SPECIES

Author Affiliation:
Biodiversity Parks Programme, Centre for Environmental Management of Degraded Ecosystems, University of Delhi, Delhi-110007

ˈCorresponding Author
Biodiversity Parks Programme, Centre for Environmental Management of Degraded Ecosystems, University of Delhi, Delhi-110007
Email: faiyazybp@gmail.com

DISCOVERY
SCIENTIFIC SOCIETY

Hog deer *Axis porcinus* reclaiming historical geographical distribution range due to ecological restoration in the Yamuna Biodiversity Park, Delhi, India

Mohan Singh, Sameer Gautam, Srivastava DP, Pranjal Jain, Umendra Sirohi, Harmeek Singh, Arjun, Ekta Khurana, Faiyaz A Khudsar*

ABSTRACT

The Hog deer (*Axis porcinus*) was known to inhabit the Yamuna floodplains of Delhi but became locally extinct due to the degradation of its characteristic habitats. A systematic restoration of floodplain wetlands, forest communities, and grasslands in the Yamuna Biodiversity Park of Delhi has led to the return of many species of animals, including the Hog deer.

Keywords: Hog deer, Floodplain Grassland, floodplain restoration, Yamuna Biodiversity Park.

1. INTRODUCTION

The Hog deer (*Axis porcinus*), classified under Kingdom: Animalia, Phylum: Chordata, Class: Mammalia, Order: Artiodactyla, Family: Cervidae, Subfamily: Cervinae, and Genus: Axis, was once widely distributed across South and Southeast Asia (Brook et al., 2015). However, in 2008, it was categorized as an endangered species by the IUCN Timmins et al., (2015) and protected under Schedule I of the Indian Wildlife (Protection) Act, 1972. The Hog Deer is a grassland obligate, adapted to live in tall grasses Dhungel and O'Gara, (1991), Odden et al., (2005), and is mainly confined to protected areas (Karanth and Nichols, 2000; Biswas, 2004). In India, it has been distributed in the alluvial grasslands of the Indo-Gangetic and Brahmaputra floodplains (Schaller, 1967; Prater, 1980).

Over time, the population of this animal has experienced a drastic decline throughout its geographical range Sinha et al., (2019), primarily due to habitat degradation and illegal hunting. As an important prey for large carnivores Stoen and Wegge, (1996), Lovari et al., (2015), it plays a vital ecological role in

ecosystem functioning. The National Capital Territory (NCT) of Delhi, located in Northern India at 28.7041° N and 77.1025° E, is surrounded by the state of Haryana on the east and by Uttar Pradesh on its northern, western, and southern sides. Delhi is characterized by two significant geographical features: River Yamuna and its floodplains, as well as rocky tracts representing last spur of the Aravalli hill ranges. These features define Delhi's environment and ecology and influence its floral and faunal composition.

However, over time, the city has witnessed unbridled development, resulting in habitat degradation and the loss of complete ecosystems, including its pristine faunal diversity. The Hog deer was reported in Delhi long ago (Anonymous, 1883-84; Anonymous 1912). After these reports, there was no further report of Hog deer in the region. The habitat of the Hog deer consists of moist grasslands associated with rivers (Biswas and Mathur, 2000). According to Odden et al., (2005), the highest density of Hog deer populations is due to the presence of floodplain grasslands. Historical habitat degradation, characterized by the loss of tall grasses, likely contributed to the extinction of the Hog deer in the Delhi region.

2. STUDY AREA

A floodplain restoration program was started in year 2002 and 2011 on the inactive and active floodplain of the Yamuna River, respectively, designated as the Yamuna Biodiversity Park (YBP) in Delhi, India. Yamuna Biodiversity Park covers an area of approximately 185 hectares (28°43'56.8"N, 77°13'06.6"E), located near Wazirabad on the flat alluvial plains of river Yamuna (Figure 1). YBP was developed as a joint collaborative project of the Delhi Development Authority (DDA) and the Centre for Environmental Management of Degraded Ecosystems (CEMDE) at the University of Delhi with the objective of restoring the lost ecosystems of Yamuna River and its floodplains. Within YBP, various initiatives have been undertaken to restore floodplain wetlands, grasslands, and establish riparian forest communities. These efforts have led to the reclamation of historical ranges by many characteristic fauna of the Yamuna floodplains.
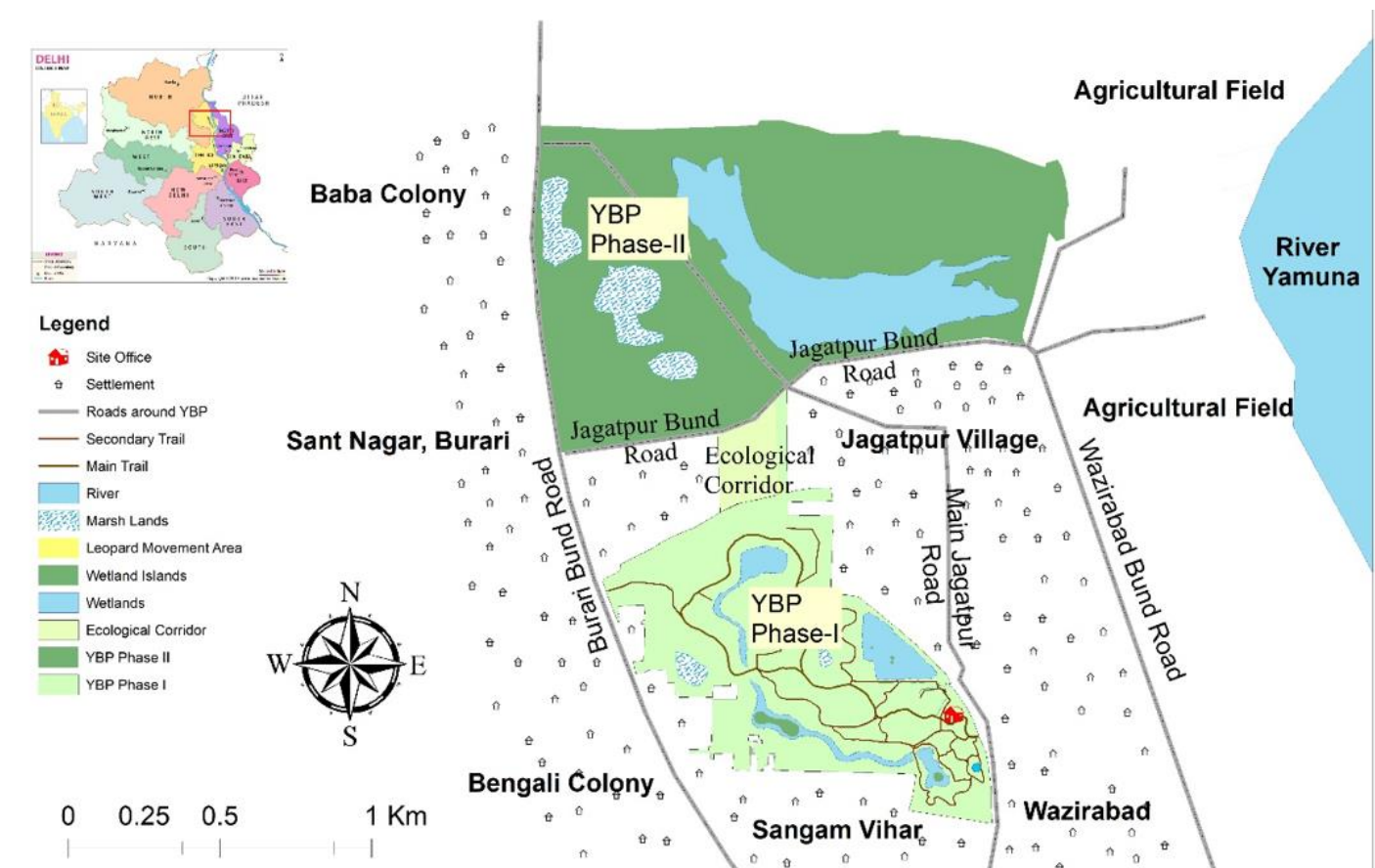
Figure 1 Map of Delhi and Yamuna Biodiversity Park

3. RESULT

The establishment of the Yamuna Biodiversity Park aimed to restore the lost glory of the Yamuna River floodplains by reviving floodplain grasslands dominated by *Saccharum spontaneum, S. bengalense,* followed by *Chrysopogon zizanioides, Imperata cylindrica,* and other grasses (Figure 2). The park also successfully restored one of the threatened *Tamarix* communities along its narrow, shallow riverine wetland with *Acacia nilotica* on the fringes. The entire area of the Yamuna Biodiversity Park now harbours restored floodplain wetlands, grasslands, and forest communities (Niangthianhoi and Khudsar, 2015). After a decade of restoration efforts, which included the restoration of floodplain grassland communities, a mosaic of wetlands, and riparian forests, various faunal elements, such as the Sieboldii snake Srivastava et al., (2020), Singh et al., (2021), as well as Wild pigs, Jungle Cats, Indian Hares, Porcupines, Nilgai, Indian Civets, etc. have started colonizing the reclaimed area.

Figure 2 Restored floodplain grassland of Yamuna Biodiversity Park

Hog deer was first recorded in the Yamuna Biodiversity Park through a Camera trap (Maker: Cuddeback, model: Attack) in 2016 (Figure 3 A, B, C). Subsequent field surveys and Camera traps placed in different locations confirmed the presence of Hog deer. Since 2016, there have been eight sightings of Hog deer, including a recent one in August 2023. In one of the sightings, we spotted Hog deer crossing the restored narrow, shallow wetland of the Yamuna Biodiversity Park.

Figure 3 (A) & (B) Camera trap photo of Hog deer installed in Yamuna Biodiversity Park (C) Hog deer crossing restored wetland of Yamuna Biodiversity Park

4. DISCUSSION & CONCLUSION

Hog deer generally graze on young grasses, herbs, flowers, and fruits, and they often browse on young leaves and shoots of shrubs, with a particular preference for *Imperata cylindrica* and *Saccharum* spp. (Dhungel and O'Gara, 1991). Studies in India and Nepal have shown a preference for grasslands dominated by blady grass (*Imperata cylindrica*) (Biswas, 2004). In another study from Bela Forest, Pakistan, the preferred habitat of Hog deer consists of a mix of *Tamarix* species with grass cover and scattered growth of *Acacia*, open grassy areas with *Saccharum munja* and *S. spontaneum*, and water ponds (Masood et al., 2012). While researching habitat selection by Hog deer in lowland Nepal, Odden et al., (2005) reported that Hog deer prefer tall grasslands comprising *Saccharum spontaneum* not only for refuge and cover (predator avoidance) but also for their diet.

The abundance of a mosaic of biological communities, including *Saccharum spontaneum* as a preferred diet, in the restored Yamuna Biodiversity Park has played a crucial role in restoring the habitat of Hog deer to Delhi's Yamuna floodplain through the

river corridor. The arrival of a female Hog deer in the Yamuna Biodiversity Park suggests that ecological restoration strategies adopted in the park, which spans both the active and inactive floodplain of the Yamuna River, may serve as a model for replication elsewhere in the floodplain. This approach can help in achieving goal of establishing functional ecosystems and natural rewilding.

Conflicts of interests

The authors declare that there are no conflicts of interest.

Ethical approval

The Animal ethical guidelines are followed in the study for species observation & identification.

Data and materials availability

All data associated with this study are present in the paper.

REFERENCES AND NOTES

1. Anonymous. A Gazetteer of Delhi 1912.
2. Anonymous. Gazetteer of Delhi district, Punjab Govt 1883-84.
3. Biswas T, Mathur VB. A review of the present conservation scenario of hog deer (Axis porcinus) in its native range. Indian For 2000; 126(10):1068-1084.
4. Biswas T. Hog Deer (*Axis porcinus* Zimmerman, 1780). FNVIS Bulletin (Wildlife Institute of India, Dehradun) 2004; 7:61-78.
5. Brook SM, Nasak C, Channa P. Indochinese Hog Deer *Axis porcinvs annamiticus* on the brink of extinction. Deer Specialist Group Newsletter 2015; 14-31.
6. Dhungel SK, O'Gara BD. Ecology of the Hog deer in Royal Chitwan National Park, Nepal. Wildl Monogr 1991; 119:1-40.
7. Karanth KU, Nichols JD. Ecological status and conservation of tigers in India. Final Technical Report. Centre for Wildlife Studies, Bangalore, India 2000; 124.
8. Lovari S, Pokheral CP, Jnawali SR, Fusani L, Ferretti F. Coexistence of the tiger and the common leopard in a prey-rich area: the role of prey partitioning. J Zool 2015; 295(2):122-131.
9. Masood A, Imran Ullah, Chaudhry-Muhammad-Jamshed Iqbal, Khan-Najam-Ul Huda. Estimating Hog deer *Axis porcinus* population in the riverine forest of Taunsa Barrage Wildlife Sanctuary, Punjab, Pakistan. Rec Zool Surv Pakistan 2012; 21:25-28.
10. Niangthianhoi SL, Khudsar FA. The nesting success of Oriental Darter *Anhinga melanogaster* in Yamuna Biodiversity Park, New Delhi, India. J Threat Taxa 2015; 7(14). doi: 10.11609/jott.2430.7.14.8148-8153
11. Odden M, Wegge P, Storaas T. Hog deer Axis porcinus need threatened tallgrass floodplains: A study of habitat selection in lowland Nepal. Anim Conserv 2005; 8(1):99–104. doi: 10.1017/S1367943004001854
12. Prater SH. The Book of Indian Mammals. Bombay Natural History Society; 4th edition 1980; 324.
13. Schaller GB. The Deer and the Tiger: Study of Wild Life in India. University of Chicago Press 1967; 376.
14. Singh M, Gautam S, Srivastava DP, Jain P, Sirohi U, Singh H, Arjun, Khudsar FA. First leopard picture in the Yamuna Biodiversity Park, India. Cat News 2021; 72:19.
15. Sinha A, Lahkar BP, Hussain SA. Current population status of the endangered Hog Deer Axis porcinus (Mammalia: Cetartodactyla: Cervidae) in the Terai grasslands: a study following political unrest in Manas National Park, India. J Threat Taxa 2019; 11(13):14655–14662. doi: 10.11609/jot.5037.11.13.14655-14662
16. Srivastava D, Gautam S, Singh M, Sirohi U, Mukherjee D, Khudsar FA. First resighting since the 1940s of Siebold's Watersnake, *Ferania sieboldii* (Schlegel 1837), in Delhi, India. Reptil Amphib 2020; 27(3):525–527. doi: 10.17161/randa.v27i3.14911
17. Stoen OG, Wegge P. Prey selection and prey removal by tiger (*Panthera tigris*) during the dry season in lowland Nepal. Mammalia 1996; 60(3):363-374.
18. Timmins RJ, Duckworth JW, Kumar NS, Anwarul-Islam M, Baral HS. Axis porcinus. The IUCN Red list of Threatened Species 2015; e.T41784A22 157664. doi: 10.2305/IUCN.UK.2015-4.RLTS.T41784A22 157664.en