is an entomologist who has had extensive experience with the ecology of ants, forest invertebrates, land restoration and invertebrate conservation throughout Australia, Africa and Brazil. Much of his work has involved the study of invertebrates in tree canopies in all three continents (Majer 1990; 1992; Majer & Delabie 1999; Recher *et al.* 1996). His focus with the Sustaining Gondwana initiative involves studies on fragmentation of the ecosystems of this region, which includes the southern portion of the WA wheatbelt, where over 90% of the native vegetation has been cleared for agriculture; he is also looking at means to revegetate these areas and restore some of the lost biodiversity.

In early 2006, JDM was invited to collaborate and advise in the fourth Brazilian Field Course in Canopy Ecology, which was to be held in the Parque Estadual de Itacolomi, adjacent to the World Heritage village of Ouro Preto, and named after the twin rocky outcrops situated in the centre of the Park (Figure 1a). Fortuitously, since this contained large tracts of

Atlantic rainforest, it provided an opportunity for a member of the Curtin Alcoa Conservation and Sustainability team to assist with the objectives of the São Paulo team.

Atlantic rainforest of Brazil is one of the most threatened tropical ecosystems in the world (see Viana *et al.* 1997). It once occupied about one million square kilometres of the eastern part of Brazil, extending from Rio Grande do Norte to Rio Grande do Sul in a strip ranging from several to 160 km wide. Much of it has been cleared for agricultural and mineral exploitation. At the national level, less than 12% of this ecosystem remains (CIMA 1991), although this figure is as low as 1% in some States and much of it that still exists occurs as small fragments and linear strips of vegetation. Coincidentally, this is a remarkably similar situation to that in the WA wheatbelt (Figures 1b & c).

Course concept

The course was developed within the scope of an international collaboration between the Global Canopy Program, based in the United Kingdom, and the Universidade Federal de Ouro Preto (UFOP). It was organised by the second author of this article (SPR) and was funded by the Foreign and Commonwealth Office of the British Embassy in Brazil, the Brazilian Ministry of the Environment and the Minas Gerais State Institute of Forestry. The course, which had been run on three previous occasions in other parts of Brazil (Ribeiro *et al.* 2002; Ribeiro and Corbara 2005), had been developed for graduate students in ecology and related disciplines, and was designed to augment their professional postgraduate training. Invitations were sent at the beginning of 2006 to all Brazilian universities which called for applicants to the course. Interested students had to provide:

- A self-written letter explaining their interest in canopy ecology;
- An indication of their areas of interest;
- A five-page project proposal for their final week-long project;

- Two letters of reference from professional contacts; and
- A curriculum vitae.

A total of 13 students were selected, with participants coming from Universidade de São Paulo (2), Universidade Estadual de São Paulo, Universidade de Campinas, Universidade Federal de São Carlos, Universidade Federal de Rio Janeiro, Universidade Federal Rural de Rio de Janeiro, National Museum of Rio de Janeiro, Universidade Federal de Minas Gerais, Universidade Federal de Viçosa, Universidade Federal de Juiz de Fora, Universidade Federal de Paraná and the Centro Universitário de Maringá. The course allowed for 15 participants, so one undergraduate from UFOP with a special interest in canopy ecology and one park ranger were also allowed to participate. All participants had to: obtain their own life insurance from the Banco do Brazil (\$US11000); sign a declaration acknowledging the possibly dangerous activities that are involved, thus absolving the organisers from legal responsibility; and sign a further declaration exempting tree climbing instructors from culpability due to any equipment failure or misapplication of procedures by the students.

A particularly innovative feature of the course was that it earned course credits (8 = 120 hours in the Brazilian university system) for the students, which could be used towards completion of their graduate programs at their home institutions.

Most activities were held within the Park boundaries. The Parque Estadual de Itacolomi contains a mosaic of wet-montane and semi-deciduous forest (subsets of Atlantic rainforest), plus large expanses of native, upland grasslands. The bifurcation of the 'Estrada Real', a road that allowed the export of gold and diamonds to ports on the coast, was situated within the centre of what is now the Park, and the trading post was built at this junction. This building, known as the 'Casa Bandeirista', still stands, and is the oldest municipal building in the state of Minas Gerais (Figure 1d). During the early part of the twentieth century, a tea plantation was established in the area. Extensive areas were cleared, irrigation dams were constructed, and a successful venture for the export of 'Edelweiss' tea to Germany grew. This industry collapsed following the Second World

War and the plantation fell into disrepair. Shortly afterwards, the area was gazetted as a State Park and the tea plantations started to be colonised by native vegetation. Some areas had been planted with *Eucalyptus* trees prior to establishment of the Park. At the present time, the Park consists of a mosaic of native grassland, forest, and old tea plantations in various stages of recolonisation. In addition to the *Eucalyptus* trees, many ornamental plant species persist in various parts of the Park.

Course structure

The three-week course ran from 10 June to 2 July 2006. One week prior to this, the organisers and the climbing instructors from the Das Pedras climbing school in Belo Horizonte visited the Park to find suitable trees and other structures to learn to climb on, to familiarise themselves with the area, to meet Park administrators, to devise an activity plan and to check climbing equipment. During this week, a risk assessment report was constructed and distributed to the students prior to their arrival.

The course was divided into three stages as follows:

Six days of training to climb trees, supervised by professional tree climbers. This stage was devoted to learning about equipment, climbing techniques, safety procedures, plus gaining mobility to work in the tree crown (Figures 2a-l).

Six days of short ecological group projects, lasting two days each, under the supervision of invited lecturers in ecology, botany and zoology, and monitored by professional tree climbers. The group projects were taken through to the data analysis stage and presented as Powerpoint presentations in the evenings. The miniprojects were also subsequently written up in the format of scientific papers for final assessment after completion of the field course.

Nine days of week long individual projects, divided into two sections. During the first two days the students chose a suitable project and hypothesis to be tested, before continuing for a further seven days of sampling and measuring under the supervision of invited lecturers and the professional tree climbers. As before, a Powerpoint presentation was given

at the end of the project and a paper was subsequently written up for final course assessment.

A series of lectures was given on evenings when students were not presenting findings. These lectures included tree genetic conservation, methods of sampling in ecology, biostatistics and data analysis, insect ecology and international canopy research.

The group and individual projects were designed and supervised by the authors plus a number of lecturers from Brazilian universities, namely: Dr Maria Christina Sanches (UFOP), Hilderberto Caldas de Sousa (UFOP), Dr Yasmine Antonini (UFOP), Dr Carlos Sperber (Universidade Federal de Viçosa (UFV)), Dr Maira Goulart (Universidade Federal de Minas Gerais (UFMG)), Dr Júlio César Fontanelle Rodrigues (UFMG) and Frederico Neves (Universidade Estadual de Montes Claros (UNIMONTES)).

In addition, a demonstration field day was held in Ouro Preto to inform the public of the course activities and to educate them about the importance of urban trees. This was held in association with the council and the local Marília de Dirceu State School. The public were invited to observe professional tree climbers and to inspect a series of displays on the organisms that can be found in the canopies of tall trees (Figures 3a-d).

Summary of projects

Some of the projects, and their significance, are listed below.

1. *Comparison of canopy invertebrates in introduced Eucalyptus and native Eugenia canopies.*
2. *Characterisation of the ant assemblages in two species of bamboo (Merostachys).*
3. *Horizontal stratification of ant assemblages in trees situated in moist and dry regions of the Park.*
4. *Ecology of an arboreal foraging ant, Camponotus rufipes.*

5. *Relationship between arboreal termites (Nasutitermes spp.) and tree structure.*
6. *Stratification of the trunk arthropod fauna and influence of trunk type and crown architecture.*
7. *Occurrence of Euglossinae bees in contrasting forest environments.*
8. *Effect of humidity and topography on the abundance and species richness of insect herbivores in the canopy and understorey.*
9. *Influence of canopy complexity on fruit predation by birds.*
10. *Use of epiphytic bromeliads by birds.*
11. *Leaf morphology traits of Rapanea umbellata in two different forest environments.*
12. *Leaf morphology traits in understorey and canopy of Myrsine umbellata trees.*
13. *Canopy and understorey effects on litter decomposition and seedling occurrence.*
14. *Influence of the Ouro Preto field day on children's perceptions of the value of urban trees.*

A perspective on the value of the course

The forest canopy is one of the last frontiers that biologists have to study. Unfortunately, forests are undergoing an increasingly rapid destruction, with important and undesirable consequences for losses to biodiversity and deterioration of our quality of life. This course enabled the students to understand the importance of the conservation and protection of trees and gave them the tools to study their role in ecosystems, their ability to harbour important components of biodiversity and the diverse array of biological interactions that exist in the tree tops.

The study of tall trees has always been hampered by the difficulties encountered when accessing the crown. This, and the preceding three courses, has trained a generation of bright young researchers who will now be able to develop careers associated with the conservation and sustainability of forest ecosystems. In addition, due to the way the course was designed, full acknowledgement of course participation was given at

their home universities. This, in turn, should enhance their professional credibility.

Thanks to the field day in Ouro Preto, which received media coverage, local residents and school children also gained an appreciation of the importance and value of trees, both in an urban and forest situation. The project concerning childrens perceptions of urban trees testified to this. Prior to attending the field day, the children were asked to draw a forest tree and annotate the picture with their thoughts on the value of the tree. The exercise was repeated immediately following the field day. The outcome was striking, with pictures shifting from having utilitarian or disinterested annotations to ones that appreciated the biodiversity value of trees and the role in ecosystem services (Figures 4a–d).

On a personal note, the course enabled one of the authors (JDM) to supervise the gathering of data that should contribute to the mission of the USP group of the Alcoa Foundation's Conservation and Sustainability Fellowship Program. Specifically, concern has been expressed about the replacement of Brazilian native vegetation by plantations (Majer & Recher 1999). The first listed project, which was supervised by JDM, provided important data on invertebrate loads on *Eucalyptus* and native trees from the same family. Levels of invertebrates were an order of magnitude higher on the latter species, which points to the fact that *Eucalyptus* trees do not support local biodiversity and provide little food resources for insectivorous birds that forage in tree canopies. Hopefully this work will ultimately be written up for publication in a journal.

In summary, the course was a resounding success. Some of the funding for the course was from a four-year project underwritten by the sponsors. This period has now expired, but the project helped the Universidade Federal de Ouro Preto to prepare a successful proposal for a masters program in Evolutionary Ecology of Tropical Biomes. This program was approved at the end of 2006 by CAPES/Brazilian Ministry of Education and should start in mid-2007. The canopy ecology course is to be an integral part of this postgraduate program and will be funded in future years from Federal and University sources. More information about

the course can be found by visiting the web page at www.ufop.br/cursodossel/index.html

Acknowledgements

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References

- CIMA** 1991. *Relatório da Comissão Interministerial sobre desenvolvimento e meio ambiente*. Brazil: Brasília.
- Majer, J. D.** 1990. The arboreal ants in some Australian forests, with particular reference to their abundance and diversity in rainforests. *Biotropica* **21**: 193-220.
- Majer, J. D.** 1992. Comparison of the arboreal ant mosaic in Ghana, Brasil, Papua New Guinea and Australia - its structure and influence on ant diversity. In: (eds. J. LaSalle & I. Gauld) *Hymenoptera and Biodiversity*. Wallingford, CAB International. Pp. 115-141.
- Majer, J. D. & J. H. C. Delabie** 1999. Impact of tree isolation on arboreal and ground ant communities in cleared pasture in the Atlantic rain forest region of Bahia, Brazil. *Insectes Sociaux* **46**: 281-290.
- Majer, J. D. & H. F. Recher** 1999. Are eucalypts Brazils friend or foe? An entomological viewpoint. *Annals of the Entomological Society of Brazil* **28**: 185-200.
- Recher, H. F., J. D. Majer, & S. Ganesh** 1996. Eucalypts, insects and birds: on the relationship between foliar nutrients and species richness. *Forest Ecology and Management* **85**: 177-195.
- Ribeiro, S. P. & Corbara, B** 2005. Dossel florestal uma fronteira desconhecida. *Ciência Hoje* **73**: 54-58.
- Ribeiro, S. P., T. Fontoura, & F. A. M. Santos** 2002. The seeds for a canopy training school: the canopy research field course of the State University of Campinas, Brazil. *What's Up? The Newsletter of the International Canopy Network* **9(1)**: 2-3.
- Viana, V. M., A. A. J. Tabanez & J. L. F. Batista.** 1997. Dynamics and restoration of forest fragments in the Brazilian Atlantic moist forest, p. 351-365. In. W F. Laurance and R. O. Bierregaard (eds.), *Tropical forest remnants: Ecology, management and conservation of fragmented communities*. Chicago, Chicago University Press.



(a)



(b)



(c)



(d)

Figure 1. (a) View of part of the city of Ouro Preto, with the double Italmi Peak visible in the background; (b) Fragmented Atlantic rainforest in a matrix of pasture, near Ponte Nova, MG; (c) Fragmented wandoo woodland in the southwest of Western Australia; (d) Casa Bandeirista situated in the Parque Estadual de Itacolomi. (photos by Jonathan Majer).



(a)



(b)



(c)



(d)



(e)



(f)

Figure 2. (a) Introduction to climbing gear; (b) First aid instruction; (c) Knot tying procedures; (d) Introductory climbing exercises; (e) Author (JDM) making first real tree climb; (f) Author (JDM) arriving at crown of tree.



(g)



(h)



(i)



(j)



(k)



(l)

Figure 2 (contd.). (g) Course participant transferring ropes within crown; (h) Movement within crown of tree; (i) Simulating fall; (j) Emergency evacuation procedure; (k) Arrival ot top of *Araucaria* tree; (l) View of Park from top. (photos a-j by Milton Barbosa Jr., k-l by Luiz Eduardo Azevedo Rocha).



(a)



(b)

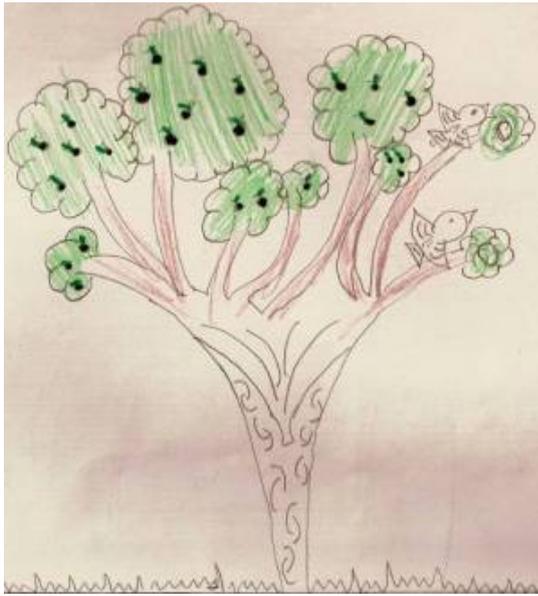


(c)



(d)

Figure 3. (a) The authors meet the mayor of Ouro Preto, Mr Ângelo Oswaldo and the environmental secretariat, Ms Silvane Pedrosa; (b) Local school children eagerly awaiting the day's activities; (c) Demonstration tree climb; (e) Displays of biota from tree crowns. (photos by Jonathan Majer).



(a)



(b)



(c)



(d)

Figure 4. Pictures of trees drawn by primary school children prior to the field day (a and c) and after being exposed to ideas about urban trees (b and d). Note how the pictures shift from being simplistic, stylised representations of trees to ones that show the structure of the canopy, including dead branches, and some of the organisms that live within the canopy (drawings collated by Anne Carolina Olivo).

ALCOA FOUNDATION'S CONSERVATION AND SUSTAINABILITY PROGRAM

Sustaining Gondwana is a strategic initiative of Curtin University of Technology that has been funded by the Alcoa Foundation's Conservation and Sustainability Fellowship Program and by the University. Its aim is to research conservation and sustainability issues along the south coast of Western Australia, from Walpole to just east of Esperance. The vegetation and fauna of this area is so diverse that it is considered to be one of the world's bio-diversity hotspots. The five year program, which is connected internationally with other Universities and Sustainability Institutes, was launched in November 2005.

The initiative is co-ordinated by four cabinet members, professors Daniela Stehlik, Jonathan Majer, Fiona Haslam McKenzie and Dong-ke Zhang. Six postdoctoral fellows are being appointed to work on issues related to this region, and their research will be augmented by activities of the cabinet members themselves as well as their graduate students. It is anticipated that the findings will be published in journals, conference proceedings and books. However, there is a need to communicate early findings, data sets and activities of group members in a timely manner so that stakeholders can benefit from outputs as soon as they become available. This is the aim of the *Sustaining Gondwana Working Paper Series*, which will be produced on an occasional basis over the life of the initiative.

The papers are not subject to peer review, but are edited by cabinet members in order to maintain standards and accuracy. Contributions from researchers and practitioners who are active in the region of focus can also be considered for publication in this series.

For further information about Sustaining Gondwana or the program Working Paper Series, please contact: strongercommunities@curtin.edu.au or visit <http://strongercommunities.curtin.edu.au>

For the global program see:

http://www.alcoa.com/global/en/community/info_page/Foundation.asp

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