Darwin Initiative
Final Report

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 and Wildlife Conservation Trust
Partner Institution(s)	University of Calcutta, University of Exeter
Darwin Grant Value	**£271,258**
Funder (DFID/Defra)	Defra
Start/End dates of Project	1/4/2012 – 31/3/2015
Project Leader Name	Dr Barbara Smith
Project Website	www.cpscu.in
Report Author(s) and date	Barbara Smith, Parthib Basu, Soumik Chatterjee, John Mauremootoo

1 Project Rationale

The project was centred at Calcutta University in the state of West Bengal, Eastern India where we established a Centre for Pollination Studies (CPS). Two rural field stations, managed by the CPS, were established, one each in of the states of Tripura and Orissa (Odisha) (Figure 1) respectively. A monitoring programme was established at 15 sites in each state. The sampling locations in each region are shown in Figures 2 and 3 respectively.

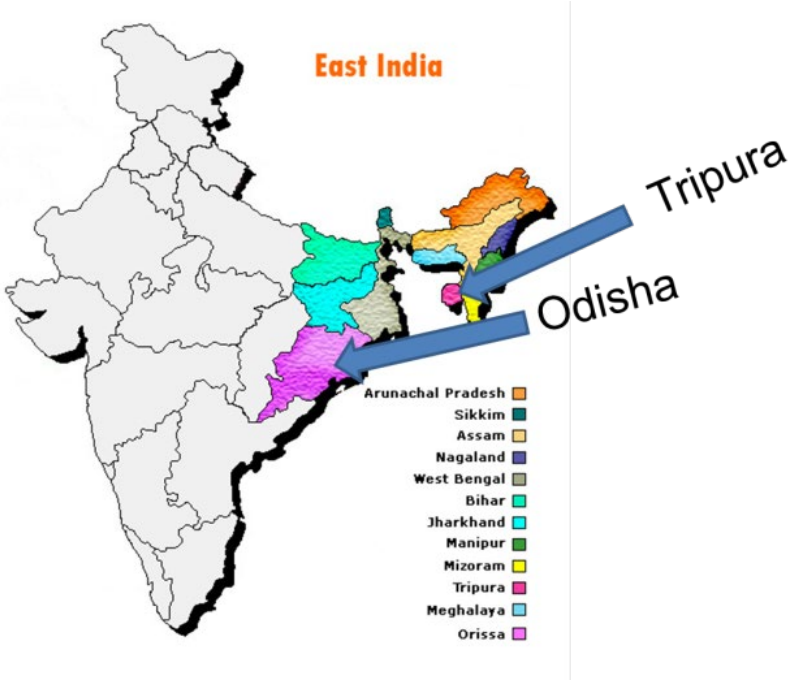

Figure1: Location of the Centre for Pollination Studies rural field stations.

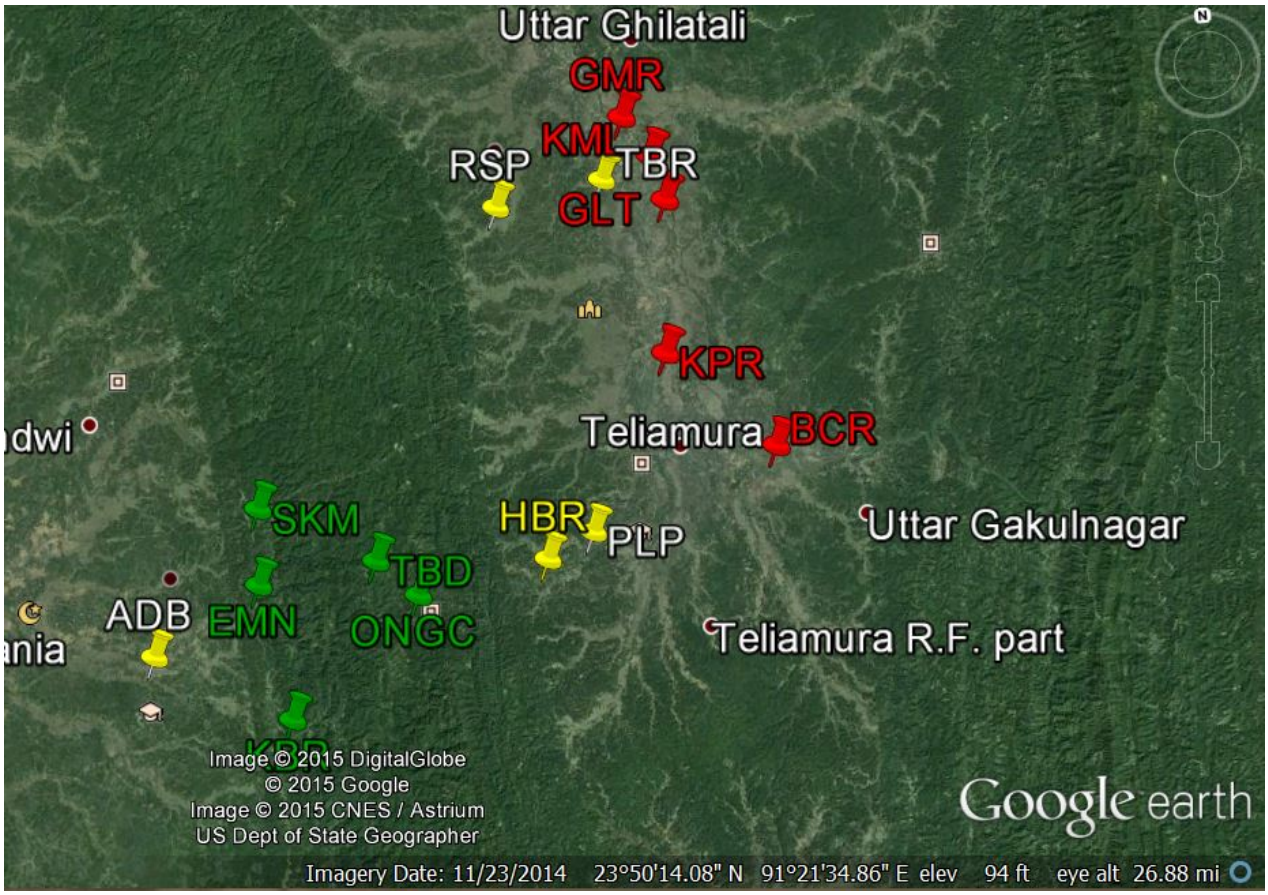

Figure 2: Location of Tripura sampling sites

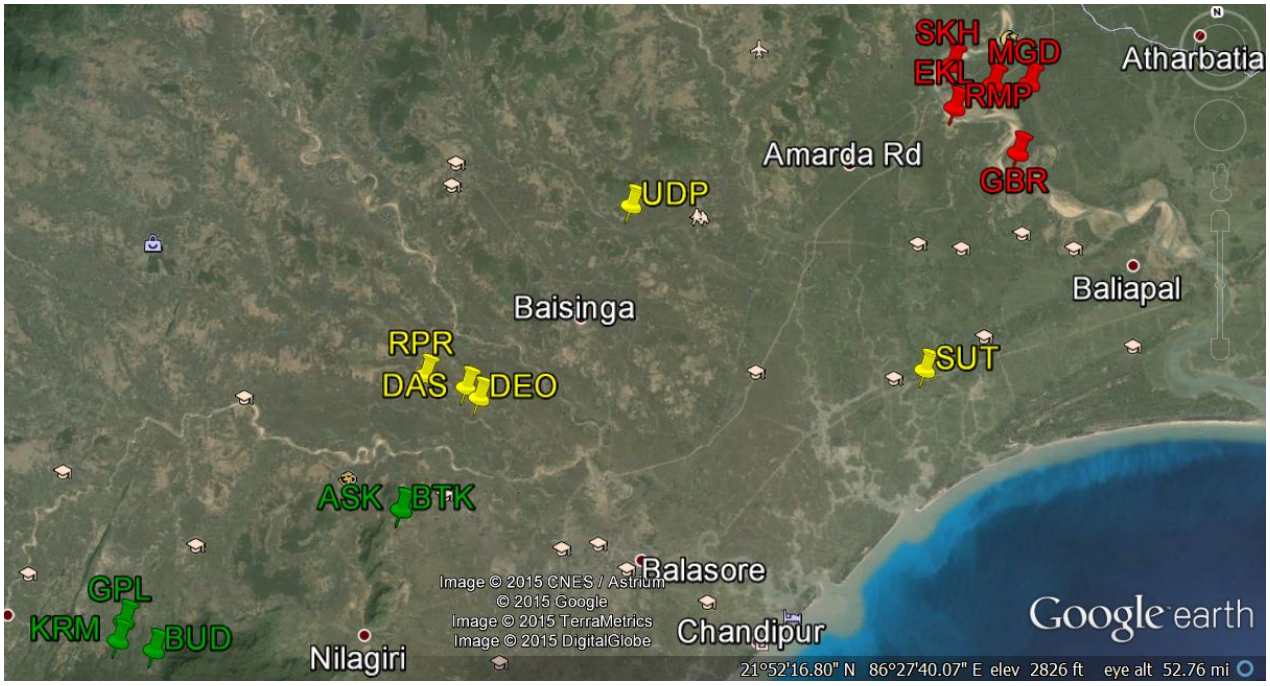

Figure 3: Location of Orissa sampling sites

The project addressed the lack of available knowledge on the status of native pollinators in India, the extent to which they might be declining and the consequent effects on vegetable yields and farmer wellbeing. It also addressed the lack of capacity among farmers to increase and conserve pollinators in order to benefit from managing pollination services.

India is still predominantly an agrarian country with large numbers of small and marginal farming communities whose food security depends on the sustained availability and quality of local crops, particularly legumes and vegetables such as gourds, pumpkins, and brinjals. These crops are pollinator-dependent. Consequently these communities rely on a healthy ecosystem to provide pollinators, which are largely wild insects.

Indian farming is becoming increasingly intensive, which threatens the natural vegetation that provides wild pollinators, yet subsistence farming remains important. Research undertaken before our project revealed a declining yield in pollinator-dependent crops in India, which was considered likely to be due to adverse impacts on the natural pollinator populations (Basu and Bhattacharya, Unpublished; http://www.bbc.co.uk/news/science-environment-11418033). Our project addressed these gaps in knowledge and practice associated with the adequate pollination of key vegetable crops.

It was also evident that farmers receive patchy advice on sustainable farming, much of it coming from representatives from agro-chemical companies rather than independent advisors. One aim of establishing the Centre for Pollination Studies (CPS) was to address this gap in independent advice for sustainable management of pollination services.

The biodiversity challenge: The project focused on pollinating species in India, particularly bees. There were huge gaps in knowledge including: pollinator identity, pollinator distribution and information on which are the most effective pollinators of crops. In addition it was suspected that the few collections held nationally were not curated to an international standard, a situation which has latterly been implicated in the reluctance of international taxonomists to loan type material. This hinders Indian scientists in developing collections and carrying out studies on crop pollination. Our project aimed to set up a centre for excellence for pollinator taxonomy, focussing on bees in agro-ecosystems, with a well curated collection of pollinating insects and staff trained to an international standard. The project also aimed to build good relationships with international taxonomists in order to collaboratively resolve issues around specimen identification.

The project aimed to provide the base-line information on the diversity and abundance of pollinators which is critical for their conservation and sustainable use (**CBD Article 7a,b**) and to identify processes or activities which could have significant adverse impacts on the same **(7c)**. The long-term data set created was to be a resource to support those devising conservation strategies (**7d**). The research element aimed to directly investigate the ecology of pollinators about which little is known, this information will facilitate the conservation of a diverse pollinator community (**12a,b**) and result in a centre of expertise to be of long-term value. The project was also designed to build capacity among farming communities to appreciate the importance of pollinators in their own lives and was designed to encourage a positive attitude to pollinator conservation and conservation of natural pollinator habitat (**12b, 13**). Furthermore this project was designed to investigate ways of conserving pollinator abundance by developing innovative solutions in consultation with stakeholders including the farming community and to encourage the use of pollinator friendly farming.

- For DFID funded projects, what poverty challenge was the project designed to address?

N/A

These challenges are at the heart of enhancing host-country capacity to conserve pollinator diversity and the associated ecosystem service function that underpins food security. It is a clear demonstration of the connection between biodiversity and human livelihood; the conservation of pollinator diversity has a potential to lead to poverty alleviation. One of the most important long-term benefits envisaged were the improved skills and knowledge of the people trained as part of the project to build a substantial body of knowledge on pollinators and pollination in agricultural systems and on ways to manage farming to support pollination services.

The challenge is relevant to a range of people, including:

- Farmers growing pollinator dependent crops and trying to engage in sustainable farming

- Conservationists seeking to conserve and restore diversity
- Scientists studying pollinator identity and distribution, the ecology of pollinators, pollination in the agroecosystem and the link between pollinators in the landscape and food production,
- Policy makers seeking to balance food security with biodiversity,

International research had identified that there is a global challenge associated with declining pollinator populations. The local challenge for this project was identified by Parthib Basu in India whose research suggested potential pollination limitation in vegetable crops. His work with subsistence farmers on a National BIOFARM project (http://www.drcsc.org/biofarm/resource.html) supported this. The BIOFARM project, a nationwide trial of integrated farming, also highlighted the need for independent on-farm advice on how to manage pollination services. The lack of curated Hymenoptera (bee) collections was well known in the academic community in both India and internationally.

The project was designed to:

- Establish a Centre for Pollinator Studies (CPS) as a focal point for expertise to enhance capacity, nationally, to make informed conservation decisions based on scientific data and enhance awareness among the farming communities and those who directly benefit from pollinator diversity.
- To establish a facility for processing and curating collections of pollinator specimens and develop a centre of expertise for pollinator identification in India.
- Through a programme of research, training and knowledge exchange, develop expertise in a core team of research fellows and field assistants to set-up long-term monitoring and sampling of pollinators and investigate key ecological questions about pollinators and their link to crop production.
- To facilitate partnerships between scientists and farmers to make a lasting contribution to the knowledge of Indian pollinators (i.e. their identity, distribution and ecology) through survey and experimental work.
- To raise awareness and engagement in the farming community about the importance of pollinator friendly farming.
- Through workshops and participatory research to develop capacity in the local communities to make evidence based evidence-decisions on managing habitats for pollinators.
- To bring together key stakeholders (farmers, scientists and policy makers) who have not historically worked in partnership in these regions and to form strong links to enable them to work together in the future.

The project aimed to provide a mechanism, previously unavailable, for the national Department of Science and Technology to provide support for the subsistence farming community and this mechanism will remain in place after the project end.

2 Project Achievements

2.1 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.

National and local understanding of the status of pollinators, **their ecology and management** has been improved by work done by the Centre for Pollination studies (CPS)established at Calcutta University (an original verification substantiated by an MoU located in Appendix 1) by the project. A centre of expertise has been developed at the CPS with staff trained in pollinator survey, sample processing, specimen preparation, curation and

identification. The verification of its existence is confirmed by the official documentation in Appendix 1. There are two groups of people associated with the Centre 1) those who are directly employed by the Darwin Project 2) those who have become associated with the CPS since its establishment and have both contributed to the development of the Centre and also benefited from its development (Table 1). A strong team delivered this improved understanding through:

- The pollinator monitoring scheme established in Orissa and Tripura by a network of individuals (including farmers) trained in pollinator monitoring (verification). This has provided information about pollinator identity and distribution (an indicator) which is verified by a database of information which is available for inspection and an extract of which is in Appendix 2.. The monitoring has revealed excellent data on the diversity and distribution of pollinators (see Table 2). The monitoring also uncovered one family of bees previously unrecorded in India (Ctenoplectra) and another species that is almost certainly new to science (*Camptopoeum* sp.) This is to be verified by international experts and the license to export it to them has been applied for. Further evidence for this work is given in a presentation given to a UK-India Agroecology Initiative (Parui & Dutta, Appendix 3). This knowledge is being shared via workshops and conferences both nationally and internationally (example presentations in Appendix 3). The quality of the work is confirmed by Staurt Roberts in his report (Appendix 2).

Table 1. Staff and their role in the Centre for Pollination Studies

ROLE IN CPS	DIRECT	ASSOCIATES
Post-Doc manager	1	0
Research Fellows (Staff)	3	3
Collections manager	1	1
Rural advice staff (Based at field stations)	6	0
Field Assistants (Based at field stations)	6	0
Of these….		
Staff trained in pollinator survey	16	3
Staff trained in general lab craft and identification skills	5	4
Staff trained in field craft	16	0
Staff trained in taxonomy	1	1

Table 2. Number of bee species recorded during pollinator monitoring

PLACE OF COLLECTION	FAMILY	GENUS	SPECIES
Tripura	5	16	63
Odisha	4	15	32

Information from the database is available on request via the project website (in this way the data-base is publicly available, this was an original verification measure). Provision of information is also verified by the employment of local Indian field surveyors (now called Field Assistants) and Rural Advisors based at field centres. (confirmation of employment located in Appendix 1) They provided a functioning advisory service which has been **welcomed by the local farming community** who report that it has **benefitted them** by providing information on the difference between beneficial insects and pests and information on which insects pollinate their crops as well as giving them

the facility to identify a number of bee species themselves (verification). This is evidenced via use of the Outcome Harvesting (OH) monitoring tool (Wilson-Grau and Britt 2013) implemented at the end of the project, the output of which can be found in Appendix 2. Local people have expressed their appreciation for the work, one farmer said the knowledge that there are both good and bad insects [beneficials and pests] was the most precious information he could imagine (Appendix 2). Many farmers reported that they felt optimistic about changing practice and that they felt empowered (see documents, Appendix 2).

- Work to **improve understanding of native pollinator ecology** integrated with information on pollinator-dependent crop pollination (an indicator) has been carried out by the research fellows in the CPS. As verification they have each given public presentations (see Appendix 3) and one scholar has published an academic paper with another in press (Appendix 3) while 11 academic papers are either in preparation or planned for the coming year. This work has led to farmers modifying farming practice which will ultimately **protect the resilience of the agro-ecosystem** as the students fed new information into the system via Field Assistants and Rural Advisors. These modifications included using flowering crops to attract pollinators and using less pesticides (see OH harvesting in Appendix 2).
- To implement pollinator friendly farming Calcutta University has collaborated with the government and local civil society. The Directorate of Biotechnology, Government of Tripura signed and an MoU with the CPS in which the government commits to mainstreaming the outputs of this Darwin Initiative project (Appendix 1). Local civil society organisations such as the Panchayat (village councils) in Tripura along with the Farmers Association in Orissa have collaborated with the CPS to implement the monitoring scheme, supporting CPS field research and delivering bee boxes to famers. It would have been impossible to be successful without their support. Details of the bee box distribution can be found in Appendix 2 and the Gallery, Appendix 6.
- Our shortfalls were associated with publication of results in peer reviewed journals which has been delayed due to the length of time it took to establish the complex experimental designs and long-term monitoring in the first year. All staff are on track to publish and the work that has been carried out, however, publication is likely to be delayed for a few months. There are sufficient resources from other sources to allow staff to do this beyond the life of the Darwin project.
- Collation of local understanding and knowledge of pollinators took place in February 2014, see Appendix 3 for a presentation describing the approach and results. Final evaluation took place in an Outcome Harvesting exercise in February 2015.

2.2 Impact: achievement of positive impact on biodiversity and poverty alleviation

The original impact ('Goal') on the application form was: Effective contribution in support of the implementation of the objectives of the Convention on Biological Diversity (CBD), the Convention on Trade in Endangered Species (CITES), and the Convention on the Conservation of Migratory Species (CMS), as well as related targets set by countries rich in biodiversity but constrained in resources.

2.2.1 Biodiversity

The contribution to the *objectives of the Convention on Biological Diversity (CBD) … as well as related targets set by countries rich in biodiversity but constrained in resources*is described below in section 4.1 'Project support to the Conventions (CBD, CMS and/or CITES'. This project did not address the Convention on Trade in Endangered Species (CITES), and the Convention on the Conservation of Migratory Species (CMS).

2.2.2 Poverty alleviation

The project activities were largely based in rural areas where subsistence farmers depend heavily on good crop yields that are relatively stable year on year. These farmers are expected to be direct beneficiaries of the project. Poverty is a multi-dimensional concept that incorporates a range of indicators including income, access to good nutrition, clean water, health and education. The 2014 Economic Survey for Odisha (Orissa) (http://www.odisha.gov.in/pc/Download/Economic_Survey_2013-14.pdf accessed 26/04/2015) shows that while poverty has declined in the state from 57.2% in 2004 – 2005 to 32.6% in 2011-2012 there remains higher levels of poverty in southern and northern regions and in the tribal communities where poverty remains high. Many of the project beneficiaries lived in deprived areas and all were subsistence farmers, growing their own food, this included the larger farmers who sold surplus to the market as a business. The economy of Tripura is characterized by "*high rates of poverty, lower per-capita income, low level of capital formation, in-adequate infrastructure facilities, geographical isolation and communication bottleneck's, inadequate exploitation and use of forest and mineral resources, low progress in industrial field as well as [a] high un-employment problem"* (http://destripura.nic.in/review2010_11.pdf accessed 26/04/2015). Poverty was calculated as 25.7% of the urban population and 41.8% for the rural population the same report.

Pollination is an ecosystem service that regulates crop production and quality. Without adequate pollination services farmers will lack a key component for a productive agricultural system and this negatively impacts nutrition and income. The project worked with farmers to manage pollination services, spread awareness and engage in educational / extension activities so that farmers were provided with information on pollinators in their landscapes as well as with signposts for the management of pollinators. As added value, the project worked with farmers on ways to reduce pesticide use (because this potentially impacts on pollinators) which not only saved on expenditure but empowered farmers with information with which they could manage their pest population independently of commercial companies.

A range of statements was collected from the project that indicate poverty alleviation or indicate that poverty alleviation is a likely outcome from the project in the longer term. In some cases the examples reflect the increased knowledge that participants obtained (also part of poverty alleviation). There were some caveats expressed, farmers were averse to taking risks with their yields particularly in the wealthier areas and they also expressed concerns about the higher costs of organic inputs (see CPS_Next steps xlxs, Poverty Alleviation tab, Appendix 2).

2.3 Outputs

There were four principal outputs laid out in the application

1. Monitoring framework for pollinators established.

Indicators in logframe: Post-doctoral level Project Manager; 2 senior level Research Fellows trained in pollinator survey and ecology, data management and analysis; 4 Field assistants trained in pollinator survey and basic data-entry; a minimum of 36 enthusiastic members of the local farming community trained in simple survey techniques to enthuse and engage the local community; a network of fixed points and / transects for pollinators at each location in place. Verification can be found in Appendix 1, which shows the appointment letters of staff and the network of farmers that have engaged with the project. This work element has resulted in a resilient framework that has both the hard and soft resources in place to continue long-term monitoring in these areas and to serve as a model for other regions.

The monitoring framework for pollinators is in place and continues to function beyond the life of the project. The engine room is the Centre for Pollination Studies (CPS) which has dedicated laboratory space in the Centre for Modern Biology at Calcutta University where academic staff were employed as stated in the log-frame i.e. a Post-Doctoral Project Manager (Soumik Chatterjee), 2 senior level Research Fellows trained in pollinator survey and ecology, data management and analysis (Arnob Chatterjee, Pushan Chakraborty). Additionally one other Research Fellow (SupratimLaha) brought his Fellowship to the CPS and joined as an official member of the founding team. In 2013 Arpan Parui and Aditi Dutta joined the team to process and prepare the insect collections and focus on identification. The result is a collection of

specimens and a pool of expertise that is available for other people wishing to set up monitoring along the same lines. Two field stations were established, one in Tripura and another in Orissa where six field assistants were employed (the employment of two additional field assistants wasf acilitated by local partners), they were Abhijit Majumder, Sampad Saha and Litan Deb in Tripura and Monoranjan Das, Monob Das and Sahadeb Mondal in Orissa. Together the team set-up a network of 30 transects (15 in each state) for long-term monitoring of pollinators, these locations are GIS mapped. Farmers in both Orissa and Tripura have been trained in setting and collecting pan traps, exceeding the number laid out in the logframe (36). In Tripura this is estimated as 250 farmers who have been through the basic training ad would be able to carry out the procedure alone. In Orissa more than 100 farmers (actual number uncertain) have taken part in training and the 15 sampling sites are run by the farmers themselves. Although all names are not known, where possible we have logged these and farmer details are shown in 'Networks.xlsx' in Appendix 2.

2.a. Base-line information regarding pollinator diversity in the east Indian states of Orissa and Tripura

Indicators from logframe: Database of base-line information established; Experimental work on crop pollinators and the interrogation and scrutiny of the database to establish ecology of key pollinators and to determine local pollinator networks.

Verification can be found in Appendix 2 see an extract of the database and student presentations.

- There is now a better understanding of pollinator diversity in these two areas and a total of unique 5770 records as base-line data. This includes one family new to India (Ctenopletra) and one species new to science (*Camptopoeum* sp).

The base-line data from the 30 sampling sites has been collated and data-based. Samples were collected monthly. Samples from 2012 – 2014 have been processed and comprise 3089 records from Tripura and 2681 records from Orissa. The remainder will be processed as the CPS will continue to work on them. In addition a farmer survey (in both Tripura and Orissa) was undertaken to collate local knowledge on local distribution of pollinators and recent trends in abundance. This information has been analysed and the publication is in preparation (B. Smith presentation, Appendix 3). The data has been used in an analysis of the effect of agricultural practice on bee diversity, was submitted to Biological Conservation in December 2014 but rejected and will be resubmitted by August 2015. A ppt. based on this analysis is in (S. Chatterjee, Appendix 3)

2.b. Assessment of key pollinator species and determination of their ecological requirements.

- The key pollinator species of commonly grown crops have been determined and significant progress has been made in understanding their ecology and association with crop and non-crop plants.

Verification can be found in Appendix 3 – presentations by CPS staff and students

We now have a clearer idea of the species on which key crops depend. Arnob Chatterjee investigated pollination limitation in brinjal (aubergine) and mustard and calculated which pollinating species are the most effective (important) pollinators of these crops. His papers are in preparation and he has presented his results to an international audience. His report and presentation can be found in Appendices 2 and 3 respectively. Pushan Chakraborty determined the visitation network of pollinators in commonly grown crops and their local plant communities, he found that the networks in intensively managed agricultural areas were more specialized and therefore less resilient to change that those in less intensively managed areas. This provides us with information which will contribute to determining management options for pollinators. His report and presentation can be found in Appendices 2 and 3. Supratim Laha has studied the role of native plants in providing ecosystem services focussing on both pollinators and also natural pest control agents. His work will be crucial for developing seed mixes and management of semi-natural habitat to promote pollination and reduce pesticide use. His report and presentation can be found in Appendices 2 and 3. In addition there were two PhD scholars associated with the CPS and supported by it who delivered important ecological information on pollinators. Ritam Battacharya identified the five most important

species for pollinating the most frequently grown vegetable crops. This will help target species for conservation efforts. His presentation can be found in Appendix 3. Priyadarshini Chakraborti Basu showed that honeybees exhibit sub-lethal but detectable stress in the presence of pesticides both in the lab and the field. This work has been published in a peer reviewed journal (Appendix 4). She has also shown that pesticides can inhibit olfactory function and this work is currently in press. A ppt. presentation is in Appendix 3.

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.

Indicators from the logframe: CPS integrated into the Centre for Modern Biology at Calcutta University; future funding for field centres established.

- The structure of a central Centre for Pollination Studies and two satellite field stations in Tripura and Orissa respectively was successful. Collaboration with external partners demonstrates that the CPS now acts as a hub for pollination ecology in Eastern India and the field stations act effectively as data collection centres and also provide advice and outreach to the local farming community which is valued by the community.

The structure and establishment of the Centre for Pollination studies is described above under the establishment of the monitoring framework. The verification is located in Appendix 1 (see CPS Syndicate and Constitution). Increasingly people are approaching CPS for advice and the expertise now accumulated in the CPS is of value to the wider academic and conservation community. WWF and the Zoological Society of India have both approached CPS for collaboration on the basis of this expertise (Letter of collaboration Appendix 1). In February the CPS hosted the first UK-India Agro-ecology Initiative (funded by the British Ecological Society) which brought the work of the CPS to the attention of other Universities in India and since then a collaboration between the Agricultural University at Bangalore has been established. The credibility of the Centre is verified by the joint applications that have recently been submitted with the CPS including a successful application for funding to support exploratory work with Coventry University (Appendix 1), a successful Darwin Initiative Fellowship for Dr Parthib Basu, the Centre Director (Appendix 1). There are also three planned applications with UK Institutions: The British Trust for Ornithology; Rothamsted Research; Oxford India Centre for Sustainable Development. In addition the Indian Agricultural Research Institute has indicated esteem by sending a post doctoral scientist for a thee month training programme in the centre. Supporting documents can be found in Appendix 1.

In the regional centres the Field Assistants (Abhijit Majumder, Sampad Saha and Litan Deb in Tripura and Monoranjan Das, Monob Das and Sahadeb Mondal in Orissa) established a field station in each state led by the Research Fellows. After establishment these were largely maintained and run by the Field Assistants. Each field station had a lab in which the first stages of sample preparation were carried out. The professional standard of the stations and the high profile of field assistants in the area led to the stations being seen as hubs for data collection and a source of advice. The provision of advice and community outreach is discussed below.

The CPS at Calcutta University is established within the Centre for Modern Biology with the support of the Vice Chancellor of the University. Funding to continue the work in Tripura is currently being negotiated by Parthib Basu (see Appendix 1). The field station in Orissa will now be funded directly from the CPS via new funding streams that have been obtained (Indo-Norway project, Appendix 1).

4. Local engagement and increased capacity among farmers to manage pollinator population.

Indicators from the logframe: Functioning advice service at CPS field centres established; advisors employed and trained.

- Rural advisors are in place in both Tripura and Orissa and together with the Field Assistants provide advice and outreach which has increased capacity among farmers to manage their pollinator populations and has engaged the local community via farmer festivals, workshops, participatory research and less formal but regular contact. This has resulted in farmers trialling methods to reduce pesticide use and to manage the local environment via flowery strips to enhance pollination.

Verification can be found in Appendix 2, in the results of the Outcome Harvesting along with a report by Arnob Chatterjee on a farmer training event.

The Rural advisory service was adapted to suit the local socio-economic conditions. In Tripura the post of Rural Advisor was taken on by Dr Baharul Islam, the Joint Director of Agriculture who disseminated much advice through Abijit Majumbder who is educated to degree level but remains part of the community. In Orissa three farmers (Rabindra Kumar Majhi, Basanta Biswal, Bhagirath Giritook) took on the role of coordinator and advisor in their respective regions, coordinated by Ashutosh Das. All were trained by central CPS staff by informal training sessions and 'on the job'. The Rural Advisors helped select farmers for participatory roles and worked with famers on managing their land to enhance pollination.

The local people were engaged and convinced about the need to maintain a healthy pollinator population through conservation and we carried out a final evaluation survey to establish community attitudes as a means of verification, the results of which are in the Outcome Harvesting document in Appendix 2 and show clearly that a substantial proportion of farmers who came into contact with the CPS are engaged and convinced. In Orissa, in the Jaleswar environs alone, an estimated 3000 farmers have become aware of the importance of pollinators and pollination because the villagers on whose land the pan traps are located pass on the information to neighbours. In Tripura 450 famers have been in touch with the Field Assistants to ask for information about pollinators and for ideas on how to implement sustainable agriculture. Farmers in both Orissa and Tripura have been using mustard and other flowers as reservoirs crop for pollinating insects and trap crops for pests. Showing that there are improved livelihood conditions for local communities engaged with the CPS is challenging and we used survey to demonstrate this (see CPS Outcomes.xlsx and CPS Next steps.xlsx (poverty alleviation) Appendix 2). Farmers in Orissa reported that since adopting new farming practices as advised by the CPS they have seen a 10% increase in yield, when averaging across all crop types although it is difficult to give a precise estimate. Farmers also report feeling healthier after reducing pesticide use. Pesticide use was associated with a set of specific symptoms that were consistently reported across all sites and in all regions (CPS Next steps.xlsx (pesticides and health) Appendix 2).

The assumptions laid out in the logframe were met.

3 Project Partnerships

The partners were: The Game and Wildlife Conservation Trust (GWCT: Lead Institution); Calcutta University (Lead Partner); Exeter University (Partner); Inspiral Pathways (John Mauremootoo, consultant and partner).

The project was a collaboration between Dr Parthiba Basu at Calcutta University in India and Dr Barbara Smith at GWCT in the UK. The project stemmed from an original need identified by Parthib Basu. Decision making on this project has been entirely collaborative, the CPS is jointly directed by Parthib Basu and Barbara Smith. Communication between the two directors was frequent, in some small way almost daily and all decisions were agreed jointly. Apart from informal contact there were three face-to-face formal planning sessions in each year, one in the UK during Parthib Basu's visit and one during each of Barbara Smith's two visits to India.

UK planning meetings: In year one Parthib Basu visited the UK in November and the project partners (Barbara Smith, (GWCT); Parthib Basu (Calcutta University); James Cresswell (Exeter University); John Mauremootoo (Inspiral Pathways)) met and developed the PME framework for the project (See the PME framework located in Appendix 2). In year two Parthib Basu again visited the UK. James Cresswell was on leave from the project (see below) and Stuart Roberts (an independent consultant in bee taxonomy) took his place. The team developed a framework for the curation of insect specimens which was useful (see SR Workshop Evaluation Appendix 2). In year three Parthib Basu and Barbara Smith met alone to discuss project completion and handover of resources.

Planning meetings in India: The planning meetings in India included all staff and associate staff at the CPS in Calcutta. In addition Barbara Smith and John Mauremootoo (coordinator for the M&E for the project) were present. These meetings comprised an element of reflection on existing work and capturing ideas for the future, see Appreciative interview summary 2014 and 2015 verbatim as well as CPS Next steps.xlsx in Appendix 2.

The partners will keep in touch.

- Parthib Basu, as Director of CPS, has obtained funding to develop a course in Agroecology with the Norwegian University of Natural Sciences on which Barbara Smith is named as adjunct faculty (official documentation in in Appendix 1).
- A Darwin Initiative Fellowship has been obtained by Barbara Smith for Parthib Basu to spend six months in the UK to develop research into natural pest control (official documentation in in Appendix 1).
- Barbara Smith is taking up a post at Coventry University and has obtained an Innovation Grant to support Soumik Chatterjee, the Post-Doc Manager at the CPS for six months to write joint grant applications. One of these will include the Game and Wildlife Conservation Trust as a partner (official documentation is in Appendix 1).
- John Mauremootoo, Stuart Roberts and James Cresswell have all expressed an interest in continuing to work with the CPS and we expect to continue to collaborate.

Challenges

James Cresswell was unfortunately taken ill in the fourth quarter of the first year. He was unable to rejoin the project until the final quarter of the final year. This prevented his involvement in much of the collaborative work however, loose contact was maintained, at least sufficient that James was able to re-engage in the final quarter. Before his departure James had put in place some structure for the PhD students and this made it possible for Barbara Smith to take on his role until he returned.

4 Contribution to Darwin Initiative Programme Outputs

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

We supported 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 substantially increased the knowledge base on which to form coherent conservation strategies based on the ecosystem approach. Long-term monitoring was established at 30 sites which gave a good indication of distribution and pollinator identity and the framework is in place to deliver information on trends over time. Three PhD programs were established, each of which addresses an aspect of the ecology of a suite of pollinators and in this way the project has contributed 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 has contributed 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 carrying out fundamental research and communicating the results to farmers, scientists and policy makers (**Strategic Goal E, Target 19**). The long-term monitoring scheme has and the research into conservation of pollination services addressed all of the above.
The project has also addressed 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 Post-Doc manager, Research Fellows and Field assistants in taxonomy and research methods*)**; 13 – Public Education and Awareness** (*Farmer Festivals, printed material aimed at farmers; informal meetings with Rural Advisors and Field Assistants; articles in UK and Indian press*) **; 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*).

4.2 Project support to poverty alleviation -N/A

4.2.1 Programme indicators

Representation of local poor in management structures of biodiversity To some extent the local poor in both Tripura and Orissa gained greater representation in the management structures of biodiversity through the project. The project had a good working relationship with local governing bodies which represent and listen to the community. In Tripura all the project related activities were in consultation with the local Panchayat Samity (local government body) which represents local people, the majority of whom can be considered to be poor. In Orissa the project worked with the local Farmers Association which represents the farming community. At each stage of the project local people were consulted via these organisations and the people who took part in the participatory components of the project were selected by these local bodies. Any new management structures for biodiversity will be determined with these local bodies and in Tripura particularly the State government is sensitive to the Panchayat. The capacity building nature of the project has led to the empowerment of communities because they now understand the management of pollinators in their respective farming systems, can contribute to any new proposals to manage pollinator biodiversity and can also act autonomously. Some verification that this is so was given by the farmer coordinators and field assistants in the Outcome Harvesting exercise (Appendix 2).

Management plans No formal management plans for biodiversity were developed however action plans were developed and then adopted by State governments. The Darwin Initiative project led to implementation of a Department of Science & Technology, Govt. of India funded project whose mandate is to promote pollinator friendly farming in Tripura (Appendix 1). Farmers will implement a plan to improve pollination services through the introduction of bee boxes (see the report on beekeeping in Appendix 2) and in 2016 will plant pollinator attracting hedgerows in order to conserve and restore pollinator diversity, the seed mixes will be based on data from Supratim Laha's research. The Centre for Pollination Studies (CPS) signed an MoU with the Department of Biotechnology, Govt. of Tripura agreeing to work together to mainstream the outputs of the CPS Darwin Initiative Research. The CPS has now received funding from the Council of Scientific and Industrial Research (CSIR), Govt. of India and is currently distributing bee boxes in Orissa with this. The beneficiaries are being selected in consultation with the Department of Agriculture, Govt. of Orissa and the Farmers' Association (Official agreement Appendix 1). In 2016 farmers will plant pollinator attracting hedgerows in order to conserve and restore pollinator diversity, the seed mixes will also be based on data from Supratim Laha's research.

The participatory nature of the project and the representation of the local poor and women in proposed management structures. These formal actions are the result of a participatory process that was at the heart of the project. Farmers have been consulted all through the process with opportunities for feedback at workshops, festivals and in the surveys. In part this is demonstrated by the involvement of the Panchayat and the Farmer's Association but it is also verified by farmer and advisor responses during the Outcome Harvesting process. The OH results demonstrate the close relationship between the project and the local poor. For example the field assistants reported that '*since working with CPS about 450 farmers in all the Tripura nodes (220 in the high intensity node, 220 in the medium intensity node, and 10 in the low intensity node) have got in touch with the field assistants to ask for information about pollinators and for ideas about how to implement sustainable agriculture'* (Appendix 2 OH Tripura Verbatim 04 CPS team in field stn.). People became more interested overtime, the field assistants also reported that *'the CPS farmer festivals were influential - they [the farmers] got the ideas from there and were very supportive of the events. Before [the events] most farmers did not understand about pollinators and sustainable agriculture and some were rude ("this is bullshit")*(Appendix 2 OH Tripura Verbatim 03). In Orissa most of the farmers were male but in Tripura many of the farmers are female as the tribal communities are matriarchal. Photographs of the famer festivals in Tripura verify this (Gallery: Appendix 6).

Positive gains in Household Income (HH) have not been measured formally. However farmers have given estimates trying to quantify the benefits. In Tripura we received this

response: ‘Since working with CPS the 350-400 farmers that CPS is working with in Teliamura / Krishnapur have increased yields of 20% on average through reduced use of pesticides. For example, in the case of spine gourd if the proper dosage of pesticide is not maintained then 10-20 flowers per plants will die because of overdose of the pesticide – they show signs of burning. It is possible to do hand pollination with large flowers like spine gourd but it’s not possible with Chilli. With bee boxes they have an above 25% increase in chilli yield.’ (Appendix 2 OH Tripura Verbatim 02). Also, since the introduction of bee boxes in December 2014 participating farmers in Teliamura / Krishnapur (10) have found increases in crop quality. Mustard seeds have increased in size and stickiness and spine gourds have benefitted too. [The farmers also say that] pollination also increases fruit size but this is an impression they have … they don’t measure crop size as part of their practice [so there is no quantitative data] Appendix 2 OH Tripura Verbatim 02). However, since working with CPS the 350-400 farmers that CPS is working with in Teliamura / Krishnapur have increased their profits but only slightly as the non-chemical inputs are more expensive than the inorganic equivalents’. Appendix 2 OH Tripura Verbatim 02). In Orissa ‘Since adopting new farming practices the collaborating farmers have seen yield increases of about 10% on average across all different types of crops – brinjal, pointed gourd, tomato, ladies fingers, etc. though it is difficult to give a precise estimate’(Appendix 2 OH Orissa Verbatim 02 Kuldiha) but ‘since adopting new farming practices the collaborating farmers in Kuldiha have seen slight (unspecified) increases in profit though not as much as they would like as there are other challenges beyond pollinators and pest control (Appendix 2 OH Orissa Verbatim 02 Kuldiha).

4.3 Transfer of knowledge

14 students achieved MSc. They were all from a developing country (India), 11 were female and 3 male. **Knowledge transfer has been at two levels.**

1) Project to farmer, see Annex 5: A selection of printed materials were produced to transfer knowledge to famers including a booklets and a calendar that were distributed in both states. Farmer festivals and smaller workshops were used to transfer knowledge directly and included an update of outputs from the projects. A film documentary was made directed at farmers, practitioners and the general public. This was screened at farmer festivals, broadcast on TV and is available on youtube. Parthib Basu gave interviews to the press.

2) Project to scientists and policy makers, see Appendix 3: Scientific talks and presentation of preliminary results has been done at 4 international and 2 national conferences. One paper has been published in peer review journal. Knowledge has been disseminated through Gamewise magazine in the UK (circulation of 22,000, Appendix 4). Policymakers in both Orissa and Tripura have been targeted directly which has resulted in the existing MoUs and agreements.

4.4 Capacity building

Did any staff from developing country partners see an increase in their status nationally, regionally or internationally? For example, have they been invited to participate in any national expert committees, expert panels, have they had a promotion at work?

1. Dr Parthiba Basu, Project Coordinator in India, has been invited to be part of the international discussion group as a specialist in pollination for TESSA, the Toolkit for Ecosystem Services Site-Based Assessment (http://tessa.tools/), led by Southampton University. Since working with CPS, Parthib Basu enhanced his skills and widened his horizons as a research ecologist (AI Parthib Basu). 2. **Dr. Soumik Chatterjee** will be funded as a Post-Doc by Coventry University for six months and will write collaborative grant applications with international partners. **3. Priyadarshini Chakrabarti Basu** received a University Fellowship grant which has been accepted by Dr Geraldine Wright at Newcastle University, where Priyadarshini will spend three months as an intern September –December 2015.This was arranged through contacts made via CPS. (AI Priyardarshi Chakrabarti, Appendix 2). **4.Debaditya Kumar** has been able, for the first time, to organise an international seminar. The seminar on Agroecology took place from February 21-14th 2015. (AI Debaditya Kumar Appendix 2).**5.**Since October 2013 as a taxonomy intern **Aditi Dutta** has improved her taxonomic skills and she is now assistant collection manager and will be funded by Calcutta

University(AI Aditi Dutta Appendix 2). **6 Arpan Parui** has been able to learn a great deal about the taxonomy of bees and other species collected by CPS; he is now Collections Manager and will be funded via the University (AI Arpan Parui Appendix 2). **7**. Farmers in and around the Tripura field sites are giving **Abhijit Majumder** (CPS Tripura Field Assistant) respect (AI Abhijit Majumder) Appendix 2.He has now been retained by CPS.**8**. Farmers in and around the Tripura field sites are recognising **Littan Deb** (CPS Tripura Field Assistant AI Littan Deb Appendix 2) and give him respect. **9.**Family and friends are showing more respect to **Sahadeb Mondal** (Field Assistant/Driver; AI Shadeb Mondal Appendix 2). **9.**Villagers now have much more respect for **Manaranjan Das** and think of him "like another person." He has increased his ability to learn and has improved his time management (CPS Orissa Field Assistant AI Manaranjan Das, Appendix 2). **Gender:** 2 female; 8 male.

The project helped the host country to implement the CBD as described in section 4.1. The development of the Centre for Pollination Studies (see section 2.3.3) has supported the Tripura Directorate of Biotechnology in implementing conservation measures for protecting pollination and has been instrumental in developing the focus on pollination in the Directorate. In Orissa (Odisha) the government has recently come on board and has become involved in encouraging beekeeping. The training that has been developed at the CPS is transferable. Aditi Dutta and Arpan Parui have been assessed by Stuart Roberts who considers them competent to train others in lab craft, sample processing and para-taxonomy which is a resource that could be of great value to India (Stuart Roberts' report Appendix 2). The network of farmers engaged in participatory research and were sensitised to sustainable farming which means that there is a proto-research platform available for other institutions who wish to develop applied research. In the last month of the project the CPS hosted the first UK-India Agro-ecology Initiative which aimed to develop research collaborations between institutions at an international scale. 10 UK representatives from seven institutions met with 37 Indian representatives from 23 Indian institutions. The meeting was a collaboration between the British Ecological Society, the Society for Agroecology in India and the CPS. This initiative is now being taken forward with a virtual collaboration space established and plans for further collaborative meetings (Appendix 5, Legacy).

4.5 Sustainability and Legacy

The Centre for Pollination Studies will continue to function within the Centre for Modern Biology supported by the University while Parthib Basu applies for status as an 'Innovation Centre'. This will institutionalise the Centre and allow Parthib Basu to recruit faculty. Barbara Smith remains as Associate Director. Aditi Dutta and Arpan Parui will be supported by other projects to continue managing the collections in the CPS. Soumik Chatterjee (Post-doc) will be employed by Coventry University until December 2015 to remain at CPS and write three grant applications between CPS and Coventry University, with UK partners to be determined by Barbara Smith and Indian partners to be determined by Parthib Basu (Appendix 1). The Centre has obtained two grants that will sustain it in the interim: 1) 'Action research and education in Agroecology —Cooperation and Comparison' 2015- 2017 (Appendix 1) with the Norwegian University of Life Sciences 2) DST SEED grant (Appendix 1). In Tripura Abhijit Majumder will be appointed under the Indian Government DST SEED project as Field Assistant. In Orissa, Sahadeb Mondalwill be appointed as Field Assistant / Driver in the Indo-Norway project. In addition there have been several partnerships developed between interested parties which are listed the Network excel sheet in Appendix 1.**Impact on policy** The Tripura Government has signed an MoU to agree to implement any outputs of the project in alignment, although there is already in place some legislation to protect pollinators there was no previous action. The Orissa government is also now on board which is an achievement for the project given the low engagement at the outset. Although no new legislation is in place there is a new interest among officials which we interpret as 'proto-change'.

5 Lessons learned

1. The project management structure was as follows: Dr..Parthiba Basu coordinated in India in close liaison with Dr. Barbara Smith, the Project Leader. The Post-doctoral Manager Soumik Chatterjee managed the Ph.D. students and the Field Assistants on a day to day basis. The Field Assistants worked closely with the Rural Advisors who and

reported to Soumik Chatterjee who reported to Parthib Basu and Barbara Smith on a regular basis. This was a very effective structure.

2. Originally there was to be a centralized rural advisory service in both states but after working in Orissa (Odisha) we realised that there had to be a decentralized rural advisory structure due to socio-economic and geographical ground realities. This advisory structure was separated into node level advisors supervised by a more centrally located Senior Advisor who reported to Soumik Chatterjee. This project management structure suited the project requirements well.
3. The majority of the project appointments were appropriate however, the first Post-doc resigned after a year. This was due to a combination of personal reasons and her desire to work on a more purely academic topic, which she is now doing. Soumik Chatterjee's recruitment was fortuitous as he brought a great dynamism to the project team.
4. The problem was outlined well based on a good understanding of the underlying issues while writing the project proposal. However, a few work elements, e.g. maintaining a permanent gourd plot, proved unachievable. The pattern of rotation made it impractical and this was not picked up during the project development. Similarly it was not possible to test beehives and flowery strips on the University farm. This was due to logistics and a good decision was made to reduce this part of the work to enable us to focus on the larger task for implementing the field work. .
5. The long term monitoring and related taxonomic work became one of the core activities of the project. The magnitude of taxonomy work and specimen management was not anticipated in advance but with the help of taxonomic interns, who were recruited later, and the taxonomic consultant the problems were managed well.
6. For other Darwin projects we would recommend the flexible M&E system that we used (Appendix 2), especially the approach of using Outcome Harvesting to assess project progress and Appreciative Inquiry to determine the elements of the project that needed attention (see below).

5.1 Monitoring and evaluation

The internal (Planning) M&E (PME) system changed over time from one designed to capture results (outputs, outcomes and impacts) in near real time through the use of standardised journals, to one that captured this information periodically though Appreciative Interviews (Whitney and Trosten-Bloom 2010) and at the end of the project through Outcome Harvesting. The latter approach was adopted in response to the fact that the project staff found it challenging to consistently maintain their journals in the light of their demanding schedules. This is a common PME challenge (Smith et al. 2012), which has frequently been addressed as it was in this project.

In hindsight, it was probably over-ambitious to expect all team members to maintain journals. A more effective use of time may have been to schedule periodic meetings or "learning events" to harvest outcomes using a similar approach to that implemented at the end of the project. The information obtained could have been processed through a participatory process to build project ownership and broad understanding as part of an action learning process. Undertaken in this way, periodic, internal, results-based monitoring could have contributed to an increased outcomes-orientation alongside the movement towards strengths-based management facilitated by the use of Appreciative Inquiry in mid-project (October 2013).

The Outcome Harvesting carried out at the end of the project highlighted an aspect of the project's effectiveness that would have been overlooked if monitoring was done solely against the logframe indicators. The latter approach would have excluded many of the project's achievements which were not anticipated during project design. The documented anticipated and unanticipated outcomes are summarised in the Outcome Harvesting report in Appendix 2.

The emphasis on open-ended questioning helped to ensure that the outcomes reported reflected the perceptions of the interviewees and not a preconceived schema. The undertaking of multiple interviews increased the credibility of some outcomes which were reported in more

than one interview. However, time constraints did not permit a systematic verification approach that would have enhanced the credibility of outcomes across the board.

The reported outcomes are a rich source of information about what processes contribute to what changes (theory of change) and how the emergent process of change differs from that originally conceived. The outcome data will be analysed in more depth in the coming months and written up for publication in an international journal.

5.2 Actions taken in response to annual report reviews

Feedback from the Annual Report has been fully addressed. At the end of year 1 we were asked to better establish farm economy baselines and clarify how the project is helping India meet its CBD obligations, this was done in the half year report. We were also asked to make clear how we were recognising the Darwin Initiative in materials and this was done.

In the review of our second year Annual Report it was acknowledged that we had dealt adequately with the comments from the first year. At the end of year two we were asked to use fewer acronyms and make a clear quantification of progress against indicators, both of which we have done in this report. Feedback from the Darwin Initiative is routinely shared among partners (circulated via email) and these comments were discussed openly among collaborators. There are no outstanding issues.

Darwin identity The Darwin Initiative logo was used on the 15 PowerPoint presentations delivered throughout the three year life of the project. It is on signage outside the Centre for Pollination Studies (see Gallery Appendix 6) at the University and also on signs outside the rural field stations. The Darwin Initiative is mentioned by name in all articles referring to the work, including three articles in Gamewise magazine (circulation 22,000), press releases and promotional material. The six CPS publications were distributed to farmers and the documentary explicitly mention the Darwin Initiative. 700 calendars and1000 booklets (three languages) were distributed as well as 150 flip books, all with the logo. The logo appears on the website and a leaflet promoting the Centre. The Darwin Initiative was promoted at the first UK-India Agroecology Initiative which was hosted by the Centre for Pollination Studies in February 2015. The Darwin initiative will be acknowledged in all future academic papers. Barbara Smith has been invited to present the project as an example of a Darwin Initiative project at Milan Expo as part of the DEFRA UK programme of events (Pathways to Pollinators, 13 July 2015) at the UK Pavilion which is itself inspired by the role of the bee in the global ecosystem.

The Darwin Initiative has been acknowledged in the following film (English and Bengali)
https://www.youtube.com/watch?v=XBjPIX9qfM8

https://www.youtube.com/watch?v=DHhLEKiGjAw

And the following national broadcast

https://www.youtube.com/watch?v=ZurPuzbr5XI

It is clearly stated on our website and in all communications with partners that the Centre for Pollination Studies was set up under a Darwin Initiative project and we branded the Centre as a Darwin Initiative product. There was some existing understanding of the Darwin Initiative in India and this resided mostly among people working with pure conservation projects that Darwin has supported. The Darwin Initiative is known by NGOs, Governments and by the local communities in areas where those projects have taken place.

References

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6 Finance and administration

6.1 Project expenditure

Project spend (indicative) sincelast annual report	2015/16 Grant (£)	2015/16 Total actual Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below) Barbara Smith James Cresswell Post-Doc RA Tripura Research fellow Orissa Research fellow Tripura Advisor Orissa Advisor Field assistants Field assistants Field assistants Field assistants			 0 0 0 0 0 100 0 0 0 0 0	Spent under Field work travel and subsistence. Se below
Consultancy costs Project coordination Host Country			0 0	
Overhead Costs GWCT OH Exeter OH University of Calcutta Office rental heating e.t.c			 0 0 0 0	
Travel and subsistence International Travel (UK) National Travel (UK)			 3% 40%	

International Travel (India) National Travel (India)			<1% <1%	
Field work travel and subsistence Tripura rural advisor renumeration incorporated See above			50%	Transferred fron Tripura Advisor
Operating Costs Conferences (UK) Conference, workshops & Seminars (India) Fieldwork operating Cost (India			 0 0	
Capital items (see below)			N/A	
Others (see below) Audit Consumables			0	
TOTAL			**<1%**	

Staff employed (Name and position)	**Cost (£)**
Barbara Smith	
James Cresswell	
Soumik Chatterjee (Post-Doc RA)	
Tripura Research fellow	
Arnob Chatterjee (Orissa Research fellow)	
Tripura Advisor	
Orissa Advisor	
Field assistants	
Field assistants	
Field assistants	
Field assistants	
TOTAL	

Capital items – description	**Capital items – cost (£)**

TOTAL	

Other items – description	Other items – cost (£)
TOTAL	92628

6.2 Additional funds or in-kind contributions secured

Source of funding for project lifetime	Total (£)
SEED, Department of Science & Technology, GoI	
CSIR, GoI	
Indo Norway Collaborative Program in Research & Education (will impart training in agroecology including pollination in agricultural systems)	
TOTAL	

Source of funding for additional work after project lifetime	Total (£)
Forest Department, Govt. of Tripura (being negotiated)	
Coventry University, U.K.	
TOTAL	

6.3 Value for Money

The project provided excellent value for money. Through a good network of contacts the Indian partners were able to procure value for the capital items and for the research stations. For example in Orissa the rent for a dedicated research station with lab and grounds was approximately £400 per annum. In Tripura similar value was obtained without loss of quality. The volume of data collected and the quality of research carried out was high and this has been delivered by adding value via external fellowships, the holders of which were attracted by the quality and profile of the establishment. The project capitalised on the novelty of the project. Similarly in the two states we were able to maximise the value of the work we carried out by collaborating with state Government partners who provided staff, time and equipment. For an investment of less than £300,000 there is an established and respected research Centre, a proto-experimental platform and a network of engaged farmers who have benefited and will continue to benefit form the research carried out by the Centre and who will participate in it. Furthermore the level of understanding of pollination ecology has been increased by at a formal education level (PhD and MSc standard), at the Field Assistant level and at the farmer level. The interest in the farming community is high and there is some evidence that the work has potential to increase livelihoods.

Annex 1 Project's logframe, including indicators, means of verification and assumptions.

Note: Insert your full logframe. If your logframe was changed since your Stage 2 application and was approved by a Change Request the newest approved version should be inserted here, otherwise insert the Stage 2 logframe.

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Goal: Effective contribution in support of the implementation of the objectives of the Convention on Biological Diversity (CBD), the Convention on Trade in Endangered Species (CITES), and the Convention on the Conservation of Migratory Species (CMS), as well as related targets set by countries rich in biodiversity but constrained in resources.			
Sub-Goal: 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	**Increased understanding of native pollinator distribution and pollination ecology leads to improved management of pollinators both on farmland and in natural areas.** **Improved livelihood conditions of local communities engaged with the CPS.**	**Pollinator monitoring scheme set-up in Orissa and Tripura together with a network of individuals trained in pollinator monitoring.** **Database of base-line information constructed and publicly available; Data analysis investigating the effect of farming on pollination completed and published.** **Centre for Pollination Studies established.**	[redacted]
Purpose 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.	**Provision of information about pollinator distribution.** **Improved understanding of native pollinator ecology integrated with information on pollinator-dependent crops'**	**Indian field surveyors and advisors established at field centres with the goal of providing advice and education to the local community** **Published data analysis revealing status of pollinators, their ecology and impact of**	**Local administration remains supportive.** **Motivated local field assistants available for training.** There is no social unrest in the project

	pollination. **Local people engaged and convinced about need to maintain a healthy pollinator population through conservation of healthy habitat .**	**farming on them.** Final evaluation survey to establish community attitudes to conservation of pollinators and their habitat.	areas.
Outputs (add or delete rows as necessary) 1. Monitoring framework for pollinators established.	**1. a1 Post-doctoral level Project Manager 2 senior level Research Fellows trained in pollinator survey and ecology, data management and analysis.** **1.b 4 Field assistants trained in pollinator survey and basic data-entry.** **1. c A minimum of 36enthusiastic members of the local farming community trained in simple survey techniques to enthuse and engage the local community.** 1. d A network of fixed points and / transects for pollinators at each location in place.	**1. a Annual evaluation of Research Fellows together with training reports.** **1.b – c University of Calcutta workshop training and workshop reports.** **1.d. Report and evaluation by research fellows in tandem with the project team**	**Research Fellows and Research Assistants remain enthusiastic and in post.** **The local community is sufficiently engaged by the project.**

2.a. **Base-line information regarding pollinator diversity in the east Indian states of Orissa and Tripura** 2.b Assessment of key pollinator species and determination of their ecological requirements.	**2. a Database of base-line information established.** **2. b Experimental work on crop pollinators and the interrogation and scrutiny of the database to establish ecology of key pollinators and to determine local pollinator networks.**	**2.a Database made publicly available.** **2. b. Annual Reports and academic papers.**	
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.	**CPS integrated into the Centre for Modern Biology at Calcutta University.** Future funding for field centres established.	Agreement by University of Calcutta available. Funding for field centres confirmed by Ministry of Environment & Forests.	**Difficulty in securing funding because of external changes to the economic situation.**
4. **Local engagement and increased capacity among farmers to manage pollinator population.**	Functioning advice service at CPS field centres established. 2 Advisors employed and trained.	Darwin Initiative and third party field inspection and evaluation.	Local communities remain receptive to project initiatives.

Activities (details in workplan)

1.1 Project start-up, capital items purchased,
1.2 Partner meetings
2.1 MSc students trained in taxonomy and research techniques
2.2 Resource (Extension) Farmers trained in pollinator survey and recording
2.3 Research fellows trained and CPS staff trained in long-term monitoring methods and data management
2.4 CPS training: Taxonomy, experimental pollination ecology
2.5 Workshops for children
3.1 a. Long-term monitoring strategy devised and plots/transects identified
3.2 a. Field surveys on farm and in surrounding area
4. 1 Research questions refined
4.2 Experimental work initiated
5.1 Advisor in place
6.1 Data-base for long term data established
6.2 Data-base for research projects established
6.3 Data-base of long-term data made public
6.4 Data analysis
6.5 Data integration and final analysis of all data
7.1 Annual 'celebration' at each field site (6 per year)
7.2 Feedback sessions with farmers
8.1 Quarterly teleconference between research partners
8.2 Reporting to Darwin
9.1 Press releases and newsletter articles
9.2 Scientific publications submitted and conferences attended
10.1 Integration and final analysis of all survey data
10.2 Formal handover of all equipment, databases etc.

Annex 2 Report of progress and achievements against final project logframe for the life of the project

Note: For projects that commenced after 2012 the terminology used for the logframe was changed to reflect DFID's terminology.

Project summary	Measurable Indicators	Progress and Achievements in the last Financial Year 2014-2015	Actions required/planned for next period
Goal/Impact: Effective contribution in support of the implementation of the objectives of the Convention on Biological Diversity (CBD), the Convention on Trade in Endangered Species (CITES), and the Convention on the Conservation of Migratory Species (CMS), as well as related targets set by countries rich in biodiversity but constrained in resources.		Provided baseline information on the identity and diversity of pollinators and new information about their ecology which will lead to their conservation. Their conservation may in turn lead to improved crop yields. Human communities have begun implement reduced pesticide use, the use of floral enhancement and the introduction of beehives and have reported an increase well being and some suggestion of a beneficial effect on their crop yield. These are steps towards sustainable use.	Do not fill not applicable
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.	Provision of information about pollinator distribution. Improved understanding of native pollinator ecology integrated with information on pollinator-dependent crops' pollination.	Pollinator monitoring scheme in place and data collection complete for this cycle. Database available on request (sample in Appendix 2). Specimen collection curated and stored at the Centre for Pollination Studies (Stuart Roberts report Appendix 2). Research undertaken by Research Fellows has produced information about important pollinators and their ecology and this year Fellows have analysed their data with	Do not fill not applicable

		respect to pollinator-dependent crops. Information is now available that can lead to conservation of pollinators on farmland (Reports Appendix 2, Presentations Appendix 3).	
	Local people engaged and convinced about need to maintain a healthy pollinator population through conservation of healthy habitat	Functioning advisory service in both Tripura and Orissa (Odisha). Local farmers engaged in long-term monitoring; engaging with workshops and outcome harvesting; farmers requesting information about how to manage habitat for pollinators; sowing their own flower strips to encourage pollinators. An outcome harvesting (OH) exercise was carried out to assess engagement (Appendix 2).	
Output 1. O1. Monitoring framework for pollinators established in the east Indian states of Orissa and Tripura.	1.a) 1 Post-doctoral level Project Manager 2 senior level Research Fellows trained in pollinator survey and ecology, data management and analysis. 1.b) 4 Field assistants trained in pollinator survey and basic data-entry. 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. 1.d) A network of fixed points and / transects for pollinators at each	The staff all remained in place and all were fully trained by the last year of the project. Significantly more farmers were engaged in the project than we originally envisaged and took part enthusiastically so that over 3000 farmers were estimated to have heard about the project and were engaged with the ideas. This was estimated in the Outcome Harvesting exercise (Appendix 2). The fixed-point network is completely GPS mapped and is ready for anyone else to use for other purposes and for local people to carry on surveying.	

	location in place.	
Activities 1 Governance		
Activity 1.1 1.1.a. Project start-up , capital items purchased 1.1.b. 1 Post-doc Project manager, 2 Research fellows, 4 Field assistants appointed 1.1.c. 2 advisors appointed 1.1.d. Field stations set - up. Advisor accommodation secured (outside project timeframe but if go-ahead given some early preparation will take place)		These elements were established and verified in the first year. Barbara Smith and John Mauremootoo were shown the CPS and met staff in the final year as verification that all remained in place. Verification is demonstrated in the interviews and reports with project partners and staff. These activities were complete.
Activity 1.2. 1.2.a. Partner meetings in host country 1.2.b. Partner meetings in UK		Partner meetings were held in both Kolkata (April 2012, October 2012, February 2013, October 2013, February 2014, September 2014, February 2015) and in the UK (November 2012, December 2013, December 2014).
Output 2. O2.a. Base-line information regarding pollinator diversity in the east Indian states of Orissa and Tripura. O2.b Assessment of key pollinator species and determination of their ecological requirements in the east Indian states of Orissa and Tripura.	2.a database of base-line information established 2.b Experimental work on crop pollinators and the interrogation and scrutiny of the database to establish the ecology of key pollinators and to determine local pollinator networks.	2.a. Database has been established and resides at the University of Calcutta mirrored at GWCT. It is a good indicator of the base-line data available (Appendix 2). Available on request, 2.b. Experimental work was completed for brinjal (aubergine), mustard, spiny gourd, chilli. Local pollinator networks have been constructed for both states. Evidence is in presentations given by students to the UK-India Initiative and in their reports (Appendices 2 and 3). One academic paper published, one in press, 11 expected and five in preparation.
Activity 2.1.Msc Students trained in Taxonomy and Research techniques		Over the life of the project 14 students were trained in para-taxonomy and research techniques (list of students in Appendix 1).
Activity 2.2. Resource (Extension farmers) trained in pollinator survey and recording		Farmers were trained throughout the project and by the end of the project, all routine pollinator monitoring in Orissa (Odisha) was carried out by them. In Tripura farmers were trained in Farmer Festivals and in small groups (farmer training report Annex 2; see Annex 6, Gallery for evidence)

Activity 2.3 Research Fellows trained and CPS staff trained in long-term monitoring methods and data management		Research fellows and CPS staff have been trained to a high standard as evidenced by the quality of work that has been carried out in long-term monitoring and the resulting database.
Activity 2.4 CPS training: Taxonomy, experimental pollination ecology		The CPS staff have carried out experimental work with project partners and identified their samples using taxonomic training from an international consultant (Annex 2, Stuart Roberts report).
Activity 2.5 Workshops for children		These did not take place due to resources being put into other areas. Children did often interact with field staff asking questions but there were no formal workshops.
Output 3CPS 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.	**CPS integrated into the Centre for Modern Biology at Calcutta University.** Future funding for field centres established.	CPS Integrated into the Centre for Modern Biology (Official documents Appendix 1). Field centres are being supported beyond the life of the project, by 1) the Indo-Norway project in Orissa and 2) Dept. Biotechnology in Tripura (see Appendix 1).
Activities 3: Survey and Monitoring		
Activity 3.1 A long-term monitoring strategy devised and plots / transects identified Activity 3.2 Field surveys on farms and in surrounding areas	Long-term monitoring established transects GPS and mapped.	
3.2.a. Field surveys on farm and in surrounding area	1km diameter landscape sectors have been mapped using data obtained from 30m resolution Landsat TM imagery. Field surveys have been carried out to ground truth this data.	
3.2.b. Pollinator visitors to permanent gourd plots recorded	This was abandoned early in the project as impracticable. Gourd plots were not permanent and farmers rotated crops regularly. Therefore data not useful.	
Activities 4: Research at CPS		
Activity 4.1 Research questions refined Activity 4.2 Experimental work initiated	Research questions were refined in the first year. The Research Fellows each defined their project and initiated their project work. This is evidenced by their subsequent output.	

4.2.a. Experimental work initiated 4.2.b. Pollination ecology experimental work 4.2.c. Testing beehive utility at CPS 4.2.d. Testing beehive utility in the field	All Research fellows initiated their experimental work into pollination ecology in the first year. This is verified by student reports (Appendix 2) It was not possible to use the University farm and therefore it was impracticable to test beehive utility at the CPS Beehives have been distributed in Tripura (from the end of monsoon) and Orissa (spring 2015), crop yield and honey production will be recorded. Baseline surveys have been completed. Beehive beneficiaries from Tripura informed us that chilli production had increased in their field after beehive introduction. See appendix 2 Tripura OH.	
Activities: **6) Data management analysis**		
6.1.) Data-base for long term data established 6.2.) Data-base for research projects established 6.3.) Data-base of long-term data made public 6.4.) Data analysis 6.5.) Data integration and final analysis of all data	Database established. Verified by Barbara Smith (personal observation) and Stuart Roberts (Report Appendix 2) Each student has a database of their research data. Barbara Smith verified. Available on request, Long-term data is available on request Data analysis is underway and papers being prepared Analysis of long-term data completed for a single over arching paper. This is a very rich database and analysis is likely to continue for several years.	
4. **Local engagement and** **increased capacity among farmers to manage pollinator population.**	Functioning advice service at CPS field centres established. 2 Advisors employed and trained.	A functioning advisory service is in place and advisors have been trained byCPS.
Activities: **5) Advisory**		
5.1.a. Advisor in place 5.2.b. Advisor attending all training courses	3 rural advisors in Orissa were employed to monitor the farmers' progress and also act as a medium to communicate with other farmers. In Tripura the joint Director of Agriculture took on this role. Advisor attended all the training courses organised by the CPS as well as participated in all the farmers surveys carried out by CPS team.	

5.2.c. Advisor engaging with farming community	Advisors were actively communicating with the farming community. They are the crucial link between farmers and CPS staff and actively spread awareness within the farming community. Verified by OH exercise (Appendix 2)
Activities: **7) Community participation**	
7.1.) Annual 'celebration' at each field site (6 per year) **7.2.) Feedback sessions with farmers** 7.2.a. Feedback sessions with farmers 7.2.b. Farmer visit to CPS	It was too ambitious to have 6 festivals per year and in fact we averaged two large events per year but also ran smaller workshop type events. Farmers engaged in Farmer Festival discussions, survey and in outcome harvesting exercises. This was impractical, farmers were unable to leave their land for a significant amount of time and it was evident that they would not benefit sufficiently to warrant the trip.
Activities: **8) Reporting against milestones**	
8.1.) Quarterly teleconference between research partners **8.2.) Reporting to Darwin** 8.2.a. Annual report to Darwin Initiative 8.2.b. Final report to Darwin Initiative	Contact between partners was regular, more than quarterly. In Annex 2 there are examples of communication form year 2. In year three this was similar and informal, this worked very well for our project. Annual reports submitted.
Activities: **9) Dissemination**	
9.1.) Press releases and newsletter articles 9.1.a. Press releases 9.1.b. Newspaper articles	3 (from India) (Annex 4) 1 from UK (Annex 4)
9.2.) Scientific publications submitted and conferences attended	
9.2.a. Scientific publications submitted 9.2.b. Conferences attended 9.2.c. Conferences spoken at 9.2.d Speaking to organisations	3 8 8 3 (Game & Wildlife Conservation Trust, Worcester University, MMB College Agartlala)

10.1.) Integration and final analysis of all survey data		
9.1.a.Integration and final analysis of all survey data 9.1.b. Completion of specimen databases 9.1.c. Publication of project results on webpages 9.1.d. Final deposition of specimens in CPS collection 9.1.e. Final deposition of duplicate specimens in other collections 9.1.f. writing of conservation assessments and recommendations	a) In depth analysis of survey data is now completed and a paper is now prepared for publication, it was submitted to one publication, was redrafted and is now with another. b) Data-base of specimens complete (as far as identification of samples allowed) . Verified by Stuart Roberts b) Two data-bases have been built from the long-term monitoring data, one with specimen data, the other with trait data. c) The website is being updated with results, the presentations are being uploaded. d) All the insect specimens were well preserved and stored systematically at CPS and made available for open use by other researchers e) This is in hand, Currently CPS has the best facilities and expertise to house the specimens. There are discussions with the Wildlife Survey of India about a duplicate collections f) Recommendations and assessments have been delivered to local governments, formal written assessment are in draft.	
10.2.) Formal handover of all equipment, databases etc.	Complete	

Annex 3 Standard Measures

We use these figures as part of our evaluation of the wider impact of the Darwin Initiative programme. Projects are not evaluated according to quantity of Standard. That is – projects that report few standard measures are not seen as being of poorer quality than those projects which can report against multiple standard measures.

Please quantify and briefly describe all project standard measures using the coding and format of the Darwin Initiative Standard Measures. Download the updated list explaining standard measures from http://darwin.defra.gov.uk/resources/reporting/. If any sections are not relevant, please leave blank.

Code	Description	Total	Nationality	Gender	Theme	Language	Comments
Training Measures							
1a	Number of people to submit PhD thesis	3	Indian	Male	Ecology of Pollinators in Agroecosystems	English	
1b	Number of PhD qualifications obtained	0					
2	Number of Masters qualifications obtained	14	Indian	Male & Female	Certificate course in Pollination biology and agroecology for masters students	English	
3	Number of other qualifications obtained	0					
4a	Number of undergraduate students receiving training	0					
4b	Number of training weeks provided to undergraduate students	0					
4c	Number of postgraduate students receiving training (not 1-3 above)	9	Indian	Male and Female	Internship in pollination biology and taxonomy of pollinators particularly wild		

Code	Description	Total	Nationality	Gender	Theme	Language	Comments
					bees		
4d	Number of training weeks for postgraduate students	60	Indian	Male & Female	Including PhD and Mastersstudents	English	
5	Number of people receiving other forms of long-term (>1yr) training not leading to formal qualification (e.g., not categories 1-4 above)	4 Field assistants and 3 rural advisors	Indian	Male	Pollinator diversity and sampling of pollinators	Bengali & Oriya	
6a	Number of people receiving other forms of short-term education/training (e.g., not categories 1-5 above)	350 farmers	Indian	Male & Female	Pollinators in agriculture, pollinator friendly farming and bee keeping	Bengali and Oriya	
6b	Number of training weeks not leading to formal qualification	12					
7	Number of types of training materials produced for use by host country(s)(describe training materials)	7	Indian languages and English		Film, flip charts, booklet series (4 booklets) and calendar	Bengali, Hindi, Oriya, English	

Research Measures		Total	Nationality	Gender	Theme	Language	Comments
9	Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country (ies)	2					No fmral plans. However, following interaction with CPS in Orissa

							(Odisha) farmers demanded non-crop plants from the agriculture department and the t agriculture department is now providing them with saplings of non-crop plants. This was evidenced by interviews during JM's OH exercise
10	Number of formal documents produced to assist work related to species identification, classification and recording.	5	Indian			Bengali, Oriya, Hindi and English	
11a	Number of papers published or accepted for publication in peer reviewed journals	2					
11b	Number of papers published or accepted for publication elsewhere	0					
12a	Number of computer-based databases established (containing species/generic information) and handed over to host country	2					State wise species data base and trait database
12b	Number of computer-based databases enhanced	0					

	(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					
13b	Number of species reference collections enhanced and handed over to host country(s)						

Dissemination Measures		**Total**	**Nationality**	**Gender**	**Theme**	**Language**	**Comments**
14a	Number of conferences/seminars/workshops organised to present/disseminate findings from Darwin project work	1 (UK – India scientific meeting held in Kolkata)	UK and India	Male and Female		English	10 scientists from UK and 40 scientists from India participated in a joint meeting for sharing experiences and findings of the Darwin Project
14b	Number of conferences/seminars/ workshops attended at which findings from Darwin project work will be presented/ disseminated.	9 attended by staff Coordinators of the project (another pending) (appendix 2 for list)					

Physical Measures	**Total**	**Comments**

20	Estimated value (£s) of physical assets handed over to host country(s)	£ 9500	
21	Number of permanent educational, training, research facilities or organisation established	1 CPS 2 Field Stations	
22	Number of permanent field plots established	67 Field plots	Ph.D student Pushan Chakrabarty established 14 field plots for studying bee – plant network in Tripura; Ph. D. student Supratim Laha established 20 field plots for studying non crop plant and pollinator interaction; Ph.D student Arnob Chatterjee established 9 field plots for studying evidence of pollination limitation in crops. There were also 24 LTM plots spread across Tripura and Orissa.

Financial Measures		**Total**	**Nationality**	**Gender**	**Theme**	**Language**	**Comments**
23	Value of additional resources raised from other sources (e.g., in addition to Darwin funding) for project work	£87755	Indian				

Annex 4 Aichi Targets

	Aichi Target	Tick if applicable to your project
1	People are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.	X
2	Biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.	X
3	Incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.	
4	Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.	X
5	The rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.	
6	All fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.	
7	Areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.	X
8	Pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.	
9	Invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.	
10	The multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.	
11	At least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.	
12	The extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.	
13	The genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.	

14	Ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.	X
15	Ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.	
16	The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.	
17	Each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.	
18	The traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.	X
19	Knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.	X
20	The mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.	

Annex 5 Publications

Provide full details of all publications and material that can be publicly accessed, e.g. title, name of publisher, contact details. Mark (*) all publications and other material that you have included with this report

Type * (e.g. journals, manual, CDs)	Detail (title, author, year)	Nationality of lead author	Nationality of institution of lead author	Gender of lead author	Publishers (name, city)	Available from (e.g. contact address, website)
Booklets (4) educational on pollinators and pollination. Aimed at farmers * Pages shown in the Gallery of Images	Published and authored by CPS 2014. 3 languages	Indian	Indian	Male	CPS & VigyanPrasar, Kolkata, India	View: https://www.youtube.com/watch?v=3yOXhvI4PsE
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 2014. 3 languages	Indian	Indian	Male	CPS & VigyanPrasar, Kolkata, India	View: https://www.youtube.com/watch?v=3yOXhvI4PsE
FLIP BOOK Insects: Farmer's friends & Foes A pictorial guide	Published and authored by CPS 2014. Language: English	Indian	Indian	Male	CPS & VigyanPrasar, Kolkata, India	View: https://www.youtube.com/watch?v=3yOXhvI4PsE
Film on CD*	Pollination crises and CPS's research	Indian	Indian	Male	CPS & VigyanPrasar,	https://www.youtube.com/watch?v=XBjPIX9qfM8 https://www.youtube.com/watch?v=DHhLEKiGjAw

	Language : English & Bengali				Kolkata, India	https://www.youtube.com/watch?v=ZurPuzbr5XI
Journal	Chakrabarti, P., Rana, S., Sarkar, S., Smith, B., Basu, B. Pesticide-induced oxidative stress in laboratory and field populations of native honey bees along intensive agricultural landscapes in two Eastern Indian states, 2014 Apidologie.	Indian	Indian	Female	Springer-Verlag, France	Doi: 10.1007/s13592-014-0308-z

Annex 6 Darwin Contacts

To assist us with future evaluation work and feedback on your report, please provide details for the main project contacts below. Please add new sections to the table if you are able to provide contact information for more people than there are sections below.

Ref No	19024
Project Title	Enhancing the Relationship between People and Pollinators
Project Leader Details	
Name	Dr Barbara Smith
Role within Darwin Project	Project Leader
Address	
Phone	
Fax/Skype	
Email	
Partner 1	
Name	Dr Parthiba Basu
Organisation	Director Centre for Pollination Studies, University of Calcutta
Role within Darwin Project	Coordinator in the host country
Address	
Fax/Skype	
Email	
Partner 2	
Name	Dr John Mauremootoo
Organisation	Inspiral Pathways
Role within Darwin Project	M&E Consultant
Address	
Fax/Skype/Phone	
Email	
Partner 3	
Name	Nirmal Nayak
Organisation	Vice President, Odisha Krusaka Sabha (A.I.K.S), Odisha state Committee.
Role within Darwin Project	His involvement was to introduce us with to farmers in Odisha and facilitated us with the network of tribal farmers in Odisha. He also actively took part in various awareness camps organized by CPS.
Address	
Fax/Skype/Phone	
Email	
Partner 4	

Name	Baharul Islam Majumdar
Organisation	Director, State land use board, Department of Agriculture, Government of Tripura.
Role within Darwin Project	He provides all kind of supports during our project initiation and progress throughout our research tenure
Address	
Fax/Skype	
Email	