Department for Environment Food & Rural Affairs

DARWIN INITIATIVE

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Darwin Initiative Main/Post/D+ Project Half Year Report

Project Ref No	22-002
Project Title	**Complete Altitudinal Rainforest Transect for research and conservation in PNG**
Country(ies)/Territory(ies)	Papua New Guinea
Lead Organisation	University of Sussex
Partner(s)	Binatang Research Center, Papua New Guinea
Project Leader	Dr Alan J A Stewart
Report date and number (e.g., HYR3)	12/11/17, HYR3
Project website/ Twitter/ Blog/ Instagram etc	www.entu.cas.cz/png/mtwilhelm/research

1. Outline progress over the last 6 months (April – Sept) against the agreed baseline timetable for the project (if your project has started less than 6 months ago, please report on the period since start up to end September).

Output 1: Focal plant and animal taxa (plants, ants, moths, butterflies, amphibians and birds) surveyed along CART as base-line information for climate change impact monitoring, and results published.

Activity 1.1 Establish 8 study sites spaced at 500m elevation intervals from 200 to 3700 m asl; design replicated study plots at each site. Activity 1.2 Design and test sampling protocols for the six focal taxa (plants, ants, moths, butterflies, amphibians and birds); execute the sampling.
We have continued with developing local logistics as well as the knowledge base on the biodiversity of each site. There are presently the following active research projects focusing on elevation trends in (i) diversity of plants, insects and vertebrates, (ii) the structure of interaction webs between plants, herbivores, mutualists, parasitoids and predators, (iii) genetic structure and dispersal of populations, and (iv) plant anti-herbivore defence, predator pressure and parasitoid pressure, and (v) manipulative experiments including translocation of plant and insect species to assess vulnerability of forest communities to climate change (see website for details). The following activities have been conducted on the CART in the last 6 months:

(i) The final survey of birds and their food resources, particularly fruits, along the CART transect was completed by UoS PhD student R. Hazell, three BRC paraecologists (B. Isua, S. Tulai and L. Paul) and eight local assistants who also received training in the methods of surveys. This survey included experimental exposure of dummy fruits to monitor preference for fruits in bird communities. Sam et al. (2017) analyzed the stomach contents of almost 1,000 birds along CART, and mapped elevational trends in the use of plant and insect food, including a positive correlation between body weight of birds and their prey.
(ii) Continued sampling of insects from translocated fig trees led by PNG PhD student L. Sam and paraecologist S. Tulai.
(iii) New research project experimentally testing the Janzen-Connell hypothesis, i.e. the effects of herbivores and pathogens on the diversity of vegetation, employing and training 26 local assistants.
(iv) A survey of orchid diversity along the CART transect.

Activity 1.3 Process the specimens, sort into species, using morphological and DNA evidence, and database the results. Activity 1.4 Analyse the data, write and publish in research journals.
Three papers have been published from this work, each co-authored by paraecologists (L. Paul, M. Mulau, B. Boane, S. Jeppy) recruited from the focal communities:

- Chmel, K., Riegert J, Paul, L., Mulau, M. and Novotny, V. Predation on artificial and natural nests in the lowland forest of Papua New Guinea. *Bird Study,* in press.
- Chmel, K., Riegert, J., Paul, L. & Novotny, V. 2016. Vertical stratification of an avian community in New Guinean tropical rainforest. *Population Ecology* 58, 535-547.

- Sam, K., Koane, B., Jeppy, S., Sykorova, J. & Novotny, V. 2013. Diet of land birds along an elevational gradient in Papua New Guinea. *Scientific Reports* 7, 44018.

Output 2: Locally recruited field assistants, BRC para-ecologists and researchers trained in biodiversity surveys and biodiversity data interpretation to assist research along CART.

Activity 2.1 Select suitable candidates for training from local communities and BRC. Activity 2.2 Design training programme, then implement training with regular feedback from the trainees in PNG.
We have continued in our training strategy for community members, with (i) a broadly applied basic training in support of research, and (ii) more intense and focused training on selected biodiversity survey techniques, taxonomy of focal taxa and processing of specimens for selected, particularly gifted, applicants. Our basic training continued during this 6 months as on-the-job training for 193 assistants hired for individual research projects at the eight study sites (elevations 200 – 3700 masl). Many of them have access and landowners' rights to more than one location so that we have reached 23 – 46 trainees per elevation, ensuring a sufficient pool of skilled assistants for on-going work.
The intense biology training included 29 BRC para-ecologists and assistants, 15 - 20 days per person. The most talented trainee, Samson Yama, has joined BRC for a longer-term training stay of 6 months. The para-ecologist and student training included a one-week long course in biostatistics using R software, led by Jimmy Moses, formerly a DI-sponsored MSc student at BRC and presently a PhD student at the University of South Bohemia. The training for CART field assistants included a one week course in insect identification led by BRC staff member Bradley Gewa, 20 days of practical training in bird identification by BRC staff member Bonny Koane, and five 3-day courses in botany work on vegetation plots. As is usual in research, training combines on-the-job daily training under the supervision of senior paraecologists with formal training sessions, lectures and seminars. Para-ecologists at BRC received training for their own jobs, whilst also being exposed to lectures and seminars for students, including (i) regular seminars led by resident students at BRC and visiting PhD students, and (ii) a weekly journal club discussing interesting research papers led by resident students. BRC is also training biologists from other PNG organizations, and is active in outreach to the general public on environmental issues. BRC staff took part in an Open Day at the Divine Word University with its own displays visited by >350 visitors, students and the general public. BRC also organized 2 days of training and field demonstration in ecological methods for 38 undergraduate students from the Forestry Department of the PNG University of Technology.

Activity 2.3 Design training programme, then implement training with regular feedback from the trainees in UK
Para-ecologists Gibson Mayiah (entomology, specializing in gall insects) and Nancy Labun (botany, manager of the 50-ha forest dynamics plot data and BRC herbarium) visited the UK, and combined their visit with an additional 5 weeks of training with our Darwin Initiative project collaborators in Malaysia and the Czech Republic (at no additional cost to DI). Both had joined BRC from secondary school and had been swiftly promoted to responsible positions within the Center. Nancy is the first female to take part in our programme of overseas training visits. Their itinerary included:

- a one-month stay in the UK, receiving training from: A. Stewart & M. Peck (Univ. Sussex) on forest carbon estimation, data analysis techniques and visiting local temperate habitats; R. Morris & E. Beauchamp (Zoology Department, Oxford) an introduction to various sampling and experimental techniques; M. Briggs & R. Camara-Leret (Kew Gardens) visit to the herbarium and gardens.
- three-week visit to the Biology Centre of the Czech Academy of Sciences and the Zoology Department at the University of South Bohemia in the Czech Republic, as long-term partners of BRC, running several research projects at CART (K. Sam – birds, S. Segar – *Ficus* trees and their pollinators, L. Sam – *Ficus* trees and their herbivores, J. Hrcek – *Drosophila* communities and their parasitoids, P. Butterill – galling herbivores, M. Libra – caterpillars and their parasitoids). They visited local study sites, including 25ha CTFS forest dynamics plot in Zofin, saw manipulative botanical and eco-physiological vegetation experiments in grasslands, visited elevation gradients in the Austrian Alps, and were trained in insect taxonomy and botany. This visit was facilitated by C. Dahl, J. Moses, and P. Toko, all former DI-sponsored MSc students that are presently PhD students at the University of South Bohemia.
- two weeks visit to Malaysia where T. Fayle (Imperial College London and Czech Academy of Sciences), with Y. Kalsum (Universiti Malaysia Sabah), hosted them with their postdoctoral researcher Mickal Houadria. They visited the 50-ha CTFS forest dynamics plot at the Danum Valley field station, primary, logged and secondary dipterocarp forests, and oil palm plantations.
- talks/seminars given on the research project and conservation activities at the Biology Centre of the Czech Academy of Sciences, University of Sussex, and Oxford University.

Output 3: PNG Honours and M.Sc. students trained in biodiversity research.

Activity 3.1 Select four candidate students, enrol them at University of PNG and select suitable dissertation topic. Activity 3.2 Continuous supervision during the field work and laboratory training,

including weekly seminars. Activity 3.3 Data analysis, dissertation writing, submission and defence. Activity 3.4 Publication of results in research journals.
Our six DI-sponsored students are preparing to submit their final theses by the end of 2017. They are part of a group of 13 resident and 4 visiting biology students: the largest such group in PNG and an excellent learning environment for biodiversity studies in PNG. The students were trained in field and laboratory techniques by more senior members of the BRC team and visiting scientists. They attended weekly seminars where a recent interesting research paper was presented by a student, followed by in-depth discussion led by a senior researcher. In August 2017, we organized the 26-day International Course in Ecology at BRC and the Wanang Conservation Area for 20 PNG and 10 European students using both overseas and local teachers. It included field trips, lectures, and small practical research projects. The PNG participants, selected on a competitive basis, included 5 BRC para-ecologists and 4 BRC students, plus 11 participants from nine PNG institutions including universities, research institutes, business companies and governmental agencies.

Output 4: New forest conservation areas established by local landowners along CART.

Activity 4.1 Conduct detailed consultations with communities interested in conservation; identify land ownership in the field.
In the past two years we have confirmed an interest in conservation amongst the local communities along the entire CART transect and across the five tribes involved. In the past 6 months we have focused on delimiting the conservation area borders with individual clans and preparing community conservation deeds with the landowners.

Output 5: Financial situation of indigenous forest owners improved along CART.

Activity 5.1 Prepare research and tourist infrastructure (trails, accommodation, research camps). Activity 5.2 Develop community management for research and tourist activities, structure of fees, financial management, and visitor rules. Activity 5.3 Advertise new research and tourist opportunities. Activity 5.4 Host research and tourist visits and assist in their activities.
All eight sites along the CART have the basic infrastructure, including local camp managers, camp sites, and local teams that provide basic field accommodation and catering (cooks, porters) to visitors. As a major development in the past six months, we have received a donation from our partner NGO, the New Guinea Institute of Biological Research for a permanent building to serve as laboratory for field research at the Numba camp on the CART. This will be a building specifically developed by Gold Bell Co. for remote locations without road access so that all parts of the building frame can be hand carried and assembled at the construction site.
We are expecting that sustainability of income can be achieved for the Mt. Wilhelm communities by promoting the elevation transect in the international research and conservation community. It is one of the few palaeo-tropical transects with undisturbed forest spanning from the lowlands to the alpine zone. Comparison of publication activity for Mt. Wilhelm with the number of research papers from Mt. Kinabalu (the nearest), Mt. Cameroon (the only complete elevation transect in Africa) or Mt. Kilimanjaro show great potential for increased research activity and therefore for income to indigenous communities. The Mt Wilhelm transect has continued to attract external research projects: six funded from the UK, USA and the Czech Republic. These projects brought GBP 34,600 income to the Mt Wilhelm communities, in addition to GBP 99,300 to BRC, as payment for field work, accommodation and transport.

2a. Give details of any notable problems or unexpected developments/lessons learnt that the project has encountered over the last 6 months. Explain what impact these could have on the project and whether the changes will affect the budget and timetable of project activities.	
None.	
2b. Have any of these issues been discussed with LTS International and if so, have changes been made to the original agreement?	
Discussed with LTS:	~~Yes~~/No
Formal change request submitted:	~~Yes~~/No

Received confirmation of change acceptance ~~Yes~~/No

3a. Do you currently expect to have any significant (e.g., more than £5,000) underspend in your budget for this year? **Yes** ☐ **No** ☒ Estimated underspend: £
3b. If yes, then you need to consider your project budget needs carefully. Please remember that any funds agreed for this financial year are only available to the project in this financial year. If you anticipate a significant underspend because of justifiable changes within the project, please submit a rebudget Change Request as soon as possible. There is no guarantee that Defra will agree a rebudget so please ensure you have enough time to make appropriate changes if necessary.

4. Are there any other issues you wish to raise relating to the project or to Darwin's management, monitoring, or financial procedures?
No.

If you were asked to provide a response to this year's annual report review with your next half year report, please attach your response to this document. Additionally, if you were funded under R23 and asked to provide further information by your first half year report, please attach your response as a separate document.

Please note: Any planned modifications to your project schedule/workplan can be discussed in this report but should also be raised with LTS International through a Change Request.

Please send your **completed report by email** to Eilidh Young at Darwin-Projects@ltsi.co.uk . The report should be between 2-3 pages maximum. **Please state your project reference number in the header of your email message e.g. Subject: 22-035 Darwin Half Year Report**