



Darwin Initiative Annual Report



Department
for Environment
Food & Rural Affairs

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

Submission Deadline: 30 April

Darwin Project Information

Project Reference	19-024
Project Title	Enhancing the relationship between people and pollinators in Eastern India
Host Country/ies	India
Contract Holder Institution	Game & Wildlife Conservation Trust
Partner institutions	University of Calcutta
Darwin Grant Value	£271,258
Start/end dates of project	1 April 2012 – 31 st March 2015
Reporting period (eg Apr 2013 – Mar 2014) and number (eg Annual Report 1, 2, 3)	Apr 2013 – Mar 2014 Annual Report 2
Project Leader name	Barbara Smith
Project website	http://cpscu.in/
Report author(s) and date	Barbara Smith, Parthiba Basu, Soumik Chattergee, John Mauremootoo and Stuart Roberts supported by the CPS team. 30/04/2014

1. Project Rationale

The project partners recognised a potential pollinator crisis in India. This project was designed in response to this and aims to 1) increase understanding of native pollinators, their status and ecology and 2) to improve the management of pollinators and the wider agro-ecosystem in partnership with the farming community and local government. The project is relevant to: those trying to achieve CBD targets in India; those concerned with global biodiversity conservation; those seeking to document and record invertebrate biodiversity in India; those concerned with agricultural ecology in India; local and national governments; farmers and the farming communities. The aim of the project is to support our partners in achieving CBD targets, particularly the Aichi Targets. It will support the partners in: Ensuring areas under agriculture and forestry are managed sustainably, ensuring conservation of biodiversity (Strategic Goal B; Target 7); Ensuring that ecosystems provide essential services, (Strategic goal D; Target 14); improving the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, and ensuring this is widely shared, transferred, and applied (Strategic Goal E, Target 19). The project directly addresses the following articles: 7 - ID and Monitoring; 12 – Research and Training; 13 – Public Education and Awareness; 18. – Technical and Scientific Co-operation. This is all carried out with a focus on pollinators and pollination services. We aim to support our partners in achieving CBD targets

by, for the first time, identifying key pollinators of subsistence crops in the region and describing their distribution and ecology. This will substantially increase the knowledge base on which to form coherent conservation strategies based on the ecosystem approach. The development challenge is to support subsistence farmers in maximising their livelihood by innovating and managing their land sustainably to maximise yield. We aim to increase capacity among farmers to recognise the importance of conserving the ecosystem to maintain pollinator services through strong partnerships between advisors and scientists. The project is located in the north eastern part of India and is centred at Calcutta University (the hub) and field stations in two regional study areas: Tripura and Orissa (see Appendix 1.1 Location Map).

2. Project Partnerships.

The need for the project was identified by Parthiba Basu (hereafter PB) at the University of Calcutta (UCal) who was concerned about an impending pollinator crisis in India. The project was developed in collaboration with Barbara Smith (BS) at the Game and Wildlife Conservation Trust (GWCT) to combine zoological expertise in the Ecology Unit (Dept. Zoology) headed up by PB with the expertise in partnership-based applied agricultural science at GWCT where BS is Senior Scientist. BS is officially recognised as Associate Director at the Centre for Pollination Studies (Appendices 2.2 a & b). There are regular meetings and communication between the project partners, in the past year these have become more regular and less formal. PB and BS are in touch by email at least three times a week and there are regular Skype meetings between the partners. All decisions are collaborative, primarily between PB and BS who are responsible for strategic decisions and the direction of the project. Much of this communication is informal – a Skype log is shown in Appendix 2.1. Where partners are responsible for specific areas (e.g. John Mauremootoo (JM) for planning, monitoring and evaluation (PME) or Stuart Roberts (SR) for invertebrate identification and pollinator autecology) they contribute to project planning and decision making. JM and SR indicate their level of involvement in their respective reports (Section 6 below and Appendix 3.2). Soumik Chatterjee (SC) joined us in July this year as Post-doctoral project manager (PDRA) and makes decisions at a local level overseen by PB. SC reports to PB on a daily basis in face-to-face meetings. The PGRAs and other PhD students report to SC, keeping him up-to-date verbally but also using monthly plans to indicate work they are planning to undertake and a daily log indicating tasks undertaken. Both PB and BS are periodically copied into these documents to aid supervision. Any significant developments are passed on to BS by either PB or SC. Field staff are monitored by both SC and the Post-graduate Research Assistants (PGRA's), this is all done in face-to-face meetings. To evaluate progress, an appreciative evaluation of field staff (as well as UCal based CPS staff) was undertaken in September 2013 and evidence is appended (Appendices 5.3 – 5.5 In the host country, PB directs the CPS, all staff and their management including management of field staff at field stations (although this may be delegated to SC, the PDRA); manages capacity building to ensure it is effective and benefits community stakeholders; supervises PhD and MSc students at Calcutta University. He also identifies and develops partnerships within India to further strengthen the CPS and disseminate and mainstream its outputs. In the UK BS oversees the project progress, develops links with international partners to further strengthen the CPS and disseminate its outputs. BS also supervises PhD projects, advises on protocols, has been involved in some of the research work and liaises with staff of the CPS on a regular basis via email. A recent and very successful innovation has been the creation of a closed Facebook group for the CPS team. This enables the group to exchange information, particularly on identifying insects / plants or queries about method and adjustments to protocols. Any member can post papers or links. An added and unplanned benefit is that all staff are now linked on Facebook and the small updates on each other's work and life has brought the team together in an open and accessible manner. This is effectively a 'lab' group. It comprises the core team (UK partners, CPS staff and students as well as two additional postgraduate students in PB's lab who are also working on pollination ecology).

3. Project Progress

Summary

The last 12 months has seen the project build on its successful beginnings by consolidating the initial gains and developing new opportunities. Dr Parthiba Basu (PB) has played the leading

role in developing the CPS, he has identified an excellent team of people and maximised the value of their input. He now leads a lean and responsive research unit which is gaining a good reputation in India with excellent links, particularly in the Tripura region. A report from PB is (Appendix 3.1). There has been highly valuable input from John Mauremootoo (JM) who has helped the project develop an implementable and useful planning, monitoring and evaluation (PME) system and from Stuart Roberts (SR) who has stepped in to help with taxonomic questions and to deliver technical advice which James Cresswell (JC) has been unable to supply due to ill health (see section 8). In addition we welcomed Soumik Chatterjee (SC) to the team to take on the role of PDRA, he has done some fantastic work in his time on the project, engaging well with the PGRAs, other PhD students and the field staff (see his report Appendix 3.3). He brings with him an asset in his ability to speak fluent Oriya (the native language in Orissa) and good local connections in the region which has enabled us to greatly enhance the work we are doing in Orissa.

3.1 Progress in carrying out project activities

This section reports against the activities given in Section 17 of the original application (Activities 1.1 -10.2).

1) *Monitoring framework for pollinators:*

Long-term monitoring strategy devised and plots/transects identified (**Activity 3.1**). Analysis of the first complete year of data is underway, preliminary results were presented at an Association of Applied Biologists / British Ecological Society meeting on [Pollinators in Agriculture conference in Brussels 1 - 4 April 2014](#).

2) *Base-line information regarding pollinator diversity gathered*

The long-term database has now been established (**Activity 6.1**) as have the databases for the research projects (**Activity 6.2**), research questions have been refined (**Activity 4.1**) and the experimental work is underway (**Activity 4.2**). Some basic analysis has been carried out and was presented at the BES/AAB *Pollinators in Agriculture* conference in Brussels (1 -3 April, 2014) (**Activity 6.4**). Data integration and final analysis of all data will take place in 2015 (**Activities 6.5, 10.1**) and after publication the data-base of long-term data will be made public (**Activity 6.3**). Databases are available for inspection. These activities are being completed in a timely manner.

3) *CPS and satellite field centres established:*

The CPS and satellite field stations are well established as reported in **Annual Report 1**. The CPS continues to develop. In the period April 2013 - March 2014 11 MSc students were trained in taxonomy and research techniques which brings the total trained so far (together with three last year) to 16, exceeding the nine planned for the project. These 11 were trained on a four month certificate course on *Pollination Ecology and Agro-ecology* that was set-up by the CPS as an optional course for existing MSc students in the Zoology Department (**Activity 2.1**). This activity has been carried out earlier than expected and its delivery (via a structured course with an opportunity to pursue research) is an improvement on the original plan (providing opportunities to carry out an MSc project with the CPS) (Appendices 4.1 & 4.2). All research fellows and CPS staff have been trained in long-term monitoring methods and data management (**Activity 2.3**), data is being collected on a regular basis and data has been entered in line with industry best practice. CPS staff received further training in taxonomy and pollinator autecology via a workshop given by Stuart Roberts (**Activity 2.4**) see feedback in Appendix 5.1.

4) *Local engagement and increased capacity among farmers to manage pollinator populations:*

Three pioneer farmers in Orissa and have been trained in pollinator survey and recording and these farmers oversee the setting and collection of monthly pan-trap sampling by at least 15 other farmers who have been trained in each sampling location. In Tripura, at least 10 farmers across different sampling stations take part in setting and collection of pan traps. This activity is carried out under the guidance of the Field Assistants and the PGRAs (**Activity 2.2**). The workshops for children will be carried out in local schools later in 2014 (**Activity 2.5**), later than planned. These were delayed as farmer training was prioritised. See AC's Training Report, Appendix 3.4.

We have dealt with the system of Rural Advisors very differently in the two regions (**Activity 5.1**). **Tripura:** The Rural Advisor is Dr Baharul Islam, Joint Director of Agriculture at the Govt. of Tripura. He oversees the implementation of the project in the state. We have three Field Assistants (one of whom is co-financed by the local government) but who deliver the project on the ground and are overseen by Dr Islam with whom they are in close contact. They engaging with the local farmers and giving them training in collaboration with the PGRAs. Of the Field Assistants, Abhijit Majumderin particular is very capable and has taken up challenges with enthusiasm. **Orissa:** the system in Orissa is less centralised. In Orissa the role of Rural Advisor was split between four. A co-ordinating advisor drawn from the farming community who is well respected across the region and three local farmers, one for each node of our gradient, who have excellent local connections and can facilitate farmer engagement with our project. There are also two Research Assistants, one of whom is well known in his locality, who together deliver the project on the ground.

The annual 'celebrations' have been adapted so they are fit for purpose. In the last year there were three small gatherings in Orissa and one large gathering in Tripura. In Tripura farmers came from across the state and we collaborated with the Department of Biotechnology to host a large celebration. Images of the events are shown in Appendix** (**Activity 7.1**) Feedback sessions with farmers (**Activity 7.2**) happen on an informal basis with the Rural Advisors. In addition farmers were able to give feedback at the celebrations. At each event we carried out farmer surveys which delivered feedback (Appendix 5.2)



Farmers being trained in pan trapping



Farmer inspecting a pan trap

5) Project management

Activity 1.1 completed and reported on in Annual Report 1. A partner meeting took place in the UK in December 2013 when PB visited GWCT for one week (**Activity 1.2**). A final partner meeting is planned for 2015 (**Activity 1.2**). All partner meetings are being carried out in the manner and time planned. A quarterly teleconference between research partners took place via Skype (**Activity 8.1**). To date reports to Darwin have been delivered on time (**Activity 8.2**). The formal handover of all equipment and databases will take place at the end of project (**Activity 10.2**).

Press releases and newsletter articles: There was an update on the project in the 2013 winter issue of the GWCT magazine GAMEWISE and a half page article story will be published as part of the 2014 Summer Issue. There were 3 newspaper articles in India (See Appendix 9). In the UK GWCT approached newspapers and were advised that they would be interested when we are able to give some estimated numbers of the identity and distribution of pollinators (**Activity 9.1**). Publicity in India is on track but in the UK we need a more developed outcome to interest the press and we anticipate being able to do this within the calendar year. One scientific publication has been submitted to *Apidologie*, it has been reviewed and corrections

have been submitted. A copy of the manuscript is available on request. BM, PB and Priyadarshini Chakraborti Basu – PCB (Research scholar in the CPS) attended the *Pollinators in Agriculture* conference in Brussels organised by the Agricultural Ecology Group of the British Ecological Society (represented by BS) and the Association of Applied Biologists (AAB)(**Activity 9.2**). PB and PCB both delivered presentations on which BS was co-author.

- *Monitoring framework for pollinators established:*

There are now 15 long-term monitoring stations established in both Orissa and Tripura. The rural advisors and farmers set and collect pan traps on a monthly basis. The material is part processed at the field stations before being sent to the CPS in Kolkata for further processing and storage. Bees are pinned before identification takes place, by-catch is stored in alcohol until further resources are available for processing. There is a rigorous GLP in place and samples are stored according to best practice. This was inspected by BS in September 2013 and by SR in January 2014, both were satisfied. Appreciative evaluation of Research Fellows took place according to our PME framework (see section 6 below and PME materials in Appendix 6) and training took place at the CPS and informally in the rural areas (Appendices 5.3, 5.4 and 5.5). Our assumptions hold this year i.e. the Research Fellows and Research Assistants remain and enthusiastic and in post and the local community is sufficiently engaged (see SC and PB reports).

- *Base-line information regarding pollinator diversity in the east Indian states of Orissa and Tripura*
- *Assessment of key pollinator species and determination of their ecological requirements*

Base-line information has been collected. The CPS staff are engaged in processing material. There is an on-going challenge in that the Indian pollinator fauna is not well known and there are few keys or experts to resolve taxonomic issues. The staff have done an excellent job of identifying bees to family and this capacity was greatly enhanced with a 5 day workshop run by Stuart Roberts. His assessment of Research Fellows and the condition of the database is located in his report (Appendix 3.2). Experimental work is continuing, one manuscript has been submitted to *Apidologie*, "Pesticide induced oxidative stress in laboratory and field populations of native honey bees along intensive agricultural landscapes in two Eastern Indian states." It has been reviewed and corrections have been submitted. A copy is available on request. We await the final decision. Supratim Laha is engaged in determining the relationship between pollinators and non-crop species, his work is proceeding well and BS and SR monitor his progress via communication in a closed Facebook group where he is able to post images.

- *CPS and satellite field centres established acting as data collection centres and advice and outreach to local farming community.*

The CPS and satellite field centres established. CPS is beginning to serve as a hub for pollination ecology in Eastern India. WWF approached the CPS to design experimental work to assess the ecological impact of introducing of *Apis mellifera* as an alternative source of income for wild honey collectors in the Sundarbans. This work is likely to go ahead in 2015 (see PB report Appendix 2.1). The field centres are functioning as data collection centres as evidenced by the data collected. CPS staff give informal advice and outreach to the local farming community to the best of their ability with the information they have (Photographic evidence in the Gallery of Images), for example on how to monitor pollinators and how to set pheromone traps to control *Leucinodes orbonalis*, a common pest. Towards the end of 2014 project activities are likely to have considerably strengthened the evidence-base for the impact of agricultural practice on pollinators, increased CPS staff capacity to give advice on the ground and consolidated information on pollinator species distribution, however, we have no continuation funds beyond 2015 and our assumption that securing funds due to difficult economic situations still holds.

- *Local engagement and increased capacity among farmers to manage pollinator populations:*

Farmers are engaged in the process as indicated by their interest in being involved in the surveys that were carried out in February 2014 (Appendix 5.2). Many of them have attended training (Appendix 3.4). We continue to work with the Govt, of Tripura agriculture and Biotechnology departments to help farmers manage their inputs but we are still developing

pollinator friendly practices which must be tested before being rolled out. In Orissa we are still engaged in raising awareness of the importance of pollinators as in general the farmers in Orissa are less well informed than those in Tripura. Our assumption that local communities remain receptive to project initiatives currently holds true. The calendar and pollination booklets have been well received.

3.2 Progress towards the project Purpose/Outcome

To improve national and local understanding of the status of native pollinators, their ecology and their management for the benefit of local farming communities and the protection of the agro-ecosystem in partnership with Calcutta University, local government and local civil society organisations.

We now have an effective long-term monitoring (LTM) scheme in place with 30 locations across our two focal regions. Some initial analysis has been done and further is underway. There are Indian field surveyors (field assistants) and advisors in place at the field centres and they currently advise farmers on monitoring pollinators and also identify insects that the farmers bring them to tell them whether they are pests or beneficial. Initial results from the LTM were presented at the BES /AAB *Pollinators in Agriculture* conference in Brussels April 2014. These data are available to local partners and we will disseminate in a formal manner later in 2014 when the analysis is complete. This data will give excellent additional information for both local and national understanding of pollinator identity and distribution. We believe we have identified a genus of Hymenoptera new to India (i.e. unknown before) and are now exploring how to best to verify our findings via an international expert in this family of insects. We expect to publish before the end of 2014. The Research Fellows (i.e. PGRA) are gathering information on which are key pollinators and we will be in a position to share this information by the autumn of 2014. Work on the ecology of those species is on-going. Although we will be able to provide some valuable information on autecology of these species there will inevitably be gaps. However we anticipate being able to indicate whether the recorded pollinator species are likely to be impacted by the intensification of farming. Supratim Laha is managing a traits database for plants and pollinators which will provide an invaluable resource for researchers seeking determine the likely effect of any changes in the plant communities on associated pollinating species. We will carry out a final survey to establish attitudes to the conservation of pollinators and their habitat and will compare this to the survey carried out in Autumn of 2013 and January / February 2014. Any improvement in yield or supplementary income from beekeeping will be assessed in structured surveys with farmers. Baseline information has been collected in this way. We are concerned about how representative of pollinator limitation our data is - these concerns are outlined in section 8. The assumptions are still valid, it remains very important that the local administration is supportive and that the field assistants are motivated and there is no social unrest in the area. Fortunately all these conditions are in currently met. Tripura government in particular is very supportive of the project and the Secretary, Department of Science, Technology & Environment, Govt. of Tripura attended our farmer festival in Tripura (see the 'Gallery of Images'). An area in which we currently face challenges is in the development of pollinator friendly farm management practices and this is because the time-frame for our research has proved too short. There was an even larger knowledge gap than we anticipated and the logistics of setting up such an extensive project took us most of the first year. The research to underpin good management needs more time. We aim to do the best we can with the time available and we are actively seeking funds to continue the work in the CPS which is showing enormous promise. We have target list of potential funding sources and the priority in the next two months is to approach these.

3.3 Goal/ Impact: achievement of positive impact on biodiversity and poverty alleviation

Ensure that native pollination systems in eastern India are well understood in order to facilitate the conservation and improvement of native pollination services and protect the ecosystems on which they depend and benefit the local subsistence farming community

We are confident that the project will increase understanding of native pollinator distribution and that this will lead to improved management of pollinators. This is evidenced by the structures for long-term monitoring that we have put in place and publications from CPS (one submitted – manuscript on request, two in draft). However we are less confident that we will be able to

show yield increase in cash terms and this is because the yield of farmer's crops is not only dependent on pollination. Crop yield is a product of the whole system management. For example, we may be able to increase yield via pollination by reducing excessive use of pesticides (potentially) but if this leads to excessive pest damage the increase in yield due to increased pollination will not be evident. Therefore we will be discussing the impact of any changes with farmers in structured surveys to harvest their perception of the impact of interventions on pollinators and their activity. We will assess the value of honey as a supplementary income in areas where bee hives are introduced.

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

We are supporting our partners in achieving CBD targets by, for the first time, identifying key pollinators of subsistence crops in the region and describing their distribution and ecology. This will substantially increase the knowledge base on which to form coherent conservation strategies based on the ecosystem approach. Long-term monitoring has been established at 30 sites which will give a good indication of distribution and pollinator identity as well as trends over time. Three PhD programs have been established, each of which addresses an aspect of the ecology of a suite of pollinators. In particular the project is contributing to India meeting the Aichi Targets by developing a program of research that will contribute to the sustainable management of areas under agriculture, ensuring the conservation of biodiversity (Strategic Goal B; Target 7) and ensuring that ecosystems provide essential services (in this case pollination services), (Strategic goal D; Target 14) - the project research is targeted and aims to produce tangible outputs in the form of advice upon a foundation of an improved evidence base and explicitly target diversity of pollinators and pollination services. The research is now established and currently it appears that these aims can be achieved within the project period, although it is important that the work is continued after the project end to build on the foundations laid by the project. In addition the project will contribute to improving the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, and ensuring this knowledge is widely shared, transferred, and applied by communicating with farmers, scientists and policy makers (Strategic Goal E, Target 19). The long-term monitoring and the research into conservation of pollination services address all of the above. The project is also addressing the following articles (*approach in parentheses*): **7** - ID and Monitoring (*Long-term monitoring at 15 sites in two regions established, the project has set-up a good-practice model for others to adopt*); **12** – Research and Training (*new certificate course in 'Pollination biology and agro-ecosystems' for MSc students; training for PDRF, RF and FA in taxonomy and research methods*); **13** – Public Education and Awareness (*Farmer Festivals, printed material aimed at farmers; articles in UK and Indian press; asked to produce display for Central Park in Agartala on pollinators*); **18**. – Technical and Scientific Co-operation (*Agreement with the Wildlife Institute of India (one of the PhD students is co-supervised from WII); sharing resources (lab space and technical services) with Dept. Agriculture, Tripura; agreement in principle to work with the University of Tripura; Signed MOU with Dept. of Biotechnology in Tripura to share resources and mainstream the outputs from the project*).

5. Project support to poverty alleviation

The project activities are largely based in rural areas where subsistence farmers depend heavily on good crop yields that are relatively stable year on year and the areas in which our project is based are economically deprived.. These farmers are expected to be direct beneficiaries of the project. Pollination services are a key component in a productive agricultural system; the outputs of the project will empower farmers by providing them with more information on pollinators in their landscapes as well as signposts for management of pollinators. It is possible that some of the project activities will yield direct economic benefits. For example where *Apis cerana* hives are introduced, the farmers may derive economic benefits from the products and we will record this. However, the management of pollinators is not the only factor in unstable or declining crop yields. In the long-term, the data gathered by the project and the information shared with farmers is likely, in tandem with other initiative such as good soil management or reduced pesticide loads, lead to better yield, however in the short-term we are unsure whether we will be able to measure the cash increase. This year we have had excellent engagement sessions with the farmers in our areas establishing if vegetable crop yields are changing. There was enthusiastic participation. At these events we distributed the

CPS calendar which contained information on both pollinating and pest species (see appendix**

6. Monitoring, evaluation and lessons

There were two personnel issues in this reporting year. In Annual Report 1 we indicated that r Mahua Ghara (MG) had decided to resign as Post-Doctoral Project Manager. There was a formal handover meeting. We recruited anew Project Manager Soumik Chatterjee, however he had not formally completed his PhD and was therefore not permitted the full salary under University rules. Dr Parthib Basu (PB) was keen to appoint SC and BS was in agreement therefore we came to the following arrangement. SC was to work part-time until his PhD was formally ratified. The remaining salary would be paid to three members of staff, Kaberi Samanta, who carried out the GIS work to produce the land sector maps (Appendix 1.2); Arpan Parui, who led the development of the insect identification and carried out the work for CPS and Aditi Dutta who was trained by Arpan and is currently taking on more of the insect sorting and identification. This work has been invaluable and would have been part of the project manager's role, although we added value by employing individuals with particular skills and aptitudes for these tasks. SC meanwhile took on the remaining part of the Project Manager role which was to establish what had happened in the final months of MGs tenure, take remedial action where necessary, manage the PhD students, develop the field station, the network of long-term monitoring sites, establish a functioning rural advisor system and further develop contacts in Orissa. SC has achieved all this and his report is appended as evidence (Appendix 2.3). Dr James Cresswell, who was acting as scientific advisor to the project was unfortunately taken ill just before he paid his annual visit to India (July 2013). He has remained unwell and has effectively withdrawn from the project although we remain open to his further involvement should he recover. BS is in contact with Exeter University and r BS has taken over the majority of his role with SR supplementing where necessary.

PME Report

By Dr John Mauremootoo

The project PME system was developed in November 2012 through a participatory process involving the project core team (Barbara Smith, Parthib Basu, John Mauremootoo and James Cresswell). The output of this has been the Darwin Initiative CPS planning monitoring and evaluation system manual, first drafted in March 2013 and regularly updated since. The system could not be operationalised immediately for several reasons including the following: limited ownership – not all members of the CPS were involved in the development of the system, limited understanding – most CPS members were not aware of fundamental PME concepts (e.g. the differences between activities, outputs, and outcomes, the difference between a vision and mission etc.), and limited experience - many CPS members had not previously been directly involved in the implementation of PME systems.

So it was essential to conduct in-house training with CPS staff to tackle these issues. On 3 May 2013 JM led a webinar with the objective of enhancing the awareness of the CPS research staff in fundamental PME principles and how they are being applied in the Darwin Project in general and their work in particular. This process improved understanding levels but additional training and mentoring was required. A CPS planning monitoring and evaluation seminar was held on 3 October 2013 in the University of Calcutta. A slimmed down version of the material presented in the seminar has been uploaded to Slideshare (<http://slidesha.re/JMxPRn>). The seminar was augmented with one-on-one sessions on the maintenance of monitoring journals.

An improved understanding of the need to provide regular documentary evidence of activities and outcomes did not initially translate itself into real-time monitoring and consistent submission of monitoring journals by the CPS team. This was addressed in BS's country visit in February 2014 when she worked intensively with the CPS team to help them complete their daily activity logs and translate this information into monitoring journals. The result has been a much improved information flow. This improvement has made information much more accessible for reporting purposes. Reporting, from most CPS staff, however, is largely at the activity level. The links between activities outcomes and methods to document outcomes will be addressed in JM's next visit to India in September 2014.

One method of "harvesting" outcomes, among other things, is Appreciative Inquiry (AI) - an organisational development paradigm that focuses on what is working ("positive deviances") as a foundation upon which to build good practice. In October 2013 JM led a series of "appreciative interviews" with CPS staff to discover what they most valued in their work and in

the group and what wishes they had for their future and that of CPS. The introduction of the AI process to CPS was opportune as it was a time of uncertainty coming shortly after the resignation of the previous PDRF. It helped the group to feel proud of what they had achieved to date and help the new PDRF to understand the strengths of the group and their aspirations. The report of the appreciative evaluation of the field and University of Calcutta staff is appended. JM led a seminar introducing appreciative enquiry and its possible use for the CPS. A slimmed down version of the material presented in the seminar has been uploaded to Slideshare (<http://slidesha.re/1aB1bcl>). A blog posting on the use of AI the CPS - Appreciative Inquiry: A cure for the fear of sandwiches - was posted on the CPS Website (<http://cpscu.in/?p=728>). It is planned to continue to use this approach in CPS in September 2015 when we will conduct an outcomes evaluation of project achievements to date.

Comments from Barbara Smith

The development of PME within the project has been very helpful. CPS staff now use the templates developed and this makes monitoring and evaluating their progress much easier. It has also benefited me as Project Leader as I now also use techniques that I learned during this process to manage projects more effectively. The Research Fellows learned that working hard does not necessarily mean working effectively. By assigning the work they do to outputs and outcomes this link is now clearer and they appear to be more focussed in their efforts although there are still opportunities for distraction which need to be managed. SC has done some good work in this area and the junior staff now give him regular work plans and progress reports. The PME manual, the templates that staff use and the user guide are located in Appendix 6.

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

We responded to the recommendations of the reviewer of our Annual Report (no.1) in a separate note and in our half year report. The project partners acknowledged that the reviewer's comments were valid, appreciated the feedback and have born those comments in the last year. The reviewer requested that we make clear in all further reports how we are contributing to India meeting its obligations under CBD (see Section 4) and to show how that the Darwin Initiative is being recognised on project materials and at project events (see Section 10).

8. Other comments on progress not covered elsewhere

Supratim Laha (SL) refined his PhD protocols to better understand the relationship between crop pollinators and wild plants. The major concern is that none of the PhD students will be in a position to submit their PhD thesis by the end of the project. The supervisory team feel confident that Pushan Chakraborty (PC) will be in a position to submit his '5000 words' which is the first stage of submission, however complete submission is a lengthy process slowed by extensive bureaucracy and is very unlikely. Arnob Chatterjee (AC) is now progressing well but was slow to start (see Annual Report 1), therefore he is likely to submit after PC, however the work the students are delivering is yielding interesting results (data is uploaded onto a secure shared drive and the quality of the data submitted is an improvement on that submitted by March 2013) and it is highly likely that they will each submit some work for publication before the end of project. See PB's report for further details. We anticipate that all three students will successfully complete their studies but, in a system that usually allows five years for a PhD, submission within three years is challenging. However, we underline that PC may come close to doing so and that this would be an enormous achievement on his part. The priority for BS and PB is to secure funding beyond the life of this project. The project has laid excellent foundations but we need to find continuation funds. We submitted a concept note for the EU – India Research and Innovation Partnership (<http://www.india-platform.org/events/details/464>) in collaboration with University of Cambridge and University of Wageningen and are awaiting a response. Our next step will be to approach the following: 1. University Grants Commission, Govt. of India; 2. Govt of Tripura; 3. FAO; 4. UNDP small grants programme. BS has written to Barbara Herren at FAO to begin enquiries.

9. Sustainability

The project and the progress it has made has evoked considerable interest in the country. In the two states where the project is being carried out the government has been enthusiastically supportive. In Tripura the government has signed an MoU with CPS to promote on pollinator friendly farming practices. The project has also caught attention of other institutions and

persons working in similar area. PB has been invited by the Kerala University (Formal invitation and workshop poster attached) to deliver lectures and field/laboratory lessons in pollinator management in vegetable crop system at a BES sponsored workshop to be held in May, 2014. The Vigyan Prasar, Govt. of India has supported the project by providing grant to develop promotional materials. Department of Science & Technology (DST), Govt of India is also positively considering another supportive project on pollinator friendly farming in Tripura. PB has received verbal communication from DST that the sanction will come through by May, 2014. PB and BS have also been interviewed in a Bengali television channel and newspapers have reported about the project (PB report Appendix 3.1 video Appendix 7;). The prospect of the project outcomes being adopted by the Tripura Government is bright and PB is actively discussing with the Tripura Government for mainstreaming the project outcomes (evidenced by the minute of such meeting enclosed). The exit strategy is to liaise with boundary and extension partners as described above to ensure we fulfil our project purpose and goal. We will also seek funding to support the CPS and its satellite field stations as described in section 8.

10. Darwin Identity

All buildings (CPS and field station); banners at farmers meetings; website; documentary; calendar; booklets and presentations are branded with the logo. On all press releases and articles published the following boiler plate is appended: 'Enhancing the Relationship between People and Pollinators in Eastern India, is a DEFRA Darwin Initiative Project (No. 019-24). The research partners are the Game & Wildlife Conservation Trust (UK), Calcutta University (India), Exeter University (UK) and Inspiral Pathways (UK). Funding has been provided by DEFRA Darwin Initiative (UK), The Department of Science and Technology (India) and Calcutta University'. Anyone who has had contact with our project will be clear that it is a Darwin Initiative project and will understand that this is a UK funded initiative to protect biodiversity and promote sustainable livelihoods. UCal, the Govts. of Tripura and Orissa were previously aware of DI but now have a much better understanding of it. In February 2014 BS gave a talk on the DI in general followed by a detailed talk on our DI project in Tripura for MBB College, Agartala 'Darwin Day' (see Appendix 11).

11. Project Expenditure

Explanatory notes. As agreed with LTS 1) BS took over JC's role for the last three quarters of the year. Therefore the salary and OH due to Exeter were transferred to GWCT. The excess in Exeter OH was spent on project development and a partner visit in the UK as agreed with LTS using a change form. The role of Tripura Advisor was taken on by Dr Baharul Islam (Joint Director of Dept. Agriculture, Tripura Govt.) at no cost and these funds were transferred to field work, travel and subsistence in the host country, also agreed with LTS.

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

Project spend since last annual report	2013/14 Grant (£)	2013/14 Total actual Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below)				
Barbara Smith			0	
James Cresswell			0	
Post-Doc RA			0	
Tripura Research fellow				
Orissa Research fellow			0	

Tripura Advisor			100	Spent under Field work travel and subsistence. See below.
Orissa Advisor			0	
Field assistants			0	
Field assistants			0	
Field assistants			0	
Consultancy costs John Mauremootoo Taxonomy and extension advice Taxonomy Project coordination Host Country			0 <1% 0	
Overhead Costs GWCT OH Exeter OH Balance of EX OH University Calcutta Office rental, heating etc			0 0 <1% 0 0	
Travel and subsistence International Travel (UK)			-5.8	Spent less than expected on national travel but this is offset by the increase in International Travel Some of this difference is due changes in the value of the rupee.
National travel (UK)			50.7	
International Travel (India)			3.2	
National Travel (India)			21.45	
Field work travel and subsistence Tripura rural advisor renumeration incorporated			<1%	
Operating Costs Conferences (UK) Conferences, workshops and seminars (India) Conferences India			0 6 18.2	
Capital items (see below)	N/A	N/A	N/A	

Others (see below) Consumables Payment to CPS (due to rupee variation, to be retained against future changes in favour of the rupee)				
TOTAL				

Highlight any agreed changes to the budget and explain any variation in expenditure where this is +/- 10% of the budget. Have these changes been discussed with and approved by Darwin?

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

I agree for the Darwin Secretariat to publish the content of this section (please leave this line in to indicate your agreement to use any material you provide here)

We have established and collected data from the first long-term monitoring programme for pollinators in India. Furthermore the local communities are involved in collecting the data and the local governments are supportive of the activities. It is an excellent example of a participatory research programme. CPS staff are now documenting a pollinator fauna about which very little is known.

The Government of Tripura has been exceptionally supportive. The Department of Biotechnology, Govt. of Tripura has shown active interest in the project and been collaborating with the CPS in various activities. This engagement with the Department of Biotechnology (DBT), Govt. of Tripura resulted in a 'Memorandum of Understanding' signed on August, 2013 between CPS (Represented by Dr. Parthiba Basu, Director, CPS) and Department of Biotechnology, Govt. of Tripura (represented by the Secretary, Department of Science, Technology and Environment, Govt. of Tripura). According to the MoU both CPS and DBT, Govt. of Tripura will actively collaborate in promoting pollinator friendly farming (introduction of bee boxes and bee hotels). This is an excellent example of developing a sustainable project with legacy.

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

Project summary	Measurable Indicators	Progress and Achievements April 2012 - March 2013	Actions required/planned for next period
<p>Goal: To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but constrained 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>(report on any contribution towards positive impact on biodiversity or positive changes in the conditions of human communities associated with biodiversity eg steps towards sustainable use or equitable sharing of costs or benefits)</p>	
<p>Purpose</p> <p>To improve national and local understanding of the status of native pollinators, their ecology and their management for the benefit of local farming communities and the protection of the agro-ecosystem in partnership with Calcutta University, local government and local civil society organisations.</p>	<p>Provision of information about pollinator distribution.</p> <p>Improved understanding of native pollinator ecology integrated with information on pollinator-dependent crops' pollination.</p> <p>Local people engaged and convinced about need to maintain a healthy pollinator population through conservation of healthy habitat.</p>	<p>30 Long term monitoring (LTM) monitoring stations established</p> <p>Research students trained in sampling and monitoring. Field staff trained.</p> <p>Farmers actively taking part in LTM, festivals and surveys.</p>	<ol style="list-style-type: none"> 1. Long term monitoring to continue. 2. Identify the majority of the collected samples 3. Analyse and integrate the datasets 4. Farmers taking ownership of the LTM.
<p>Output 1. .</p> <p>Monitoring framework for pollinators established.</p>	<p>1. a1 Post-doctoral level Project Manager 2 senior level Research Fellows trained in pollinator survey and ecology, data management and analysis.</p> <p>1.b 4 Field assistants trained in pollinator survey and basic data-entry.</p>	<p>a. New Post-doc manager in place and well established</p> <p>b. All senior research staff underwent training in this period</p> <p>c. Data bases in a good condition and building</p> <p>Field assistants now fully trained in pollinator survey and training farmers themselves.</p>	

	1. c A minimum of 36 enthusiastic members of the local farming community trained in simple survey techniques to enthuse and engage the local community.	An additional 31 farmers trained this year (150 last year). Many of these farmers are now able to run pan traps and train other farmers.
	1. d A network of fixed points and / transects for pollinators at each location in place.	A network of fixed point transects have been set up. Research staff set up long term monitoring sites in Tripura and Orissa.
Output 2. Baseline information	a. Base-line information regarding pollinator diversity in the east Indian states of Orissa and Tripura	Database of base-line information established and data currently being processed and entered.
	b. Assessment of key pollinator species and determination of their ecological requirements.	Experimental work on crop pollinators and the ecology of key pollinator underway (PhD Arnob Chatterjee). Experimental work on plant pollinator networks underway (PhD Pushan Chakraborty). Experimental work on pollinators and non-crop plants being carried out (Supratim Laha).
Activity 1.2 Farmers' awareness cum training camps on long term monitoring and importance of pollination in agro-ecosystem		
Output 3. CPS and satellite field centres established. CPS acting as a hub for pollination ecology in Eastern India and the field centres acting as data collection centres and advice and outreach to local farming community.	a. CPS integrated into the Centre for Modern Biology at Calcutta University.	Formally integrated/
	b. Future funding for field centres established.	Funding for field stations not yet secured from Govt. of India – funding is being actively applied for. Govt. of Tripura indicates it may continue with LTM after the project end.
Output 4. Local engagement and increased capacity among farmers to manage pollinator population.	a. Functioning advice service at CPS field centres established.	4 farmer events organised.
	b. Advisors employed and trained.	New advisory structure in place and working successfully.

Annex 2 Project's full current logframe

The project logframe remains unchanged from the original application

Annex 3 Standard Measures

Table 1 Project Standard Output Measures

Code No.	Description	Year 1 Total	Year 2 Total	Year 3 Total	Year 4 Total	Total to date	Number planned for reporting period	Total planned during the project
Established codes								
	Training Measures							
1a	Number of people to submit PhD thesis	0						2
1b	Number of PhD qualifications obtained	0						0
2	Number of Masters qualifications obtained	3 training – not yet graduated	14			14		9 (3 each year)
3	Number of other qualifications obtained							
4a	Number of undergraduate students receiving training							
4b	Number of training weeks provided to undergraduate students							
4c	Number of postgraduate students receiving training (not 1-3 above)	5	1			6		3 each year
4d	Number of training weeks for postgraduate students	24	24			48		36 (12 weeks each year). Students continue to be involved in field projects post training.
5	Number of people receiving other forms of long-term (>1yr) training not leading to formal qualification(ie not categories 1-4 above)	4 field assistants	4 field assistants			4		2
6a	Number of people receiving other forms of short-term education/training (ie not categories 1-5 above)	150 farmers	31 farmers			181		36
6b	Number of training weeks not leading to formal qualification	4	2			6		4
7	Number of types of training materials produced for use by host country(s)	3	1(extra)			4		4
	Research Measures							
8	Number of weeks spent by UK project staff on project work in host country(s)	14 weeks	11 weeks			25		11 weeks per year
9	Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country (s)	Not yet done	0					2
10	Number of formal documents produced to assist work related to species identification,	1 in pre-press form. To be	4 in 3 languages			4		4 in 3 languages

	classification and recording.	published this year.					
11a	Number of papers published or accepted for publication in peer reviewed journals	1	1 submitted. 3 in prep			2	3 in three years
11b	Number of papers published or accepted for publication elsewhere	1	2			3	6 in three years
12a	Number of computer-based databases established (containing species/generic information) and handed over to host country	1 LTM	1 plant / traits				2
12b	Number of computer-based databases enhanced (containing species/genetic information) and handed over to host country						
13a	Number of species reference collections established and handed over to host country(s)	1 established	1 extra in prep - herbarium			2	2 in three years
13b	Number of species reference collections enhanced and handed over to host country(s)	0					2 in three years
	Dissemination Measures						
14a	Number of conferences/seminars/workshops organised to present/disseminate findings from Darwin project work	None so far					2 (1 in Uk 1 in India) over three years
14b	Number of conferences/seminars/workshops attended at which findings from Darwin project work will be presented/disseminated.	2	2			4	4 in 3 years
15a	Number of national press releases or publicity articles in host country(s)	0					3 over 3 years
15b	Number of local press releases or publicity articles in host country(s)	1 in Orissa	1 Tripura			2	3 over 3 years
15c	Number of national press releases or publicity articles in UK	1				1	3 over 3 years
15d	Number of local press releases or publicity articles in UK	1	0			1	3 over 3 years
16a	Number of issues of newsletters produced in the host country(s)	Not achieved.	0				1 per Qtr.
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				1	1
17b	Number of dissemination networks enhanced or extended	0					1
18a	Number of national TV programmes/features in host country(s)	0	1			1	2
18b	Number of national TV programme/features in the UK						1

18c	Number of local TV programme/features in host country	1 to be telecast in May, 2013 PB and BS	1 Tripura			2		3
18d	Number of local TV programme features in the UK							
19a	Number of national radio interviews/features in host country(s)							1
19b	Number of national radio interviews/features in the UK	Not achieved						2
19c	Number of local radio interviews/features in host country (s)	1 PB in All India Radio				1		2
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)	£ 9500						£9500
21	Number of permanent educational/training/research facilities or organisation established	1 CPS 2 field stations						1 CPS established 2 field stations as temporary training and facilitation centres
22	Number of permanent field plots established	7 field plots apart from 24 LTM plots	30 LTM plots now established			30		At least 11
23	Value of additional resources raised for project	Grant from Govt of India for creating dissemination materials worth £11026	£20,903 See Appendix 8 Co-finance			33,9029		£114,477 in three years
New - Project specific measures	Rural Advisory							Rural Advisory in Odisha restructured without any additional cost. Instead of one Rural Advisor, the out lay is divided between three advisors at each node of the intensification gradient and another person to liaison between them. This seems practicable due to the ground socio-political situation.

Table 2 Publications

Type (eg journals, manual, CDs)	Detail (title, author, year)	Publishers (name, city)	Available from (eg contact address, website)	Cost £
Booklets (3) educational on pollinators and pollination. Aimed at farmers * Pages shown in the Gallery of Images	Published and authored by CPS 2014. 3 languages	CPS	Soumik Chatterjee	Free
Calendar with information on identifying pollinators* Hard Copy sent to LTS. More on request. Page shown in the Gallery of Images	Published and authored by CPS 3 languages	CPS	Soumik Chatterjee	Free
Film on CD* Added to dropbox for this report	Pollination crises and CPS's research	Vigyan Prasar and CPS	Soumik Chatterjee	Free

Annex 4 Onwards – supplementary material (optional but encouraged as evidence of project achievement)

All supplementary material has been uploaded into a dropbox for inspection – link sent to Eilidh Young, documents cited in the text.

13. Appendix 1 Project location

Appendix 1.1 Project location

Appendix 1.2: Sampling location examples

14. Appendix 2 Staff activities

Appendix 2.1 Skype communications log

Appendix 2.2 a) CPS constitution

Appendix 2.2 b) CPS syndicate

15. Appendix 3 Staff reports

Appendix 3.1 Dr Parthib Basu's report

Appendix 3.2 Stuart Roberts Report

Appendix 3.3 Soumik Chatterjee's report

Appendix 3.4 Arnob Chatterjee Farmer training report

16. Appendix 4 MSc Course information

Appendix 4.1 Course outline

Appendix 4.2 Students enrolled on Pollination course

17. Appendix 5 Evaluation

Appendix 5.1 SR Workshop Evaluation

Appendix 5.2 Farmer survey summary data

Appendix 5.3 AI Interview status

Appendix 5.4 CPS Appreciative interview transcripts(Rural Advisors)

Appendix 5.5 AI seminar evaluation

18. Appendix 6 Project Monitoring and Evaluation

Appendix 6.1 PME Manual

Appendix 6.2 Journal template and User guide

Appendix 6.3 Outcome Tracking form

19. Appendix 7 Video material

20. Appendix 8 Co-financing

21. Appendix 9 Media and dissemination

22. Appendix 10 Gallery of Images

23. Appendix 11 Additional evidence

Checklist for submission

	Check
Is the report less than 10MB? If so, please email to Darwin-Projects@ltsi.co.uk putting the project number in the Subject line.	Yes
Is your report more than 10MB? If so, please discuss with Darwin-Projects@ltsi.co.uk about the best way to deliver the report, putting the project number in the Subject line.	To drop box - agreed
Have you included means of verification? You need not submit every project document, but the main outputs and a selection of the others would strengthen the report.	yes
Do you have hard copies of material you want to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number.	no
Have you involved your partners in preparation of the report and named the main contributors	yes
Have you completed the Project Expenditure table fully?	yes
Do not include claim forms or other communications with this report.	