



PREDICTIVE TOOLS FOR TARGETING CONSERVATION EFFORT IN
BORNEAN FOREST RESERVES

Project 14-022

1st Annual report: April 2006

Dr Jane K. Hill
Department of Biology, University of York

Darwin Initiative

Annual Report

1. Darwin Project Information

Project Ref. Number	14-022
Project Title	Predictive tools for targeting conservation effort
Country(ies)	Malaysia
UK Contractor	University of York
Partner Organisation(s)	University of Leeds, Natural History Museum, Universiti Malaysia Sabah, (Malaysia), Forest Research Centre (Sabah, Malaysia)
Darwin Grant Value	£128,560
Start/End dates	1 June 05 / 31 May 08
Reporting period (1 Apr 200x to 31 Mar 200y) and annual report number (1,2,3..)	1 st April 2005 to 31 March 2006 Annual report 1
Project website	http://www.york.ac.uk/depts/biol/staff/jkh.htm
Author(s), date	Jane Hill; April 06

2. Project Background

- Over the past few decades, many researchers have worked on analytical tools for mapping tropical biodiversity and for designing reserve networks. However, lack of available distribution data for species means that these analyses are generally limited to only a few well-studied taxa analysed at coarse spatial scales. Moreover, climate change has not been considered in this context and conservationists generally have assumed that species ranges are static and have not taken account of how climate change may interact with land-use changes to affect species distributions. Such information will be crucial for describing the distribution of biodiversity both now and in the future.
- The State of Sabah (Malaysian Borneo) is exceptionally biologically diverse yet one of the poorest financially in Malaysia and the vast majority of its income is generated through conversion of rainforest into oil palm plantation and other forms of silviculture. Thus existing areas of forest are under increasing pressure from land-use changes but resources for protection are highly limited. The choice of forest areas to preserve is largely arbitrary because local researchers and forest managers lack the analytical tools required to identify sites which have the greatest conservation value. This project will develop tools for identifying existing reserves of high conservation value, and to determine how their value may change in the future as a consequence of changes in the size, number or quality of other reserves.

3. Project Purpose and Outputs

- The project will investigate whether existing computer modelling techniques can be used effectively in highly-diverse, relatively aseasonal tropical regions. If successful, the

development of these techniques will make it possible to prioritise the conservation value of existing rainforest reserve networks in Sabah and to assess the likely impacts on conservation value of future land-use and environmental changes. This will allow conservationists, forest managers and other stakeholders to promote responsible economic growth whilst maximising the conservation of biodiversity. We shall focus on butterflies and achieve the project's main objectives (1) by collating existing data on distributions of forest species and mapping fine-scale distributions across the whole of Borneo, based on species' climate and habitat requirements, (2) by using computer models to integrate these data across species to quantify the conservation value of existing reserves in Sabah based on biologically important criteria, and (3) by using model outputs to provide clear practical advice on the biodiversity consequences within reserve networks of changes in climate and land-use.

- The project logical framework is included in the appendix.
- Neither the outputs nor the proposed operational plan have been modified over the last year.

4. Progress

- The two Darwin Fellows who will be working on the project have been appointed. These are Dr Suzan Benedick (SB, senior fellow) and Mr Mazidi Abd. Ghani (MAG, junior fellow). The Project Leader (Jane Hill) and Database Manager (Keith Hamer) visited Sabah for 6 weeks in August-September 2005. During this trip we visited our Malaysian collaborators at Universiti Malaysia Sabah (Prof Dr Maryati) and at the Forest Research Centre Sepilok (Dr Chey Vun Khen). The main aims of the visit were to i) discuss progress on the project to date; ii) obtain advice on how to go about gaining permission for working on insect collections in Sabah, iii) develop protocols for selecting other Museums to visit in Europe, Malaysia and SE Asia. These aims were achieved: we visited two of the Sabah collections and started to develop the protocols that will be used to construct the electronic bases. SB remained in Sabah and from October 05 – March 06 has collected data from four Museum collections in Sabah (Borneensis collection at UMS, Sabah Parks collections at Kinabalu Park and Sabah Museum, Forest Research Centre collection at Sepilok). She is currently in Sarawak visiting the Sarawak Museum collections, and is requesting permission to visit museums in Brunei, Indonesia and Japan. MAG worked with SB on the Borneensis collections from November 05 – January 06 and received training from SB in butterfly identification and classification. MAG arrived in York in January 06 and has subsequently attended Masters level courses in ecology, conservation and GIS. During the year, there have been regular meetings in the UK with UK project partners and MAG has made a short visit to the NHM (February 06) to receive training in handling museum specimens and inputting data.
- Progress over the last year is in agreement with the timetable. It has become clear that once the project protocols were developed, the most efficient method of data collection is for one DRF (SB) to be based in Sabah while the other (MAG) is based in York. This will maximise the amount of data available for subsequent analysis and modelling. SB will visit York in year 2 of the project and in year 1 has received appropriate training in Sabah. There has been no slippage.
- *Project achievements.* We have obtained permission to visit museums in Sabah and are using personal contacts built up at these Institutions to obtain permission to visit collections in other Malaysian States and in Indonesia. We have identified Museums outside of Borneo that hold substantial collections of Bornean material and which we intend to visit. We have been developing methods for capturing information from specimen labels as quickly, accurately and efficiently as possible. These methods include the use of a digital camera to capture label information from several specimens simultaneously, and thus to so minimise time spent away from York/Kota Kinabalu. These techniques will be tested at the NHM in May – July 06 and their usefulness will be assessed. We are investigating sources of data for fine-scale climate data (precipitation, temperature) for Borneo, and also land-cover data for forest cover. The resolution of these

data will determine the resolution of the species distribution models and reserve design modelling. Existing data bases developed by David Lees (NHM Collections Advisor) have been modified for the project and the first set of data is being entered into the data base by MAG in York.

- No significant difficulties have been encountered this year.
- The design of the project has not been changed this year.
- *Workplan for 06-07*. Complete visits to Museums in Asia and Europe (March 07). SB to visit York to receive further training in analytical and modelling techniques (March 07). Project partners (JKH, KCH, DL) to visit Sabah to discuss project progress and development with Malaysian project partners (Sept 07). MAG to return for a short visit to Sabah to report on project progress and liaise with SB (July 07). Report current findings at International European Conservation Conference (Hungary, July 07). Continue to develop methods for geo-referencing location information obtained from specimens.

5. Actions taken in response to previous reviews (if applicable)

- N/A

6. Partnerships

- Collaboration between UK and host country partners over the last year continues to be excellent. The successful collaboration built up over past projects continues to be productive and has ensured that the project's outputs for this year have been achieved on time. The host country partners have been instrumental in advising the project on which Museums to visit and for getting permission to gain access to the collections.
- We have made contact with an on-going project based in Sabah (project 14-016). JKH is collaborating on their development of criteria for designating areas of High Conservation Value Forest and we are exploring possible future collaboration, for example whether our modelling approach produces similar conservation rankings of forest areas compared with the HCVF approach.

7. Impact and Sustainability

- While in Sabah, SB and MAG have given research seminars at UMS and so ensured that information about the project's progress is being disseminated to other local researchers. The continued expansion of both student and staff numbers within the Institute for Tropical Biology and Conservation at Universiti Malaysia Sabah is evidence for increased capacity for biodiversity research in the host country – two previous Darwin Fellows who worked with us are now employed at the University carrying out research and teaching in biodiversity conservation and ideally placed to disseminate information on the current project. Databases arising from the project will be held by the Forest Research Centre and Universiti Malaysia Sabah and available for the long-term monitoring of impacts of land-use changes on biodiversity well beyond the end of the project. Our experience from past Darwin projects is that both SB and MAG are likely to be offered jobs with UMS at the end of the project, thus ensuring that research on species distributions and biodiversity changes in Borneo continues beyond the lifetime of the project.

8. Outputs, Outcomes and Dissemination

- There have been no differences in actual *versus* agreed outputs this year.
- Funding is included in the project for a workshop to be held in Sabah at the end of the project period which will ensure that findings from the project are disseminated locally.

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

Code No.	Description	Year 1 Total	Year 2 Total	Year 3 Total	Year 4 Total	TOTAL
4C&4D	DRF training	2 x 3 months				
8	UK staff visits to Sabah	2 x 6 weeks				

Table 2: Publications

Type * (e.g. journals, manual, CDs)	Detail (title, author, year)	Publishers (name, city)	Available from (e.g. contact address, website)	Cost £
journal	<i>Benedick, S. et al. Impacts of rain forest fragmentation on butterflies in northern Borneo: species richness, turnover and the value of small fragments</i>	. Journal of Applied Ecology (Blackwells)	Currently 'in press', not yet available	nil
journal	<i>Benedick, S, et al. Impacts of habitat fragmentation on genetic diversity in a tropical forest butterfly</i>		Submitted to Journal for peer review, not yet available	nil

9. Project Expenditure

Table 3: Project expenditure during the reporting period (Defra Financial Year 01 April to 31 March)

- It was agreed that an underspend on T&S in year 1 would be spent on buying an additional computer and the remained funds transferred to the T&S budget in year 2.

10. Monitoring, Evaluation and Lessons

- Two Darwin Research Fellows have been recruited successfully to the project. Their training is assessed through their successful attendance at Masters level courses and the successful construction of a data base. The collection of data is monitored through successfully gaining access to, and visiting museums. The success of these visits for the development of subsequent computer models will be monitored by assessing the number of specimens studied and the amount of data obtained.
- It is becoming clear that there is an enormous amount of information available for use by the project, and that not all data can be collected within the time frame of the project. Decisions will be made in terms of reducing the number of study species and focusing on certain groups/species. To ensure maximum coverage of distribution data across Borneo, we will identify and prioritise visits to collections that include specimens from as large an area as possible across Borneo. This will ensure that initial data collection is completed and that analysis and modelling commences within year 2 of the project.

11. OPTIONAL: Outstanding achievements of your project during the reporting period (300-400 words maximum)

■ I agree for ECTF and the Darwin Secretariat to publish the content of this section

In this section you have the chance to let us know about outstanding achievements of your project over the year that you consider worth highlighting to ECTF and the Darwin Secretariat. This could relate to achievements already mentioned in this report, on which you would like to expand further, or achievements that were in addition to the ones planned and deserve particular attention e.g. in terms of best practice. The idea is to use this section for various promotion and dissemination purposes, including e.g. publication in the Defra Annual Report, Darwin promotion material, or on the Darwin website. As we will not be able to ask projects on an individual basis for their consent to publish the content of this section, please note the above agreement clause.

Annex 1 Report of progress and achievements against Logical Framework for Financial Year: 2005/2006

Project summary	Measurable Indicators	Progress and Achievements April 2005-Mar 2006	Actions required/planned for next period
<p>Goal: To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve</p> <ul style="list-style-type: none"> • The conservation of biological diversity, • The sustainable use of its components, and • The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources 			
<p>Purpose To prioritise the biological importance of forest reserves for maximising biodiversity, and to provide clear practical advice on biodiversity consequences of changes in climate and land-use. To enable effective long-term conservation planning</p>	<p>Practical advice given to stakeholders (May 2008). Computer modelling tools used to predict species distributions (May 2007), current patterns of biodiversity (Dec 2007), and potential changes in distribution of biodiversity (Feb 2008)</p>		
<p>Outputs</p>			
<p>Quantitative assessment of conservation value of forest reserves based on a range of integrated biodiversity criteria.</p>	<p>Research papers written up.</p>	<p>SB receives training in scientific writing and successfully submits two manuscripts for publication from a previous Darwin Initiative-funded project</p>	<p>DRFs continue visiting Museum collections in Europe and SE Asia and collecting data for computer models</p>
<p>Training of 2 Darwin Fellows in ecological and modelling techniques for reserve design and assessment and for predicting potential biodiversity changes in the future.</p>	<p>Successful completion of training courses by Darwin Research Fellows</p>	<p>Appointment of two Darwin Research Fellows, Suzan Benedick and Mazidi Abd. Ghani. JKH and KCH visit Sabah.</p>	<p>DRFs continue to receive training</p>

PROJECT LOGICAL FRAMEWORK

Project summary	Measurable Indicators	Means of verification	Important Assumptions
<p>Goal:</p> <p>To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve</p> <ul style="list-style-type: none"> • the conservation of biological diversity, • the sustainable use of its components, and • the fair and equitable sharing of benefits arising out of the utilisation of genetic resources 			
<p>Purpose</p> <p>To prioritise the biological importance of forest reserves for maximising biodiversity, and to provide clear practical advice on biodiversity consequences of changes in climate and land-use. To enable effective long-term conservation planning.</p>	<p>Practical advice given to stakeholders (May 2008). Computer modelling tools used to predict species distributions (May 2007), current patterns of biodiversity (Dec 2007), and potential changes in distribution of biodiversity (Feb 2008)</p>	<p>Conservation guidelines written and reserves prioritised to assist in effective conservation planning and promotion of biodiversity. Production of species' distribution maps and database.</p>	<p>Forest managers and conservation organisations have an effective input into economic planning. This is guaranteed by State legislature.</p>
<p>Outputs</p> <p>Quantitative assessment of conservation value of forest reserves based on a range of integrated biodiversity criteria. Training of 2 Darwin Fellows in ecological and modelling techniques for reserve design and assessment and for predicting potential biodiversity changes in the future.</p>	<p>Research papers written up. Successful completion of training courses by Darwin Research Fellows</p>	<p>Research papers published in peer-review journals. Darwin Fellows successfully apply the techniques they have developed.</p>	<p>Darwin Fellows take up conservation posts in Sabah and use their knowledge and skills to inform decision makers. Our close links with local collaborators will facilitate this: our previous Darwin Fellows now have permanent posts at UMS and FRC. Research leads to clear recommendations and guidelines for stakeholders.</p>
<p>Activities</p> <p>Collection of data on distribution of species in Borneo from existing sources, including Museum collections and published information (Jun 05 - Sep 06). Development of models to predict species' distributions across Borneo in relation to climate, elevation and habitat and testing model predictions with new field data (Oct 06 – Sep 07). Using distribution data to determine conservation value of existing forest areas in Sabah and to quantify biodiversity changes under a range of climate and land-use scenarios (Oct 07 – May 08). Invite local scientists and stakeholders to a 3-day workshop in Sabah to discuss implications of project findings (May 08).</p>		<p>Activity Milestones (Summary of Project Implementation Timetable)</p> <p>Protocols for data collection developed, production of relational database and maps of species' distributions. Appointment of two Darwin Fellows who travel to the UK for training in database design and testing, development of techniques for predicting species' distributions and prioritising forest reserves. Organisation of workshop in Sabah for disseminating project findings.</p>	