Edinburgh University Ecological Expedition to Brise Fer, Black River Gorges National Park, Mauritius:
June 28th – September 7th 2000

A study on the diversity of Phanerophytes in managed and non-managed areas in the upland forests of Mauritius.

Phase One – Conservation Management Area

By

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Background

The original aim of this expedition was to comprehensively map areas of tropical forest on the Mascarene Islands of Mauritius and Reunion, setting up permanent plots which could be revisited to monitor forest dynamics. Inspired by the work of Professors David H. Lorence and Robert W. Sussmann (1986) it was hoped that the results of our survey could be compared to their study of exotic species invasion in native Mauritian forests. However, it was realised early on that due to time constraints it would be impossible to visit both islands in the time available. Thus it was decided to concentrate entirely on the island of Mauritius.

Once the project was underway it became evident that the scope of the study was too large to be completed in a single expedition. Therefore it was decided to split the project into two phases. Phase One entailed the detailed mapping of the Brise Fer Old Plot, a Conservation Management Area within the Black River Gorges National Park. Phase Two is expected to take place in the late summer of 2001 and will consist of a similar mapping program concentrating on the Brise Fer Unweeded Area, adjacent to the Old Plot.

Aims

The purpose of the first phase of the study was to gather detailed data from the Brise Fer Old Plot that could then be applied in the following ways:

i) To establish a baseline from which to examine changes in forest structure over time.
ii) To get data on the spatial distribution of trees in an area containing the best-conserved native forest remaining in Mauritius. This can give us a model on which to base forest reconstruction programs for the future.
iii) To establish the similarities and differences between Mauritian forests and other forests studied elsewhere.

Once phase two has been carried out and the unweeded control plot has been mapped, additional applications will be possible:

iv) Data will provide relevant information for studies of the faunal composition of managed and non-managed areas e.g. where released endangered birds are nesting, etc.
v) To give us some idea of how similar the managed and non-managed areas were before management. Because of the slow rate of growth of native trees it is likely that adult composition is still similar to the situation at the time when management began. These data will allow us to establish how valid the non-managed areas are as controls.

Locations

The study consisted of a complete spatial inventory of trees in the contiguous 10m x 10m strata of the Brise Fer Old Plot (sampling area 0.72 ha). It was hoped that the Brise Fer non-managed area (sampling area 0.82 ha) would also be mapped in the time available. However, mapping took much longer than originally anticipated and a follow-up expedition is planned to sample the non-managed area in summer 2001.

Methods

The corners of the study area had their locations fixed using a GPS tracking system. The area was divided up into a 10m x 10m stratum of grid squares, permanently marked with waterproofed steel posts and individually labelled. All phanerophytes of greater than 1.3 m in height were identified as far as possible to species level and measurements of diameter at breast height were taken. Those that could not be identified to species level were tagged for later identification. The location of each phanerophyte within each grid square was individually recorded.

Results

The locations and dbh values for each tree are currently being compiled, using a Geographical Information System, by the Mauritius Wildlife Foundation. Within the permanently marked 0.72 m^2 of the Brise Fer 'Old plot' 6648 individual trees were recorded from 98 different species.

18.4% of species account for 72.1% of the individuals. 0.72% of all individuals were exotic.

Although the two data sets are not directly comparable due to different measurement criteria, differences in species diversity at Brise Fer between 1986 and 2000 are illustrated in tables 1 and 2 below:

Table 1. Number of species (diversity) per 1000m^2 at Brise Fer for individuals ≥ 2.5 cm dbh, 1986. Percentage given in parentheses (%).

	Indigenous		Exotic		Total	
Families	**25**	(89.3)	**3**	(10.7)	**28**	(100.0)
Species:	**57**	(95.0)	**3**	(5.0)	**60**	(100.0)
shrubs	**0**		**0**		**0**	
vines	**4**	(6.7)	**1**	(1.6)	**5**	(8.3)
all trees	**53**	(88.3)	**2**	(3.3)	**55**	(91.6)
large trees (mean ≥ 10cm dbh)	**29**	(48.3)	**2**	(3.3)	**31**	(51.6)

Taken from Lorence & Sussman (1986).

Table 2. Number of species (diversity) in 0.72 ha Brise Fer Old Plot for all individuals ≥ 0.5 cm dbh, 2000. Percentage given in parentheses (%).

	Indigenous		Exotic		Total	
Families	**39**	(88.6)	**5**	(11.4)	**44**	(100.0)
Species:	**90**	(91.8)	**8**	(8.2)	**98**	(100.0)
shrubs	**0**		**0**		**0**	
vines	**9**	(9.2)	**0**		**9**	(9.2)
all trees	**81**	(82.7)	**8**	(8.2)	**89**	(90.8)
large trees (mean ≥ 10cm dbh)	**20**	(20.4)	**1**	(1.0)	**21**	(21.4)

The Old Plot shows a typical species/area curve for wetland tropical forest, as shown in figure 2 below.

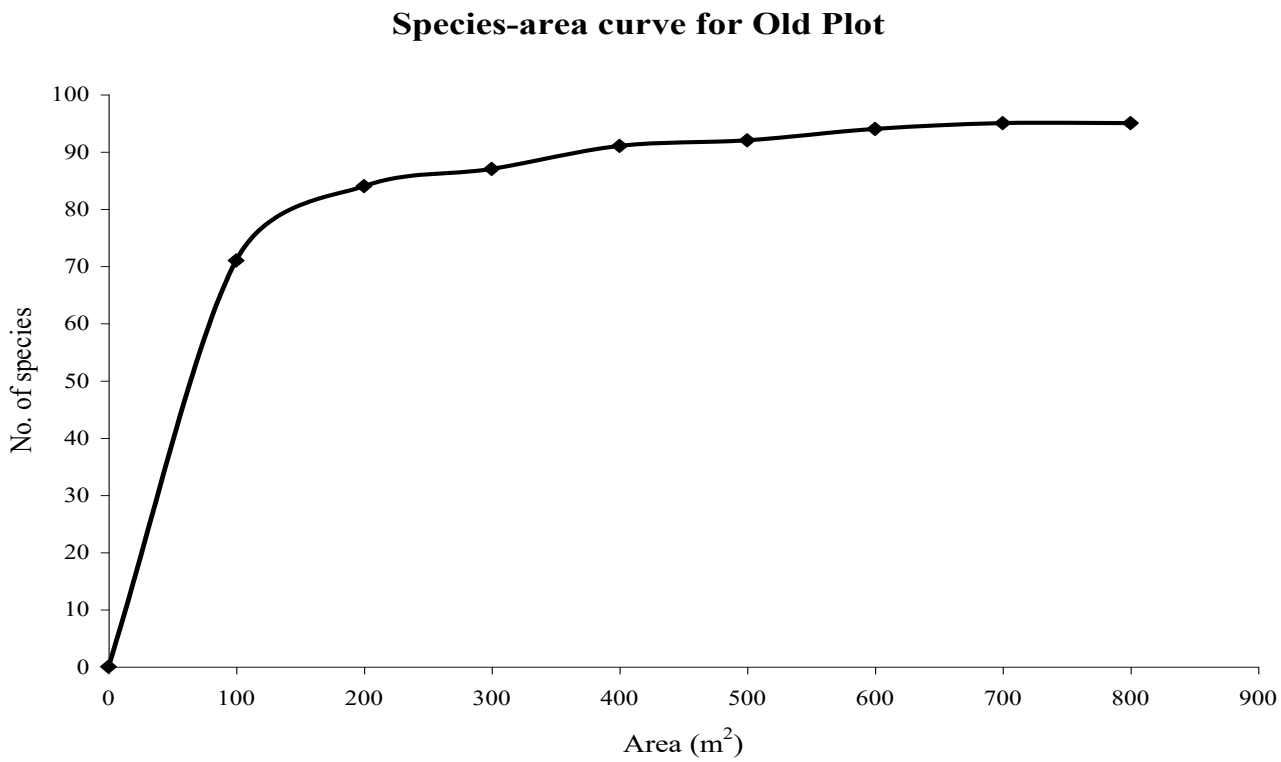

Fig 2. Species area curve for Brise Fer Old Plot, 2000.

Species of note

The following species were all found inside the Brise Fer Old Plot thanks to the thorough nature of the study:

Cordyline mauritiana (Dracaenaceae), a highly endangered epiphyte.

Chassalia lanceolata ssp lanceolata and *C. grandifolia* (Rubiaceae), both species are endemic and locally abundant but nationally rare.

Chionanthus broomeana (Oleaceae), now the eleventh known individual of this critically endangered endemic tree species.

Diospyrus revaughanii (Ebenaceae), thought to be the rarest of the endemic ebonies of Mauritius.

Embelia micrantha (Myrcinaceae), a rare vine believed to have curative properties.

Psiloxylon mauritianum (Myrtaceae), a critically endangered canopy tree.

Sideroxylon grandiflorum (Sapotaceae), the Tambalocoque or 'dodo tree'. Nets are currently being used to protect the fruit of this endangered endemic from monkey depredation in the hope that regeneration will result.

Discussion

Although only the first stage of the study has been completed the work has already yielded some useful results. A study of this nature is implicated in both general ongoing research into wetland forest ecology, and directly in the development of conservation strategies specific to this area of Mauritius. With regard to the aims laid out above we have successfully established a large volume of baseline data which will be used by MWF in basic analyses of the forest structure and diversity (see Results for our own preliminary findings). These are both important aspects of forest conservation and ecological research and will thus be more comprehensively studied at a later date. The data will also be used in a comparative study with similar work done by Dr. Strasbourg on Reunion (to be arranged).

The majority of the work however is dependent on the completion of phase two of the investigation (Summer 2001). Once the data from the unweeded plot is compiled (together with the Old Plot data) as species composition and age structure information and a digital map, a full scientific analysis can be undertaken in conjunction with MWF.

The team did not encounter any major problems during the study. There were some initial difficulties in developing a mapping technique that was quick and accurate, and there were obvious problems with plant identification at the start. However we soon overcame these obstacles and the work progressed efficiently. Overall the mapping did take much longer than anticipated because of taxonomically problematic species and thus had to be separated into two phases. Phase two should be carried out more quickly due to our initial knowledge of the flora although the second study site is larger in area.

Acknowledgements

The authors would like to thank Professors Lorence and Sussmann for their encouragement and support without which the project would not have taken place.

Ms. Jennifer Ah-King worked alongside the Edinburgh team for the duration of the project. Her knowledge of local flora proved invaluable and the authors would like to thank her for both her contribution and her patience.

Mr Gabriel D'Argent acted as consultant on the project and provided invaluable help with identification when it proved necessary.

Dr. John Mauremootoo (Mauritius Wildlife Foundation) was the overall supervisor for the project.

The authors would also like to thank the staff and volunteers of the Mauritius Wildlife Foundation for their encouragement, hospitality and friendship.

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Appendix I. Itinerary

June 29th: Arrival in Mauritius

June 30th – July 2nd: Familiarisation with the on-going conservation work in Mauritius

July 3rd – 4th: Familiarisation with upland forest, with J. Mauremootoo & G. D'Argent

July 5th – September 6th: Project implementation by Edinburgh team with the aid of G. D'Argent, and J. Mauremootoo as necessary

September 7th: Departure from Mauritius

Appendix II. Budget

Expenses	Cost
Air Fare	£2400
Subsistence (Accommodation, Food)	£3000
Equipment	£500
Vehicle Hire	£1000
10% Contingency	£690
Total	**£7590**

Funding	Value
Davis Fund	£4000
James Rennie Bequest	£900
Weir Fund	£1200
Personal Contribution	£1500
Total	**£7600**

Spending was as expected prior to the expedition and it was decided to give what was left of the contingency money as a donation to the Mauritius Wildlife Foundation to help in their continuing conservation efforts.