

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

## ***Annual Report***

### **1. Darwin Project Information**

Project title	Sustainable development of Madagascar's littoral forest
Country(ies)	Madagascar
Contractor	<i>Environmental Change Institute, University of Oxford</i>
Project Reference No.	<i>162/9/006</i>
Grant Value	<i>£79,162</i>
Start/Finishing dates	<i>May 2000 - June 2002</i>
Reporting period	<i>May 2000 - April 2001</i>

### **2. Project Background**

- Briefly describe the location and circumstances of the project and the problem that the project aims to tackle.

The future persistence of the biologically unique littoral forests surrounding southeastern Madagascar is uncertain due to pressures from local deforestation and the potential large-scale deforestation associated with a proposed mining project. This research aims to investigate patterns of species richness as related to present and future scenarios of degradation within the remaining forest fragments. The methodology will include innovative techniques for the rapid assessment of canopy structure and species richness. Results from these assessments will be useful for determining where conservation should focus within the area and for assessing the impacts of development and local exploitation on this unique ecosystem.

### **3. Project Objectives**

- State the purpose and objectives (or purpose and outputs) of the project. Please include the Logical Framework for this project (as an appendix) if this formed part of the original proposal or has been developed since, and report against this.

Project Purpose:

The key purpose of this project is to assess if biodiversity can be conserved in small, degraded forest patches, which are under pressure from local villagers and large-scale industrial mining impacts.

This question will be addressed by: (a) undertaking a critical examination of the process of the corporate Environmental Impact Assessment (EIA) and assess its role in contributing to the conservation of biodiversity 'hotspots', and (b) using alternative, but complementary methods to collect data which will contribute to the identification and conservation of forest biodiversity, and which will be directly relevant to the conservation planning process.

The following set of objectives will comprise this research:

1. To examine the integrity, completeness and the scope of the ongoing EIA process and the conclusions reached
  2. To develop an alternative methodological approach (based on photogrammetry, remote sensing and rapid survey techniques, integrated through GIS) to the mapping and analysis of the dynamics and detailed plant taxonomy of the forest fragments, that can be used as an independent check on the approaches adopted as part of QMM's own studies.
  3. To support the second objective with local capacity building and training in monitoring and assessment techniques.
- Have the objectives or proposed operational plan been modified over the last year and have these changes been approved by the Darwin Secretariat? No

#### **4. Progress**

- Please provide a brief history of the project to the beginning of this reporting period. (1 para.)

The project officially began in May 2000 and has been progressing steadily throughout the past year. Three official field campaigns have been undertaken and have resulted in the acquisition of some very helpful and interesting information, which researchers are currently analysing. We have also been actively involved in three stakeholder meetings on the impacts of the mining within the study area, which have allowed us to share our work, learn about other research in the region, develop contacts and to understand multiple perspectives towards conservation within the region. These experiences have also been instrumental in the development of our plans for training and capacity building within the region, which will be a significant project focus within the upcoming year. We have also shared our work at two international conferences and have written two papers to accompany these presentations. It has been a busy and successful year, which has provided the foundation for another equally productive twelve months.

- Summarise progress over the last year against the agreed baseline timetable for the period. Explain differences including any slippage or additional outputs and activities.

#### **Outputs:**

- Terence Dawson (ECI) and Dan Lambert (QMM) presented the outline of their collaboration project at the DARWIN meeting held at the Natural History Museum, May 2000.
- Paul Smith (RBG Kew) attended a Madagascar regional development stakeholder's meeting, held in Paris, May 2000.
- The inaugural meeting and planning workshop of the project was held at the Environmental Change Institute, June 2000.
- Field campaign investigating the structure and composition of the forests (July-August 2000) and accompanying report, May 2001
- Dr. Jorg Ganzhorn from the University of Hambourg gave a training course in ecological assessment and monitoring techniques to 24 people in Fort Dauphin: 8 Malagasy graduate students from the Universities of Tana and

Toliary, 5 Malagasy QMM employees and 11 visiting students from the Universities of Hamburg and Oxford, 24 July – 4 August 2001

- Terence Dawson attended conservation planning workshop, Montreal Canada, September 2000.
- Official project website, October 2000
- Stakeholder meetings on the dilemmas of mining and on developing a biodiversity plan for the southeastern region of the country, London, England October 2000
- Field campaign to obtain aerial photographs of the St. Luce, Mandena and Petricky forests and to measure forest canopy structure and light regimes using a TRAC meter, November-December 2000
- Online photographic database of endemic plant species in the region, February 2001
- Field campaign to assess the quality and biological importance of the Mandena and Petricky forests through detailed botanical and taxonomic assessments, March 2001, and accompanying report, May 2001
- Training of QMM employees in aerial photographic image acquisition and analysis techniques, March 2001
- Geo-rectified map of Mandena forest from aerial photographs, July 2001
- Two conference presentations: International Remote Sensing of Environment Symposium in Cape Town, South Africa, March 2000 and International Geophysical Society Conference in Nice, France, March 2001
- Four published papers

At the current time, the project is on-schedule although the aerial surveying of the littoral forests was delayed by 2-months due to aircraft availability and a series of biodiversity conservation planning workshops organised by QMM and held in Montreal on 5-9 September (Terence Dawson attended) and London on 19-20 October (Terence Dawson, Paul Smith and Stephen Cobb attended). The thematic maps of the region may take longer than expected due to technical difficulties and distortion of the images. However, mosaiking of these images into thematic maps should be completed by the end of December 2001. All of the other outputs are in accordance with the original timeline.

- Provide an account of the project's research, training, and/or technical work during the last year. This should include discussion on selection criteria for participants, research and training methodologies as well as results. Please **summarise** techniques and results and, if necessary, provide more detailed information in appendices (this may include cross-references to attached publications)

## **Research:**

1. *An investigation into plant composition and structure within the highly fragmented, degraded forests of Southeastern Madagascar, July-August 2000*

In collaboration with undergraduate students from the Department of Biology, Oxford, we developed a science plan for the first fieldwork campaign to investigate structure and composition of various forest fragments in Mandena and St. Luce from 4 July and 28 August 2000. A total of 24 plot and 24 transect surveys were conducted with the establishment of 8 plots for future assessments and monitoring.

2. *Aerial photography campaign and image analysis, November 2000*

In November 2000, aerial photographs were made of the Petricky, Mandena, and St. Luce forests. Photographs were taken at a height of 8,500 feet with a Nikon 01 digital camera, which was interfaced to a lap top computer and Geographical Positioning System. The series of images are currently being stitched together and geo-referenced so that we may analyse canopy structure and degradation of the forests. We are conducting this analysis with Erdas Imagine and Idrisi software.

3. *Assessment of canopy structure through the measurement of forest light regimes using a TRAC meter*

Monitoring of the forest with a TRAC light meter was conducted along previously marked transects throughout the Mandena and Petricky forests. GPS measurements were taken along each transect so that we may be able to determine if there are correlations between the light meter readings on the ground and the interpretations of canopy texture and, thus, structure, visible in the aerial photographs. These measurements may also provide a quantitative value for canopy degradation, which has previously been assessed by QMM staff members with a subjective, ranked classification system. This meter, which has not been used widely in tropical forests, may provide a useful tool for rapid ecological assessment of habitat quality of the littoral forests.

4. *Assessment of forest quality and importance of the vegetation in the forest of Mandena and Petricky (SE Madagascar)*

This field campaign aimed to assess the quality and importance of the vegetation within the forests of Mandena and Petricky. The specific objectives for accomplishing this task were:

- To provide scientific names for trees occurring along previously marked transects within the forest of interest,
- To compare the scientific names with local Malagasy vernacular names within the study region
- To assess the value of Malagasy vernacular names in vegetation survey within the study area
- To record a sub set of the sub-canopy flora in designated forest parcels as a preliminary indication of whether recording the tree flora alone is adequate for use in rapid plant diversity/conservation assessment methods.
- To make general observations about the conservation measures undertaken by QMM for conservation within the mining region

The identification of voucher specimens has recently been completed and preparation of the vouchers is currently being conducted at Kew gardens. A report presenting results can be found attached in the appendix.

### 5. *Assessment of the potential for eco-tourism in Fort Dauphin, July 2001*

A graduate student from Oxford University's Environmental Change Institute has recently conducted an assessment of the potential for eco-tourism in the Fort Dauphin region (MSc thesis completed September 2001).

### 6. *Audit of the corporate EIA process (on-going)*

Dr. Stephen Cobb is continuing to engage QMM in dialogue on their EIA process and public reporting protocols. In collaboration with WWF Madagascar and Conservation International, there will be a review of the independent assessment of the QMM EIA report, which will be completed during the forthcoming year.

### **Training:**

1. Dr. Jorg Ganzhorn from the University of Hambourg delivered a training course in ecological assessment and monitoring techniques to 24 people in Fort Dauphin: 8 Malagasy graduate students from the Universities of Tana and Toliary, 5 Malagasy QMM employees and 11 visiting students from the Universities of Hamburg and Oxford, 24 July – 4 August 2001
2. Dr. Aaron Davis (RBG, Kew) trained 3 Malagasy students in littoral forest plant taxonomy and herbarium voucher specimen preparation (Fort Dauphin and Tana, Jan-Feb 2001).
3. Dr. Terry Dawson trained Malagasy representatives of QMM and WWF in aerial photographic acquisition and analysis techniques, March 2001.
4. Jane Ingram attended the Smithsonian Institution Assessment and Monitoring of Biodiversity for Adaptive Management Course, May-June, 2001 (she was awarded a scholarship placement).

We are currently planning a seminar in Fort Dauphin on biodiversity mapping and monitoring to be offered in Spring or Summer 2002. This will be delivered in collaboration with WWF based in Fort Dauphin and the Libanona Ecology Center and offered to graduate students from the University of Tular and interested professionals in the region.

- Discuss any significant difficulties encountered during the year.

Aerial photographs take much longer to geo-rectify than previously thought which has set us back slightly in producing thematic maps for the region.

- Has the design of the project been enhanced over the last year, e.g. refining methods, indicators for measuring achievements, exit strategies?

The design of the project has remained relatively constant, however, as the project has progressed, we have expanded many of our plans, especially those regarding capacity building within the region. Through various stakeholder meetings and field campaigns we have had invaluable opportunities to develop collaborations between other organizations and researchers working within the region. Such a network of contacts has proven to be instrumental in planning how our work can be most effectively disseminated, presented and used to the benefit of the community. Through research assistant Carter Ingram's involvement in an international course offered by the Smithsonian, in addition to her work with on developing a biodiversity training initiatives for the whole of Madagascar, we have been able to expand our contact base across the island and learn from previous conservation initiatives in Madagascar and other parts of the developing world. These experiences have facilitated the

development of future workshops and plans for community interaction based on expertise and insight from both the Malagasy and global perspectives.

- Present a timetable (workplan) for the next reporting period.

August 2001: Field campaign to complete radiation measurements of forest fragments. Presentation to WWF Madagascar on aerial photographic techniques for biodiversity assessment. Meeting at the University of Tulear to discuss terrestrial-marine interactions and coastal zone conservation in Madagascar.

September 2001: Conference presentation on the application of aerial photography for biodiversity assessment at the Remote Sensing Society Conference in London.

22 October 2001- 27 December 2001: Field campaign to assess patterns of species diversity and forest degradation across the landscape.

March - June 2002: Training course in biodiversity assessment and monitoring in Fort Dauphin (Libanona Ecology Centre) and/or University of Tuliar.

## 5. Partnerships

- Describe collaboration between UK and host country partner(s) over the last year. Are there difficulties or unforeseen problems or advantages of these relationships?
  - **World Wildlife Fund, Madagascar:** We have met Mark Fenn, representative of WWF in Fort Dauphin, and have established a collaboration for developing a training course in Fort Dauphin for biodiversity assessment and monitoring.
  - **Azafady:** Dr. Dawson has met and had discussions with the leaders of this non-governmental organization, which is working in Fort Dauphin. They have provided much valuable insight into projects underway throughout the region and the potential impacts of mining on local communities. Azafady's perspective has been crucial in providing us with insight into how many of the local people perceive the potential mining project.
  - **QMM:** Employees at QMM have been very helpful throughout all of our field campaigns in the organization of transportation and associated logistics in conducting research throughout the region. Our interactions with QMM workers have provided a valuable contrast to the information we have gleaned from Azafady and WWF representatives working in the area with regards to the mining project and the associated impacts.
  - **Libanona Ecology Center (LEC):** Through our communication with WWF, which shares various facilities with the LEC, we plan to offer a training course in biodiversity assessment and monitoring in conjunction with what the LEC currently offers.

Our interactions in the community and with representatives of these organizations have strongly affirmed the necessity of remaining neutral and objective throughout the project. Thus, we are exercising caution in not associating ourselves too strongly with any one institution lest we lose our credibility with another.

- Has the project been able to collaborate with similar projects in the host country or establish new links with / between local or international organisations involved in biodiversity conservation?

We have established many new links with international and national organizations working on similar projects in Madagascar. We have met and discussed projects

with researchers at the University of Hamburg, Durham University and Edinburgh University. We have also established a strong collaboration with the Smithsonian Institution for developing a biodiversity training initiative for Madagascar. Through this we have engaged in discussions with representatives from Malagasy NGO's and Government departments: Conservation International, Madagascar, Eaux et d'Foret, Office Nationale pour l'Environment, CEME, and SAINA. We have also been in contact with a Malagasy NGO, Tsapilo, in becoming part of a network of organizations to build collaboration throughout the south-eastern region of the country.

## 6. Impact and Sustainability

- Discuss the profile of the project within the country and what efforts have been made during the year to promote the work. What evidence is there for increasing interest and capacity for biodiversity resulting from the project? Are satisfactory exit strategies for the project in place?

We have contacted numerous organizations throughout the year to obtain their opinion and insight into how to develop an effective training program for biodiversity protection in Madagascar. Through these interactions, we have been able to share our research with people in Madagascar. These communications have led to further interactions, often initiated by representatives from Malagasy non-governmental organizations interested in our work and the future training course we plan to offer. The in-country enthusiasm for developing a biodiversity training course for Malagasy environmental leaders and professionals has been especially inspiring and has demonstrated that there is much willingness to protect the environment, but simply, a lack of available training to do so.

We are currently devising and constantly modifying our exit strategy. The course will be a valuable component of our exit strategy as it will provide a legacy, which will hopefully continue long after the completion of this specific project. Through community interaction during our upcoming field campaign, we plan to glean information on the type of reports, presentations and/or documents, which are most appropriate for the different stakeholder groups within the country.

## 7. Outputs, Outcomes and Dissemination

- Please expand and complete Table 1. **Quantify** project outputs over the last year using the coding and format from the Darwin Initiative Standard Output Measures (see website for details) and give a brief description. Please list and report on appropriate Code Nos. only. The level of detail required is specified in the Guidance notes on Output Definitions which accompanies the List of Standard Output Measures.

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

Code No.	Quantity	Description
3	1	Rose Askew, British: received BSc honours degree based on research, "An investigation into plant composition and structure within the highly fragmented, degraded forests of Southeastern Madagascar"
4a	11	Students from the Universities of Oxford and Hamburg were trained in the 10 day training course coordinated

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		by Dr. Jorg Ganzhorn (please see above for more details on the course)
4C	8	Malagasy graduate students from the Universities of Tana and Tuliar were trained were trained in the 10 day training course offered by Dr. Jorg Ganzhorn
6A	5	Malagasy employees from QMM were trained were trained in the 10 day training course offered by Dr. Jorg Ganzhorn
6A	3	Dr. Aaron Davis trained 3 Malagasy students in plant taxonomy and herbarium specimen preparation
6A	2	Dr. Dawson trained QMM employee and WWF representative in aerial photography image acquisition and analysis
8	10.5 weeks	Dr. Terry Dawson: total of 4.5 weeks in host country Dr. Aaron Davis: total of 4 weeks in host country Scott Henderson: total of 2 weeks in country
10	1	Online photographic data base on endemic plant species within the region
12A	1	Website established
14A	1	Roundtable discussion led by Dr. Terry Dawson with members of the QMM staff to present the project
14B	1	Presentation of 'Poverty and deforestation – the complex agenda on biodiversity loss in Madagascar' at International Geophysical Society conference in Nice, France, March 2001
22	8	Permanent plots were established July-August 2001 for future monitoring purposes

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- Explain differences in actual outputs against those agreed in the initial 'Project Implementation Timetable' and the 'Project Outputs Schedule', i.e. what outputs were not achieved or only partly achieved? Were additional outputs achieved?

Several outputs which were only partially achieved. Only one student to date (WWF staff member) has been trained in remote sensing data and geographical Information Systems. However, we are planning to offer a workshop, which will cover these topics, and will be offered to up to 20 students at the Libanona Ecology Center in early-mid 2002. The revised and updated plant species data base is a few months behind schedule due to the fact that identification of the vouchers collected in during the January-February 2001 field campaign is taking longer than expected due to the sheer volume of the amount of species collected. However, this should be completed by the end of September. At this point, all other outputs have been completed as scheduled.
- In Table 2, provide full details of all publications and material produced over the last year that can be publicly accessed, e.g. title, name of publisher, contact details, cost. Details will be recorded on the Darwin Monitoring Website Publications database which is currently being compiled. Mark (\*) all publications and other material that you have included with this report



**Table 2: Publications**

<b>Type *</b> (e.g. journals, manual, CDs)	<b>Detail</b> (title, author, year)
Journal	<i>Ingram, J.C., Dawson, T.P., and Henderson, S.J., 2001, Poverty and Deforestation: The Complex Agenda of Biodiversity Loss in Madagascar, Geophysical Research Abstracts, in press.</i>
Conference Proceedings	<i>Ingram, J.C., Dawson, T.P. and Henderson, S., 2001, The use of aerial photography for understanding the relationship between forest canopy structure and biodiversity, Geomatics, Earth Observation and the Information Society, The Remote Sensing and Photogrammetry Society, Nottingham, UK.</i>
Conference Proceedings	<i>Dawson, T.P., Henderson, S.J. and Vincelette, M., 2000, Sustainable forest resource management for biodiversity protection in Madagascar, Proceedings, 28<sup>th</sup> International Symposium on Remote Sensing of Environment, CSIR Satellite Applications Centre, South Africa, 8, 16-19.</i>
Conference Proceedings	<i>Henderson, S.J., Dawson, T.P., Vincelette, M., 1999, The relationship between loss of canopy trees and biotic composition in a littoral forest of SE Madagascar, Abstracts, British Ecological Society Winter Meeting, University of Leeds, 20 - 22 December 1999, 67.</i>
Report	<i>Askew, R., 2000, An investigation into plant composition and structure of highly fragmented degraded forests of South-Eastern Madagascar, unpublished BSc thesis, Department of Biology, University of Oxford, Oxford.</i>

- Provide details of dissemination activities in the host country during the year. Will these activities be continued by the host country when the project finishes, and how will this be funded and implemented?

Training courses in:

Biodiversity Assessment - Fort Dauphin (10 days)

Plant taxonomy and herbarium specimen preparation - Tana and Fort Dauphin (20 days)

Aerial Photography - Tana and Fort Dauphin (3 days)

Presentations:

Darwin project objectives - Fort Dauphin (2 days to QMM local team and WWF)

## **8. Project Expenditure (Note: financial accounting will be prepared separately)**

- Please expand and complete Table 3.

**Table 3: Project expenditure during the reporting period**

Item	Budget	Expenditure
Salaries (specify)		
Rent ,rates heating lighting etc		
Office administration costs		
Capital items/equipment		
Others		
Total		

- Highlight any recently agreed changes to the budget and explain any variation in expenditure where this is +/- 10% of the budget

## 9. Monitoring, Evaluation and Lessons

- Discuss methods employed to monitor and evaluate the project this year. How can you demonstrate that the outputs and outcomes of the project actually contribute to the project purpose? i.e. what indicators of achievements (both qualitative and quantitative) and how are you measuring these?

A number of publications are currently being prepared for submission to international peer-reviewed journals. In addition, I can solicit support from a number of separately funded students who are working towards their post-graduate degrees, which are or will be externally examined.

- Are there lessons that you learned from this year's work and can you build this learning into future plans?

This has proved to be a very interesting project - with many research sidelines and extensions developing along the way. Madagascar is desperate for support - both financially as well as in capacity building. Within my role as biodiversity program leader in the Environmental Change Institute, I have managed to expand a number of research avenues and collaborations in Madagascar including new projects in avifauna ecology and coastal marine ecosystems in the region. I foresee my research and training work there to continue for a number of years into the future.

## 10. Author(s) / Date

Terence Dawson (Principal Investigator)

Jane Carter Ingram (Research Assistant)

10<sup>th</sup> August 2001