**Species richness and conservation status of herpetofauna and Mammals in Bhimbandh Wildlife Sanctuary, Bihar, India**

**Abstract**

This study assessed the diversity of herpetofauna (reptiles and amphibians) and mammals within Bhimbandh Wildlife Sanctuary, Bihar, India, evaluating their conservation status and ecological roles. A 15-day survey was conducted in March and April 2025, observing animals directly, using camera traps, and checking for signs like footprints. Five amphibian species, 25 reptile species, and 13 mammal species were identified. Critical analysis revealed significant taxonomic inaccuracies in the primary source, including the erroneous listing of species endemic to other continents. According to the International Union for Conservation of Nature (IUCN) Red List, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendices, and India’s Wildlife (Protection) Act, 1972, although many species are globally classified as 'Least Concern,' several face significant regional threats. Notable threatened species include the Endangered Ganges Softshell Turtle (*Nilssonia gangetica*) and Indian Narrow-headed Softshell Turtle (*Chitra indica*), and Vulnerable species such as the Sloth Bear (*Melursus ursinus*), Four-horned Antelope (*Tetracerus quadricornis*), Indian Flapshell Turtle (*Lissemys punctata*), and Spotted Pond Turtle (*Geoclemys hamiltonii*). This paper highlights the ecological contributions of these species and emphasizes the limitations of relying solely on global conservation status for localized management. It advocates integrated conservation strategies addressing human-wildlife coexistence, anti-poaching measures, and continuous and accurate monitoring.

Keywords: Herpetofauna, Mammals, Biodiversity, Conservation Status, Bhimbandh Wildlife Sanctuary, Bihar, India.

**Introduction**

Conservation areas including the Protected Areas (PAs) are key refugia for global biodiversity (Dalton et al., 2023). Many different stakeholders, from governments to civil society to businesses, need information on the state of species and habitats and the threats they face to facilitate efficient, data-driven decision-making and to enhance conservation impact and sustainability (IUCN-SSC, 2023). Biodiversity monitoring is therefore an essential element of environmental management. Priorities for improving protection of biodiversity include: improving the inventory, with surveys focused on geographical areas and taxonomic groups which are under-collected (Corlett, 2020). Detailed biodiversity inventories may help in the identification and conservation of the hotspot areas that would help maximize biodiversity conservation (Yang et al., 2022)

This study presents an inventory of herpetofauna (reptiles and amphibians) and mammals within the Bhimbandh Wildlife Sanctuary (BWS), an ecologically significant yet historically underexplored protected area in Bihar, India. The initial dataset, derived primarily from local survey documents and preliminary observations, presents significant methodological challenges. Notably, there were considerable gaps and inconsistencies in taxonomic details, along with a marked absence of comprehensive conservation status information for many listed species. This inherent unreliability underscores the pressing need for rigorous validation and data enrichment.

To address these critical limitations and ensure the scientific integrity and robustness of our findings, this study systematically supplemented primary observational data. Information was meticulously cross-referenced and integrated from multiple reputable scientific databases, including the Global Biodiversity Information Facility (GBIF), IUCN Red List, Reptile Database, and Amphibian Species of the World (Frost, 2021; GBIF, 2024; IUCN, 2023; Uetz, P., Freed, P., & Hošek, 2023). This rigorous, multi-source approach has enabled the correction of taxonomic inaccuracies, including the identification and removal of erroneously listed species endemic to other biogeographical regions. It also facilitated the completion of crucial conservation status details, referencing authoritative global, national, and regional assessments (Convention on International Trade in Endangered Species of Wild Fauna and Flora., 2025; WPA, India, 1972; IUCN, 2023). Furthermore, this comprehensive data integration provides robust ecological descriptions and distribution notes for the identified species within the sanctuary’s unique habitat mosaic. The overarching aim of this study is to deliver a reliable, taxonomically sound, and ecologically relevant scientific assessment of regional biodiversity within the BWS, providing a foundational and verifiable resource for future ecological research, evidence-based conservation planning, and sustainable management initiatives in this vital landscape.

**Study Area and Duration**

The faunal survey was conducted over a continuous period of 15 days, from the last week of March to the first week of April 2025, within the Bhimbandh Wildlife Sanctuary located in Munger District, Bihar, India.

The Bhimbandh Wildlife Sanctuary (25.23°N, 86.28°E) is located in the southwest of Munger district in Bihar, India, near the town of Haveli Kharagpur (*Fig. 1*). It spans an area of approximately 681.99 km² and is characterized by diverse terrain, including the undulating Kharagpur Hills, part of the Chota Nagpur Plateau in southeastern Bihar. The sanctuary lies south of the Ganges River, west of Santhal Pargana, and is surrounded by densely populated, non-forestry areas. BWS has a diverse range of habitats, including dry deciduous forests, grasslands, seasonal wetlands, hot water springs, and human-modified landscapes. This ecological heterogeneity supports a wide range of vertebrate species and makes Bhimbandh an important site for biodiversity assessments.

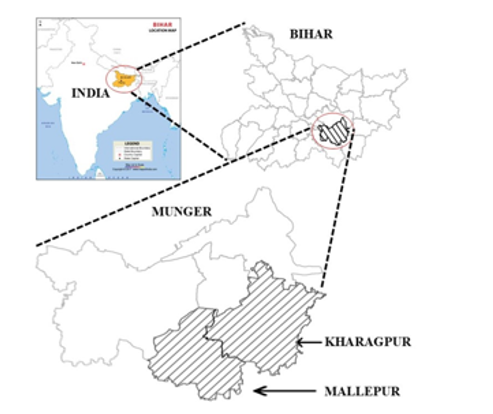


Figure 1. Map of the study area.

The area is covered by tropical dry deciduous forests, with dominant species, such as *Shorea robusta* (sal), *Diospyros melanoxylon* (kendu), *Boswellia serrata* (salai), *Terminalia tomentosa* (asan), *Terminalia bellirica* (bahera), *Terminalia arjuna* (arjun), and *Pterocarpus marsupium* (paisar). The terrain is undulating with valleys and foothills. Grasslands, wetlands, and geothermal springs were also present (Sinha & Santra, 2019). During the study period, the region experienced late dry season climatic conditions, characterized by rising daytime temperatures, dry leaf litter, and sparse ground vegetation. These conditions were favorable for faunal surveys as they enhanced animal movement, visibility, and detectability, especially for terrestrial mammals and herpetofauna.

The survey was strategically designed to capture species diversity across key habitat types and ecological gradients within this sanctuary. Fieldwork was conducted daily between 10:00 AM and 5:00 PM, a timeframe selected to balance logistical feasibility with species activity patterns, especially for herpetofauna, which are often more active during warmer daylight hours in the early summer.

**Methodology:**

**Survey Design**

To ensure systematic and replicable data collection, this study adopted a two-stage methodological framework, comprising the following:

Stage I: Primary Field-Based Data Collection

Stage II: Secondary Data Augmentation and Cross-Validation

This integrative approach was aimed at maximizing species detectability while addressing potential limitations, such as temporal constraints and species crypticity.

**Stage I: Primary Data Collection**

Data were collected using multiple methods. Some animals were observed by direct sightings, while others were identified through indirect signs, such as footprints, scats, or droppings. These methods were chosen because they are considered to be effective for detecting mammals and herpetofauna in tropical forests.

1. **Point Count and Camera Trap Methodology**

**Objective:** To detect species, particularly small mammals, reptiles, and amphibians, using visual and auditory cues.

**Procedure:** Fixed observation points were strategically established across ecologically significant locations within the sanctuary, encompassing diverse habitat types such as forest interiors, open clearings, and areas adjacent to water bodies. These points were selected to maximize species detectability, based on habitat preferences and known animal movement corridors.

At each fixed point, two complementary methods were employed to document faunal presence:

1. **Camera Trap Installation:**

Camera traps were deployed at selected observation points, primarily to capture the presence and activity of medium-to large-sized mammals, particularly nocturnal or elusive species. Each camera trap unit was left in place for a minimum of two consecutive days to allow sufficient time for photographic detection. Camera placement was guided by signs of animal presence, such as pugmarks, scats, or known trails, and traps were set at appropriate heights and angles for the target species.

1. **Visual and Auditory Observation:**

Direct observations were conducted at each point for 20–30 min during two key faunal activity windows.

**Early Morning:** 06:00–09:00 AM

**Late Evening:** 16:00–18:30 PM

These sessions focused on detecting herpetofauna and small-to medium-sized mammals using both visual encounters and auditory cues (e.g., calls, movement through leaf litter). Observations were carried out by trained local cattle guards, who possess intimate knowledge of terrain and wildlife behavior, thereby enhancing detection accuracy and efficiency.

**Data Recorded:** All sightings and evidence recorded during these sessions, including species name, number of individuals, time, habitat characteristics, and GPS location, were documented.

1. **Fixed Route Monitoring (Transect Walks)**

**Objective:** To systematically document species occurrence across varied terrain and habitat types.

**Procedure:** Linear transects 1–2 km in length were laid in each major habitat zone. Each transect was walked slowly (1–1.5 km/hr) by a team of 2–3 trained observers. All species were sighted, heard, or whose signs were encountered along the transects were recorded.

**Frequency:** Each transect was surveyed on at least three nonconsecutive days to reduce temporal bias.

**Data Recorded:** Species name, number of individuals, mode of detection (visual/auditory/sign), behavior, and associated habitat parameters.

1. **Pugmark and Sign Survey**

**Objective:** To detect elusive, nocturnal, or crepuscular species that are difficult to observe directly.

**Procedure:** Surveys were conducted along known animal trails, waterholes, and open forest roads to identify signs such as pugmarks and footprints, scats or droppings, scratch marks on trees, digging signs, and feeding remnants (e.g., fruit remains and kill sites). This method helped identify mammals, such as *Panthera pardus fusca* (Indian leopard), *Melursus ursinus* (sloth bear), and *Hyaena hyaena* (Striped Hyena).

All field observations were geotagged using GPS devices and manually logged in data sheets, which were later digitized for analysis.

**Stage II: Secondary Data Augmentation and Validation**

The following secondary data sources and validation protocols were employed to compensate for detection biases and validate the field identifications.

1. **Literature Review**

A thorough review of the existing literature was conducted to contextualize the field data and verify the known distribution of the observed species. Sources included:

1. Peer-reviewed articles from journals such as *Journal of Threatened Taxa*, *Zoo’s Print*, and *Indian Forester*.
2. Regional faunal checklists and biodiversity registers from the Zoological Survey of India (ZSI).
3. **Reference Databases**

To verify the conservation status, nomenclature, and legal protection, species were cross-referenced with the following authoritative databases:

**IUCN Red List of Threatened Species:** Used to obtain global population trends and threat categorizations (e.g., Endangered, Vulnerable, Near Threatened).

**CITES Appendices (I, II, III):** Reviewed to identify species listed under international trade restrictions.

**India’s Wildlife (Protection) Act, 1972 (Amended 2022):** Species were mapped to their corresponding schedules (I–IV), indicating the level of legal protection accorded under Indian law.

1. **Cross-Verification and Taxonomic Validation**
2. All primary data were cross-referenced with secondary sources to resolve inconsistencies, confirm species identification, and update the nomenclature according to the latest taxonomic standards. This process ensures a high level of data reliability and rigorous scientific rigor.
3. Local experts and herpetologists were consulted to verify species records, particularly for morphologically similar or cryptic species.

**Results**

The identified species, their common names, scientific names, family, and order based on the validated data are presented in Tables 1-3. Detailed observations on these animals are presented in table 4. The errors in the original document have been corrected, and missing information has been supplemented through external research.

**Amphibians**

Four frogs were found in the amphibian category (Table 1), (Figure 2).

Table 1: Amphibians identified in Bhimbandh Wildlife Sanctuary

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Order** | **Family** | **Scientific Name** | **Common Name** | **WPA**  **Status** | **IUCN Status** | **CITES**  **Status** | **Population Trend** |
| Anura | Dicroglossidae | *Euphlyctis cyanophlyctis* | Skipper Frog | Not Listed | Least Concern | Not Listed | Stable |
| Anura | Dicroglossidae | *Minervarya agricola* | Cricket Frog | Not Listed | Least Concern | Not Listed | Unknown |
| Anura | Dicroglossidae | *Hoplobatrachus tigerinus* | Indian Bullfrog | Schedule IV | Least Concern | Appendix II | Decreasing |
| Anura | Rhacophoridae | *Polypedates maculatus* | Spotted Tree Frog | Not Listed | Least Concern | Not Listed | Unknown |

**Reptiles**

The reptile inventory comprised of 25 species, predominantly snakes and turtles, along with some lizards (Table 2). Some reptiles are shown in Figure 3.

Table 2: Reptiles identified in Bhimbandh Wildlife Sanctuary

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Order** | **Family** | **Scientific Name** | **Common Name** | **WPA**  **Status** | **IUCN Status** | **CITES**  **Status** | **Population Trend** |
| Squamata | Scincidae | *Eutropis carinata* | Keeled Indian Mabuya | Not Listed | Least Concern | Not Listed | Unknown |
| Squamata | Agamidae | *Calotes versicolor* | Changeable Lizard | Not Listed | Least Concern | Not Listed | Unknown |
| Squamata | Gekkonidae | *Hemidactylus frenatus* | Forest gecko | Not Listed | Least Concern | Not Listed | Stable |
| Squamata | Elapidae | *Naja naja* | Spectacled Cobra | Schedule II Part II | Not Assessed | Not Listed | Unknown |
| Squamata | Elapidae | *Bungarus caeruleus* | Indian Krait | Not Listed | Least Concern | Not Listed | Unknown |
| Squamata | Viperidae | *Daboia siamensis* | Russell's Viper | Schedule II Part II | Not Assessed | Not Listed | Unknown |
| Squamata | Colubridae | *Ptyas mucosa* | Oriental Rat Snake | Not Listed | Least Concern | Not Listed | Decreasing |
| Squamata | Natricidae | *Amphiesma stolatum* | Buff Striped Keelback | Not Listed | Least Concern | Not Listed | Unknown |
| Squamata | Pythonidae | *Python molurus* | Indian Rock Python | Schedule I | Near Threatened | Appendix II | Decreasing |
| Squamata | Erycidae | *Eryx conicus* | Rough-tailed Sand Boa | Schedule IV | Not Assessed | Not Listed | Unknown |
| Squamata | Erycidae | *Eryx johnii* | Red Sand Boa | Schedule IV | Not Assessed | Not Listed | Unknown |
| Squamata | Natricidae | *Rhabdophis plumbicolor* | Green Keelback | Not Listed | Least Concern | Not Listed | Unknown |
| Squamata | Colubridae | *Fowlea piscator* | Checkered Keelback | Not Listed | Least Concern | Not Listed | Unknown |
| Squamata | Colubridae | *Dendrelaphis tristis* | Daudin's Bronzeback | Not Listed | Least Concern | Not Listed | Unknown |
| Squamata | Colubridae | *Oligodon arnensis* | Common Kukri Snake | Not Listed | Least Concern | Not Listed | Unknown |
| Squamata | Typhlopidae | *Indotyphlops braminus* | Brahminy Blind Snake | Not Listed | Least Concern | Not Listed | Unknown |
| Squamata | Colubridae | *Lycodon aulicus* | Common Wolf Snake | Not Listed | Least Concern | Not Listed | Unknown |
| Testudines | Trionychidae | *Lissemys punctata* | Indian Flapshell Turtle | Schedule I | Vulnerable | Appendix II | Decreasing |
| Testudines | Trionychidae | *Nilssonia gangetica* | Gangetic Softshell Turtle | Schedule I | Endangered | Appendix I | Decreasing |
| Testudines | Geoemydidae | *Geoclemys hamiltonii* | Spotted Pond Turtle | Schedule IV | Vulnerable | Appendix I | Decreasing |
| Testudines | Trionychidae | *Chitra indica* | Indian Narrow-headed Softshell Turtle | Schedule I | Endangered | Appendix I | Decreasing |
| Testudines | Geoemydidae | *Pangshura tecta* | Indian Roof Turtle | Schedule IV | Least Concern | Appendix I | Decreasing |

**Mammals**

The mammalian inventory included 13 diverse species, from primates to carnivores and ungulates (Table 3). Some mammals are shown in Figure 4.

Table 3: Mammals Identified in Bhimbandh Wildlife Sanctuary

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Order** | **Family** | **Scientific Name** | **Common Name** | **WPA**  **Status** | **IUCN Status** | **CITES**  **Status** | **Population Trend** |
| Primates | Cercopithecidae | *Semnopithecus schistaceus* | Nepal Gray Langur | Schedule II Part I | Least Concern | Appendix I | Decreasing |
| Carnivora | Canidae | *Canis aureus* | Golden Jackal | Schedule III | Least Concern | Appendix III | Increasing |
| Artiodactyla | Suidae | *Sus scrofa* | Wild Boar | Schedule II (often targeted for vermin declaration) | Least Concern | Not Listed | Unknown |
| Carnivora | Ursidae | *Melursus ursinus* | Sloth Bear | Schedule I | Vulnerable | Appendix I | Decreasing |
| Artiodactyla | Cervidae | *Muntiacus muntjak* | Southern Red Muntjac | Schedule III | Least Concern | Not Listed | Decreasing |
| Lagomorpha | Leporidae | *Lepus nigricollis* | Indian Hare | Schedule II | Least Concern | Not Listed | Unknown |
| Artiodactyla | Bovidae | *Tetracerus quadricornis* | Four-horned Antelope | Schedule I | Vulnerable | Appendix III | Decreasing |
| Artiodactyla | Cervidae | *Axis axis* | Spotted Deer (Chital) | Schedule III | Least Concern | Not Listed | Unknown |
| Carnivora | Viverridae | *Viverra zibetha* | Large Indian Civet | Schedule II Part II | Least Concern | Appendix III | Decreasing |
| Carnivora | Felidae | *Panthera pardus fusca* | Indian Leopard | Schedule I | Near Threatened | Appendix I | Stable/Slightly Increasing (regionally declining) |
| Carnivora | Hyaenidae | *Hyaena hyaena* | Striped Hyaena | Schedule II Part II | Near Threatened | Appendix III | Decreasing |
| Carnivora | Herpestidae | *Urva smithii* | Ruddy Mongoose | Schedule II Part I | Least Concern | Appendix III | Unknown |
| Carnivora | Viverridae | *Paradoxurus hermaphroditus* | Indian Palm Civet | Schedule II Part II | Least Concern | Appendix III | Unknown |

Species designated as “Not Listed” under India’s Wildlife (Protection) Act, 1972, Schedules, they are generally covered by broader wildlife protection mandates unless specifically assigned to highly threatened or targeted categories; “Not Assessed” for the IUCN Red List indicates no evaluation has been conducted, and “Not Listed” for CITES denotes inapplicability to international trade regulations.

**Table 4: Details of the Species observed at BWS.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Order** | **Family** | **Scientific Name** | **Common Name** | **Individual Count** | **Life Stage** | **Reproductive Condition** | **Behaviour** |
| Anura | Dicroglossidae | *Euphlyctis cyanophlyctis* | Skipper Frog | 4 | Juvenile | non-reproductive | swimming |
| Anura | Dicroglossidae | *Minervarya agricola* | Cricket Frog | 5 | Juvenile | non-reproductive | swimming |
| Anura | Dicroglossidae | *Hoplobatrachus tigerinus* | Indian Bullfrog | 1 | Adult | non-reproductive | jumping |
| Anura | Rhacophoridae | *Polypedates maculatus* | Spotted Tree Frog | 2 | Juvenile | non-reproductive | roosting |
| Squamata | Scincidae | *Eutropis carinata* | Keeled Indian Mabuya | 3 | Juvenile | non-reproductive | crawling |
| Squamata | Agamidae | *Calotes versicolor* | Changeable Lizard | 4 | Adult | reproductive | crawling |
| Squamata | Gekkonidae | *Hemidactylus frenatus* | Forest gecko | 7 | Adult | reproductive | crawling |
| Squamata | Elapidae | *Naja naja* | Spectacled Cobra | 1 | Adult | reproductive | hissing |
| Squamata | Elapidae | *Bungarus caeruleus* | Indian Krait | 1 | Adult | reproductive | coiling |
| Squamata | Viperidae | *Daboia siamensis* | Russell's Viper | 1 | Adult | reproductive | crawling |
| Squamata | Colubridae | *Ptyas mucosa* | Oriental Rat Snake | 1 | Adult | reproductive | crawling |
| Squamata | Natricidae | *Amphiesma stolatum* | Buff Striped Keelback | 1 | Adult | reproductive | crawling |
| Squamata | Pythonidae | *Python molurus* | Indian Rock Python | 1 | Adult | reproductive | crawling |
| Squamata | Erycidae | *Eryx conicus* | Rough-tailed Sand Boa | 2 | Adult | reproductive | crawling |
| Squamata | Erycidae | *Eryx johnii* | Red Sand Boa | 1 | Adult | reproductive | crawling |
| Squamata | Natricidae | *Rhabdophis plumbicolor* | Green Keelback | 1 | Adult | reproductive | crawling |
| Squamata | Colubridae | *Fowlea piscator* | Checkered Keelback | 1 | Adult | reproductive | coiling |
| Squamata | Colubridae | *Dendrelaphis tristis* | Daudin's Bronzeback | 1 | Adult | reproductive | crawling |
| Squamata | Colubridae | *Oligodon arnensis* | Common Kukri Snake | 1 | Adult | reproductive | crawling |
| Squamata | Typhlopidae | *Indotyphlops braminus* | Brahminy Blind Snake | 1 | Adult | reproductive | crawling |
| Squamata | Colubridae | *Lycodon aulicus* | Common Wolf Snake | 1 | Adult | reproductive | crawling |
| Testudines | Trionychidae | *Lissemys punctata* | Indian Flapshell Turtle | 1 | Juvenile | non-reproductive | swimming |
| Testudines | Trionychidae | *Nilssonia gangetica* | Gangetic Softshell Turtle | 5 | Juvenile | non-reproductive | swimming |
| Testudines | Geoemydidae | *Geoclemys hamiltonii* | Spotted Pond Turtle | 1 | Juvenile | non-reproductive | swimming |
| Testudines | Trionychidae | *Chitra indica* | Indian Narrow-headed Softshell Turtle | 2 | Adult | reproductive | swimming |
| Testudines | Geoemydidae | *Pangshura tecta* | Indian Roof Turtle | 1 | Adult | reproductive | swimming |
| Primates | Cercopithecidae | *Semnopithecus schistaceus* | Nepal Gray Langur | 25 | Juvenile & Adult | reproductive, non-reproductive & lactating | running |
| Carnivora | Canidae | *Canis aureus* | Golden Jackal | 2 | Adult | reproductive | foraging |
| Artiodactyla | Suidae | *Sus scrofa* | Wild Boar | 6 | Juvenile & Adult | reproductive & non-reproductive | running |
| Carnivora | Ursidae | *Melursus ursinus* | Sloth Bear | 3 | Adult | reproductive | foraging |
| Artiodactyla | Cervidae | *Muntiacus muntjak* | Southern Red Muntjac | 3 | Adult | reproductive | running |
| Lagomorpha | Leporidae | *Lepus nigricollis* | Indian Hare | 3 | Adult | reproductive | running |
| Artiodactyla | Bovidae | *Tetracerus quadricornis* | Four-horned Antelope | 1 | Adult | reproductive | running |
| Artiodactyla | Cervidae | *Axis axis* | Spotted Deer (Chital) | 2 | Adult | reproductive | running |
| Carnivora | Viverridae | *Viverra zibetha* | Large Indian Civet | 1 | Adult | reproductive | foraging |
| Carnivora | Felidae | *Panthera pardus fusca* | Indian Leopard | 1 | Adult | reproductive | foraging |
| Carnivora | Hyaenidae | *Hyaena hyaena* | Striped Hyaena | 1 | Adult | reproductive | foraging |
| Carnivora | Herpestidae | *Urva smithii* | Ruddy Mongoose | 1 | Adult | reproductive | foraging |
| Carnivora | Viverridae | *Paradoxurus hermaphroditus* | Indian Palm Civet | 2 | Adult | reproductive | running |

**Conservation Status Analysis**

The conservation status of the identified species was analyzed using the IUCN Red List, India's Wildlife (Protection) Act, 1972 (WPA), and CITES.

**IUCN Red List Status (IUCN, 2023)**

Although many species are classified as "Least Concern," a closer examination reveals significant vulnerabilities.

**Endangered**: The Gangetic Softshell Turtle (*Nilssonia* *gangetica*) and the Indian narrow-headed soft-shell turtle (*Chitra indica*) face a very high risk of extinction, primarily due to habitat degradation, pollution, and over-exploitation.

**Vulnerable**: The Sloth Bear (*Melursus* *ursinus*), Four-horned Antelope (*Tetracerus* *quadricornis*), Indian Flapshell Turtle (*Lissemys* *punctata*), and Spotted Pond Turtle (*Geoclemys* *hamiltonii*) show a high risk of extinction, often linked to population declines or restricted ranges.

**Near Threatened:** The Indian Leopard (*Panthera* *pardus* *fusca*), Striped Hyaena (*Hyaena* *hyaena*), and Indian Rock Python (*Python* *molurus*) are close to qualifying for a threatened category, warranting proactive conservation.

A critical observation is that several species, despite being "Least Concern" globally by IUCN, exhibit decreasing population trends or face significant regional threats like poaching and habitat loss. This highlights a crucial disconnect between global assessments and localized realities, potentially diverting conservation efforts from populations facing acute local pressure.

**India's Wildlife (Protection) Act, 1972 (WPA)**

The WPA provides legal protection in India through its schedule. The union government created amendments to the Wild Life (Protection) Act of 1972 in December 2022. These amendments resulted in an increase in the animal species protected by the WPA while also increasing the penalty manifold (GOI, 2022).

Schedule I: Offers the highest protection, including the Indian Rock Python, Indian Flapshell Turtle, Gangetic Softshell Turtle, Indian Narrow-headed Softshell Turtle, Sloth Bear, Four-horned Antelope, and Indian Leopard. This underscores its national significance.

Schedules II, III, and IV: Provide varying degrees of protection to species such as the Nepal Gray Langur, Indian Hare, Large Indian Civet, Striped Hyaena, Ruddy Mongoose, Indian Palm Civet, Wild Boar, and Indian Bullfrog. National legislation forms a vital framework for in situ conservation, controlling hunting, trade, and habitat destruction.

**CITES Appendices**

The Convention on International Trade in Endangered Species (CITES) bans international trade in species threatened with extinction (Mialon et al., 2022). A large number of threatened fauna species remain unprotected worldwide owing to inefficient management between the principal conservation organizations IUCN and CITES (Gorobets, 2020).

**Appendix I**: Prohibit international commercial trade for species threatened with extinction, including Nepal Gray Langur, Sloth Bear, Four-horned Antelope, Indian Leopard, Gangetic Softshell Turtle, Indian Narrow-headed Softshell Turtle, and Spotted Pond Turtle.

**Appendix II & III**: Regulate trade for species that are not immediately threatened (Appendix II) or those subject to national regulation (Appendix III). Several species, such as the Indian Flapshell Turtle, Indian Bullfrog, Golden Jackal, Large Indian Civet, Striped Hyaena, Ruddy Mongoose, and Indian Palm Civet.

**Ecological Roles and Significance**

Diverse herpetofauna and mammalian species of the Bhimbandh Wildlife Sanctuary are crucial for maintaining ecosystem health.

**Apex Predators**: The Indian Leopard, along with snakes like the Spectacled Cobra and Indian Rock Python, regulate prey populations, prevent overgrazing, and impact trophic cascades.

**Herbivores**: Species such as Spotted Deer, Southern Red Muntjac, Wild Boar, and Four-horned Antelope are primary consumers, vital for vegetation management and as a food source for carnivores.

**Omnivores/Insectivores**: The Sloth Bear, Golden Jackal, and various civets and mongooses contribute to seed dispersal, pest control, and nutrient cycling through their diverse diets.

**Scavengers**: Striped Hyaena plays a crucial role in carcass removal and the maintenance of ecosystem hygiene.

**Aquatic Species**: Turtles (e.g., Gangetic Softshell Turtles) and amphibians are integral to wetland ecosystems, contributing to nutrient cycling and serving as indicators of aquatic health.

The presence of a robust assemblage of these functional groups indicates a relatively healthy ecosystem. The decline or loss of any of these species could have significant ripple effects, disrupting food webs and ecological processes.

**Discussion**

This biodiversity assessment of the Bhimbandh Wildlife Sanctuary provides a vivid snapshot of its rich herpetofauna and mammal diversity, underscoring its ecological significance within the region. Beyond cataloging species, our study revealed a critical vulnerability: deficiencies in current baseline data collection practices. The discovery of non-native species erroneously included in the original survey highlights significant flaws in initial species identification protocols. Such inaccuracies, akin to building a house on an unstable foundation, undermine the credibility of biodiversity inventories and misdirect conservation efforts, and distort our understanding of the sanctuary’s ecological composition.

This finding emphasizes the urgent need for rigorous taxonomic verification by experienced experts and meticulous cross-referencing with authoritative region-specific faunal lists in future assessments. Through careful validation and correction of the primary dataset, including the removal of species mistakenly listed as endemic to other continents, we transformed a flawed resource into a robust and scientifically reliable baseline for the sanctuary. This process provides a solid foundation for future conservation efforts.

Moreover, our study reveals a critical disconnect between global IUCN “Least Concern’ classifications and the acute threats that many species face within Bhimbandh. Despite their stable global status, numerous species are experiencing population decline due to localized pressures, such as poaching, habitat loss, human-wildlife conflict, and pollution. These regional threats paint a far grimmer picture than global assessments suggest, demonstrating that reliance on international classification alone is inadequate for effective localized management.

Conservation strategies must be tailored to the unique vulnerabilities and dynamics of Bhimbandh ecosystems. By highlighting the disparity between global statuses and regional realities—particularly for species listed under CITES Appendix I (e.g., Ganges Softshell Turtle, Sloth Bear) and Appendices II and III (e.g., Indian Flapshell Turtle, Indian Bullfrog)—our research advocates for region-specific interventions. This nuanced approach is essential for safeguarding Bhimbandh’s unique biodiversity and serves as a call for action to prioritize immediate, ground-level realities over broad global classifications.

**Conclusion**

This study provides a comprehensive and validated assessment of herpetofauna and mammalian diversity in the Bhimbandh Wildlife Sanctuary, identifying 25 reptiles, 5 amphibians, and 13 mammalian species. This study critically highlights the importance of robust taxonomic validation in biodiversity assessments by correcting significant inaccuracies in the initial survey data, such as erroneously listed non-native species. Analysis of conservation statuses, referring to the IUCN Red List, CITES Appendices, and India’s Wildlife (Protection) Act, 1972, reveals that several species, despite being globally classified as “Least Concern,” face severe regional threats, underscoring the need for localized conservation efforts. Endangered species, including the Ganges Softshell Turtle (*Nilssonia gangetica*) and Indian Narrow-headed Softshell Turtle (*Chitra indica*), along with Vulnerable species such as the Sloth Bear (*Melursus ursinus*), Four-horned Antelope (*Tetracerus quadricornis*), Indian Flapshell Turtle (*Lissemys punctata*), and Spotted Pond Turtle (*Geoclemys hamiltonii*), listed under CITES Appendix I or II, demand immediate attention. The ecological roles of these species are vital for maintaining the sanctuary ecosystem balance. Effective conservation hinges on integrated strategies that address human-wildlife coexistence, strengthen anti-poaching measures, and ensure continuous and accurate monitoring.

**Recommendations**

Based on these findings, the following recommendations are crucial for the effective conservation of the BWS.

1. Conduct Expert-Led Surveys: Future biodiversity assessments must be carried out by experienced taxonomists to ensure accurate baseline data.

2. Implement Robust Monitoring: Establish long-term, systematic monitoring programs for key threatened species to track population dynamics and habitat health.

3. Strengthen Anti-Poaching Efforts: Enhance patrolling, intelligence gathering, and enforcement to combat illegal wildlife trade, particularly for CITES- and WPA-listed species.

4. Mitigate Human-Wildlife Conflict: Develop and implement strategies to reduce conflicts, including community engagement and compensation mechanisms.

5. Prioritize Habitat Restoration: Focus on restoring and protecting critical habitats, especially aquatic ecosystems, from degradation and fragmentation.

6. Develop Localized Conservation Plans: Create specific action plans for Bhimbandh that address regional threats, independent of global conservation statuses.

7. Build Local Capacity: Train local forest staff and community members in accurate species identification, data collection, and conservation techniques.

8. Regular Data Validation: Establish a system for periodic review and validation of biodiversity data, integrating new scientific findings.

Implementing these integrated strategies, underpinned by accurate and continuously monitored data, is essential for safeguarding the Bhimbandh Wildlife Sanctuary's unique biodiversity.

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1.

2.

3.

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Figure 2. Photoplates of some amphibians of Bhimbandh Wildlife Sanctuary.



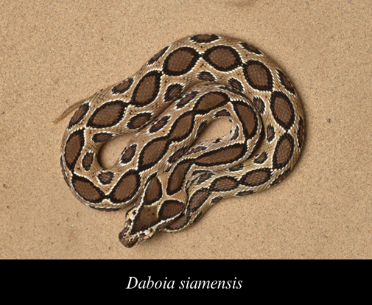


Figure 3. Photoplates of some reptiles of Bhimbandh Wildlife Sanctuary.



Figure 4. Photoplates of some mammals of Bhimbandh Wildlife Sanctuary