

Darwin Initiative

Annual Report

Darwin Project Information

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Project Title	Training the next generation of Papua New Guinean conservation biologists
Country(ies)	Papua New Guinea (PNG)
UK Contractor	University of Sussex
Partner Organisation(s)	Binatang Research Center, Papua New Guinea Wildlife Conservation Society, Papua New Guinea Natural History Museum, UK
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Project website	http://waterbeetles.info/Darwin/DarwinHTMLs/DarwinBackground.html
Author(s), date	Dr A J A Stewart, 15 May 2007

Acronyms used in report:

PNG Papua New Guinea
US University of Sussex
NHM Natural History Museum, London
WCS Wildlife Conservation Society, Goroka, Eastern Highlands Province, PNG
BRC Binatang Research Center, Madang, PNG
(Binatang means 'insect' in the most widely spoken local language in PNG, Tok Pisin).

1. Project Background

The project is a collaboration between the University of Sussex (US), the Natural History Museum (NHM) in London, the Binatang* Research Center (BRC) in Madang, Papua New Guinea and the Wildlife Conservation Society (WCS) in Goroka, Eastern Highlands Province, Papua New Guinea. During the reporting period in question, the project work was divided between the above two centres in PNG.

The project stems from the recognition that one of the major obstacles to successful conservation planning in Papua New Guinea is the extremely deficient state of knowledge of the country's flora and fauna and how existing knowledge can be applied to biodiversity conservation. Part of the problem is that the country lacks adequately trained conservation biologists who can obtain the requisite data, interpret them and make decisions or give advice

based on the findings. The project tackles this problem through training in conservation biology and research methods.

The purpose of the project is twofold: (1) to train eight new conservation biologists to become the potential conservation leaders of tomorrow, and (2) in the process of that training, gather highly relevant data that can be used to guide conservation planning and policy. The strategy has been to bring two early-career PNG biologists to the UK for a two-month period of intensive training in advanced entomological techniques, who then return to PNG to become local training and research coordinators at each of the two partner institutions. These individuals then become responsible for training eight PNG honours students (in two cohorts) in a variety of fieldwork and laboratory techniques and for coordination of these students' research projects. The principal output of the project will be these eight highly trained conservation biologists, who will be equipped with the necessary skills and experience to conduct biodiversity surveys, conduct field investigations and make sound conservation decisions and recommendations based upon robust scientific principles and data.

2. Project partnerships

Collaboration between UK and host country partners.

After the initial problems described in the previous Annual Report, collaboration between the UK and host country partners has worked well with free flow of email discussion and prompt resolution of problems. Dr Michael Balke (NHM team) has spent a total of ten weeks in PNG during the reporting period (in two visits), visiting both WCS and BRC to run training events, as well as to set up research and teaching materials and sample insects from a wide range of sites. Dr Alan Stewart has also visited to train the Darwin students at BRC.

Synergy with other Darwin projects

Kanawi Chamillou and Leontine Baje were assisted in the more practical aspects of their Honours research by BRC Parataxonomists employed on Darwin post-project EIDP09/10-030 (*Consolidating local capacity for biodiversity surveys in Papua New Guinea*; Project Leader: Alan Stewart). Similarly, the students have been able to educate the parataxonomists in the more theoretical aspects of biology. As reported in the previous Annual Report, this remains a very fruitful synergy with tangible benefits for both sides.

BRC retains contact with a Darwin project on butterfly farming (*Sustainable insect collecting and farming in Papua New Guinea*; Ref: 14-003; led by Dr. Tim Bayliss-Smith, Cambridge University), having had regular discussions with Mr. Rob Small, a doctoral researcher on this project, based in Madang.

Collaboration with other projects

Darwin-funded research and training based at BRC is benefiting greatly from synergy with the concurrent NSF-funded project on *Plant-insect food webs and tropical rain forest succession* (NSF-00515678). This project is studying the differences in host specificity and species richness of insects feeding on young and mature trees (as models of the effects of rainforest disturbance) in four 1ha plots (two each in pristine and cleared forest) at one of BRC's main field study sites at Wannang, in which all mature trees have been inventoried and all insects on the vegetation are being reared for species-level identification. This continues to be a very substantial logistic undertaking that has provided ideal training opportunities for the Darwin-funded students, especially Kanawi Chamillou and Kipiro Damas. It also fits in well with the objective of the Darwin project to build student projects around the comparison of pristine and disturbed rainforest habitats.

The existence of the Darwin project has prompted support from the Percy Sladen Memorial Fund of the Linnean Society to enable Katayo Sagata to investigate aquatic habitats in the north-west tip of the Huon Peninsula, where he rediscovered the large diving beetle *Rhantus*

papuanus Zimmermann, 1919, which was previously believed to be extinct due to habitat destruction.

3. Project progress over the last financial year

Team-building:

As in the previous year, the Honours student positions were advertised nationwide. All research students were recruited from the annual biological training course held at WCS. All are undertaking research for their Honours degrees at the University of Papua New Guinea (UPNG).

Training activities:

A wide variety of training activities took place at both WCS and BRC, including both formal fixed-length courses (which were open both to Darwin students and others) and ongoing day-to-day training for the Honours students. The following lists the main components:

- **Taxonomy course:** 4-day course at WCS, April 2006. Covering taxonomy, species concepts, how to make and curate collections and how these issues affect conservation. 33 participants from NGOs and PNG government departments.
- **GPS & database course:** 3-day course at WCS, July 2006. Covering how to use GPS and what its limitations are, how to enter this data into ArcView Software and calculate home ranges, and how to create and use Access databases. 11 participants.
- **Population dynamics models course:** 4-day course at WCS, 7-11 August 2006. Focused on no-take zones, source-sink models, reproductive outputs and sustainable yields for hunting, and demonstrating the use of Distance and Access Software. 14 participants from NGOs and PNG government departments. Darwin Initiative coordinators Darren Bito and Miriam Supuma participated, as well all DI students based at WCS.
- **Molecular biodiversity assessment and DNA aided taxonomy:** WCS, Goroka 11-12 December 2006. A needs assessment exercise, held with WCS students and carried out by Dr Michael Balke, to identify training needs in the fields of DNA taxonomy, conventional taxonomy and proposal writing.
- **Training Course in Aquatic Insect Field Techniques:** 27 November - 3 December 2006, based at BRC. Instruction by Dr Michael Balke, covering collection and other field techniques, habitats, preservation techniques etc. Preliminary visit in November 2006 served to plan and organise a more formal two-week training course in March 2007. The former course was attended by Darwin student Kanawi Chamilou together with four BRC parataxonomists and three trainees from local NGOs. Andrew Kinibel, based at BRC, is already trained to a level where he can identify major groups and is very advanced at working with landowners and on legal issues.
- **13th annual conservation biology training course:** 29 January to 22 February 2007 at WCS, Goroka. Designed for PNG university students and conservation biology professionals. The field site for surveys and demonstrations was the local Mt Gahavisuka Provincial Park. See Annex 3 for photos.
 - Instructors included: Dr. Andrew Mack, Ross Sinclair, Dr. Frank Clarke, Miriam Supuma, Enock Kaledimimo, Paul Igag and Leo Legra.
 - Participants included 9 women and 14 men from: University of PNG (including Darwin students), University of Goroka, PNG University of Technology, two professional botanists from the PNG Forestry Research Institute, a biologist from the Nature Conservancy, two parataxonomists from the Binatang Research Centre, and a curator from the local McCarthy Museum.

- The training manual for biodiversity survey methods, project design and project analysis and write-up was fully revised for this year.

Participants were taught:

- standard mist netting techniques, bird handling, banding and data collection, and museum specimen preparation. During the three-week course, students caught and banded 66 birds (29 species) over 14 days of mist netting.
 - setting up permanent plant plots, how to tag trees, determine DBH and height, record tree location, and identify tree species, as well as how to climb trees using ropes. By the end of the course, 320 trees had been surveyed from 33 families (52 genera).
 - how to live-trap mammals, handle and anaesthetize them, and record relevant data, use of mist nets and harp traps to capture bats, and bat handling and data collection. By the end of the course, 27 individuals from five species and four families had been captured in the traps, plus nine bat captures from five species and two families. Capture highlights included the New Guinea Quoll *Dasyurus albopunctatus*, a Ringtail Opossum *Pseudochirilus forbesi* and Raffray's Bandicoot *Peroryctes raffrayana*.
 - population abundance and density estimates and precision estimates using three methods: quadrat sampling, line transect sampling; mark, release, recapture, using beetles (see photos).
 - mapping with the use of compass and tape measure versus the use of GPS systems.
 - statistics, graphing, survey data analysis, report writing and oral presentations. Participants gave seminar presentations and held journal article discussion groups.
- **Leafhoppers and planthoppers (Auchenorrhyncha) course:** one-week training on identification, morphology, taxonomy, ecology, biocontrol of this important group of insects, led by Dr Alan Stewart, March 2007. This training was mainly for Darwin students Leontine Baje and Francesca Dem, but other BRC staff also participated.
 - **Employment skills course:** One-week course led by Dr Alan Stewart at BRC, March 2007, using lectures and discussion sessions on giving presentations; writing job applications; applications for funding; constructing a CV; interview skills.
 - **Accessing literature course:** 1-day course at WCS. Covering literature database searches and the use of bibliography software (EndNote). 14 participants.
 - **Plant taxonomy course:** One-week course on taxonomy, ecology and herbarium techniques, held at BRC and led by Dr. George Weiblen (University of Minnesota, USA); attended by Darren Bito and parataxonomists.
 - **Tropical Ecology field course:** Three-week course organised by The University of South Bohemia (Czech Republic) and taught by Professors Jan Leps and Vojtech Novotny. 10 European students (mostly MSc level), based at BRC and its research sites. Darren Bito participated in a part of the course (but could not complete the course due to illness). Participants were shown the work of parataxonomists and Honours students.
 - **Weekly scientific paper discussions at WCS** with a different peer-reviewed paper each week relevant to conservation in Papua New Guinea.
 - **Weekly skills testing at WCS** using sample tests of the Graduate Record Exam. This exam is the standard used by U.S. universities for admission to postgraduate degree programs.
 - **Endnote biological reference library:** This is linked to an electronic library of published papers on biodiversity, systematics, conservation and ecology. Development of this database continued this year: the WCS Endnote library reached 17,000 citations and 2,550 full papers; approximately 1,000 new pdf files were databased and added to the library at BRC, bringing the total of available papers to 3,500. This resource is freely available to all

trainees in the program for use in their research and is particularly useful in a country such as PNG where high speed internet connections and modern libraries do not exist.

PNG Honours students' research projects:

The following students have been undertaking research for their Honours Degrees (University of Papua New Guinea, Port Moresby), based at either WCS or BRC. The following accounts summarise their progress within the reporting period. The first cohort of students (who started around January 2006) finished their field work in the previous reporting period and have since been working on essays, literature searches, data analyses and completing their theses. All of the students successfully gave oral presentations of their work at the Eighth Annual New Guinea Biological Conference (BIOCON VIII) in Port Moresby, 26-28 September 2006, within the conference theme: *Linking Cultural and Biological Diversity: Framework for Research, Training and Action*.

First student cohort, recruited January 2006:

Ms Kore Tau

Flying fox abundance, reproduction and roost selection in caves and stone holes in the Crater Mountain Wildlife Management Area, Papua New Guinea.

Supervised by Drs Andy Mack and Deb Wright. Based at WCS.



Kore taking a GPS reading at one of her cave sites. This allows her to map how close each site is to human habitation and determine whether this affects the bat species that choose to inhabit that cave.

Because flying foxes are relatively large vertebrates living in conspicuous communal roosts, they are particularly attractive as an easy source of protein to subsistence hunters. In Papua New Guinea cave entrances are partially blocked and all of the emerging bats are killed.

Kore completed her Honours field work during the last reporting period, spending a total of seven months in the rugged mountains of the Crater Mountain Wildlife Management Area from March 2005 through March 2006. She counted bats in each of 14 caves and sinkholes, mist-netted them for identification and reproductive information, and measured cave parameters to see if any of them affect bat selection for roosting caves. Kore's field data are extremely useful, providing the first information on population estimates and reproductive frequency for montane flying foxes in PNG. She has collected valuable information on site parameters that will help conservationists identify which caves are most suitable for roosting bats of several species. She has also positively confirmed the occupancy of an extremely rare species of flying fox, Bulmer's Fruit Bat, *Aproteles*

bulmerae, until recently considered extinct, in two caves in the Crater Mountain area. Persecution of these vulnerable populations could easily lead to their extinction, so Kore is also documenting hunting activities.

This reporting period Kore has been working on her essays, literature search, data analysis and write-up at the WCS Training Center, with an intention to finish her Honours degree and defend her thesis in July 2007. Kore has applied for several scholarships for overseas Masters programs which she hopes to start in early 2008. During the second half of 2007 she plans to continue her bat work with censuses for the critically endangered *Aproteles bulmerae* at WCS's other field site, Mekil Conservation Initiative, in the Saundan Province of PNG.

Mr Enock Kaledimimo

Density, diversity and reproductive status of small mammals in the Crater Mountain Wildlife Management Area, Papua New Guinea.



Enock processes a Melomys rat caught in one of his live traps. A microchip is inserted under its skin to enable individual identification later if it is recaptured. By analysing the numbers of new captures and recaptures, Enock can estimate the population density of each species he captures.

Supervised by Drs Andy Mack and Deb Wright. Based at WCS.

PNG has a diverse fauna of small mammals that play important ecological roles as seed predators and dispersers. Additionally, many are important in the diets of rural people who depend on wild game for their dietary protein. Yet there has never been a study of population demography of any small mammal in PNG. There are no estimates of population density, home range, longevity or even breeding age or time of year. Honours student Enock Kaledemimo used state-of-the-art mark and recapture methods on a 6 ha grid over a full year to study the terrestrial small mammals of Crater Mountain. His study is the first of its kind on the island of New Guinea and is destined to become a standard for future research and management.

Enock completed his fieldwork during the last reporting period and this period has been working on his essays, literature search, data analysis and write-up at the WCS Training Center, with a view to finishing his Honours degree and defending his thesis in June 2007. Enock has been awarded a Christensen Conservation Leaders Graduate Fellowship for a Masters Degree study at the University of Missouri, St. Louis, USA, and will be leaving for his studies in July 2007.

Ms Eunice Dus

Estimating carbon production of mangrove forests through litter fall and biomass accumulation in Central Province, Papua New Guinea

Supervised by Drs Andy Mack and Deb Wright. Based at WCS.

Mangroves are highly productive ecosystems and are very vulnerable to multiple threats including logging, clearing, pollution and global climate change. They are important as nurseries for many economically important fisheries. They also act as better carbon sinks than many other ecosystems because some of the carbon they capture from the atmosphere ends up on the ocean floor where it decomposes very slowly. For her Honours degree Eunice estimated the carbon production of mangrove forests by measuring litter fall and biomass accumulation on Motopure Island, Central Province over a seven month period.

Eunice completed her field work during the last reporting period and this period she has been working on her essays, data analysis and write-up at the WCS training center. Eunice gave an oral presentation of her work at the Eighth Annual New Guinea Biological Conference in

September 2006. Eunice will defend her thesis and finish her Honours degree in May 2007. She has been awarded a scholarship for a Masters degree at the Australian National University and will leave for her studies in June 2007.



Eunice studied productivity in mangroves by collecting leaf and twig fall in litter traps like this one. The litter is then dried and carefully weighed to determine how much

Mr Kanawi Chamilou

Successional trends in the structure and composition of a lowland tropical forest in Papua New Guinea.

Supervised by Professor Vojtech Novotny (BRC)



Kanawi's project focused on plant communities in 1 ha plots of primary and secondary lowland forest that have been established at BRC's primary field site in Wannang. A knowledge of patterns and processes of succession in rainforest is vital for understanding how forests recover from logging operations and how quickly and to what extent they come to resemble pristine rainforest in species composition and structure.

Kanawi collected data on the leaf area of all plants with stem diameter (DBH) > 5cm from two 1,000 m² plots, one from primary and another from secondary lowland rainforest. He has also been evaluating the three-dimensional spatial distribution of leaf area and herbivore damage in these plots. Kanawi also

received two weeks of field training in water beetle collection techniques by Dr. Michael Balke (Natural History Museum, London) in December 2006.

Ms Leontine Baje

Host specificity and species richness of sap-sucking insects (Auchenorrhyncha, Hemiptera) in a lowland rainforest in Papua New Guinea.

Supervised jointly by Professor Vojtech Novotny (BRC) and Dr Alan Stewart (US)

Leontine has been based at BRC, working at the well-studied Ohu preservation area. The Auchenorrhyncha (cicadas, leafhoppers, planthoppers, treehoppers etc.) are an under-worked but important group of herbivorous insects in tropical rainforest. Leontine concentrated on the Typhlocybinae, a group that feeds on the mesophyll sap of their hosts, which are simple to rear from nymphal stages to establish accurate host-plant associations. This information will be essential for assessing the extent of recovery of insect faunas after major disturbance events such as rainforest clearance.



Leontine's project suffered some delay due to her pregnancy and the birth of her child in September 2006. Considering the situation, the delays were quite small. She finished her field work by September 2006, collecting quantitative samples of sap-sucking Typhlocybae from 75 rainforest tree species. This material has now mostly been sorted to morpho-species level. Professor Novotny and Dr Stewart will be assisting her to collaborate with Dr Irena Dworakowska, the world's leading authority on tropical typhlocybine leafhoppers, to determine the material as far as possible taxonomically. It is envisaged that the results will constitute a journal paper on host-plant specificity in leafhoppers, for comparison with other taxonomic groups that have been studied in this respect at BRC.

Second student cohort, recruited February 2007:

Ms Aileen Sagolo and Ms Samoa Asigau



In March 2007, WCS took on two new Honours students: both women were on the annual WCS training course in February 2007 and course leaders were very impressed and offered them positions. WCS staff have since been working with them to design their research projects.



Aileen learning single-rope climbing technique



Samoa learning to check birds for molt.

Mr Kipiro Damas

Floristic composition and structure of lowland rainforest in Papua New Guinea.

Supervised by Professor Vojtech Novotny (BRC)

Kipiro was recruited from the research staff at the Papua New Guinea Forestry Research Institute in Lae, the country's leading botanical research institution that also houses the National Herbarium. Kipiro has enrolled at the University of Papua New Guinea and started his Honours project. He has initiated field data collection as well as work in the herbarium.

Ms Francesca Dem

Host specificity and species richness of phloem- and xylem-sucking herbivores in a lowland rainforest in Papua New Guinea.

Supervised jointly by Professor Vojtech Novotny (BRC) and Dr Alan Stewart (US)



Francesca is a recent graduate from the University of Papua New Guinea. She has enrolled there for her Honours degree, the project starting in January 2007. She received some preparatory training at BRC from Dr Alan Stewart when he visited in November 2006. This focused on basic identification of Hemiptera, laboratory techniques and rearing adult insects from nymphal stages. She has tested the techniques for sampling and rearing of insects on live-caged saplings and has started field data collection.

Training of the research supervisors

Mr Katayo Sagata

Katayo started this project as the PNG Project Coordinator based with WCS. He was one of the two trainees who travelled to the UK in September-November 2005 to receive training in modern molecular and other systematics techniques at the NHM in London. After returning to PNG, he undertook fieldwork at several locations in PNG, training in digital macro photography techniques at BRC and wrote several papers, in addition to his role as project coordinator. Katayo was trained by Dr Michael Balke in the lab and in the field to collect, database and identify aquatic insects and write up scientific papers. He was also trained to organize fieldwork, an important issue in PNG, which enabled him to successfully plan and undertake a collecting trip to the Huon Peninsula (sponsored in part by a grant from the Percy Sladen Memorial Trust of the Linnean Society). Many new species were collected. Some of the material has already been distributed to taxonomists for identification and description; other material is currently being used for molecular biodiversity assessments (water beetles, selected bugs and mayflies).

In August 2006, Katayo obtained a scholarship for a one-year Masters program at Victoria University in New Zealand. He will be returning to WCS to resume his post in August 2007.



Before leaving, Katayo trained Bangan John, a PNG graduate, to work temporarily with Darwin collaborator Dr Michael Balke on his water beetle project.

Ms Miriam Supuma



Miriam replaced Katayo as the Darwin Initiative student supervisor and project coordinator whilst the latter was studying in New Zealand. She is highly qualified, having begun with WCS on one of the annual training courses in 2001, conducted her Honours degree research with WCS in 2003, and then obtained a scholarship and attended James Cook University in Australia for her Masters degree in 2005. After that she returned to re-join the WCS-PNG program and has since been the overall student supervisor and assistant director.

Mr Darren Bito



Darren has been the PNG Project Co-ordinator and research supervisor based at BRC during the current reporting period. He accompanied Katayo Sagata (above) on the training visit to the UK in 2005. Alongside his supervision duties and training Darwin Honours students, he has continued in his research on herbivore communities colonizing alien plant species in PNG, being trained and assisted by V. Novotny. His first paper was accepted by the *Journal of Biogeography* (see publications list), representing one of very few papers authored solely by a PNG researcher in an international journal of this rank. He has also been working on submitting for publication a second manuscript from his MSc study. He presented the results of his research as an oral presentation *Geographic variability of moth communities on an alien tree, Spathodea campanulata in New Guinea and the Bismarck Archipelago* at the New Guinea Biological Conference in Port Moresby. In addition, he received tutorials on writing research papers and on writing research and fellowship applications from V. Novotny.

Darren was recently successful in securing a PhD studentship at Griffith University in Brisbane, Australia, working with Professor Roger Kitching on tropical forest insect communities. He left BRC to take up this position in June 2007. Darren also successfully competed for a Darwin Fellowship to come to the UK for a year (primarily at Sussex, but also at Oxford and Leeds universities); however, by the time the Fellowships were announced, he had already accepted the PhD position in Australia. BRC is now actively recruiting for his replacement.

UK Project Co-ordinator

Dr Frank Clarke was hired to replace Neil Springate and to aid the training of student conservation biologists in PNG. He arrived in January 2007 and began immediately helping to instruct on the annual conservation biology field course at WCS (see above). Unfortunately, Dr Clarke contracted a serious eye infection whilst in PNG that required urgent medical attention. He returned to the UK at the beginning of May and was on sick-leave for three months. He tendered his resignation at the end of July 2007. At the time of writing, we are debating how the funds remaining on the UK project co-ordinator budget should be used.

Capacity building:

Aquatic insects reference collection:

This is growing steadily, with parts housed at BRC in Madang (having been moved from WCS), parts at the NHM in London, and parts in Munich, Germany. After successfully obtaining export permits, Dr Michael Balke is now in the process of sorting, identifying and curating a reference collection for PNG aquatic insects which will be repatriated at the end of 2007 / Spring 2008.

Dr Balke also identified the need for proper curation of the large PNG herpetological collection which is currently housed at WCS. The Darwin project has contributed some much-needed storage equipment for this collection whilst plans are drawn up for a more long-term sustainable solution.

Biodiversity data collection:

Dr Michael Balke has spent two extended periods in PNG during the current reporting period: 28 March to 25 May and 3 November to 14 December 2006. With the assistance of Darwin-funded students and Katayo Sagata (local project co-ordinator), Dr Balke has now sampled aquatic insects from some 160 localities in PNG. This is a sampling density hardly ever achieved before in this country. He and his various assistants carried out awareness-raising lectures in most villages that they visited, to inform the grassroots communities about their work and the importance of biodiversity conservation and to obtain landowner's feedback. Plans are now in place to design and distribute leaflets to inform local villagers about their aquatic biodiversity and its conservation.

3.1 Overall progress in carrying out project activities and towards project outputs

Output 1: 2 training courses for PNG students

The annual conservation biology training courses run by WCS have attracted an increasing number of participants: 15 in the last annual reporting period and 23 this year. We have thus already exceeded our target of training 30 students on this course during the lifetime of the project. The training course will run again early in 2008. This course has proved to be an excellent way of training a large number of students in a very focused and time-efficient manner, but also it is a good way of selecting the most promising and motivated students for further study, including the Honours programme.

Output 2: 8 BSc. Honours students trained (18 months each)

The first cohort of five BSc Honours students (Baje, Chamilou, Tau, Kaledimino, Dus) have all completed their data collection and are currently in advanced stages of writing up their theses. It is the intention that these will lead to manuscripts that are publishable in good quality ecology/conservation journals. At least three of this first cohort (Kaledimino, Dus, Tau) intend to continue their studies at Masters level (two have places already arranged and sponsored).

The second cohort of students (Sagolo, Asigau, Damas, Dem) have all made promising starts on their research projects.

The project is therefore on course for having trained nine honours students by the time it is finished. We expect a significant proportion of these (if not all) will either go on to further academic studies (either within PNG or overseas) or will remain in the conservation field within PNG. Those obtaining further qualifications overseas have a high probability of returning to fill positions as senior managers in conservations NGOs, local and national government etc. Most students have a strong affinity for their home country and view their future there. Our project will have made a substantial impact on PNG's ability to meet its commitments under the CBD if, as we expect, these people become influential decision makers driving future conservation policy in the country.

Output 3: 2 PNG local coordinators trained, including in UK

The UK training part of this output was achieved in the previous annual reporting period. Since then, both Katayo Sagata and Darren Bito have received continued training in various aspects of field biology, conservation and project management. Katayo Sagata temporarily suspended his involvement with the project while he pursued a Masters degree in New Zealand (being replaced by Miriam Supuma), but has since returned to WCS and the Darwin project. Darren Bito has now taken up a PhD position in Australia (working on tropical forest insect communities), but will undoubtedly return after his studies are finished. Again, we fully expect both of them to pursue promising careers in the conservation sector after completion of their studies and, to this end, we have given them every encouragement to obtain further and higher qualifications.

Output 4: Insect reference collection enhanced with specimens and databases

This is an ongoing objective throughout the project. Both BRC and WCS maintain insect reference collections (although that at WCS is not extensive), supported by databases of holdings. Material is also regularly supplied to the national insect collection at NARI in Port Moresby. Dr Balke has made excellent progress in initiating a reference collection of PNG's aquatic insects, currently housed at BRC.

Output 5: Baseline biodiversity surveys in lowland and montane disturbed and undisturbed forests conducted

This is also an ongoing objective, achieved through the field survey work done on a range of taxonomic groups by the Honours students. So far, these cover plants, insects, bats, and small mammals. All are providing important insights into the basic ecology of PNG's flora and fauna which will be vital for understanding and making decisions about their future conservation.

Summary of progress to date:

In spite of a difficult start involving significant personnel problems last year, the project has now settled down to a very full and successful training programme and some highly productive research. Collaboration between partners is working well and the early signs are that the students are keen to pursue their training in conservation ecology to a higher level. We are confident that the remaining project outputs can be achieved (in some cases exceeded) by the end of the project's lifetime.

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

Code No.	Description	Year 2 Total
6A, 6B	3-week Conservation Biology course	14 participants
7	Postgraduate training manual on biodiversity survey methods	1 revised
7	Conservation Biology course materials	2
14B	Student presentations at NG Biological Conference	5
10	Forest Biodiversity field guide produced	under review
4C, 4D	BSc Honours PNG students graduate after 18 months of training	4 due Dec 2007
15A, 15B	Press release, student graduation announced	planned Dec '07
11A, 11B	Papers from Hons. dissertations	4+ in prep.
8	UK personnel weeks in PNG for student training	24

Table 2: Publications

Authors funded wholly or partly by Darwin project listed in **bold type**.

Type * (e.g. journals, manual, CDs)	Detail (title, author, year)	Publishers (name, city)	Available from (e.g. contact address, website)	Cost £
Journal	Balke, M. J. Pons, I. Ribera, K. Sagata, and A. P. Vogler. Infrequent and unidirectional colonization of megadiverse <i>Papuadytes</i> diving beetles in New Caledonia and New Guinea.	Submitted to: <i>Molecular Phylogenetics and Evolution</i>		N/A
In-flight magazine for Air Nuigini	Sagata, K. My experience at the British Natural History Museum.	Submitted to: <i>Paradise Magazine</i>		N/A
Journal	Bito, D. (2007) An alien in an archipelago: geographic variability in moth (Lepidoptera) communities colonizing <i>Spathodea campanulata</i> in the New Guinea and Bismarck Islands.	<i>Journal of Biogeography</i> , 34 , 769–778	pdf from BRC	N/A
Report	Gilman, E., H. Van Lavieren, J. Ellison, V. Jungblut, L. Wilson, F. Areki, G. Brighthouse, J. Bungitak, E. Dus , M. Henry, M. Kilman, E. Matthews, I. Sauni, N. Teariki-Ruatu, S. Tukia, and K. Yuknavage. (2006) Pacific Island mangroves in a changing climate and rising sea. UNEP Regional Seas Reports and Studies No. 179, United Nations Environment Programme, Regional Seas Programme, Nairobi, Kenya.	UNEP	WCS	N/A

5. Actions taken in response to previous reviews

- i. The Project Leader has kept the Secretariat closely informed of developments with the appeal by Dr Springate to his termination of contract (point 2 of review)
- ii. Further details are provided on the ongoing programme of research and survey of various taxonomic groups through the Honours student projects (point 4 of review)
- iii. This report provides more detailed background on the research aspects of the project in terms of each of the students' Honours projects (point 10 of review).

6. Other comments on progress

Changes at WCS:

Members of the Wildlife Conservation Society (WCS) PNG Programme, based in Goroka in the Eastern Highlands of New Guinea, have been doing conservation research over the last 20+ years at their long-term field site at Crater Mountain. The area was recently identified by

a mining company as suitable for mineral extraction, giving the local tribal landowners a choice between conservation and substantial revenues from granting mineral rights. They chose the latter and so WCS lost the right of access to their long-term field study site. At around the same time, an American female student who was working at the site with WCS was assaulted. The response to these events by the WCS Head Office in New York was immediately to terminate the contracts of the two co-directors of the PNG programme: Drs Andy Mack and Debra Wright. The WCS-PNG Programme is now being run by Acting-Director Miriam Supuma, who was previously acting as our Darwin local co-ordinator whilst Mr Katayo Sagata studied for an MSc in New Zealand for a year (returning in August 2007). At the moment, it is not entirely clear what the future holds for WCS in PNG. The indication from the New York office is that they will slim down the current operation in PNG, which may well mean its eventual closure, although they have given an assurance that they will honour all extant project commitments (including our Darwin project). The remaining staff are considering setting up a separate local conservation NGO of their own. If this actually happens, we may need to consider whether we could operate the Darwin project through the new NGO. The Darwin Secretariat was informed of these events by the project Leader on 10th July 2007.

7. Sustainability

The level of response to calls for Honours students to work in biodiversity (and indeed also advertisements for other job opportunities at BRC and WCS) is gratifyingly high. This shows that both institutions are regarded highly and that there is a large pool of talented and highly motivated students in the country who wish to be trained in conservation biology.

The exit strategy is that, by the end of the project, we will have trained at least eight skilled PNG scientists, who will be equipped to drive the future national conservation agenda. They will be able to identify conservation priorities and culturally appropriate solutions to PNG's considerable environmental challenges, ultimately enabling the country to meet its commitments to the CBD. We envisage these trainees providing critical future links between indigenous village communities, government officials, NGOs and overseas scientists. Furthermore, the training received by the more senior personnel should equip them to train subsequent generations of biologists after the Darwin project is finished. For these reasons, we are confident that the project's outputs and impacts will be sustained beyond the life of the project.

The project's legacy will be the knowledge, skills and experience obtained by the trainees, who we hope will eventually go on to contribute to training their successors in this field. The project will also make a substantial contribution to the knowledge of hitherto understudied groups of organisms in PNG through the collection of data and specimens.

8. Dissemination

The principal dissemination of the project's activities will be through publication of research results and conclusions in peer-reviewed scientific journals. The profile of the project is being actively promoted by Dr Balke through the project website that he has created:

<http://waterbeetles.info/Darwin/DarwinHTMLs/DarwinBackground.html>

Both BRC and WCS actively maintain websites that describe their activities and outputs:

WCS: <http://www.wcs.org/international/Asia/175994/PNGpublications>

BRC: <http://www.entu.cas.cz/png/index.html>

All Honours students are strongly encouraged to present the results of their research at the annual New Guinea Biology Conference (BIOCON); five Honours students and one project co-ordinator (Darren Bito) gave presentations of their work at the most recent (8th) conference in September 2006.

9. Project Expenditure

10. OPTIONAL: Outstanding achievements of your project during the reporting period (300-400 words maximum). This section may be used for publicity purposes

N/A

Annex 1 Report of progress and achievements against Logical Framework for Financial Year: 2006/2007

Project summary	Measurable Indicators	Progress and Achievements April 2006-Mar 2007	Actions required/planned for next period
<p>Goal: To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve</p> <ul style="list-style-type: none"> • The conservation of biological diversity, • The sustainable use of its components, and • The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources 			
<p>Purpose</p> <p>To enhance the in-country capacity of PNG to implement the CBD by postgraduate training of outstanding PNG students to become local leaders in biodiversity conservation and research.</p>	<p>a) PNG students better trained in conducting biodiversity research & monitoring</p> <p>b) Enhanced capacity to conduct and communicate biodiversity research & implement conservation policy by PNG nationals.</p> <p>c) Better characterisation of aquatic and terrestrial biodiversity associated with different land use patterns in PNG forests.</p>	<p>a) 4 Honours students enrolled, receiving training, & started on research projects</p> <p>b) Favourable course reports for students attending conservation biology course and ongoing monitoring of student learning progress.</p> <p>c) Research projects initiated</p>	<p>As predicted, PNG has sufficient supply of talented, highly-motivated students interested in biodiversity work.</p>
<p>Outputs</p>			
<p>a) 2 training courses for PNG students</p>	<p>a) 30 participants trained in biology and biodiversity sciences</p>	<p>a) 23 students attended conservation biology course, February 2007</p>	<p>Training course in conservation biology will take place again in early 2008.</p>

b) 8 BSc. Honours students trained (18 months each)	b) 8 students trained	b) 4 honours students enrolled in 2 nd cohort	1 st student cohort currently completing their theses; 2 nd cohort currently conducting fieldwork / data collection
c) 2 PNG local coordinators trained, including in UK	c) 2 PNG local coordinators receive UK-based training in taxonomic & DNA methods to implement future training courses in PNG	c) Output achieved in last annual reporting period.	Output achieved.
d) Insect reference collection enhanced with specimens and databases	d) Collections enhanced at WCS, BRC, UPNG, NARI, databases online.	d) Specimen collection established at WCS, & further specimens deposited at BRC	Ongoing enhancement of specimen collections and databases
e) Baseline biodiversity surveys in lowland and montane disturbed and undisturbed forests conducted	e) Samples collected, sorted and analysed, museum specimens prepared, data analysed	e) Ongoing sampling and survey of plant, insect, bat and small mammal communities.	Ongoing sampling, sorting of materials etc.

Annex 2 Project's full current logframe

Project summary	Measurable Indicators	Means of verification	Important Assumptions
<p>Goal:</p> <p>To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve</p> <ul style="list-style-type: none"> • the conservation of biological diversity, • the sustainable use of its components, and • the fair and equitable sharing of benefits arising out of the utilisation of genetic resources 			
<p>Purpose</p> <p><i>To enhance the in-country capacity of PNG to implement the CBD by postgraduate training of outstanding PNG students to become local leaders in biodiversity conservation and research.</i></p>	<p>a) PNG students better trained in conducting biodiversity research & monitoring</p> <p>b) Enhanced capacity to conduct and communicate biodiversity research & implement conservation policy by PNG nationals.</p> <p>c) Better characterisation of aquatic and terrestrial biodiversity associated with different land use patterns in PNG forests.</p>	<p>a) Honours degrees awarded</p> <p>b) Student course reports, theses and presentations at NG Biological Conferences</p> <p>c) Research publications on biodiversity patterns by students and researchers</p>	<p>a) There are enough talented and interested students for the postgraduate training programme</p> <p>b) Government & local landowners will consult with and trust scientists & policy makers.</p> <p>b-c) Majority of participants in training courses will take up careers relevant to CBD implementation in PNG</p>
<p>Outputs</p> <p>a) 2 training courses for PNG students</p> <p>b) 8 BSc. Honours students trained (18 months each)</p> <p>c) 2 PNG local coordinators trained, including in UK</p> <p>d) Insect reference collection enhanced with specimens and databases</p> <p>e) Baseline biodiversity surveys in lowland and montane disturbed and undisturbed forests conducted</p>	<p>a) 30 participants trained in biology and biodiversity sciences</p> <p>b) 8 students trained</p> <p>c) 2 PNG local coordinators receive UK-based training in taxonomic & DNA methods to implement future training courses in PNG</p> <p>d) Collections enhanced at WCS, BRC, UPNG, NARI, databases online.</p> <p>e) Samples collected, sorted and analysed, museum specimens prepared, data analysed</p>	<p>a) Attendance lists, exam results</p> <p>b) 8 BSc degrees awarded; theses and reports, 8 conference presentations</p> <p>c) 2 seminars at NHM, 2 research publications;</p> <p>d) Specimens receipt acknowledged by the institutions, database evaluation by users</p> <p>e) 4 research publications, report to DEC</p>	<p>a) Active participation of students</p> <p>b) Students are dedicated and capable of carrying out and completing ambitious research work independently</p> <p>c) the PNG local coordinators is interested in broadening his experience overseas.</p> <p>d) sufficient time and facilities for collecting, design of ID tools, collections facilities supported by PNG institutions</p> <p>e) research is cutting-edge</p>

Activities	Activity Milestones (Summary of Project Implementation Timetable)
Training: Honours programmes.	Yrs 1-2: Cohort 1, Yrs. 2-3: Cohort 2 of students enrolls, completes research, writes and defends theses
Training: Research and training coordinators	Yrs. 1-3: Training, project co-ordination and student supervision duties in PNG; Yr. 1: Two PNG local co-ordinators trained in UK
Information products & reference collections.	Yrs. 1-2: Fieldwork, databasing; Yrs 2-3: Identification tools created, reference collections and databases enhanced
Field research programme & work with landowners.	Yrs 1-3: Research conducted, Yrs. 2-3 research results summarized in technical papers but also in accessible materials to be distributed to schools & village communities; conservation recommendations to Government.

Annex 3: Photo gallery of activities on Darwin project 14/054, April 2006 to March 2007

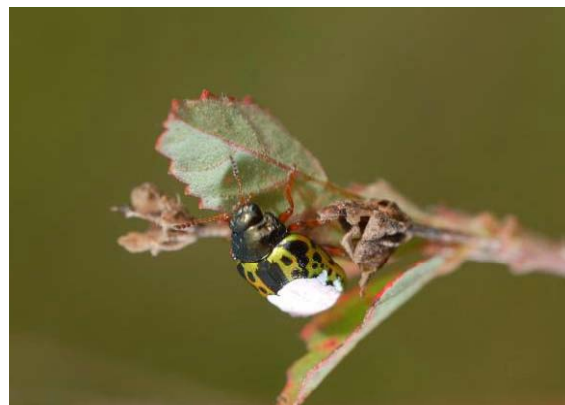
13th annual WCS biological training course, 29 Jan-22 Feb 2007



Learning to mist-net, measure and band birds.



Using sweep nets to teach mark-recapture methods for estimating population density.



Participants marked captured beetles with white nail polish and released them. After 24 hours, participants went back to the same site and re-sampled to determine the number of recaptures versus new individuals.

Aquatic Insects Field Techniques course:



Studying catches at Keki lodge



Sampling coastal river fauna



Aquatic sampling at Madang Town Cleland Park attracting local interest



Trainees by Madang golf course pool

Leafhoppers and planthoppers (Auchenorrhyncha) course:



Alan Stewart discussing curation of BRC insect collection with Leontine Baje (Darwin student)

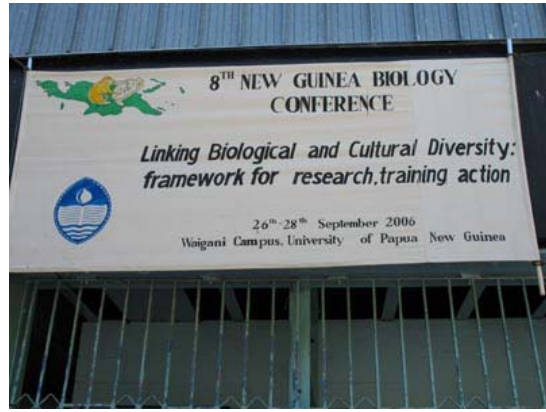


Maling Rimandai (parataxonomist), Leontine Baje, Alan Stewart and Francesca Dem working on identification and curation of leafhoppers at BRC.

8th New Guinea Biology Conference (BIOCON)
26-28 September 2006, UPNG



Darwin project delegates from BRC & WCS



Entrance to conference, UPNG



Participants from BRC: Markus Manumbor, Steven Sau, Darren Bitto, Martin Mogia



Conference in session