Darwin Initiative Annual Report

Darwin Project Information

Project Ref Number	14-022
Project Title	Predictive tools for targeting conservation effort
Country(ies)	Malaysia
UK Contract Holder Institution	University of York
UK Partner Institution(s)	University of Leeds, Natural History Museum (London)
Host country Partner Institution(s)	Universiti Malaysia Sabah, (Malaysia), Forest Research Centre (Sabah, Malaysia)
Darwin Grant Value	£128,560
Start/End dates of Project	1 June 05 / 30 September 08
Reporting period (1 Apr 200x to 31 Mar 200y) and annual report number (1,2,3..)	1st April 2007 to 31 March 2008 Annual report 3
Project Leader Name	Dr Jane K. Hill
Project website	http://www.york.ac.uk/depts/biol/staff/jkh.htm
Author(s), date	Jane Hill, April 2008

1. 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 though 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.

2. Project 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. In particular, the host country partners were instrumental in helping us gain access to Museums and collections in the first phase of the project. They have also assisted with field work

campaigns and advised us on which sites to study, provided permission for sampling, and help in the identification of insect material.

Darwin Fellow Noel Tawatao continues to be associated with the research group in York even though his fellowship has come to end. This continued association has further strengthened collaboration with Universiti Malaysia Sabah. Noel's research has the potential to add value to the project by including information on conservation value of protected areas in terms of ant species richness and diversity. Our links with WWF Malaysia continue to be productive in terms of obtaining remotely-sensed Landcover data for Borneo. Collaboration with WWF will also ensure that our findings feed back to local stakeholders and conservation organisations.

3. Project progress

The two Darwin Fellows Dr Suzan Benedick (SB, senior fellow) and Mr Mazidi Abd. Ghani (MAG, junior fellow) are continuing to work effectively on the project. The Project Leader (Jane Hill) and Database Manager (Keith Hamer) visited Sabah for 5 weeks in August-September 2007. 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) discuss training of Darwin Fellows, iii) review current research outputs iv) discuss future employment prospects of Fellows once the project has finished. These aims were achieved. Dr Chey Vun Khen visited the UK for a second time during the project, primarily to pursue his on-going research on Lepidoptera at the Natural History Museum.

SB has been based in Sabah, and from April 07 – March 08 has collected new field data for Lepidoptera to test the robustness of our models, as well as collecting new empirical data to examine impacts of recent climate warming on species distributions. SB has also been assisting MAG in checking the data entries in our main data base, verifying species names and location names and providing information for geo-referencing the records. SB has also been involved with organising the workshop at the end of the project. SB was on maternity leave this year; as a consequence it was agreed with the Darwin Secretariat that the project would have a no-cost extension until 30 September 2008.

MAG has spent most of his time from April 07- March 08 based in the UK. MAG has run climate-envelope models ('Maxent' model) for all species and generated output to compare observed and predicted species' distributions. He attended a training course in Tucson Arizona (Species Distribution Modelling; South Western Research Station; April 07) run jointly with Dr Alison Cameron (Mapping & modelling advisor). MAG returned to Malaysia in August-October 07 to liaise with SB; his visit coincided with the visit by Jane Hill and Keith Hamer allowing all key personnel (both Malaysian & UK) to meet up.

Findings from the project were included in an exhibition arranged by Jane Hill and Keith Hamer at the Royal Society Summer exhibition. MAG was involved with setting up the exhibit and manning the stall (http://www.summerscience.org.uk/). Our exhibit was entitled 'Life at the Top – biodiversity in tropical forest canopies' and the work of the Darwin Initiative was widely publicised.

There has been one change to the logframe. The project has a no-cost extension until 30 September 2008 and the workshop will now be held in August 2008.

3.1 Progress in carrying out project activities

Progress over the last year is in agreement with the timetable. All the activities have been carried out in the manner and time planned. We have made excellent overall progress towards the project outputs and thus we are confident that the project will achieve them by its close. Our measuring of output indicators show that our progress is on-track, and we have no reason to change our belief at this stage that our output level assumptions hold true.

1) **Collection of data**. This has now been completed and all data have been inputted. A data base has been constructed comprising 22,274 butterfly records from 312 species.

2) **Development and testing of distribution models**. This has been completed. MAG has received training in spatial modelling and GIS at York (through Masters' level taught courses and personal tuition), and has received training in species distribution modelling (in particular in using the model MAXENT) by attending a specialist course at the University of Arizona (run by Alison Cameron, project member). MAG has collated climate data for Borneo and incorporated this into the distribution modelling. The distributions of 106 butterfly species have been modelled. Predictions have been compared with new empirical data for 3 sites in a previously poorly studied region of Sabah. New empirical data for Lepidoptera have also been collected by SB from 10 sites along a climate gradient in Sabah. These sites were previously sampled in 1965 and the new data will be used to examine to degree to which species distributions have shifted during 40 years of climate change.

3) **Identifying existing reserves of high conservation value**. This is on-going. MAG is using existing modelling software ('Zonation' and connectivity software) to quantify the conservation value of existing protected areas, and to examine to consequences of changes in land-use and future climate warming on conservation value. We will also be able to examine the effectiveness of proposed new protected area schemes such as WWF's 'Heart of Borneo' project.

4. Standard Output Measures

4.1 Table below shows standard output measures up to April 07.

Table 1 Project Standard Output Measures

Code No.	Description	Year 1 Total	Year 2 Total	Year 3 Total	Year 4 Total	TOTAL
6	Sabah collaborator visits the UK		1	1		
8	UK staff spend time in Sabah training personnel in the field and liaising with overseas partners	12 person weeks	12 person weeks	10 person weeks		

Table 2 Publications

Type * (eg journals, manual, CDs)	Detail (title, author, year)	Publishers (name, city)	Available from (eg contact address, website)	Cost £
Journal	*Benedick *et al*. 2006. Impacts of rain forest fragmentation on butterflies in northern Borneo. (2006)	Journal of Applied Ecology, 43, 967-977	Project leader	£0
Journal	*Benedick *et al*. Impacts of forest fragmentation on genetic diversity in a tropical forest butterfly on	Journal of Tropical Ecology 23, 623-634	Project leader	£0

	Borneo. (2007)			
Journal	Benedick *et al*. In preparation. Impacts of habitat disturbance on moths		Not yet published	£0

4.2 Progress towards the project purpose and outcomes

We consider that our progress made towards the project purpose this year has been good. Evidence for this is the extensive database we have compiled and our ability to successfully model distributions of butterflies in Sabah. All project partners have liaised successfully and continue to collaborate fruitfully. We are confident that the training of SB and MAG will leave a lasting legacy of trained personnel in Sabah. To this end, SB has been involved in the training of under-graduate students in Sabah, using skills and experience obtained during the project. It is likely that SB will be employed as a lecturer at Universiti Malaysia Sabah at the end of the project. Our examination of the conservation value of existing reserves is ongoing. Once we achieve this, we will be able to assess whether our protocols are likely to adopted by local Institutes and Conservation bodies. We consider that the purpose level assumptions still hold true and we think that our indicators are sufficient for measuring outcomes.

4.3 Progress towards impact on biodiversity, sustainable use or equitable sharing of biodiversity benefits

The main aim of our project to assess current conservation status of protected areas and how they may change with future land-use and climate changes will clearly have a major impact on the promotion of biodiversity and have positive biodiversity impacts. We are making good progress.

5. Monitoring, evaluation and lessons

The two Darwin Research Fellows have been successfully trained and this is evident from the successful construction of a data base. We have been monitoring the amount of data obtained, and our success is evident in our ability to model species distributions in relation to climate variables across Sabah.

It was clear from an early stage that there is an enormous amount of information available for use by the project, and that not all data could be collected within the time frame of the project. Therefore we have made strategies decision to focus on key aspects of the project to ensure that the timetable remains on-track. We have focussed on selected families of butterflies (Nymphalidae, Pieridae and Papilionidae) as well as focussing on particular modelling approaches (MaxEnt species distribution model). To ensure maximum coverage of distribution data across Borneo, we prioritised visits to collections that included specimens from as large an area as possible across Borneo. This has resulted in us completing the initial data collection on time.

We have been pleased with the amount of data held in collections and published sources, and the relative ease with which it has been possible to extract information. However, as stated in the previous annual report, we have been disappointed that is has been difficult to get permission to visit collections in Kalimantan and this situation has not changed

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

Our previous review was generally positive and our partners were pleased to see that the good progress of the project was appreciated.

Points raised:

Comments for project leader: Our data base will be made available to other Institutes on completion of the project. The database is currently in Microsoft Excel and thus will be widely available to other users. In most cases, the availability of the data base has been a pre-requisite for gaining access to collections. We feel, however, that the modelling output and predictions are likely also to be useful to stakeholders – these projections will also be available at the end of the project. The workshop will be the main way in which findings from the project will be disseminated to stakeholders. Our experience is that workshops incorporating all key local stakeholders are the most effective method of disseminating and exchanging information. We would welcome advice from the Darwin Secretariat in terms of other ways in which we can ensure that out project's findings are adopted by stakeholders. The project web site is linked to Jane Hill's web page (http://www.york.ac.uk/depts/biol/staff/jkh.htm)

Legacy. All modelling techniques are freely available over the web, and all distribution data will also be freely available. The ability of stakeholders to make use of this information will depend on locally trained personnel capable of utilising and interpreting the information. The employment of the two DRFs at Universiti Malaysia Sabah on completion of the project will be the most effective lasting legacy.

Project expenditure. This is on-track. We have agreed a non-cost extension of the project until 30 September and the transfer of £1200 from the subsistence budget to the workshop budget.

7. Other comments on progress not covered elsewhere

There have been no changes to the project other than the no-cost extension due to SB taking maternity leave and the re-timing of the final workshop. We have not encountered any significant difficulties, although the failure to gain permission to visit the Bogor Museum in Jakata in year 2 reduced our ability to gain butterfly data for Kalimantan. The project does not face any particular risks.

8. Sustainability

Recent findings from the project have been presented at conferences this year by MAG (British Ecological Society Tropical Ecology Group, Oxford March 2008). Findings from the project were also exhibited at the Royal Society Summer Exhibition (July 2007)

9. Project Expenditure

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

Item	Budget (please indicate which document you refer to if other than your project schedule)	Expenditure	Balance
Rent, rates, heating, overheads etc			
Office costs (eg postage, telephone, stationery)			
Travel and subsistence			
Printing			
Conferences, seminars, etc			
Capital items/equipment			
Others			
Salaries (specify)			
TOTAL			

*We agreed a transfer of £1200 into 2008-09.

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

We were invited to showcase our findings at the Royal Society Summer Exhibition. This is a prestigious event attended by >5000 members of the general public and scientists. It is held annually at Carlton House Terrace, London for 4 days during July. The exhibition was an opportunity to present our findings on the diversity of tropical rainforests in Borneo, as well as to publicise the Darwin Initiative. Visitors to the exhibit were able to take part in a quiz, and to examine tropical forest invertebrates. Visitors also received 'freebies' including postcards, plants, pencils and badges.

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

Annex 1 Report of progress and achievements against Logical Framework for Financial Year: 2007/08

Project summary	Measurable Indicators	Progress and Achievements April 2007 - March 2008	Actions required/planned for next period
Goal: *To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but constrained in resources to achieve* *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*			
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	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)	Training of DRFs in computer modelling. Distributions of ~ 200 butterfly species modelled successfully using climate & land cover data	Complete quantification of conservation status of protected areas. Examine changes in conservation value following potential future land-use and climate changes.
Quantitative assessment of conservation value of forest reserves based on a range of integrated biodiversity criteria.	Research papers written up. Completion of training of DRFs	Training of DRFs is on-track. The publication of findings will provide an excellent indicator of the success of their training.	
Activity 1.1 Collection of distribution data		Completed	
Activity 1.2, Development of models		Completed	
Activity 1.3 Determination of conservation status of existing areas		On-going	
Activity 1.4 Workshop to disseminate findings		To be held in August 2008	

Annex 2

PROJECT LOGICAL FRAMEWORK

Project summary	Measurable Indicators	Means of verification	Important Assumptions
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 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			
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.	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)	Conservation guidelines written and reserves prioritised to assist in effective conservation planning and promotion of biodiversity. Production of species' distribution maps and database.	Forest managers and conservation organisations have an effective input into economic planning. This is guaranteed by State legislature.
Outputs Quantitative assessment of conservation value of forest reserves	Research papers written up. Successful completion of	Research papers published in peer-review journals. Darwin Fellows	Darwin Fellows take up conservation posts in Sabah and use their knowledge and skills to inform decision

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.	training courses by Darwin Research Fellows	successfully apply the techniques they have developed.	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.
Activities 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).		Activity Milestones (Summary of Project Implementation Timetable) 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.	

Annex 3 onwards – supplementary material (optional)

Checklist for submission

	Check
Is the report less than 5MB? If so, please email to Darwin-Projects@ectf-ed.org.uk putting the project number in the Subject line.	
Is your report more than 5MB? If so, please advise Darwin-Projects@ectf-ed.org.uk that the report will be send by post on CD, putting the project number in the Subject line.	
Do you have hard copies of material you want to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number.	
Have you completed the Project Expenditure table?	
Do not include claim forms or communications for Defra with this report.	