

SURVEYS OF MICROCHIROPTERAN BATS IN MADAGASCAR 2000

**Aberdeen University
Université d'Antananarivo**

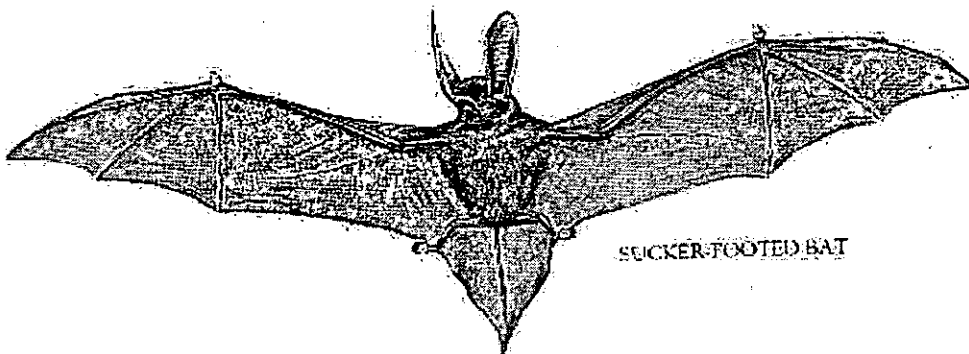
Contacts:

**Daniel Bennett
Department of Zoology
University of Aberdeen
Tillydrone Avenue
Aberdeen
AB24 2TZ
Scotland
Great Britain**

email: d.bennett@abdn.ac.uk

**Ko Foky Amyot Felix
Dept. Animal Biology
Université d'Antananarivo.
Antananarivo 101.
Madagascar**

email: wcsmad@dts.mg



SUCKER-FOOTED BAT

Introduction

This project will follow-up the work of the Queen's University Belfast Madagascar Bat Project 1999. The previous work identified and characterised the echolocation calls of many microchiropteran bats in the Masoala peninsular, produced a revised key to the bats of Madagascar and suggested that the use of trapping methods alone to survey bat communities was inadequate (Russ and Bennett 1999). Bats are difficult to study because of their mobility, small size and ability to detect traps. Therefore studies of community diversity require very intensive efforts to provide an accurate measurement of relative abundance. This joint Université d'Antananarivo and University of Aberdeen project aims to conduct the first ever ultrasonic surveys of bat communities conducted in Madagascar, using state of the art time expansion ultrasonic receivers to record echolocation calls. Application of these methods in Europe by members of the team has led to the discovery of a new species of breeding bat in Britain, and documentation of a species new to Ireland. Both discoveries were made in areas where intensive bat research has been undertaken for some forty years or more (Russ *et al.*,1998, Russ, 1996). By collecting calls of bat species present on the east coast of Madagascar, training local students and academics in the use of ultrasound analyses and the provision of suitable equipment, future studies of bats on the island will be greatly facilitated. The use of high effort trapping involving harp traps as well as mist nets will be employed in order to catch as many species as possible. The data generated will provide much needed data on bat community diversity in Madagascar and will have direct implications for bat conservation in the forests remnants of Madagascar as well as in cultivated areas. This project therefore represents an opportunity to apply the latest technologies to one of the most

important issues in global bat conservation today, and one which directly reflects the recommendations of IUCN'S Global Action Plan for Microchiroptera (in press).

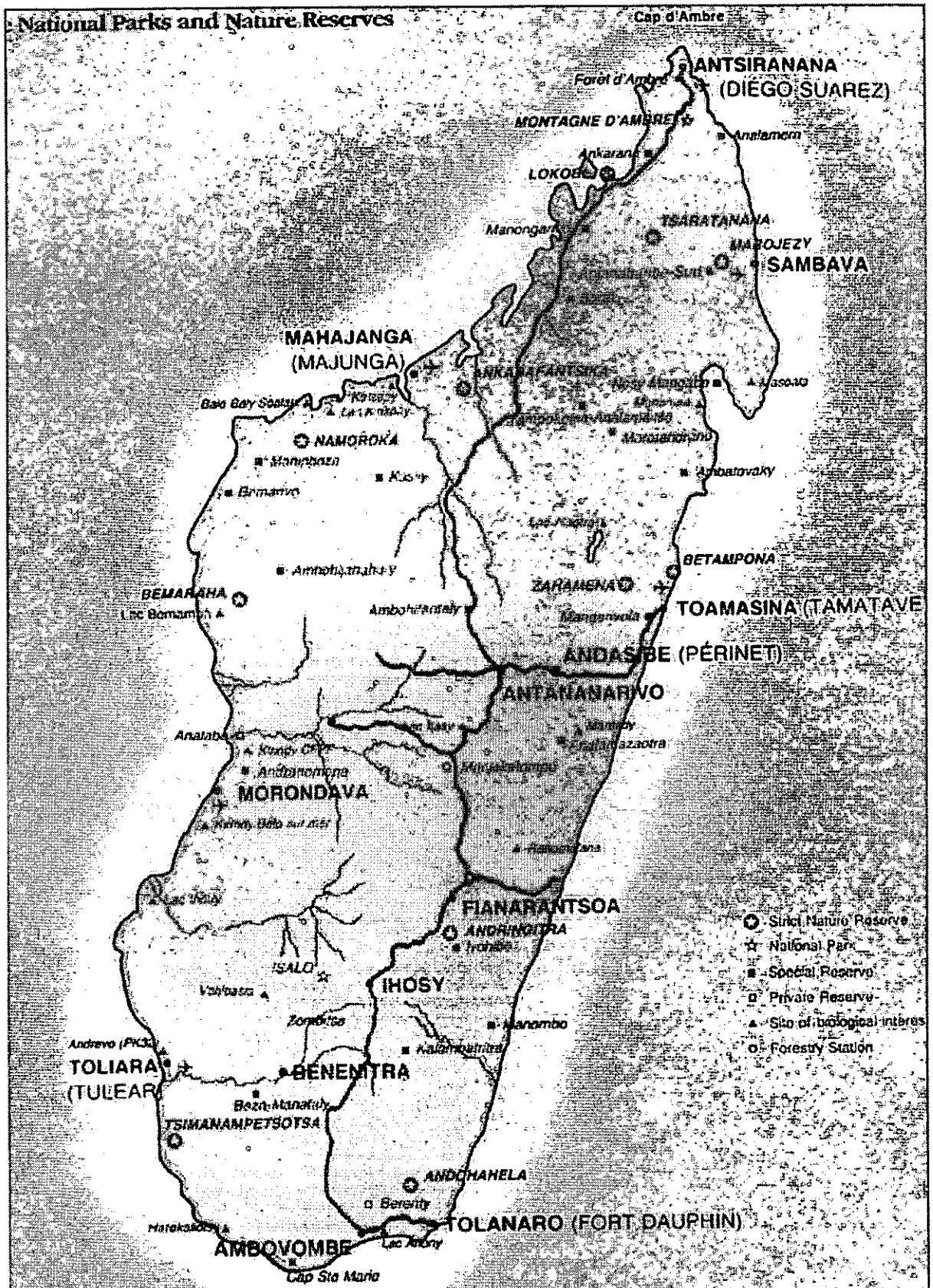


Fig 1: The national parks and nature reserves of Madagascar

Aims

1. To conduct surveys of microchiropteran communities throughout the remaining forests of eastern Madagascar using a combination of trapping and ultrasound recording.
2. To compile a library of the echolocation calls of all Malagasy echolocating bats by time expansion techniques that will facilitate future studies throughout Madagascar and in the Western Indian Ocean.
3. To train Malagasy students in all aspects of bat capture and in collection and analysis of ultrasound and at the end of the project all equipment will be left with the Université d'Antananarivo.
4. To present lectures and seminars at the Université d'Antananarivo on the use of echolocation in studies of bats, and at schools and colleges in the vicinity of study sites with a view to providing environmental education on the ecological and economic benefits of bat conservation.
5. To initiate the development of an Action Plan for Malagasy microchiropterans to complement the plan under development for megachiropterans.

Justification

Madagascar is remarkable for its usually high number of endemic taxa, many of which have no closely related species surviving anywhere on Earth. It is also considered a very high conservation priority because deforestation in many areas is almost complete. Sussman and Green (1990) predict that at the present rate of clearance only forest on the very steepest slopes will survive the next 30 years (Fig. 2). Although many elements of Madagascar's fauna are well characterised, the microchiropteran fauna of the island remains very poorly known, as a result of difficulties in sampling populations, taxonomic confusion and the lack of trained Malagasy personnel and resources to conduct surveys, and up until last year only the rapid inventory teams led by Dr S. Goodman had included bats in their surveys with limited success - in that catch rates per unit effort was not high. Seminars conducted by the present team in 1999 demonstrated that there was considerable interest among students and academics in the use of ultrasound to study bats and the problems of bat conservation in Madagascar. Conservation of small mammals such as microchiropteran bats in Madagascar is of great urgency because the majority of mammal species known to have become recently extinct world-wide are similarly small and inconspicuous (Ceballos & Brown, 1995). Recent studies in Madagascar and elsewhere have demonstrated that sampling and analyses of echolocation calls is a very efficient way of determining species composition in bat communities, particularly in forest habitats where communities are most speciose (O'Farrell *et al.* 1999, Russ and Bennett 1999). Echolocation calls can also be used very effectively to distinguish cryptic species whose taxonomic status is difficult to determine visually without killing the animal (Jones and Parijs 1993, O'Farrell and Gannon 1999). Perhaps the greatest advantage of the method for

ecological studies is that it is completely non-disruptive and does not disturb the animals in any way. By building a library of positively identified echolocation calls, training local workers in the relevant techniques and providing the necessary equipment, monitoring of microchiropteran communities in Madagascar will be greatly facilitated. The results will be of considerable use in comparing the fauna of areas subjected to different levels of deforestation and will have immediate use in the formulation of strategies for the conservation of microchiropterans. The data will also be of use in the study of insectivorous bat communities elsewhere, specifically in Africa and the islands of the Western Indian Ocean.

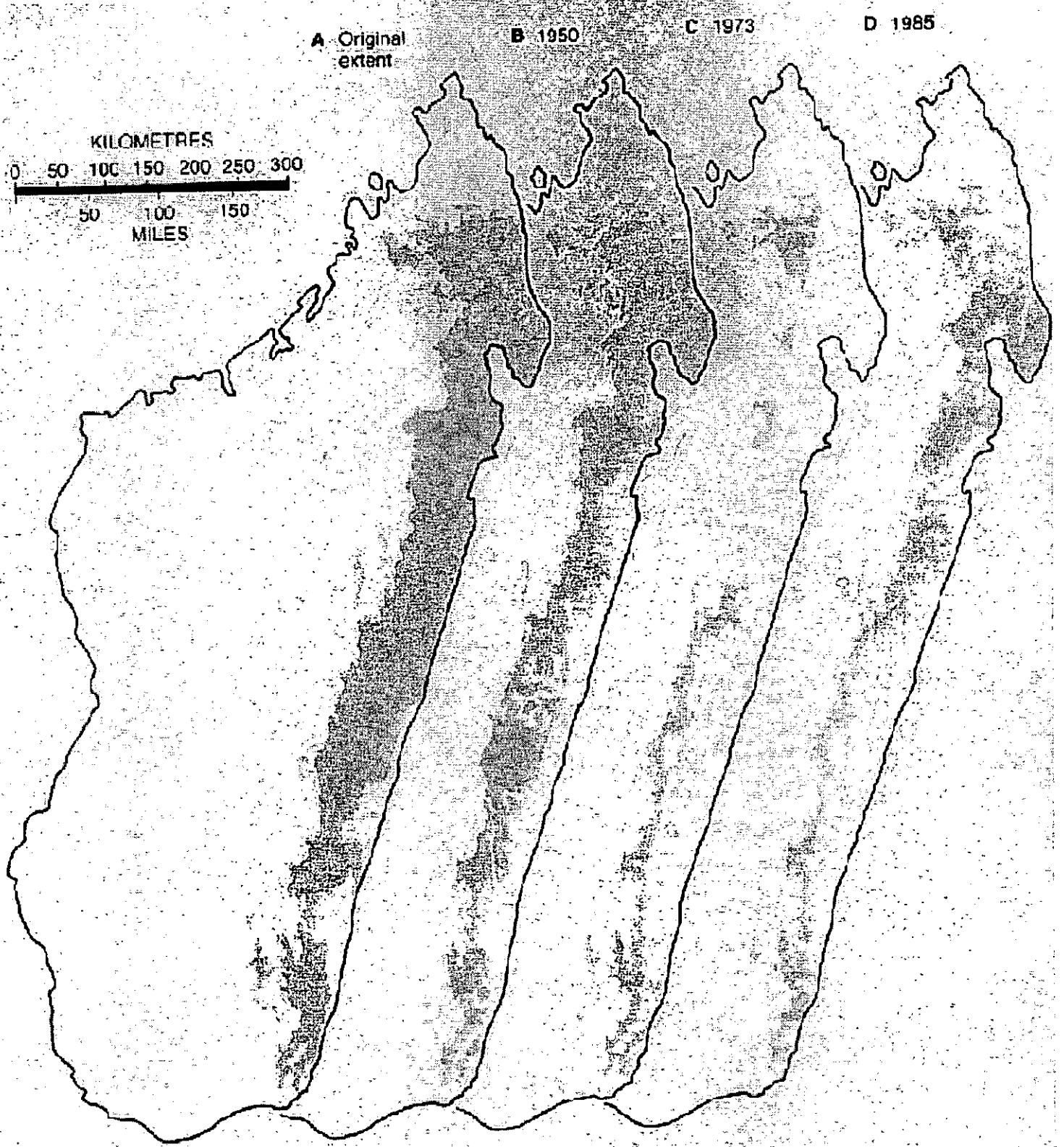


Fig.2: The decline in Malagasy rainforest

Background.

The last five years have seen concerted effort to survey both megachiropterans and microchiropterans in Madagascar (e.g. Hutcheon 1996, Goodman 1996, Bayliss and Hayes 1999). In 1999 a team from Queens University Belfast and Université d'Antananarivo carried out trapping and echolocation sampling at sites in the Masoala Peninsular of Madagascar (Russ and Bennett 1999). The work represented the first attempt to catalogue and describe the ultrasound characteristics of Malagasy bats. The results indicated that yield per unit catch effort for microchiropterans was very low, and that the majority of captures were of a single species of megachiropteran. Overall numbers of insect bats caught were so low that no estimate of overall diversity could be made. This problem is apparent in all previous attempts to measure diversity in microchiropteran communities in Madagascar (Bayliss and Hayes 1999, Huchteon 1996, Goodman 1996). Some species were known to have been present from echolocation recordings but were not trapped, other species were caught but not detected by ultrasound. Using a combination of trapping and ultrasound methods, species richness for sites examined equaled or exceeded those made anywhere in Madagascar. A number of uncaptured species remained unidentified because their echolocation was recorded but no reference calls were available. Of particular note was the discovery that the rare and endemic sucker-footed bat *Myzopoda aurita* was more widespread than had been predicted by previous workers. Continued work by Malagasy reseachers is currently not possible because of the high initial cost of the necessary equipment and because of the lack of personnel trained in collection and analysis of bat ultrasound.

The proposed project will continue the work of the 1999 team and act on its recommendations by applying ultrasonic detection and high effort trapping methods to a number of forested sites throughout eastern Madagascar, training local workers in the techniques and providing the equipment necessary for similar surveys of bats after the project.

Conservation Status of some Malagasy Bats

Of the 25 species of Malagasy Microchiroptera, the following are listed in the IUCN Action Plan:

<i>Scotophilus borbonicus</i>	Category/Criteria: Critically endangered/A1c
<i>Emballonura atrata</i>	Category/Criteria: Vulnerable/A2c
<i>Triaenops furculus</i>	Category/Criteria: Vulnerable/A2c
<i>Myzopoda aurita</i>	Category/Criteria: Vulnerable/A2c
<i>Mormopterus jugularis</i>	Category/Criteria: Vulnerable/A2c
<i>Otomops martiensseni</i>	Category/Criteria: Vulnerable/A2c
<i>Mormopterus acetabulosus</i>	Category/Criteria: Vulnerable/B1+2c
<i>Scotophilus robustus</i>	Category/Criteria: Lower risk: near threatened
<i>Tadarida fulminans</i>	Category/Criteria: Lower risk: near threatened
<i>Miniopterus fraterculus</i>	Category/Criteria: Lower risk: near threatened
<i>Miniopterus minor</i>	Category/Criteria: Lower risk: near threatened
<i>Miniopterus schreibersi</i>	Category/Criteria: Lower risk: near threatened
<i>Myotis goudoti</i>	Category/Criteria: Lower risk: near threatened.

All other Malagasy microchiropterans are listed as: Unknown due to insufficient data.

Relevant action plans:

Current action plans for Malagasy bats emphasize megachiropterans. In most cases there is insufficient data on microchiropteran populations to base any firm conservation strategies. This project meets all criteria of Species Action Plan No. 4.8 - the old world or sucker-footed bat (*Myzopoda aurita*), of the I.U.C.N./ S.S.C. Action Plan for Microchiropterans. The need to ascertain habitat preference data for the species listed above was considered the highest priority in the I.U.C.N. Red Data Book, 1996.

Methods

Selected sites (listed below) throughout eastern Madagascar will be visited and bat communities sampled by trapping, searching for roosts and recording of echolocation calls.

1. Massive trapping effort investment at each site. The previous study estimated that a minimum of 1,500 net nights would be required to catch representatives of all members of a community with a species richness of 20. Minimum effort per night will be 30 harp traps (total area > 45m²) and 35 mist nets. Trapping methods will attempt to reduce the large proportion of megachiropterans in the sample by targeting insectivorous bats, and using novel strategies to catch all species present. This includes the use of large locally constructed harp traps set along flyways such as stream beds and along paths, tunnel traps (developed by Phillip Alveola, UPLB, Philippines), banks of nets at various heights and ultra canopy nets (developed by Keith Ross). All bats caught will be identified, measured, marked and released. Some bats will be marked with temporary luminescent marks to facilitate recording of echolocation calls (O'Farrell *et al* 1999). Results of trapping will provide an unparalleled data set describing the diversity of microchiropterans in different habitats.
2. Intensive searches will be made for roosts during the day, targeting tree hollows, caves, rolled up leaves and human habitations

3. Echolocation calls of different species will be recorded in and around roosts, during foraging, in flight cages and immediately upon release. Recordings will be made on Tranquility II bat detectors and sound converted to digital files on a laptop computer.

4. Calls will be analysed using the programme Batsound v1.3 (Petersson Elektronik AB, Uppsala, Sweden) to identify distinguishing characteristics of the calls of individual species. A library of bat calls will be created and freely distributed among workers in Madagascar, Africa and the Islands of the Western Indian Ocean.

5. University students not directly involved with the project and schoolchildren will be given the opportunity to conduct their own bat surveys using donated heterodyne detectors, some of which will be left at schools close to study sites. Teachers will be encouraged to keep records of use.

Language

Official project language will be French. However all reports will be produced with full English translation and students will be encouraged to publish results in English.

Study Sites

Study sites will include areas of protected and unprotected forest as well as agricultural areas on forest boundaries. A number of sites have been tentatively selected but the final choice will depend on recommendations of local workers and Malagasy researchers. Priority areas include patches of intact forest and partially degraded habitats on the edge of protected areas.

- Analamera Special Reserve
- Masoala National Park
- Betampona Nature Reserve
- Zahamena Nature Reserve
- Ranomafana
- Andringitra Reserve
- Manombo
- Kalambatritra Reserve
- Lac Onony

Team Members

All named team members participated in the 1999 Project and are experienced in all relevant methodology. They possess at least a basic knowledge of the French language and all hold current first aid certificates.

Felix Amyot Kofu (joint Team Leader). Age 27. DéA. (Animal Biology) student at Université d'Antananarivo (equivalent to British MSc. Experience of field work on larger mammals throughout eastern Madagascar. Following 1999 project was appointed bat specialist to the Wildlife Conservation Society in Madagascar. Excellent spoken and written French and English.

Daniel Bennett (joint Team Leader). Age 33 (UK). Research Assistant, Department of Zoology, University of Aberdeen. Thirteen months experience of conducting bat research in the tropics. Leader of Aberdeen University Western Visayas Project (1996) and Black Volta Project (1997). Good spoken and written French.

Keith Ross (Treasurer). Age 25 (UK). Interests include the roosting and foraging behaviour of micro- and megachiropterans, the role of rivers and fragmented forest habitats in bat foraging, and chiropteran phylogeny. Holder of current U.K. bat handling licence. Travelled extensively in Europe and Africa, worked on large scale bat surveys in Scotland & Ireland.

Familiar with all aspects of GPS technologies and field navigation techniques, ex-member of Robert Gordon's College Combined Cadet Force. Good spoken and written French.

Jon Russ (Scientific Officer) . Age 28 (UK). PhD. Student, Queens University Belfast. Specialising in the behavioural ecology of the Chiroptera; echolocation, resource partitioning and habitat preferences on both a local and national scale. Currently carrying out the 'Northern Ireland Bat Survey' and, since 1996, discovered colonies of two bat species new to Ireland. Possesses extensive skills in echolocation collection, extraction and analysis. Holds an extended U.K. bat handling licence and a home office animal handling certificate. Author of a book on the echolocation and sound analysis of bats in Britain and Northern Ireland (Russ 1999). Good written and spoken French.

James O'Neill (Logistics Officer); Age 24 (UK). PhD. Student, Queens University Belfast. Holder of current U.K. mist netting (bats) and bat handling licences. Member of 1996 Aberdeen University Expedition to the Western Visayas Islands, studying fruit bat diversity. In 1997, discovered insectivorous bat species new to Britain. Very good spoken & written French.

Lorraine Marshall-Ball (Equipment Officer) Age 21 (UK). Final year BSc Zoology (Hons) student, University of Aberdeen. Extensive field experience including research on otters and European mink in Western Russia. Worked with captive fruit bats at Jersey zoo, Channel

Islands. Recent work has involved use of GPS field equipment and radio-telemetry. Excellent spoken and written French.

Up to ten students from Université d'Antananarivo to be selected by Prof. Daniel Rakotondrovony and Dr Emilliene Razafinahatrata when adequate funding has been secured. These students will be Baccaalaureat and DéA students and recent graduates.

In addition a number of field workers and academics will be invited to participate in the project at various times.

Dates and Itinerary

Project Dates: April - December 2000

April: Travel to Antananarivo, equipment testing and training at sites around the city.

May: Surveys in Masoala peninsular (Site 1)

June: Site 2

July: Site 3

August: Site 4

September: Site 5

October: Site 6

November: Site 7

December: Site 8

December 23: End of Project.

Permits

Permission to carry out scientific research in Madagascar is not required because the project is working under the University of Aberdeen's Accord de Collaboration with the Department of Animal Biology at the Université d'Antananarivo. A permit to catch and release bats is required from the Tripartite Commission and will be obtained on the Project's behalf by Matthew Hatchwell of the Wildlife Conservation Society in Antananarivo and Prof. Daniel Rakotondrovony of Université d'Antananarivo. Permits to enter National Parks will be granted just prior to work at each site by the local A.N.G.A.P. (Association National pour la Gestion des Aires Protegees) office, with whom the University of Aberdeen also has an Accord.

Contacts

The following people and organisations cooperated with the team's previous activities and their help has been requested for the proposed project.

Le Ministre de l'Enseignement Supérieures, Antananarivo

Le Ministre de l'Affaires Etrangères, Antananarivo.

Association National pour la Gestion des Aires Protégées 1424, Antananarivo 101,

Matthew Hatchwell, Wildlife Conservation Society, Antananarivo

Prof. Daniel Rakotondravony, Head of Dept. of Animal Biology of Université d'Antananarivo, Antananarivo 101.

Dr. M. E. Nicol, WWF Aires Protégées, 738, Antananarivo 101, .

Dr. Steve Goodman, WWF Aires Protégées, 738, Antananarivo 101, .

Prof. P. A. Racey, Regius Professor of Natural History, Dept. of Zoology, University of Aberdeen, AB24 2TZ.

Dr. Roderick Mast of Madagascar Programme International, Eighteenth St. N.W. D.C. 20036

Dr. Albert Randrianjafy, Directeur, Parc Biologique et Zoologique de Tsimbazaza, .P. 4096, Antananarivo 101, Madagascar..

Dr Colin Catto, Bat Conservation Trust, Cloisters House, Battersea Park Road, London, SW8 4BG

Dr J. P. Paddack, Head, WWF Aires Protégées. Antananarivo 101

Budget

Expenses	# Sterling
PRE PROJECT	
Communications	80
Stationary and printing	150
EQUIPMENT	
5 Tranquility II bat detectors	1500
5 tape recorders	400
Two lap top computers	350
Extra batteries for computers	70
Insurance for equipment	300
Mist nets	500
Harp Traps	250
Medical	450
IN MADAGASCAR	
Insurance for Malagasy members	400
Accommodation and food in cities	400
Travel (Public transport costs, fuel, vehicle hire)	1300
Allowances for Malagasy students	1200
Wages for hired helpers	2000
Food and accommodation in the field	2000
POST PROJECT	
Report production and mailing	400
Contingency	1500
TOTAL REQUIRED	13250

Notes

Insurance and travel to Madagascar met by UK members

Accommodation in field includes tents, tarpaulins and rent of buildings

All travel will be overland and by public transport where possible

Hired helpers include local field guides and cook

Health and Safety

All team members from overseas must provide evidence of comprehensive medical insurance and vaccination against tetanus, hepatitis A + B, rabies, meningitis, polio, typhoid and TB. Use of malarial prophylactics will be compulsory for overseas members, use of permethrin coated mosquito nets will be compulsory for all members. All Malagasy members of the team will be insured in Madagascar at the Project's expense. Wearing of long sleeves on all limbs will be compulsory. Team members will work in groups of at least three people and always be accompanied by guides in the field. Only water provided is to be used for washing and drinking.

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