

Darwin Initiative for the Survival of Species

Final Report

1. Darwin Project Information

Project Reference No.	EIDP09/10-030
Project title	<i>Consolidating local capacity for biodiversity surveys in Papua New Guinea</i>
Country	<i>Papua New Guinea (PNG)</i>
UK Contractor	<i>University of Sussex</i>
Partner Organisation (s)	<i>Binatang Research Centre, Papua New Guinea</i>
Darwin Grant Value	<i>£70,687</i>
Start/End date	<i>1.7.05 to 30.6.07</i>
Project website	<i>www.entu.cas.cz/png/</i>
Author(s), date	<i>Dr A J A Stewart, Prof V Novotny, 25 October 2007</i>

2. Project Background/Rationale

The project was based at the New Guinea Binatang* Research Centre (BRC) in Madang, Papua New Guinea (PNG). As a 'post-project', it followed on from our previous project *Developing local capacity for biodiversity surveys in Papua New Guinea* (162/10/030) that finished in August 2004.

PNG contains 5-8% of the world's biodiversity, including at least 20,000 species of plants (70% of them endemic) and a large, but unknown number of insect species. It has been designated as one of the three major tropical wilderness areas of the world, as with >34 million hectares of tropical forests, PNG ranks 9th among the most forested tropical countries. PNG is also an extremely inaccessible country with large areas first opened to the outside world only 50 years ago. Enormous tracts of forest remain biologically virtually unexplored. PNG Conservation Needs Assessment (1993) identified poor knowledge of the country's biota as a major obstacle to designing sound conservation strategies. Although 70% of the original forests of PNG are still intact, they are coming under increasing pressure due to population increase, the increasing aspirations of the people to material development, and increasing demand for PNG timber as exploitable forests in neighbouring Malaysia and Indonesia diminish. Clearly, only a part of the existing forests in PNG can be saved, and identifying those which are most valuable is currently the top conservation priority, at a time when the PNG government is considering granting major logging concessions and village landowners are considering their options for future development of their forests.

The overall aim of the project has been to create and develop a locally recruited and locally based team of experts - parataxonomists - who are able to conduct surveys of insect and plant biodiversity in PNG, generating high quality research data and material and, in collaboration with researchers, exploring protocols for insect diversity surveys in rain forests. The long-term goal has been that, once trained and equipped, this team

would become financially independent, attracting contracts to provide assistance to local landowners, environmental and government organisations and research teams.

* Binatang means 'insect' in the most widely-spoken local language, Tok Pisin.

3. Project Summary

The original Darwin Initiative project successfully established the team of parataxonomists that can carry out biodiversity surveys for local landowners, environmental and government organisations and researchers, and that is also active in environmental education of grassroots villagers. The original project equipped and trained a team of 12 parataxonomists that now represents the most productive insect biodiversity survey team in PNG, and is also recognised as one of the top parataxonomist teams world-wide (Sheil & Lawrence, 2004, TREE 19:634). The main objective of the Post-project was to consolidate these achievements by strengthening the team's capacity for biodiversity data analysis, report writing, fundraising, and financial management, as well as expanding its expertise in new directions, such as forest canopy access and marine surveys. The broader objective of the project was to demonstrate the conservation and research value of parataxonomist teams in general and to promote their wider use in tropical countries.

With the exception of the details of the training programme, the projected outputs and proposed operational plan remained unchanged. Considerable volatility of the various externally-run training courses that we had originally planned forced us repeatedly to revise the details of the training schedule. The parataxonomist team is now somewhat larger than previously (18 compared to an original 12), including nine new recruits requiring in-house training rather than external courses. Nevertheless, members of the team have participated in a wide variety of courses that have introduced novel techniques and elevated the collective expertise considerably.

The project addressed the following CBD articles: No. 12, Research and Training (40%), No. 7, Identification and Monitoring (20%); No. 13, Public Education and Awareness (15%); No. 8, In-situ Conservation (10%); No. 10, Sustainable Use of Components of Biological Diversity (5%); No. 14, Impact Assessment and Minimizing Adverse Impacts (5%); and No. 17, Exchange of Information (5%).

The principal output has been the completion of a wide range of training courses by the 18 parataxonomists and the office supervisor, chosen to develop a set of advanced skills that are required to establish the team as a fully independent unit. Other outputs include enhancement of databases and insect collections, scientific papers and training texts, participation in conferences and the dissemination of information to the media via press releases, popular articles and radio broadcasts. The construction and provision of a fully-equipped dormitory building to allow BRC to accommodate residential and visiting students and scientists is a lasting legacy of the project.

4. Scientific, Training, and Technical Assessment

Research

The main research activity centred on the study of insect biodiversity in tropical rainforests of New Guinea, focusing particularly on herbivorous species (Fig 5). The post-project focused on the analysis of insect samples obtained during the previous DI project at several lowland rainforest sites, particularly their sorting, morphotyping and imaging by parataxonomists and data analysis by PIs. This project produced the first detailed assessment of insect beta diversity in lowland tropical forests (Novotny et al.

2007). Further, it significantly expanded our on-line database of New Guinea Lepidoptera (www.entu.cas.cz/png/caterpillars), now comprising 518 Lepidoptera species, information on 687 host plant records, as well as images of caterpillars, often previously unknown, for 273 species.

Parataxonomist assistance to other research projects at BRC contributed to papers published on host specificity of leaf-chewing insects (Novotny et al. 2006), bark beetles (Hulcr et al. 2007), root-feeding beetles (Pokon et al. 2005) and caterpillars colonizing alien trees (Bito 2007, Bito & Smith 2005). Parataxonomist assistance therefore also facilitated research by local PNG students, D. Bito and R. Pokon.

Further, parataxonomists took part in a new research project mapping plant-insect food webs in 1ha of primary and 1 ha of secondary rainforest in Wanang. The research part of the project is funded by the National Science Foundation (USA), while the Darwin Project role included the training of parataxonomists in the field by visiting researchers, as well as the community education activities by parataxonomists (see below).

Training and capacity building activities

In country training of parataxonomists:

The parataxonomists received training in a variety of formats: variable length, from one-day through to 3-week courses; courses focused on specific topics through to ongoing daily training; one-to-one training through to group/team work; lectures, practical demonstrations, seminar discussions. The training schedule remained flexible throughout, allowing us to take advantage of opportunities arising from visits by overseas scientists with expertise in specific topics. The emphasis has been on the development of generic/transferrable skills that support the already well-developed skills array in biodiversity studies.

The following courses were run during the post-project period:

- *Induction course*; for the newly hired parataxonomists, 18 days (2 days weekly over a period of 9 weeks), Vojtech Novotny and Jan Hrcek (University of South Bohemia), November-December 2005.
- *Computer data management* 2 days, Darren Bito (BRC), August 2005.
- *Basic mathematics applied to biodiversity survey analysis*, 1 day, Prof Vojtech Novotny, September 2005
- *Botanical survey techniques* (plant identification, field surveys, herbarium techniques) by Dr. George Weiblen (University of Minnesota, USA), August 2006
- *Basics of biology, insect and plant ecological techniques and computer skills*, training for 18 parataxonomists, 1 day a week for 5 weeks, in 2006 (Vojtech Novotny and Jan Hrcek) and 2007 (Vojtech Novotny and Petr Klimes)
- *Sap-sucking insects* (sampling, identification, and ecology) by Leontine Baje (Honours student, University of PNG)
- *Basic Canopy Access Proficiency* course, Danum Valley Research Station, Malaysia, organised by Canopy Access Ltd, Global Canopy Programme UK, and the University of Malaysia Sabah (2 weeks, November 2005). Attended by Darren Bito and senior parataxonomist Martin Mogia (Fig. 8).
- *Plant Identification* course by Kipiro Damas, a senior botanist at the PNG Forestry Research Institute (2 weeks, November 2005). Attended by three parataxonomists (Brus Isua, Markus Manumbor and Kenneth Molem).

- *Insect parasitoids* (mounting and family identification) by Jan Hrcek, a visiting MSc student from the University of South Bohemia (Czech Republic) (3 days, January 2006).
- *Botanical and entomological techniques* course; at the PNG Forestry Research Institute in Lae (1 week, February 2006), attended by three parataxonomists (Martin Mogia, Gibson Sosanika, and Kua Nimai).
- *Computing techniques for parataxonomy* (digital photography, image processing using Adobe Photoshop, Microsoft Excel); Dr Jiri Hulcr, Michigan State University (February-March 2006); attended by all staff parataxonomists.
- *Introduction to insect orders*; Jiri Hulcr (Michigan State University), 1 day, February 2006
- *Field course in sampling and preserving xylophagous insects* by Jiri Hulcr, 4 days in February 2006, attended by 3 parataxonomists.
- *Ecology and taxonomy of bark beetles* by Dr Jiri Hulcr (1 week, March 2006), attended by parataxonomists Martin Mogia, Aloysius Posman and Gibson Sosanika.
- *Quantitative plant ecology for parataxonomists* (surveys and forest structure studies); Prof Vojtech Novotny (4 weeks, February – March, 2006).
- *Herbarium specimen management, curation and databasing course* by Tim Whitfeld (University of Minnesota) for 10 days in June 2007 for 4 parataxonomists, including 3 days of practical work in the PNG National Herbarium
- *Field course in sampling and preserving amphibians* by Dr Allen Allison (Bishop Museum, Honolulu), 3 days in March 2007, attended by 8 parataxonomists
- *Field course in sampling and preserving aquatic insects* by Dr Michael Balke (NHM, London), 1 week in November 2006, attended by 10 parataxonomists.
- *Tropical Field Course of Ecology* for Biology students from the University of South Bohemia (Czech Republic) and BRC parataxonomists, 3 weeks, lead by V. Novotny and J. Hrcek (University of South Bohemia), 3 weeks in September-October 2006, attended by 5-8 parataxonomists (depending on activity). Included small field projects in a lowland rainforest, and field trips to montane forests and coral reefs.
- *Career management skills* (applying for jobs, writing your curriculum vitae, application forms, interview skills, research grant applications, giving presentations); one week seminar series, by Dr Alan Stewart, November 2006
- *Human Resource Management*; Divine Word University, Madang, February – March 2006 (attended by Dorothy Wal, BRC accountant)
- *Driving license training* (including 4WD); taken by parataxonomists Steven Sau, Roll Lilip, Aloysius Poisman and Sentiko Ibalim
- *Swimming training* (6 BRC staff)
- *PADI scuba diving training* (parataxonomists Martin Mogia, Markus Manumbor and Steve Sau).
- Visits by 18 parataxonomists to the PNG Forestry Research Institute, PNG National Agriculture Research Institute, Rainforest Habitat Zoo, and Botanical Gardens in Lae (2007).

- Parataxonomists from BRC trained 45 villagers from forest dwelling communities in basic methods of insect and plant sampling and insect rearing.
- Parataxonomists from BRC organised two 1-day Science Fairs for elementary schools in Riwo village; total attendance approximately 250 childrens.
- Four oral presentations at the New Guinea Biological Conference in Port Moresby, August 2006 by parataxonomists M. Mogia, S. Sau, M. manumbor and E. Tamtiai.

Our training took advantage of a diversity of approaches, including senior parataxonomists training their junior colleagues, and all parataxonomists being trained by (i) resident PNG students working on their Honours thesis (and sponsored by a different DI project), (ii) resident overseas PhD students, (iii) visiting overseas researchers, (iv) external training courses. Furthermore, parataxonomists themselves trained field assistants from village communities and organised science shows for elementary schools. We found the synergy between visiting overseas PhD students (Jan Hrcek, Petr Klimes, and Tim Whitfeld), local Honours students (Leontine Baje, Kipiro Damas, Francesca Dem) and parataxonomists a particularly efficient way of improving the research training of all parties involved, as their skills were complementary: university students had a more theoretical background, while paratraxonomists were better in field work and alpha taxonomy of plants and insects. Our training programmes for parataxonomists and students were both funded by (different) DI projects.

Furthermore, joint participation both by ten overseas Biology students (mostly BSc and MSc level) from the Czech Republic and BRC parataxonomists in a 3-week *Tropical Ecology* field course was highly rewarding both to overseas students and parataxonomists.

Overseas training of parataxonomists:

Senior parataxonomists Elvis Tamtiai, Steven Sau and Roll Lilip visited Europe for 2 months of training, split between the UK and the Czech Republic in July-September 2006. They were the last group to visit the UK.

All nine senior parataxonomists at BRC have been given a Darwin-sponsored opportunity to receive overseas training over the lifetime of the original project and post-project. In all cases, this involved training in ecological field and laboratory techniques at the University of Sussex, taxonomy and museum curatorial techniques at the National Museums & Galleries of Wales in Cardiff, and plant identification and botanical curation techniques at the herbarium of the Royal Botanical Gardens at Kew. Advantage was also taken of round-world flight offers to visit collaborating scientists in other countries within these trips. Thus, all of the parataxonomists visited the Czech Republic (Czech Academy of Sciences) and the majority also visited USA (University of Minnesota, and Smithsonian Institution, Washington) and Panama (Smithsonian Tropical Research Institute).

The overseas visits by parataxonomists improved their skills in biological research but, equally importantly, broadened their understanding of the international context of research and biodiversity conservation, as they could see and experience the laboratory phase of the field biodiversity research they assisted in PNG, including taxonomic work on specimens in museums, as well as DNA analysis and data analysis at major laboratories. They also experienced for the first time relatively species poor temperate-zone ecosystems, which gave them an opportunity to appreciate the unique position of their country in the efforts to preserve global biodiversity.

Conservation-oriented training by parataxonomists:

We have assisted two communities (in Ohu and Wanang villages) wishing to protect their rainforests. In Ohu village, near Madang town, where we have been working on research for >10 years and trained several parataxonomists, we assisted, together with WWF, in the community-initiated application to declare their rainforest protected area of 300 ha as a Wildlife Management Area. Likewise, we have worked with people from Wanang, a remote village where 11 clans owning 11,000 ha of primary rainforest signed the Wanang Conservation Deed, a legal instrument designed to protect their forests from logging (which was imminent as the entire area is a part of the Middle Ramu logging concession, presently tendered to logging companies). Our activities brought direct income from research to village communities, thus strengthening their incentive for forest conservation. Furthermore, our parataxonomists trained 45 villagers in assisting visiting researchers and tourists, thus preparing the village community for hosting ecotourism and research activities. Finally, we have assisted in preparation of conservation plans for the Conservation Area.

Parataxonomists produced reports in Tok Pisin targeting village audiences at the study sites where we conducted field research, as well as a number of educational leaflets on environmental issues for distribution in villages (also freely available on the internet to other NGOs and interested parties). Parataxonomists also organised Science Fairs for elementary school children (Fig. 6).

Local capacity building:

We have completed the process of transfer of >10,000 mounted, labelled and at least partially identified insect specimens to the PNG National Insect collection at the PNG National Agricultural Research Institute (NARI) in Port Moresby, as well as >1,000 specimens to the Insect Collection at the PNG Forestry Research Institute (FRI) in Lae. We have continued our collaboration with both NARI and FRI, as well as with the two leading local universities, the University of PNG in Port Moresby and the University of Technology in Lae.

The project also left a significant legacy at BRC, including a new dormitory with six bedrooms and a library (Fig 4). This facility significantly improved the living and working conditions of parataxonomists and permitted expansion of their team.

Building the parataxonomist team:

Our team went through significant personnel changes during the post-project, including losing four parataxonomists and hiring nine new parataxonomists (Fig 7).

One parataxonomist, R. Kutil, unfortunately died. Another parataxonomist, W. Boen, left after six years at BRC. He was a highly qualified team leader. His departure, caused by a combination of family problems and personal conflicts with some other BRC staff, was a disappointment. He went on to use the skills that he had learnt as an employee at BRC in other NGOs, but we do not know his present employment status.

Two parataxonomists, G. Damag and M. Manaono, were laid off

This was a difficult decision, but it has proved to be beneficial for morale in the team as it emphasized pursuit of excellence at BRC. Both former parataxonomists remain in contact with BRC and are occasionally contracted as field assistants to visiting researchers, a task better suited to their abilities.

We advertised for the new positions in the two main national newspapers. There was an overwhelming response to our advertisement (Fig. 1) by 450 applicants, ranging from very professional CVs from senior research technicians or university graduates to letters written on pages torn from school exercise books and arriving from remote areas

on a mission plane. We interviewed 50 applicants and further screened the applicants during probation periods of employment to obtain nine truly exceptional candidates.

This experience indicates the high standing of our parataxonomist programme in PNG, as we received applications from the entire country (the nine parataxonomists that we hired cover seven different native languages). We hired new staff based on their enthusiasm, interest in biology and field experience, rather than simply looking for the highest formal education. Thus, we have hired applicants with formal education ranging from 8 to 12 years of school, some of them with extraordinary life stories (e.g. G. Sosanika is the first youth from his remote montane village to complete 10 years of school education; S. Ibalim left his village to attend secondary school by a mission plane with no means to return for six years, until he secured employment with BRC). Two years after the reconstruction of the parataxonomist team, we are extremely satisfied with its quality.

We started our project with Darren Bito as the Research Supervisor of the parataxonomist team. Mr. Bito was then a freshly graduated MSc in Biology from the University of PNG. He did his MSc research during a two year residency at BRC. He is exceptionally talented for biological research so that we encouraged him to continue in his studies, and assisted in his application for a Griffith University (Brisbane) PhD stipend. His application was successful and he left for his studies towards the end of the project, in May 2007. In addition to his training and management input, he was also able to complete two publications from this Thesis (Bito 2007, Bito & Smith 2005).

5. Project Impacts

We have expanded our team of parataxonomists from 12 to 18 personnel, trained new staff members and improved the expertise of senior staff to such an extent that the parataxonomists were successful in assisting cutting-edge biodiversity research. This included a key contribution by parataxonomists to a study on tropical biodiversity published in *Nature*, earning them co-authorship of the paper.

The credibility of the parataxonomist team is such that there are several international research groups requesting their assistance, including renewal of long-term collaboration with the University of Minnesota and the Smithsonian Institution, as well as new partners, including Oxford University and the Center for Tropical Forest Studies. This interest should ensure the sustainability of parataxonomist operations.

The parataxonomist team at BRC has become well known in Papua New Guinea, collaborating with all major biological research institutes and Biology university departments in the country, and receiving more than 100 applications for each vacancy. They are noted locally also for their educational assistance to conservation-oriented village communities and schools.

Our parataxonomist project also influenced the perception of parataxonomist research internationally, as it became one of the three leading operations of its kind (together with D. Janzen's team and INBio in Costa Rica). This is illustrated, for example, by Sheil & Lawrence's (2004, *TREE* 19:634) analysis. We hope that this approach will be replicated elsewhere in the tropics, although it has not happened yet. This is probably due to difficulties facing any new parataxonomist operation as it requires sustained presence of researchers in tropical countries, long-term training and close collaboration with local partners.

Last but not least, these developments were accompanied by a marked increase in job satisfaction expressed by the parataxonomist staff, from a position three years ago that was already high.

Achievement of project purpose: The parataxonomist team has become one of the

most qualified biodiversity survey teams in the country and is being approached for assistance by the leading national research institutes (National Agriculture Research Institute and Forestry Research Institute) as well as universities. The team, in collaboration with local and overseas researchers, provided the single most extensive addition to the National Insect Collection over the past 10 years, assembled taxonomic and ecological information on a species rich taxon (Lepidoptera) in an on-line database, and provided an assessment of beta diversity within a 500 x 150 km of largely undisturbed forest (Novotny et al. 2007). Further, in synergy with another DI project, BRC has become one of the most important training centres for postgraduate Biology students in PNG. These results point to an important position of Darwin-built capacity for biodiversity surveys at BRC in the context of PNG. The project also had a direct impact on the development of village-based conservation of tropical forests, particularly in the 10,000ha Wanang Conservation Area, directly under the threat of logging.

The project thus achieved its main objectives of facilitating the ability of PNG to meet its obligations under the CBD primarily by research and training.

Collaboration between UK & local partner: The collaboration between UoS and BRC has been sustained for more than 6 years. It not only significantly improved the parataxonomist training at the partner organization, but also stimulated collaboration in a new direction: training postgraduate PNG students in biology (this Darwin project – 15/054 - is ongoing). Also, the partnership lead to further contacts between BRC and UK institutions, including training stays by PNG parataxonomists at several UK organizations, and new interest from Oxford University (R. Morris, O. Lewis) in research collaboration.

Within PNG, the project stimulated fruitful collaboration between BRC and the government research institutes (NARI, FRI), as well as universities (University of Technology and University of PNG). It also lead to extended collaboration with NGOs, including WWF, WCS, TNC, Bismarck-Ramu Group and village-based conservation groups in Baitabag, Wanang, Mu and Ohu Villages.

Social impact: The project offered parataxonomist careers to talented young people, largely from underprivileged parts of society, i.e. with formal education ranging from 4 to 12 years of school and from village families relying on subsistence agriculture. Their experiences, shared both informally in their communities and with children in schools, helped to promote the ideas on the importance of education and environmental issues in their village communities at large.

The project has had a significant, and originally unexpected, impact in the remote community of Wanang village. This community, comprising of 11 clans, decided to protect their 10,000 ha of tropical forests from imminent logging and invited BRC to do research field work there as an alternative to logging. The site has become our principal research site as the parataxonomists spent 160 person-months there during the past two years. They trained and employed 45 villagers as field assistants (employing 15 of them at a time). This project transformed the entire community, with increased income from this employment, as well as the influx of new ideas brought by parataxonomists and researchers. The community started a village market, a provisional elementary school, increased social activities, including for example a soccer tournament, improved access to basic medical care and industrial goods. In the light of these positive developments, the pre-existing conservation conviction was greatly strengthened in the community.

The following table lists all staff receiving training during the period of the Darwin projects (2001-2007), including new positions that they have moved on to after leaving BRC.

Name	Position	Dates at BRC	New position
Kenneth Molem	Senior parataxonomist	1995 - present	n.a.
John Auga	Team leader, Deputy Director	1996-present	n.a.
William Boen	Team leader	1996-2005	Unknown
Markus Manumbor	Team Leader	1996-present	n.a.
Brus Isua	Senior parataxonomist	1997-present	n.a.
Richard Kutil	Senior parataxonomist	1998-2006	Deceased
Steven Sau	Senior parataxonomist	2004-present	n.a.
Roll Lilip	Senior parataxonomist	2004-present	n.a.
Cliffson Idigel	Junior parataxonomist	2005-present	n.a.
Erik Brus	Junior parataxonomist	2006-present	n.a.
Martin Keltim	Junior parataxonomist	2006-present	n.a.
Elvis Tamtai	Senior parataxonomist	1998-present	n.a.
Aloysius Posman	Junior parataxonomist	2005-present	n.a.
Sentiko Ibalim	Junior parataxonomist	2005-present	n.a.
Gibson Sosanika	Junior parataxonomist	2005-present	n.a.
Maling Rimandai	Junior parataxonomist	2005-present	n.a.
Robin Kalwa	Junior parataxonomist	2005-present	n.a.
Martin Mogia	Senior parataxonomist	1999-present	n.a.
Joseph Kua	Junior parataxonomist	2005-present	n.a.
Andrew Kinibel	Junior parataxonomist	2005-present	n.a.
Max Manaono	Junior parataxonomist	2000-2004	Field assistant
George Damag	Junior parataxonomist	2002-2004	Field assistant
Anne Borney	Accountant	2005-2006	Unknown
Dorothy Wal	Office Manager	2003-present	n.a.
Darren Bito	Research Supervisor	2005-2007	PhD student at Griffith Uni. Brisbane

6. Project Outputs

Dissemination of project outputs has been through a combination of (i) peer-reviewed papers in the highest quality international scientific journals (including *Nature* and *Science*), focused on the international scientific community, (ii) oral and poster

presentations at host country national conferences (the biannual New Guinea Biological Conference) and international meetings (e.g. International Congress of Entomology, Brisbane, 2004), (iii) feature articles in popular magazines (e.g. *Paradise*, the in-flight magazine of Air Niugini) aimed at the general public, and (iv) leaflets on environmental and conservation issues distributed at meetings with local village communities. BRC continues to be active in producing further dissemination materials using all these methods, especially in respect of papers in the mainstream scientific journals. BRC has also recently upgraded its website (www.entu.cas.cz/png/) providing pdf files of both technical publications and leaflets and other materials for village education, making them available to interested NGOs and other organizations. This web site will continue to be maintained free of charge by Czech Academy of Sciences, one of the BRC partner organizations.

7. Project Expenditure

An underspend of approximately £6K on Travel & Subsistence was mostly directed towards payment of salaries and training for the extra parataxonomists.

8. Project Operation and Partnerships

Local partnerships: The project was implemented by BRC in Papua New Guinea. This organization was responsible for project management and principal project activities. The main partners were key players in PNG biodiversity research and surveys, viz. the PNG National Agriculture Research Institute (housing the National Insect Collection) and the Forestry Research Institute (housing the National Herbarium), as well as the Forestry Department of the University of Technology in Lae and the Biology Department of the University of PNG, the two leading universities in the country. Further collaborations involved international and local NGOs active in conservation, viz. WWF, WCS, TNC, and the Bismarck-Ramu Group, as well as village-based conservation groups in Baitabag, Wanang, Mu and Ohu Villages - the locations of our principal research and educational work.

Collaboration with other projects: Our project was closely coordinated with a parallel Darwin project (15/054) led by Alan Stewart and collaborating with BRC and WCS on student training. There was considerable synergy between parataxonomist and student

training, as described earlier in this report. Also, we have been in close contact with another Darwin project “Sustainable insect collecting and farming in PNG”, led by Dr Tim Bayliss-Smith (Cambridge University). This included visits and discussions to BRC by R. Small, the lead person based in PNG, as well as BRC parataxonomists participating in a workshop organised by this project and disseminating a handbook for village butterfly farmers prepared by the project.

There is no BS Office established in PNG, but we have collaborated with the Department of Environment of the PNG Government and provided them with all materials produced by our project.

International partners participating in project activities:

G. Weiblen and T. Whitfeld (University of Minnesota): research collaboration and training in botany

A. Allison (Bishop Museum, Honolulu): training in herpetology

M. Balke (NHM, London): training in aquatic entomology

S. E. Miller (Smithsonian Institution): research collaboration

J. Hulcr (Michigan State University): research collaboration and training in entomology

J. Hrcek, P. Klimes, J. Leps (University of South Bohemia, Czech Republic): research collaboration and training in ecology, entomology and botany

M. Wilson (Cardiff Museum): training in entomology, museum curatorial techniques

T. Utteridge (Royal Botanic Gardens, Kew): training in plant taxonomy, identification, herbarium techniques

Continuity of partnerships: The partners remain fully active after the completion of the project, both in their work with communities and collaboration with government institutions. There is potential for private involvement, particularly amongst the mining and logging sector, to commission biodiversity surveys, but so far there was only one such project completed in the past (a survey for the Misima Gold Mine) and none immediately forthcoming.

9. Monitoring and Evaluation, Lesson learning

Assessment of training: The parataxonomist training was monitored and small problems solved on a daily basis, particularly by V. Novotny who spent 17 months out of the 24 months of the project duration in PNG. The externally run courses in tree climbing, scuba diving, swimming and driving were concluded by an external examination required for issuing a certificate. The combined results of numerous internal training sessions and courses in biology and computer literacy, as well as overall progress by parataxonomists, were evaluated on the basis of a comprehensive “Christmas Test” in 2006, comprising questions on basic biological concepts, as well as identification of principal insect and plant taxa, sampling and curation methods, and other aspects of the parataxonomist profession. The test also included practical tasks in computer literacy. This was a very comprehensive evaluation as the test was 35 pages long, included over 250 individually evaluated tasks, and had a limit of 8 hours for completion. It is available at www.entu.cas.cz/png/ParataxTest06.pdf. The test results demonstrated that (i) senior parataxonomists did better overall than junior ones, despite somewhat higher formal education of the latter group, and (ii) that parataxonomists did not do worse than recent Biology graduates from the country’s premier university, the University of Papua New Guinea, who were resident at the BRC and also participated in the test (Fig. 2). Both results indicate the high level of parataxonomist achievement.

Assessment of job satisfaction: Parataxonomists were given an opportunity to express their views on job and salary satisfaction in a strictly anonymous and voluntary

survey, which was conducted at the end of the initial 3-year Darwin project (2004) and then repeated at the end of the 2-year post-project (2007). The overall high level of work satisfaction increased further between 2004 and 2007, while the satisfaction with salaries decreased slightly (Fig. 3).

Assessment of research: The quality of research was tested by peer review of the submitted manuscripts. Our ability to publish in internationally respected journals, including *Science* and *Nature*, suggests very high standards. We would like to highlight particularly our recent paper in *Nature* (Novotny et al. 2007) as it demonstrates the full potential of parataxonomists. This study required eight 3-month long sampling expeditions to remote areas, all accomplished by our parataxonomists, some of them without supervision. This achievement justified co-authorship by six senior parataxonomists (J. Auga, B. Isua, K. Molem, M. Manumbor, E. Tamtiai and M. Mogia) on the paper. Such a result attests to the high level of training and independent ability amongst parataxonomists to accomplish logistically complex field work, something that would have been unthinkable before the Darwin training programme.

Problems encountered during the project: Many externally organised training events became unavailable during the time elapsed between project planning and implementation, but we were able to explore both internally and externally organised alternatives.

General lessons: Our project highlights the advantages of working with parataxonomists, i.e. locally trained research technicians, in biodiversity surveys and biological research. This approach is not only highly efficient, but also brings considerable benefits for local grassroots environmental education. Furthermore, synergy between parataxonomists and local as well as overseas students has been excellent. However, these lessons apply only when parataxonomists are well trained and provided with steady careers, which requires considerable initial investment in time and funds. Likewise, the impact of overseas students is particularly valuable during long-term stays (6 months or longer), as such experience is necessary to adjust culturally to local communities and students.

10. Actions taken in response to annual report reviews (if applicable)

The annual reports suggested that we evaluate the lessons learnt from the loss of four parataxonomists from the original team before the start of the current post-project funding, and focus attention on the evaluation of training progress and perspectives for fund-raising to sustain team activities in the future.

These suggestions have been taken up and have influenced our team building strategy and monitoring (outlined earlier in the report). The sustainability of the BRC operation is detailed below.

Sustainability of parataxonomist activities: BRC has been able to attract some current and prospective research projects, relying on the assistance of parataxonomists, suggesting (although not guaranteeing) sustainability of operations in the future. These include:

- The research funds for biodiversity research attracted by BRC from the National Science Foundation, Czech Academy of Sciences, and National Geographic Society in 2005-2007 amounted to £120,000 annually.
- Ecological research of insects and plants lead by G. Weiblen (University of Minnesota), supported by NSF funding. This includes a current NSF project (until 2008), with a renewal funding application pending. The project employs 11 parataxonomists.
- Establishment of a permanent 50-ha forest dynamic plot as a part of the Centre for Forest Tropical Studies (CFTS) international network. BRC has become a partner

organization with CTFS and our proposed 50-ha plot one of the priority new plots in the network (<http://biogeodb.stri.si.edu/bioinformatics/sigeo/?target=article&targetId=1>). This proposed project would ensure long-term employment for 12 parataxonomists.

- Research of plant-herbivore-parasitoid food webs lead by R. Morris and O. Lewis (Oxford University). A proposal is being developed for NERC, potentially employing 8 parataxonomists.

11. Darwin Identity

Promotion of Darwin identity: Darwin sponsorship is highlighted on the BRC web page, acknowledged in all research publications, and used during Darwin sponsored education activities.

Awareness of Darwin Initiative: The Darwin Initiative has become familiar particularly amongst biology students at both major PNG universities, due to its role in sponsoring BRC (and WCS) postgraduate students.

Distinctness: The project was very distinct with regard to the training of parataxonomists and the grassroots educational and conservational activities. In contrast, the research activities were a part of a larger project, pooling funds with those from the National Science Foundation (USA) and the Czech Academy of Science.

12. Leverage

Additional funds: The £14,000 investment to build a dormitory for parataxonomists was matched by £10,000 from the Czech Academy of Sciences.

The educational activities by parataxonomists in schools facilitated a donation of £15,000 by the Czech Government to build a new classroom for a village school in partnership with BRC.

The BRC parataxonomist team attracted approximately £160,000 of funds to support biodiversity research from USA and the Czech Republic in 2005-2007.

Securing future funds: A significant objective of the post-project has been focused on strengthening the capacity of BRC staff to secure further funds for continuing its biodiversity work in PNG. To this end, the Project Leader (Alan Stewart) ran a *Career management and skills training* course at BRC, to assist parataxonomists in securing future funds for BRC and in advancing their employment careers.

13. Sustainability and Legacy

Enduring achievements: The project produced a well trained and socially happy team of parataxonomists with its cohesion increased by joint experience of difficult field work in remote areas. This team is determined to pursue further research and education activities. Its collective attitude and skills indicate strongly that it will be able to sustain its activity. The Darwin-sponsored facilities, including a dormitory, a vehicle and laboratory/field equipment, have been, and will continue to be, invaluable in this regard. The partners will be staying in touch and developing further joint projects.

Wider application of project outputs: The project's research results have become widely known in the ecological research community. While we have been credited with demonstrating the efficiency of the parataxonomist approach to biodiversity research and its benefits to conservation and society, it remains to be seen whether this approach will be replicated across the tropics, as we believe it should be.

New applications for funding: At present, new funding for the parataxonomist team is

being sought from NERC, NSF and the Czech Academy of Sciences. They will combine biodiversity research with parataxonomist training, focusing primarily on the research side.

14. Value for money

This is a rather unique project, concerning one of only three parataxonomist teams of this size and experience active in the tropics, the other two operating in a rather different environment in Costa Rica. It is therefore difficult to judge its cost efficiency. However, it is probably reasonable to assume that we have been rather cost efficient considering the fact that a combination of regular grants from the Darwin Initiative, NSF, and the Czech Academy of Sciences has been sufficient to: (i) build and maintain a field research station, (ii) provide advanced training and sustained careers for 18 parataxonomists, (iii) accomplish research publishable in *Science* and *Nature*, (iv) become one of the top training institutions in PNG for local postgraduate students in biology, and (v) develop activities in grassroots education and conservation.

15. Appendix I: Project Contribution to Articles under the Convention on Biological Diversity (CBD)

Project Contribution to Articles under the Convention on Biological Diversity		
Article No./Title	Project %	Article Description
6. General Measures for Conservation & Sustainable Use		Develop national strategies that integrate conservation and sustainable use.
7. Identification and Monitoring	20	Identify and monitor components of biological diversity, particularly those requiring urgent conservation; identify processes and activities that have adverse effects; maintain and organise relevant data.
8. In-situ Conservation	10	Establish systems of protected areas with guidelines for selection and management; regulate biological resources, promote protection of habitats; manage areas adjacent to protected areas; restore degraded ecosystems and recovery of threatened species; control risks associated with organisms modified by biotechnology; control spread of alien species; ensure compatibility between sustainable use of resources and their conservation; protect traditional lifestyles and knowledge on biological resources.
9. Ex-situ Conservation		Adopt ex-situ measures to conserve and research components of biological diversity, preferably in country of origin; facilitate recovery of threatened species; regulate and manage collection of biological resources.
10. Sustainable Use of Components of Biological Diversity	5	Integrate conservation and sustainable use in national decisions; protect sustainable customary uses; support local populations to implement remedial actions; encourage co-operation between governments and the private sector.
11. Incentive Measures		Establish economically and socially sound incentives to conserve and promote sustainable use of biological diversity.
12. Research and Training	40	Establish programmes for scientific and technical education in identification, conservation and sustainable use of biodiversity components; promote research contributing to the conservation and sustainable use of biological diversity, particularly in developing countries (in accordance with SBSTTA recommendations).
13. Public Education and Awareness	15	Promote understanding of the importance of measures to conserve biological diversity and propagate these measures through the media; cooperate with other states and organisations in developing awareness programmes.
14. Impact Assessment and	5	Introduce EIAs of appropriate projects and allow public participation: take into account environmental

Minimizing Adverse Impacts		participation; take into account environmental consequences of policies; exchange information on impacts beyond State boundaries and work to reduce hazards; promote emergency responses to hazards; examine mechanisms for re-dress of international damage.
15. Access to Genetic Resources		Whilst governments control access to their genetic resources they should also facilitate access of environmentally sound uses on mutually agreed terms; scientific research based on a country's genetic resources should ensure sharing in a fair and equitable way of results and benefits.
16. Access to and Transfer of Technology		Countries shall ensure access to technologies relevant to conservation and sustainable use of biodiversity under fair and most favourable terms to the source countries (subject to patents and intellectual property rights) and ensure the private sector facilitates such assess and joint development of technologies.
17. Exchange of Information	5	Countries shall facilitate information exchange and repatriation including technical scientific and socio-economic research, information on training and surveying programmes and local knowledge
19. Bio-safety Protocol		Countries shall take legislative, administrative or policy measures to provide for the effective participation in biotechnological research activities and to ensure all practicable measures to promote and advance priority access on a fair and equitable basis, especially where they provide the genetic resources for such research.
Total %	100%	Check % = total 100

16. Appendix II Outputs

Standard Output Measures table.

The following table refers to the two years of the post-project only (2005-2007).

Code	Total to date (reduce box)	Detail (←expand box)
Training Outputs		
1a	Number of people to submit PhD thesis	0
1b	Number of PhD qualifications obtained	0
2	Number of Masters qualifications obtained	1 (,Rapo Pokon)
3	Number of other qualifications obtained	0
4a	Number of undergraduate students receiving training	0
4b	Number of training weeks provided to undergraduate students	0
4c	Number of postgraduate students receiving training (not 1-3 above)	0
4d	Number of training weeks for postgraduate students	0
5	Number of people receiving other forms of long-term (>1yr) training not leading to formal qualification(i.e not categories 1-4 above)	18 parataxonomists, 1 Office Manager
6a	Number of people receiving other forms of short-term education/training (i.e not categories 1-5 above)	45
6b	Number of training weeks not leading to formal qualification	90 person-weeks
7	Number of types of training materials produced for use by host country(s)	3
Research Outputs		
8	Number of weeks spent by UK project staff on project work in host country(s)	2
9	Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country (s)	2
10	Number of formal documents produced to assist work related to species identification, classification and recording.	0
11a	Number of papers published or accepted for publication in peer reviewed journals	6
11b	Number of papers published or accepted for publication elsewhere	0
12a	Number of computer-based databases established (containing species/generic information) and handed over to host country	0
12b	Number of computer-based databases enhanced (containing species/genetic information) and handed over to host country	1
13a	Number of species reference collections established and handed over to host country(s)	0
13b	Number of species reference collections enhanced	1

Code	Total to date (reduce box)	Detail (←expand box)
	and handed over to host country(s)	
Dissemination Outputs		
14a	Number of conferences/seminars/workshops organised to present/disseminate findings from Darwin project work	0
14b	Number of conferences/seminars/ workshops attended at which findings from Darwin project work will be presented/ disseminated.	1
15a	Number of national press releases or publicity articles in host country(s)	0
15b	Number of local press releases or publicity articles in host country(s)	0
15c	Number of national press releases or publicity articles in UK	2
15d	Number of local press releases or publicity articles in UK	2
16a	Number of issues of newsletters produced in the host country(s)	27
16b	Estimated circulation of each newsletter in the host country(s)	0
16c	Estimated circulation of each newsletter in the UK	
17a	Number of dissemination networks established	0
17b	Number of dissemination networks enhanced or extended	0
18a	Number of national TV programmes/features in host country(s)	0
18b	Number of national TV programme/features in the UK	0
18c	Number of local TV programme/features in host country	0
18d	Number of local TV programme features in the UK	0
19a	Number of national radio interviews/features in host country(s)	1
19b	Number of national radio interviews/features in the UK	0
19c	Number of local radio interviews/features in host country (s)	0
19d	Number of local radio interviews/features in the UK	0
Physical Outputs		
20	Estimated value (£s) of physical assets handed over to host country(s)	£17,000 (dormitory,, laboratory & field equipment)
21	Number of permanent educational/training/research facilities or organisation established	1 dormitory for visiting students & researchers incl. a library
22	Number of permanent field plots established	1
23	Value of additional resources raised for project	£10,000 (cost match for the dormitory)

Appendix III: Publications

Provide full details of all publications and material that can be publicly accessed, e.g. title, name of publisher, contact details, cost. Details will be recorded on the Darwin Monitoring Website Publications Database that is currently being compiled.

Mark (*) all publications and other material that you have included with this report

Type *	Detail (title, author, year)	Publishers (name, city)	Available from (e.g. contact address, website)	Cost £
Journal	Basset, Y., Novotny, V., Miller, S.E., Weiblen, G.D., Missa, O. & Stewart, A.J.A. (2004) Conservation and biological monitoring of tropical forests: the role of parataxonomists. <i>Journal of Applied Ecology</i> 41, 163-174.		pdf available at BRC web site and from authors	Nil
Journal	Novotny, V., Drozd, P., Miller, S. E., Kulfan, M., Janda, M., Basset, Y., Weiblen, G. D. (2006) Why are there so many species of herbivorous insects in tropical rainforests? <i>Science</i> 313:1115-1118.		pdf available at BRC web site and from authors	Nil
Journal	Novotny, V., Miller, S.E., Hulcr, J., Drew, R.A.I., Basset, Y, Janda, M., Setliff, G.P., Darrow, K., Stewart, A.J.A., Auga, J., Isua, B., Molem, K., Manumbor, M., Tamtai, E., Mogia, M. & Weiblen, G.D. (2007) Low beta diversity of herbivorous insects in tropical forests. <i>Nature</i> 448: 692-6.		pdf available at BRC web site and from authors	Nil
Database	Caterpillars feeding on New Guinea plants - online. Published at www.entu.cas.cz/png/caterpillars/		freely on-line	Nil
Journal	Bito. D. 2007. An alien in an archipelago: <i>Spathodea campanulata</i> and the geographic variability of its moth (Lepidoptera) communities in the New Guinea and Bismarck Islands. <i>Journal of Biogeography</i> 34, 769–778.		pdf available at BRC web site and from authors	Nil
Journal	Bito. D. & Smith, D. R. 2005. Larva and possible food plant of <i>Ancyloneura varipes</i> (Cameron) (Hymenoptera: Pergidae) in Papua New Guinea. <i>Proc. Entomol. Soc. Wash.</i> 107 , 463-465.		pdf available at BRC web site and from authors	Nil
Journal	Hulcr, J., Novotny, V., Maurer, B. A. & Cognato, A. I. (2007) Low beta diversity of ambrosia beetles (Coleoptera: Curculionidae: Scolytinae and Platypodinae) in lowland rainforests of Papua New Guinea. <i>Oikos</i> in press. , doi: 10.1111/j.2007.0030-1299.16343.x		pdf available at BRC web site and from authors	Nil
Journal	Pokon, R., Novotny, V & Samuelson, G. A. (2005) Host specialization and		pdf available at BRC web site and from	Nil

	species richness of root feeding chrysomelid larvae (Chrysomelidae, Coleoptera) in a New Guinea rainforest. <i>Journal of Tropical Ecology</i> 21, 595-604		authors	
Powerpoint presentation	Manumbor, M. (2006) <i>Studying insect communities in PNG rainforests: a parataxonomist approach</i> . New Guinea Biological Conference, Port Moresby, 2006.		pdf available at BRC web site and from authors	Nil
Powerpoint presentation	Sau, S. (2006) <i>Host specialization of leaf miners in a lowland rainforest</i> . New Guinea Biological Conference, Port Moresby, 2006.		pdf available at BRC web site and from authors	Nil
Powerpoint presentation	Tamtai, E. (2006) <i>Geographic distribution of Lepidoptera in PNG rainforests</i> . New Guinea Biological Conference, Port Moresby, 2006.		pdf available at BRC web site and from authors	Nil
Newsletter	Bito, D. (2006) Research on the last frontier. I, science. The Imperial College Science Magazine, Spring 2006, 4:16-17		pdf available at BRC web site and from authors	Nil
Leaflets	27 educational leaflets (see list below)		pdf available at BRC web site and from authors	Nil

List of educational leaflets by parataxonomists - in English or Tok Pisin

Idigel, C. (2007) Look after our forest.

Idigel, C. (2007) Research work on caterpillars in Wanang.

Manumbor, M. (2006) Bus em namba wan samting long man. [Forest is important to people]

Manumbor, M. (2006) Leatherback turtles face extinction.

Manumbor, M. (2006) Environmental education in schools and villages: Parataxonomist perspective.

Manumbor, M. (2005) Kainkain snek na mama bataplai. [Variety of caterpillars and their adults.]

Manumbor, M. (2007) Sains wok I kamap long Wanang Conservation area na asples lain. [Science is coming to Wanang Conservation Area and its landowners.]

Sau, S. (2006) An endemic creatureCuscus.

Sau, S. (2006) Environment issues Volume 1.

Sau, S. (2005) Ficus hesperidoides.

Sau, S. (2005) Frogs of New Guinea.

Sau, S. (2005) PNG Eco forestry.

Sau, S. (2006) With out your natural resources, forget development.

Sau .S. (2005) Ohu Bus Leb. [Ohu Bush Laboratory]

Sau, S. (2006) Lowland forest of New Guinea: its insects and habitats.

Sau, S. (2006) Bus na wara bilong yumi. [Our forests and rivers]

Sau, S. (2007) Ol binatang i kolim long WIAD WMA [Insects of the Wiad Wildlife Management Area]

Sau, S. (2006) Misima mining area - What will happen to the environment?

Sosanika, G. 2007 Procedures for collecting of ambrosia beetles.

Sosanika, G. 2007 Insects leaflets.

Sosanika, G. 2007 Ambrosia beetles.

Sosanika, G. 2007 Buprestidae beetles Part 1.

Sosanika, G. 2007 Buprestidae beetles Part 2.

Sosanika, G. 2007 Wokman bilong Mesuim Allen na Bulisa.

Sosanika, G. 2007 How to measure leaf area. Part 1.
Sosanika, G. 2007 Process of calculating leaf area of a tree.
Tamtiai, E. (2005) Nagada Madang lagoon marine biodiversity.

18. Appendix IV: Darwin Contacts

To assist us with future evaluation work and feedback on your report, please provide contact details below.

Project Title	Consolidating local capacity for biodiversity surveys in Papua New Guinea
Ref. No.	EIDP09/10-030
UK Leader Details	
Name	Dr Alan J A Stewart
Role within Darwin Project	Project Leader
Address	School of Life Sciences, University of Sussex, Falmer, Brighton, BN1 9QG
Phone	
Fax	
Email	
Other UK Contact (if relevant)	
Name	
Role within Darwin Project	
Address	
Phone	
Fax	
Email	
Partner 1	
Name	Professor Vojtech Novotny (Director)
Organisation	Binatang Research Center
Role within Darwin Project	Host-country Partner
Address	New Guinea Binatang Research Center, P.O.Box 604, Madang, Papua New Guinea.
Fax	
Email	
Partner 2 (if relevant)	
Name	
Organisation	
Role within Darwin Project	
Address	
Fax	
Email	


19. Appendix V: Logical Framework

Project summary	Measurable indicators	Means of verification	Important assumptions
<p>Goal:</p> <p>To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve</p> <ul style="list-style-type: none"> • the conservation of biological diversity, • the sustainable use of its components, and • the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources 			
<p>Purpose</p> <p>To consolidate the parataxonomist biodiversity survey team by developing its personnel structure, improving its research infrastructure and broadening its range of skills, thus increasing the team's ability to conduct locally-driven biodiversity surveys in PNG on a financially sustainable basis.</p>	<p>By year 2 of the project, the parataxonomist team independently:</p> <ul style="list-style-type: none"> - conducting biodiversity surveys in the field - analysing data and producing survey reports - fundraising and obtaining new customers - managing financial and other aspects of its operation 	<p>The number, extent, quality, and the taxonomic and geographical scope of biodiversity surveys conducted by the parataxonomist team.</p> <p>The demand for the surveys from researchers, conservationists and village communities</p> <p>The financial sustainability of the team</p>	<p>Local experts are more sensitive to country needs and have a better understanding of the local social and environmental situation so that they can collect and use biodiversity information for conservation more efficiently than overseas experts. Local experts can attain a sufficient level of expertise to conduct such surveys.</p>
<p>Outputs</p> <p>A fully equipped and trained team of parataxonomists, conducting biodiversity surveys including field work, building of biological collections, data analysis and report writing, which can collaborate with researchers, conservationists and grassroots villagers, thus being capable of providing biodiversity information to both the scientific community and resource owners.</p>	<ul style="list-style-type: none"> - The biodiversity team is enhanced by a newly recruited training and research co-ordinator - The accommodation facility is completed - The 14 training programmes in PNG and 3 in UK are completed by the parataxonomists and the office supervisor - The entire biodiversity team is a well-functioning unit capable of conducting surveys - The survey results presented at research conferences 	<ul style="list-style-type: none"> - The results of the final examinations by the trainees from the 17 planned training programmes representing 218 training weeks - The team's internal evaluation of the skills and results of all its members - The team's results from the biodiversity surveys provided to customers and presented at the New Guinea Biological Conference in both years 	<ul style="list-style-type: none"> - There is a pool of highly dedicated and capable school leavers in PNG villages with extensive traditional knowledge of the natural world, who could be trained as fully qualified biodiversity surveyors (parataxonomists) - the senior personnel on the project are able to accomplish such training - there is a continuing demand for biodiversity surveys in PNG

- The number of surveys conducted
- The financial results of the team

Activities	Activity Milestones (Summary of Project Implementation Timetable)
Infrastructure	- Dormitory completed Yr. 1
Team personnel	- Training and research co-ordinator recruited, office supervisor trained Yr. 1
Training in management	- <i>Advanced Financial Management Course</i> Yr. 2
Training in advanced terrestrial and marine survey methods	<p>Completed courses:</p> <ul style="list-style-type: none"> - <i>Open Water PADI Basic and Advanced Scuba Diving</i> Yr. 1 - <i>Forest Canopy Access Course for Researchers and Research Assistants</i> Yr. 1 & 2 - <i>Coral-reef and Marine Biology Monitoring</i> Yr. 2 - <i>Community Surveys of Marine Resources</i> Yr. 2 - <i>Strengthening Conservation Capacity in PNG</i> Yr. 2 - <i>Insect Ecology</i> Yr. 2 - <i>Plant Taxonomy and Herbarium Techniques</i> Yr. 2 - <i>Insect Taxonomy and Museum Curatorial & Imaging Techniques</i> Yr 2 - <i>Curation and Taxonomy of Insects</i> Yr. 3
Training in data analysis, report writing, and fundraising	<p>Completed courses:</p> <ul style="list-style-type: none"> - <i>Advanced First Aid</i> (organised by Red Cross) in Madang Yr. 1 - <i>Graduate Certificate in Communication of Science and Technology</i> Yr. 1 & 2 - <i>Field Techniques, Experimental Design, Data Analysis and Scientific Communication field course</i> Yr. 1 & 2 - <i>Proposal Writing and Fund Raising</i> Yr. 1 & 2 - <i>Preparing for Employment</i> Yr 2. - <i>Protected areas management</i> Yr. 2 - <i>Introduction to Biology</i> Yr. 1 & 2 - <i>Presentations at the New Guinea Biological Conference</i> Yr. 1 & 2

Fig. 1 Advertisement for new parataxonomist positions



New Guinea Binatang Research Center in Madang

Vacancies for School Leavers: Technicians for Biological Research

Do you want to make new discoveries about New Guinea plants and insects? Do you mind working 70 hours a week? Are you fit and tough enough to spend months in the bush? Are you bright enough to master computers and follow complicated research protocols? Patient enough to process thousands of research samples? Bold enough to come up with new ideas? Out of school but ready to learn new things? Happy to live with people from different cultures of PNG, Europe and America? Work with colleagues from grassroots villagers to university professors? Then join our research team! We are looking for exceptionally talented and dedicated grade 10 to 12 school leavers with a passion for biology to work as research technicians (parataxonomists) in our international team studying rainforest insects. All applications should include school leaver certificates, curriculum vitae with any information that can help us to select the right candidate, two references, and an essay explaining why are you interested in this work and what you expect from it.

Applications for above positions should be mailed to the New Guinea Binatang Research Center, PO Box 604, Madang or e-mailed to binatangi@datec.com.pg. For enquiries contact Prof. V. Novotny, ph. 853 3258. See www.entu.cas.cz/png/ for information on the Center. The deadline for receiving your application is **Friday 16 September 2005**. Positions available from 1st January 2006. Only shortlisted candidates will be notified.

Fig. 2 Results of the Biology knowledge and skills test

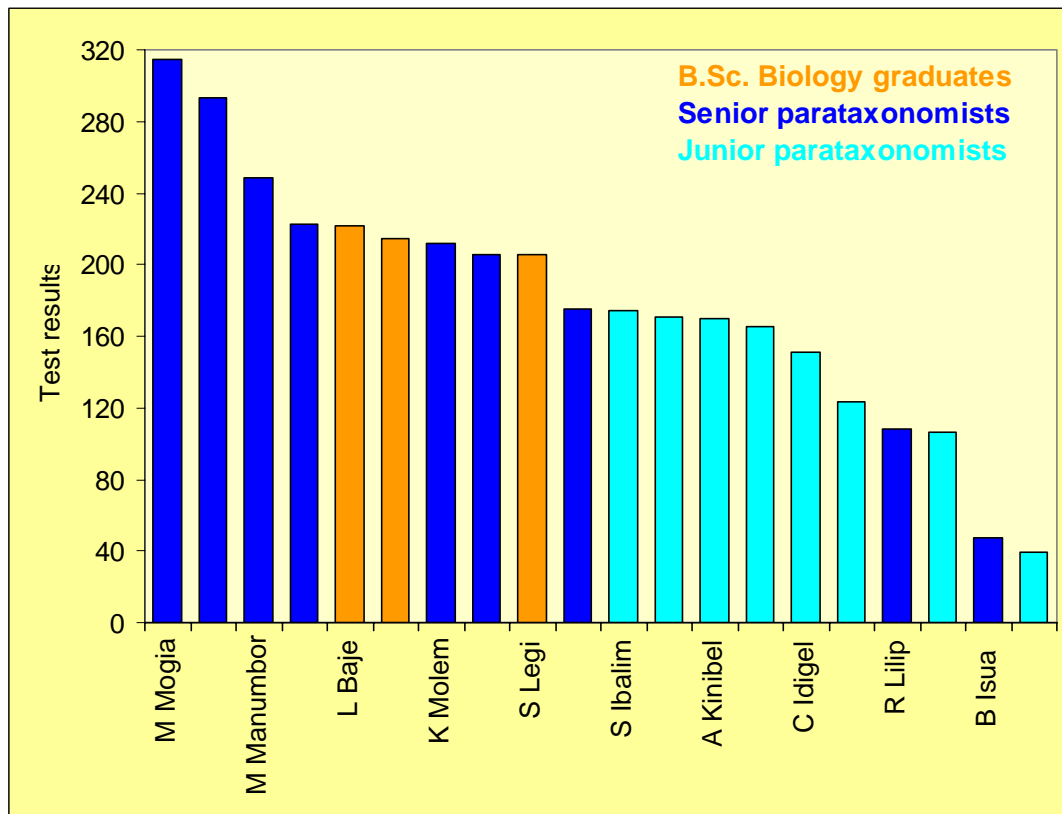


Fig. 3. Anonymous survey of BRC parataxonomists on job and salary satisfaction

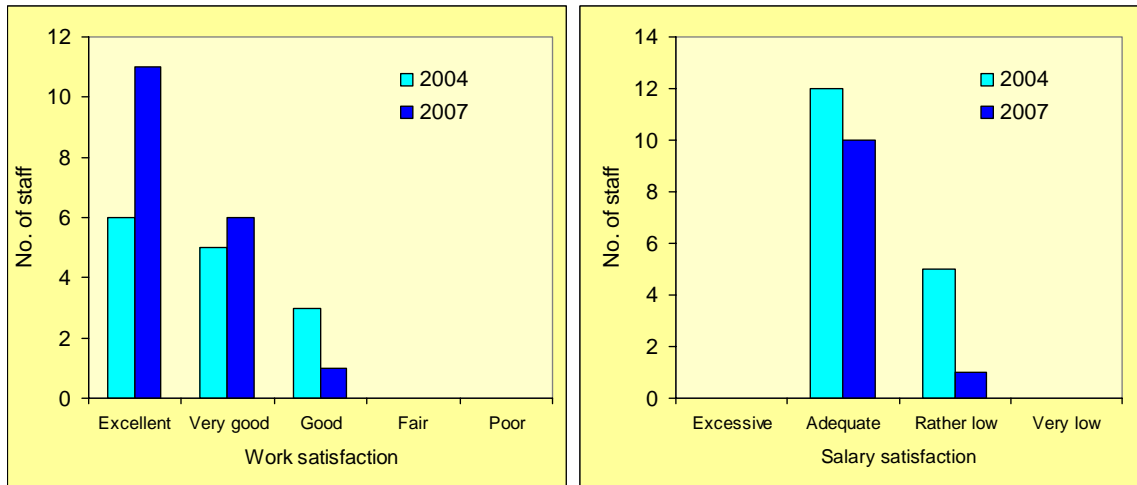


Fig 4. New Darwin-funded dormitory building



New building viewed from different angles, and new library.

Fig 5. Research activities by parataxonomists



Quantifying forest structure



Measuring leaf areas



Rearing caterpillars on cut leaves



Entering laboratory records

Fig 6. Outreach / education activities by parataxonomists



Demonstrating to high school pupils



Showing village children insects at Riwo Science Show

Fig 7. BRC staff and students



Parataxonomist team, students, office staff and Director (Vojtech Novotny, front-left), May 2006



BRC staff, students and Darwin Project Leader (Alan Stewart, top-right), November 2006

Fig 8. Training of parataxonomists



Instruction on searching leaves for insects



Senior parataxonomist Martin Mogia receives certificate of competency on canopy access course, Danum Valley, November 2005