Pygmy Hog: Back from the Brink

Parag Jyoti Deka[1] [2], Goutam Narayan[3] and Dhritiman Das[4]

Background and Context

The pygmy hog (*Porcula salvania*) is the world's smallest and rarest wild pig most threatened by extinction. It belongs to a unique genus that has no close relative. The species is categorised as 'Endangered' by IUCN and is listed in the Schedule I of the Indian Wildlife (Protection) Act. The species was formerly distributed along the narrow alluvial tract south of the Himalayan foothills from south-eastern Uttarakhand in the west to central Assam in the east, along the international border of Nepal and Bhutan with Indian states of Uttar Pradesh, Bihar, West Bengal and Assam[5] [6]. The landscape, known as *terai* in U.P. and Nepal and as *duar* in north Bengal and western Assam, consists of more or less flat and relatively well drained terrain covered with riverine forests and tall grasslands in the flood plains of the tributaries of the rivers Ganges and Brahmaputra. The pygmy hogs occupied some of the grassland patches in this tract.

The information on its distribution prior to 1970s is scanty and imprecise and the species was never reported to be plentiful. By the 1960s, it was already feared extinct by Gee[7] and others. Much more information became available after the species was 'rediscovered' in 1971 near Barnadi Wildlife Sanctuary and in Manas National Park[8] [9], both located along Assam's border with Bhutan.

Surveys in 1977 by Oliver[10] [11] confirmed the species' continued presence in Manas, Barnadi and some other reserve forests in Assam, e.g. Subankhata, Daranga, Rowta, Balipara, Nauduar and Gohpur. Despite recommendations for improved management and protection of grassland habitats by Oliver, particularly against extensive dry-season burning, organised thatch collection, commercial plantation of trees, livestock grazing and other human uses, little was done and most of the populations disappeared by the early or mid-1980's. By 1985, the wild populations survived only in and around Manas and in Barnadi[12].

Extensive surveys were again carried out between 1995 and 2000[13] in all areas of north-eastern India where pygmy hogs had been reported or suspected to occur in the past. These surveys confirmed the extinction of the species in Barnadi, where the species was last recorded definitively in 1991, and all other sites except Manas National Park which now supports the last known viable wild population of this species. By 1993, the species had become restricted to only a few pockets of the Manas National Park.

---

[1] Durrell Wildlife Conservation Trust - Pygmy Hog Conservation Programme (PHCP)
[2] Aaranyak - Threatened Species Recovery Programme (TSRP)
[3] EcoSystems-India - Rare & Endangered Species Conservation Unit (RESCU)
[4] Durrell Wildlife Conservation Trust - Pygmy Hog Conservation Programme (PHCP)
[5] Oliver, W. L. R. (1980). The Biology and Conservation of the Pigmy Hog *Sus (Porcula) salvanius* and the Hispid Hare *Caprolagus hispidus*. *Special Scientific Report No. 1*, *Jersey Wildlife Preservation Trust*: 80 pp.
[6] Oliver, W. L. R. & Deb Roy, S. (1993). The Pygmy Hog (*Sus salvanius*). In: Oliver, W. L. R. (Ed.). *Pigs, Peccaries and Hippos: Status Survey and Conservation Action Plan*, 121-129. IUCN, Gland, Switzerland.
[7] Gee, E. P. (1964). *Wildlife of India.* Collins Ltd., London.
[8] Tessier-Yandell, J. (1971). The pigmy hog, *Sus salvanius*. *Cheetal* **14**/3: 23-28.
[9] Mallinson, J. J. C. (1971). The pigmy hog, *Sus salvanius* (Hodgson) in northern Assam. *Journal of the Bombay Natural History Society* **68**: 424-433.
[10] Oliver, W. L. R. (1979). Observations of the biology of the pigmy hog (with a footnote on the hispid hare): pigmy hog survey report, part II. *J. Bombay Nat. Hist. Soc.* **76**: 115-42.
[11] Oliver, W. L. R. (1980). The Biology and Conservation of the Pigmy Hog *Sus (Porcula) salvanius* and the Hispid Hare *Caprolagus hispidus*. *Special Scientific Report No. 1*, *Jersey Wildlife Preservation Trust*: 80 pp.
[12] Oliver, W. L. R. & Deb Roy, S. (1993). The Pygmy Hog (*Sus salvanius*). In: Oliver, W. L. R. (Ed.). *Pigs, Peccaries and Hippos: Status Survey and Conservation Action Plan*, 121-129. IUCN, Gland, Switzerland.
[13] Narayan, G. & Oliver, W. L. R. (2015). Pygmy Hog *Porcula salvania.* In: Johnsingh, A. J. T. & Manjrekar, N. (Eds.). *Mammals of South Asia,* Vol. 2: 129-145. Universities Press, Hyderabad.

Adult Pygmy Hog ©Parag Deka

Threats

Most of the habitat in the known and presumed range of the pygmy hog has been converted to human settlements and farm land. The remaining grassland areas have become fragmented and the resulting pockets have shrunk with increased levels of human disturbance. Factors such as indiscriminate dry-season burning, grass-cutting, domestic livestock grazing, commercial forestry, flood-control schemes, collection of minor forest produce and hunting have degraded most of these grasslands. The remaining viable population in Manas has also steadily declined over time due to the spread of alien invasive plants species such as, *Chromolaena odorata*, *Mikania micrantha* and problematic native plant species such as *Leea asiatica, Bombax ceiba and Lagerstroemia parviflora and Diellenia pentagyna* which are now becoming a big threat in many grassland areas.

Manas Grassland Pygmy Hog Habitat ©Parag Deka

The Baseline

Several measures were undertaken to conserve the species and its habitat after 'rediscovery' of pygmy hogs in 1971, but many in vain. It was given top priority by inclusion in the Schedule I of the Wildlife (Protection) Act 1972 by India and in the Appendix I of the CITES, the latter despite the fact that international trade was not an issue for the species. In 1981, the Barnadi Reserve Forest in Assam was upgraded to a Wildlife Sanctuary mainly to accord better protection to grassland species such as pygmy hog and hispid hare, but the protection machinery broke down in Barnadi after the intensification of ethnic disturbances around 1990. In 1973, Manas became one of the first Tiger Reserves of India with the subsequent designation as a UNESCO World Heritage Site in 1986. In the late 1990s, the Bhutan Government had shown some interest in pygmy hog conservation, but deterioration of the security situation along Indo-Bhutan border hampered this initiative.

Several attempts were also made to breed the animal in captivity between 1971 and 1990. More than 50 wild hogs were taken into captivity and there were over 50 recorded captive births in the Assam State Zoo and Zurich Zoo. However, all these attempts failed, and by 1993 no pygmy hog survived in captivity anywhere on earth[14] [15] [16]. These projects involved considerable effort and expenditure but they did not succeed due to lack of proper facilities and scientific approach, and inexperience of managers [17].

The Initiative

The Durrell Wildlife Conservation Trust (DWCT) and IUCN/SSC Wild Pig Specialist Group (WPSG) have carried out surveys and studies on pygmy hogs since the late 1970s and they put forward a number of recommendations for the conservation of the species[18]. Unfortunately, few of these recommendations were implemented until 1995.

In 1995, DWCT and WPSG initiated the Pygmy Hog Conservation Programme (PHCP) in collaboration with Government of Assam and Government of India (GoI)[19]. This important recovery programme for the highly threatened species and their equally endangered habitats has been conducted under the aegis of a formal Memorandum of Understanding (MoU) signed between IUCN/SSC Wild Pig Specialist Group, Durrell Wildlife Conservation Trust (DWCT), the Forest Department, Government of Assam, and the Ministry of Environment, Forest and Climate Change (M0EF&CC), (GoI). The programme is at present being implemented by two local partners: EcoSystems-India and Aaranyak. The above MoU stipulates that ownership of all pygmy hogs bred in captivity would lie with the Government of Assam till perpetuity. Translocation and reintroduction of any such animal is possible only with mutual consent of the agencies involved.

---

[14] Mallinson, J. J. C. (1977). Breeding of the pigmy hog, *Sus salvanius* (Hodgson) in northern Assam. *Journal of the Bombay Natural History Society* **74**: 288-298.

[15] Oliver, W. L. R. (1980). The Biology and Conservation of the Pigmy Hog *Sus (Porcula) salvanius* and the Hispid Hare *Caprolagus hispidus*. *Special Scientific Report No. 1*, *Jersey Wildlife Preservation Trust*: 80 pp.

[16] Oliver, W. L. R. & Deb Roy, S. (1993). The Pygmy Hog (*Sus salvanius*). In: Oliver, W. L. R. (Ed.). *Pigs, Peccaries and Hippos: Status Survey and Conservation Action Plan*, 121-129. IUCN, Gland, Switzerland.

[17] Narayan, G. & Oliver, W. L. R. (2015). Pygmy Hog *Porcula salvania.* In: Johnsingh, A. J. T. & Manjrekar, N. (Eds.). *Mammals of South Asia,* Vol. 2: 129-145. Universities Press, Hyderabad.

[18] Oliver, W. L. R. & Deb Roy, S. (1993). The Pygmy Hog (*Sus salvanius*). In: Oliver, W. L. R. (Ed.). *Pigs, Peccaries and Hippos: Status Survey and Conservation Action Plan*, 121-129. IUCN, Gland, Switzerland.

[19] Oliver, W. L. R., Narayan, G. & Raj, M. (1997). The Pygmy Hog Conservation Programme: background description and report on progress to end December 1996. *Dodo, Journal of Jersey Wildlife Preservation Trust* **33**: 45-71.

A properly structured action plan was formulated under this initiative to save the species and its habitat. This included:

- Conservation breeding of the species as an insurance against the possible early extinction of the species in the wild and to provide animals for reintroduction.

- Upgrading the (legal as well as actual) protection status of the above sites; undertake field research to plan ideal management practices for maintenance of optimal diversity of these habitats and mechanism to implement the recommendations.

- Reintroduction of viable number of pygmy hogs in selected sites from where they have disappeared for their long-term survival in the wild; and monitoring the reintroduced populations.

- Monitoring and modifying habitat management practices to promote survival of all original inhabitants of such habitats.

Major activities under the Programme include: field surveys; conservation breeding after capturing founders from the wild; preparing the captive hogs in a semi-wild facility, proper grassland management and restoration at the release sites; reintroduction and monitoring of released populations; biological and behavioural studies in captivity; and conservation education and action in the fringe areas of Manas and release sites. Recommendations for better conservation of the remnant and reintroduced hog populations and scientific management of grassland habitats in selected areas of Assam have also been submitted to the relevant authorities and have been included in the various published and unpublished reports of the Programme.

The conservation breeding initiative was started from scratch as no pygmy hog survived in captivity anywhere by the time this initiative was launched. The construction of the Research and Breeding Centre started in late 1995 at Basistha, on the outskirts of Guwahati city in Assam, and it was ready to house the animals by March 1996. The facility comprised a specially designed range of 9 inner and 9 outer inter-connected enclosures, perimeter fence, project house and staff accommodation. The outer enclosures or paddocks were planted with tall grasses brought from known pygmy hog habitats.

The project was given permission to bring in six hogs into captivity. The only known method of catching wild pigmy hogs unharmed is by flushing them from cover and driving them into a series of 3-4 nets deployed over a length of 40-50 m in dense grass using elephants and pedestrian beaters. The use of elephants is necessary as the riders can spot the hogs as well as any potentially dangerous animal in the tall grass, and also facilitate passage through the dense patches of vegetation. Later, a young male rescued in 2001, and another male and two females captured in 2013 from the same range joined the captive breeding stock in order to improve the heterozygosity of the captive population.

The captive breeding initiative met with considerable success in the first 5 year period and the captive population increased by about thirteen times to 77 (40 males and 37 females), which included 4 of the original founders. While these results greatly exceeded expectations, continued breeding at the same rate could have caused overcrowding in captivity. Unfortunately, the animals could not be released in the wild due to prevailing security situation in and around the potential release sites, and scarcity of funds to establish a ‘pre-release’ facility. The reintroduction process was started after the conditions improved almost five years after the Programme was ready to release animals. Meanwhile, a captive

population of about 70 hogs was maintained between 2002 and 2006 by breeding only a limited number of animals at Basistha centre. A recent genetic study reveals encouraging news that the captive population has retained its genetic diversity despite a long-term captive breeding programme. This was possible due to strict scientific conservation breeding protocol by the Programme.[20]

Preparation for release into the wild began in 2007 and accordingly the number of breeding pairs was increased to produce hogs for reintroduction. A second breeding centre was developed at Potasali, near Nameri National Park, adjoining a 'pre-release' facility. This was also necessary to reduce the risk of any catastrophic event because the entire global population of captive pygmy hogs were at one site.

One of the objectives of the extensive surveys between 1995 and 2005 was to identify future reintroduction sites, and three potentially suitable sites in north western Assam - Sonai Rupai Wildlife Sanctuary, Nameri National Park and Orang National Park were shortlisted in consultation with local stakeholders. After 2010, a fourth site - Barnadi Wildlife Sanctuary - too was added to this list as the protection here improved. These four sites fall within the known range of the species, though no evidence could be found[21] of its continued occurrence at these sites. Initially, Manas was not considered for release of captive-bred hogs as the original population, though declining, was still present in the Park. Later, the eastern or Bhuyanpara range was also added to the potential sites for release as the grassland habitat in some of locations in the range had improved. These sites were not directly contiguous with the areas bearing hogs in the central or Bansbari range of the Park and no sign of pygmy hogs were found in them despite repeated surveys.

Sonai Rupai located about 150 km east of Manas was selected for the first releases in 2008 as it was possible to quickly restore the relatively small and secure grasslands in the Gelgeli area of the sanctuary. Sonai Rupai had been generally neglected and it was assumed that reintroducing rare pygmy hogs may generate increased interest for better protection of the protected area. Project staff worked with the sanctuary authorities and staff to improve protection and management of identified grasslands – largely to control annual dry season burning of grass and illegal livestock grazing. Sanctuary staff was also trained in wildlife monitoring and habitat management to help in restoration of the grassland habitat and monitoring of hogs reintroduced there between 2008 and 2010. Similar efforts were also initiated in Orang for better management of the grassland habitat before the release of pygmy hogs started there in 2011. In addition to fire management, PHCP staff advised and helped the authorities in erecting a solar power fence along its northern boundaries. In 2014-15, the focus of restoration efforts shifted to Barnadi where the grassland patches had shrunk and were overgrown with tree colonisers and weeds. PHCP staff worked tirelessly along with local communities to create open grasslands where pygmy hogs were first reintroduced in 2016. Twenty-three social groups with a total of 116 captive-bred pygmy hogs were released into the wild at three different sites in Assam between 2008 and 2018 – 35 in Sonai Rupai, 59 in Orang and 22 in Barnadi.

[20] Purohit D, Manu S, Ram MS, Sharma S, Patnaik HC, Deka PJ, Narayan G, Umapathy G. 2021. Genetic effects of long-term captive breeding on the endangered pygmy hog. PeerJ 9:e12212 http://doi.org/10.7717/peerj.12212

[21] Meijaard, E., Narayan, G. & Deka, P. 2019. *Porcula salvania*. The IUCN Red List of Threatened Species 2019: e.T21172A44139115. https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T21172A44139115.en.

Twenty-four captive-bred pygmy hogs were released between 2020 and 2021 in the Bhuyanpara range of Manas National Park from where they had disappeared and the locations were isolated from the current wild population[22]. This is a significant milestone in the effort to save one of the most endangered mammals in the world as, about 26 years ago, six hogs were captured from the Babsbari range of the Park as the founders for the conservation breeding project. The iconic species now returns back to their home where their last original population still survives but has dramatically declined. With this, the number of pygmy hogs reintroduced into the wild by PHCP has reached 142. About 60 hogs will be released over a 5-year period in the Bhuyanpara range of Manas.

Pygmy hogs are extremely shy and secretive in the wild. Monitoring them in the wild is a challenge as they remain hidden in tall dense grass and rarely emerge into the open. Several different methods have been used over the past years to track the released animals. There were intense radio tracking studies that were carried out after the release of the captive hogs. In addition to that, a wide ranging survey of known and suspected sites of pygmy hog distribution have been carried out. Grassland ecology studies have also been carried out in collaboration with Guwahati University to provide grassland management guidelines for conservation of natural floral and faunal diversity of the grassland habitats. Under a Darwin Initiative award, PHCP expanded its capacity building and community conservation initiatives in Manas and selected reintroduction sites. The capacity building and training programmes targeting frontline protection staff in the field have been carried out, while the rural communities in the fringe areas of the parks are being encouraged to undertake conservation initiatives. The project has established a system for monitoring of released pygmy hogs and their grassland habitat and is exploring potential sites for future reintroductions.

Pygmy Hog Research and Breeding Centre Basistha ©Parag Deka

[22] Briefly. (2021). Oryx, 56(1), 3-8. doi:10.1017/S0030605321001678

Pygmy Hog Pre-release Center ©Parag Deka

The Present Day Scenario

Recent studies suggest that reintroduction in Orang National Park has been particularly successful. Conservative estimates indicate that the population has crossed the 150 mark in this park. However, surveys in the last four years indicate disappearance of the population from the original location in Kuribeel in the Manas National Park. Therefore, it can be safely assumed that, along with the captive population of 70-80 hogs, about 70% of the world population of this species is either in the release site or in captivity, as the last naturally surviving wild population of the species in Manas probably numbers less than 100 individuals[23].

While serious concerns have been expressed about the fate of the last surviving natural population, it has also been accepted by many that unless the Pygmy Hog Conservation Programme had initiated conservation efforts in the 1990s through captive breeding and reintroduction there could have been greater chances of the species disappearing faster. The Pygmy hog was critically endangered and in the IUCN redlist when PHCP started the programme in 1995 and it was upgraded to Endangered category.[24] A recent publication also acknowledges that pygmy hog is one of the 48 species that were saved from extinction by conservation action[25].

The Programme has maintained the only captive population of the species on earth for about twenty-five years and plans to initiate breeding loans to other institutions. As a first step, three captive hogs have been shifted to Assam State Zoo and hopefully through them it will

[23] Narayan, G. & Oliver, W. L. R. (2015). Pygmy Hog *Porcula salvania.* In: Johnsingh, A. J. T. & Manjrekar, N. (Eds.). *Mammals of South Asia,* Vol. 2: 129-145. Universities Press, Hyderabad.

[24] Meijaard, E., Narayan, G. & Deka, P. 2019. *Porcula salvania*. The IUCN Red List of Threatened Species 2019: e.T21172A44139115. https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T21172A44139115.en.

[25] Bolam, F. C., Mair, L., Angelico, M., Brooks, T. M., Burgman, M., Hermes, C., ... & Butchart, S. H. (2021). How many bird and mammal extinctions has recent conservation action prevented?. Conservation Letters, 14(1), e12762.

reach other institutions with demonstrated competence in conservation breeding of endangered species. Although efforts are being taken to identify potential reintroduction sites in the past distribution range of the species in Assam and areas west of the state, the future success of any such efforts will depend on the grassland habitat management practices, prevailing security situation and financial sustainability of such conservation efforts.

Pygmy Hog Released ©PHCP

Lessons Learnt and Conclusions

Till 2018, the PHCP was guided by the IUCN Species Action Plan (SAP) 1993, prepared by the Wild Pig Specialist Group. In 2019, a revised SAP was prepared with a long term vision till 2030 after a collaborative exercise involving all stakeholders. In addition, the PHCP is guided by Durrell's 'Rewild Our World' strategy and two associated plans which map out the programme until 2025, one for field and community activities in Manas and the second for the pygmy hog captive breeding and reintroduction programme. In order to achieve the programme's vision of restoring pygmy hog populations in the wild and protecting their grassland habitat for the benefit of all threatened species and local communities, a detailed programme plan was developed following the "Conservation Standards" framework and enacted from 2020. The Manas Plan renewed the focus of PHCP on the recovery of grasslands and these grassland obligate species. At the same time the Pygmy Hog Plan envisions to establish pygmy hog populations in the entire sub-Himalayan grassland to ensure their long term survival. Under this plan, a trial of different grassland management practices in the Manas National Park (MNP) has been initiated to design an efficient model for the same. As part of a broader grassland habitat restoration framework, the programme is experimenting control of Invasive Alien Plants such as *Chromolaena odorata* and *Mimosa diplotricha* along with experimentation to stop the invasion of woody problematic native species like *Bombax ceiba* etc. in the grassland. All restoration efforts are conducted with the active participation of stakeholders as well as the local community. The learnings and restoration experience of Sub Himalayan grasslands are being shared with other conservation partners.

The survival of pygmy hogs is closely linked to the existence of the tall, wet grasslands of the region which, besides being a highly threatened habitat itself, is also crucial for survival of a number endangered species such as the greater one-horned rhinoceros (*Rhinoceros unicornis*), tiger (*Panthera tigris*), eastern barasingha (*Rucervus duvaucelii ranjitsinhi*), water buffalo (*Bubalus arnee*), hispid hare (*Caprolagus hispidus*) and Bengal florican (*Houbaropsis bengalensis*)[26]. The pygmy hog is one of the most useful indicators of current wildlife management practices in these habitats as it has disappeared from grasslands which still support some other species. It is therefore important to understand why it is disappearing faster than other less sensitive species and take remedial actions if we wish to preserve the original habitats in their pristine state and with optimal diversity. This will eventually benefit all species of these threatened habitats. Preserving these important habitats, which are one of the richest in the Indian subcontinent in terms of their biodiversity, will also help in maintaining long term ecological and economic wellbeing of the region. These wet grasslands serve as buffer against floods in rainy season while maintaining high groundwater levels in dry season, indirectly benefiting farming communities living in the fringe areas.

[26] Dutt, B., 2019. Rewilding: India's Experiments in Saving Nature. Oxford University Press.