

Darwin Initiative – Final Report

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

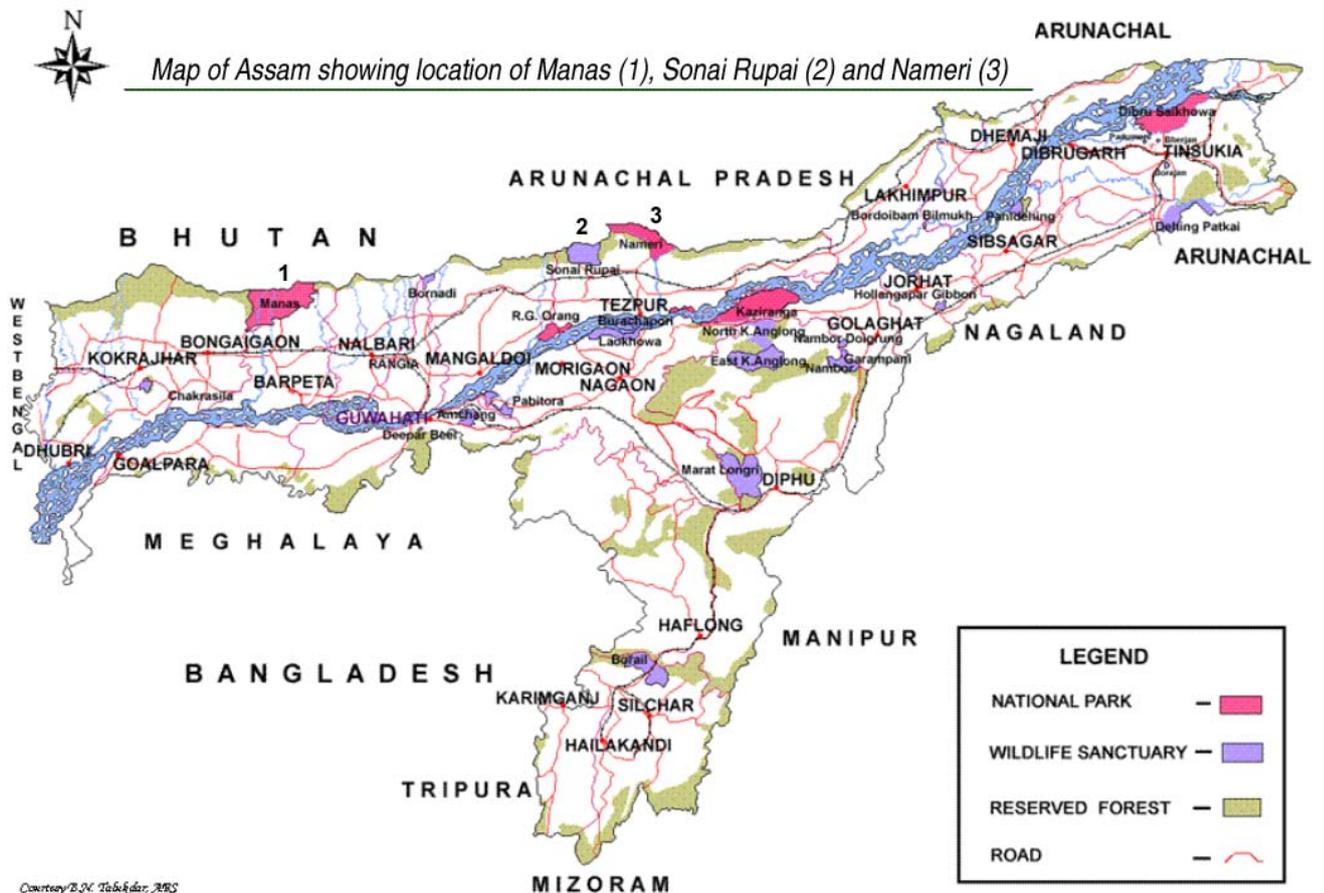
Darwin project information

Project Reference	162/15/017
Project Title	Implementing a Recovery Plan for the Critically Endangered Pygmy Hog in Assam
Host country(ies)	India
UK Contract Holder Institution	Durrell Wildlife Conservation Trust
UK Partner Institution(s)	Zoological Society of London
Host Country Partner Institution(s)	1. Forest Department (FD), Ministry of Environment and Forests, Government of Assam. 2. IUCN – SSC Pigs Peccaries and Hippos Specialist Group (PPHSG) 3. Pygmy Hog Conservation Programme Research & Breeding Centre (PHCPRBC), Basistha, Assam
Darwin Grant Value	£182,000
Start/End dates of Project	Apr 2006 – Mar 2009 (July 2006 start), extended to March 2010
Project Leader Name	Prof. John E. Fa
Project Website	www.durrell.org
Report Author(s) and date	Goutam Narayan, John E. Fa

1 Project Background

The pygmy hog (*Porcula salvania*) is the smallest, genetically unique, highly specialised and the most endangered [IUCN Red List Category C2a (ii)] of the world's wild suids. It was presumed to occur in early successional tall grasslands along the southern Himalayan foothills, extending from Nepal in the west, to N.W. Assam in the east. Suspected to have become extinct, the species was 'rediscovered' in 1971.

The main purpose of this project is to improve the conservation status of critically endangered pygmy hog in Assam, enhance habitat management practices of tall grasslands in Manas Tiger Reserve (MTR) - a UNESCO World Heritage Site, which supports the last remaining population of this species - and expand the species' distribution by establishing new populations with local captive-bred hogs in a former range area, the Sonai Rupai Wildlife Sanctuary (SRWS) and the adjacent Nameri National Park (NNP). Major achievements of the project include successful reintroduction of pygmy hog in Sonai Rupai, where 35 hogs were released over the project period. Other outputs include capacity building of frontline forest department staff, production of training manuals on monitoring and protection of wildlife, initiation of community based conservation action in fringe villages, and research on the species and its habitat by graduate and post-graduate students.



Courtesy: B.N. Talukdar, ABS

Fig.1. Map of Assam, showing location of study sites.

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

This project has assisted India in implementing the CBD under Articles 7, 8, 9, 12, 13, and 15 and has provided information to prepare the case for removal of MTR from the *List of World Heritage Sites in Danger* (see Annex 3). Under a continuing MoA (Memorandum of Agreement), valid till 2015, key objectives of the Ministries of Environment and Forests of the Govt. of Assam and Govt. of India (CBD focal point) were partly fulfilled.

In addition, the project has contributed to achieving the following objectives of the National Biodiversity Strategy: 1) developing the expertise within Assam to promote the protection of natural habitats for the maintenance of viable populations (e.g. of pygmy hog and other tall grassland species) in their natural surroundings; 2) providing a scientific and technical training programme to facilitate the conservation and sustainable management of key components of Assam's biodiversity (tall grassland ecosystem); 3) establishing a range of field-based tools and infrastructure supporting Assam's capacity for protected area management, and 4) building local knowledge, awareness and support for the protection of unique biodiversity of the region (and within the context of sustainable development) through a community-based education and outreach programme.

3 Project Partnerships

The Pygmy Hog Conservation Programme (PHCP) is a long established collaborative project of Durrell Wildlife Conservation Trust (DWCT), IUCN/SSC Wild Pigs Specialist Group, Forest Department of the Government of Assam and, and the Ministry of Environment and Forests (MoEF) of Government of India under a continuing MoA since 1995. In addition, DWCT signed an MoU (valid till 2010) with EcoSystems-India, a local charity for biodiversity conservation, to implement the activities of PHCP and to operate Pygmy Hog Conservation Programme Research and Breeding Centre (PHCPRBC) at Basistha, and a Pre-Release Centre at Potasali. These facilities focus on conservation breeding and reintroduction, habitat studies and capacity building.

The project has worked closely, and most productively, with the Forest Department of Assam in implementing capacity-building, undertaking fieldwork in Manas, the last refuge of pygmy hogs in the wild, and Sonai Rupai where the species has been successfully reintroduced. The project partnerships have been most effective, and the project has received support and encouragement from even the highest level in the government. To ensure smooth operation of the project, Durrell took charge of the overall strategic planning, research priorities, scientific inputs, GIS assistance and financial control. PHCPRBC and ESI together administered in-country activities such as planning, implementation and monitoring of work plans, supervision of field staff and researchers, management of local finances, purchase of equipment, local collaborations and dissemination of outputs and contact with media.

NGOs and government organisations with whom active collaborations were established included *Centre for Environmental Education (CEE*, partner in Darwin project 06-017) for environmental education outreach, *Aaranyak* for field surveys and habitat studies, *Natures Fosters* for community conservation in the fringe villages, *Assam Haathi Project* (Darwin grant 16-007 awarded to Chester Zoo) for human-animal conflict mitigation, *College of Veterinary Sciences*, Khanapara, for animal health related advice and investigations, *Bombay Natural History Society (BNHS*, partner in Darwin project 162/12/027) for habitat management advocacy, *Central Zoo Authority (CZA)* for networking, capacity building of Zoo personnel and publicity; and *Manas Tiger Reserve* and *Western Assam Wildlife Division* authorities for field based activities in Manas and reintroduction sites respectively.

4 Project Achievements

The project's achievements, as set out in the logical framework, are described in Annex 1.

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

The primary goal of PHCP is to promote recovery of pygmy hog and to reduce its population decline. The Darwin project aimed to establish a reintroduced population in the wild in addition to promoting scientific management of grassland habitats through conservation action and capacity building of select stakeholders. Wherever the recommendations for grassland management were implemented, there was discernible improvement in the habitat conditions.

Though the project focussed on recovery of the pygmy hog, the improvement of the grassland habitat would benefit many other endangered species of this threatened habitat, especially the Bengal florican [IUCN Red List Category A3bcd+4abcd]; hispid hare [B2ab (ii, iii, v)]; eastern barasingha [C1], swamp francolin [A2cd+3cd+4cd], Indian water buffalo [A2cde+3cde+4cde; C1], tiger [A2bcd+4bcd; C1+2a (i)] and the greater one-horned Indian rhinoceros [B1ab (iii)], besides a host of smaller rare animals and plants.

The conservation breeding and reintroduction of the species followed the IUCN conservation Breeding and Reintroduction Specialist Groups (CBSG and RSG) guidelines as well as the IUCN Conservation Action Plan for the pygmy hog (Oliver and Deb Roy 1993). A total of 61 (30 male and 31 female) hogs were born and raised in captivity in the three year project period between 2007 and 2009. During the same period, 43 (21♂♂ 22♀♀) hogs were prepared for release in the wild. While twenty-five (11♂♂14♀♀) of these 43 hogs were successfully released in 'vacant', but restored and protected grasslands in Sonai Rupai in 2008 and 2009, the last batch of 10 individuals were released there in May 2010. This has created a second wild population of this critically endangered species, thereby enhancing the survival prospects of this species seriously threatened with extinction.

This Darwin supported event not only constituted the first such reintroduction attempt, but also laid down the foundation for proposed similar series of releases into habitats within the known or presumed former range of this species in this region. Restoration of habitat at the second reintroduction site in Orang National Park commenced in 2008, and the habitat is now suitable for release of first batch of hogs in 2011. The project's performance in conservation breeding and reintroduction fits very well into **CBD 2010's** goals and targets under *Focal Area: Protect the components of biodiversity, Goal 2. Promote the conservation of species diversity; Target 2.1: Restore, maintain, or reduce the decline of populations of species of selected taxonomic groups, and Target 2.2: Status of threatened species improved.*

There has been a varied impact of capacity building efforts. While project-trained frontline staff of Sonai Rupai, Nameri and Orang were able to contribute significantly towards habitat restoration and monitoring, the effect was limited in Manas. The impact of community conservation action, confirming to **CBD 2010's Focal Area: Promote sustainable use Goal 4. Promote sustainable use and consumption. Target 4.2: Unsustainable consumption, of biological resources or that impacts upon biodiversity, reduced,** began to show good results only at the end of project period as the community engagement initiatives have long gestation period. Education outreach programmes involving village school teachers and NGOs however exhibited better and quicker outcomes.

4.2 Outcomes: achievement of the project purpose and outcomes

The project's purpose was to improve the conservation status of the critically endangered pygmy hog through the following: 1) develop human capacity and procedural mechanisms in wildlife and habitat monitoring, data analysis and status reporting; 2) improve management of the tall-grasslands through enhanced knowledge of the status of the habitats and the impact of factors including grassland burning and extraction activities on pygmy hog densities and other associated species; 3) reintroduce captive-bred animals in one or more areas within their recent known range, and implement improved habitat management and protection of these areas via training of Forest Department personnel, and 4) build community involvement and support for the conservation of the tall grasslands and its wildlife through establishment of community-based biodiversity and environmental education, outreach and sustainable development programmes.

The project had mixed results in fulfilling its purposes. Excellent progress was made in the conservation breeding and reintroduction component, and monitoring has revealed that the reintroduced hogs are independently breeding and dispersing, making these initiatives highly successful. These efforts continue and the PHCP is confident that it will be able to reintroduce more viable populations, using captive bred hogs.

The response to capacity building, namely training of frontline staff, school teachers, NGOs and other village level institutions (Self Help Groups) was good, however, efforts to establish mechanisms for wildlife and habitat monitoring and database management by the PA staff did not succeed. The impact of improved habitat management in the tall-grasslands is evident in Sonai Rupai, Orang and to a limited extent in Nameri. Unfortunately similar positive results were not seen in Manas owing to several factors.

Partnerships with grassroots NGOs for community engagement was fruitful, with creation of village level micro credit institutions for sustainable use of resources and alternative livelihood generation. Such efforts in the three fringe villages of Manas NP have so far benefited about 100 households. In addition, about 25 more households have improved their alternative livelihood skills in two villages of Nameri Tiger Reserve. With assistance from Assam Haathi Project, interventions such as chilli nursery, trip wire, spotlights, etc. for human-elephant conflict mitigation were also introduced.

4.3 Outputs (and activities)

Output 1 - Comprehensive system for monitoring of pygmy hog populations, other associated grassland species and their habitats in MTR established.

We were able to undertake a range of activities to achieve the outputs. The presence of pygmy hogs was confirmed in all 3 ranges of Manas NP through field surveys, and status report generated. Land cover map and habitat studies were conducted to identify grasslands suitable for the species to complement surveys in Manas and to plan reintroduction in Sonai Rupai. The information thus generated helped to develop a long-term conservation plan for pygmy hogs and scientific management of its habitat. The above exercises were conducted by project staff as well undergraduate, graduate and post graduate students as a part of their academic curriculum.

Some specific components of the output such as vegetation maps and habitat modelling could not be completed as the researchers employed for the tasks discontinued citing difficult field conditions, and prevailing unstable security situation. A student from the Zoology Department of Gauhati University, who had earlier worked as field biologist with PHCP, completed his Ph.D. thesis (Lahkar 2008) on ecology and management of grasslands in Manas under the project. A subsequent attempt to get the follow-up study conducted by a team headed by the student did not materialise owing to problems related to transfer of funds to Assam. Although the existing project staff tried to collect relevant data but this was not adequate to achieve the specific outputs. In fact, the security situation in the entire western Assam North Bank belt remains uncertain, preventing timely implementation of many field based activities.

Output 2 - New pygmy hog populations established in SRWS/NNP:

Site Selection and Habitat Restoration for Reintroduction: After extensive surveys and detailed consultations with the relevant authorities two sites were selected as being potentially suitable for reintroduction purposes, i.e. Sonai Rupai Wildlife Sanctuary and Nameri National Park. A third site, Orang National Park, was kept under observation to assess flood water levels in the rainy season, and later it was concluded that the grasslands in the northern part of the Park are suitable for releasing the hogs. These three sites fall within the pygmy hog's known recent range in north-western Assam, though no evidence could be found of its continuing occurrence in these areas, despite the presence of suitable habitats. Of the first two sites, Sonai Rupai was selected for the first such release on the basis that it contained considerably more tall grasslands than Nameri, but that this area had been generally neglected and that any such reintroduction attempt might also generate increased interest and resources to effect the enhanced future protection and management of the entire area. To these ends, the PHCP continues to work with the Sanctuary authorities and staff to improve protection and management and to control annual dry season burning of grass. Sanctuary staff was also trained in wildlife monitoring and habitat management to help in restoration of the grassland habitat and monitoring of released hogs.

Pre-release Protocol: Social groups of unrelated and mostly young hogs were integrated at Basistha breeding centre before being transferred to a specially constructed 'pre-release' facility in Potasali, on the outskirts of Nameri National Park, east of Sonai Rupai Wildlife Sanctuary. Every effort was made to 'pre-condition' the animals for eventual release by maintaining them in three separate social groups, in simulated natural habitats intended to encourage natural foraging, nest-building and other behaviours; whilst also minimising human contacts to mitigate tameness and other behavioural characteristics consequent upon their captive management. Radio-harnesses designed for post-release monitoring studies were also field-tested by trial attachments to two individuals in each group, but unexpected problems in the long-term use of these harnesses were exposed as they caused unacceptable injuries to the hogs. Possible alternative means of monitoring were devised and initiated, including training the animals to visit random bait sites and screening for field 'sign'. It was also decided to get radio implants designed and manufactured for further trials.

Reintroduction and Post-release Monitoring: After their five month tenure in the 'pre-release' enclosures at Potasali these hogs were transferred in early May to temporary 'soft-release' enclosures constructed for this purposes in a relatively secluded, but easily accessible area of natural habitat in the far interior of the Sonai Rupai Wildlife Sanctuary. These enclosures were also rigged with two lines of electric fencing and kept under continual surveillance as a precaution against potential predators and to deter incursion by wild elephants. The animals were maintained for a further three days in these enclosure before being released, by the simple expedient of removing sections of fence and allowing the animals to find their own way out.

Sixteen pygmy hogs (7 males, 9 females) were released in Gelgeli grasslands of Sonai Rupai in May 2008 and indirect evidences suggested that at least 10-12 of them continued to survive several months after release. Footprints of newborn hogs too were seen indicating successful farrowing in the wild by a released female. A video camera trap was also used carefully deployed near active nests and the hogs caught in camera appeared healthy and had shiny coats, unlike the somewhat emaciated hogs captured from the wild in Manas in 1996. Some of these individuals were identified by hair-clipping marks shaved before release. That the released hogs appeared to be in good health despite harsh weather and sometimes difficult foraging conditions up to nine months after their release was most encouraging in that it not only confirmed their survival, but suggested their successful adaptation to the wild after at least one or (in most cases) two generations of captive management.

Following similar protocol, nine hogs were released in May 2009 and ten more in May 2010, thereby releasing a total of 35 hogs in different locations of Gelgeli grasslands in Sonai Rupai. Besides numerous signs of hog activity around the release locations there were a few direct sighting of adult and even young hogs that were most certainly born in the wild. However, to get a better idea about survival, breeding and dispersal of released hogs it may be necessary to recapture some of the hogs in Sonai Rupai and possibly insert radio implants in some for more accurate monitoring.

Habitat restoration in the potential reintroduction sites was a major challenge. Indiscriminate annual dry season burning, illegal livestock grazing and human encroachment posed problems and we were able to cope through capacity building, awareness generation, advocacy and helping the Park authorities to strengthen the protection. Problems were largely resolved in Sonai Rupai, evident from dramatic improvement in habitat quality. However, despite shifting out of the cattle camps in Nameri cattle grazing continued preventing improvement of the grassland habitat. Although the attempts to encroach part of the study area were thwarted, some other areas of Sonai Rupai are still under occupation of illegal settlers, who continue to pose a serious threat.

Output 3 - Trained and accredited instructors for pygmy hog and other grassland species conservation, continuing training of field patrol and monitoring staff.

Production of resource material and organisation of training workshops were achieved successfully. Posters, manuals, trainee guides and data recording booklets were produced in English as well as in local language, Assamese, for use and distribution among trainees. Under the *Instructors' Training Workshops*, only five out of 28 participants managed to qualify as trainers, and the others as monitors. Also 43 frontline staff received continued training in follow up sessions. In addition 12 frontline staff went through training in habitat protection and restoration in Sonai Rupai.

Though the training workshops had very good response, and the monitoring of wildlife during patrolling started off under the supervision of PHCP staff, this could not be sustained once the frontline staff was left to continue the monitoring on its own. This was attributed to low levels of interest and motivation, mainly due to serious lack of support facilities in the field camps, unwillingness of staff to work under these conditions. The senior authorities were apprised of this development and were requested to improve the field working conditions adequately in order to encourage the staff to undertake this additional responsibility of wildlife monitoring and recording in course of their regular duties. It has now been agreed upon that the Forest Department will take efforts to incorporate the monitoring system as a part of regular duties of frontline field staff. Also the instructors' training programme, developed by the project, would become a formal course at the Assam Forest School, Jalukbari, conducted twice a year for groups of 15 participants each. The participants with appropriate aptitude would be selected by PA managers and nominated for the course.

Output 4 - Community education programme

The outputs of the community outreach programme were achieved successfully, exceeding the targets. Seventy school teachers from local schools in the fringe villages of Manas participated, and were imparted training in conducting environment education among community members including school children. Some of the trainees are being assisted to generate awareness in conservation of pygmy hog and its grassland habitat in schools.

Community conservation efforts in the three fringe villages of Manas have benefited about 100 households. In addition, about 25 more households have improved their alternative livelihood skills in two villages of Nameri. Through formation of self help groups in the project villages, member households have acquired new skills and honed their existing ones in weaving, sewing, handicrafts, food preservation, betelnut leaf plate making, piggery, and farming. The villagers are attempting to reduce resource use from the Manas by promoting sustainable cultivation of cash crops (ginger, vegetables, rubber, etc.) and small timber (bamboo).

Output 5 - Publications and publicity

In addition to production of EE resource material and publications in scientific journals, we were able to contribute two book chapters, posters and write a children's book on pygmy hog. Wide publicity to the project achievements especially the release of the hogs in the wild was given through TV interviews, press conferences, participation in conferences, and talks delivered at various fora on invitation.

4.4 Project standard measures and publications

Please see Annex 4 for standard measures and Annex 5 for publications.

4.5 Technical and Scientific achievements and co-operation

The UK and India project staff jointly conducted the research undertaken under this project, which also involved work by M.Sc. and Ph.D. students. The project staff has open-access to data thus generated, and all publications are multi-author. The Project Leader guided research in coordination with India project staff. The research projects were:

(a) Pygmy hog and grasslands surveys

Rapid surveys were carried out in all three ranges of Manas National Park. Data were collected along transects marked previously using GPS. The surveys revealed evidence of the continuing survival of small populations of the pygmy hogs in Manas. However, no significant improvement was found in the habitat quality in the grasslands of Bansbari Range, while tall grasslands in both Bhuyanpara and Panbari Ranges had evidently recovered to some extent from illegal livestock grazing and thatch collection following enhanced community participation in habitat protection. The notable exception was Kokilabari Seed Farm in Bhuyanpara Range, a large portion of which had become reasonably good grassland habitat after the seed farm had closed down, but with spreading of agricultural activity the grasslands are now disappearing rapidly.

Surveys intended to locate additional release sites with suitable habitat were carried out again in the grasslands of Sonai Rupai Wildlife Sanctuary. Similar surveys were also carried out in Nameri and Orang National Parks to assess the grasslands as potential release sites. No evidence of any existing pygmy hog populations were found either of these sites, despite the fact that both areas lie within the recent known or assumed distribution range of this species. While the habitat in Orang appeared suitable, the areas of Nameri that had good alluvial grassland in the past were clearly overgrazed by livestock. Although permanent cattle camps (*khuntis*) were shifted out of the area, large numbers of cattle continue to use the area during daytime.

Barnadi Wildlife Sanctuary was also surveyed but the situation has not improved much, so it cannot yet be considered for future release of hogs. Most of the grasslands have become degraded or have undergone succession to woodland. Frontline field staff shortages, drinking water scarcity in the protection camps, poor communication network and general lack of funds for vehicles and roads or even for clearing patrolling path and fire breaks has crippled this small sanctuary where no pygmy hog been reliably reported since early 1990s and grass fire is one of the biggest threats.

(b) Pygmy hog behaviour studies

The behavioural study on the pygmy hogs was conducted by a M.Sc. student to assess changes in hog behaviour during the soft release process. The study focused on examining the behaviour of the hogs in captive conditions at Basistha compared to the behaviour with hogs kept under semi-wild conditions at the pre-release centre in Potasali. Sampling was carried out from December 2007 to April 2008, with data collected from 25 individuals. Since the study period coincided with the breeding season, much of the observations pertained to breeding behaviour. Fifteen minute long focal animal observations on individuals housed in the breeding enclosures were used to measure various behavioural events, with group scans between the focal animal observations to measure various states. Some sequence scans were also made opportunistically. The majority of observations were made on breeding pairs. In Potasali, where instantaneous scans were the priority, observations were made on 17 individuals, with focal animal sampling happening whenever hogs were visible, particularly during the feeding hours. The percentage time spent in different behavioural states was calculated across individuals from group scans to obtain time activity budgets and the rates of a particular behavioural event were calculated from frequency of occurrence of that behaviour in focal animal samples.

An ethogram was made using the behavioural observations conducted during focal animal sampling and instantaneous scans. Comparisons were made between observation at Basistha and Potasali in order to assess the adaptability of the animal to novel situations and environments. It was seen that the hogs in both sites spent more time foraging than on the other activities. In general the pattern of pygmy hog behaviour concurs with previous reports for other suids. Certain behaviour such as displaying and rump-sniffing which are associated with breeding were restricted to the males. In the pre-release centre, hogs exhibited behaviour not seen in the breeding centre.

The results obtained from this study clearly show that the hogs, despite being maintained in captivity since their birth, and over several generations, still exhibit the potentials to adapt to new situations as well as display behaviour reflecting to their natural environment. This indicates a positive prognosis for the future of the reintroduction project.

(c) Fire studies

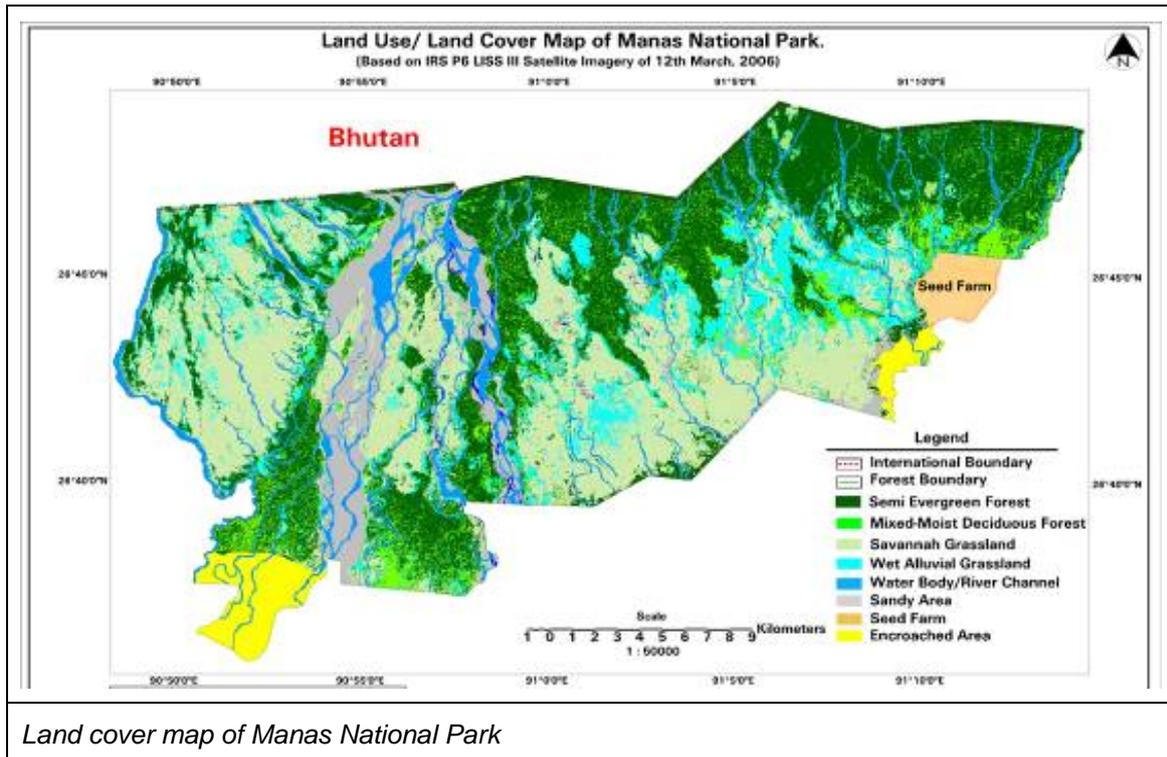
A study on occurrences of fire in Manas National Park between 2000 and 2008 was conducted by a Masters student from UK to help us recommend a better management plan for the pygmy hog grasslands. In the study, we analyzed spatial and temporal patterns of remotely identified fires within Manas NP. We used data for 781 active fires, obtained from the Terra satellite MODIS (Moderate Resolution Imaging Spectroradiometer) images, detected in the MNP during the dry seasons (October-May) of 2000-2008. Number of annual fires increased significantly from 12 in the 2000-2001 dry season, to over 100 after 2005-2006. Most fires (85%) were recorded in December and January each year. Over half of all fires occurred in tall grasslands, but highest density of fires was found in wetland and riverine vegetation. Distance of fires to roads, rivers and the park boundary was estimated in a GIS; most fires occurred closest to rivers, roads and the park boundary. A map of fire intensity was generated using a kernel density estimation tool. There were three most frequently burnt areas in the MNP, but also clearly unburned sites. According to our results, we recommend that remotely detected fires can be usefully employed as a tool to understand susceptibility of areas and habitats to burning in protected areas. In order to reduce the threats and to conserve grassland diversity and its inhabitants, the establishment or improvement of effective fire management is essential. We make three important recommendations from this study that can help minimize the risk of detrimental damage on both grassland diversity and species dependent on the grassland habitat.

A detailed literature review was prepared on grass burning in the area. The review aims to evaluate fire as a management tool and its role in influencing forage availability and quality in floodplain grasslands as well as its consequences for the associated faunal species. This information along with the results from the grassland studies will be used to develop effective grassland management practices for the conservation of threatened biodiversity of *terai* grasslands.

(d) Land cover assessment of Manas National Park

A detailed land cover map of Manas National Park has been produced with the help of the local partner organisation. The land cover map is being used to conduct surveys and assess the impact of fire. The last 5 years of spatial fire alert data have been obtained and analysed.

Detailed assessment of the changes in the grasslands over a period of twenty years is also being planned using IRS LISS 3, Aster and Landsat satellite data; land cover / vegetation classified using field control points.



(e) GIS database

The development of a GIS-based Manas Wildlife Monitoring System was planned as a stand-alone system in Delphi programming language which would ensure that the operation of system is not affected by computer software changes or upgrades. The system is designed to ensure it is practical and simple to use in the field with minimal training (see supplementary item Databases.doc). It is also being designed to be flexibly configured for use in other protected areas. A desktop computer (with printer and power system) has been purchased. The database is being further developed by Dr. Raj Amin, and will be made available by mid-2011. A paper on the importance and application of the system develop by our project is being written for publication.

(f) Genetic studies

A phylogenetic study under the project by Funk *et al.* (2007) using pygmy hog's mitochondrial DNA has restored the original classification of the pygmy hog as a monotypic genus *Porcula*. Pygmy hog was originally described by Hodgson (1847) as belonging to a unique mono-specific genus but later it was grouped with other wild pigs (genus *Sus*) by taxonomists. The genetic study carried out in collaboration with the Centre for Cellular and Molecular Biology (CCMB), Hyderabad, and Henry Wellcome Ancient Biomolecules Centre, University of Oxford, revealed that pygmy hog is not closely related to other pigs. Using three mitochondrial DNA loci (2316 base pairs of control-region, cytochrome b, 16S), combined with rigorous statistical testing of alternative phylogenetic hypotheses, the pygmy hog was distinguished from all other pigs. In particular, the analyses showed that the pygmy hog neither clustered together with *Sus scrofa*, nor with any other *Sus* species. The strong evidence for the phylogenetic exclusion of the pygmy hog from the *Sus* clade supports that this taxon, like the babirusa and warhogs, deserves separate recognition. A proposal for the resurrection of the original species name *Porcula salvania* was implemented by GenBank, a universal repository for nucleotide sequences at the National Center for Biotechnology Information (NCBI, 2007), and accepted for inclusion as an update in the 3rd edition of the Wilson and Reeder's Mammal Species of the World (Colin Groves, in litt.). The project is also trying to get micro-satellite markers identified for the species to determine relatedness among the captive individuals through DNA fingerprinting.

(g) Social research

Under the community initiative, preliminary survey of the fringe villages and discussions with the community were conducted to identify the model villages for village level interventions. Following this exercise, three villages: Barengabari (Bansbari range), Thajjobari (Bhuyanpara range) and Sourang (Panbari range) were selected. These villages exhibit severe dependence on forest resources with the potential to reduce the extraction of forest products. Subsequent consultation with the community revealed that the village level interventions will be need-based, and will consider the development priorities of the community to garner its support for reduction in harvest of major and minor forest produce.

A socio-economic survey including the resource use pattern was conducted, followed by focus group discussions (with women, men, self-help groups) for need assessment of proposed interventions. The interventions were introduced in a phased manner to instill a sense of stewardship in the people of project villages as well as secure the active participation of the community. Entry-level activities were initiated to strengthen the involvement of the villagers. Interventions planned for the project villages included creation of self help groups for micro credit based activities, alternative income generation sources (weaving, food preservation training, cash crop farming), reduction of human-elephant conflict through trip-wire, chilly use as a deterrent) and veterinary care.

(h) Grasslands awareness poster

A set of two posters for use in grassland awareness has been produced.

(i) Meetings/conferences/workshops

Members of the India project team attended about 12 scientific workshops, conferences and consultations during the project duration, wherein the activities and progress made under the project were showcased. Further, at the Basistha and Potasali facilities information on the project was disseminated to stakeholders (foresters, civil society members, teachers, students, journalists, bureaucrats, etc.). In addition, Dr. Goutam Narayan and Dr. Parag Deka assisted following training programmes as resource persons: a) for Zoo Directors and Zoo Keepers (Central Zoo Authority, Assam State Zoo); b) for Forest Range Officers (Forest School, Ranger's College and Wildlife Areas Development and Welfare Trust); c) for Wildlife and other Veterinarians (Wildlife Trust of India, College of Veterinary Science); and d) for school teachers and environmental awareness personnel.

Three review meetings were held in Jersey and Assam in 2007, 2008 and 2009 to review and to prepare action plans for the project activities. Project personnel and advisors including Prof. John E. Fa, Dr. Rajan Amin, Mr. William Oliver, Dr. Goutam Narayan, Dr. Parag Deka and Nandita Hazarika participated.

4.6 Capacity building

Capacity building has been the key thrust area of the project, and thus the training and capacity building element was specifically designed to ensure that its benefits will continue despite staff changes through the implementation of an institutionalised on-site on-going modular training programme. With an objective to develop new skills among select stakeholders including project partners; training was imparted to different target groups. The main beneficiaries of the project's capacity building efforts were as follows.

Frontline staff of Assam Forest Department

A Training Course for Frontline Field Staff of Assam on Monitoring and Protecting Wildlife was launched under the project. Two such intensive trainings were conducted, with the participants drawn from Manas, Nameri, Orang, and Barnadi PAs. The course trained participants to be instructors and accredited monitors in wildlife monitoring and protection. The training course aimed to build their capacity to gather accurate information from field for scientific monitoring of the wildlife and habitat, and for their better protection and conservation. The 6-day course was divided into nine modules covering a range of topics: i) Conservation Background, ii) Animal Biology, Behaviour and Identification, iii) Legal Procedure in Handling Forest Offences, iv) Patrol Tracking and Law Enforcement, v) Map Work and GPD, vi) Use of Binoculars, vii) Use of Data Recording Forms, viii) Forest Department and Community Relationships, and ix) Animal Injury and Staff Health & Hygiene. Both theory and practical sessions were held. Out of 28 participants, 5 staff members qualified as instructors and 21 as accredited monitors depending on their performance in evaluation tests.

As follow up, the instructors and some accredited monitors from the intensive training courses at Manas and Nameri assisted in conducting field based training for some other protection staff in the area of their work. These trainers and monitors were given direct assistance by a field biologist contracted for the purpose. Altogether 43 new trainees from the following three ranges of Manas participated in these follow-up training programmes. Binoculars and GPS were supplied to those key camps where the staff regularly went on patrolling in the Park.

Follow-up training of frontline protection staff of Sonai Rupai Wildlife Sanctuary and Nameri National Park continued using some trainers and monitors identified during the Darwin training course conducted in collaboration with Zoological Society of London. At least 8 of the trained staff in Sonai Rupai, 4 in Nameri and 2 staff in Orang were engaged in survey and monitoring exercises.

The protection camps and forest guards within our area of operation in Sonai Rupai were trained to avoid and prevent grass burning and they have restricted fire over the last couple of years (except some cases where it was burnt by local intruders or cowherds).

In addition, lectures and demonstrations were also organised for frontline staff visiting the project sites from forest schools in Assam, Manipur, Mizoram and Arunachal Pradesh.

School teachers and local NGOs

Training of local school teachers from the fringe village of Manas as well as NGO members in environmental education and wildlife conservation, helped to increase their knowledge about the importance of local wildlife and other natural resources, and to learn how to use different EE tools and methods for awareness generation. The two training workshops organised in collaboration with local NGOs, *Manas Bhuyanpara Conservation Ecotourism Society*, *Agrang Ecotourism Society*, and Centre for Environment Education (CEE) were attended by 70 enthusiastic participants representing more than 20 middle and high schools. Training kits consisting of education resource material, posters and stickers were distributed among the participants. The workshop used a combination of illustrated talks, interactive games, discussions, film shows and field trips to impart training to the teachers with focus on grasslands and threatened wildlife of Manas, particularly the pygmy hog. Some school teachers and NGO members trained under the project undertook conservation education efforts around Manas National Park. Project team members were also called upon to assist CEE in their capacity building programmes covering 15 schools in the vicinity of Nameri.

The project assisted in a couple of stakeholders' workshops on "Communities, wild tiger and their habitat: Enhancing community participation in formulation and implementation of conservation and education programmes" jointly organized by *Aaranyak* and *EcoSystems-India* at Potasali (Nameri) and Bongaigaon (Manas) in May 2007. Other collaborators included *Nature's Foster*, *Green Manas* and some other local NGOs.

Undergraduate and graduate students

As mentioned above, a graduate student from Gauhati University completed his Ph.D. thesis on ecology and management of grasslands in Manas, based on data collected earlier under the project.

Three M.Sc. students completed short-term projects after receiving training and guidance from programme personnel. One of them, from the Wildlife Conservation Society's M.Sc. Wildlife course (based at National Centre for Biological Sciences, Bangalore) carried out the behavioural study on the hogs. The second student from the Imperial College, London, carried out the fire studies. In addition a fresh Masters graduate was recruited and trained to carry out the grasslands studies in Manas.

Further four B.Sc. students received training in habitat monitoring and pygmy hog surveys and socio-economic surveys for community conservation. They were also advised on possible job placements.

PHCP Staff training

Three field assistants from Manas, Potasali and Nameri area were trained in rapid survey techniques for tracking signs of pygmy hogs and differentiating them from tracks and foraging marks of other wildlife in the grasslands. They were also trained to use GPS and to record data, mainly to assist in scientific surveys rather than carry them out independently.

Community engagement

Empowerment of the people is the central theme of the project's community conservation exercise. Thus the initiatives in the three model fringe villages of Manas incorporated need based training in their mandate. Capacity building was undertaken in three main areas: popularisation of alternative livelihood options, human-animal conflict mitigation, and improvement of Park-people relations for effective conservation of the pygmy hog grasslands in Manas. The villagers were encouraged to form Self Help Groups (SHGs) to address economic and conflict issues.

Training and counselling of the SHG members were carried out in Barengabari (Bansbari Range), Thaijoguri (Bhuyanpara Range), and Sourang (Panbari Range) villages. Frequent monthly/quarterly meetings were held in all these villages to encourage members to adopt livelihood initiatives to reduce dependence on forest produce. Subsequently, SHG groups started cultivating cash crops such as ginger, chilli, jute, vegetables on their own land or leased plots. In addition beekeeping, and pickle and jam making training given to SHGs has yielded good results with members earning profits from sale in the local market. In Thaijoguri, the women SHG group is making profits through fish farming as a collective enterprise, and selling hand woven products.

To strengthen the operation of existing and new SHGs, training in the account keeping / registration and management of SHGs was carried out in all these villages. Regular monthly contributions by the members and procedure for securing bank loans were also discussed. The SHG members now have started credit and thrift operations among themselves. A local student was trained to maintain the account books and records of the SHG in Barengabari. Spurred by the success of livelihood alternatives, SHG members in the project villages are now interested in participating in conservation initiatives.

Targeting the members of community who go inside the Park to catch small fish and to extract thatch grass, we organized awareness generation campaigns to encourage fish cultivation in the abandoned water bodies in the villages and cultivation of thatch grass or other cash crop in the fields in the months when paddy is not grown.

Frequent crop and livestock raiding, and property damage by elephants, boars and tigers in the project villages has highlighted the need to address the human-animal conflict issues with greater urgency in order to achieve even minimum goals of community conservation initiatives. Sourang is the worst affected among the three villages. Following requests by villagers to mitigate conflict; various options were assessed. Rechargeable spotlights developed by project partner EcoSystems-India were distributed in Sourang. The trip-wire installed by us in the village has been successfully giving advance warning about raiding wild elephants so that the villagers can take appropriate action to reduce damage to crop and property. A very hot variety of local chilly (*bhot jolokia*) saplings have been distributed to SHG members for cultivation. Besides benefiting economically by selling the sapling and fruit of the plant, the chilly can be used effectively as chilly-smear rope barrier and chilly smoke device against wild elephants as demonstrated by the Darwin Initiative sponsored Assam Haathi Project of Chester Zoo and EcoSystems-India.

In addition, training in bee keeping was started at Potasali (Nameri) for the local villagers. Also local NGOs were also assisted in developing and submitting community based project proposals for government funding. The project also started (led by Dr. Parag Deka) an alternative livelihood training for local women (micro enterprise to make cottage products, such as. pickle and jams made from local fruits and condiments, handicraft made from local bamboo and cane).

Manas training and community centre

The construction of the Manas training centre at Bansbari was undertaken to cater to the training programmes organised as well as for use by project field staff working in Manas under the aegis of the project.

4.7 Sustainability and Legacy

Durrell has been actively involved in the pygmy hog project since the early 1970s, when the species was re-discovered. Thus PHCP activities under the Darwin project will continue to be sustained, albeit on a smaller scale till further funding can be secured.

Among its achievements, the conservation breeding and reintroduction component is most likely to endure, given the magnitude of the conservation value of conserving the pygmy hog as well as the scale of technical and financial inputs. Efforts to mainstream the frontline staff training course into the Assam Forest Department's regular training agenda have met with positive results. The receipt CEPF grant will also ensure continuation of community initiatives in the fringe villages. The legacy of infrastructure, skills, and staff created under the project will be utilized to sustain future activities. Moreover, all the project partners have signed a MoU valid until 2015 to collaborate for securing the future of the pygmy hog. Durrell is not proposing any exit strategy for the project, but it is looking at empowering local expertise to continue the activities started by the Darwin project.

5 Lessons learned, dissemination and communication

The experience gained by project staff in Assam has been key factor in sustaining the project operations in the post-Darwin phase. The implementation of the project has taught us that conservation action programmes that entail captive breeding, habitat restoration and reintroduction as well as community engagement have long gestation periods, and it is difficult to measure the impacts within a short span of time (less than 5 years). Further, some of the tasks concerning habitat studies and follow up action in monitoring wildlife could not be completed as our target groups performed much below our expectations despite efforts. This has added to our understanding that long-term commitment from the different stakeholders will be honoured only (see Section 4.3 Outputs, item *Output 3*) if direct incentives are offered.

For dissemination of information on the project see Section 4.3, item *Output 5*; Section 4.5 Technical and Scientific achievements and co-operation, item (i); and Annex 5.

The dissemination of the project achievements will continue even after the completion of the project as the Darwin component is part of the larger ongoing programme. As the PHCP progresses in the subsequent years, due credit will be given to Darwin for having leveraged the programme to its current status.

5.1 Darwin identity

Due importance has been given to support extended by Darwin Initiative through publicity. Wherever possible, the Darwin has been acknowledged: Darwin logo on the banners displayed: in workshops held, and Darwin funding in all publications, both print and electronic. Even though the Darwin project forms a part of the PHCP, its importance is not undermined as most local established conservation organisations are aware of the Darwin Initiative and its identity.

6. Monitoring and evaluation

The project was monitored jointly by Durrell Chief Conservation Officer, Prof. John E. Fa, and ZSL Darwin Fellow, Dr. Rajan Amin, with support from Chairman of IUCN/SSC Wild Pigs Specialist Group, William Oliver, and Durrell Conservation Programme Head, Dr. Andrew Terry. Others who visited the project sites to evaluate the progress and provided useful recommendations included Dr. Mark Stanley Price, Sarah Seymour, Mark Brayshaw and Paul Masterton (all from Durrell) and Dr. Richard Kock (from ZSL).

In November 2008, Dr. Robert Wild, Associate Director, LTS International, Edinburgh, visited Assam as a representative of Darwin Initiative. Although his visit was primarily to conduct a mid-term review of Assam Haathi Project, a human-elephant mitigation initiative of EcoSystems-India and Chester Zoo, he decided to visit PHCP project sites at Basistha and Potasali to apprise himself about the activities of the project.

Monthly checks and reports from the project field sites by senior field staff provided an assessment of the progress of implementation of the project activities. These reports were relayed to Project leader, and any problems were referred to the project leader and project manager for remedial action.

The situation in Assam especially around Manas and Sonai Rupai has always remained precarious because of local political disturbances. However, despite this, we feel that we were able to make significant progress during the project duration. With continued cooperation from the local stakeholders, we managed to achieve our goals with considerable success.

5.2 Actions taken in response to annual report reviews

The reviews received were passed on to PHCP local staff in Assam, and appropriate action was taken to improve the management and implementation of project activities.

6 Finance and administration

6.1 Project expenditure

Item	Budget (<i>Quarter 4 Actual Expenditure claim, 15/12/09</i>)	Expenditure	Balance
Rent, rates, heating, overheads etc			
Office costs (e.g. postage, telephone, stationery)			
Travel and subsistence			
Printing			
Conferences, seminars, etc			
Capital items/equipment			
Others			
Salaries (specify)			
TOTAL			

6.2 Additional funds or in-kind contributions secured

The Pygmy Hog Conservation Programme is one of Durrell's flagship projects. To ensure continuity of Darwin activities into the future, Durrell is actively seeking further financial support. A proposal submitted to the Critical Ecosystems Partnership Fund was approved for grant in October 2008. Also, a major fund-raising dinner (The Pygmy Hog Party) was held in, Whitehall, in October 2007 was a big success. There are also proposals in the pipeline for further funding beyond 2010.

In-kind support was also provided by William Oliver by way of technical advice, mentoring and visits to field sites. The Assam Forest Department helped with the necessary permits and field support. EcoSystems-India contributed 5 man-months of professional time and administrative support to the project.

Value of DI funding

All project participants agree that the Darwin funding provided a very important stimulus to undertake long overdue activities to protect the pygmy hog and other species in the Assamese terai grasslands. The Darwin support came at a very opportune time and we could strengthen and expand the activities of the existent programme. Also new activities such as community conservation initiatives could be undertaken. The funds allowed all aims of the project to be achieved and resulted in a greater positive impact than would otherwise have occurred.

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

LOGICAL FRAMEWORK

Project summary	Measurable Indicators	Progress and Achievements April 2006 – March 2010	Actions required/planned for next period
<p>Goal: To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but constrained in resources to achieve</p> <ul style="list-style-type: none"> • the conservation of biological diversity, • the sustainable use of its components, and • the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources 			
<p><i>Purpose</i> To build local capacity in Assam to have the capacity and information systems for: 1) pygmy hog conservation; and 2) meet overall CBD objectives for the area.</p>	<p>Improved information on wild pygmy hog populations, and habitat available for effective management and implementation of a forward five-year strategy.</p> <p>Regular reviews and feedback reports.</p>	<p>The project's purpose has been largely fulfilled. Except installation of the information database systems, all other outputs have been achieved. Details are given below.</p>	
<p>Output 1 Comprehensive system for monitoring of pygmy hog populations, other associated grassland species and their habitats in MTR established.</p>	<p>Distribution, habitat use and relative abundance of the pygmy hog, and other grassland species in MTR extrapolated.</p> <p>Annual status reports</p> <p>Habitat sensitive area maps and PHVA models produced.</p> <p>Long-term plan for pygmy hog conservation developed.</p>	<ul style="list-style-type: none"> • Annual pygmy hog surveys conducted in 3 ranges of Manas NP to establish presence and abundance of pygmy hogs. Pygmy hogs were found in all the ranges of Manas, most of them in Bansbari Range. • A status report and regular progress reports prepared. • Monitoring of the reintroduced population and release of pygmy hogs in a second site in Assam (see Section 4.2 <i>Output 2</i>). • Land cover and habitat map of Manas based on satellite imageries prepared (see Section 4.5). • A 5-year conservation plan for pygmy hogs prepared. 	

Project summary	Measurable Indicators	Progress and Achievements April 2006 – March 2010	Actions required/planned for next period
	<p>2 MSc's trained.</p> <p>Local BSc and MSc student placement studies.</p>	<ul style="list-style-type: none"> Two MSc students trained in behavioural and satellite data based habitat studies. One (1) post-MSc student trained in field surveys. In addition, a PhD student completed his data analysis and dissertation under the project. Four BSc students received training; three from local colleges in habitat monitoring and pygmy hog surveys and socio-economic surveys for community conservation. They were also advised on possible job placements. 	
<i>Activity 1.1:</i> Field surveys to determine presence or absence of pygmy hogs, habitat status and suitability in Manas and potential reintroduction sites.		<ul style="list-style-type: none"> Surveys undertaken in Manas, Sonai Rupai, Nameri, Orang and Barnadi [see Section 4.5 (a)]. 	
<i>Activity 1.2:</i> Preparation of land cover and habitat status maps.		<ul style="list-style-type: none"> Habitat maps prepared for Manas [see Section 4.5 (d)]. Low resolution maps also produced for Sonai Rupai for identification of suitable habitat and monitoring of reintroduced hogs (see Section 4.2 <i>Output 2</i>). A detailed literature review prepared to evaluate fire as a management tool and its role in influencing forage availability and quality in floodplain grasslands as well as its consequences for the associated faunal species. Study on spatial and temporal pattern of fire in the Manas, towards partial fulfillment of MSc degree. 	
<i>Activity 1.3:</i> Preparation of long-term conservation plan		<ul style="list-style-type: none"> <i>Conservation Strategy and Action Plan for Pygmy Hog in Assam</i> developed. 	
<i>Activity 1.4:</i> Training of MSc and BSc students		<ul style="list-style-type: none"> A total of 7 students benefited. Two Masters thesis were produced and 4 undergraduates trained (see Section 4.6). 	
Output 2 New pygmy hog populations established in SRWS/NNP.	<p>Suitable release sites within SRWS/NNP identified</p> <p>Improved protection, monitoring and grassland habitat management in SRWS/NNP</p>	<ul style="list-style-type: none"> Identification of potential release sites within Sonai Rupai, Nameri and Orang and habitat suitability assessment. Improvement of grassland habitat in Sonai Rupai after better management and protection, following project's recommendations to Sonai Rupai and Nameri authorities; and capacity building of frontline field staff by PHCP. Infrastructure development by authorities for better protection of the pygmy hog release sites with inputs from PHCP. 	

Project summary	Measurable Indicators	Progress and Achievements April 2006 – March 2010	Actions required/planned for next period
	Captive-bred hogs from PHCPRBC in Guwahati moved to 'pre-release' holding and management enclosures, and 25 hogs released and monitored in SRWS/NNP	<ul style="list-style-type: none"> • The habitat in the identified grasslands in south-eastern Nameri did not improve adequately due to continued cattle grazing. • Nine groups of captive bred hogs comprising 43 individuals were shifted to the Potasali pre-release enclosures from 2007-2009. These hogs were prepared successfully for independent survival in the wild. • Out of the prepared hogs, of 25 were reintroduced in restored grasslands of Sonai Rupai in 2008 and 2009. With the release of 10 more of these hogs in May 2010, a total of 35 hogs formed a new population. • Monitoring revealed that at least two-thirds of the released hogs survived and are thriving. Signs of breeding in the wild and dispersal were found in all years. 	
<i>Activity 2.1:</i> Habitat and security assessment of new pygmy hog sites in SRWS/NNP.			<ul style="list-style-type: none"> • Report on habitat suitability of potential release sites within SRWS/NNP prepared. • Recommendations for scientific management of grassland habitat developed and forwarded to the concerned authorities.
<i>Activity 2.2:</i> Habitat restoration of identified reintroduction sites in SRWS/NNP.			<ul style="list-style-type: none"> • 12 frontline staff members from Sonai Rupai informally trained and deployed for improved monitoring and grassland protection. • Project staff worked jointly with frontline staff for scientific management and restoration of the grassland habitat. • PHCP installed solar powered fencing around protection camps in Sonai Rupai to prevent elephant depredation. Medical camps were also organised for frontline staff for prevention and prophylaxis of malaria, and other ailments.
<i>Activity 2.3 :</i> Establishment and monitoring of pygmy hog populations in SRWS/NNP			<ul style="list-style-type: none"> • Social groups of unrelated hogs formed, at the breeding centre, for release into the wild. • Under the 'soft release' procedure, these groups were shifted to Potasali Pre-release Centre, Nameri, and were maintained there for five months in large separate enclosures under minimal human contact.

Project summary	Measurable Indicators	Progress and Achievements April 2006 – March 2010	Actions required/planned for next period
		<ul style="list-style-type: none"> • Study conducted on behavioural profile of pygmy hog, specially change in their behaviour from captivity to wild towards partial fulfilment of MSc degree (see Section 4.5). • After marking, these social groups were transferred sequentially to final 'release' enclosures erected at different locations at the release site in Sonai Rupai. After 2-3 days, they were released into the wild. • The new population of released hogs was monitored using baiting station vigil, searching for signs of hog (nests, footprints, forage marks, and droppings) and occasional video camera trapping. 	
<p>Output 3: Trained and accredited instructors for pygmy hog and other grassland species conservation, continuing training of field patrol and monitoring staff.</p>	<p>Minimum of 10 park staff trained and accredited as instructors</p> <p>Minimum 30 patrol and monitoring staff trained.</p> <p>Training manuals and posters.</p>	<ul style="list-style-type: none"> • 28 frontline staff completed training under the 5-day Darwin course <i>Monitoring Manas' Wildlife</i>. Out of these, 5 achieved Instructor accreditation, and 21 participants achieved Monitor accreditation (see <i>Section 4.5</i>). • 43 frontline staff participated in the follow-up training in 3 ranges of Manas. Binoculars and GPS were supplied to those key camps where the staff regularly went on patrolling in the Park. • 12 frontline staff in Sonai Rupai trained and used for monitoring and protection • Two training manuals and a field book in Assamese and English produced: <i>Monitoring and Protecting Wildlife – Darwin Training Course for Frontline Staff of Protected Areas of Assam</i>: (a) Instructor's Training Manual, (b) Field Training Manual; and (c) Data Recording Field Book • A set of 12 posters used a teaching aid alongside the manuals produced in Assamese. • A set of 2 posters on grasslands use produced. 	
<p><i>Activity 3.1.</i> Training workshop in monitoring and survey methods</p>		<ul style="list-style-type: none"> • Two workshops conducted. 	
<p><i>Activity 3.2.</i> Initial intensive on-site training of MTR park monitoring staff followed by on-going training on periodic basis by local trainers</p>		<ul style="list-style-type: none"> • On-site training provided to 28 frontline staff of Manas, Nameri, Sonai Rupai, Orang and Barnadi. • 43 frontline staff of Manas received field training from the accredited instructors under supervision of project staff. 	

Project summary	Measurable Indicators	Progress and Achievements April 2006 – March 2010	Actions required/planned for next period
<i>Activity 3.3.</i> Training of MTR park officers in GIS, data entry and management, data quality control, and basic data processing using Grassland Mammal Information Management System and field protocols. Training in production of annual status reports. Workshop for park ecologists and monitoring staff trained in habitat assessment and management techniques		<ul style="list-style-type: none"> No suitable candidates for such training were available in the Park headquarters. Further there were no Park ecologists, and the motivation of the field staff was low. 	
<i>Activity 3.4.</i> Training of MTR staff in the use of radio tracking equipment		<ul style="list-style-type: none"> Demonstration of radio tracking equipment was given to frontline staff in SRWS/ NNP, but no training could be provided as the radio tracking exercise on the hogs was abandoned due to injuries caused by the harness during the trial run. 	
<i>Activity 3.5.:</i> Workshop on PHVA analysis of pygmy hog and associated grassland species data gathered by MTR and SRWS/NNP staff and finalisation of PHVA model.		<ul style="list-style-type: none"> In absence of adequate data gathered by Park staff, PHVA could not be undertaken. 	
<i>Activity 3.6.</i> Workshop to develop the long-term plan for the conservation of pygmy hogs and the grassland habitats		<ul style="list-style-type: none"> Workshop conducted at DWCT, and a 5-year plan produced. 	
Output 4 Community education programme.	<p>Minimum of 20 school teachers and relevant park staff and members of local groups and NGOs per year trained in accredited conservation and environment education.</p> <p>A social, cultural and economic assessment of the MTR adjoining communities undertaken. Outputs used to inform and support local government organisations and NGOs in developing community livelihood initiatives.</p> <p>Outreach programme implemented.</p>	<ul style="list-style-type: none"> Two <i>Educators' Workshop for Conservation of Manas Tiger Reserve</i> in Manas were conducted. The project staff helped organize another workshop in Nameri with focus on grasslands and tiger conservation. 70 local school teachers from fringe villages of MTR trained in Environment Education tools, and conservation issues pertaining to grasslands and pygmy hog conservation (see <i>Section 4.6</i>). Assistance (stationery, teaching aids) was given to trained teachers for follow up activities involving students and community members. Kits containing resource manual and additional educational material for EE programmes distributed to workshop participants. Socio-economic surveys of three fringe villages of Manas undertaken to design a need based capacity building programme aimed at sustainable resource use. Operations of existing Self Help Groups (SHGs) in the project villages were strengthened and new SHGs were formed to adopt alternative livelihood options. 	

Project summary	Measurable Indicators	Progress and Achievements April 2006 – March 2010	Actions required/planned for next period
		<ul style="list-style-type: none"> • Training imparted to SHGs in operational procedures and accessing micro-credit. In addition training in select alternative livelihoods (leaf plate making, food preservation, bee keeping, etc.) provided (see <i>Section 4.6</i>). • The SHGs formed are thriving, and getting high returns from activities such as weaving, cash crop farming, handicraft making, etc. • Measures such as chilli nursery, trip wire and spotlights for mitigating human-animal conflict were introduced. • Increased awareness among villagers on wildlife protection, and willingness to cooperate with authorities and civil society agencies to promote wildlife conservation. 	
Output 5 Publications and publicity.	2 radio broadcasts per year; Education material produced 5 publications submitted	<ul style="list-style-type: none"> • A radio broadcast and extensive publicity about pygmy hog release projects activities through print and electronic media (several TV local and national channels, Internet sites including BBC). • Project staff invited for interviews and panel discussions on local and national TV channels. • Press conference and several news items in local and national newspapers. • Book for children on pygmy hog, <i>Walk with Takuri</i>, published. • Two book chapters submitted for publication. • Poster on grasslands prepared. • Poster with FAQs on pygmy hog in Assamese and English prepared. • Short video clip on release operations • More than five papers published in various scientific journals. 	

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

Project summary	Measurable Indicators	Means of verification	Important Assumptions
<p>Goal:</p> <p>To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve</p> <ul style="list-style-type: none"> • the conservation of biological diversity, • the sustainable use of its components, and • the fair and equitable sharing of benefits arising out of the utilisation of genetic resources 			
<p>Purpose</p>			
<p>To build local capacity in Assam to have the capacity and information systems for: 1) pygmy hog conservation; and 2) meet overall CBD objectives for the area.</p>	<p>Improved information on wild pygmy hog populations, and habitat available for effective management and implementation of a forward five-year strategy.</p> <p>Regular reviews and feedback reports.</p>	<p>Annual park staff status reports on wildlife populations. Recommendations for pygmy hog meta-population and habitat management.</p> <p>At least one new pygmy hog population restored.</p>	<p><i>High level support within FD and MoEF, GoA, for the aims of the pygmy hog conservation and management strategy developed by project.</i></p>
<p>Outputs</p>			
<p>(a) Comprehensive system for monitoring of pygmy hog populations, other associated grassland species and their habitats in MTR established.</p>	<p>Distribution, habitat use and relative abundance of the pygmy hog, and other grassland species in MTR extrapolated.</p> <p>Fully working GIS database system at MTR (by Y1), SRWS/NNP (by Y2) and PHCPRBC (by Y1).</p> <p>Minimum of 8 staff trained in GIS, use of database system, data analysis and status reporting (Y1 and Y2).</p>	<p>Wildlife monitoring data in system database.</p> <p>Papers published on relationship between distribution and abundance of species and habitat characteristics.</p> <p>Report of habitat suitability analyses for pygmy hogs</p>	<p>Retention of staff with specialised training skills and experience, and high motivation.</p> <p>Support for equipment maintenance and repairs.</p>

Project summary	Measurable Indicators	Means of verification	Important Assumptions
	<p>Annual status reports</p> <p>Impact of burning on pygmy hog populations and other wildlife understood, and prime habitats identified by Y2.</p> <p>Habitat sensitive area maps and PHVA models produced (Y2, Y3).</p> <p>Habitat assessment manual produced; at least 5 staff trained in habitat assessment (Y2).</p> <p>Conservation priorities for specific areas in MTR developed by Y2.</p> <p>Long-term plan for pygmy hog conservation developed by Y3.</p> <p>2 MSc's trained.</p> <p>Local BSc and MSc student placement studies.</p>	<p>produced to guide management practices.</p> <p>Number of annual status reports.</p> <p>Sensitivity maps and PHVA models produced to guide management practices.</p> <p>Habitat assessment manual and number of staff trained.</p> <p>Digital and photographic products to aid MTR resource managers.</p> <p>BSc, MSc reports and certificates.</p> <p>5-year conservation plan for pygmy hogs produced.</p>	
<p>b) New pygmy hog populations established in SRWS/NNP.</p>	<p>Suitable release sites within SRWS/NNP identified by Y1.</p> <p>Improved protection, monitoring and grassland habitat management in SRWS/NNP by Y2.</p> <p>Captive-bred hogs from PHCPRBC in Guwahati moved to 'pre-release' holding and management enclosures, and 25 hogs released and monitored in SRWS/NNP by Y2.</p>	<p>Report on habitat assessment and suitable release sites within SRWS/NNP.</p> <p>Number of SRWS/NNP staff trained in protection, monitoring and grassland management.</p> <p>Pygmy hogs released in one new area and status monitored over time.</p>	<p>Full collaboration from SRWS/NNP staff.</p>

Project summary	Measurable Indicators	Means of verification	Important Assumptions
c) Trained and accredited instructors for pygmy hog and other grassland species conservation, continuing training of field patrol and monitoring staff.	<p>Minimum of 10 park staff trained and accredited as instructors by Y1.</p> <p>Minimum 30 patrol and monitoring staff trained.</p> <p>Training manuals and posters.</p>	<p>Numbers of staff trained and achievement levels summarised in training assessment reports.</p> <p>Quality of training manuals and posters</p>	<p>Trained staff retained and stimulated instructors.</p> <p>Well motivated field patrol and monitoring staff.</p>
d) Community education programme.	<p>Community education and liaison officer appointed by Y1.</p> <p>Minimum of 20 school teachers and relevant park staff and members of local groups and NGOs per year trained in accredited conservation and environment education (Y1-Y3).</p> <p>A social, cultural and economic assessment of the MTR adjoining communities undertaken. Outputs used to inform and support local government organisations and NGOs in developing community livelihood initiatives.</p> <p>Outreach programme implemented.</p>	<p>Number of school teachers and relevant park staff and members of local groups and NGOs trained.</p> <p>Community awareness and education material produced.</p> <p>Quality of assessment report, summary produced in local language for communities and local groups.</p> <p>Number of outreach activities undertaken.</p> <p>Number of livelihood initiatives started.</p>	<p>Suitable education and community liaison officer available.</p> <p>Teachers have continued interest in CEE training.</p>
e) Publications and publicity.	<p>Conservation education material produced and published in Assamese and local Bodo languages by Y1.</p> <p>Community education awareness material produced and published in Assamese and local Bodo languages by Y1.</p> <p>Radio broadcasts.</p> <p>2 papers submitted to peer-reviewed journals by Y3.</p>	<p>Copies of all publications sent to Darwin Initiative.</p>	<p>Outlets for publications and publicity willing to participate.</p>

Annex 3 Project contribution to Articles under the CBD

Project Contribution to Articles under the Convention on Biological Diversity

Article No./Title	Project %	Article Description
7. Identification and Monitoring	5	Identify and monitor components of biological diversity, particularly those requiring urgent conservation; identify processes and activities that have adverse effects; maintain and organise relevant data.
8. In-situ Conservation	30	Establish systems of protected areas with guidelines for selection and management; regulate biological resources, promote protection of habitats; manage areas adjacent to protected areas; restore degraded ecosystems and recovery of threatened species; control risks associated with organisms modified by biotechnology; control spread of alien species; ensure compatibility between sustainable use of resources and their conservation; protect traditional lifestyles and knowledge on biological resources.
9. Ex-situ Conservation	40	Adopt ex-situ measures to conserve and research components of biological diversity, preferably in country of origin; facilitate recovery of threatened species; regulate and manage collection of biological resources.
12. Research and Training	15	Establish programmes for scientific and technical education in identification, conservation and sustainable use of biodiversity components; promote research contributing to the conservation and sustainable use of biological diversity, particularly in developing countries (in accordance with SBSTTA recommendations).
13. Public Education and Awareness	5	Promote understanding of the importance of measures to conserve biological diversity and propagate these measures through the media; cooperate with other states and organisations in developing awareness programmes.
15. Access to Genetic Resources	5	Whilst governments control access to their genetic resources they should also facilitate access of environmentally sound uses on mutually agreed terms; scientific research based on a country's genetic resources should ensure sharing in a fair and equitable way of results and benefits.
Total %	100%	Check % = total 100

Annex 4 Standard Measures

Code	Description	Totals (plus additional detail as required)
Training Measures		
2	2 MSc students trained in conservation research.	2 MSc students and a post graduate trained. Project completed, degrees received.
3	At least 60 teachers and relevant park staff and members of local groups and NGOs trained in environment education	70 teachers and NGO members trained.
3	At least 8 staff trained in the production and interpretation of standardised annual status reports	No suitable candidate found during the training.
4A	4 BSc students trained	Training completed by 4 students
6A	Darwin education and community liaison officer trained further in environment education	1 person trained
6A	At least 10 trained instructors.	5 instructors accredited. 21 monitors also trained.
6A	At least 10 trained staff in the use of radio tracking equipment	Radio tracking exercise abandoned.
6A	At least 8 trained staff in field tools and procedures, data processing and reporting.	No suitable candidate found during the training.
6A	At least 8 trained staff in GIS	No suitable candidate found during the training.
6A	At least 30 trained staff in large mammal monitoring and survey techniques.	43 participated in the follow-up of training
6A	At least 5 park ecologists and monitoring staff trained in habitat assessment techniques	There were no park ecologists. No suitable monitoring staff was found for habitat assessment.
6B	Number of training weeks provided	12 weeks
7	Training manuals, guidance notes and accreditation tests	3 training manuals (6 copies of each printed and in use), a set of animal ID cards, 10 tests for instructors taken by 26 trainees and 3 tests for follow up training taken by 43 staff.
7	Training posters	Set of 12 posters (8 sets distributed)
7	Training centre	1 training facility was established in Manas
7	Data collection forms and data quality control procedures	1 data recording booklet prepared (about 200 distributed)

Code	Description	Totals (plus additional detail as required)
7	Social, cultural and economic assessment report (summary in local language)	2 surveys in 3 villages
Research Measures		
8	JF = 10 x 3 weeks; RA = 10 x 3 weeks	Two high-level papers published.
9	3 standardised annual large mammal status reports at park level produced.	None
9	Species/habitat management plans produced for MTR and SRWS/NNP.	2
10	Conservation education, awareness and teaching material including conservation education booklet produced.	70 school teachers trained, 70 sets of educational material plus accessories (stationery, stickers, etc.), 1 children's illustrated book on pygmy hog and grassland animals.
10	Vegetation maps	1 land cover assessment map for Manas
10	Habitat assessment manual	None
10	Pygmy hog habitat suitability and viability model and sensitivity map produced.	1 suitability map for Sonai Rupai
11B	6 scientific papers produced and submitted.	6 (4 published and 2 in Press)
12B & 7	Fully operational GIS-based Grassland Mammal Information Management System with user manual and tutorials.	None
Dissemination Measures		
14A	Community seminar, forums and projects.	1 community seminar, 6 village meetings, monthly meetings with SHG groups, 7 types of alternative livelihood measures initiated.
14A	Formation of self help groups in fringe villages	4 SHGs formed and trained, about 100 households benefitted.
14A	Habitat assessment seminar and report	None
12A	Vegetation database	Task abandoned
15A & 15B	National and UK press releases, radio broadcasts.	4 TV interviews, 1 press conference, 10+ newspaper articles.
Financial measures		
23	Over £120,000 spent by DWCT in running the PPHSG during the three years of this project	Annual contribution from Durrell for salaries, upkeep and field activities of team in Assam.

	<i>Wilde Schweine und Flusspferde</i> . Eds. Macdonald AA and Gansloßer U (2008)			
Book chapter	Pygmy Hog (<i>Porcula sylvania</i>). Narayan G and Oliver WLR. In: <i>Mammals of South Asia</i> . Eds. Johnsingh AJT and Manjrekar N (in press)	Universities Press, Hyderabad	www.universitiespress.com	None
Book chapter	Conservation breeding and introduction of the pygmy hog in North Western Assam, India. Narayan G, Deka PJ, Oliver WLR, Fa JE. In: <i>RSG Book</i> Ed. Soorae PS (in press)	IUCN/SSC Reintroduction Specialist Group, Abu Dhabi		None
Assessment Report	<i>Porcula salvania</i> . 2010. Narayan G, Deka P and Oliver W. In: IUCN Red List of Threatened Species. Version 2010.4.	IUCN Conservation Centre, Gland	www.iucnredlist.org	None
Masters thesis	A behavioural profile of captive bred pygmy hogs <i>Porcula salvania</i> prior to reintroduction into the wild. A thesis submitted in partial fulfilment for the degree of M.Sc. in Wildlife Biology and Conservation, WCS Post-Graduate Programme in Wildlife Biology & Conservation. Centre for Wildlife Studies and National Centre for Biological Sciences, Bangalore. Robin Kurian Abraham (2008)		EcoSystems-India mail@ecosystems.in	None
Masters Thesis	Identifying Spatial and Temporal pattern of fire in the Manas National Park, India: Implications for grassland habitat conservation. A thesis submitted in partial fulfilment of the requirement for the degree of Master of Science and the Diploma of Imperial College, London. Chihiro Takahata (2008).		EcoSystems-India mail@ecosystems.in	None

Doctoral thesis	Ecology and management of grassland with special reference to grass and bird communities in Manas National Park, Assam. A Ph.D. thesis submitted to Gauhati University, Bibhuti Prasad Lahkar (2008).		EcoSystems-India mail@ecosystems.in	None
Training Manuals	1. Monitoring and Protecting Wildlife – Instructor’s Training Manual – Darwin Training Course for Frontline Staff of Protected Areas of Assam (in English and Assamese); 2. Monitoring and Protecting Wildlife – Field Training Manual (in English and Assamese)	PHCP	EcoSystems-India mail@ecosystems.in	None
Posters	A set of two grasslands posters	PHCP	EcoSystems-India mail@ecosystems.in	None
Training and Resource Manual	Educators’ Workshop for Conservation of Manas Tiger Reserve – Resource Manual	PHCP	EcoSystems-India mail@ecosystems.in	

Annex 6 Darwin Contacts

Ref No	162/15/017
Project Title	Implementing a Recovery Plan for the Critically Endangered Pygmy Hog in Assam
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