



## **Darwin Initiative for the Survival of Species**

### **Annual Report**

**June 2002 – April 2003**

**School of Biological Sciences  
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**Contractor: Prof. Paul Racey**

**Project leader and Darwin Fellow: Richard Jenkins**

## **1. Darwin Project Information**

Project title: **Conservation and management of Malagasy Microchiroptera and their habitats**

Country: Madagascar

Contractor: Prof. Paul Racey

Project Ref. no: 162/10/024

Grant value: £145,125

Start/Finishing dates: December 01/12/01 to 30/11/04

Reporting period: 01/04/02 to 31/3/03

## **2. Project Background**

The project is located in Antananarivo, the capital of Madagascar. The ground floor of the Darwin Fellow's house (three rooms) is given over to Darwin Trainees for desk space, library facilities, computer use and microscope work.

The microchiropteran bats of Madagascar have received very little conservation attention compared to other Malagasy mammals (e.g. lemurs, tenrecs and carnivores). Madagascar has many young zoologists, trained to survey groups such as birds, lemurs or reptiles, who have directly benefited from the considerable interest shown by overseas researchers/NGOs in the island's biodiversity. However, a lack of research by overseas specialists on Malagasy bats has resulted in few opportunities for students to specialise in bat research and this has had the knock-on effect of producing a short-fall of trained people to conduct bat surveys. Our Darwin project aims to directly address this issue by providing training with up-to-date methods of bat survey. By raising the awareness of conservation organisations to bat-related issues we will encourage the demand for bat researchers and we will meet this demand by leaving in place an equipped and able team of Microchiropteran specialists.

## **3. Project Objectives**

- Survey insectivorous bats in protected areas of the eastern rainforests and in limestone regions using bat detectors, mist nets and harp traps.
- Train Malagasy graduates in these techniques that will then be extended to other protected areas and used to establish longer term monitoring programmes.
- Incorporate the conservation requirements of bats into management plans for individual protected areas.
- Establish a national database of bat biodiversity and produce a national action plan for the conservation of insectivorous bats.
- Carry out a programme of environmental education in limestone cave areas to encourage bat friendly practices and sustainable ecotourism.

- Evaluate the ecological services provided by bats in controlling insect pests as leverage for their incorporation into national conservation agendas.

#### **4. Progress**

##### *Brief project history*

The project started on December 1<sup>st</sup> 2001 with the appointment of the Darwin Fellow. Plans to begin the work in Madagascar during February 2002 were suspended because of the unprecedented political and civil turmoil in the country. The Darwin Fellow followed Foreign and Commonwealth Office advice and postponed travel to Madagascar (March-May 2002), eventually to arrive in country during June 2002. This report covers the period from arrival in the country to date (March 2003) The period immediately after the political crisis (July-September) was characterized by a gradual recovery leading to the post-crisis period (October 2002-) when the country returned to normal.

##### *Summary of progress*

In the 10.5 months that the project has been operation in Madagascar, the following progress has been made:

- One DEA student has been trained and has completed his fieldwork and a second has recently joined the project.
- Two full-time Malagasy assistants have been appointed and trained in the use of ultrasound bat detectors and bat catching techniques.
- Three Malagasy biologists (post-DEA) have been trained as above and are conducting short research projects.
- One national park guide has been trained in the use of bat detectors and conducts weekly monitoring of bat activity.
- Professor Olga Ramilijaona, Head of Department of Animal Biology, University of Antananarivo, visited the project in the field and was shown the different methods for detecting and catching bats.
- Microchiropteran surveys of rainforests in Anjozorobe, Analamazaotra-Mantadia and Makira have been carried out
- Reconnaissance visits made to littoral forests in the south-east and to the Ankarana caves in the north.
- Over 50 interviews conducted using a standard questionnaire to assess peoples' awareness of Microchiroptera.
- Preliminary reports have been submitted to the Department of Animal Biology (University of Antananarivo), Directorate of Water and Forests and the National Association for the Management of Protected Areas (ANGAP).
- A microchiropteran bat database and specimen collection has been started.

The project has undergone slippage from the original start date on the proposal of April 2001. A delay in the recruitment of a Darwin fellow who was prepared to be permanently based in Madagascar for two and a half years and the political crisis has necessitated a revision of the work plan (see below).

### *Project's research*

Over the last year the project has developed three main research themes:

#### 1. Habitat preference

There is no available information on the impact that forest fragmentation and agricultural expansion is having on bat species in Madagascar. This is in stark contrast to other mammal groups where the impact is well documented and certain forest-dependent species receive conservation attention. The project has therefore aimed to compare bat species composition and activity in different habitats. This involves surveying primary forest, secondary forest, exotic plantations and farmland areas in three rainforest sites. In adopting this approach we aim to provide site-specific information for individual reserves and information on the relative importance to bats of secondary and disturbed habitats in Madagascar.

#### 2. Echolocation

Further descriptions of the echolocation calls of Malagasy bats are a pre-requisite to developing reliable surveys methods for bat detectors. Every effort is made to trap bat species at each site, whether in free-flight or near a roost, to enable the recording of their echolocation calls (in free-flight and in a flight cage). This project represents the first attempt in Madagascar to make a reference collection of echolocation calls that are cross-referenced with specimens.

#### 3. Diet

Biologists in Madagascar are becoming increasingly aware of the potential role that bats could make to reducing population of insect pests. However, there has been no previous attempt to describe the diet of Malagasy Microchiroptera. We have started by focussing on the family Molossidae (high-flying species, known to consume vast quantities of insects in other countries) and comparing diet between seasons and habitats. Future projects will investigate the diet of forest bats (e.g. Vespertilionidae and Hipposideridae).

### *Project's training*

The project has concentrated on introducing the concept and operation of bat detectors to the Malagasy students. The various advantages and limitations of the three main types (heterodyne, frequency division and time-expansion) are explained and each student is given ample opportunity to practice their use in the field. The technical nature of this training demands one-to-one teaching and considerable effort is therefore expended on each individual. This is not only important to ensure the students understand the equipment but is also essential for fieldwork where standardisation between observers is required. In the coming year there will be a shift in the training emphasis to methods of analysing the recorded echolocation calls.

### *Project's methods*

Bat catching has been undertaken using methods that have been successful elsewhere. Standardised effort was used, consisting of 72 m of mist net and two 1x1m harp traps, to compare between sites and habitats. Nets and traps were otherwise deployed on an *ad hoc* basis when catching bats at roost sites.

The survey method with bat detectors evolved during the course of the first year. The project now uses the following protocol: habitats are surveyed using five-minute point

counts at a series of locations separated by 100-200 m. This method was preferred over the more commonly used walked-transect because of the difficult terrain in many of the sites. At each point count observations are made in heterodyne mode; this involves noting the frequency of each bat sound and a description of activity (i.e. foraging or passing). Simultaneous recordings are made in frequency division onto a Sony mini-disk to allow the duration of bat activity to be determined. This latter method has two distinct advantages: (1) trials have shown higher consistency between observers for recording the duration of activity from mini disk recordings than counting bat passes directly in the field and (2) in areas of intense bat activity, more accurate counts of bat passes and feeding can be made from the recording. Time-expansion recordings are also made at each point count and these are used to identify species. Using the three approaches we are therefore able to quantify the activity of each species at each point count.

Dietary studies require the collection of faecal samples; bats are trapped as they return to their roosts after foraging and placed in a clean, dry cloth bag for up to 30 minutes. A maximum of five faecal pellets is collected from each individual bat, which is colour marked with ink, before release to avoid pseudo-replication of samples. Representative samples of the insect fauna at bat feeding areas are collected with the aid of malaise and light traps.

#### *Project's results*

Few data have been analysed to the extent that they can provide us with a clear set of results at this stage. However, there are a number of important findings:

- Capture rates in rainforests are extremely low with typically one capture every five nights. Bat detectors have also revealed low activity levels within rainforest.
- Species richness in many rainforest sites is low (<5) but forest areas that have been disturbed (cyclone damage/selective logging) typically have a higher diversity and abundance of bats.
- Rainforest managers should adopt a 'landscape' approach to bat management because the peripheral habitats (e.g. plantations, farmland) provide suitable habitats for many species. Furthermore, many of the vulnerable species (e.g. *Mormopterus jugularis*) have strong associations with people, roosting in buildings and foraging over rice fields.

#### *Significant difficulties*

The project has encountered two significant difficulties:

1. The political crisis in Madagascar was on an unprecedented scale and resulted in major food and fuel shortages in the capital coupled with deliberate destruction of bridges and power lines elsewhere. The crisis lasted from January until July 2002 (when the previous leader fled the country and Madagascar's new President received international recognition). As noted in the 6-month report, the crisis caused a four-month delay in setting up the project in Madagascar and this has affected the proposed schedule of field surveys.

2. There is a shortage of available students wishing to register for their Diplômes d'études Approfondies (DEA) from the Department of Animal Biology. This is

caused by demand from NGOs (etc.) outstripping the number of available students on the DEA course. In the first 10.5 months in Madagascar we have been allocated two DEA students, one in July 2002 and one in March 2003.

*Refinement of project design?*

In response to the problem described above we have made an important refinement to the selection criteria for Darwin Trainees after consultation with Prof. Olga Ramilijaona and Dr Daniel Rakotondravony (our Co-Principle Investigator).

Darwin trainees

Due to the lack of students available to receive training as part of their degree we have decided to train students who have already finished their DEA fieldwork. The University of Antananarivo continues to select our trainees and gives preference to those with an interest or knowledge in bats or invertebrates.

This system is working well and we do not have a shortage of Darwin trainees – just a shortage of trainees enrolled as current DEA students. However, there is a financial consequence of this new arrangement: DEA students, as stipulated in our Protocol of Collaboration with the University of Antananarivo, receive a field per diem but no contribution to the costs when processing specimens/analysing data/thesis writing (although thesis production costs are met). However when training post-DEA students to conduct bat research, we are obliged to cover their full costs in the field and in the laboratory or office. Thus, the cost of a two-month field period followed by six months office/lab work for a DEA student is £180 and for a post-DEA student is £800.

A second consequence of the new arrangement is that the post-DEA trainees will probably remain on the project for longer than a DEA student. This will result in fewer Darwin trainees than originally proposed (12), but will not reduce the overall number of training weeks provided by Darwin for Malagasy graduates. A benefit of the new arrangement is improved continuity from the fact that we have a more stable and integrated team.

Work plan for next twelve months (the next 6 month reporting period shaded)

Activity	Description	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Fieldwork	Isalo National Park	■								■			
	Sarodrano					■		■					■
	Namoraka Integrated Reserve								■				
	Ambohitantely		■										
	Bemaraha National Park			■	■				■				
	Fort-Dauphin										■	■	
	Analamazaotra-Mantadia						■						
Kirindy												■	
Training	Insect taxonomy	■	■				■			■			
	Echolocation calls analysis	■	■										
	DEA thesis preparation	■	■	■	■	■	■	■	■	■	■	■	■
Office/lab	Faecal specimen processing	■	■	■	■	■	■	■	■	■	■	■	■
	Faecal specimen collection	■	■	■	■	■	■	■	■	■	■	■	■
	Report production						■			■	■		
Capacity building		■											
Publicity	Education poster			■	■								
	Radio broadcast						■	■					
	Newspaper articles						■	■					
Outputs	Makira Plateau report				■					■	■		
	Caves guidelines								■	■			

## **5. Partnerships**

The project's host country partner is the Department of Animal Biology (DAB), University of Antananarivo, Madagascar. There is a very close working relationship between the objectives and activities of the project and the DAB. The only difficulty concerns the availability of DEA students described above. Through our recently renewed (another three years) protocol of collaboration we received the following assistance from the DAB:

- Provision of DEA or post-DEA students.
- Letters of support/recommendation for Darwin Trainees and Darwin Fellow.
- Facilitating the acquisition of research permits and export permits from the Department of Water and Forests.
- Access to relevant local literature and some equipment (e.g. microscopes).

Research topics for DEA students and study site selection are both discussed with DAB in addition to giving regular oral updates on the project activity. Dr Daniel Rakotondravony, a small mammals specialist and co-PI on the project, is familiar with all aspects of the work. He maintains a close interest in our research, particularly the dietary studies and has been extremely helpful in our applications for extra funding. Prof. Olga Ramilijaona is an entomologist and took over from Dr. Rakotondravony as departmental head in March 2003. She undertook a three-day field visit to Analamazaotra (which we funded) to see first hand the Darwin Trainees using time-expansion bat detectors and trapping Molossidae bats as part of the dietary investigation.

Dr Cazimir Rafamantarantsoa, Head of Entomology, Tsimbazaza Botanical and Zoological Park, Antananarivo, has given a short course on insect taxonomy to the Darwin Trainees and provided helpful advice on the analysis of faecal pellets.

## **6. Impact and Sustainability**

The existence of the project appears to be well known within Madagascar and this has resulted in a number of invitations to conduct bat research:

- (1) Dr Patricia Wright who heads the research work at Ranomafana National Park has invited us to conduct surveys in the Ranomafana-Midongy Sud rainforest corridor.
- (2) Qit Madagascar Minerals (QMM)/Flora and Fauna International invited us to conduct bat surveys in and around the proposed mining area of the Fort-Dauphin littoral forests. QMM is a subsidiary of Rio Tinto which has provided us with a substantial additional grant through their partnership with Fauna and Flora International.
- (3) Dr Frank Hawkins (Conservation International) requested information on forest dependency in Microchiroptera with a view to managing disturbed forest areas in Analamazaotra-Mantadia National Park.
- (4) The Wildlife Conservation Society invited us to participate in their multi-disciplinary survey of the proposed protected area in Makira Plateau. To our knowledge this is the first time that a bat survey team has been asked to work alongside lemur and small mammal teams.

We have also recently been invited to help build the capacity of a bat NGO (ACCE) based near Moramanga and dedicated to the Conservation, Education and Protection of Bats. They have received first-phase funding from Conservation International but their ambitions for the project are hindered by a lack of research and field experience. We are currently in discussions to hold training workshops in bat identification and the use of bat detectors for staff of this NGO.

Mme Rindra Rakotoharifetra, Director of Programme Bemaraha, has shown considerable interest in our proposed work in the limestone caves of Bemaraha National Park during 2003. In particular they want us to survey the caves that are on tourist circuits to provide management advice and to survey the less-disturbed caves that are rarely visited by tour groups.

## 7. Outputs, outcomes and dissemination

Table 1. Project Outputs (According to Standard Output Measures)

Code No.	Quantity	Description
4C	1	<sup>a</sup> Felicien Randrianandrianina: completed his fieldwork and data collection (Sept- 02:Feb 03) for his Diplomes d'études Approfondies (DEA) thesis: <i>The Use of Echolocation to Determine Habitat Use and Species Composition of Microchiroptera in Primary Forest and Disturbed Habitats</i> . Currently analysing data and preparing thesis.
4C	1	<sup>a</sup> Andrianajoro Rakotoarivelo: recently joined the project (March 2002) for his DEA field research project: <i>Dietary preference in Male and Female Hipposideros commersoni</i> . Proposed fieldwork (June – September 03).
4C	1	<sup>b</sup> Amyot Kofoky: full time research assistant, has commenced fieldwork for his PhD and also has other project duties, including training in the use of bat detectors and management of field surveys.
4C	1	<sup>b</sup> Fanja Ratriomomanarivo: full time research assistant trained in the use of bat detectors and conducting a post-DEA project: <i>Roost Selection and Conservation of Microchiropteran Bats in Madagascar Karst Landscapes</i> .
4C	1	<sup>b</sup> Julie Ranivo: research assistant who spent five months on the project, learning about Microchiroptera survey methods, before taking maternity leave. She hopes to return to the project in May 2003.
4C	1	<sup>b</sup> Rado Andrianaivoarivelo: conducting a post-DEA project: <i>Seasonal Variation and Resource Partitioning in the Diet of Molossidae from Urban and Rural Madagascar</i> .
4C	1	<sup>b</sup> Daudet Andriafidison: trained in the use of bat detectors and conducting a post-DEA project: <i>Diet and Habitat Requirements of the Rare Bat Otomops madagascariensis</i> .
4C	1	<sup>b</sup> Nicolas Rakotomalala: is a post-DEA entomology student who recently joined the team to assist in the identification of insect specimens and bat faecal samples.

<b>4D</b>		<sup>a</sup> Each DEA student receives 3-5 months field training and at least 1 year of close supervision during thesis preparation. <sup>b</sup> Post-DEA students receive training and then conduct closely-supervised individual research projects for a year or more.
<b>6A</b>	1	Simon Randriamimala (National Association for Management of Protected Areas employee) trained in the use of heterodyne bat detectors and conducts weekly surveys of the activity of molossid bats near Analamazaotra-Mantadia National Park.
<b>8</b>	9 weeks	Based in UK following Foreign and Commonwealth Office advice.
<b>8</b>	43 weeks	Based in Madagascar
<b>15A</b>	2	Publicity articles in national newspapers (one in French, one in Malagasy)
	1	Article in WWF's Malagasy conservation magazine.
<b>16A</b>	1	'New Project Announcement' produced in English, French and Malagasy and distributed in Madagascar to appropriate departments/organisations.
<b>19A</b>	1	Ten minute feature, in Malagasy, on Radio National Madagascar (August 2002)
<b>23A</b>	£12,000	From Rio Tinto via Flora and Fauna International for student support (year 1)
	£1,800	Royal Society grant to support Prof. Racey's field visit, October 2002
	£360	QMM contribution to reconnaissance visit to Fort-Dauphin
	£625	Wildlife Conservation Society contribution to field survey of Makira Plateau
	£11,000	From National Geographic Society for student support (year 2)

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## 8. Project expenditure

The project expenditure is based on the DETR Darwin Initiative Grant claim form. The budget is currently in the process of being re-scheduled by the university and Darwin staff to accommodate the unusual and unexpected circumstances during the first seven months of the project. The re-scheduling is expected to be completed by the end of May 2003.

Item	2002/3 Grant	2002/3 Claimed
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## **9. Monitoring, Evaluation and Lessons**

Under normal circumstances the project would be evaluated against the goals and objectives set out in the original work plan. However, for the reasons described above the initial schedule of outputs and field surveys have undergone revision, thus preventing this form of project evaluation.

Achievement can be measured by comparing the capacity of students from DAB to conduct Microchiroptera surveys when the project began (June 2002) to their current capacity. From a starting point of a single individual with a background in bat identification and bat detectors, we have already reached the point where any of five Darwin Trainees could undertake a basic survey with a bat detector. Furthermore, during February 2003 the team divided into two survey teams in geographically distinct areas, with one group consisting entirely of Darwin Trainees; this would have been impossible at the beginning of the project. This also demonstrates success in one of our key objectives – to train Malagasy students to become proficient with the use of ultrasonic bat detectors.

### 10. Author(s)

Dr. Richard Jenkins  
Prof. Paul Racey

29.4.03