

Darwin Initiative – Final Report

(To be completed with reference to the Reporting Guidance Notes for Project Leaders
(<http://darwin.defra.gov.uk/resources/reporting/>) -

it is expected that this report will be a **maximum** of 20 pages in length, excluding annexes)

Darwin project information

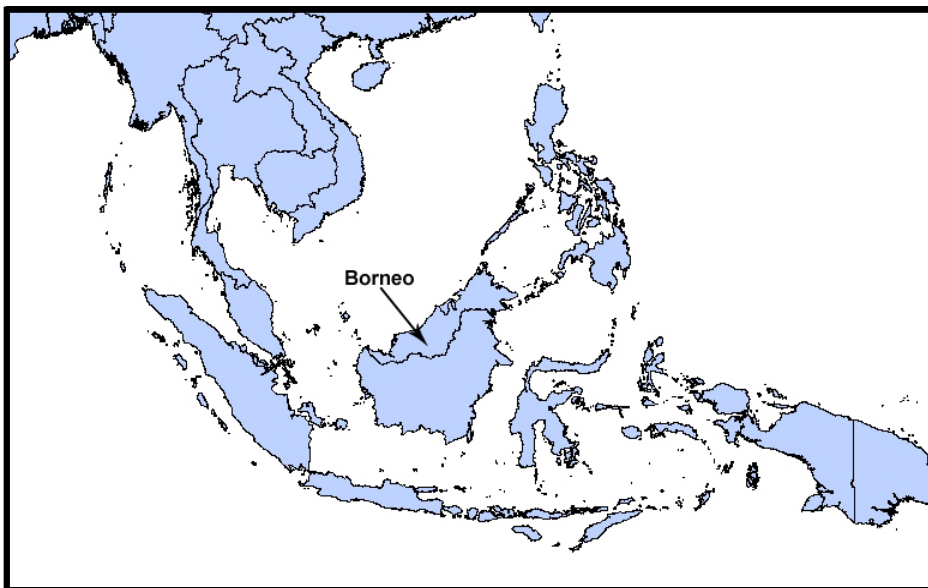
Project Reference	14-022
Project Title	Predictive tools for targeting conservation effort in Bornean forest reserves
Host country(ies)	Malaysia
UK Contract Holder Institution	University of York
UK Partner Institution(s)	University of Leeds, Natural History Museum
Host Country Partner Institution(s)	Universiti Malaysia Sabah, (Malaysia), Forest Research Centre (Sabah, Malaysia)
Darwin Grant Value	£128,560
Start/End dates of Project	1 June 05 / 30 September 08
Project Leader Name	Dr Jane K. Hill
Project Website	http://www.york.ac.uk/depts/biol/staff/jkh.htm
Report Author(s) and date	Jane Hill, March 2009

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.

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.

Map of study area showing the location of the island of Borneo in SE Asia:



2 Project support to the Convention on Biological Diversity (CBD)

The project related specifically to the following CBD articles:

7. Identification and Monitoring. New field data for butterflies were collected from poorly-studied sites to ground truth the effectiveness of our modelling approach.

8. In-situ Conservation. Findings from the project provide information on the conservation priority ranking of existing Protected Areas on Borneo, and also on how these priorities may change in the future as a consequence of land-use change and climate warming.

12. Research and Training. Two DRFS were trained in experimental design, field techniques and computer modelling for simulating species distributions in relation to environmental variables, and for ranking Protected Areas in terms of species richness and landscape (forest) connectivity.

The project also directly addressed the cross-cutting themes of 'Climate Change and Biological Diversity', and 'Protected Areas'.

The project addressed the following 2010 biodiversity targets:

Goal 1. Promote the conservation of the biological diversity of ecosystems, habitats, and biomes.

Goal 2. Conservation of species

Goal 3. Address threats from climate change and pollution.

The project addresses the CBD thematic programme of 'Forest Biodiversity'.

The training of two Darwin Fellows contributed to building capacity in Malaysia to help them meet their CBD targets. At the end of the project, the subsequent employment of one Darwin fellow at Universiti Malaysia Sabah (one of the host partners) makes them ideally placed to train others, and thus contribute to Malaysia's future ability to meet its CBD targets. Copies of the report outlining the projects findings, including policy-related material, was sent to the CBD focal point for Malaysia (Ministry of Natural Resources

and the Environment). The project's findings are relevant to the UN Framework Convention on Climate Change, but the project did not support CMS or CITES.

3 Project Partnerships

The existing collaborative partnerships between the three UK Institutions, Universiti Malaysia Sabah and the Forest Research Centre were strengthened during this project. Specifically, the two host organisations were crucial in:

- recruiting staff
- facilitating permission to visit field sites and permits to sample Lepidoptera
- providing access to Museum collections, and advice in identifying additional collections to visit and curators to contact in SE Asia
- taxonomic help in identifying Lepidoptera material

The project had developed through previous collaborations and on-going discussions with the host organisation who had highlighted that little was known of the conservation value of existing protected areas or how these might change in the future as a consequence of species shifting their ranges to track climate change. Lack of local expertise in experimental design, statistics and computer modelling had been highlighted by project partners during the project planning phase and so these skills were prioritised in DRF training programmes.

The UK and Malaysian project partners have collaborated for >10 years and this contributed greatly to the success of the project, thus re-affirming the value of having strong links with host partners from the original inception of the project. Being able to appoint and retain key staff as DRFs was crucial, and being able to visit a large number of collections was vital for the construction of the data base. The host partners liaised with local stakeholders, government agencies and conservation bodies, and thus greatly enhanced the effectiveness of the end-of-project workshop and the dissemination of our findings.

We did not establish an MOU.

The UK partners were the Universities of York and Leeds, and the Natural History Museum, London (NHM). The Universities provided skills and training through their Masters taught degree programmes in 'Ecology & Environmental Management' (York) and in 'Biodiversity and Conservation' (Leeds). The NHM provided training in data base construction and geo-referencing of record localities, and access to one of the most important collections of Bornean Lepidoptera worldwide. Through other on-going collaborations between the University of York and EU/US Institutes, the DRFs received expert personal tuition in computer modelling skills by the authors of the software for modelling species distributions in relation to environmental factors ('MaxEnt'; Dr Richard Pearson, American Museum of Natural History), and for designing reserve networks ('Zonation'; Dr Atte Moilanen, University of Helsinki). DRF2 also attended a residential workshop in Arizona (organised by Dr Pearson) to provide additional specialist training in using 'MaxEnt' models.

4 Project Achievements

The project reached all achievements set out in the original logframe:

1. Training of two DRFs in field sampling, data analysis and computer modelling techniques,
2. Production of a database of butterfly distribution records for Borneo,
3. Development of computer models to simulate butterfly distributions on Borneo in relation to climate suitability and habitat availability,
4. Use of reserve design software to prioritise the conservation value of current Protected Areas (based on IUCN definition), and to highlight additional areas deserving of greater protection
5. Discussion of findings at end-of-project workshop with local and regional stakeholders

Annex 1 provides further information on these outputs, activities and achievements.

4.1 Impact: achievement of positive impact on biodiversity, sustainable use or equitable sharing of biodiversity benefits

The impacts of the project are:

1. Increased institutional capacity for examining and understanding impacts of habitat loss and climate change on regional biodiversity,
2. Increased awareness of the conservation value of currently protected areas, and how these may change in the future,
3. Increased awareness that many areas of high conservation value (in relation to species richness and high quality forest) lie outside Protected Areas and thus require higher levels of protection to maintain regional biodiversity.

4.2 Outcomes: achievement of the project purpose and outcomes

The project achieved its original purpose and its outcomes. Findings from the project will provide additional information and evidence for local researchers and conservationists in support of their attempts to increase the protection of forested areas, and to prevent further degradation of natural forest habitats.

4.3 Outputs (and activities)

The project achieved all its outputs as outlined in the logframe.

The project had a 4 month no-cost extension due to DRF1 (Dr Suzan Benedick) taking maternity leave towards the end of the project. This had little impact on the project. We delayed the end-of-project workshop until August so that Dr Benedick could be fully involved in organising and running the workshop.

4.4 Project standard measures and publications

These are listed in Annexes 4 and 5.

4.5 Technical and Scientific achievements and co-operation

During the project, the two DRFs (Suzan Benedick and Mazidi Abd. Ghani) have:

- 1) Successfully developed and implemented techniques for collating existing information held in museum collections and incorporating the information into a spatially-explicit, geo-referenced data base of butterfly distribution records for Borneo.
- 2) Successfully used the database to develop maximum entropy ('MaxEnt') models to simulate potential distributions of butterflies across Borneo, based on climate variables and habitat availability.
- 3) Collected new field data to quantify the degree to which species distributions have shifted uphill on Mount Kinabalu (Sabah, Malaysian Borneo) during recent climate warming.
- 4) Collected new field data to test the robustness of model outputs by collecting new field data from previously poorly-sampled regions of northern Borneo. These data were used to test the reliability of butterfly presence/absence information simulated by the models, and to compare model predictions with independent empirical field data.
- 5) Incorporated distribution data into reserve design software ('Zonation') to prioritise the conservation value of existing protected areas under current climate and to examine how these rankings may change in the future under climate warming.

Our project concludes that;

- Over the past 40 years, the distributions of many tropical moths have shifted to higher elevations, associated with recent climate warming. The degree to which distributions have shifted (about 60 m uphill over 40 yrs) is consistent with observed temperature changes.
- Our models confirm that the distributions of many butterflies on Borneo are limited by climate.
- Climates on Borneo are predicted to get warmer and wetter in future, and the distributions of many species will change as a consequence of these climate changes
- Protected areas support many of the most important areas on Borneo in terms of conservation value (i.e. species richness and forest connectivity), but many of the 'best' areas are not currently protected.

4.6 Capacity building

This project has left a lasting legacy of two fully trained researchers capable of using GIS techniques, computer models and reserve design software for simulating impacts of climate change and habitat loss on species distributions. The evidence that this has been successful comes from the successful publication of findings in peer-reviewed papers, presentation of findings at conferences, and the completion of an MSc thesis (DRF2).

4.7 Sustainability and Legacy

We expect the following achievement to endure:

- The database of butterfly records. This will be maintained at the University of York, and made available for downloading by researchers for further analyses.

Of the two DRFs employed on the project, one of them (Dr Suzan Benedick) is now employed as a Lecturer in Sustainable Agriculture by one of the host partners, Universiti Malaysia Sabah. All primary resources developed by the project (database, distribution maps) will be available to other researchers.

The majority of the partners (University of York, University of Leeds, Universiti Malaysia Sabah (UMS), Forest Research Centre (FRC)) will continue their successful collaboration on a new DI project starting in June 2009. In addition, collaborations between the University of York, UMS and FRC are also continuing through other funded projects (Earthwatch, and NERC-funded PhD studentships).

5 Lessons learned, dissemination and communication

Overall, we found the project to be a very successful and positive experience for all. This was primarily due to the appointment and retention of excellent research staff from our host partner organisations (DRFs Dr Suzan Benedick and Mazidi Abd. Ghani). This in turn was a consequence of the long-running existing collaboration between UK and host partners, which meant that host partners were able to recruit staff with suitable skills, interests and experience, who were then retained during the lifetime of the project, and very likely to be employed at host partner Institutes at the end of the project. We found that the workshop that we organised at the end of the project was a very effective way of discussing the wider implications of our findings with stakeholders, and for getting feedback on the project's conclusions.

We have disseminated information from the project via several methods in order to reach our target audience of researchers, conservationists, policy makers and the general public. Our main research findings have been presented at International conferences and published in international peer-reviewed journals. In addition, our press releases and presentation at the Royal Society summer exhibition has disseminated our work to UK interested parties and the general public.

The workshop we organised at the end of the project involved >40 participants from ~20 organisations across SE Asia. These organisations included representatives from Universities, Research Institutes, Government Departments and agencies, Forestry Departments, and conservation bodies. Copies of the report of our research findings has been sent to these organisations. Thus the workshop ensured that the project's findings and implications were disseminated to and discussed with policy makers and conservationists, thus providing every opportunity for these findings to be included in developing policy.

Findings from the project will continue to be presented at future conferences and workshops, and the submission of additional research papers to peer-reviewed Journals is planned.

5.1 Darwin identity

The Darwin Initiative identity was promoted by:

- Incorporating the Darwin logo on all web-based information
- Inviting national and regional media to attend the workshop – with Darwin logos included in workshop backdrops and briefing materials
- Acknowledging Darwin funding in scientific publications, reports, and conference presentations.
- Incorporating the Darwin logo on project publicity material e.g. postcards (see postcards enclosed with this report).
- Acknowledging Darwin funding in press releases

The project was recognised as a distinct project by researchers and conservation organisation in Sabah – our research focus on Protected Areas and climate change is very different from any other on-going DI, international or local research project.

The Darwin Initiative has a very high profile in Sabah, particularly among the University, Government research institutes, conservation bodies (e.g. WWF-Malaysia) and the State Forestry Department. This is primarily due to the training of local counterparts who have subsequently secured employment within these organisations.

The photograph is of Barry Gardiner MP (DEFRA Secretary of State 2006-07) visiting the main field site in Sabah (Malaysian Borneo) and being shown insect material sampled during the project.



Prof Maryati (local co-ordinator) Mazidi Ghani (DRF)
Noel Tawatao (previous Darwin Fellow) Suzan Benedict (DRF)

6 Monitoring and evaluation

There were no changes to the logframe during the project.

Monitoring and evaluation of the project were assessed via regular progress reports from DRFs and by regular field work visits by Project leader (Hill), Database manager (Hamer) and Collections adviser (Lees). Training of DRFs in modelling techniques was assessed in York by the project leader (Hill) and GIS manager (McClellan) via weekly individual meetings and weekly lab group discussions and research presentations.

The initial logframe measurable indicators were useful in the monitoring and evaluation of the project. Baseline information was collected from museum collections on butterfly distributions on Borneo. These data were then successfully incorporated into computer models and used in (1) predicting species distributions on Borneo, (2) assessing current and future patterns of biodiversity, and (3) assigning conservation value of currently protected areas.

External evaluation of the project arises from acceptance of research papers in Journals via the peer-review process and the examination of Mazidi Ghani's MSc thesis.

6.1 Actions taken in response to annual report reviews

During the life-time of the project, comments on our annual reviews have generally been positive and our host partners have been pleased to see that the good progress of the project has been appreciated. The main points raised in previous reviews referred to:

Project expenditure. This continued to be on-target for most of the project, but there was a slight under-spend at the end of the project (~£3k; see below).

Access to data and resources. The database of butterfly records is available to other Institutes and researchers. The projected distribution maps of butterflies that were generated from these data are also available. The teaching aids developed during the project are also available electronically. All these resources can be accessed via the project leader's web page. <http://bioltfws1.york.ac.uk/biostaff/staffdetail.php?id=jkh>

All modelling software used in the project is freely available over the web (including access to excellent web based learning guides). The ability of stakeholders to make use of this information will depend on locally trained personnel capable of utilising and interpreting the information. Our teaching aids will facilitate their use.

Legacy. We consider that the employment of Dr Suzan Benedick (DRF1) at Universiti Malaysia Sabah on completion of the project will be a very effective lasting legacy. She is now in an excellent position to train others. In addition, Dr Benedick is now a host partner on a new Darwin Initiative project, further ensuring the project's lasting legacy.

7 Finance and administration

7.1 Project expenditure

Item	Budget (from stage 2 application)	Underspend
Rent, rates, heating, overheads etc		
Office costs		
UK Travel and subsistence for UK staff		
Printing		
Conferences, seminars, workshop		
Capital items/equipment Digital camera & laptop		
Bench fees, DRFs travel, fieldwork costs, DRFs subsistence in UK		
Salaries (DRF1 and DRF2)		
TOTAL		

It was agreed with the Darwin Initiative that the underspend would be used to cover VAT costs self-imposed by York University Tax Office associated with paying invoices raised by host partners in Malaysia.

7.2 Additional funds or in-kind contributions secured

Additional funds were secured from the University of York for a UK PhD studentship which allowed us to extend the fieldwork to examine impacts of climate warming on Lepidoptera distributions in Borneo. Not only did these funds allow us to extend the scope of our project, they also allowed us to continue fieldwork during a period when Dr Suzan Benedick (DRF1) was on maternity leave.

7.3 Value of DI funding

DI funding has enabled the following:

- Training of researchers at host partner Institutes in skills and knowledge related to climate change impacts on biodiversity in tropical regions
- DRF2 (Mazidi Ghani) obtaining a MSc degree
- Production of an extensive database of butterfly distribution records that can be used in future to monitor and assess changes in diversity
- The first empirical analysis of climate change impacts on range shifts in tropical insects

Annex 1 Report of progress and achievements against final project logframe for the life of the project

Project summary	Measurable Indicators	Progress and Achievements April 2007 - March 2008	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 constrained 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>A greater understanding of the current conservation value of existing protected areas in terms of forest cover and faunal diversity, and how these might change in future.</p> <p>Identifying locations for increased protection and which will promote conservation of regional biodiversity.</p>	n/a
<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 long-term conservation planning.</p>	<p>Practical advice given to stakeholders. Computer modelling tools used to predict species distributions, current patterns of biodiversity, and potential changes in distribution of biodiversity.</p>	<p>Conservation guidelines written.</p> <p>Existing Protected Areas prioritised in terms of forest cover and butterfly diversity.</p>	n/a
<p>Output 1. Quantitative assessment of conservation value of forest reserves based on a range of integrated biodiversity criteria</p>	<p>Reports and research papers written up.</p>	<p>Report written. One further research paper submitted for publication.</p>	
<p>Activity 1.1, Using models to simulate species distributions under future climate scenarios.</p>		<p>Completed.</p>	
<p>Activity 1.2, Using species distributions and land cover information to prioritise the conservation value of existing protected areas, and to highlight areas that deserve increased levels of protection.</p>		<p>Completed.</p>	
<p>Output 2. Workshop to discuss and disseminate project findings and implications for planning long-term conservation of biodiversity on Borneo.</p>	<p>Workshop organised</p>	<p>Completed</p>	

Annex 2 Project's final logframe, including criteria and indicators

Project summary	Measurable Indicators	Progress and Achievements April 2007 - March 2008	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 constrained 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>A greater understanding of the current conservation value of existing protected areas in terms of forest cover and faunal diversity, and how these might change in future.</p> <p>Identifying locations for increased protection and which will promote conservation of regional biodiversity.</p>	Project completed
<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 long-term conservation planning.</p>	<p>Practical advice given to stakeholders. Computer modelling tools used to predict species distributions, current patterns of biodiversity, and potential changes in distribution of biodiversity.</p>	<p>Production of species' distribution maps and database.</p> <p>Conservation guidelines written and existing Protected Areas prioritised to assist in effect long-term conservation planning and promotion of biodiversity.</p>	Project completed
<p>Output 1.</p> <p>Quantitative assessment of conservation value of forest reserves based on a range of integrated biodiversity criteria</p>	<p>Reports and research papers written up.</p>	<p>Report written. One research paper submitted for publication, three papers published/accepted for publication.</p>	
<p>Activity 1.1 Construction of a database of butterfly records on Borneo.</p>		<p>Completed. Database made available to local stakeholders and other researchers.</p>	
		<p>Completed.</p>	

Activity 1.2, Development of niche models to project species distributions across Borneo in relation to climate variables and forest cover. Testing of model output with new field data.		
Activity 1.3, Using models to simulate species distributions under future climate scenarios.		Completed.
Activity 1.4, Using species distributions and land cover information to prioritise the conservation value of existing protected areas, and to highlight areas that deserve increased levels of protection.		Completed.
Output 2. Training of 2 DRFs in ecological and modelling techniques for reserve design, and for predicting potential biodiversity changes in future.	Successful completion of training courses by DRFs	Training completed. MSc thesis completed by DRF2. DRF1 employed by host organisation as lecturer.
Output 3. Workshop to discuss and disseminate project findings and implications for planning long-term conservation of biodiversity on Borneo.	Workshop organised	Completed

Annex 3 Project contribution to Articles under the CBD

Project Contribution to Articles under the Convention on Biological Diversity

Article No./Title	Project %	Article Description
6. General Measures for Conservation & Sustainable Use		Develop national strategies that integrate conservation and sustainable use.
7. Identification and Monitoring	20	Identify and monitor components of biological diversity, particularly those requiring urgent conservation; identify processes and activities that have adverse effects; maintain and organise relevant data.
8. In-situ Conservation	20	Establish systems of protected areas with guidelines for selection and management; regulate biological resources, promote protection of habitats; manage areas adjacent to protected areas; restore degraded ecosystems and recovery of threatened species; control risks associated with organisms modified by biotechnology; control spread of alien species; ensure compatibility between sustainable use of resources and their conservation; protect traditional lifestyles and knowledge on biological resources.
9. Ex-situ Conservation		Adopt ex-situ measures to conserve and research components of biological diversity, preferably in country of origin; facilitate recovery of threatened species; regulate and manage collection of biological resources.
10. Sustainable Use of Components of Biological Diversity		Integrate conservation and sustainable use in national decisions; protect sustainable customary uses; support local populations to implement remedial actions; encourage co-operation between governments and the private sector.
11. Incentive Measures		Establish economically and socially sound incentives to conserve and promote sustainable use of biological diversity.
12. Research and Training	45	Establish programmes for scientific and technical education in identification, conservation and sustainable use of biodiversity components; promote research contributing to the conservation and sustainable use of biological diversity, particularly in developing countries (in accordance with SBSTTA recommendations).
13. Public Education and Awareness		Promote understanding of the importance of measures to conserve biological diversity and propagate these measures through the media; cooperate with other states and organisations in developing awareness programmes.
14. Impact Assessment and Minimizing Adverse Impacts		Introduce EIAs of appropriate projects and allow public participation; take into account environmental consequences of policies; exchange information on impacts beyond State boundaries and work to reduce hazards; promote emergency responses to hazards; examine mechanisms for re-dress of international damage.
15. Access to Genetic Resources		Whilst governments control access to their genetic resources they should also facilitate access of environmentally sound uses on mutually agreed terms; scientific research based on a country's genetic resources should ensure sharing in a fair and equitable way of results and benefits.

Article No./Title	Project %	Article Description
16. Access to and Transfer of Technology		Countries shall ensure access to technologies relevant to conservation and sustainable use of biodiversity under fair and most favourable terms to the source countries (subject to patents and intellectual property rights) and ensure the private sector facilitates such assess and joint development of technologies.
17. Exchange of Information		Countries shall facilitate information exchange and repatriation including technical scientific and socio-economic research, information on training and surveying programmes and local knowledge
19. Bio-safety Protocol		Countries shall take legislative, administrative or policy measures to provide for the effective participation in biotechnological research activities and to ensure all practicable measures to promote and advance priority access on a fair and equitable basis, especially where they provide the genetic resources for such research.
Other Contribution	15	Smaller contributions (eg of 5%) or less should be summed and included here.
Total %	100%	

Annex 4 Standard Measures

Code	Description	Totals (plus additional detail as required)
Training Measures		
2	Number of Masters qualifications obtained	1
4c	Number of postgraduate students receiving training (not 1-3 above)	2
4d	Number of training weeks for postgraduate students	72 (=18 months)
5	Number of people receiving other forms of long-term (>1yr) training not leading to formal qualification(ie not categories 1-4 above)	1
6b	Number of training weeks not leading to formal qualification	72 (=18 months)
7	Number of types of training materials produced for use by host country(s)	2 (booklet and Powerpoint presentation)
Research Measures		
8	Number of weeks spent by UK project staff on project work in host country(s)	28
9	Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country (s)	1
11a	Number of papers published or accepted for publication in peer reviewed journals	3 (PNAS, J Trop Ecol, Insect Con & Div)
11b	Number of papers published or accepted for publication elsewhere	1 (Sepilok Bulletin)
12a	Number of computer-based databases established (containing species/generic information) and handed over to host country	1 (>22,000 butterfly records)
13b	Number of species reference collections enhanced and handed over to host country(s)	2 (>50 species of butterfly in 'Borneensis' collection, >500 species of moth at Forest Research Centre)
Dissemination Measures		
14a	Number of conferences/seminars/workshops organised to present/disseminate findings from Darwin project work	2 (project workshop in Sabah, Royal Society summer exhibition (London))
14b	Number of conferences/seminars/ workshops attended at which findings from Darwin project work will be presented/ disseminated.	6 (British Ecological Society x3, Association for Tropical Biol & Con, Ogasaki Extinction workshop; European Congress of Con Biol)
15c	Number of national press releases or publicity articles in UK	4 (RS summer exhibition, 2nd July 2007 x3; PNAS article, 21st January 2009)

Annex 5 Publications

Type *	Detail (title, author, year)	Publishers (name, city)	Available from (eg contact address, website)	Cost £
Data base	Butterfly distribution records	-	Jane Hill, University of York http://www-users.york.ac.uk/%7Ejkh6/index.htm	-
Data base	Butterfly distribution maps	-	Jane Hill, University of York http://www-users.york.ac.uk/%7Ejkh6/index.htm	-
Journal	Benedick, S., et al. (2007) <i>Journal of Tropical Ecology</i> 23, 623-634.	-	Jane Hill	-
Journal	Ghani MA et al. <i>Insect Conservation & Biodiversity</i> (submitted)	-	Jane Hill	-
Journal*	Chen, I-C, et al. (2009) <i>PNAS</i> 106, 1479-1483.	-	Jane Hill	-

Annex 6 Darwin Contacts

Ref No	14-0222
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