Darwin Initiative – Final Report

*(To be completed with reference to the Reporting Guidance Notes for Project Leaders (http://darwin.defra.gov.uk/resources/reporting/) - it is expected that this report will be a **maximum** of 20 pages in length, excluding annexes)*

Darwin project information

Project Reference	14-003
Project Title	Sustainable insect collecting and farming in Papua New Guinea
Host country	Papua New Guinea
UK Contract Holder Institution	University of Cambridge
UK Partner Institution(s)	-
Host Country Partner Institution(s)	(1) Department of Biology, University of Papua New Guinea (2) Department of Environment and Conservation, PNG Government (3) Insect Farming and Trading Agency, Lae (4) Wau Ecology Institute, Wau
Darwin Grant Value	£177,310
Start/End dates of Project	01 April 2005-30 June 2008
Project Leader Name	Dr Tim Bayliss-Smith
Project Website	http://www.geog.cam.ac.uk/people/bayliss-smith/
Report Author(s) and date	Tim Bayliss-Smith, University of Cambridge, July 2008

1 Project Background

Insects in New Guinea

The island of New Guinea contains thousands of insect species of which the more attractive ones (notably butterflies) are eagerly sought by international collectors. In Papua New Guinea (PNG) 55% of the known butterfly species are endemic to the New Guinea archipelago, including the world's largest butterfly *Ornithoptera alexandrae*. To meet market demand within the constraints set by CITES on international trade, insect farming (strictly speaking, insect ranching) has been carried out in PNG since 1978. However, apart from some superficial studies in the 1990s no research has been done on the institutional structure, ecological impact or socio-economic effects of this trade, a deficiency that this project set out to remedy.

For 30 years the selling of insects has made some direct contribution towards sustainable livelihoods for rural Papua New Guineans, and the theory of sustainable use of wildlife (Hutton and Leader-Williams 2005) suggests that these enhanced livelihoods ought to provide incentives for biodiversity conservation, and also a discouragement of the illegal trade in wildlife. To investigate this hypothesis our project was funded by Darwin Initiative in 2005 with both research and also capacity building objectives, with a view to improving the ease, efficiency and sustainability of the insect trade.

Summary of objectives and achievements

The project had three main OBJECTIVES:

1. Research into collecting/farming to establish the scale of exploitation, analysed by insect species and by PNG province, and the scale and distribution of livelihood benefits.

   ACHIEVEMENT: thanks to full collaboration by our project partners, the research programme was wholly successful, but submission of a full report (Ph.D thesis by Rob Small) has been delayed to December 2008.

2. Capacity building for the two principal NGOs that are middlemen in this trade, Insect Farming and Trading Agency (IFTA) and Wau Ecology Institute (WEI).

   ACHIEVEMENT: despite sustained efforts by the project, both NGOs appeared in May 2008 to be on the verge of collapse, for reasons outside the project's control.

3. Following a workshop organised by the project and attended by all stakeholders (February 2007), agreement on new policies and practices for the sustainable use of PNG's insects.

   ACHIEVEMENT: the workshop took place but was not attended by senior officers of Department of Environment and Conservation (DEC) for reasons outside this project's control. Sixteen months later the day-to-day transactions of the NGOs with DEC seem to be less fraught with suspicion and delay, but there is still no movement on downlisting Ornithoptera alexandrae *from CITES Appendix I to II, nor obvious progress on procedures for enabling the export of live butterfly pupae from PNG.*

Conclusions

With the wisdom of hindsight, we conclude that the project's capacity-building objectives had little chance of full success in the context of a failing state characterised by weak or zero governance, where most of the NGOs that are not driven by commercial motives or religious zeal struggle to survive without external subsidy. Unfortunately the two insect trading NGOs are, for different reasons, locked into failing institutional structures, and while our day-to-day relationships with their staff were good or excellent, we believe that organisations such as these cannot provide fertile ground for long-term success.

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

Research findings regarding insect biodiversity conservation

Our findings can be summarised as follows:

- Butterfly ranching is technically feasible for village producers under Papua New Guinea conditions, provided that training and support are available on an ongoing basis from middlemen institutions – two NGOs have fulfilled this role in PNG in the last decade. Only high quality specimens fetch good prices in the international market, but even so market demand has not grown sufficiently for insects to be an income source for more than a few hundred individuals, scattered over most provinces of PNG but increasingly concentrated in just a few.
- Maintaining forest/forest edge habitats for valued species is certainly of importance to insect ranchers and collectors, but it is doubtful if this understanding constitutes an important incentive (by itself) for their communities to conserve forests. Money from butterflies, however sustainable an income source, is not sufficiently substantial and nor is it widely shared, and so cannot compete with oil palm development or the windfall payments available from rainforest logging, for example.
- The PNG butterfly ranching and insect collecting industry has proved to be sustainable financially as well as ecologically for 30 years, but the middlemen organisations are NGOs that have not proved to be sustainable in institutional terms – both are currently failing. Some new form of middle-man organisation must be found, probably business-oriented like the very successful PNG crocodile skin trade, before the PNG insect trade can be regarded as fully sustainable.

Relations to Government

We initially received strong indications of support from the Department of Environment and Conservation (DEC) for the capacity building and policy strengthening elements of the project, including a warm welcoming letter from the Secretary, Dr Wari Iamo (see Annex). We hoped that this interest combined with the research elements of the project would enable us to work closely with DEC.

In relation to insect biodiversity, our capacity building with DEC should have made a significant contribution to CBD Article 10 (Sustainable Use), 11 (Incentive Measures) and 12 (Research and Training). From 2005-2008 we tried hard to make progress, making repeated visits to DEC's office in the national capital, Port Moresby (DEC has almost no field staff, and almost no contact with the provinces). However, it appeared that the middle-ranking staff with whom we had contact had little interest in a sustainable use project that was centred on strengthening middlemen NGOs and enhancing livelihoods for villagers. They could see no significant benefits to DEC in terms of revenue generation. On the contrary, they feared that any reforms in procedures to assist the legal trade in insects would lead to an increased workload, for example requiring them to issue more promptly the export permits for CITES II-listed insect species. While the export of crocodile skins (also CITES II listed) is highly profitable and receives priority treatment, the insect trade is more labour-intensive and intricate. The insect trading organisations are small, poor and remote, and cannot be milked for large fees.

Our proposal to set up a DEC website, and even pay for its operation, was also viewed with suspicion, perhaps because all except the most senior DEC officers have no computers (they are stolen), or if they have computers they have no internet access and do not use email except for private purposes. Making DEC more accessible to the outside world seemed to them somehow threatening, and anyway was clearly a low priority. We were told that our offer of a DEC website, with an actual pilot version designed by Rob Small for them to improve, was a matter that needed discussion by a DEC committee. However despite our enquiries nothing happened for a year, and in the end the matter was dropped.

We also were denied any direct access to the Secretary of DEC, Dr Wari Iamo, who showed no interest in meeting us or attending our presentations to DEC staff or seminars at the University (where Dr Iamo used to lecture). Instead his attentions seemed to be focussed increasingly on international meetings to discuss carbon trading projects and on investigating new opportunities for DEC in the area of climate change, alongside the routine business of granting permits for mining and logging companies.

This Darwin Initiative project is not alone in finding DEC a frustratingly inert partner, staffed by officers whose instinctive response (and former training) is to protect the environment by legal sanctions (which are not enforced) and by negative incentives, but who do not have the will to act unless assisted by direct subsidy. For example the two junior officers who attended the Sustainable Use of Wildlife workshop in Madang in February 2007 had all their travel, food and accommodation expenses paid, but were annoyed when not paid by the project an additional per diem allowance (something we could not afford). We sometimes felt that no progress would be made unless we had the capacity to offer DEC officers free trips to overseas conferences, e.g. climate change in Bali, or pay local bribes in the way that is routine for mining and logging companies needing permits. AusAID, WWF and others have tried to build capacity within DEC, and have failed. We also made little significant progress.

3. Project Partnerships

During the project's negotiation phase (2004) we tried to establish links with three types of partner, in order to include all stakeholders apart from grass-roots level insect collectors and farmers:

1. Government. In 2004 DEC actively discouraged our attempt to enrol it as a project partner, on the grounds of its temporary incapacity (restructuring, staff absences, etc.). At the time we little dreamt that this incapacity was DEC's normal state. Their initial negative stance did diminish by mid-2006, with indications that there could be some positive outputs from our engagement with DEC (see Annex for letter from DEC Secretary). Unfortunately, due to internal politics, this turned out not to be the case.

2. University of PNG, Department of Biology. As the country's main university and the only one with an active Biology Department, UPNG was an obvious partner, especially for a project itself based in a UK university. As well as interaction with staff and seminars (both of which have happened), we proposed to finance and supervise two Biology Honours students, to work on conservation and insect-related topics.

   Through the active assistance of Prof. Lance Hill and Dr Jane Mogina, two students were identified. One student, Ms Florence Jicki, did a field project on the CITES Appendix I species, Queen Alexandra's Birdwing butterfly, in Oro Province. She completed her thesis and graduated in 2007. Our second student, Mr Elliot Tovaboda, worked on a GIS for butterfly habitats in the Bulolo region. We reported last year that Elliot appeared to have dropped out of his studies, but happily he has now resumed work and is set to graduate in 2008. In February 2007 Ms Jicki and Dr Mogina both contributed very positively to the Workshop on Sustainable Use of Wildlife in Madang, which Dr Mogina used to help launch her new career as Director of Mama Graun, an NGO devoted to Protected Areas (in effect, doing the job for national parks that DEC fails to do).

   In summary, while our capacity building objectives for UPNG Department of Biology were relatively modest, we believe we have fully succeeded in our relationship to this partner. Its reward was to receive the value of the major capital asset of the project, a Toyota Landcruiser, to help with UPNG student field trips and staff research projects. [The vehicle was based in Madang-Lae, which has no road link to the capital Port Moresby, so it would have been necessary to transport it by sea to Port Moresby; but in any case the vehicle was not wholly suitable for UPNG's needs, so we sold it to Voluntary Service Overseas in Madang and transferred the funds to UNPG Department of Biology, earmarked by them for vehicle purchase in Port Moresby].

3. NGO middlemen in the insect trade: IFTA and WEI. These two organisations dominate the legal insect trade. Permits to trade insects have been issued by DEC to some other organisations and individuals, but either they have not flourished or their permits have been revoked because of misuse. To the best of our belief, in May 2008 IFTA and WEI were the only legal middlemen remaining in operation. Characteristically, DEC were unable or unwilling to provide us with clear information on the subject in May 2008.

It is therefore sad to record that in mid-2008 both NGOs appear to be failing, for different reasons but with one common feature. These organisations were originally established in the optimistic decades just before and after independence in 1975, when the sustainable (commercial) use of wildlife was a radical idea not wholly acceptable to most conservationists, schooled in the 'fences and fines' approach of national parks, sanctions and negative incentives that then (and to some extent still now) was predominant in western practice.

In fact, some officers in the former Department of Wildlife of the PNG Government did have at the time (1970s and 1980s) quite advanced ideas about the possibilities of conservation by farming wildlife. In particular four possibilities seemed promising:

(a) Crocodiles, especially *Crocodilus porosus*, hunted for 100 years for their skins but capable also of being reared in captivity.

(b) Butterflies, especially the much sought-after endemic birdwing butterflies, where again the ranching of pupae from eggs laid by wild insects in areas of enhanced habitat was a possibility.

(c) Cassowaries, where there was strong local demand for both meat and plumes.

(d) Deer, escaped introduced species abundant in some lowland areas, where again farming was a possibility based on New Zealand experience.

IFTA

Farming cassowaries and deer both proved to be unprofitable or unfeasible, but in the 1970s village-based crocodile and butterfly farms were established with government help. A few village crocodile farms remain, but most failed because of the difficulty of securing a food source for the reptiles that did not compete with human needs (meat, fish, chickens). However, the butterfly farms achieved long-term success in many parts of the country, with Insect Farming and Trading Agency (IFTA) established in 1978 and given a monopoly on export trading. At the time world prices for dead specimens were high, and IFTA flourished under the management of enthusiastic and knowledgeable expatriates. Declining profitability and less effective management in the last 10 years have not helped IFTA's cause, but its more fundamental problem is being embedded into an organisation called University Development Consultancy (UDC) that is owned by UNITECH (Lae University of Technology). IFTA has been linked within UDC with a zoo, called Rainforest Habitat (RF), sharing managers and premises. Unfortunately RF has no regular income stream or raison d'etre, and in the absence of tourists or subsidies from local businesses it has struggled to survive especially since DEC has blocked its attempts to export captive-bred tree kangaroos (an RF success story) to zoos in USA, amid accusations of American 'bio-piracy', loss of PNG's biodiversity heritage, etc. In fact, unless DEC gets paid something, such export permits are never likely to be issued - as insect traders have discovered to their cost.

Today UNITECH is virtually a bankrupt institution. In 2004 we found that innovation and investment in IFTA had been non-existent, staff morale was low, relationships with DEC were poor, and our project was welcomed by UDC mainly as a hope of staving off IFTA's collapse.

The logical strategy would have been to privatise IFTA and restructure its management and operations, but as we had no chance to carry out such reforms this project had to confine its efforts in capacity building to staff training, website design, publication of an Insect Ranching and Collecting Manual for village use, and help with smoothing relations with DEC. These actions were successful in the short term, and within IFTA Catherine Aisi emerged as a good potential manageress if she were to be given the freedom to run the organisation as an autonomous business. However, given its position within UNITECH she sees no future for herself within the organisation. IFTA turnover is down and its profits remain small or non-existent. In short, IFTA exists today as a loss-making business at the whim of a failing institution, and our capacity building efforts may have simply postponed its final collapse.

WEI

Our second NGO partner, Wau Ecology Institute (WEI), has a different history. Established in the former gold-mining town of Wau in 1968 by Prof. John Gressitt, an entomologist of world repute, and with funding from the Bishop Museum in Hawaii, WEI was a vigorous and successful research institute. It had its own library, published its own field guides to PNG fauna and research papers by visiting scientists, and had an educational programme organising courses at its field studies centre. Sadly Gressitt died in a plane crash and Wau became a less attractive place with the 1980s breakdown of law and order in the region.

Almost the last visiting scientist was Michael Hudson, an entomologist, who came to WEI in 1992 as a privately funded volunteer under the Peace Corps program and stayed on, adding butterfly ranching and export sales of dead specimens to the Institute's activities in 1996.

Meanwhile, in the 1990s WEI was abandoned by Bishop Museum as a lost cause and had its other funding sources removed one by one. By 2004 coffee from trees planted on its own land and Hudson's insect ranch had become its only sources of revenue, plus occasional visitors to the guest house. Wau itself, a boom town in the 1930s, ceased to receive regular flights, its road link to the outside world (Lae) was frequently cut by landslides, bridge failures and hold-ups. The assistant manager of WEI was killed in 2002. In 2005 Michael Hudson was happy to become a project partner in order to help boost his insect trading and so keep WEI solvent.

The situation in mid-2008 appears terminal for WEI. In 2007 alluvial gold was found on the Institute's land, and an illegal gold rush ensued. Hudson appealed for police help and in retaliation the gold miners cut his telephone link (and therefore internet connection) to the outside world, including his customers. The falling value of the US dollar also hit profitability. Staff were laid off and payments to local insect collectors had to be postponed.

Perhaps the final straw for Wau Ecology Institute was a violent dispute in October 2007 among WEI board members (now consisting of local business men) over the distribution of coffee revenues, as a result of which the guest house was burnt down. Michael Hudson knows it is time to end his 16-year relationship with Wau, and without his entomological and business expertise the Wau Insect Ranch will almost certainly fail. Already WEI is a paper institution. Illegal gold mining continues, the tunnels reaching almost up to the remaining buildings. Our proposal to Michael Hudson in 2006 that he consider re-locating his Insect Ranch to a safer and more accessible part of PNG, with help from our project, was refused by him for various reasons, and now it is probably too late.

An alternative: the Crocodile Model?

Meanwhile it is instructive to note the growing legal export of crocodile skins, mainly stemming from the crocodile farm in Lae owned by Mainland Holdings, a major PNG business that also owns Table Birds, a large chicken farm. The crocodile enterprise is large and growing, employing 160 Lae residents. It has a cheap source of chicken heads and feet as the main crocodile food, and it employs well-motivated and innovative staff eager to find ways to improve skin quality for its Japanese and French buyers. In addition, the company has the means to pay for DEC staff to rubber-stamp its CITES export permits and conduct annual surveys of the wild crocodile populations in the Sepik. These wild populations are the principal source of the 10,000 eggs needed each year by the farm. The eggs are collected by ten Sepik villages and they are paid for (plus the gift of one hen's egg per crocodile egg) by Mainland Holdings. The ecological surveys show the wild populations are increasing, under village protection. DEC can show CITES that the trade is sustainable, the croc farm in Lae now has 53,000 animals (4-year turnover), profits are high, and everyone is happy.

Could this model work in PNG for the butterfly trade? Probably yes, but not with the current NGOs in charge, not with DEC obstruction of live pupae exports to butterfly houses in Europe, North America and New Zealand, and not unless Sustainable Wildlife is treated as a business (obviously a regulated business) just like any other.

4. Project Achievements

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

We have provided direct support to village producers through the Insect Farming and Collecting Manual, which was widely distributed and is used by both IFTA, WEI and conservation NGOs in their local training courses. Training workshops were funded by the project in two provinces (Oro and East Sepik).

The project has managed to create a working relationship between the Wau Ecology Insitute and Mainland Holdings crocodile farm. The farm regularly flies chartered aircraft to the Upper Sepik river to collect crocodile skins and has agreed to allow insect stock destined for WEI on the flights free of charge.

The project cannot claim any measurable or demonstrable changes in the conservation of insect biodiversity, reduced habitat loss or benefit sharing, beyond demonstrating to all stakeholders that the outside world regards Sustainable Use of Wildlife as a viable strategy -- a position not accepted by all local conservationists, especially those trained by WWF, the Nature Conservancy and Conservation International.

We have also sustained institutional capacity in the University of Papua New Guinea through support of two Honours students and staff, and in the two insect trading NGOs, IFTA and WEI. However, such enhanced capacity in the NGOs may not prevent their failure or bankruptcy in the long term, given their institutional structure and other problems.

4.2 Outcomes: achievement of the project purpose and outcomes

(see sections 3 and 4.1)

4.3 Outputs (and activities)

Despite delays at the start (related to visas and permits), in the end the project achieved, or attempted to achieve, almost everything that we undertook in the initial proposal. In 2004 we specified three main *OBJECTIVES*:

(a) *Research into collecting/farming to establish the scale of exploitation by insect species and by PNG province, and the scale and distribution of livelihood benefits*.

ACHIEVEMENT: thanks to full collaboration by our project partners, the research programme was successfully completed, with one academic paper so far published (Small 2007) and others in preparation. However, submission of a full report of project research (Ph.D thesis by Rob Small) has been delayed to December 2008. This report will thoroughly document the following conclusions:

- Butterfly ranching is technically feasible for village producers under PNG conditions, provided that training and support are available on an ongoing basis from middlemen institutions – two NGOs have fulfilled this role in PNG in the last decade. Only high quality specimens fetch good prices in the international market, but even so market demand has not grown sufficiently for dead insects to be an income source for more than a few hundred individuals, scattered over 12-15 provinces.
- Maintaining forest/forest edge habitats for valued species is certainly of importance to insect ranchers and collectors, but it is doubtful if this understanding constitutes an important incentive (by itself) for communities to conserve forests. Money from butterflies, however sustainable an income source, is not sufficiently substantial or widely shared, and so cannot compete with oil palm development nor with the windfall payments available from rainforest logging, for example.
- The PNG butterfly ranching and insect collecting industry has proved to be sustainable financially as well as ecologically for 30 years, but the middlemen organisations are NGOs that have not proved to be sustainable in institutional terms – both are currently failing. Some new form of middle-man organisation must be found, probably business-oriented like the very successful PNG crocodile skin trade, before the PNG insect trade can be regarded as fully sustainable.

(b) Capacity building for the two principal NGOs that are middlemen in this trade, Insect Farming and Trading Agency (IFTA) and Wau Ecology Institute (WEI). Also capacity building in the UPNG Department of Biology.

ACHIEVEMENT: sustained efforts over three years should have secured the future of both NGOs, but unfortunately, for reasons outside the project's control, both NGOs appeared in May 2008 to be on the verge of collapse. DEC appears to have no contingency plan to cover this possibility, so that the illegal trade seems set to take over. Alternatively, funding and leadership might become available to establish a new organisation that has the entomological AND business expertise to run insect trading in more efficient ways, so that insect trading becomes as successful (and sustainable) as crocodile skin trading.

(c) *Following a workshop organised by the project and attended by all stakeholders (February 2007), agreement on new policies and practices for the sustainable use of PNG's insects.*

ACHIEVEMENT: the workshop took place and for those attending it was regarded as successful, but it was not attended by senior officers of Department of Environment and Conservation (DEC) for reasons outside this project's control. We were victims of a government decree forbidding any participation by public servants in NGO meetings, a decision provoked by outspoken WWF criticisms of PNG state policies and practices in the logging industry. Sixteen months later the day-to-day transactions of the insect trading NGOs with DEC seem to be less fraught with suspicion and delay, an achievement that we trace to the Workshop that we organised. However there is still no movement on downlisting of Ornithoptera alexandrae from CITES Appendix I to II, a step that might discourage the current illegal trade and provide a boost for Queen Alexandra Birdwing insect ranchers in Oro Province. Nor is there obvious progress on procedures for enabling the export of live butterfly pupae from PNG. This is another reform that we have for long advocated as necessary to enhance the profitability of insect trading, but it awaits a DEC initiative which DEC officers are unlikely to take while the whole issue remains hypothetical, as well as unprofitable to DEC itself.

4.4 Project standard measures and publications

(see Annex 4 and Annex 5)

4.5 Technical and Scientific achievements and co-operation

(a) In PNG, as part of local educational objectives:

Florence **Jicki**, University of PNG, Department of Biology, Honours thesis "The dependence of *Ornithoptera alexandrae* on *Pararistolochia dielsiana* density" (2007).

Elliot **Tovaboda**, University of PNG, Department of Biology, Honours thesis "A Geographical Information System for assessment of butterfly habitats in the Bulolo valley" (in preparation, 2008).

(b) In PNG, as part of local capacity building objectives:

"Customer Service Training Manual for IFTA Staff Training" (Rob **Small**, 2006).

"How to Ranch and Collect Insects in Papua New Guinea *(Tok Pisin version:* Rot bilong Lukautim na Kisim Binatang long Papua Niugini*)*" (by Catherine **Aisi**, IFTA, Michael **Hudson**, WEI, and Rob **Small**, University of Cambridge, 2007. 86 pp., print run 600 copies.

"Report on the Sustainable Trade in PNG's Wildlife, Jais Aben, Madang, February 2007" (Tim **Bayliss-Smith** and Rob **Small**, 2007).

All these reports and the article by Rob Small published in *Oryx* (2007) are available online: www.geog.cam.ac.uk/research/projects/insectfarming

(c) Ph.D thesis:

"Implementing sustainable use: the Papua New Guinea insect trade" (by Rob **Small**, expected completion early 2009)

(d) Conference presentations and international publications:

"Becoming unsustainable? Recent trends in the formal sector of insect trading in Papua New Guinea" (by Rob **Small**, *Oryx* vol. 41, pp. 386-389).

Cambridge Conservation Forum, January 2007: "The insect trade in Papua New Guinea" (unpublished paper by Rob **Small**)

9th Student Conference on Conservation Science, March 2008: "Sustainable use in Papua New Guinea" (unpublished paper by Rob **Small**)

Seminars: (a) UPNG Department of Biology; (b) Australian National University, Canberra; (c) University of Otago, New Zealand: by Rob **Small** and Tim **Bayliss-Smith**, Rob **Small**, and Tim Baylis**s-Smith**, respectively, May 2008: Title:

"Sustainable use in Papua New Guinea: conservation through private enterprise".

4.6 Capacity building

(see section 3)

4.7 Sustainability and Legacy

Our local capacity building, especially at UPNG, may endure. Internationally research publications and Rob Small's Ph.D thesis (and subsequent career) will probably be an enduring legacy. There will probably be a continuation of contacts with individuals within the partner organisations in PNG.

The Oceania sub group of IUCN Sustainable Use Specialist Group (SUSG) is keen to extend its work into Papua New Guinea. The SUSG will be working with Rob Small in order to achieve this extension.

5 Lessons learned, dissemination and communication

With the wisdom of hindsight, we conclude that the project's capacity-building objectives had little chance of full success in the context of a failing state characterised by weak or zero governance, and where most of the NGOs that are not driven by commercial motives or religious zeal struggle to survive without external leadership or subsidy. Unfortunately the two insect trading NGOs are, for different reasons, locked into failing institutional structures, and while our day-to-day relationships with staff were good or excellent, we believe that organisations like these cannot provide fertile ground for long-term success (see section 3).

The project's approach of working across different scales, from grass-roots to local NGOs, national government, and CITES-level governance, proved to be successful in gaining insights at multiple levels in the commodity chain that links village collectors and ranchers with the international market. Such an approach has many merits in studying the sustainability of the insect trade in a large and diverse country like PNG, and indeed it also helped us to understand the sustainability of the crocodile trade in PNG, for example. We believe that had the project concentrated its focus on just one scale or level, for example studying just the national institutions or the middlemen NGOs, it would not have had a more positive impact in terms of output.

It is intended by both Tim Bayliss-Smith and Rob Small to build upon these insights and to disseminate them in future research, teaching and publications.

5.1 Darwin identity

The Darwin identity and logo was disseminated by the project in PNG and at international conferences, seminars, etc., wherever possible. In relevant ministries of the the PNG government and in UPNG circles there is clear understanding of the Darwin Initiative and its objectives.

6 Monitoring and evaluation

The only major changes in project design were those made necessary by a five month delay in project implementation, because of problems with research visas being issued for Rob Small and Tim Bayliss-Smith.

A tentative proposal by the project after Year 2 to re-focus capacity building on a new insect trading organisation led by Michael Hudson came to nothing, because of Hudson's reluctance at that time to re-locate from Wau.

In general, we did not find the M&E system particularly useful. Logframes do not have much currency in PNG.

6.1 Actions taken in response to annual report reviews

No specific changes that proved to be practical were recommended in the annual report reviews.

7 Finance and administration

7.1 Project expenditure

Original budget estimates (£)

CATEGORY	**2005-05**	**2006-07**	**2007-08**	**2008-09**	**Project totals**
Rent, rates, heating, cleaning, overheads					
Office costs, postage, telephone, stationery					
Travel and subsistence					
Printing					
Conferences, seminars					
Capital items (Toyota Land Cruiser, satellite phone)					
Other costs (audit, visas, vehicle running costs, vehicle maintenance, insurance					
Salaries					
TOTAL PROJECT COSTS (Darwin funded)					

Actual expenditure (£)

CATEGORY	2005-05	2006-07	2007-08	2008-09	Project totals
Rent, rates, heating, cleaning, overheads					
Office costs, postage, telephone, stationery					
Travel and subsistence					
Printing					
Conferences, seminars					
Capital items (Toyota Land Cruiser, satellite phone)					
Other costs (audit, visas, vehicle running costs, vehicle maintenance, insurance					
Salaries					
TOTAL PROJECT COSTS (Darwin funded)					

Comments on differences between budget estimates and actual expenditure:

1. Some variations in annual expenditures reflect delays in expenditure as a result of project activity in PNG not beginning until 5 months after the estimated start-up time, because of delays with the issue of PNG visas to Tim Bayliss-Smith and Rob Small.
2. Some other variations are the result of differences in coding categories for expenditure between the Cambridge University accounting system and that used by Darwin Initiative.
3. Explanations by Category of over-expenditures that exceeded 10% of the original estimate:

(a) Rent, rates, heating, cleaning, overheads. This item was overspent by £2854 because of rent increases in Madang Lodge, where the project had its base, that were outside our control; because of the shortage of secure rented accommodation in Madang, re-location to a cheaper place was not feasible.

(b) Office costs, postage, telephone, stationery. This item was over-spent by £5556 mainly because we severely under-estimated the extortionate cost of telephone and internet connections provided by Telekom, the PNG state monopoly.

4. Explanations by Category on under-expenditures that exceeded 10% of the original estimate:

(a) Travel and subsistence. Most of the under-expenditure took place in Year 1, as a result of the delayed start-up of the project because of visa problems.

(b) Printing. The £1900 under-expenditure resulted from our main publication *How to Ranch and Collect Insects in Papua New Guinea* being all charged by Cambridge University to the Conferences and Seminars budget, to which the publication was in any case linked (all persons attending received a copy).

(c) Total Project Costs. Our project's under-spend for 2005-09 was £11969, which mainly was the result of disruptions to the project timetable that resulted from the 5 month delay in start-up in 2005, and the refusal by D.I. to allow more than a small amount of our yearly under-spends to be carried over to subsequent financial years.

Breakdown of salary costs.

Project team member	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**Total**
Tim Bayliss-Smith					
Rob Small					
Rob Small's PNG Counterpart (F. Jicki)					
UPNG Biology Student 1 (Florence Jicki)					
UPNG Biology Student 2 (Elliott Tovaboda)					
Project total					

Comments on variations between actual expenditure and budget estimates:

1. Tim Bayliss-Smith's salary was estimated at £XXXX for his three months of leave of absence from his University post, from January-March 2007, when he was working full-time for the project. In the event Cambridge University only claimed his salary for the two months January and February 2007, a total of £XXXX apparently because of a clerical error.
2. Rob Small's actual salary was exactly as estimated.
3. Rob Small's PNG Counterpart was not employed until Year 3 of the project, because of the absence of suitable candidates willing to be based in Madang, thus saving the project some expenditure.
4. UPNG student grants (£2910 each) were somewhat in excess of the estimate (£2000 each), because of increases in UPNG fees for Honours students.

7.2 Additional funds or in-kind contributions secured

(a) Salary costs: those funded by Cambridge University were as shown in Section 23, Table B of the original application.

(b) Total Costs (Table C, section 23, original application). Those funded by Cambridge University were the same as predicted.

(c) We also received some in-kind assistance from our project partners, in the form of accommodation in Wau, Bulolo and Lae, and some local transport, but much of this assistance was paid for by the project as an aspect of our local capacity building.

7.3 Value of DI funding

The project would have been inconceivable without Darwin Initiative funding (and also the support of Cambridge University).

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

Project summary	Measurable Indicators	Progress and Achievements April 2007 - March 2008	Actions required/planned for next period
Goal: To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but constrained in resources to achieve • 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		Year 3 was devoted to research, as well as continuing our contacts with NGO partners and UPNG. The fieldwork programme was partly carried out in conjunction with IFTA and WEI, and with the help of Florence Jicki (ex-UPNG and Rob Small's project counterpart), and was successfully concluded with only one or two gaps (e.g. visits to Rabaul and Highlands) because of shortages of time and funds.	(do not fill if not applicable)
Purpose: Original Purpose. PNG's insect biodiversity better protected through improved policies and practices for the sustainable use of insects through commercial exports.	Original Indicators 1. Knowledge. *By end of Year 1:* new knowledge on insect trading by IFTA/WEI, and exports approved by DEC. *By end of Year 2:* new knowledge on social and economic benefits. 2. Future policies and practices. *By mid-Year 2:* Discussion and agreement among major stakeholders concerning future policies and practices.	Original Assumptions - PNG remains a country with freedom of travel by air and road, so fieldwork can be done in safety. *Comment: security concerns were manageable in 2005-08 except during the General Election of mid-2007, but at a cost to the project in time and expense.* - Our partner NGOs continue to be viable. *Comment: see Section 3. The NGOs remained just about viable, and grateful for our capacity building efforts, but their long-term future now appears bleak.* - UPNG assists with project affiliation, staff input, student selection and supervision. *Comment: UPNG was our most effective partner.* - DEC remains willing to share data and co-operate. *Comment: this*	(do not fill if not applicable)

		assumption proved to be incorrect. The junior officers with whom we worked were helpful but with some reluctance, and were unable to shift DEC's overall policy direction and practices, which remained inefficient and (probably) corrupt. Actual Progress 1. Knowledge. *By end of Year 1:* One publication by Rob Small 'in press' in international journal *Oryx.* *By end of Year 2:* Reports to conservation conferences by Rob Small. *By end of Year 3:* Draft of R. Small's Ph.D thesis in preparation, final draft expected in December 2008. 2. Future policies and practices. *By mid-Year 2:* Workshop report and justification for 'National Strategy for Sustainable Use of PNG's Insects' posted on the internet and distributed within PNG.	

Output 1. Original planned outputs: 1. Research into the sustainability of insect farming/trading and how to improve it.	Original Indicators 1. *By Year 3:* Research reports on: (i) Insects traded by IFTA and WEI. (ii) Insects exported with DEC permits. (iii) Income benefits within PNG. 2. *By Year 2:* Honours degrees awarded to two PNG students. 3. *By end Year 1:* DEC website up and running.	Original Assumptions - R. Small succeeds with his Ph.D registration at Cambridge University; *Comment: not a problem.* - NGOs and DEC remain co-operative research partners; *Comment: an optimistic assumption, but our presence and, in particular, the stakeholders workshop of February 2007 seems to have eased some tensions.* - DEC continues to be an independent and uncorrupt department of PNG government; *Comment: an ignorant and probably incorrect assumption in 2005, and certainly untrue today. DEC provided little help to us and spurned all our efforts to help them and reform their procedures.* - Successful supervision arrangements organised for UPNG students. *Comment: no problems encountered here.* Actual achievements relative to indicators: Time did not permit the writing of Research Reports -- although these topics will become chapters in Rob Small's thesis -- with the exception of Training Manuals and the Report on the Workshop on Sustainable Use of PNG's Wildlife. Florence Jicki graduated in 2007. Elliot Tovaboda is expected to graduate in late 2008. As explained in section 3, DEC refused our offer of a website, despite repeated attempts to demonstrate its utility and feasibility.
Activity 1.1 Field research programme		This took place as planned, but with delays, certain additions and some deletions to the original plan. Village fieldwork mainly took place in the following provinces: Morobe (2006, 2007, 2008), Sepik (2008), Oro (2007, 2008) and Bougainville (2008).

Activity 1.2 Capacity building		Efforts were focussed on the two active middlemen NGOs in the insect trade (IFTA and WEI), and on UPNG staff and students. Training courses were organised on IT, customer services and village training courses. For the middlemen an important joint output was "How to Ranch and Collect Insects in Papua New Guinea *(Tok Pisin version:* Rot bilong Lukautim na Kisim Binatang long Papua Niugini*)*" by Catherine **Aisi**, IFTA, Michael **Hudson**, WEI, and Rob **Small**, University of Cambridge, 2007. 86 pp., print run 600 copies. Michael Hudson (WEI) also helped Rob Small with the fieldwork of our two UPNG students Tovaboda and Jicki, in 2006, in Bulolo valley and Oro province respectively.
Output 2. (Original output) 2. Enhanced engagement by University of PNG in biodiversity/ sustainable use issues.	Original Indicators 2. *By Year 2:* Honours degrees awarded to two PNG students.	Florence Jicki gained B.Sc. Honours 2006. She has future plans to proceed to Masters level and a possible career in biological conservation. Elliott Tovaboda is currently (May 2008) working towards his B.Sc. Honours degree which he intends to complete by the end of the year.
Activity 2.1. Supervision of UPNG students and their engagement in conservation and ecology field research		(see above)
Activity 2.2. UPNG staff engagement in conservation and ecology field research		Main success story here is the recent career of Dr Jane Mogina, who assisted the project in many ways, was an active participant in the Workshop (see below), and is now (seconded from UPNG) launched in a career as Director of Mama Graun, an NGO attempting to manage Protected Areas in PNG. Other UPNG staff were less involved in the project.
Output 3. (Original output) 3. Enhanced capacity of DEC.	Original Indicators 3. *By end Year 1:* DEC website up and running.	Failure to achieve this and other objectives, because of difficulties encountered with DEC especially at senior levels. (see section 2 above)

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

(not applicable)

Project contribution to Articles under the CBD

Project Contribution to Articles under the Convention on Biological Diversity

Article No./Title	Project %	Article Description
6. General Measures for Conservation & Sustainable Use	10%	Develop national strategies that integrate conservation and sustainable use.
7. Identification and Monitoring		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		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	30%	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	10%	Establish economically and socially sound incentives to conserve and promote sustainable use of biological diversity.
12. Research and Training	50%	Establish programmes for scientific and technical education in identification, conservation and sustainable use of biodiversity components; promote research contributing to the conservation and sustainable use of biological diversity, particularly in developing countries (in accordance with SBSTTA recommendations).
13. Public Education and Awareness		Promote understanding of the importance of measures to conserve biological diversity and propagate these measures through the media; cooperate with other states and organisations in developing awareness programmes.
14. Impact Assessment and Minimizing Adverse Impacts		Introduce EIAs of appropriate projects and allow public participation; take into account environmental consequences of policies; exchange information on impacts beyond State boundaries and work to reduce hazards; promote emergency responses to hazards; examine mechanisms for re-dress of

Article No./Title	Project %	Article Description
		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		Countries shall facilitate information exchange and repatriation including technical scientific and socio-economic research, information on training and surveying programmes and local knowledge
19. Bio-safety Protocol		Countries shall take legislative, administrative or policy measures to provide for the effective participation in biotechnological research activities and to ensure all practicable measures to promote and advance priority access on a fair and equitable basis, especially where they provide the genetic resources for such research.
Other Contribution		Smaller contributions (eg of 5%) or less should be summed and included here.
Total %	100%	Check % = total 100

Annex 3 Standard Measures

Code	Description	Totals (plus additional detail as required)
Training Measures		
1a	Number of people to submit PhD thesis	1
1b	Number of PhD qualifications obtained	
2	Number of Masters qualifications obtained	
3	Number of other qualifications obtained	
4a	Number of undergraduate students receiving training	2
4b	Number of training weeks provided to undergraduate students	7
4c	Number of postgraduate students receiving training (not 1-3 above)	
4d	Number of training weeks for postgraduate students	
5	Number of people receiving other forms of long-term (>1yr) training not leading to formal qualification(ie not categories 1-4 above)	
6a	Number of people receiving other forms of short-term education/training (ie not categories 1-5 above)	8
6b	Number of training weeks not leading to formal qualification	6
7	Number of types of training materials produced for use by host country(s)	3
Research Measures		
8	Number of weeks spent by UK project staff on project work in host country(s)	Rob Small: 86 weeks Tim Bayliss-Smith 16 weeks
9	Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country (s)	
10	Number of formal documents produced to assist work related to species identification, classification and recording.	1
11a	Number of papers published or accepted for publication in peer reviewed journals	1
11b	Number of papers published or accepted for publication elsewhere	
12a	Number of computer-based databases	

Code	Description	Totals (plus additional detail as required)
	established (containing species/generic information) and handed over to host country	
12b	Number of computer-based databases enhanced (containing species/genetic information) and handed over to host country	2
13a	Number of species reference collections established and handed over to host country(s)	
13b	Number of species reference collections enhanced and handed over to host country(s)	
Dissemination Measures		
14a	Number of conferences/seminars/workshops organised to present/disseminate findings from Darwin project work	1
14b	Number of conferences/seminars/ workshops attended at which findings from Darwin project work will be presented/ disseminated.	
15a	Number of national press releases or publicity articles in host country(s)	3
15b	Number of local press releases or publicity articles in host country(s)	
15c	Number of national press releases or publicity articles in UK	
15d	Number of local press releases or publicity articles in UK	
16a	Number of issues of newsletters produced in the host country(s)	
16b	Estimated circulation of each newsletter in the host country(s)	
16c	Estimated circulation of each newsletter in the UK	
17a	Number of dissemination networks established	1
17b	Number of dissemination networks enhanced or extended	
18a	Number of national TV programmes/features in host country(s)	
18b	Number of national TV programme/features in the UK	
18c	Number of local TV programme/features in host country	
18d	Number of local TV programme features in the UK	

Code	Description	Totals (plus additional detail as required)
19a	Number of national radio interviews/features in host country(s)	1
19b	Number of national radio interviews/features in the UK	
19c	Number of local radio interviews/features in host country (s)	
19d	Number of local radio interviews/features in the UK	
Physical Measures		
20	Estimated value (£s) of physical assets handed over to host country(s)	£8,400
21	Number of permanent educational/training/research facilities or organisation established	
22	Number of permanent field plots established	
23	Value of additional resources raised for project	£40,823
Other Measures used by the project and not currently including in DI standard measures		

Publications

Type * **(eg journals, manual, CDs)**	**Detail** **(title, author, year)**	**Publishers** **(name, city)**	**Available from** **(eg contact address, website)**	**Cost** **£**
Top international journal	"Becoming unsustainable? Recent trends in the formal sector of insect trading in Papua New Guinea" by Rob **Small**, *Oryx* vol. 41, pp. 386-389	London	Reproduced at www.geog.cam.ac.uk/research/projects/insectfarming	

Annex 4. Darwin Contacts

Ref No	14-003
Project Title	Sustainable insect collecting and farming in Papua New Guinea
UK Leader Details	
Name	Dr Tim Bayliss-Smith
Role within Darwin Project	P.I.
Address	Department of Geography, University of Cambridge, Cambridge CB2 3EN
Phone	
Fax	
Email	
Other UK Contact (if relevant)	
Name	Mr Rob Small
Role within Darwin Project	Research Assistant
Address	Department of Geography, University of Cambridge, Cambridge CB2 3EN
Phone	
Fax	
Email	
Partner 1	
Name	Mr Jeffrey Juju
Organisation	Insect Farming and Trading Agency
Role within Darwin Project	NGO insect trading organisation, partner in research and capacity building
Address	University Development Consultancy, UNITECH, Lae, Papua New Guinea
Fax	
Email	
Partner 2 (if relevant)	
Name	Mr Michael Hudson
Organisation	Insect ranch, Wau Ecology Institute
Role within Darwin Project	NGO insect trading organisation, partner in research and capacity building
Address	
Fax	
Email	

Annex 5. Letter from Department of Environment and Conservation