Darwin Initiative Annual Report

Department for Environment Food & Rural Affairs

Important note: *To be completed with reference to the Reporting Guidance Notes for Project Leaders: it is expected that this report will be about 10 pages in length, excluding annexes* **Submission Deadline: 30 April**

Darwin Project Information

Project Reference	19-008
Project Title	Building biodiversity research capacity to protect PNG rainforest from logging
Host Country/ies	Papua New Guinea
Contract Holder Institution	University of Sussex
Partner institutions	Binatang Research Center, Madang, Papua New Guinea
Darwin Grant Value	£246,488
Start/end dates of project	1st April 2012 – 31st March 2015
Reporting period (eg Apr 2013 – Mar 2014) and number (eg Annual Report 1, 2, 3)	April 2013 – March 2014 Annual Report 2
Project Leader name	Dr Alan J A Stewart
Project website	
Report author(s) and date	AJA Stewart, V Novotny, M Peck; 30th April 2014

1. Project Rationale

The island of New Guinea includes the third largest remaining area of tropical forest in the world, harbouring 5-7% of global biota of which 70% is endemic, and comprising a large bio-reservoir of carbon. Unfortunately, in 1972-2002, 15% of the country's forests were cleared and 9% were degraded through logging. Conservation projects generally fail to present indigenous owners of forests in Papua New Guinea (PNG) with a reasonable financial offer in exchange for conserving their forests – i.e. pay conservation's opportunity cost. The alternative approach that we are adopting in this project is to work with conservation-minded indigenous communities to develop their forests as internationally recognised areas for ecological research, thereby bringing sustainable income to the community which, over 10-15 years, would match the potential income from logging, while also improving the country's research infrastructure and skills for biological research. This project aims to put one nascent conservation area of ~10,000 ha centred around the village of Wanang on a solid organizational and financial basis, earning £20-30,000 annually, thereby radically improving the livelihoods of the villagers whilst providing an inspiring example of a financially and biologically successful conservation area in PNG, thriving despite competing logging alternatives. A secure and well equipped rainforest research site will appeal to the international community of researchers in tropical ecology who lack long-term monitoring sites in this biologically key region of the world. This project will therefore test a model for conserving critical forest ecosystems for scientific study in the face of increasing pressure from commercial interests.

Map of Papua New Guinea, showing position of the project focal site at Wanang (Latitude:-5.25, Longitude:145.267). For further site details, see Center for Tropical Forest Science website: http://www.ctfs.si.edu/site/Wanang and Wanang Conservation Area website: http://www.entu.cas.cz/png/wanang/homepage

2. Project Partnerships

Project partnerships: We have developed a close partnership between the University of Sussex (UoS) and the Binatang Research Center (BRC), the principal PNG partner. This collaboration between the UK and host country partners works well with free flow of email discussion and prompt resolution of issues. This is substantially based upon the long history of association between the two partners (Alan Stewart and Vojtech Novotny) including on three previous Darwin Initiative projects.

Alan Stewart is responsible for day to day management of the project, including co-ordination of visits to the UK by the para-ecologists as well as visits by UK personnel to PNG. The New Guinea Binatang Research Center (BRC), under the directorship of Prof Vojtech Novotny, is our principal partner in project management, training and research. It is the leading biological research institution in PNG with a staff of 24 researchers, students and highly-skilled research technicians. Mika Peck (Lecturer in Biology at the University of Sussex) has recently joined the wider project team, contributing his expertise on REDD+, forest carbon stock assessment and remote sensing for biodiversity assessment. Dr Peck brings a wealth of experience of South American rainforest ecosystems, including from a previous Darwin Initiative project (14/040) on primate conservation in Ecuador.

The collaboration works especially well via email for advising BRC-based students. This remote supervision produced two papers in international journals published this year, led by a Darwin-supervised PNG student and co-authored by UoS and BRC researchers (Stewart and Novotny): Dem *et al*. 2014, and Baje *et al*. 2014.

Collaboration continues with other long-standing partners in the UK. We have benefitted greatly over the years from collaboration with the Herbarium staff at the Royal Botanic Garden at Kew, who have generously made their time available to train our para-ecologist visitors from PNG. This year, we extended this to include a visit to the RBG's Millennium Seed Bank project at Wakehurst Place (Ardingley, Sussex). Dr Mike Wilson (National Museum of Wales, Cardiff) has also been generous with his own time and that of his staff in the Entomology Department in hosting these visitors over several years. Alan Stewart's long-standing links with BBSRC Rothamsted Research (Harpenden) also enabled the para-ecologists to visit the research station and learn about a wide variety of projects there.

Other Collaborations: The project's principal collaboration in PNG is with the village of Wanang that has set up and operates the Wanang Conservation Area (WCA). BRC has built and operates a field research station in the WCA, the focal site of the project, and leads research projects there, including a 50-ha forest plot which is part of the worldwide network of such plots coordinated by the Center for Tropical Forest Science. BRC is mediating the partnership with the Wanang Conservation Area Board and the entire Wanang community, which is the focus of the present project.

We have also developed good working relationships with the PNG Government, particularly the Department of Environment and Conservation (DEC) which actively supports our goal of declaring Wanang forest as a Conservation Area.

Additionally, the student training sustains a productive partnership with the University of PNG, with presently four Honours and two MSc students resident at BRC.

3. Project Progress

3.1 Progress in carrying out project activities

Overall, the project continues on track, with steady progress towards implementing the project's activities, except delays with the official declaration of Wanang Conservation Area by the PNG Government. The delays are due to the slow process of approval by the Provincial Government. We are working in close coordination with the PNG Department of Environment and Conservation (DEC) to resolve these problems. Training activities have continued as planned, as have the various biodiversity surveys and ecological studies that were started in Year 1. These will provide important data to support the case for the Wanang Conservation Area becoming accepted as an important focus for future research and survey.

Dr Mika Peck visited BRC and Wanang in December 2013 in order to train para-ecologists and field assistants in forest carbon assessment in preparation for the possible implementation of more formal REDD+ procedures in future. Alan Stewart will be visiting in May 2014 to initiate the work towards developing the WCA into a centre for internationally-based research on tropical forests.

We have implemented a systematic and continuous programme of training for Wanang field assistants, BRC paraecologists, and postgraduate students. The International Tropical Ecology Course (3-27 July 2013) hosted by Wanang was a success. Further, we have successfully completed several biodiversity surveys, and attracted several research teams to Wanang for their own surveys which will contribute to the baseline knowledge of Wanang biodiversity (National Museum of Natural History, Paris: 4 researchers for 12 person-weeks in 2012-3, Belgium Museum of Natural History Brussels: 2 researchers for 10 person-weeks in 2012-3, University of Minnesota: 3 researchers & PhD students for 28 person-weeks in 2012-4, Smithsonian Tropical Research Institute, Panama: 1 researcher for 5 person-weeks in 2012-4). We have also progressed in the training of the Wanang community for management, and guided the Wanang Conservation Board to produce a Wanang Conservation Area booklet (appended to this report). Our efforts to bring outside investment to Wanang CA were partly successful – there are significant investments in the research station infrastructure (solar power system and canopy access using Canopy Bubble: total investment: £165,000), while our efforts to attract sustainable investments to cover conservation royalties and development support for Wanang community are still continuing. In the final year of the project, we will add carbon stock

estimates for the Wanang CA which could create further fund raising opportunities with private donors.

3.2 Progress towards project outputs

The following account reports against the project implementation timetable (see table at end of Annex 2):

Outputs 1.1-1.3: Wanang Conservation Area (WCA) management and infrastructure

In last year's Annual Report, we reported that our discussions with the Wanang village community regarding how best to implement training for management of the WCA and the building of logistical support for research had led us to the conclusion that this might best be achieved through bringing in a Business Development Officer to oversee and partake in the training and development of a robust and forward-looking business plan for the development of the WCA as a centre for international research in tropical forest ecology. It is pleasing to report that our application to the Waterloo Foundation (http://www.waterloofoundation.org.uk/) for a grant of £24,450 towards start-up funds to employ a full-time Papua New Guinean graduate as Business Development Officer for the WCA were successful. We have appointed Mr Clant Alok (currently finishing his M.Sc. thesis on soil chemistry of the Wanang 50-ha forest plot) to this position and he will be starting on 1st May 2014.

BRC has been making progress with organizing the WCA declaration as a legally protected area with DEC and other stakeholders. BRC organized a meeting in October between DEC officials, Wanang landowners, Madang Provincial Government, Madang Forestry Office and Woodbank Ltd., the holder of the logging concession for the areas surrounding the Wanang CA, with the aim of finalizing the formal submission of WCA documents to the PNG Government. The submission is presently awaiting Madang Provincial Government approval. If granted approval by provincial and central government, this would provide official recognition of the conservation area as one of national significance for the preservation of biodiversity in PNG. Such applications take time to process through the PNG government system, but we expect to receive a decision by the end of the present project.

The WCA attracted significant investment in field research infrastructure during the year: a solar panel electricity system for the Wanang Field Station, funded by The Prince of Monaco Foundation (£41,000), and a 'Canopy Bubble' – a forest canopy access system funded by the Grant Agency of the Czech Republic (£124,000). These were awarded on the basis of current Darwin-enhanced performance of the WCA and for facilitating future research activities to help sustain the WCA.

BRC assisted the Wanang community with staff and technology (GPS) for the delineation and field clarification of the boundary between WCA and the neighbouring logging areas. BRC also assisted the Wanang community with building a government-sponsored classroom in the Wanang Conservation Primary School. Finally, the Wanang Conservation Board, assisted by BRC, produced a Wanang Conservation Area booklet informing researchers and other visitors about the CA and the logistics of their visit (appended to this report).

Outputs 2.1-2.2: Training of WCA field assistants

We have implemented year-round training and practical research for five Wanang villagers: two for the study of seed-eating insects, two for butterfly monitoring and one for bird monitoring. These are long-term monitoring projects based in Wanang CA, and associated with the 50-ha CTFS plot, designed to build long-term base-line data for future research. One Wanang villager and a paraecologist from BRC received training by Dr M Peck (UoS) on forest carbon assessment. Additionally, one Wanang villager continued field research at Mt. Wilhelm, a PNG National Park, for four months.

Output 2.3: Training of Binatang Research Center (BRC) para-ecologists at BRC

- Four BRC paraecologists were trained in insect sampling and rearing methods for six months by Conor Redmond (PhD student of V. Novotny).
- Three BRC paraecologists and one MSc student (J. Moses) were trained in ant sampling and identification for two months by Dr T. Fayle and N. Plowman (PhD student of V. Novotny).

- Five BRC paraecologists were trained in plant and insect sampling by L. Sam (a PhD student) along the Mt. Wilhelm altitudinal gradient, for seven months.
- One BRC paraecologist was trained in seed-eating insect and butterfly surveys by Dr. Y. Basset (visiting researcher) for three weeks.
- One BRC paraecologist and one Hons student were trained in plant sampling for chemical analyses by Dr S. Segar (visiting scientist) for one month.
- Four BRC paraecologists were trained in botany by Drs G. Weiblen and T. Whitfeld (visiting scientists) for one month.
- BRC hired five new paraecologists who received introductory training by senior BRC staff led by Research Supervisor Pagi Toko.

Output 2.4: Training of Binatang Research Center (BRC) para-ecologists in UK

Joseph Valeba and Bradley Gewa (both BRC paraecologists) visited the UK, Australia, Singapore & the Czech Republic for intensive training, including:

- One week at the University of Sussex for training in forest carbon assessment, GPS mapping and remote sensing, plus visits to protected areas and field study sites.
- One week at the Herbarium, Royal Botanic Gardens, Kew for training in plant identification
- A five-day Basic Canopy Access course based at the Harcourt Arboretum, near Oxford.
- One week in the Entomology Department at the National Museum of Wales for training in insect curatorial techniques and collections management, plus visits to field sites.
- One day visits to the Millennium Seed Bank facilities at Wakehurst Place, Sussex, and to BBSRC Rothamsted Research, Harpenden.
- Visit to research collaborators at Griffith University (Brisbane) and a giving seminar there.
- Seminar given at the University of South Bohemia, Czech Republic, plus visits to protected areas and field study sites.
- Visit to research collaborator and seminar given at the National University of Singapore.

Output 3.1: Honours & MSc student research

Darwin Initiative students continued in their research:

- Nigel Baro, Hons. study, ethnobotany in Wanang Conservation Area and four other village communities also completed an internet-based language survey and initiated a Facebook page on PNG languages (https://www.facebook.com/pnglanguages?ref=br_tf); the field work has been completed and he is now writing up the honours dissertation to be submitted before the end of the DI project.
- Jimmy Moses, MSc student, finished field work and data analysis on altitudinal gradients in ant communities, Mt Wilhelm; he is writing up his honours dissertation which will be submitted before the end of the DI project.
- Clant Alok, MSc student, completed his sampling of plant-soil interactions in Wanang (50 ha plot) and along the Mt Wilhelm altitudinal transect. He is currently awaiting the results of chemical analyses, after which he will write up his honours dissertation before starting as Business Development Officer for the WCA (part-funded by the Waterloo Foundation).
- Clementine Sesega. Hons. student, finished field work for plant-insect interactions between folivorous insects and their fig (*Ficus*) hosts, and is working now on specimens and data analyses.
- Regular weekly seminars for students and researchers at BRC are held to discuss research papers.
- Two new Honours students were enrolled at the University of PNG and are resident at BRC: Gibson Aubona (supervisor V. Novotny, study of chemical composition of selected Wanang plant species as defence against herbivores) and Elizah Nagombi (supervisor: C. Dahl, study of frog communities in PNG). Chris Dahl is a former MSc student who was supported by one of our previous Darwin projects at BRC, and is presently a PhD student at the University of South Bohemia in the Czech Republic. He is involved with the current DI project through supervision of this Honours student.

Output 3.2: Hons. and MSc student field ecology course

The International Course in Tropical Ecology (lead by V. Novotny and J. Leps) was based at the Wanang Research Station and BRC, training 10 European and 17 PNG participants. The PNG participants included three BRC postgraduate students (C. Alok, C. Sesega, J. Moses), two BRC paraecologists (K. Pomoh, H. Novatuo), one Wanang research assistant (L. Paul), as well as 11 junior researchers, students and technicians from other institutions in PNG. The course included 11 small research projects completed in Wanang CA.

Outputs 4.1-4.3: Biodiversity surveys

- A large-scale Mt Wilhelm altitudinal survey of ecological interactions between fig (*Ficus*) trees and their herbivorous insects, sampling insects from *Ficus* foliage along 10 transects (500 x 5 m each) at 6 elevations: 200m, 700m, 1200m, 1700m, 2200m, and 2700m asl. continued for 10 months, led by V. Novotny and S Legi. Sam Legi is a former Darwin-supported MSc student at the University of PNG and resident at BRC, who is now a PhD student at Griffith University (Brisbane, Australia), engaged in biodiversity surveys in PNG.
- Long-term surveys of seed-feeding insects and butterfly communities in the Wanang CA, led by V. Novotny and Y. Basset.
- A bird survey completed in the WCA by K. Chmel (PhD student of V. Novotny).
- A survey of vertical stratification of rainforest insects in collaboration with the Royal Belgium Institute of Natural Sciences, using a hot-air balloon to access the canopy in the WCA, led by Dr M. Leponce.
- A PhD student in anthropology (Bridget Henning, University of Minnesota) completed a detailed survey of the Wanang village community and the benefits accruing from conservation versus logging in local communities.
- Completion of the field survey of 50-ha CTFS plot in Wanang, followed by taxonomic identification of plants and preparation of a plant booklet on the Wanang plot.

Output 5.1: Biodiversity guides and publications

We have produced two booklets on Wanang forest (*Wanang Conservation Area* and *Wanang Birds*), both of which are appended to this report. We also published eight research papers in peer-reviewed and good impact factor journals and one book chapter (see list in Table 2 in Annex 3). These addressed the following topics (numbers refer to rows in Table): promoting the paraecologist approach to tropical research [2]; publication of Hons and MSc results of Darwin PNG students [1], [3], [4], [5], [6]; surveys of biodiversity in Wanang CA: [4], [5], [8], [9]; analyzing the determinants of tropical insect biodiversity [1], [3]-[9].

Output 6.1: Fund raising for WCA

Our funding bid (£24,450) to the Waterloo Foundation was successful. A number of infrastructure improvements have been funded by external sources – solar power system and canopy access – see above. Further support is being negotiated from Swire-Steamships, a local transport company that has sponsored Wanang CA in the past.

3.3 Progress towards impact on biodiversity, sustainable use and equitable sharing of biodiversity benefits

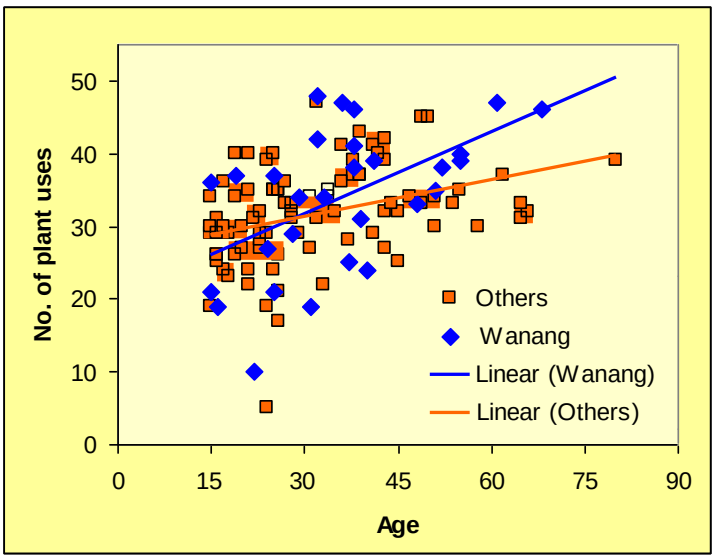
We have invited an anthropology survey (B. Henning, unpubl.) to quantify the equitability of income related to conservation in Wanang CA (direct conservation payments, employment opportunities) in comparison with logging projects nearby. The benefits per lineage (24 individuals, 8 adults) ranged from USD 6,700 – 18,100 for conservation and from USD 4,700 – 44,900 for logging, demonstrating higher equitability in the Darwin conservation project.

The human impact on biodiversity was studied particularly in our paper:

Sam, K., Koane, B., Jeppy, S. & Novotny, V. 2014. Effect of forest fragmentation on bird species richness in Papua New Guinea. Journal of Field Ornithology, in press.

authored by DI co-PI V. Novotny, his PhD student K. Sam, a BRC paraecologist B. Koane, and a Wanang field assistant S. Jeppy, the latter two trained as a part of the DI project. The study compares bird communities in the large forest area protected in Wanang with three small (300-1200 ha) forest fragments. The forest fragments supported 80-84 forest bird species, compared to 107 in Wanang. Large-bodied frugivores and understory insectivores were particularly sensitive to habitat fragmentation. The food scarcity hypothesis which states that the decline of insectivorous birds in forest fragments is caused by an impoverished invertebrate prey base was not supported, but we found that microhabitats preferred by sensitive birds were scarce in forest fragments, but common in continuous forest.

Another highlight of our studies is the result by DI-sponsored Honours student N. Baro, who interviewed villagers in Wanang and four other villages and found a decrease in ethno-botanical knowledge with decreasing age of the respondent, highlighting the current threat to cultural diversity.



Number of plant uses for a list of 25 rainforest species known to respondents from Wanang and four other villages is positively correlated with their age (N. Baro, unpubl.).

3.4 Progress towards the project Purpose/Outcome

We continue to be pleased with the progress made towards the project purpose over this year of the project. All outcomes are being worked towards as planned, on time and on budget.

We believe that the purpose level assumptions still hold true, namely that: landowners are interested in rainforest conservation; that monetary benefits from conservation and research can compete with the benefits from the alternative use of the forest, particularly logging; and that a sufficient supply of suitably qualified and motivated personnel exists within PNG to sustain an ecological research team. We are also satisfied that the indicators remain adequate for measuring the outcomes.

4. Project support to the Conventions (CBD, CMS and/or CITES)

The principal relevance of this project to international conventions is to the CBD. Our project contributes to the goals stated in the PNG Fourth Report on CBD (2010) of increasing protected areas from 4.5 to 10% of the country in 2011-2015 and the improvement of their management. It is also relevant to the CBD Aichi Biodiversity targets for 2011-2020, particularly Target 5 (halving the rate of loss of forests by 2020), Target 11 (protecting minimum areas of important habitats) and Target 19 (building research capacity and knowledge base).

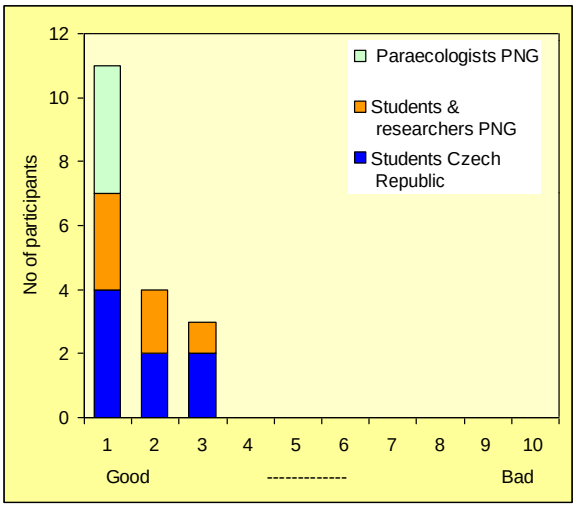
5. Project support to poverty alleviation

One of the primary objectives of this project is to develop a sustainable business model for the Wanang community through its management of the WCA as a site for long-term internationally-based scientific research, to be matched against the alternative of short-term

gain from logging concessions. We have demonstrated that there is considerable interest and enthusiasm in the local community for this concept and that the research opportunities provided by the WCA are attractive to overseas scientists. Our challenge now is to build this into a coherent 'package' which can be marketed to a wider constituency. We fully expect that this will generate significant new income for the local community which will contribute to the alleviation of poverty and the more equitable distribution of that income within the local community.

6. Monitoring, evaluation and lessons

The project has semi-annual feedback from the members of the Wanang Conservation Area Board (at Board meetings). Furthermore, we have feedback from the University of PNG supervisors and the Head of Biology Department (Dr Osia Gideon) on the progress of Hons and MSc students trained at BRC. The International Tropical Ecology Course students submitted detailed anonymous evaluation forms on their experience of the training (see graph below). The BRC staff members submit anonymous assessment of training and other activities once a year. Peer review of our publications provides independent quality control on biodiversity studies.



Feedback from the International Tropical Ecology Course: participants anonymously evaluated various aspects of the course, including overall satisfaction (shown here) on a scale from 1 (best) to 10 (poor).

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

Our responses to the minor points raised by the reviewer of our last Annual Report are:

- We trained 18 para-ecologists in the reporting year, but we intend to increase this to 20 in the final year of the project.
- We have completed the Standard Output Measures table including the column for the year planned (apologies that this was omitted before).
- Dr Peck has trained the two paraecologists visiting the UK in forest carbon estimation techniques, has visited and trained a local field assistant in the WCA and has set up the detailed protocol for a complete survey of 43 plots in the WCA to be completed in the next year.
- We have re-numbered the outputs in the activity table in Annex 2 and the output sections in our report to be consistent with the logframe.
- The application to the Waterloo Foundation was successful and a Business Development Officer has been appointed who will start on 1st May. Although somewhat behind an ideal schedule, we are confident that this will nevertheless leave sufficient time for the development of a business plan and its initial implementation during the remaining 12 months of the Darwin project (although note that the Waterloo project will continue for a further six months after the DI project finishes).

8. Other comments on progress not covered elsewhere

We requested a small carry-over (£2,000) to the next financial year (2014/15), which was granted.

We do not believe that the project faces any particular risks at this stage.

9. Sustainability

Our training programmes improve the career prospects of the trainees and therefore have long-term impact. For instance, Chris Dahl was trained as a local MSc student resident at BRC during our previous DI project. He is now a PhD student in the Czech Republic, acting also as a supervisor for one of our current DI-sponsored Honours students in PNG. Likewise, another former DI-supported local MSc student, Legi Sam, is now a PhD student in Australia, leading one of the biodiversity surveys within the current DI project in PNG.

The sustainability of funding the Wanang CA is one of the main goals of this project. We have taken steps to ensure this by: (i) improving Wanang CA management and creating information materials for visiting researchers (Wanang Conservation Area booklet), (ii) assembling data on local biodiversity, (iii) improving research infrastructure (solar power, canopy access, CTFS 50-ha plot), and (iv) actively seeking research and corporate funding for conservation. This foundation has attracted funding but not yet in the form of a sustainable income guaranteed for a long-term future. We plan to (i) assess carbon stocks in the Wanang CA to facilitate conservation funding, and (ii) explore the options of starting an endowment fund, either in the UK or USA, which would guarantee long-term sustainability. The additional input from our Waterloo Foundation funded project will help to progress this aspect of the project in the third year.

10. Dissemination

We have used a number of pathways to disseminate the outputs from this project within PNG and also through international conferences and invited seminars:

Web

Our activities are featured on the BRC web site www.entu.cas.cz/png.

Film

In collaboration with the Czech Academy of Sciences, we have produced a 35 minute documentary, *The Adventure of Tropical Ecology*, featuring prominently conservation activities at Wanang. We are currently negotiating the screening of the documentary by PNG television.

Radio

N. Baro was interviewed on Radio Australia in September 2013 by Bethany Keats & Kenya Kala on disappearing languages in PNG: http://www.radioaustralia.net.au/tokpisin/radio/onairhighlights/png-i-wok-long-lusim-save-long-tubuna-pasin-na-tokples/1193022.

Booklets

Wanang Conservation Board: *Wanang Conservation Area*

Tvardikova et al.: *Wanang Birds* booklet

Conferences:

Baro, N., 2014. The factors determining native language skills and ethnobiological knowledge in village communities of PNG. Oral presentation at the Saem Majnep Memorial Symposium on Traditional Environmental Knowledge, Goroka, PNG.

Klimes, P., Fayle, T., Fibich, P. and Novotny, V. Disentangling the diversity of arboreal ant communities in tropical canopies: Lessons from continuous forest plots. Association for Tropical Biology and Conservation Conference, 50th Anniversary Meeting: New Frontiers in Tropical Biology, Costa Rica, June 2013. Oral presentation.

Novotny, V., Drozd, P., Adamec, M., Shearman, P. & Baro, N. Cultural diversity for ecologists: Why are there so many languages in the tropics and what can we do to conserve them? Association for Tropical Biology and Conservation Conference, 50th Anniversary Meeting: New Frontiers in Tropical Biology, Costa Rica, June 2013. Oral presentation.

Novotny, V. Exploration and conservation of tropical biodiversity. ASEM Biodiversity Workshop 2013: Challenges to Biodiversity Conservation in Tropical Ecosystems, 12- 24 May 2013, Brunej. Lecture.

Novotny, V. How to study extremely complex plant-insect food webs in tropical rainforests: progress, failures and opportunities in tropical ecology. Annual Conference of the Society for Tropical Ecology - Tropical organisms and ecosystems in a changing world- Vienna, Austria on April 02 - 05, 2013. Plenary lecture.

Novotny, V. Diversity patterns of species, and human cultures, along a complete rainforest elevational gradient in New Guinea. INTECOL London, July 2013.

Seminars

The DI project featured prominently in invited seminars given by:

V. Novotny at Smithsonian Institution (USA), Tokyo University (Japan), Chiba University (Japan), University of California Davis (USA), and University of Papua New Guinea (Port Moresby).

B. Gewa and J. Valeba at the University of South Bohemia (Czech Republic), National University of Singapore, and Griffith University (Australia).

Impact case study

The current and previous Darwin-funded projects in PNG (and also the previous project on primate conservation in Ecuador) were featured as one of the 'impact' case studies for the 2013 Research Excellence Framework exercise submission by the University of Sussex. This case study is now being used to disseminate and advertise the wider impact of the university's research, published as a separate document entitled: *Building sustainable local economics to conserve tropical rainforest* (appended to this report).

11. Darwin Identity

All presentations and talks by students and staff at conferences and seminars use the DI logo on their slides. All training workshops conducted by UK trainers and PNG staff use the DI logo in their slide presentations. All journal publications and other forms of printed output (booklets etc.) arising from DI-supported work have acknowledged support from the Darwin Initiative.

Our experience is that the Darwin Initiative is well known to, and highly respected amongst, conservation NGOs and the universities in PNG, but there is perhaps less familiarity among government departments such as DEC. Through our interactions with DEC, we expect this project to raise the profile of the Darwin Initiative in provincial and central PNG government.

12. Project Expenditure

Table 1 project expenditure during the reporting period (1 April 2013 – 31 March 2014)

Project spend since last annual report	2013/14 Grant (£)	2013/14 Total actual Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below)				
Consultancy costs	N/A			
Overhead Costs				
Travel and subsistence				Agreed C/Fwd of £2,000
Operating Costs				
Capital items (see below)	N/A			
Others (see below)	N/A			
TOTAL				

Annex 1: Report of progress and achievements against Logical Framework for Financial Year 2013-2014

Project summary	Measurable Indicators	Progress and Achievements April 2013 - March 2014	Actions required/planned for next period
Goal/Impact *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/Outcome • Establish a model rainforest conservation area (CA) with management structure and conservation plan in place • Develop facilities and expertise of the landowners and PNG professionals to host biological research in the CA, thus raising funds for conservation • Establish an internationally competitive PNG research team that will be the centre of excellence in biodiversity research and training in PNG. • Gather key data on biodiversity response to rainforest disturbance to guide conservation policy.	• The continuing existence of the CA and its support by the indigenous landowners • The ability of the CA to host and support ecological research • A 'critical mass' of DI-trained researchers, students and para-ecologists working in PNG on conservation policy-relevant questions. • Data on distributions for selected taxa and modelled predictions of impacts on their communities under rainforest disturbance scenarios. • Research published in international peer-reviewed research publications.	• Application submitted for designation of Wanang Conservation Area (WCA) as an officially protected area; discussions with village community about training for management of the WCA and development of logistic support and infrastructure for international research projects. • On-going training of researchers and para-ecologists • Research projects continuing on: altitudinal gradients in insect communities; insect-host plant interactions; butterfly communities; vertical stratification of forest insect communities; birds. • 8 research papers published in international peer-reviewed journals; one book chapter published.	• Initiation and development of business model for WCA as location for international research projects. • Further training of village assistants, para-ecologists and researchers. • Continuation of student research projects. • Publication of research results as and when appropriate.

Output 1. Wanang Conservation Area (WCA) established	WCA has a Conservation Board and a Management Plan in place.	WCA has been established, a Management Plan is being discussed and an application for government endorsement has been submitted to DEC
Output 2. Ten village assistants and 18 para-ecologists trained to support research in the WCA. Two para-ecologists visit UK and other countries for networking and for intensive training.	Training and evaluation programmes in PNG and UK completed.	8 Wanang village assistants have been trained to support research activities in the WCA. 18 para-ecologists trained in techniques for sampling, sorting and identification of insects and plants and field project management. Two para-ecologists visited the UK for 6 weeks in August-September 2013
Output 3. Three completed Honours or Masters degrees by PNG students with dissertations focusing on biodiversity research	Honours or MSc dissertations completed	Four students (2 Honours; 2 Masters) are continuing their research projects.
Output 4. Biodiversity surveys for plants, insects and vertebrates along a disturbance gradient to document rainforest response to anthropogenic threats, including carbon storage estimates	Surveys completed, samples sorted, specimens identified, data analysed and results published.	Major surveys of insect communities along altitudinal gradients (as proxy for climate change impacts) continued for 10 months. Long-term surveys of insect communities in the WCA continuing, using data collected in first year as baseline information against which to compare effects of anthropogenic disturbance. Field survey of 50-ha CTFS plot completed. Pilot survey of forest carbon stocks initiated and locations for a comprehensive survey planned. Surveys of butterflies and birds in WCA completed.
Output 5. Guides for focal plant and animal taxa as an information source for local people, visiting researchers and PNG government departments	Guides produced, printed and distributed.	Two guides (to birds in the WCA and an introduction to the WCA in general) have been produced for visiting researchers.
Output 6. Sustainable income of £20-30,000 per year generated by supporting research in WCA, to replace potential income from logging.	Money deposited in the bank. Contracts signed with research clients	£24,450 has been raised from the Waterloo Foundation for the employment of a full-time Papua New Guinean graduate as Business Development Officer for the WCA.

Annex 2 Project's full current logframe

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Goal: Effective contribution in support of the implementation of the objectives of the Convention on Biological Diversity (CBD), the Convention on Trade in Endangered Species (CITES), and the Convention on the Conservation of Migratory Species (CMS), as well as related targets set by countries rich in biodiversity but constrained in resources.			
Sub-Goal: • To develop a sustainable approach to rainforest conservation supported by indigenous landowners. • To further the ability of PNG nationals to conduct research and biological training in their own country for CBD/CMS/CITES adherence. • Collect data on the responses of focal taxa to rainforest disturbance to allow evidence-based conservation decisions to be made.	• Model conservation area supported and operated by landowners • Improved capacity of PNGeans for biodiversity research and training. • Improved understanding of species responses to disturbance in rainforests informing national strategic conservation policy	• On-site visit to the model conservation area • Trained PNG students, para-ecologists, and researchers. • Biodiversity data and biological specimens held and used by BRC and PNG government departments • PNG authored research papers • DI project evaluation.	[redacted]
Purpose • Establish a model rainforest conservation area (CA) with management structure and conservation plan in place • Develop facilities and expertise of the landowners and PNG	• The continuing existence of the CA and its support by the indigenous landowners • The ability of the CA to host and support ecological research	• On-site visit, minutes from the Conservation Board meetings • List of research projects hosted by the CA • Honours and MSc degrees defended	• Landowners are interested in rainforest conservation • Monetary benefits from conservation and research can compete with the benefits from the alternative use of the forest, particularly logging

professionals to host biological research in the CA, thus raising funds for conservation • Establish an internationally competitive PNG research team that will be the centre of excellence in biodiversity research and training in PNG. • Gather key data on biodiversity response to rainforest disturbance to guide conservation policy.	• A 'critical mass' of DI-trained researchers, students and para-ecologists working in PNG on conservation policy-relevant questions. • Data on distributions for selected taxa and modelled predictions of impacts on their communities under rainforest disturbance scenarios. • Research published in international peer-reviewed research publications.	• Test results of para-ecologists trained • Insect and plant specimens deposited in research collections • Public databases of species and specimens • Reprints of published papers.	• Sufficient supply of suitably qualified and motivated personnel exists within PNG to sustain an ecological research team.
Outputs 1. Wanang Conservation Area (WCA) established.	WCA has a Conservation Board and a Management Plan in place.	On-site visit, minutes from the Conservation Board meetings.	Landowners are interested in rainforest conservation. Monetary benefits of conservation & research can compete with the benefits from alternative uses of the forest, particularly logging
2. Ten village assistants and 18 para-ecologists trained to support research in the WCA. Two para-ecologists visit UK and other countries for networking and for intensive training.	Training and evaluation programmes in PNG and UK completed.	Feedback from trainees and trainers; results of tests of trainees' progress and learning.	Local villagers and para-ecologists are interested and capable of working as research assistants. Challenging but realistic training programmes can be devised to suit the range of abilities of trainees.
3. Three completed Honours or Masters degrees by PNG students with dissertations focusing on biodiversity research	Honours or MSc dissertations completed	Theses and dissertations. Degree certificates.	A supply of talented undergraduate students exists who are interested in post graduate education and careers in ecology & conservation.
4. Biodiversity surveys for plants, insects and vertebrates along a disturbance gradient to document rainforest response to anthropogenic threats, including carbon storage estimates	Surveys completed, samples sorted, specimens identified, data analysed and results published.	Public databases of species available on-line. Specimens deposited in museums. Reprints of scientific papers.	Researchers, para-ecologists and village assistants can work in synergy and accomplish surveys in remote field conditions.

5. Guides for focal plant and animal taxa as an information source for local people, visiting researchers and PNG government departments	Guides produced, printed and distributed.	Electronic and printed copies of biodiversity guides.	Researchers, para-ecologists and village assistants can describe local biodiversity on levels that are useful for local villagers, the educated public, as well as researchers.
6. Sustainable income of £20-30,000 per year generated by supporting research in WCA, to replace potential income from logging.	Money deposited in the bank. Contracts signed with research clients	Financial records. Research contract reports.	WCA is attractive to local and particularly overseas researchers and can provide high quality services to a range of research projects.

	Activity	No of Months	Year 1				Year 2				Year 3			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1.1	WCA management training	36	X	X	X	X	X	X	X	X	X	X	X	X
1.2	WCA legal declaration by the Department of Environment and Conservation	24	X	X	X	X	X	X	X	X				
1.3	WCA logistical support for research established	33	X	X	X	X	X	X	X	X	X	X	X	
2.1	WCA field assistants training at BRC	3		X				X				X		
2.2	WCA field assistants training in the field	33	X	X	X	X	X	X	X	X	X	X	X	X
2.3	BRC paraecologist training at BRC	36	X	X	X	X	X	X	X	X	X	X	X	X
2.4	BRC paraecologist training in UK	6			X				X				X	
3.1	Hons. and MSc student research	30	X	X	X	X	X	X	X	X	X	X		
3.2	Hons. and MSc student field ecology course	1							X					
3.3	Hons. and MSc student dissertation writing and defense	6											X	X
4.1	Plant biodiversity surveys and carbon storage estimates	27	X	X	X	X	X	X	X	X	X			
4.2	Insect biodiversity surveys	27	X	X	X	X	X	X	X	X	X			
4.3	Vertebrate biodiversity surveys	27	X	X	X	X	X	X	X	X	X			
5.1	Biodiversity guides and publications	9										X	X	X
6.1	Fund raising for WCA	36	X	X	X	X	X	X	X	X	X	X	X	X

Annex 3 Standard Measures

Table 1 Project Standard Output Measures

Code No.	Description	Year 1 Total	Year 2 Total	Year 3 Total	Number planned for next reporting period	Total planned during the project
2	Number of people to attain Masters qualification				2	2
3	Number of people to attain other qualifications (Honours degree)				2	2
4C	Number of postgraduate students to receive training	2	5		2	2
4D	Number of training weeks to be provided	Ongoing	Ongoing		Ongoing	Continuous
5	Number of people to receive at least one year of training (which does not fall into categories 1-4 above)	20	18, but only 7 new – others the same as previous year		20	
6B	Number of training weeks to be provided	Ongoing	Ongoing		Ongoing	Continuous
8	Number of weeks to be spent by UK project staff on project work in the host country		2		8	20
10	Number of individual field guides/manuals to be produced to assist work related to species identification, classification and recording		2		3	5
11A	Number of papers to be published in peer reviewed journals	1	8		2	3
11B	Number of papers to be submitted to peer reviewed journals	2	8		2	4
12B	Number of computer based databases to be **enhanced** and handed over to host country				1	1
13B	Number of species reference collections to be **enhanced** and handed over to host				1	1

	country					
14B	Number of conferences/seminars/ workshops **attended** at which findings from Darwin project work will be presented/ disseminated.		6 conf. 5 sem.		3 conf. 3 sem.	3
15A	Number of national press releases in host country	1				2
15C	Number of national press releases in UK	1				1

Table 2 Publications

Type (eg journals, manual, CDs)	**Detail** (title, author*, year) (* Darwin-funded authors are underlined)	**Publishers** (name, city)	**Available from** (eg contact address, website)	**Cost £**
Journal paper	[1] Novotny, V., Miller, S. E., Hrcek, J., Baje, L., Basset, Y., Lewis, O. T., Stewart, A. J. A. & and Weiblen, G. D. 2012. Insects on plants: explaining the paradox of low diversity within specialist herbivore guilds. *American Naturalist* **179**, 351–362. [IF 4.725]		PDF from authors	Nil
Book chapter	[2] Novotny, V., G. D. Weiblen, S. E. Miller, and Y. Basset. 2012. The role of paraecologists in twenty-first century tropical forest research Pages 154-157 *in* M. D. Lowman, T. D. Schowalter, and J. F. Franklin, editors. Methods in Forest Canopy Research.	University of California Press, Berkeley.	PDF from author	Nil
Journal paper	[3] Baje, L., Stewart, A. J. A. & Novotny, V. 2014. Mesophyll cell-sucking herbivores (Cicadellidae: Typhlocybinae) on rainforest trees in New Guinea: local and regional diversity of a taxonomically unexplored guild. *Ecological Entomology*, in press [IF 1.995]		PDF from authors	Nil
Journal paper	[4] Basset, Y., Eastwood, R., Sam, L., Lohman, D. J., Novotny, V., Treuer, T., Miller, S. E., Weiblen, G. D., Pierce, N. E., Bunyavejchewin, S., Sakchoowong, W., Kongnoo, P., and Osorioarenas, M. A. 2013. Cross-continental comparisons of butterfly assemblages in tropical rainforests: implications for biological monitoring. *Insect Conservation and Diversity* **6**, 223-233. [IF 1.705]		PDF from authors	Nil
Journal paper	[5] Dahl, C., Richards, S. J. & Novotny, V. 2013. The Sepik River (Papua New Guinea) is not a dispersal barrier for lowland rain-forest frogs. *Journal of Tropical Ecology* **29**, 477–483. [IF 1.401]		PDF from authors	Nil
Journal paper	[6] Dem, F., Stewart, A. J. A., Gibson, A., Weiblen, G. D. & Novotny, V. 2014. Low host specificity in species-rich assemblages of xylem- and phloem-sucking herbivores		PDF from authors	Nil

	(Auchenorrhyncha) in a New Guinea lowland rain forest. *Journal of Tropical Ecology*, doi:10.1017/S0266467413000540. [IF 1.401]			
Journal paper	[7] Hamilton, A. J., Novotny, V., Waters, E. K., Basset, Y., Benke, K. K., Grimbacher, P. S., Miller, S. E., Samuelson, G. A., Weiblen, G. D., Yen, J. D. L. & Stork, N. E. 2013. Estimating global arthropod species richness: refining probabilistic models using probability bounds analysis. *Oecologia*, **171**, 357-365, [IF 3.412]		PDF from authors	Nil
Journal paper	[8] Sam, K., Koane, B., Jeppy, S. & Novotny, V. 2014. Effect of forest fragmentation on bird species richness in Papua New Guinea. *Journal of Field Ornithology*, in press [IF 1.101]		PDF from authors	Nil
Journal paper	[9] Vlasanek, P., Sam, L. & Novotny, V. (2013) Dispersal of butterflies in a New Guinea rainforest: using mark–recapture methods in a large, homogeneous habitat. *Ecological Entomology* **38**, 560-569 [IF 1.995]		PDF from authors	Nil
Booklet	* Wanang Conservation Board: *Wanang Conservation Area*		PDF from authors	Nil
Booklet	* Tvardikova *et al*. (2013): *Wanang Birds*		PDF from authors	Nil

Annex 4 Onwards – supplementary material

Photo gallery:

Fig. 1.

A: Overseas scientists, BRC paraecologists and Wanang assistants working on insect samples from biodiversity surveys at the Wanang Research Station in the Wanang Conservation Area.

B: Dr Basset training BRC paraecologists and Wanang technicians in insect sampling by Malaise trap.

C: Village assistants being trained in herbarium samples preparation for plant plot survey in Wanang Conservation Area at BRC.

D: BRC paraecologist Martin Mogia giving a lecture to Wanang field assistants on insect morphology at the Wanang Research Station.

Supplementary documents submitted with main report:

1. *Building sustainable local economics to conserve tropical rainforest*- publicity material on research impacts of Darwin Initiative and other projects, issued by University of Sussex.

2. *Birds of Wanang* booklet by Katerina Tvardikova.

3. *Wanang Conservation Area* booklet by Wanang Conservation Board.