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# An updated checklist of the mammals of West Bengal

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**ABSTRACT**

The Checklist of Mammalian fauna of West Bengal has been updated after more than two and half decades to include recent taxonomic changes, new additions and distribution records for West Bengal. In this checklist, 234 species (Extant 211, Extinct 23) and 215 sub-species, belonging to 137 genera, 39 families and 11 orders, are reported. The chiropterans represent maximum number of species (75) followed by rodents (50), carnivores (48), Artiodactyls (29), Eulipotyphla (11), Primates (8), Lagomorpha (5), Perissodactyla (3), Pholidota (2) Scandentia (2) and Proboscidea (1). Relative to the 1992 version, the gain in number of species is 46 (+24.46%), that of sub-species 70 (+48.27%), genera 31 (+29.24%) and families 7 (+21.87%). Following recent molecular evidences, Cetacea is reordered under Artiodactyla in the new version. There are, however, a few records that remain unresolved, doubtful or controversial.

**Key words:** checklist, mammals, taxonomy, distribution, habitat, status, conservation.

**Abbreviations** (Old names in parenthesis).

BWLS: Ballavpur Wildlife Sanctuary, Birbhum district
BBWLS: Bibhuti Bhushan (Parmadan) Wildlife Sanctuary, North 24-Parganas district
BDWLS: Bethuadahari Wildlife Sanctuary, Nadia district
BTR: Buxa Tiger Reserve, Alipurduar district.
CWLS: Chapramari Wildlife Sanctuary, Jalpaiguri district
CKWLS: Chintamoni Kar (Narendrapur) Wildlife Sanctuary, South 24-Parganas district.
EKW: East Kolkata Wetlands, North and South 24-Parganas districts.
GNP: Gorumara National Park, Jalpaiguri district.
HIWLS: Halliday Island Wildlife Sanctuary, South 24-Parganas district,
JNP: Jaldapara National Park, Alipurduar district.
LIWLS: Lothian Island South 24-Parganas district.
MWLS: Mahananda (Mahanadi) Wildlife Sanctuary, Darjeeling district.
NVNP: Neora Valley National Park, Kalimpong district.
RWLS: Raiganj (Kulik) Wildlife Sanctuary, North Dinajpur district.
RBWLS: Ramnabagan Wildlife Sanctuary, Burdwan district.
SG: Sacred Groves
SNP: Singhalila National Park, Darjeeling district.
STR: Sundarban Tiger Reserve, North and South 24-Parganas districts.
SWLS: Senchal Wildlife Sanctuary, Darjeeling district.
SKWLS: Sajnakhali Wildlife Sanctuary, South 24-Parganas district.
ZSI: Zoological Survey of India, Kolkata.

## INTRODUCTION

West Bengal falls in the transition zone between Peninsular Indian sub-region, Indo-Malayan sub-region of Oriental zone and Palaearctic region, resulting in great array of natural ecosystems embellished with ingress, colonization and interspersion of mammalian life-forms in the state from the entire adjoining regions. On the contrary, due to burgeoning population pressure, quite a number of mammal species have either become extinct from the state or lost large part of their erstwhile range and restricted to fragmented habitats with small threatened populations. Under the circumstances, periodical evaluation of their status is necessary, which will serve as an indicator to measure the habitat and habitant conditions in the state and prepare the management prescriptions or action plans to sustain the existing diversity in future.

The previous checklist of the mammals of West Bengal was published during the last decade of 20th century by Zoological Survey of India or ZSI (Agrawal et al. 1992). Thereafter, no exclusive study in this field was conducted to evaluate the current status of mammals by incorporating the new discoveries and taxonomic changes in West Bengal during the last 26 years. Hence, it was considered desirable to conduct an extensive study with a view to filling up the knowledge gap during the intervening period by preparing an updated checklist of mammals in the state.

## MATERIALS ND METHODS

### Study area

West Bengal is the only state in India, ranged between the (Eastern) Himalayas on the north and Bay of Bengal (coastline about 210 km) on the south, with Chhotanagpur plateaus, Gangetic plains and delta covering the remaining part harbouring rich mammalian diversity. Geographical area of the state is 88,752 km$^2$ (21°20′N-27°32′N, 85°50′E-89°52′E), which is administratively divided into 23 districts (Fig. 1). The state borders nationally with Odisha (south-west), Jharkhand (west), Bihar (west), Sikkim (north) and Assam (east) and internationally with Nepal (west), Bhutan (north-east) and Bangladesh (east). The districts that are located on the north of the Ganga Darjeeling (2,092.5 km$^2$), Jalpaiguri (2,844 km$^2$), Cooch Behar (3,387 km$^2$), Malda (3,733 km$^2$), Uttar Dinajpur (3,140 km$^2$), Dakshin Dinajpur (2,219 km$^2$), Alipurduar (3,383 km$^2$) and Kalimpong (1,044 km$^2$) are often referred to collectively as North Bengal. This area is divided into the Darjeeling Himalayan hill region, the *Terai* and *Duars* region and the North Bengal plains. The districts on the south of River Ganges Bankura (6,882 km$^2$), Paschim Bardhaman (1,603.17 km$^2$), Purba Bardhaman (5,432.69 km$^2$), Birbhum (4,545 km$^2$ ), Purulia (6,259 km2), Murshidabad (5,324 km2), Nadia (3,927 km2 ), West Midnapore (9,345 km2), Jhargram (3,037.64 km2), East Midnapore (4,736 km2 ), Hooghly (3,149 km2), Howrah (1,467 km2), Kolkata (185 km2), North 24 Parganas (4,094 km2) and South 24 Parganas (9,960 km2) constitute a variety of geographical regions such as the Rarh region, the Western plateau and high lands, the coastal plains, the Sunderbans and the Gangetic Delta.

The climate is generally humid tropical monsoon. It varies from moist-tropical in the southeast to dry tropical in the southwest and from subtropical to temperate in the mountains of the north. The temperature ranges from 0°C to 45°C. The annual rainfall ranges from 900 mm in the southwest to 1,700 mm in the coastal region and 6,000 mm in the northern mountain areas.

The soil pattern of the state ranges from acidic in the entire north to Gangetic alluvial in the central districts; lateritic red soil to coastal saline soil in the southern delta region.

Total recorded forest of the state is 11,879 km$^2$ (Reserve Forest 7,054 km$^2$, Protected Forest 3,772 km$^2$, Unclassed State Forest 1,053 km$^2$) or 13.38% of the geographical area. However, as per the digitized boundary of recorded forest area in the state, forest cover within and outside the recorded forest area covers 13,625 km$^2$ or 15.52% of the geographical area. As of 2015, this area is extended to 16,828 km$^2$ or 18.96% of the geographical area. Reserve Forest, Protected Forest and Unclassed State Forest constitute 59.4%, 31.8% and 8.9% of the geographical area respectively. Estuarine water bodies like rivers and creeks in mangrove forest and rivers flowing through the recorded forest land have been included while computing the forest cover. Similarly large portions of farm forestry plantation, raised outside forest land, having forest-like micro ecosystem, have been enumerated as forest cover. Thus, the vegetation cover of the state is raised to around 27% of the geographical area. The vegetation cover also includes village orchards or groves, tea gardens and horticultural plantations. All these areas are more or less used by the mammals.

These forest areas (tree cover) are divided into four classes:

(1) Very Dense Forest (VDF) including mangrove cover with canopy density 70% and above (2.59%);
(2) moderately Dense Forest (MDF) including mangrove cover with canopy density between 40% and 70% (4.26%);
(3) Open Forest (OF) including mangrove cover with canopy density between 10% and 40% (7.14%); and
(4) Scrub with canopy density less than 10% (0.08%).

However, the sum of VDF, MDF and OF is termed as ‘FOREST COVER’. Tree Cover

includes all the land less than one hectare in area, especially those surrounding villages and woodlands. Such areas need Satellite and Manual Field Verification. The forest cover including the tree cover is 21.31% of the State's geographical area as per the India State of Forests Report, 2015 published by Forest Survey of India, Dehradun.

Broadly, the forest cover of the state belongs to 10 type groups. The hills in North Bengal are broadly divided into Lower Hill (up to 1,000 m), Middle Hill (1,001–1,950 m), Upper Hill (1,951–3,500 m) and Subalpine Forests (>3,500 m). Below 1,000 m, there are Moist Tropical Forests, whereas Montane Subtropical Forests start from 1,000 m and Montane Temperate Forests from 1,500 up to 3,000 m. Higher up, the forests are composed of evergreen conifers, mainly broadleaved trees with chief understorey of *Rhododendrons,* occasionally forming dense brakes.

Territorial Forest Divisions- Baikunthapur (228.82522 $km^2$), Bankura (North 545.9387 $km^2$ & South 563.00475 $km^2$), Birbhum (166.44542 $km^2$), Burdwan (218.45461 $km^2$), Coochbehar (66.5538 $km^2$), Darjeeling (267.6687$km^2$), Durgapur (49.6327 $km^2$), Howrah (including Hooghly) SF (3.37281 $km^2$), Jalpaiguri (310.88 $km^2$), Jhargram (594.9757 $km^2$), Kalimpong (372.8766$km^2$), Kangsabati (North 271.0417 $km^2$ & South 285.593 $km^2$), Kharagpur (325.4351 $km^2$), Kurseong (163.5277$km^2$), Malda (17.02045 $km^2$), Medinipur (513.5804 $km^2$), Nadia-Murshidabad (12.3343 $km^2$+ 7.7006 $km^2$), Panchet (338.501 $km^2$), Purba Medinipur (18.87472 $km^2$), Purulia (676.8757 $km^2$), Raiganj SF (6.02379 $km^2$+ 8.27426 $km^2$), Rupnarayan (291.3864 $km^2$), 24-Pargans (North 0.9634 $km^2$ & South 1602.62 $km^2$).

During British period, three game associations were created in north Bengal in 1926 to control hunting in their jurisdiction, namely:

(a) the Darjeeling Shooting and Fishing Club,
(b) the Tista-Torsa Game Association and
(c) the Torsa-Sankosh Fishing and Shooting Association.

These associations employed guards to prevent local inhabitants from poaching in their protected areas. These were operative up to 1958 and the practice was banned from December 1962. They were given hunting and fishing lease outside the sanctuaries.

West Bengal inherited the larger share left by the British in the form of Protected Areas. The state got all the three Game Sanctuaries, i.e., Jaldapara (93.24 $km^2$), Chapramari (7.77 $km^2$) and Senchal (38.85 $km^2$) constituted under the Indian Forest Act, 1927. These were later renotified under Wild Life (Protection) Act, 1972. During the post-independence days, many more have been added to the PA network totalling 22 at present.

In addition, four temporary Game Sanctuaries were also created during pre-independence period in Bengal. These were- Bhutri (20.72 $km^2$), Pana (12.95 $km^2$) and Gaburbasra (38.85 $km^2$) in Buxa, Alipurduar district during 4.9.1935 to 30.9.1938 and Mongpong (25.90 $km^2$) in Kalimpong district during 1937-38 to 1945-46.

At present, Wildlife Conservation Areas in the state are spread over 4,691.8462 $km^2$ or 39.49% of recorded forest categorised into-

I. Protected Areas (PAs) 1502.8146 $km^2$:

(a) National Park- (1) Singalila (78.60 $km^2$) in Darjeeling district, (2) Neora Valley (159.8917 $km^2$) in Kalimpong district, (3) Gorumara (79.45 $km^2$) in Jalpaiguri district, (4) Jaldapara (216.34 $km^2$) in Alipurduar district, (5) Buxa (117.10 $km^2$) Alipurduar district, (6) Sundarban (1,330.10 $km^2$) in South 24-Parganas district (World Heritage Site in 1987);

(b) Wildlife Sanctuaries- (1) Jorepokhri (0.04 $km^2$) in Darjeeling district, (2) Senchal (38.88 $km^2$) in Darjeeling district, (3) Mahananda (158.04 $km^2$) in Darjeeling district, (4) Chapramari (9.60 $km^2$) in Jalpaiguri district, (5) Buxa (314.52 $km^2$) in Alipurduar district, (6) Pakhki Bitan (14.09 $km^2$) in Jalpaiguri district, (7) Raiganj (1.30 $km^2$) in Uttar Dinajpur district, (8) Chintamoni Kar (0.07 $km^2$) in South 24-Parganas district, (9) Bibhutibhusan (0.64 $km^2$) in North 24-Parganas district, (10) Bethuadahari (0.6686 $km^2$) in Nadia district, (11) Ballavpur (2.021 $km^2$) in Birbhum district, (12) Ramnabagan (0.145 $km^2$) in Purba Burdwan district, (13) West Sundarban (556.45 $km^2$) in South 24-Parganas district, (14) Sajnekhali (362.40 $km^2$) in South 24-Parganas district, (15) Halliday Islands (5.95 $km^2$) in South 24-Parganas district, (16) Lothian Islands (38.00 $km^2$) in South 24-Parganas district;

II. Tiger Reserves (TR) 3,345.7599 $km^2$ in Alipurduar district, [(1) Buxa (1983)[760.8699 $km^2$ overlapping with PAs=Critical 'tiger' habitats or Core 390.5813 $km^2$, Buffer/Peripheral 370.2886 $km^2$]; (2) Sundarban (1973)[2,584.89 $km^2$ overlapping with PAs=Critical 'tiger' habitats or Core 1,699.62 $km^2$, Buffer/Peripheral 885.27 $km^2$ in North and South 24-Parganas districts];

III. Elephant Reserves [(1) Eastern Duars (overlapping with PAs and TR) in Alipurduar district: 977.51 $km^2$ (Core 484.00 $km^2$, Buffer 493.51 $km^2$, Zone of influence: Forest and tea gardens to the west and south: 1,800 $km^2$) (2) Mayurjharna 414.00 $km^2$ in parts of Purulia, Paschim Medinipur and Bankura districts (Zone of influence 1,436 $km^2$ in parts of Purba Medinipur and Bankura districts)];

IV. Biosphere Reserve (Sundarban) 9,630 $km^2$ (overlapping with PAs and TR).

V. Conservation Reserves over a total area of 1,415.91 $km^2$ [1. Deul (10.50 $km^2$), Paschim Bardhaman district, 2. Hijli (15.50 $km^2$), Paschim Medinipur district, 3. Tekonia (5.87 $km^2$), Cooch Behar district, 4. Mukutmonipur (43.70 $km^2$), Bankura district and 5. Garpanchkot (1,340.34 $km^2$), Purulia district] have been declared in 2017.

VI. Wetlands (5,050 km$^2$), of which only EKW (125 km$^2$) in North and South 24-Parganas districts is a Ramsar Site, are also habitats of some smaller mammals. These wetlands are distributed from the high altitude Darjeeling hills to the plains of southern part of Bengal. These wetlands are mainly lakes, floodplains, marshes, bogs and estuaries of Sunderbans.

VII. Sacred Groves (SGs): The community-protected forest fragments of various sizes or SGs (known as "Jaherasthan"), mostly found in south-western Bengal (Purulia, Bankura, Birbhum, Jhargram, East and West Midnapore), function as important refugia for some small mammalian species (rabbit, porcupine, striped squirrels, rats, bats etc).

However, introduction of the protected area category 'Community Reserves' under the Wild Life (Protection) Amendment Act, 2002 has introduced legislation for providing government protection to such community-held lands, which could include SGs.

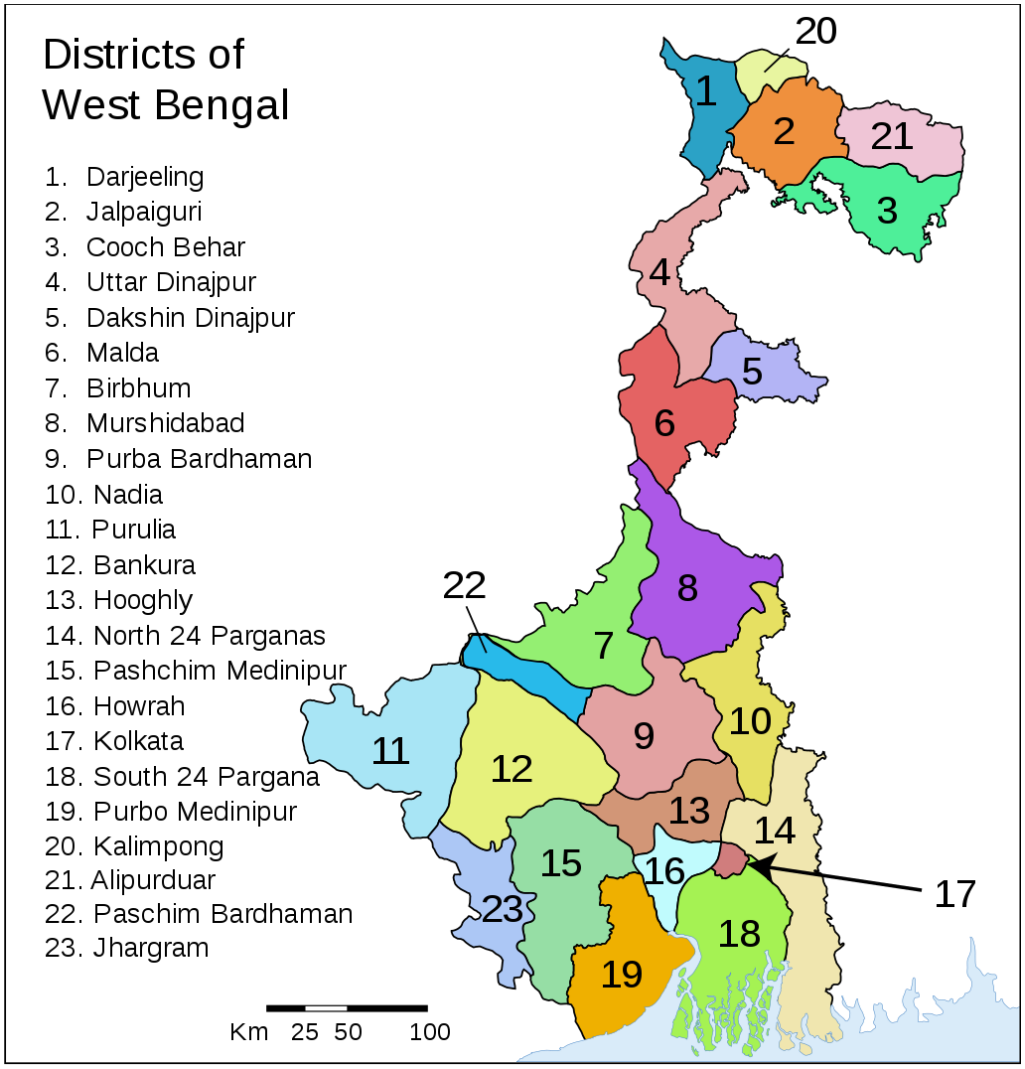


**Fig 1.** Map of study area.

Out of ten recognized biogeographic zones of India, based on altitude, moisture, topography, rainfall etc, four zones [(i) 2C Himalaya- Central Himalayas, (ii) 7B Gangetic Plain- Lower Gangetic plains, (iii) 8B Coasts- East Coast and (iv) 6B Decan peninsula- Chhotanagpur] are represented in the state.

The state is also classified into four zoogeographic regions, which resemble those of the bordering states and counries. The distribution of mammals in various parts of the state differs. For example, the fauna and flora of Darjeeling hills resemble more to the fauna and flora of Sikkim Bhutan and Nepal than the other fauna of the State. Similarly, there is resemblance between north Bengal and Assam, whereas the biodiversity of south-west Bengal resembles those of Jharkhand and Odisha. The flora and fauna of Indian Sundarbans resembles those of contiguous Bangladesh counterpart. Past records show that a variety of animals representing vast tracts of all these Zoogeographic regions were found in this State. In course of time, some of them gave way to increasing human pressure. The status (past and

present), distribution and known habitats of all mammalian species in West Bengal are recorded in this updated inventory.

**Data collection**

Initially, secondary data were collected by reviewing the literature for mammal studies conducted in the study area, at nearby sites or in comparable habitats in the region. In addition, district gazetteers, museum records, field reports, record books of forest department, project reports, theses, working plans, management plans, annual reports and other lesser-known sources of information were also consulted. The data on Departmental radio-collaring (elephant and tiger), Noninvasive genetic assessment (tiger, rhino) and camera-trapping (Tiger, Leopard, Asiatic Golden Cat, Clouded leopard, Fishing cat, Leopard cat, Marbled cat, Jungle cat, Wild dog, Himalayan Palm Civet, Large Indian Civet, Small Indian Civet; Crab-eating Mongoose, Binturong, Himalayan Black Bear, Sloth Bear, Yellow-throated Marten, Wild boar, Cheetal, Barking deer, Hog deer, Sambar, Asian elephant, gaur, Assamese macaque, Rhesus macaque, Crestless Porcupine, Himalayan Serow, etc.) were also accessed for this purpose.

Secondly, interviews with local residents and concerned forest officials were conducted with the aim of collecting materials (sighting, hunting records/memories and trophies) on the pattern and conditions of mammal habitation in the past and at present. These materials made it possible to improve the efficiency of the baseline survey for identifying the species and their occupied locations.

The information obtained was used to compile a preliminary list of species that may be encountered at the study site. For identification of the species, 'Handbook of the Mammals of South Asia' (Bahuguna & Mallick 2010) was consulted.

For collection of primary data, all the protected areas (PAs) and other territorial forest and impact areas were visited in phases during different seasons and different hours of the day. The inventory was specifically prepared on the basis of direct observations as well as identification of signs, footprints, feces, etc. Based on the frequency of direct sighting and indirect evidences, the species-wise status is categorized into extinct (no further record since first known), very rare (2-3 records), rare (4-5 records), occasional (6-10 records), frequent (<15 records) and common (>15 records). In addition, some other status of the species like endemic, new record, introduced, doubtful and unknown, are mentioned. Habitat assessment was also done wherever possible.

## RESULTS AND DISCUSSION

West Bengal is a mega-biodiversity state spread over four biogeographic zones and 10 forest type groups, covering Temperate and Sub-Alpine forests of Darjeeling to estuarian plains of Sundarbans, representing a wide range of mammals including rare, threatened and endemic species.

**Major groups of Forests type and assemblage of mammals of conservation significance**

1. Sub-alpine forests 14C (3,000-3,660 m): 20 $km^2$ in Sandakphu, Sabarkum, Phalut in SNP:
Smaller mammals like voles, water shrews, pikas, long-eared bats, Barbastelle, mouse, rat, etc.
2. (i) East Himalayan Moist Temperate forests 12C (1,500-1,800 m): 150 $km^2$ in Rimbik in Darjeeling,
(ii) Northern Montane Wet Temperate Forests 11B (1,650-3,000 m): 150 $km^2$ in Selimbong, Kankibong, Little Rangit, Lopchu, Mahaldiram, Chattakpur, Dhobijhora, Upper Babukhola, Phuguri, Paglajhora and Lower Babukhola forest blocks in Darjeeling:
Tiger, leopard, clouded leopard, leopard cat, Himalayan black bear, red panda, yellow-throated marten, barking deer, goral, serow, tahr, flying squirrels, etc.
3. (i) Northern Tropical Wet Evergreem 1B (plains to 150 m): 167 $km^2$ in Bagdogra range of Kurseong divison, Khutimari areas of Jalpaiguri division, Damanpur, Cheko, Gadadhar, Rajabhatkhawa, Rydak of BTR,
(ii) Northern Sub-tropical Semi-evergreen forests 2B (300-1,650 m): 25 $km^2$, in Sumbong and Peshok of Darjeeling division, Buxaduar of BTR,
(iii) Northern Sub-tropical Broad-leaved Wet Hill 8B: 800 $km^2$ in North Bengal hills (300-1,650 m): Sim, Upper Sumbong, Upper Reyong, Forests blocks of Majua, Lower Babukhola, Phuguri, Bunklong, Khairbani, Mana, Sittong Numbong, Setikhola, Shivakhola, Mirik, Paglajhora, Kuhi and Latpanchar in Darjeeling.
(iv) North India Moist Deciduous forests 3C: 1,757 $km^2$ in *duars* and *terai.*
Pygmy hog, scaly ant-eaters. tiger, leopard, wild dog, mongoose, bears, otters, civets, cats, fox, jackal, elephant, rhino, gaur, deer, wild boar, monkey, langur, squirrels, etc.
4. Littoral and Swamp Forests: Tropical Seasonal Swamps of Barringtonia 4D: 20 $km^2$: Bats, mongoose, jungle cat, jackal, civet, etc. in Malda and Dinajpur districts.
5. Northern Tropical Dry Deciduous forests 5B: 4,527 $km^2$ in Bankura, Purulia, Jhargram, Midnapur, Birbhum, Burdwan:
Pangolin, tree shrew, wolf, fox, jackal, mongoose, leopard, deer, elephant, sloth bear,etc.
6. Littoral and Swamp Forests- The Mangroves 4B: 4,263 $km^2$ in Sundarbans:
Tiger, fishing cat, leopard cat, deer, wild pig, monkey, dolphins, otter, etc.

**Key Habitats**

Distribution of the mammals is governed by the basic biological needs like availability of food and water in association with shelter.

**1. Riparian zone**

This type of vegetation is mainly found in small strips along the rivers and streams and dominated by *Ficus racemosa*, *F. semicordata*, *Bischofia javanica, Bridelia retusa, Macaranga denticulata, Duabanga grandiflora, Dillenia pentagyyna, Zygiphus* spp. in association with grasses like *Saccharum sponstaneum, S. narenga, Themeda arundinacea, Imperata spp, Phragmitis karka, Arundo donax*, etc. Leaves, fruits and twigs of this vegetation are palatable food for sambars, elephants and monkeys. Giant squirrels is also sighted in this zone. Spotted deer herds take shelter in these areas. Giant Squirrel occurs mostly in riparian zones, which retain the attribute of tall large crowned trees with continuous canopy, deep shade, characteristic vegetation diversity and presence of higher level of moisture. Hog deer, being an obligate species of grassland, is also found here.

2. **Savannah areas with Khair-Sisoo and Simul-Sirish succession**

Hispid hare, being the obligate species of grassland, takes shelter here. This type of vegetation offers best grazing ground for Cheetal, Sambar, Barking deer, Hog deer, Gaur and Elephants. The leaves, flowers and fruits of *Acacia catechu, Bombax ceiba, Dalbergia sissoo, Oroxylum indicum, Emblica officinalis, Bauhinia purpuria, Dillenia pentagyna*, etc. are liked by large herbivores as food.

3. **Natural water bodies**

Mammals, both herbivores and carnivores, drink water in these perennial sources, particularly during summer.

4. **Broad leaved Hill Forests**

In consequence to the variation of the altitudes, the type of vegetation varies considerably in these forests. The foothill portions generally bears dry mixed forests with some sal along the crest of the spurs and ridges. *Dendrocalamus hemiltonii, Acrocarpus frexinifolius, Phoebe lanceolata, Pterospermum acerifolium, Gynocardia odorata,* etc. occur as associates. Here, mammal concentration is higher, but sighting is rare.

**5. Wet (Semi-evergreen) Mixed Forest**

It has a complete canopy of considerable height and fully shaded forest floor covered with leaf litter. Grasses and other herbs are usually very little and the top storey formed by some deciduous species. Grazing and browsing of ungulates are very rare except some degraded places where the canopy is open. Food items available in this type are mainly underground corms and tubers of *Curcuma amada, Zingiber roseum, Dioscorea bulbifera, Asparagus racemosa, Colocasia esculenta, Costos speciosus* and others. The foliage of small trees and shrubs at low canopy level of *Macaranga denticulata, Leea asiatica, Mallotus philippinessis, Litsaea monopetala* and fleshy fruits of *Syzygium cumini, Sapium baccatum, Litsaea gluitinosa, Cinnamomum glaucescens, Ficus benghalensis, Elaeocarpus lucidus*, etc. are also important for sustenance. Since this type is rich in foliage trees and fleshy fruits, arboreal mammals like Rhesus monkeys and Squirrels are distributed very well here. Due to absence of grass, large herbivores are usually not found except wild pigs, which dig up and eat underground corms and tubers. Elephants are often found.

**6. Dry Mixed Forests**

This habitat comprises of very diverse type of vegetation. No particular vegetation occurs continuously. The mammals are distributed in pockets. Deciduous tree species of medium to good height are found here. They form an open canopy. In dry season, grasses are generally absent. Considerable quantity of grasses, shrubs and herbs are available during the monsoon. This type of vegetation provide better habitat to some mammals than wet mixed forest. Population of monkey, squirrel and other arboreal species are less due to lack of fleshy fruits and foliages. Ungulates like barking deer, sambar, gaur and elephants prefer such area. Rhinos are also found frequently in this forest type.

**7. Moist Sal Forests**

In this type Sal forms the top canopy with bahera, Sidha, Udal, Chilaune, Kawla, Bhadrase, Parrari as associates and the middle storey is composed of *Meliosma simplicifolia, Aphanomixis polistachae, Premna benghalensis, Bauhinia purpurea, Turpinia pomifera, Trewia nudiflora, Microstegium ciliatum, Dillenia pentagyna*, etc. This type of vegetation is not suitable for herbivores as food is not abundant but cover and water are available.

**8. Mangroves**

The habitat is classified into five categories: (i)Water/Channels-1161.44 km², (ii) *Phoenix* dominated (*Phoenix paludosa+Excoecaria agallocha*)- 1033.76 km², (iii) *Ceriops* dominated-*Ceriops decandra*-333.48 km², (iv) Barren dry areas-145.6 km², (v) *Avicennia-Sonneratia* mixed habitats-126.56 km². The order of tiger's preference for habitat use is *Avicennia-Sonneratia* habitat > *Phoenix dominated habitat* > *Ceriops* dominated habitat > Barren areas > Water. Though *Avicennia-Sonneratia* was preferred, 58% of tiger locations were in the most common habitat type (*Phoenix* dominated areas) followed by 18% within *Ceriops* dominated habitats, which offer shelter from tidal inundations, since these habitats are on relatively higher ground and might, therefore, often be used as resting and cub rearing refuges. Water channels are used for shifting from one to another island or human habitations in the fringe area for shelter and food. River banks are preferred by the tiger for higher availability of prey species and easy hunting.

**Mammalian Species diversity**

About 6,495 species of mammal (96 recently extinct and 6,399 extant including 6,382 wild, genera 1,314, families 167, orders 27) have been reported from the globe (Burgin et al. 2018), of

which India accounts for 425 species placed under 48 families and 12 orders (Chakravaarty & Ramachandran 2019). As per the present study, the mammalian diversity of West Bengal is represented by 234 species (Extant 211, Extinct 23) and 215 subspecies, belonging to 137 genera, 39 families and 11 orders (Table 1). The chiropterans represent maximum number of species (75) followed by rodents (50), carnivores (48), Artiodactyls (29), Eulipotyphla (11), Primates (8), Lagomorpha (5), Perissodactyla (3), Pholidota (2) Scandentia (2) and Proboscidea (1). Relative to the 1992 version, the gain in number of species is 46 (+24.46%), that of subspecies 68 (46.89%), genera 31 (+29.24%) and families 7 (+21.87%). Order Insectivora is reassigned to the order Eulipotyphla including shrews, moles, etc. and order Cetacea to order Artiodactyla following the recent molecular evidences. There are a few recorded species, validity of which remains unresolved, doubtful or controversial. Besides, there are many changes in taxonomy and distribution.

A detailed species account is presented in Table 2. Here, each species entry includes the scientific name and recognized sub-species with known regional distribution. Comments have been provided at species level including habitat and status. The exact number of mammalian species is uncertain at a point of time due to new discoveries, intra-state and inter-state movement, taxonomic revisions and molecular phylogeny studies. Recent taxonomic updates and nomenclatural changes have been incorporated. The published and unpublished references dealing with the species occurrence in the state is also provided in the reference.

Human population density in different districts shows a negative correlation with the species richness. However, there is a positive correlation between total forest cover and faunal richness in the districts. It appears that north Bengal, particularly undivided Darjeeling district (including Kalimpong), represents maximum number of species. It is also seen that the mammal diversity in the state are positively correlated with the altitudinal variation, natural, dense and unfragmented forest cover, providing adequate shelter, food including source of perennial sweet water for both carnivores and herbivores, as well as low anthropological disturbances.

**Endemicity**

Two species (*Eptesicus tatei* and *Herpestes palustris*) are considered endemic to the state. Three specimens of the former were collected during 19$^{th}$ century only from the temperate forests of Darjeeling (exact locations not available). No further records of this species are available.

During 1964 and 1965, three specimens of *H. palustris* were collected from Acharya Jagadish Chandra Bose Indian Botanic Garden and outskirts in Howrah district, whereas, during the same period, 28 specimens were collected from different sites of present EKW and outskirts of both South and North 24-Parganas. This species is now under threat of extinction due to anthropogenic pressure.

**Extinction**

23 species (four primates, six carnivores, two perissodactyla and 11 artiodactyla), earlier recorded from the state, are considered extinct. These are- *Hoolock hoolock, Nycticebus bengalensis, Trachypithecus geei, Pileatus pileatus, Acinonyx jubatus, Lynx lynx, Panthera leo, Panthera uncia, Helarctos malayanus, Arctogalidia trivirgata, Dicerorhinus sumatrensis, Rhinoceros sondaicus, Porcula salvania, Moschiola indica, Moschus chrysogaster, Rucervus duvauceli, Antilope cervicapra, Gazella bennettii, Bos frontalis, Bubalus arnee, Boselaphus tragocamelus, Tetracerus quadricornis and Pseudois nayaur*. The number may increase because some species are not sighted for many decades. Some species are also regionally extinct. For example, *Rhinoceros unicornis* is extinct from Sundarbans, but found in GNP and JNP of north Bengal.

**Threatened species**

Some of the threatened species of the state are- Binturong, Chinese and Indian Pangolin, clouded leopard, fishing cat, gaur, golden cat, Himalayan tahr, hispid hare, hog badger, honey badger, Indian elephant, Indian wolf, leopard, leopard cat, red panda, marbled cat, ratel, greater one-horned rhino, serow, clawless otter, sloth bear, Indian tiger, Ganges river dolphin, litte Indian porpoise, Irawaddy dolphin, marsh mongoose, crab-eating mongoose, Asiatic black bear, Assamese macaque, common otter, Himalayan crestless porcupine, Sikkim bat, Sikkim rat, smooth-coated otter, wild dog, etc.

**Conservation threats**

Habitat fragmentation and disruption of the traditional migratory corridors, inter-state or intra-state, due to expansion of human settlements, population boom, conversion of forest land for agriculture, tea and other industries, national highways/motor roads, meter gauge to broad gauge railway track and many other non-forestry uses are major conservation threats impeding the frequent movement of wild animals within their home range. While the anthropogenic activities (e.g. illegal collection of fuel wood, fodder, grazing etc.) are destroying the habitats and disturbing the day-to-day activities of the animals, poaching of the mammals is causing high decimation of the extant species and their ultimate extinction.

**Man-Mammal Conflict**

Man-animal conflicts usually arise out of straying of wild animals into habitations. This results into killing of the animal or death/injury of human beings and loss of crop/cattle/huts. This is the most

serious problem in the state. It has become more acute due to shrinkage of habitats and increased activity in and around the forest. Tiger, leopard, elephant, gaur, rhino, deer and other smaller mammals are the worst sufferers of this conflict. Categorised compensation is paid to the victims-human beings and properties.

**Tiger**

In Sunderbans, there are records of the 'man-eating' tigers and tiger-straying in the north-western fringe villages since the 18th century. Between 1881 and 1912 more than 2,400 full-grown tigers were killed by the hunters in Sundarbans under official patronage, *i.e.* rewards. Montgomery (2008) mentioned that about the end of the nineteenth century 4,218 people were killed by tigers.

The man-eating tigers in the Sundarban are divided, according to their behaviour pattern, into three broad categories-

Category I: This includes two sub-categories, of which one is inherent and designed maneater (25 %). This sub-category is again subdivided into two micro-groups: one is aggressive maneater (80%) and the other lusty and adventurous (20%).

Category II: Undesignated man-eater (15%), and

Category III: Circumstantial man-eater (60%).

Mallick (2007) categorized the problem of human-tiger conflict in Sundarbans into two types:

(*i*) Conflict outside the forest area: This is caused when the tiger stray out of the forests and enter the villages on the opposite side by crossing the channels. In the past, these fringe villages were established on the reclaimed forestland, where the interface is mostly demarcated by a small creek, *e.g.* Kalitala and Samsernagar on the boundary of Arbesi-1.

(*ii*) Conflict within the forest areas: This is caused due to intrusion (with or without legal permits) of people in the tiger habitat. Mostly the honey collectors and fishermen fall prey to the tigers inside the forest.

Most human kills took place in the forests of north-eastern part. Most of the victims (59%) were residents of Gosaba block followed by Hingalganj (14.96%), Basanti (9.99%), Hasnabad (3.8%), Canning II (2.54%), Pathar Pratima (2.54%), Kultali (2.03%) and others (5.14%). In case of the fishermen and crab collectors, the incidents mainly occur in the small creeks deep inside the forest and very close to the tiger habitat. The tiger victim data during the last three decades reveal that Jhila followed by Pirkhali, Chandkhali and Arbesi were the four most vulnerable forest blocks because, except Chandkhali, border the fringe villages of Gosaba and Hingalganj CD blocks, from where a large number of people regularly enter the forests for their livelihood. On the contrary, the intensity of tiger attacks in the distant and remote core area is much low.

The saline water, muddy terrain, recurrent high tide, dense vegetation etc coupled with difficulty in preying upon animals bring about a psychological change in the tiger behaviour. This type leads to be cyclic and chronic, giving the tiger predatory proficiency.

The straying of tiger is a common phenomenon in Sundarbans (Mukherjee & Tanti 2001), in which the tiger swims across the rivers to reach the fringe villages in darkness for many reasons. The spurt in this aberrant behaviour has been marked since 2002. Whereas up to 2001, there were 140 cases of tiger straying, the figure up to March 2010 rose to 148. During 2008-2011, the tigers came out of the forests for 58 times and entered the villages in most of the cases. In 2010-2011, there were 28 cases of tiger straying in STR and 11 in South 24-Parganas Forest Division and the corresponding figures in 2011-12 (up to August) were 5 and 3 respectively. The tiger straying incidents take place throughout the year, but most of them occurred during 3 months (Dec–Feb) of the winter season (42%) followed by 3 months (July–Sept) of the monsoon season (31 %). 84.22% of cases have been reported from 21 villages of five affected blocks of Sundarban (Das, 2011). In most cases, the tigers resorted to cattle lifting or poultry feeding. Only in 8.9% of the cases human beings were attacked or killed. Majority of the straying tigers (68.46%) were male. In most cases (78.9%) strayed tigers were aged and 22% of these were partly injured. 96.05% straying occurs during the night.

Depending on tiger-density, STR has a higher intensity of conflict whereas South 24-Parganas Division has a lower intensity of conflict. The villages where the straying tigers (single male or female and often a pair) had so far strayed are Adibasipara, Amlamati, Anpur-Rajatjubilee, Bali, Bhuruliapara, Dayapur, Deulbari, Dulki, Emlibari, Glasskhali, Gosaba, Hemnagar, Hentalbari, Jamespur, Jharkhali, Kalidaspur, Kalitala, Kishorimohanpur, Kultali, Kumirmari, Lahiripur-Chargheri, Lakhimpur, Mathurakhanda, Mitrabari, Mollakhali, Pakhiralaya, Petkulchand, Purba Sripatinagar, Samsernagar, Satjelia, Satyanarayanpur, Sonagaon, Sudhangsupur, Tridibnagar, etc. They strayed from seven forest blocks- Arbesi (crossing the River Raimangal, Kapura or Kalitala *khal*), Chandkhali, Gosaba, Harinbhanga, Jhilla (Korankhali *khal*, Rangabelia), Pirkhali (River Pitchkhali, Gomdi *khal*, Dattar Passur *khal*) and Panchamukhani (Bidya). The civil blocks of Gosaba, Hingalganj and Kultali are most vulnerable to the tiger straying. In Hingalganj, such villages are Samsernagar, Kalitala, Hemnagar and Pargumti, whereas in Gosaba, these are Rajatjubilee, Jamespur, Dayapur, Kumirmari and Lahirippur and Kultali include Kultali, Sunkijan, Deulbari, Bhasa, Maipeet East Gurguria, Nagenabad and Katamari. Sitarampur, Daspur, K. plot, Kishorimohanpur in Patharpratima block and

Jharkhali in Basanti block are also some other affected villages. Although in the last few years, tiger straying incidents are few in Basanti block, such incidents have increased in Kultali block since 2007.

During the late twentieth century, the problem of tiger-straying was not so acute except for a few years. In 2009–2010, the incidences were on the rise, probably as an impact of the 'Aila' and ultimately in 2010–2011, the tiger straying cases showed an all time record. According to the present study, the adjoining areas of the Rivers Melmel and Gomor under Gosaba CD Block are more dangerous than other parts of human settlement in Sundarban because it is just opposite to the buffer zone of STR. Although many tigers strayed, the villagers help the forest staff to rescue them safely with the people's cooperation in Sundarbans. Retaliatory killing of tiger is rare now.

The measures like driving (including bursting firecrackers at night) the tiger back to the forest, trapping with a live bait (generally a culprit returns to the trap laid after a cycle of 9-15 days), sedating, radio collaring, ear tagging (chips) and monitoring the released tigers (majority of whom were released in different blocks like Chamta, Gosaba, Panchamukhani, Chandkhali, Matla, Harinbhanga, Bagmara, Netidhopani, Pirkhali, Khatuajhuri, Ajmalmari, Herobhanga, etc.) are the most cost-effective means to reduce the human-tiger conflict.
There was a strong case of such aberrant behaviour of the tiger (Bahuguna & Mallick 2010):
*An old tiger was trapped in July 2008 on the fringe of Sundarbans. It was released in the forest. Although apparently it was healthy, it had only one canine intact. It was again captured in October at the same place. This time it was released deep inside the forest. In November, it again appeared in same area from where it was captured. This time it was released at the southernmost tip of Sundarbans. But, this time also it came back to the same place, covering a distance of about 100 km by crossing many rivers, one of which is 4-5 km wide. Finally, it was trapped in December and handed over to the Kolkata Zoo.*

The probable reasons of tiger straying in the Sundarbans are-

(i) Scarcity of Prey Animals,
(ii) Difficulty in Hunting,
(iii) Proximity of Reclaimed Human Settlement to the Tiger Habitat,
(iv) Tigers do not Stray in the Village ust to Kill Easy Prey like Human,
(v) Embankment Protection Mangrove Strips of the Villages are Confused by the Tigers as their Own Habitat,
(vi) Littering Female Strays in the Paddy Field to Protect her Cubs,
(vii) Paddy Fields Confused with *Porteresia coarctata*,
(viii) Generally Old Tigers Stray for Easy Prey of domestic animals,
(ix) Straying Due to Washing Out of Pheromone by Tidal Waves,
(x) Male Tiger Losing Domain to the Aggressive Male Tiger may Stray,
(xi) Fog during winter misdirect the tiger,
(xii) Adventure attitude of the youngs, and
(xiii) Impact of Environmental Change.

**Elephant**

**North Bengal**

In northern West Bengal, the habitat of the endangered Indian elephant lies in Darjeeling (*terai*), Jalpaiguri and Alipurduar (*duars*) districts spread over 1,828.35 $km^2$ of forests (Elephant Census, 2010) and divided by major rivers into three zones: 1) Terai (Mechi-Teesta) - 339.96 $km^2$; 2) Western duars (Teesta-Torsa) - 482.54 $km^2$; and 3) Eastern duars (Torsa-Sankosh) - 1,005.85 $km^2$.

The east-west ecological range of the *terai* elephant population extends from the Teesta char (Baikunthapur Division) through MWLS and southern forests of Kurseong Division, up to Bahundangi Village Development Council, Jhapa district, Nepal, on the western border. In recent years, this landscape, interspersed with human habitations, has become an extensive human-elephant conflict (HEC) zone in terms of human mortality, crop depredations and loss of properties.

The recent elephant population in North Bengal is reported to be average 514 (range 460-564) individuals spread across an area of 2,000 $km^2$ as a result of protection, creation of PAs and cessation of capture (*Mela Shikar, Kheda operation*). The human population has also increased in the past few decades dut to large-scale immigration.

During $19^{th}$ century, the entire stretch of forests along the foothills of North Bengal from the Indo-Nepal border with Mechi river in the west to the Sankosh river in the east bordering Assam is believed to be a historically contiguous elephant range. But, large tracts of forests in the prime elephant habitats were converted to agricultural lands, tea gardens, labour lines, army camps, road and rail tracks, resorts and townships. Just about 34% of the century-old elephant habitat in North Bengal constitutes forests now.

This has led to a steady rise in Human-Elephant Conflict (HEC) with majority of such incidents occurring outside PAs. The average annual number of human deaths and injuries to elephant attacks between 2006 and 2016 was estimated to be 212. Hotspots of human-elephant conflicts were identified in an east-west direction primarily around PAs, tea plantations and along major riverine corridors. Local community members used to chase and harass elephants from agriculture fields or human settlements under the influence of alcohol and thus were primary victims of fatal interactions.

HEC may be divided into two classes:
A. Direct conflict

1. Conflict in search of food
2. Poaching

B. Indirect conflict
1. Collision with trains
2. Transboundary conflict in Nepal
3. Electrocution
4. Stuck or falls down into Ditch/ Deep Excavation/ Well.
5. Shot as rogue

According to Naha et al. (2019), out of a total of 2,122 incidents, 476 persons died whereas the rest (n=1646) sustained injuries due to elephant attacks between 2006–2016. The annual mean number of humans killed and injured by elephant attacks in North Bengal was estimated to be 47 (SE 8) and 164 (SE 97) respectively. The highest number of attacks was recorded in 2010–11 (360 injuries and 56 deaths). There was a sudden peak in number of such incidents between 2008 and 2012 which gradually declined. Between 2006–2016, annual crop damage by elephant depredation was estimated to be 2,078 ha. Based on complaints registered, the state forest department officials paid an annual sum of INR 47,01,309 for compensating human deaths and injuries, whereas for crop damage it was estimated to be INR 54,17,390 per year. The annual compensation due to property damage based on forest department records were estimated to be or INR 30,08,012. Thus the annual *ex gratia* / compensation amount paid by the forest department regarding human death, injury, crop depredation and household damage combined was INR 131 lacs.

54% of elephant attacks occurred between May-July (30%) and August-October (24%) followed by 32% between November to January and rest 14% during February to April. Fifty percent of these attacks were recorded between 1800h and 0000h (23% between 1800h and 2100h and 27% between 2100h and 0000h) whereas 14% between 0000h and 0300h and 13% between 0030h and 0600 h respectively. Majority of the elephant attacks occurred in flat areas with an average elevation of 103 m.

Majority of the elephant attack victims were middle aged adults, with 20% in the 20–30 years category followed by 20% in the 30–40 years, 23% in the 40–50 years and 16% in the 50–60 years category respectively. 74% of the elephant-attacked victims were males. 30% of the victims were farmers, 19% daily labours and 17% tea estate workers by profession. 36% of the victims were drunk and were chasing elephants in agriculture fields and near households, 20% were returning home after dark from work, 7% had gone collecting fuelwood from the forests, 8% were defecating in the open at night and 8% were sleeping inside houses when attacks occurred. Most of the victims were in a group comprising of < 3 people with an average of 4 households present in the vicinity of the site, and 25% of the attacks occurred in patches dominated by miscellaneous tree species, 21% near betel nut plantations, 13% within tea estates and 12% in agricultural fields).

**South Bengal**

Prior to 1900, South Bengal had dense Sal forests that housed elephant herds. However, rapid deforestation in the early 20$^{th}$ century depleted the vast Sal reservoir, thereby causing the elephants to leave the region for several decades. In 1976, there was a single elephant sighting—a herd of 42 elephants migrated from the Dalma Sanctuary in Jharkhand to Sindri in Purulia district. They roamed around for 20 days, destroyed paddy crops and killed 2 people.

Elephant herds from Dalma began migrating to south West Bengal regularly from 1987 onwards. Approximately 20 to 50 elephants would arrive in September and return after winter. Over the last two decades, damages to cropland and villages by visiting herds has been increased, escalating to a menace the villagers are still facing today.

Das Chatterjee (2016) wrote:

"Incidentally, the elephants' migration was aided by the success of forestry projects in West Bengal, under which large patches of degraded forest were turned into regenerated forest. These forest patches provide corridors for movement and convenient shelter to elephants." A change detection study based on satellite data from 1988 to 1991 for Midnapore, Bankura and Purulia districts confirmed an increase of 315 km$^2$ in forest cover. Initially, the herd from the Dalma would come up to Jhargram in West Midnapore, their movement restricted up to the western bank of river Kangsabati. Later, the herds started crossing the Kangsabati and spending most of the time in the eastern part of the river as this area is fertile with food and water in abundance.

With each passing year, as the migratory herds kept expanding their numbers, they began pushing deeper into south Bengal, even crossing over to Burdwan district. A herd also marched to Hooghly district during the last century. There are an estimated 140-150 elephants in south Bengal of which about one-third return to their home in the Dalma hills. But the majority stay back due to the easy availability of food and water. In the 1990s, small elephant herds from Dalma visited these southern districts for a very short period of time but now, not only they are four times stronger in number but are also staying throughout the year in south-west Bengal.

Initially, only the Dalma herd invaded the southern Bengal area, but a forest department report states that another herd, which migrated from Odisha through the Mayurjharna Elephant Reserve area have not been able to go back to its original habitat due to the construction of elephant-proof trenches (EPT) along the Odisha-Bengal boundary. This herd is identified by its physical appearance—shorter in stature and a lighter colour compared to the Dalma elephants.

Their depredation is more harmful than that of the Dalma herd.

Over the years, measures adopted to address the issue—using physical barriers, crop guarding and scaring or driving them away by throwing stones or bursting crackers— have proven futile.

Some of the mitigation measures currently underway include –

1. The forest department is working towards maintaining official documentation that helps identify each elephant based on types (herds or solitary bulls) and keeps track of their movement and numbers
2. Impart training to Forest staff in tranquilizing, immobilizing and capturing wild animals
3. Raising fodder and bamboo plantation on the route
4. Digging earthen dams and EPTs
5. Alternative crop patterns
6. Electric fencing
7. Launching awareness campaigns in affected areas to sensitize people.

**Leopard**

The leopards are widely distributed in the forests, fringe tea gardens and fringe villages of North Bengal. The problem of human-leopard conflicts has recently increased in North Bengal due to changes in the land use pattern.

During the period 2000 to 2013, a total of 101 humans were attacked by leopards, of which 10 persons died and 91 individuals suffered injuries. Higher conflicts have been observed in the tea gardens (77%) than in the forest areas and its fringes (23%). Leopard-attacked victims comprise 73% male and 27% female.

In addition, during the period 2002-03 to 2012-13, a total of 1,649 livestock have been killed by leopards in tea gardens and forest fringe villages and a total compensation of Rs. 1.03 million has been paid.

During the same period 245 leopard deaths were recorded, of which 185 were recorded as natural deaths and 60 leopard deaths as unnatural for the reasons of road accidents, retaliatory killings, poaching and elimination as rogues.

25 leopards were captured during the period 2010 to 2013. During the same period, a total of 8 leopards were immobilized when they strayed to human settlements. After medical treatment, all these captured leopards are released back into the nearest PA.

Human-leopard conflict is a result of diminished prey base, fragmentation of habitat and increase in disturbances due to biotic interferences in leopard habitats.

**Gaur**

Due to deforestation, inadequate fodder availability in the forest and encroachment, Gaurs stray into human habitat mainly during November to April to graze in the fringe area crop fields. When they are surrounded by people and stoned or driven, the animals violently attack the people, kill and injure in many such incidents. Forest staff have also been seriously affected in several capture operations. In most cases, the animals become so exited and exhausted due to continuous disturbance by people that they are prone to cardio-respiratory failure soon after immobilization. During crossing railways line gaurs are often hit by train and killed.

**Rhino**

Tendency of the rhinos to stray out of the PAs due to increased biotic and abiotic pressure was observed more during the fall and winter than other seasons. In most of the cases, bulls were involved and the majority strayed from JNP. Traditionally, these animals are retrieved back to the respective PA with the help of manpower and *kunkis* (trained captive elephants). But driving through the fragmented thickly populated disturbed areas is very difficult and risky too. Besides, such efforts consume lot of resources as well as time. When such an effort fails, chemical restraining and translocation of the disoriented animal becomes the only viable option left to save the life of the individual.

**Bear**

Two species of bears found in the state - Asiatic Black Bear and Sloth Bear are killed for illegal trade. The latter are also hunted during annual tribal festival in Purulia and Jhargram. Human-Asiatic Black Bear conflict in Wildlife Divisions I (SWLS), II (NVNP) and Kalimpong are also reported. They cause major damage through livestock and crop (mainly maize) depredation, and may also attack humans. These reports are on the increase in recent years.

**Fishing cat**

Fishing cat has become another worst victim of human-wildlife conflict in the wetland zones outside PAs, particularly rapidly developing urbanized areas near Kolkata and its suburbs in the Howrah and Hooghly districts as well as Mednipur and Nadia districts. Baseless panic and mistaken identification also leads to killing of the fishing cat. Poisoning, trapping, snaring and clubbing seem to be common methods to kill Fishing Cats in the human-dominated landscape. In a few cases, death due to train or road-traffic accidents was also reported. Its poaching cases most often go unnoticed or are ignored unless some interested people and non-governmental organisations pursue the case until the perpetrators are convicted (Adhya 2015). In the Sundarbans, local people from Sagar Island admitted to having exterminated the cat from their island (Mukherjee et al. 2012). In 2010-2011 (18 months), at least 27 fishing cat killings were reported from areas like Shyampur, Bagnan, Amta, Bally, Domjur and Dankuni — all in conflict with the locals in Howrah and Hooghly districts. From

August 2016 till date, only seven fishing cat killings, including two road kills, were reported in Howrah (Adhya 2017). Consequently, it is now under significant threat of local extinction.

**Civet**

For the past few years, the Wildlife Wing of Forest Department, West Bengal, has experienced a rise in the number of calls and mails regarding civet-depredation. It is reported that at least 20 civets, which have strayed into people's homes, are being brought to the rescue centre every month. These are again released back into the wilderness. But the centre is also running out of space.

Civets are hunted for meat (some tribes shoot, snare and trap with help of hunting dogs), fur or body parts, which are sometimes used in folk medicine. Last November (2017) it was reported that one of the two culprits, who killed and ate a civet and proudly posted the photographs on Facebook, was arrested during a joint operation conducted by the Forest Department, SOG, CID and Titagarh P.S. Many civets have also been exterminated as pests for depredation of poultry and orchards.

The nocturnal civets have to cross the road frequently in search of food, water and mates. But they are slow-movers, hence killed by speeding vehicles. Even if they are injured and handicapped, survival in the wild becomes difficult and they die a painful death.

**Gangetic dolphin**

A few cases of poaching are recorded. Entanglement of Ganges River dolphins in fishing nets causes significant damage to the local population. The primary cause is believed to be entanglement in fishing gear such as nylon gillnets because their preferred habitat is often in the same location as primary fishing grounds. On few occasions accidental killing due to collisions with vessels has also been observed.

**Wild boar**

Wild boar, a prolific breeder, occur in almost all protected lands with wide elevational distribution, ranging from plains to 3,500 m and are attracted to agricultural crops, that are often richer in protein, carbohydrates, and mineral nutrients than wild plants and animals. Large foraging groups, for their opportunistic crop-raids at night, tendency to trample the crop and preference for forest edges, make wild boars particularly problematic in fragmented landscapes comprised of small farms. When the crop is young, the wild pigs from the forested neighbourhood come and destroy the crops by tilling the soil using its teeth in search of food. When the crop is ready for harvest, these animals destroy the crop by eating the grains and also by random movement across the fields. As a primary crop raider, it is viewed as one of the most destructive pest that causes great damages to crops (particularly potato, maize, paddy), for example at Latpanchar area of MWLS, Rampuria and Lalung in SWLS, Samanden bordering SNP.

**Yellow-throated marten**

Consequent upon extensive forest reclamation, over-exploitation of vegetative resources, habitat loss-degradation-fragmentation, hunting and diminishing prey, the human-marten conflict, i.e. nocturnal raids causing large-scale depredation on the poultry and pets, is often reported from the enclave and fringe villages. Sunar et al. (2012) recorded that about 50% of the wildlife depredation on the village livestock in and around SWLS was caused by the Yellow-throated Marten alone. The affected areas were mostly enclave forest villages (Rambi Forest Village, Rangiroom Forest Village, Rishop Forest Village, Rampuria Forest Village, Chattakpur, etc), one khasmahal or leasehold land (Lhabda) and two fringe villages (Raja Hatta and Upper Johnson Hatta). In Samanden Forest Village (Rammam), the kills of Yellow-throated marten [n= 8 (61.5%) involved chicken and n= 2 (100% kitten) was reported during the period April 2011–May 2012.

**Others**

In addition, human conflicts with primates, jackal, deer, mongoose, rodents, etc. are also prominent in and around the reserve forests in the state, particularly human-dominated non-forest landscape. Mitigation of these conflicts. i.e. curbing depredation is a challenging task of the PA managers.

**Transboundary Conservation Landscape for migratory species**

The transboundary landscape in the state with Nepal, Bhutan and Bangladesh provides habitat to many umbrella and charismatic species including tiger (*Panthera tigris*), elephant (*Elephas maximus*) and red panda (*Ailurus fulgens*). The thrust areas for collaborative conservation of these species are SNP, NVNP, BTR and STR.

1. Linkage of SNP with Reserve Forests of Sikkim's Barsey Rhododendron Sanctuary and Kangchendzonga National Park and Nepal's Kanchenjunga Conservation Area (around 5,000 km²) on the north-west. SNP is bordered on the west by an unmetalled road. Williams (2004) in his study along the Indo-Nepal border recorded three sightings of red panda - one at 2,857 m, when it first ran into the Nepalese side of the ridge and then scampered across the border road into SNP. The second sighting occurred at approximately 2,442 m, 0.5 km below Gairibans on the Jamuna-Gairibas road, when a red panda shifted from a *Lindera pulcherrima* into a *Rhododendron arboreum* and scampered away over a large boulder. The third sighting took place at 2,685 m, directly below Kaiyakatta, 200 m southwest of Kaiyakatta creek. The red panda jumped down from its resting spot

on the stump of a twisted *Rhododendron grande* and sped into the mist.

2. Elephant herds also migrate into Nepal, during the crop harvesting seasons through the Panighata (Kurseong Division) corridor via Mahananda-Lamagumpha-Bamanpokhri. The results from radio-collaring of elephants during 2005-2006 have indicated that parts of Jhapa district were included in the home range of certain elephant herds from south-western Darjeeling district (Mahananda population). Hence, this landscape is an integrated habitat for elephants.

3. In the past, Teesta Valley (54.14 $km^2$, 27°03'36.00"N, 88°25'48.00"E) under Darjeeling Forest Division was a habitat occupied by the tiger, which used to migrate in between the valley in Darjeeling and Sikkim by conveniently crossing the intervening rivers.

4. In Kalimpong district, NVNP is linked with Sikkim's Pangolakha Wildlife Sanctuary (128$km^2$ , 27°32′N-27°35′N, 88°76′E-88°79′E) and Bhutan's Torsa Strict Nature Reserve (around 2,000 $km^2$) on the north. Tigers in Sikkim are seasonal migrators from the upper reaches of NVNP.

5. Recently, trans-boundary dispersal and exchange of genes of tiger between Phibsoo WLS ( 268.93$km^2$, 26°42′N-26°51′N, 89°56′E-90°12′E) of southern Bhutan (having biological corridor linking Royal Manas) and contiguous northern BTR is also mentioned in the Tiger Action Plans of 13 Tiger Range Countries (2011) by Global Tiger Forum and National Tiger Survey of Bhutan (2014-2015). The forests of Ripu and Chirang are contiguous not only with those of BTR but also Phibsoo WLS of Bhutan. Promoting trans-boundary collaboration for conservation of tigers involving the concerned PA Managers of Assam, Sikkim and West Bengal in India and Bhutan should be ensured. During the present study, it was observed that Kalikhola and Khurul sources through Kumargram Forest Block and Newlands Forest Block are two important sites along Indo-Bhutan boundary. On the eastern side, the corridor is narrow because of location of Kumargram and Sankosh forest villages and at present a two-way movement of elephants is taking place through this corridor.

6. STR with contiguous forests of Bangladesh Sundarbans on the south-east: A tiger had entered into Malmelia village in North 24-Parganas and was eventually trapped in the Arbeshi forest on 21 May 2010. It was tranquillized and radio-collared before being released in the Khatuajhuri forest of STR on 22 May. This Khatuajhuri male was a blind tiger on the right eye, perhaps indicating signs of territorial fights. There is enough prey in the Katuajhuri jungle and the forest guards, who examined the terrain, found carcasses of prey animals devoured by the tiger. The radio collar signals revealed that on the first two days, it was on the hunt and traveled only 6-7 km. But on the third day, the tiger traveled more than double that distance. The signals showed that it crossed the River Harinbhanga and left its command area and moved into a new territory at will, even if there is enough prey. So, it was surprising when the tiger suddenly started moving from south to east, towards Bangladesh. It was not known whether it had originally strayed into the Indian territories from Bangladesh or now it strayed across the border. This hints that a tiger can migrate due to reasons other than the lack of prey base, probably infight. Signals were being received from the collar and had located it somewhere in the middle of Talpatty Island (only two kilometres from the mouth of River Harinbhanga). In recent times, a tiger and a tigress, which had entered into Shamsernagar village bordering STR, were also found to have entered the Indian territories from Bangladesh. It was reported that in 2008, when the supercyclone 'Sidr' caused severe damage to the mangroves forests of Bangladesh Sundarbans, the tigers crossed the bordering river and took refuge in the Indian Sundarbans.

## CONSERVATION INITIATIVES

The most important aspects of the biodiversity (including mammals) conservation in the state are as follows:

Protection of Wildlife and their Habitats, control of poaching through regular patrolling on foot, elephant back, vehicle and speed boats, improvement of communication network (Long distance RT network), supply of improved weapons to the wildlife guards, wildlife squads, Intelligence gathering including strengthening of information network, installation of watchtower at strategic points etc, regular coordination between various enforcement agencies like BSF, Railway Police, Customs, Director of Revenue Intelligence, Police etc. are the measures taken to control poaching and illegal trade of wildlife products.

Habitat Improvement Programme like canopy opening in monoculture teak plantations, followed by natural or artificial regeneration of grasses and under planting with bamboo and tree fodder species, Development of water holes and wetland development through soil moisture conservation works have been implemented on top priority basis. Regular maintenance of fire lines are given priority to control ground fire. Grassland Management is one of the major activities in the terai and duars Forests. Indigenous grasses are being regularly planted to increase the fodder base of herbivores.

Reduction of Man-Animal Conflict: Long term and short term strategies are being applied to reduce the magnitude of this conflict. Habitat Improvement Programme in the elephant range is being done regularly. Maintenance and development of corridors of large mammals like elephants has been a key activity. Further, conflict

is being reduced through erection of Power fencing, judicious use of tranquilization techniques, driving of wild elephants from human habitation with the help of anti-depredation squads and voluntary squads with the help of local people. Programme of Awareness Generation on wildlife conservation in the forest fringe areas is being taken up to seek cooperation of local people in combating animal depredation.

Eco-development activities in and around PAs: Around 103 eco-development committees and 127 forest protection committees have been formed in the fringe villages of PAs with around 62,030 members, who are protecting more than 1,82,406.24 ha of forests.

Ex-situ conservation: Padmaja Naidu Himalayan Zoological Park, Darjeeling and Alipore Zoological Garden, Kolkata are involved in conservation breeding. Captive breeding programmes have also been undertaken by the forest department at Sajnakhali, Sukna, Murti, Kalimpong, Adina (Malda), S. Khairbari, Rajabhatkhawa, Garchamuk (Uluberia, Howrah), Jhargram, Kumari Kangsabati, Bankura, Ramnabagan, Rasikbeel (Cooch Behar), Kunjanagar (Jalpaiguri), Surulia (Purulia), etc. Around nine hundred Cheetals have been translocated from the excess population in the PAs of South Bengal to STR and other PAs in North Bengal. During early 21st century, captive-bred Red Pandas were translocated from Padmaja Naidu Himalayan Zoological Park to SNP, but they did not survive for long.

Research and Monitoring: Regular census of wild animals is conducted in various PAs as well as in the reserve forests (first conducted in the state in JNP in 1964). A formal census regime of tiger population in Project Tiger reserves is conducted every two years, and in the rest of the areas every four years. Surveillance and monitoring of wildlife in protected areas across the state is now a regular practice. Periodic monitoring of forests of the state is done with application of remote sensing and GIS technology for mapping and assessment of bio-resources. Monitoring changes in biodiversity in different ecosystems is recorded regularly and accordingly management actions are implemented to correct the negative impacts. A priority list of research programme has been prepared for each PA and different scientific institutions, universities and NGOs are involved to conduct research. Research has been conducted on various aspects of eco-biological studies on different species, habitat requirement and socio-economic pattern of fringe villages. The scientific survey reports and baseline data on different aspects are included in the management plan which also is updated from time to time based on scientific findings.

The new techniques for monitoring include:

(a) Radio-collar/GPS collar;

(b) Remote photography (camera trapping);

(c) Genotyping of scats and hair; and

(d) Tracing of pugmark and other indirect signs like scrapes, scent marks, rake marks on trunks, vocalization (roaring).

The National Tiger Conservation Authority (NTCA) has laid down an improved counting system using the latest technology like satellite tracking and camera trapping of tigers. The outcome of the 2006 census through a new methodology "Monitoring of tigers, co-predators, prey and habitat" was not published. The study by Wildlife Institute of India was completed in 2010. Data were available since 2007. Tiger occupancy in Sundarban was reported to be 1,586 km2 (Jhala et al. 2008). The survey, based on direct sighting and indirect evidences along the river/creek banks, bank-side mangroves and at the watchtower locations, revealed that the tigers were present throughout the landscape with varying abundance (Mallick, 2011). In all, the tiger was sighted 417 times (mean 13 in September and maximum 56 in January) in fourteen forest blocks in 2010. Four cubs were also sighted, two each at Pirkhali and Chhotohardi in November. However, the cub-sighting ratio is very low in the study area. In all only five cubs were found in three out of fifteen blocks (20%).

The present study has revealed some interesting results. The most important outcome is that maximum tigers were sighted in Pirkhali block, but the frequency was highest here during the four months from January to April and then the sightings started reducing from May onwards recovering only in December. This may indicate a periodical fluctuation of population in this block. Another remarkable feature is that Netidhopani is the second important sighting area in the region, but here also the sighting records were not uniform throughout the year, but fluctuates during the rainy and winter months. Arbesi block is the third important sighting area. Here, most sightings were recorded in December. On the contrary, the sighting record in the adjacent Panchamukhani block is low throughout the year. Matla block may be termed as very low in terms of sighting, where from August to December no sighting record was available. Experience is almost similar in Chamta, Chhotohardi, Chandkhali and Gosaba blocks. But in the southern blocks of Gona, and Bagmara, sighting was almost negligible and in Mayadwip it was nil. Jhilla, Khatuajhuri and Harinbhanga blocks

were not much important in terms of sighting. So, the presence of tigers was mostly felt in the northern belt of forest blocks, whereas only one block in the central zone, i.e. Netidhopani, holds most of its residents throughout the year.

However, since 2007, according to the national prescription for the tiger monitoring, a range of techniques including camera traps, DNA sampling, pug mark surveys and the assessment of tiger claw marks on trees have been followed in the Indian Sundarban to get a reliable estimate of tiger numbers. The estimate showed that the Indian Sundarbans has >50 (but <100) adult tigers. A density of 4.3 tigers/100 km2 (taking into account about 1,600 km² land area) was found with the range being 64–90 tigers. However, that was not a total count but only a tidal channel search and the inner mangrove forests were excluded due to lack of proper animal trails and fear of tiger attacks.

On the basis of field surveys in Indian Sundarbans, carried out from October 1998 to February 1999, Karanth & Nichols (2000) reported the tiger density of 0.84 tigers/100km2. The photographs of six different tigers obtained by camera traps showed differences in stripe patterns that permit unambiguous identification of the individuals. But no estimates of prey abundance were provided. The small data set of captures (SBT 101–106= 6 inclusive of a cub less than one year of age [SBT 105]).

Again, during the year 2010-2011, an attempt was made to estimate the tiger population and density by using camera (Moultrie Digital) traps in a mark re-capture framework with closed population estimators at Netidhopani and the area covered was 220 km2. Since the Sundarban is a unique habitat with six hourly tidal effects, it was extremely difficult to locate regularly used game trails for setting the camera traps. Therefore, it was decided to use lures and baits to attract the tigers to camera traps. Due to this limitation the cameras could not be set systematically across the study area but were sparsely spaced near attractants of fresh water ponds. In all, 102 photos were taken using camera traps recording presence of 12 different tigers (10 adult and two cubs). But, due to limited sampling, a reliable estimate of mean maximum distance moved could not be made for density estimation. Nor the camera configuration provided a robust design for using the modern approaches of spatially explicit likelihood and Bayesian approaches to density estimation.

In South 24-Parganas Forest Division, a camera trap exercise was initiated jointly by WWF-India and the state forest department in January 2012.

Initially, the new technology for enumeration like radio collars on tigers and cameras trapping in Sundarbans became useless when exposed to the salt water of Sundarbans. In a few cases, the radio-collars were detached or stopped functioning much earlier than their longevity and none of the collars fitted were found functional more than four months. The terrain of Sundarbans, where tigers alternate between land and saline water, may be one of the reasons for the radio collar getting defunct. Moreover, it can easily come off a tiger's neck as the big cats have to negotiate through dense mangrove forest. A few camera traps were also damaged by the saline high tides (reportedly stolen in BTR). However, this technique is now successfully used in Sunderbans and other PAs in the state.

7. Extension of Nature Education and Awareness Generation.

8. Rescue and Rehabilitation:

Every year hundreds of wild mammals are rescued and rehabilitated in different parts of the state. For example, during 2012-13, the following species (number indicated in parenthesis) were rescued and rehabilitated by the Wildlife Squads- Langur (218), Monkey (72), Civet (285), Jungle Cat (38), Fishing Cat (10), Sambar (6), Mongoose (6), Jackal (25), Fox (1), Dolphin (3), Spotted Deer (8), Tiger (2), Hog Deer (2), Barking Deer (12), Pangolin (3), Hyaena (1), Leopard (19), Elephant (8), Gaur (15), Leopard Cat (1), Wild Boar (1), Porcupine (3), Squirrel (4), Nilgai (1) and Chinese Ferret Badger (2).

**Lessons learnt on *in situ* and *ex situ* conservation initiatives in the state**

Both *in situ* and *ex situ* conservation are essential and complementary to each other, aiming at long-term survival of the flagship species along with harmonious co-existence of other indigenous species in the natural ecological background. The climate change adaption and mitigation, management of problem animals and many other emerging challenges have to be confronted. It is most crucial for the management to balance between maintaining viable populations of the key as well as associated species by regulating their density and distribution, safeguarding the human welfare, property as well as satisfying the needs of stakeholders in a cost-effective manner. Proactive education and public awareness programmes are the keys to achieving that balance. Protection and conservation of the wetlands lying in the non-forest areas should be another priority area. Besides, the organizational set up should be revamped at the grass root level and efficiency ensured. "What's necessary" includes creation of a New Conservation Movement dedicated to gaining ground in pursuit of ecological sustainability.

**Table 1:** Tabular summary of checklist (Figures in parenthesis recorded in Agrawal et al. 1992)

| SL NO | ORDERS | NO OF FAMILIES | NO OF GENERA | NO OF SPECIES | NO OF SUB - SPECIES |
|---|---|---|---|---|---|
| 1 | EULIPOTYPHLA (INSECTIVORA) | 2(2) | 7(6) | 11(13) | 13(11) |
| 2 | SCANDENTIA | 1(1) | 2(2) | 2(2) | 2(2) |
| 3 | CHIROPTERA | 7(7) | 32(29) | 75(60) | 60(44) |
| 4 | PRIMATES | 3(1) | 5(2) | 8(3) | 6(3) |
| 5 | CARNIVORA | 8(8) | 32(23) | 48(37) | 48(30) |
| 6 | PROBOSCIDEA | 1(1) | 1(1) | 1(1) | 1(1) |
| 7 | PERISSODACTYLA | 1(1) | 2(1) | 3(1) | 2(0) |
| 8 | ARTIODACTYLA(*) | 9(3+3=6) | 27(10+6=16) | 29(13+6=19) | 18(11) |
| 9 | PHOLIDOTA | 1(1) | 1(1) | 2(1) | 1(0) |
| 10 | RODENTIA | 4(3) | 25(23) | 50(48) | 60(41) |
| 11 | LAGOMORPHA | 2(1) | 3(2) | 5(3) | 4(2) |
| Total | 11(12) | 39(32) | 137(106) | 234(188) | 215(145) |

*Cetaceans included in Artiodactyla (separately dealt with in Agrawal et al. 1992).

**Table 2**: Checklist of extant and extinct mammalian species in West Bengal.

| **ORDER EULIPOTYPHLA**<br>**FAMILY SORICIDAE**<br>SUB-FAMILY CROCIDURINAE<br>TRIBE CROCIDURINI | | | COMMENTS |
|---|---|---|---|
| **GENUS** | **SPECIES** | **SUB-SPECIES** | |
| 1. Grey or Himalayan White-toothed Shrew | | | |
| ***Crocidura*** | *attenuata* | *rubricosa* | Frequent. Restricted to North Bengal. Specimens at ZSI from Mungpo (Mongpu), Gopaldhara, Pashok, Takdah in Darjeeling and Hasimara in Alipurduar (Agrawal et al. 1992; Khajuria & Ghose 1970). Habitat: Lowland and montane tropical and subtropical moist forest, bamboo forest, herbaceous vegetation, scrubland, foothills of *Terai* and *Bhabar* regions. JNP (Maheswaran & Kumar 2003). Anderson (1877) described *C. kingiana* from Mungpo in Darjeeling on the basis of lateral glands being absent. Later (1881) he could find lateral glands in the type series and synonymised it with *C. rubricosa.* Ellerman & Morrison-Scot (1951) treated both the *rubricosa* and *kingiana* as separate subspecies of the *C. attenuata* without assigning any definite reason. |
| 2. Etruscan Pygmy Shrew | | | |
| ***Suncus*** | *etruscus* | *nitidofulvus* | Very rare. Probably, extinct. Holotype from Kolkata, also found in Howrah (Agrawal et al. 1992). Sterndale (1982) mentions its presence in Kolkata as *Sorex melanodon.* Habitat:Warm and damp habitats covered with shrubs, grasslands. |
| | | *pygmaeoides* | Occasional in north Bengal (Anderson 1881, Wroughton 1917). Specimens from Darjeeling (Pashok) and Alipurduar (Hasimara and Bhamabari). Found in different types of habitats in plains and hills up to an altitude of 3,000m. Found under litter in forests (Pratihar & Chakraborty 1996). GNP, RBWLS, BTR. |
| 3. House Shrew | | | |
| *Suncus* | *murinus* | *griffithi* | Occasional. Restricted to higher altitudes of Darjeeling. Specimens collected from Ghoom and Tonglu. SNP. |
| | | *soccatus* | Common. Found in Darjeeling, Kalimpong and Alipurduar districts. |
| | | *caerulescens* | Common. All districts, in forests or near human |

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| | | | habitations. Specimens collected from Barakar, Paschim Bardhaman. GNP (Pratihar & Chakraborty 1996), BTR, EKW, JNP (Maheswaran & Kumar 2003), RBWLS, STR (Ghosh 1995). Found in forests as well as near human habitations in all sorts of habitats up to an elevation of 3,000 m. |
| 4. Yellow-throated or Anderson's Shrew | | | |
| *Suncus* | *stoliczkanus* | *stoliczkanus* | Rare. Found only in Bankura (Agrawal et al. 1992). Specimens collected from Bankura and Ranibundh. Habitat:Grassy embankments, near water courses, riverine areas, open areas interspersed with scrub in tropical forests, gardens and agricultural fields. |
| SUB-FAMILY SORICINAE TRIBE NECTOGALINI | | | |
| 5. Himalayan Water Shrew | | | |
| ***Chimarrogale*** | *himalayica* | *himalayica* | Occasional. Restricted to Darjeeling. Pashok, MWLS. Semi-aquatic associated with streams in temperate evergreen forests. |
| 6. Hodgson's Brown-toothed or European Alpine Shrew | | | |
| ***Episoriculus*** | *caudatus* | *caudatus* | Common. Holotype from Darjeeling (specimens collected from Mongpu and Sandakphu). Restricted to North Bengal. Found in broad-leaved, rhododendron and conifer forests. Also reported from Alipurduar. BTR, MWLS, SNP. |
| 7. Indian Long-tailed Shrew | | | |
| *Episoriculus* | *leucops* | *baileyi* | Occasional. Restricted to Darjeeling. MWLS. |
| 8. Hodgson's or Blanford's Long-tailed Shrew | | | |
| *Episoriculus* | *macrurus* | - | Occasional. Restricted to (type from) Darjeeling. |
| 9. Elegant Water Shrew | | | |
| ***Nectogale*** | *elegans* | *sikkimensis* | Occasional. Restricted to Darjeeling. Semi-aquaic, haunts rivers and streams. |
| 10. Sikkim Large-clawed or Himalayan Shrew | | | |
| ***Soriculus*** | *nigriscens* | *nigriscens* | Common. Restricted to Darjeeling including type locality at elevations above 1200 m (Ghoom 1915, Gopaldhara, Palmajua). |
| **FAMILY TALPIDAE** SUB-FAMILY TALPINAE TRIBE TALPINI | | | |
| 11. Eastern or Indian Short-tailed Mole | | | |
| ***Euroscaptor*** | *micrura* | *micrura* | Common in both plains and hills. Restricted to North Bengal. Mongpu in Kalimpong and Gopaldhara, Pashok and Selimbong in Darjeeling. SWLS, SNP, MWLS, CWLS, GNP, BTR. |
| **ORDER SCANDENTIA FAMILY TUPAIIDAE** SUB-FAMILY TUPAIINAE | | | |
| 12. Indian or Madras Tree Shrew | | | |
| ***Anathana*** | *ellioti* | *pallida* | Occasional. Found only in Purulia (Bandwan, Ajodhya Hills) only. Habitat: Scrub jungle, dry and moist deciduous forests and wet evergreen forests. Prefer rock crevices and burrows in forest. |
| 13. Common or Malay Tree Shrew | | | |
| ***Tupaia*** | *belangiri* | *lepcha* | Occasional. The type of *lepcha* was from Sangsir, Narbong, Darjeeling dist. Restricted to North Bengal. Specimens collected from Nimbong, Sivok (Darjeeling dist) and Hasimara (Alipurduar dist). BTR, JNP, SNP. Found in tropical, subtropical, deciduous and evergreen forests. |
| **ORDER CHIROPTERA** SUB-ORDER MEGACHIROPTERA **FAMILY PTEROPODIDAE** SUB-FAMILY ROUSETTINAE TRIBE ROUSETTINI | | | |
| 14. Indian Fulvous Fruit Bat or Rousette Fox Bat | | | |
| ***Rousettus*** | *leschenaultii* | *leschenaultii* | Common. Throughout the state. MWLS, CWLS, GNP, BTR, SWLS, SNP. Materials examined: Bankura district- Susunia, Kalimpong district: Gorubathan, Tarkhola, Hooghly district: Barul, Jalpaiguri district: |

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| | | | Khuntimari, Sulkapara, Medinipur district: Balivasa, Chandra, Mandalpuskarini; South 24-Parganas district: Baruipara, Bawali. Habitat: Tropical moist forest to urban environments. |
| SUB-FAMILY PTEROPODINAE TRIBE PTEROPODINI | | | |
| 15. Indian Flying Fox or Indian Fruit Bat | | | |
| ***Pteropus*** | *giganteus* | *giganteus* | Common. Specimen collected from Sulkapara, Jalpaiguri. Purulia. Throughout. MWLS, CWLS, JNP, GNP, BTR, STR, RWLS. Forests, rural-urban gardens, orchards close to water source. Earlier included as *Pteropus intermedius* and listed under *Pteropus vampyrus.* |
| SUB-FAMILY CYNOPTERINAE TRIBE CYNOPTERINI | | | |
| 16. Indian Short-nosed Fruit bat, Lesser Dog-faced Fruit Bat | | | |
| ***Cynopterus*** | *brachyotis* | *brachyotis* | Rare. Csorba et al. (2008) only mentioned its occurrence without any specific site. Habitat: Orchards, gardens, forested tracts. Taxonomic situation confused. Sometimes included under *C. sphinx* (Vahl 1797) (Bates and Harrison 1997). |
| 17. Greater Indian Short-nosed Fruit bat | | | |
| *Cynopterus* | *sphinx* | *sphinx* | Common throughout the state. Both plains and hills. Darjeeling: Sukna. Jalpaiguri: Ambari, Kalimpong: Gorubathan, Kumani, Alipurduar: Chilapata, Hasimara. MWLS, CWLS, GNP, BTR RBWLS, STR, RWLS, BBWLS. Habitat: Rural areas, primary and secondary forest habitats to urban landscapes. There is considerable confusion between this species and *C. brachyotis*. Recent molecular studies confirm that *C. sphinx* is genetically distinct from *C. brachyotis.* |
| 18. Niphan's tailless or Ratanaworabhan's Fruit Bat | | | |
| ***Megaerops*** | *niphanae* | - | Occasional. Restricted to Darjeeling. Specimen from Pashok. Hill (1983) identified this specimen as belonging to *M. ecaudatus* (Temminck, 1837) with some hesitation. Koopman (1989) considered obviously this specimen as *M. niphane*. Habitat: Found in deciduous forests, coniferous forests, bamboo forests and subtropical mixed forests across the foothills of Himalaya. Also farmlands in the fringe areas. |
| 19. Blanford's Mountain Fruit Bat | | | |
| ***Sphaerias*** | *blanfordi* | - | Occasional. Restricted to Darjeeling. Specimens from Darjeeling, Goomti and Palmajua. Inhabit bamboo forests. |
| SUB-FAMILY MACROGLOSSINAE TRIBE MACROGLOSSINI | | | |
| 20. Hill Long-tongued Fruit Bat | | | |
| ***Macroglossus*** | *sobrinus* | *sobrinus* | Occasional. Found in Darjeeling and Koch Behar (Atiamochar). Recently, first recorded from Narendrapur of South 24-Parganas (Dar et al. 2018). Prefers lowland and montane forest. Occurs in secondary habitats and also in old fruit orchards, villages, and banana plantations, rarely recorded in mangroves, also common in association with humans, particularly under roofs of houses. Ellerman & Morrison-Scott (1951, 1966) have maintained *sobrinus* as a subspecies of *Macroglossus minimus* (E. Geoffroy, 1810). Most of recent authors, however, consider *minimus* and *sobrinus* as distinct species. |
| 21. Dawn bat or Cave Fruit Bat | | | |
| ***Eonycteris*** | *spelaea* | *spelaea* | Occasional. Restricted to Darjeeling. Pashok, Sukna. The specimen listed from Calcutta appears to be of doubtful origin. It might have actually been procured |

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| | | | from Darjeeling area where Dr. F. Stoliczka, the donor of the specimen, collected during 1871. Inhabits caves in forested areas, disturbed and agricultural areas, orchards, attics. |
| SUB-ORDER MICROCHIROPTERA **FAMILY RHINOPOMATIDAE** | | | |
| 22. Lesser Rat -tailed or Mouse-tailed Bat | | | |
| ***Rhinopoma*** | *hardwickii* | *hardwickeii* | Rare. Recorded in Sundarbans. Doubtful past record in Kolkata (Das 2003), but first photographed in Garhpanchakot, Purulia, in September 2011. Inhabits caves, ruins, underground tunnels and old buildings. |
| 23. Large Rat-tailed or Greater Mouse-tailed Bat | | | |
| *Rhinopoma* | *microphyllum* | *kinneari* | Rare. Doubtful past record in Kolkata (Das 2003). Roosts in crevices, small caves, mines, underground tunnels, wells, old monuments and buildings. |
| **FAMILY EMBALLONURIDAE** SUB-FAMILY TAPHONOINAE TRIBE TAPHOZOINI | | | |
| 24. Pouch-bearing Bat | | | |
| ***Saccolaimus*** | *saccolaimus* | *crassus* | Found in South West Bengal. Rare sighting. Habitat: Forests, swamp habitat, plantations and agricultural areas. |
| 25. Long-armed Sheathtailed or Long-winged Tomb Bat | | | |
| ***Taphozous*** | *longimanus* | *longimanus* | Frequent. Mostly recorded from South Bengal than North Bengal (Darjeeling). MWLS. Found in varied habitats from arid areas to humid zones. Roosts in caves, old tunnels, old buildings, large wells, hollows and crowns of trees, eaves of houses. |
| 26. Black Bearded Tomb Bat | | | |
| *Taphozous* | *melanopogon* | *melanopogon* | Old record from south Bengal. During 19$^{th}$ century, common about Kolkata (Sterndale 1982). Rare, if not already extinct. Lives in forested habitats in tropical region, hill areas and urban landscape. |
| 27. Naked-rumped Tomb Bat | | | |
| *Taphozous* | *nudiventris* | *kachhensis* | Rare. Recorded from north Bengal (Sevoke, near Mahananda WLS) and south Bengal. Temperate, tropical and arid regions. Inhabits crevices of rocks, houses, tunnels, forts. |
| **FAMILY MEGADERMATIDAE** | | | |
| 28. Great Indian False Vampire Bat | | | |
| ***Megaderma*** | *lyra* | *lyra* | Common. Throughout. Darjeeling (Ghyabari, Lopchu [c. 800m], Siliguri and Sukna), Jalpaiguri (Chilapata and Khuntimari), and Koch Behar (Atiamochor and Mathabhanga). Tropical and sub-tropical forests. Prefers agricultural fields. |
| 29. Malay Lesser False Vampire Bat | | | |
| *Megaderma* | *spasma* | *horsfieldi* | Jalpaiguri and South 24-Parganas. Specimen collected from Gosaba, South 24-Parganas district: 12-19. 09. 1983. Usually found in wet areas. Lives in caves, hollow of trees, buildings, etc. |
| | | *spasma* | Rare. Moist habitat. Sporadic records. BTR (Chunabhati). |
| **FAMILY RHINOLOPHIDAE** SUB-FAMILY RHINOLOPHINAE | | | |
| 30. Himalayan Horseshoe Bat | | | |
| ***Rhinolophus*** | *affinis* | *himalayanus* | Occasional. Restricted to North Bengal. Specimens from Darjeeling, Pashok, Hasimara. MWLS, BTR. Found commonly in man-made habitats such as orchards, degraded habitats and agriculture areas. Forages in understory of forest, |
| 31. Greater Horseshoe Bat | | | |
| *Rhinolophus* | *ferrumequinum* | *tragatus* | Very rare. Holotype recorded as *Rhinolopbus brevitarsus*: unsexed; study skin with skull (damaged); Darjeeling; 1875; W.T. Blanford donor. Higher reaches of Darjeeling. Doubtful (Das 2003). Habitat: |

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| | | | Grassland, Forest, Shrubland. |
| 32. Little Indian Horseshoe Bat | | | |
| *Rhinolophus* | *lepidus* | *lepidus* | Common. Found in both north (Darjeeling) and south Bengal. Habitat: Dry and moist forest and fringe areas. |
| 33. Greater Eastern Woolly Horseshoe Bat | | | |
| *Rhinolophus* | *luctus* | *perniger* | Occasional. Restricted to Darjeeling and Kalimpong-specimens from Nimbong, Singla. NVNP. A forest dweller, roosts in caves, rocky outcrops and overhanging ledges and large trees with hollow. |
| 34. Big-eared Horseshoe Bat | | | |
| *Rhinolophus* | *macrotis* | *macrotis* | Rare. Found in Darjeeling dist (Lopchu). Molur et al. (2008) did not mention any specific site of occurrence. Lowland tropical moist forests. |
| 35. Mitred Horseshoe Bat | | | |
| *Rhinolophus* | *mitratus* | - | Rare. Very old record from Darjeeling and south Bengal by Blanford (1891). Earlier included under *R. philippinensis.* Simmons (2005) treats it as distinct species under the trifoliatus species-group. |
| 36. Pearson's or Greater Eastern Horseshoe Bat | | | |
| *Rhinolophus* | *pearsonii* | *pearsonii* | Rare. Restricted to Darjeeling. Type locality: Darjeeling. Also recorded from Pashok and Lopchu. MWLS. Roosts in caves in hilly areas and found in montane forests, bamboo forests and cultivated areas. |
| 37. Least Horseshoe Bat | | | |
| *Rhinolophus* | *pusillus* | *blythi* | Occasional. Restricted to Darjeeling dist only. Specimens from Sangser, Pashok and Nimbong. Tropical moist forest, roosting in caves, foraging low over bamboo clumps in limestone areas. |
| 38. Indian Rufous Horseshoe Bat | | | |
| *Rhinolophus* | *rouxi* | *rouxi* | Occasional. Recorded north and south Bengal. Specimens from Darjeeling, Pashok, Kumani and Nimbong. MWLS, CWLS, GNP. Found in caves, hollows of large tree in moist evergreen forests, unused wells, old dilapidated buildings and temples |
| 39. Chinese rufous horseshoe bat | | | |
| *Rhinolophus* | *sinicus* | - | Rare. Bates et al. (2008) mentioned its occurrence in the state, but not any specific site. Earlier listed under *R. rouxii*, now considered to be a distinct species. Found in montane forests. |
| 40. Trefoil Horseshoe Bat | | | |
| *Rhinolophus* | *trifoliatus* | *trifoliatus* | Rare. Restricted to Darjeeling. MWLS. Earlier included *R. mitratus*, now considered distinct. Found in dense evergreen forests. |
| SUB-FAMILY HIPPOSIDERINAE TRIBE RHINONYCTERINI | | | |
| 41. Great Himalayan Leaf-nosed Bat | | | |
| ***Hipposideros*** | *armiger* | *armiger* | Occasional. Restricted mainly to Darjeeling (Gopaldhara, Tongsong, Pashok, Nimbong, Goomti, Mahanadi and Lopchu. No site-specific record from Jalpaiguri or Burdwan. BTR, RBWLS. Found in montane and bamboo forests. |
| 42. Dusky Leaf-nosed Bat | | | |
| *Hipposideros* | *ater* | *ater* | Doubtful. Only mentioned in RWLS (Management Plan). No direct sighting record is available. Earlier listed under *H. bicolor*, now a distinct species. |
| 43. Bicoloured Leaf-nosed Bat | | | |
| *Hipposideros* | *bicolor* | - | Occasional. Recorded in STR only. Recorded in Working Plains of Jalpaiguri. Mangrove forests. |
| 44. Least Leaf-nosed Bat | | | |
| *Hipposideros* | *cineraceus* | *micropus* | Occasional. Restricted to Darjeeling (Sangser, Nimbong, Panigaon). Roosts in hollows of trees in |

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| | | | montane forests. |
| 45. Fulvous Leaf-nosed Bat | | | |
| *Hipposideros* | *fulvus* | *pallidus* | Occasional. Recorded from Darjeeling, Jalpaiguri and Medinipore. Earlier included under *H. bicolor,* now considered distinct. Forests and civil areas. |
| 46. Kelaart's Leaf-nosed Bat | | | |
| *Hipposideros* | *lankadiva* | *indus* | Occasional. Restricted to Darjeeling, Jalpaiguri (Khuntimari) and Sundarbans. Foothill and mangrove forests. |
| 47. Anderson's Leaf-nosed Bat | | | |
| *Hipposideros* | *pomona* | *gentilis* | Occasional in North Bengal. Specimens from Nimbong, Sangser, Pashok, Narbong, Tongsong and Hasimara. Montane and pristine tropical monsoon forests. |
| TRIBE COELOPINI | | | |
| 48. Tailless Leaf-nosed Bat | | | |
| ***Coelops*** | *frithi* | *frithi* | Very rare. Recorded from Darjeeling and Sundarban (type locality). Two specimens collected in 19$^{th}$ century. Subtropical forests and mangroves. |
| **FAMILY VESPERTILIONIDAE** SUB-FAMILY VESPERTILIONINAE TRIBE EPTESICINI | | | |
| 49. Serotine | | | |
| ***Eptesicus*** | *serotinus* | *pachyomus* | Rare. New record. Sighted in Rechila chawk of NVNP in the late evening. Temperate forests. |
| 50. Sombre Bat | | | |
| *Eptesicus* | *tatei* | - | Rare. Endemic to Darjeeling. Syntypes recorded as *Nycticejus atratus*: specimens with skulls (damaged) in spirit; Darjeeling, 1853; WS Sherwill collector. Anderson (1881) and Wroughton (1918) listed these specimens as types. Reported from moist montane forests. |
| 51. Tickell's Bat | | | |
| ***Hesperoptenus*** | *tickelli* | - | Occasional. Recorded from Hasimara, Bharnabari. BTR and STR. Found in lowlands, hills and mangroves. |
| SUB-FAMILY MYOTINAE | | | |
| 52. Hairy-faced or Intermediate Bat | | | |
| ***Myotis*** | *annectans* | *primula* | Occasional. Restricted to Darjeeling (Pashok and Teesta Valley). Montane forests and valleys. |
| 53. Hodgson's Bat | | | |
| *Myotis* | *formosus* | *formosus* | Occasional in Darjeeling. Foothill montane forests. |
| 54. Van Hasselt's Mouse-eared Bat | | | |
| *Myotis* | *hasseltii* | *hasseltii* | Occasional. In India only rcorded from West Bengal. Recorded from Kolkata (Dhakuria, Indian Museum Compound, Park Circus, Park Street) and N. 24-Parganas: Hasnabad. Dry and mangrove forests. |
| 55. Nepali Whiskered Bat | | | |
| *Myotis* | *muricola* | *muricola* | Occasional. Restricted to Darjeeling (Gairibans, Ghum) and Kolkata. BTR. Montane and lowland forests, scrub, secondary growth and gardens. |
| 56. Mustachioed Bat | | | |
| *Myotis* | *mystacinus* | *nipalensis* | Occasional. Restricted to North Bengal. Darjeeling, Hasimara. CWLS, GNP, BTR. Forest, woodland edge, shrubland, open meadows, human landscape. |
| 57. Mandelli's Mouse-eared Bat | | | |
| *Myotis* | *sicarius* | - | Rare. Restricted to Darjeeling (Pashok). Montane forests on hill sides and in valleys. |
| 58. Himalayan Whiskered or Siliguri Bat | | | |
| *Myotis* | *siligorensis* | *siligorensis* | Occasional in Darjeeling (Ghoom). Type locality: Siliguri. MWLS. Montane forests and human landscape. |

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| SUB-FAMILY VESPERTILIONINAE TRIBE PLECOTINI | | | |
| 59. Brown Long-eared Bat | | | |
| ***Plecotus*** | *auritus* | *homochrous* | Occasional in Darjeeling. Deciduous and coniferous woodlands. |
| 60. Eastern Barbastella | | | |
| ***Barbastella*** | *leucomelas* | *darjelingensis* | Occasional in North Bengal. Darjeeling, Tongsong, Mongpu, Nimbong, Hasimara. MWLS, BTR. Moist temperate and dry coniferous forest areas. |
| TRIBE NYCTICEIINI | | | |
| 61. Harlequin or Alpine Bat | | | |
| ***Scotomanes*** | *ornatus* | *ornatus* | Occasional. Restricted to Darjeeling (Sevoke, Tongsong, Pashok) and Jalpaiguri. Recorded as *Nycticejus ornatus*: unsexed; skin (in bad condition), skull not found; Darjeeling; 1858; purchased. Anderson (1881) and Wroughton (1918) mentioned only the specimen from Darjeeling as type. Found in deep, humid valleys and hilly forests. BTR. |
| 62. Common Yellow Bat | | | |
| ***Scotophilus*** | *heathii* | *heathii* | Frequent. Recorded from north and south Bengal. JNP, GNP, BTR. Forests and civil areas. |
| 63. Lesser Yellow Bat | | | |
| *Scotophilus* | *kuhli* | *kuhli* | Frequent. North Bengal: Darjeeling: Pashok, Jalpaiguri: Khuntimari, Alipurduar: Hasimara, Koch Behar: Sitalkuchi. CWLS, GNP, BTR, STR. Earlier included under *S. heathii*. Forest and civil areas. |
| 64. Yellow Desert Bat | | | |
| ***Scotoecus*** | *pallidus* | - | Occasional. Found in Kolkata only. Earlier genus *Nycticeius.* |
| TRIBE PIPISTRELLINI | | | |
| 65. Javan Pipistrelle or Babu Pipistrelle | | | |
| ***Pipistrellus*** | *javanicus* | *babu* | Occasional. Montane species migrating to lower altitude in suitable season. Darjeeling, Nimbong, Sukna, Pashok, Paperkheti and Takdah and Jalpaiguri. BTR. This taxon belongs to the *javanicus* subgroup of the *pipistrellus* species group. Earlier treated as distinct species, the taxa *babu* Thomas, 1915 (Ellerman and Morrison-Scott 1951) is recognized as valid subspecies (Corbet and Hill 1992). |
| 66. Thomas's Pipistrelle | | | |
| *Pipistrellus* | *cadornae* | - | Occasional in Darjeeling. Holotype Pashok. Dry bamboo and mixed forests. |
| 67. Kelaart's Pipistrelle | | | |
| *Pipistrellus* | *ceylonicus* | *indicus* | Rare. Found only in Kolkata. Human habitations in both rural and urban areas. |
| 68. Indian Pipistrelle | | | |
| *Pipistrellus* | *coromandra* | *coromandra* | Common. Darjeeling, Nimbong, Sukna, Pashok, Mongpong, Paperkheti and Takdah, and Jalpaiguri. MWLS, JNP, BTR. Forests, agricultural and urban landscapes. |
| 69. Indian Pygmy Pipistrelle | | | |
| *Pipistrellus* | *mimus* | *mimus* | Common. Throughout. BTR, RBWLS, STR. Taxonomy as per Ellerman and Morrison-Scott (1951) and Sinha (1999). |
| 70. Pegu Pipistrelle | | | |
| *Pipistrellus* | *peguensis* | - | Occasional. Occurrence of peguensis in India is based on six specimens collected from Darjeeling in 1872 (Sinha 1990; Das 2003). Primary and secondary forests, agricultural and urban landscapes. |
| 71. Least Pipistrelle | | | |

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| *Pipistrellus* | *tenuis* | - | Common in north and south Bengal. Sitalkuchi, Kalijhora, Haldibari, Hasimara, Khuntimari, Sulkapara. GNP. Forested areas, rural and urban landscapes. |
| 72. Chocolate Pipistrelle | | | |
| ***Falsistrellus*** | *affinis* | - | Darjeeling (Pashok) and Kolkata. MWLS. Roosts in roofs of buildings and cracks, hollows in trees, near human habitations. Earlier forms included under *Pipistrellus (Harpiocephalus) mordax*. But, presently considered distinct by Simmons (2005). |
| 73. Grizzled or Pungent Pipistrelle | | | |
| *Falsistrellus* | *mordax* | - | First reported by Das (2003) from West Bengal extending its distributional range further westward. Specimen collected from Kurseong. Earlier genus of the species was considered *Pipistrellus* (*Harpiocephalus*). |
| 74. Dormer's Bat | | | |
| ***Scotozous*** | *dormeri* | - | Common in south West Bengal. Also north Bengal. Bharnabari. BTR. Found in drier areas and near human habitations in rural and urban landscapes. Earlier treated under genus *Pipistrellus* and *Scotoecus*, now treated as a distinct genus. |
| 75. Common Noctule | | | |
| ***Nyctalus*** | *noctula* | *labiatus* | Occasional. Restricted to Darjeeling, Sangser. Tongsong. Forages over wetland, woodland and pasture. |
| TRIBE VESPERTILIONINI | | | |
| 76. Bamboo or Club-footed Bat | | | |
| ***Tylonycteris*** | *pachypus* | *fulvida* | Occasional. Restricted to Darjeeling, Pashok, Kalimpong, Nimbong, Sangser, Sevoke. Tropical deciduous forests with extensive bamboo growth, lowland agricultural areas and disturbed habitats. |
| SUB-FAMILY MINIOPTERINAE | | | |
| 77. Schreibers' Long-fingered Bat | | | |
| ***Miniopterus*** | *schreibersi* | *fuliginosus* | Rare. Found in Kolkata only. Open and semi-open natural and artificial habitats, including suburban areas. |
| SUB-FAMILY MURININAE | | | |
| 78. Hairy-winged Bat | | | |
| ***Harpiocephalus*** | *harpia* | *lasyurus* | Occasional in North Bengal. Darjeeling: Tongsong, Kurseong, Teesta Valley, Ghoom; Alipurduar: Hasimara. MWLS, CWLS, GNP, SWLS, SNP, BTR. Montane forests and valleys with tall trees in the vicinity of water. Earlier subspecies *madrassius* synonymized with *lasyurus.* |
| 79. Round-eared Tube-nosed Bat | | | |
| ***Murina*** | *cyclotis* | *cyclotis* | Occasional in Darjeeling. Pashok, Takdah, Singla, Gopaldhara, Tong Song, Teesta Valley. MWLS. Forest dweller. Holotype recorded as *M. cyclotis*. |
| 80. Hutton's Tube-nosed Bat | | | |
| *Murina* | *huttoni* | *huttoni* | Rare. Restricted to Darjeeling. Teesta Valley, Pashok, Tong Song. MWLS. Found in montane forests, tropical broadleaved forests and banana plantations. |
| 81. Greater Tube-nosed Bat | | | |
| *Murina* | *leucogaster* | *rubex* | Occasional. Restricted to Darjeeling. Type locality Pashok. Sangser. Forested and open areas. |
| 82. Scully's Tube-nosed Bat | | | |
| *Murina* | *tubinaris* | - | Occasional. Restricted to Darjeeling (Darjeeling, Gopaldhara). Found in Montane forests on the mountain slopes and roosts among trees. Earlier |

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| | | | treated as subspecies of *M. huttoni.* |
| SUB-FAMILY KERIVOULINAE | | | |
| 83. Obscure Bat | | | |
| ***Kerivoula*** | *hardwickii* | *depressa* | Occasional. Restricted to Darjeeling (Gopaldhara, Pashok and Tongsong). Warm valleys, forests, caves. |
| 84. Papillose Bat | | | |
| *Kerivoula* | *papillosa* | *lenis* | Rare. Specimen was collected from Kolkata only in 1916. Lowland mixed deciduous forests. |
| 85. Painted Bat | | | |
| *Kerivoula* | *picta* | *picta* | Occasional in North and South Bengal. Darjeeling, Jalpaiguri, Kolkata. BTR. Dry deciduous forests. |
| **FAMILY MOLOSSIDAE** SUB-FAMILY MOLOSSINAE | | | |
| 86. Egyptian Free-tailed Bat | | | |
| ***Tadarida*** | *aegyptiaca* | *tragata* | Occasional. Found in Kolkata only. Holotype recorded as *Nyctinomus tragatus*: specimen and skull in spirit; Calcutta, West Bengal, India; other particulars not known. According to Das (2003) tragata has priority over gossei and thomasi, so the Indian population should be named as Tadarida aegyptiaca tragata (Dobson). But Simmons (2005) listed both tragatus and thomasi as distinct subspecies. |
| 87. European Free-tailed Bat | | | |
| *Tadarida* | *teniotis* | *insignis* | Occasional. Restricted to Darjeeling. Darjeeling and Kurseong. Temperate habitats. |
| 88. Wrinkle-lipped Free-tailed Bat | | | |
| ***Chaerephon*** | *plicata* | *plicata* | Occasional. Found in Kolkata only. Common during 19th century. Forested areas, over rice fields, old disused buildings and temples. |
| **ORDER PRIMATES** SUB-ORDER HAPLORHINI **FAMILY HYLOBATIDAE** | | | |
| 89. Western Hoolock Gibbon | | | |
| ***Hoolock*** | *hoolock* | *hoolock* | Five individuals were brought from Assam and introduced in MWLS in 1965, initially successful and believed to have bred. Habitat: Moist deciduous forests in lower reaches. The number was seven in July 1988 (Divisional Forest Officer, Kurseong, vide Memo no. 1494/26/ 22/ dt. 29 July 1988), but population completely wiped out within 1993, all reportedly poached. Now extinct from MWLS. Mootnick & Groves (2005) stated that Hoolock gibbons do not belong in the genus *Bunopithecus*, and placed them in a new genus, *Hoolock*. This genus was argued to contain two and later three distinct species which were previously thought to be subspecies: *Hoolock hoolock* |
| **FAMILY LORICIDAE** SUB-FAMILY LORINAE | | | |
| 90. Bengal Slow Loris | | | |
| ***Nycticebus*** | *bengalensis* | *bengalensis* | Dr. F.B. mentions occurrence of this species Hamilton in Second Working Plan of Baikunthpur forest division in 1810. One stray animal was rescued (1999) from Alipurduar. No previous record from BTR. Extinct. |
| **FAMILY CERCOPITHECIDAE** SUB-FAMILY CERCOPITHECINAE TRIBE PAPIONINI | | | |
| 91. Assamese Macaque | | | |
| ***Macaca*** | *assamensis* | *pelops* | Common in Darjeeling, Habitat: Dense deciduous and sem-evergreen forests. Semi-habituated macaques frequent the Hill Cart road between Siliguri and Darjeeling, Sevoke and Teesta bridge areas. Also found in Jalpaiguri. NVNP, SWLS, MWLS, SNP, BTR. Hypomelanism recorded in Darjeeling. |

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| 92. Common Monkey or Rhesus Macaque | | | |
| *Macaca* | *mulatta* | - | Common in plains of Darjeeling, Kalimpong, Jalpaiguri and Alipurduar districts. Rare in Koch Behar dist. A 'semi-habituated' group was found at Mahakal temple in Darjeeling town at 2100 m. Habitat: deciduous and evergreen forest, scrub, mangroves, settlements. Common in most of the PAs on plains. CWLS, GNP, MWLS, JNP, BTR, LIWLS, HIWLS, SKWLS, STR, SNP, NVNP, SWLS. Highest population in Sundarbans (Mallick 2019a). This species has been revised by Fooden (2000), who regards *M. mulatta* as monotypic. The molecular differences identified among *M. mulatta* populations are alone not consistent enough to conclusively define any subspecies. In Sundarbans, the preferred biotope or permanent abode of the monkeys is the well-drained or less predation-prone arboreal habitat, but the treeless reed swamp does not support these animals. Ecologically, the scattered small patches of Keora *S. apetala* (2% of the mangrove forests) are most important in the mangrove food chain. The monkey troops are found mostly on this quick growing, tallest (10-20 m) and spacious tree with heavy foliage than other natural mangrove genera of lower height and foliage. The monkeys are inclined to follow the alternate tidal flooding and either restrict or increase their foraging movements within the home range. When the floodwater is drained, a rich foraging and hunting ground is exposed on the intertidal mudflat, sparsely vegetated or with no vegetation and exploited by the monkey troops in search of available food resources for a longer duration. When the habitat gets partially submerged, the monkeys are mostly confined to the arboreal abode, rarely descending from the trees. The third biotope, i.e. the estuary or creek with characteristically low-saline brackish water system, is foraged during the low tide for fish, crab, floating tender leaves or ripe fruits. |
| SUB-FAMILY COLOBINAE TRIBE PRESBYTINI | | | |
| 93. Common Langur or Hanuman Monkey | | | |
| ***Semnopithecus*** | *entellus* | *entellus* | Common in South Bengal than North Bengal. All habitats excluding high mountains and sundarbans. Raidak River is its easternmost limit. BTR (Buxa fort and Chunabhati areas), MWLS, with a possible few in SWLS and NVNP. RBWLS, BDWLS, JNP, GNP, CWLS, Haunts tropical deciduous, semi-evergreen, and subtropical broadleaf forests as well as human-dominated landscape. Group size smaller, usually below 20. In Birbhum district with only 3.5% forest cover, distributed mostly in three main category habitatsvillage, town and temple. Decrease in Hanuman langur population in West Bengal due to conversion of forestlands into agricultural fields. |
| | | *schistaceus* | Now a valid species. Hodgson (1840) recorded at 4,000’ in Darjeeling (Dorjiling) ( https://www.zsl.org /sites/default/files/ media /2014-03/roberta transcriptions-2124.pdf). Original source of the specimen doubtful. No further information available, |
| 94. Tarai Grey Langur | | | |
| *Semnopithecus* | *hector* | - | Rare. Restricted to *terai* of Darjeeling. Sevok, |

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| | | | Pankhabari. |
| 95. Golden Langur | | | |
| ***Trachypithecus*** | *geei* | - | A stray (escaped captive?) one found in MWLS. Extinct. |
| 96. Capped Langur | | | |
| *Trachypithecus* | *pileatus* | *pileatus* | Introduced in MWLS in 1965, but they did not survive. Extinct. |
| **ORDER CARNIVORA** SUB-ORDER CANIFORMIA **FAMILY CANIDAE** SUB-FAMILY CANINAE TRIBE CANINI | | | |
| 97. Asiatic Jackal | | | |
| ***Canis*** | *aureus* | *indicus* | Common. Due to their tolerance of dry habitats and omnivorous diet, widely distributed. Found in most PAs, semi-urban and rural landscapes. Hybridization with feral dogs reported in rural Howrah and Salt Lake city. Habitat: semi-arid environments to tropical dry decisuous forests, mangrove, agricultural, rural and semi-urban habitats. Become locally 'endangered' or 'extinct' in and around Kolkata due to rapid change in land-use pattern and shrinkage of their natural habitat, reduced day-time shelter and food-base. In the non-forest landscape (conflict area), the patches of marshy grassland harbour the jackals. But these grasslands along with their wild denizens are now in their verge of obliteration. Now walled-in within boundaries of parks, clubs, vacant plots, the city's airport, closed-down factories and research institutes. While being driven away from their peripheral habitat, their population show constant decline. The disappearance of the jackal seems to be dangerously imperceptible, despite their importance in sustaining the city's fragile ecological balance. the species has become rare in East Kolkata Wetlands during the last 50 years. Even in its traditional habitat in Tollygunge Club, the jackal population was estimated to be around 15, down from 45-odd almost a decade ago. At Royal Calcutta Golf Club, the thick undergrowth—a preferred location for jackals' dens—was cleared in November, 2003 after a six-month's closure. Consequently, the jackals were forced into the open. The hungry pack started making forays into the densely populated localities of Aurobindo Nagar, Ashwini Nagar, Azadgarh and Madartola. A few years back, a Metro Railway yard came up after clearing the forest where they lived. These days, not a howl is heard at Banabitan. In a corner of the campus at Variable Energy Cyclotron Centre, now resides only a small group of jackals. Another group of jackals reportedly used to dwell in a vacant plot of land adjacent to Kolkata Police 'Abasan' (housing), but now they are not sighted. Once an agricultural zone and prime jackal habitat, the development of Rajarhat-New Township has further reduced its habitat. The maximum jackal population inhabiting the extensive grassland at Dum |

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| | | | Dum airport was a perennial problem at the airport, the forest department has arranged for trapping/sedating, translocating and rehabilitating the total population, Forest department had captured 200 jackals from the airport during last few years and rehabilitated to the forest areas in Bankura and near the Sunderbans. |
| 98. Small Indian Wolf | | | |
| *Canis* | *lupus* | *pallipes* | Rare in north Bengal. Once sighted in Koch Behar, Jalpaiguri and plains area of Darjeeling dist. Once omnipresent, now Occasional in south-west of the state (Bankura, Purulia, Midnapore). Habitat: warm and dry conditions, grassland, scrublands of semi-arid regions and agro-forestry landscape. Habitat fragmentation has further pushed the species to the brink by forcing them into direct contact with people resulting in conflicts and retaliatory killings. Moreover, hunting of wolves as well as their prey such as hare, fowl, partridge and mongoose among others for bush-meat has taken a toll. Recent genetic research suggests that the Indian Wolf has not cross-bred with any other subspecies in over 400,000 years, which would make it a separate species of it's own, i.e. *Canis indica* (Aggrawal et al. 2007). |
| 99. Dhole or Indian Wild Dog | | | |
| ***Cuon*** | *alpinus* | *primaevus* | Occasional in North Bengal. Sur (1957) reports presence in RFs of Pambu, Guling, Churanthi, Fagu, Eastner, Mo, Iche, Pankhasari, and Lava blocks from 6000ft elevation down to foothills between the Tista and Jaldhaka Rivers in the pack of 3 to 10 dogs. 7th WP of Jalpaiguri division also mentions wild dogs in Gorumara. Not noticed thereafter. Present in Darjeeling and Buxa as per Annual Report of Wildlife Preservation in West Bengal for 1972-73. Allowed to be destroyed as per Part II of 5th WP of Buxa Division. Later on, population started decreasing. Last 4-5 packs found moving in the forests of Newlands and Santrabari (BTR) during late sixties. Biswas and Ghose (1982) recorded in Rydak. Last seen from Sankosh in 1986 and thought to be extinct thereafter. Resighted during 1998 in Tashigaon block. A pack of 8-10 members reported from Santrabari block and another pack between 25th Mile, 22nd Mile (north-south), Sangai (Sangay) and Shikari roads (east-west), which killed a calf in Rajabhatkhawa FDH. Reported extinct in Kalimpong subdivision (9th WP, 1997-98 to 2017-18). Again reported in 2000, when Khati, noticed a pack of four and took photograph. Next year, a pack of 16 recorded by MWLS staff. Unconfirmed and unauthentic local reports of its presence in Midnapore (Agrawal et al., 1992) and Darjeeling forests. PAs: BTR, JNP (Kodalbasti, Chilapata areas), NVNP, MWLS. Habitat: Open woodland |

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| | | | interspersed with grassy meadows. Scrupulously confines to forests rich is food, water and shade from sun for rest during hot weather. Wood (1929a) saw wild dogs at the altitude of 7000ft. Sur (1957) mentioned two varieties of wild dogs in the Eastnar and Mo blocks, west of Jaldhaka River. The smaller about one and half feet high with colour like that of foxes; found in Mo block of Jaldhaka Range. Five small dogs were found in one pack. One killed measured 2ft 6in. The mouth of big-sized dogs blackish and tail had big tuft of fur like tail of Bhutia dogs. The colour was neither black nor red but somewhat grey-coloured. |
| TRIBE VULPINI | | | |
| 100. Indian or Bengal Fox | | | |
| ***Vulpes*** | *bengalensis* | - | Type locality "Bengal." Type "probably exported from Calcutta" (Pocock 1936); restricted to "the adjoining area of India [near Calcutta], south of the Ganges" (Pocock 1936:49). Occasional in South Bengal. Rare in north Bengal. Once sighted in Koch Behar, Jalpaiguri and plains area of Darjeeling dist. One seen on the main road between Mathabhanga and Jalpaiguri town at night on 30 June 1995. Found near agricultural fields, human habitations, and irrigation backs. Prefer open habitats and lower grass height and avoidance of dense vegetation. |
| 101. Red Fox | | | |
| *Vulpes* | *vulpes* | *montana* | Occasional. Restricted to Darjeeling. NVNP, SNP, SWLS. |
| **FAMILY AILURIDAE** | | | |
| 102. Red Panda | | | |
| ***Ailurus*** | *fulgens* | *fulgens* | Common in SNP and NVNP as well as surrounding territorial forests above 2000m. Extinct from SWLS. Habitat is composed of the bamboo, rhododendron, mixed deciduous and coniferous forests with dense canopy and hollow tree understorey. Prefer the undisturbed temperate upper hill forests near a waterbody at an altitudinal range of 2,100-3,600 m, particularly the dense evergreen canopy and thick undergrowth (visibility not more than 5–10 m, often less than 2 m) of Abies, Acer, Juniperus, Lithocarpus, Magnolia, Quercus, Rhododendron, Yushania and Arundinaria. |
| SUB-ORDER FELIFORMIA **FAMILY FELIDAE** SUB-FAMILY FELINAE) | | | |
| 103. Asiatic Cheetah or Hunting Leopard | | | |
| ***Acinonyx*** | *jubatus* | *venaticus* | Extinct. Last found in Murshidabad. According to Raoul (1893), "Of panthers or leopards in Bengal proper, where also pigs abound, there are three varieties to be found, including the cheetah (*Felis jubata*). This latter seems very rare, and I have come only across one, which had been killed by some of the Modoopore ("Madhupur", Nawda Block, Murshidabad District) villagers in 1874 and about half a mile or so away, lies the river Jellinghee 'Jalangi'," (Page 153, Chapter XVII – Miscallaneous), where the Bhairab, an offshoot of the Ganges) meets (O'Malley, 1914). Now become habituated to living in the human-dominated |

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| | | | landscape subsisting on garbage and human waste. |
| 104. Asian Golden Cat | | | |
| ***Catopuma*** | *temminckii* | *temminckii* | Occasional. Recently camera-trapped in NVNP (Mouchaki to Bhote Trail under Thosum Beat; in between 27˚02.139'N and 88˚46.730'E; 1,501m on 28th February, 2017 at 8:53 am) (Chatterjee et al. 2018) and also BTR on the hilly sides in between 12 and 26 February, 2018 (Ghose et al. 2019). Evergreen, moist, subtropical and tropical deciduous forests, specially in foothills and hills. |
| 105. Jungle Cat | | | |
| ***Felis*** | *chaus* | *affinis* | Common in North Bengal PAs. Found in bush-jungle, long grass, plantations and reed-beds near rivers, lakes, and marshes, mostly in comparatively dry zones., vicinity of human habitations. |
| | | *kutas* | Type locality: Midnapore. Occasional in Sundarbans, but rare in other parts of South Bengal. In 1832, a stuffed cat was presented at a meeting of the Asiatic Society of Bengal that had been caught in the jungles of Midnapore. Pearson who donated the specimen described it as different in colour from *F. chaus* and proposed the name *F. kutas*. |
| 106. Wild Cat | | | |
| ***Felis*** | *sylvestris* | *ornata* | New record from GNP (Ghosh 2012). May be misidentification. Doubtful. Occurrence to be verified again in the field. |
| 107. Himalayan Lynx | | | |
| ***Lynx*** | *lynx* | isbellinus | Stray visitor from higher altitudes to Darjeeling. Extinct. |
| 108. Marbled Cat | | | |
| ***Pardofelis*** | *marmorata* | *charltoni* | Rare in northern Bengal. Type locality of charltonii was Darjeeling. NVNP, SNP, BTR, SWLS. No recent sighting record. |
| 109. Leopard Cat | | | |
| ***Prionailurus*** | *bengalensis* | *bengalensis* | Type locality: Coast of Bengal; restricted to S. Bengal. Common in Sundarbans. Two melanistic leopard cats were recorded in Sundarbans on 25 March 2012, during camera trap monitoring. |
| | | *horsfieldi* | Larger skull than bengalensis, more luxuriant coat and bushy tail in winter. Ground colour paler and not so richly ochreous. Occasional. High forests of Darjeeling. Most of the PAs. |
| 110. Fishing Cat | | | |
| ***Prionailurus*** | *viverrinus* | *viverrinus* | Occasional except in Sundarbans. Elusive in the PAs. BTR, CWLS, GNP, HIWLS, LIWLS, NVNP, STR, BPWLS, BDWLS, JNP, MWLS, RBWLS, SKWLS, SWLS, Specimen collected: Tollygunge, Kolkata, 12th March 1915. Purchased and donated by R. Chakraborty. Inhabits scrub or thick forests; frequents tidal creeks, rivers, mangrove swamps, hill streams and reed beds. Wetlands along the major river systems leading down to their estuaries and mangroves of the Sundarbans are the fishing cats' habitat. Naturally, this wetland-adapted species is found in its preferred habitat comprising of tall reed-beds of Nal (*Phragmites vallatoria*), Hogla (*Typha elephantina, T. domingensis*), Khori (*Saccharum narenga*), Khagra (*Saccharum spontaneum*), etc. surrounded by shallow water bodies or scrubby and/or dense vegetation associated with mangrove swamps. Habitat loss, degradation and fragmentation |

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| | | | along with hunting/poaching and retaliatory killing of Fishing Cats have led to an alarming population-decline. |
| SUB-FAMILY PANTHERINAE | | | |
| 111. Clouded Leopard | | | |
| ***Neofelis*** | *nebulosa* | *macrosceloides* | Occasional. NVNP (Joributi, East Nar 17 near Thotne, East Nar 19 at Mithun khar, West Nar -5). Some of the records were from outside the NVNP area in and around villages. BTR. In 1992, a straying clouded leopard was recued from a house in Alipurduar and later released in the core area. In 2005, two clouded leopards were spotted in the forests of Kumargram and Hatipota. Photographed in Panbari in 1996. A clouded leopard was also camera trapped in March 2014 from the upper reaches of BTR. Subspecies *macrosceloides* due to possible skull differences from *nebulosa.* Inhabits mostly dense evergreen and sub-Himalayan tropical forests up to 3000m elevation. |
| 112. Asiatic Lion | | | |
| ***Panthera*** | *leo* | *persicus* | Extinct. Prater (1971) recorded migration of lion up to Bengal in the past. Fossil of lion was found in the Pleistocene alluvial deposits near Susunia in Bankura district (Dutta 1976). A fossil fragment of the left mandible with last molar teeth was also collected on 20$^{th}$ February, 1982 from the oldest alluvial deposits of Jhikoria village, about 13 km north-west of Susunia hill (23°23'30" 86°58') in Bankura district (present in the ZSI collection) (Saha et al. 1984). |
| 113. Leopard or Panther | | | |
| *Panthera* | *pardus* | *fusca* | Type locality: Bengalen [= Bengal, India]. Common in north Bengal forests and tea gardens. Seen in deciduous and evergreen forests, scrub jungle, open country and fringes of human habitation. BTR, GNP, NVNP, SNP, CWLS, JNP, MWLS, SWLS, STR. |
| 114. Bengal Tiger | | | |
| *Panthera* | *tigris* | *tigris* | Rare in North Bengal and common in Sundarbans. Now restricted to Protected Areas of north (NVNP, BTR) and south Bengal (STR). Extinct from other areas. Melanism and albinism (undermined) recorded. Habitats: MWLS: Extinct recently. The prey-rich riverine grassland in central and eastern portions of the MWLS, comprising of Gulma valley, Choklong, Silibhita and lower Ghoramara was the habitat of a dozen of tiger. But this favourite alluvial savanna grasslands had been declining, resulting in reduction in prey as well as predator populations.<br>NVNP: Recently, three tiger images were camera-trapped at three different times of the day in three different areas (located near Rachila). During present study, visited NVNP when a hunting spot was seen in compartment 13 of Rachila block (3,150 m, 27°06′N, 88°45′E), where a tiger had killed approximately a 35kg ungulate species a few days ago. The temperate forest here represents a dense canopy and thick undergrowth of *Quercus-Lithocarpus-Yushania-Rhododendron.* |

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| | | | BTR: Tiger habitat is not uniformly distributed in BTR. During the present study, it was observed that 147.26km2 (Reserve Forests of Chunabhati, Dhawla, Godamdabri, Gadadhar, North Bholka, Narathali, Rangamati, South Bholka and Tobgaon blocks) or 19.35% of BTR in addition to 29.09km$^2$ (Protected and Unclassed State Forests) or 2.77 % of BTR (mostly buffer areas), were not occupied by any tiger. Besides, a small patch of upper ridges of Sinchula range (between 1,700 m and 1,800 m altitude) was not used by them as their habitat. The present study has revealed that 205.55km2 (27.01% of Reserve Forests in BTR, mostly the PAs like Jainti, North Rajabhatkhawa, Phaskhawa, Raimatang and South Rajabhatkhawa blocks), appears to be the prime habitat of tiger because those blocks have comparatively high diversity of prey species.<br>GNP: Extinct. Riverine grassland and Savannah woodland occupied about 20% of the total plant cover of this PA, which was the grazing-cum-foraging ground of the wild herbivores and the tiger. A couple of tiger was reported in this PA up to 1990s and reportedly migrated to NVNP,<br>Sundarbans: Habitat: Coastal forests with Casuarina spp. and others bordered by high retaining sand-wall; Heritiera-Phoenix forests, Excoecaria-Phoenix forests; pure Phoenix forests, Excoecaria-Ceriops forests (Mallick 2011). Out of these habitats the thickets of *Heritiera fomes* (Sundari), *Nypa fruticans* (Golpata) and *Phoenix paludosa* (Hental) as well as a few suitable floral consociations form the habitat in the mangrove forests.<br>The ideal tiger habitat, where the tiger is commonly found, is recorded above the natural tidal limits in the pure forests of *Phoenix* and mixed forests of *Heritiera-Phoenix*, *Excoecaria-Phoenix* and *Excoecaria-Ceriops.* During the study, the tigers were observed to use these different habitats for definite purposes like shelter, breeding, hunting, etc. this habitat use pattern vis-à-vis the forest types are recorded separately. Out of thirteen forest types/ associations, nine (88 per cent) are used as habitats (shelter= 72 per cent, breeding= 7 per cent, and hunting= 9 per cent) and four types (12 per cent) are not normally preferred by the tigers. Due to frequent shifting or island-migration and occupation of new habitat by the tigers, the habitat occupation and range of movement varies considerably from individual to individual and from time to time, mainly depending on availability of the prey species- be it wild, domestic or human beings entering forests, some with legal permits and mostly illegally. The forests on the sandy and sandy loam-soil in the sea shore form a special type of habitat over a very small area (Chaudhuri and Choudhury, 1994). The tiger often uses the coastal forests with *Casuarina* sp and others, bordered by high retaining sand-wall for protection from the high tides, for breeding. It often visits the *Ceriops* forests for the specific purpose of hunting. In the |

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| | | | *Excoecaria* forests its presence is rarely observed. Since its presence is low in the mixed forests of *Heritiera-Excoecaria* and *Heritiera-Excoecaria-Ceriops,* even if these are located above the natural tidal limits, these patches are not considered ideal habitat of the tiger. The tigers are not commonly found in the habitats in the lower zone below tide level, but above (Chakrabarti, 1979). For example, it is generally uncommon in the habitats composed of *Oryza coarctata*, *Avicennia-Oryza* and *vicennia-Sonneratia.* Similarly, it is not common in the *Rhizophora-Bruguiera* mixed forest above the natural tidal level because of low density. The noted special features of the tiger habitat are that there is complete absence of the ground flora. Humus formation is also poor, the leaves and branches that fall to the ground are washed away in the high tide, leaving no chance to form suitable soft cushion for their rest. There is no thick crowned bush or branchy trees to afford shade and shelter. The *Ceriops* and *Aegialitis* afford side shade and the tunnels in *Phoenix* bushes provide the tiger with best shade and shelter. However, Netidhopani block with an open crop of low height and patches of *Phoenix* (Hental) formation, which are above the daily tidal inundation level, is recorded a high concentration of tiger and there are four old adult resident tigers. It was also observed that the salinity and tiger activity might have some positive correlations. The areas of pure *Ceriops* formation having high salinity registered maximum human casualties (Chakrabarti, 1984). But this is a controversial issue unless it is proved with sufficient data. There is adequate cover all over the Sundarban forests, but aerial photographs of the tiger habitat showed limitation of suitable territory (Chaudhuri and Chakrabarti, 1980). Since the entire land area of the forest blocks is not regularly inundated by the tidal water, the rhythmic activity in the tiger behaviour pattern owing to daily tidal movement, lunar cycles, etc is recorded (Chaudhuri and Chakrabarti, 1980). The high and low tide constantly change the physical environment, whereas the force of the current modifies their muscle formation and the saline water forms the chemical environment. In the extreme high tide, when the *Phoenix* areas go under water, the tigers have to lead an amphibious life.<br>In South 24-Parganas Forest Division, three eastern blocks flanked by the River Matla- Ajmalmari (133.40 km2), Dhulibhasani (55.68 km2) and Chulkati (63.91 km2)- harbour a small population of the Bengal tiger (c.20), whenereas the distant Thakuran, Herobhanga, Saptamukhi and Muriganga blocks are not known habitat of the tiger.<br>The scientists and officials of STR are investigating whether the Sundarban tiger is a different sub-species compared to those found in the sub-continent, but nothing concrete has so far established. Some experts suspect that, *prima facie*, the years of evolution, lack of sweet water affecting the height and growth of mangrove forests, the |

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| | | | increasing salinity and arduous search for prey in the inhospitable terrain of Sundarban have caused increased physiological stress, triggering a genetic mutation, apparently leading to formation of an entirely new sub-species of the Bengal tiger..<br>Considering the mutation rates that led to a genetic change, usually an animal that was isolated for a period of one million years is classified as a different species and one that was genetically isolated for between 20,000 and 50,000 years as a different sub-species. In the case of the Sundarban tiger, it was perhaps separated from the mainland tigers about 500 to 1,000 years ago. Some hundred years back, the tigers were found not only in the Sunderban, but everywhere in the surrounding mainland, where the areas were full of riverain forests and grasslands with prey base in abundance. |
| 115. Snow Leopard | | | |
| *Panthera* | *uncia* | *uncioides* | Stray visitor to Darjeeling. SNP. Extinct. |
| **FAMILY HERPESTIDAE** SUB-FAMILY HERPESTINAE | | | |
| 116. Common or Grey Mongoose | | | |
| ***Herpestes*** | *edwardsii* | *edwardsii* | Common. Open scrub, cultivated land, rocky patches and forest edges, wetlands. MWLS, CWLS, GNP, BTR, BDWLS. |
| 117. Small Indian or Gold-speckled Mongoose | | | |
| *Herpestes* | *auropunctatus* | - | Common. MWLS, CWLS, GNP, BTR. Earlier considered subspecies of *H. javanicus.* The molecular studies supported by morphological evidence showed that they are separate species. Found near human habitations, particularly adjacent to paddy or sugarcane fields and burial grounds. |
| 118. Marsh or Bengal Mongoose | | | |
| *Herpestes* | *palustris* | - | Only endemic species of mammal in the Indian wetlands and the only endemic species of the genus *Herpestes* not only in West Bengal but also in India.<br>Occasional. Howrah, N. and S. 24-Parganas. Now restricted to EKW and surroundings. Inhabits around large but shallow water bodies covered with thick growth of aquatic and herbaceous plants, i.e. wetland-bogs, brackish marshes, swampy edges infested with reeds, the emergent hydrophytes, such as *Phragmites karka* and *Typha angustifolia.* |
| 119. Ruddy Mongoose | | | |
| *Herpestes* | *smithi* | *smithi* | New record from Turga Dam site near Ajodhya Hills, Purulia (Ghosh 2004). Hawkins (1986) mentions presence up to Bengal. Rajasthan east to West Bengal (Alfred et al. 2002). Since the eastern limit of its occurrence is Bihar (Menon 2003) it may, however, occur in Purulia. Also recorded in Working Plans of Coochbehar Forest Division. No sighting record. Inhabits dry and moist forests |
| 120. Crab- eating Mongoose | | | |
| *Herpestes* | *urva* | - | Frequent in parts of North Bengal. GNP, CWLS. BTR. Inhabits stream banks, swamps, inundated paddy fields, and moist deciduous forests. |
| **FAMILY HYAENIDAE** SUB-FAMILY HYAENINAE | | | |
| 121. Striped Hyena | | | |
| ***Hyaena*** | *hyaena* | *hyaena* | Rare. South West Bengal (Purulia). Bankura (Ranibundh, Sonamukhi), Midnapore. BTR |

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| | | | (Management Plan). Often poached by the villagers. A straying hyena was rescued at Chaitanyadih village under Noahantu forest beat in Purulia in February 2014. Habitat includes forests, dry scrub thorny open jungles and semi-urban area. |
| **FAMILY MUSTELIDAE** SUB-FAMILY LUTRINAE TRIBE AONYCHINI | | | |
| 122. Clawless or Small-clawed Otter | | | |
| ***Aonyx*** | *cinereus* | *concolor* | Occasional. Noth and south Bengal. Darjeeling. Alipurduar (along Torsa R). MWLS, CWLS, BTR, SWLS, JNP, GNP, NVNP. Mangroves, river banks. |
| TRIBE LUTRINI | | | |
| 123. Common or Indian Hill Otter | | | |
| ***Lutra*** | *lutra* | *monticola* | Occasional. Noth and south Bengal. CWLS, MWLS, BTR, SWLS, JNP, GNP, STR, NVNP. Found in inland waters, estuaries and marine waters. |
| 124. Smooth Indian or Smooth-coated Otter | | | |
| ***Lutrogale*** | *perspicillata* | *perspicillata* | Occasional. Noth and south Bengal. MWLS, CWLS, BTR, SWLS, JNP, GNP, STR. Found in plains along the margin of large rivers and lakes, in mangrove forests along the coast and estuaries. |
| SUB-FAMILY MELINAE | | | |
| 125. Hog Badger or Bear Cat | | | |
| ***Arctonyx*** | *collaris* | *collaris* | Rare in North Bengal. BTR, JNP, MWLS, NVNP, CWLS. Occurs in semi-evergreen forests and sub-montane belts. Inhabits dense tropical forests and prefers rocky, broken terrain. Prefers riverbeds. |
| 126. Small-toothed Chinese Ferret Badger | | | |
| ***Melogale*** | *moschata* | *millsi* | Rare. GNP. BTR (crushed by vehicle in 1995). Inhabits tropical and sub-tropical forests and also grasslands. |
| 127. Long-toothed Burmese Ferret Badger | | | |
| *Melogale* | *personata* | *nipalensis* | Rare. Darjeeling and Alipurduar (Hasimara). JNP. GNP, CWLS, BTR. Habitat similara to Chinese Ferret-badger. |
| SUB-FAMILY MELLIVORINAE | | | |
| 128. Honey Badger or Indian Ratel | | | |
| ***Mellivora*** | *capensis* | *inaurita* | Rare. JNP. GNP, CWLS. Lives in dry and moist deciduous forests up to 900m altitudes. |
| SUB-FAMILY MUSTELINAE | | | |
| 129. Himalayan Yellow-throated Marten | | | |
| ***Martes*** | *flavigula* | *flavigula* | Rare except in Darjeeling. Recorded from 35 locations in six PAs with highest sighting frequency in 12C East Himalayan Moist Temperate Forests and $11B/C_1$ Northern Montane Wet Temperate Forests, especially where *Quercus-Rhododendron* grow profusely with *Tsuga-Acer*, in contrast to lowest frequency in $14C_2$-Sub-Alpine Forests (*Abies-Betula-Rhododendron*) and $8B/C_1$-East Himalayan Subtropical Wet Hill Forests (*Quercus-Michelia-Alnus-Phoebe-Betula-Acer).* Mostly recorded between dawn and dusk in the woods, valleys, catchments and watersheds. Flat slope, clayey terrain, sandbanks or proximity of natural water sources and moderate pasture/scrub/grass cover is the preferred diurnal foraging ground of this species. The estimated population (<1,000) of this hypercarnivore is scattered over 33.24% (855 $km^2$) of the nineteenth-century range (2,572 km), |

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| | | | prevailing throughout the hilly forest tracts of north Bengal, consequent upon extensive forest reclamation, over-exploitation of vegetative resources, habitat loss-degradation-fragmentation, hunting and diminishing prey. BTR, MWLS, NVNP, SNP, SWLS, JNP. |
| 130. Beech or Stone Marten | | | |
| *Martes* | *foina* | *intermedia* | Rare in Darjeeling and Kalimpong. NVNP. Inhabits temperate and sub-alpine zone of Himalayas up to 3600m; rarely found below 1500m. |
| 131. Pale Weasel | | | |
| ***Mustela*** | *altaica* | *temon* | Rare in Darjeeling, Kalimpong. SNP, NVNP. No recent sightng record. Habitat: Coniferous and temperate forests. Prefers sparse vegetation; predominantly open-landscape. |
| 132. Yellow-bellied Weasel | | | |
| *Mustela* | *kathiah* | *kathiah* | Rare except in Darjeeling. No recent sightng record. High hill forests. |
| 133. Himalayan or Siberian Weasel | | | |
| *Mustela* | *sibirica* | *subhemachalana* | Rare in higher reaches of Darjeeling. No recent sightng record. Habitat: Forests of both temperate and alpine biotopes above 1500m. Preferably inhabits open grass and shrubs, dense forests, dry sandy valleys and even low-lying swamps. |
| 134. Black-striped Weasel | | | |
| *Mustela* | *strigidorsa* | - | Rare in Darjeeling. NVNP. Found in temperate forests from 1000m and 2500m altitude. No recent sightng record. |
| **FAMILY URSIDAE** SUB-FAMILY URSIDAE | | | |
| 135. Smaller Malayan Sun Bear or Bruang | | | |
| ***Helarctos*** | *malayanus* | *malayanus* | Extinct in Darjeeling. Inhabited sub-tropical forests up to 1000m. |
| 136. Sloth Bear | | | |
| ***Melursus*** | *ursinus* | *ursinus* | Occasional. Hypomelanism recorded. MWLS, JNP, BTR, CWLS, GNP. Found up to 2500m in Himalayas. Thrives in a mixed deciduous forests; prefering dry, rather open, coppice Sal. |
| 137. Himalayan or Asiatic Black Bear | | | |
| ***Ursus*** | *thibetanus* | *laniger* | Occasional In North Bengal. Restricted to PAs. SNP, SWLS, MWLS, NVNP, BTR. Favours wet, thick, cool sub-tropical and temperate forests |
| **FAMILY VIVERRIDAE** SUB-FAMILY PARADOXURINAE | | | |
| 138. Binturong or Bear Cat | | | |
| ***Arctictis*** | *binturong* | *albifrons* | Rare. First camera-trapped at two places in the East Himalayan Subtropical Wet Hill forest (8B/CI) of Phaskhawa block (Bhutiabasti Beat, Jainti Range) and sighted in the Eastern Sub-montane semi-evergreen forest (2B/CIb) of Bhutanghat block (Mainabari Beat, North Rydak Range) in BTR during 2015 (Mallick 2018a). Earlier, Choudhury (1999) observed that its records from Sikkim and Bhutan suggest that small numbers do occur in the adjacent areas of NVNP and BTR. But no sighting record is available regarding its presence in NVNP. |
| 139. Three-striped Palm Civet or White-eared Musang | | | |
| ***Arctogalidia*** | *trivirgata* | *millsi* | Extinct in Darjeeling. |
| 140. Himalayan or Masked Palm Civet | | | |
| ***Paguma*** | *larvata* | *neglecta* | Rare in Darjeeling (Narbong, Gopaldhara). Higher areas of BTR, NVNP, MWLS, SWLS. |

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| | | | Lives in tree holes in mountain and hill forests at an altitude 400-2500m. |
| 141. Common Palm Civet or Toddy Cat | | | |
| ***Paradoxurus*** | *hermaphroditus* | *bondar* | Common in north and south Bengal. NVNP, MWLS, GNP, BTR, BDWLS, STR, SWLS, JNP, CWLS, RBWLS, BBWLS, BPWLS, LIWLS, HIWLS, SKWLS, CKWLS, RBWLS. well-wooded forests up to an altitude of 1500m. Also found near habitations on large mango trees or palm trees. Many forsaken an arboreal existence adapting themselves to a life in human settlements, selecting a roof, an outhouse or drain as a place of hiding. |
| SUB-FAMILY PRIONODONTINAE | | | |
| 142. Spotted Linsang or Tiger-Civet | | | |
| ***Prionodon*** | *pardicolor* | *pardicolor* | Rare. Darjeeling. No recent sighting record. Inhabits thick hill forests between 150m and 3000m altitude. |
| SUB-FAMYLY VIVERRINAE | | | |
| 143. Large Indian Civet or Civet Cat | | | |
| ***Viverra*** | *zibetha* | *zibetha* | Common. North (Narbong, Sivok, Sungma, Hasimara, Bharnabari, Malda) and south Bengal (Kolkata, S. 24-Parganas). Low hills, moist deciduous and evergreen forests and near human habitation, CWLS, BTR, SWLS, MWLS, GNP, STR, NVNP, JNP. |
| | | *picta* | South West Bengal (Agrawal et al. 1992). Status not known. |
| 144. Small Indian Civet | | | |
| ***Viverricula*** | *indica* | *baptistae* | Common (northern Bengal). A civet skin was found in Hasimara in the Bhutan Dooars that differed slightly in colour from other civet skins collected in Bengal and Assam (Pocock 1933). CWLS, GNP, NVNP, SWLS, MWLS, JNP. Found up to an elevation of 2500m. |
| | | *bengalensis* | Common in south Bengal. RBWLS, STR, BDWLS, BPWLS, LIWLS, HIWLS, SKWLS, CKWLS. Live around human settlement instead of forests. Prefer scrub and dry forests to undisturbed evergreen patches, but also live close to human habitation and often find refuge in attics or drainpipes of houses. They are also present in the parks and suburban gardens with mature fruit trees, fig trees and undisturbed vegetation because they require fruit-bearing, medium-sized trees with horizontal branches to rest on as well as feeding. Only a few decades back, there were many old buildings with old dense trees, abandoned gardens, abandoned factory sheds in Kolkata, all of which were ideal shelters for the civets to hide and breed. Consequent up on the fast changing scenario of urban Kolkata and fringe areas, now-a-days, their sightings are, however, rare in those niches. |
| | | *thai* | Rare. Restricted to BTR. |
| **ORDER PROBOSCIDEA FAMILY ELEPHANTIDAE** SUB-FAMILY ELEPHANTINAE TRIBE ELEPHANTINI | | | |
| 145. Indian or Asiatic Elephant | | | |
| ***Elephas*** | *maximus* | *indicus* | Common in north and south-western Bengal. PAs and surroundings. The satellite imagery analysis in BTR estimated the areas of various vegetation |

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| | | | types, visited by the radio-collard elephants during early 21st century, which are: dense evergreen forest (56 $km^2$), semi-evergreen forest (92 $km^2$), deciduous forest (87 $km^2$), degraded forest (141 $km^2$), dry thorn forest (28 $km^2$), flood plains (50 $km^2$), and plantations and mixed forest (221 $km^2$) in addition to area under tea, cereal cultivation and settlement. |
| **ORDER PERISSODACTYLA** SUB-ORDER CERATOMORPHA **FAMILY RHINOCEROTIDAE** SUB-FAMILY RHINOCEROTINAE TRIBE RHINOCEROTINI | | | |
| 146. Sumatran or Asiatic Two-horned Rhinoceros | | | |
| ***Dicerorhinus*** | *sumatrensis* | *lasiotis* | Extinct. One shot ca.1915 in Dalgaon forest of Jalpaiguri (Inglis et al. 2019). Another one shot near the Sankosh river of present BTR (*ibid*). |
| 147. Javan or Smaller One-horned Rhinoceros | | | |
| ***Rhinoceros*** | *sondaicus* | *inermis* | Extinct from both north Bengal (a young female specimen shot by JA Mollar from Denmark in Moraghat forests in Jalpaiguri on 24 February 1881 and kept in the Copenhagen Museum) and South Bengal. EO Shebbeare reported one killed by JWA Grieve in Buxa. However, Grieve last recorded its sighting in Chilapata (JNP) forests. Type locality of *inermis* collected from Sundarbans in 1876. It was recorded from Sagar (Saugor) Island, Pealee river bank (Baruipur), Raimangal river bank. During early 18th century, the grassland was spread up to the River Piyali, where the greaterand smaller one-horned rhinos were found to roam about, but the forest reclamationwas started there since 1775 and both the grassland and the depending fauna were wiped out during the next hundred years. The sub-recent remains of *Rhinoceros unicornis* have been discovered in this region (Ghosh *et al.*, 1992). There is hardly any grassland or large herbivores within the mangrove forest now. |
| 148. Great Indian One-horned Rhinoceros | | | |
| ***Rhinoceros*** | *unicornis* | - | Restricted. Common in JNP and GNP. Extinct from Sundarbans (Bakkhali, Mollakhali in Gosaba), Malda, Murshidabad, Koch Behar, Darjeeling, Jalpaiguri, BTR. Inhabits two types of forests, viz. (i) dense moist forest and low hill slopes of terai and *duars* (ii) tall grass land and mixed forest.<br>Habitat use pattern<br>JNP<br>The rhinos appear to be confined to the moist habitats supporting the semi-evergreen to evergreen forests, almost always in association with the alluvial plains and tall grassland. This largest tract of tropical grasslands (savannah) in the state consists of *Saccharum sponaneum, S. arundinaceum, Phragmites karka, Arundo donax, Narenga porphyrocoma, Themada villosa*, etc, dotted with associations of Khair-Sissoo (*Acacia catechu-Dalbergia sissoo*) and Simul-Siris (*Bombax ceiba-Albizia procera*) woodlands.<br>GNP<br>It appears that the rhinos usually prefer the savannah and natural grasslands for grazing than the plantations and riverine forests. |

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| | | | Forest typewise undisturbed habitats used by the rhinos as dung midden are-<br>JNP<br>1. Savannah forest – 59.31%<br>2. Natural grassland- 23.64%<br>3. Plantation- 13.87%<br>4. Riverine forest- 3.18%<br>5. Tropical moist deciduous forest- Nil<br>GNP<br>1. Savannah forest –14.08%<br>2. Natural grassland- 26.77%<br>3. Plantation- 23.95%<br>4. Riverine forest- 14.08%<br>5. Tropical moist deciduous forest- 21.12%.<br>During the present study in JNP, 96.04 km² (45% of the total area) were found to be most suitable habitat of the rhinos, of which the pure grasslands cover 30.55 km² (14.11%), grasslands with *Acacia-Dalbergia* succession 42.90 km² (19.81%) and grassland with *Bombax-Albizia* succession 22.59 km² (10.3%), whereas the secondary habitat was estimated to be about 50 km² and the seasonal (monsoon) upland habitat to be approximately 10 km². The rhinos are not presently known to visit Titi (39.19 km²), Jaigaon (17.56 km²) and Dalsingpara (14.78 km²) blocks, north of National Highway 31A as well as Salkumar (5.02 km²) in between the two legs. In GNP too, the resident rhinos do not use the whole park area. In fact, the core habitat used by them is only 8 km² (10.06%). There are two distinct ecotones for the rhinos- Riverain Rolling Flood Land Forests (RFF), Riverine Riparian Forests (RRF). This habitat offers the best grazing ground for the rhinos. During the present study, the rhinos were found to graze mostly in the riverine grasslands of Dhupjhora and Jaldhaka blocks (6.86 $km^2$). The rhinos usually avoided the wet mixed forests, but, in the dry season (summer), when there is threat of fire in the grassland, the rhinos frequently used this type of forests at Barahati 1, 3; Central 1; Medlajhora 1; Dhupjhora 1b, 2 and Kakurjhora 2 as resting place and browsed on the lower canopy. The rhinos were mostly seen in the wallow pools and saltlicks.<br>Temporary or seasonal local migration for food and shelter is a common phenomenon among the adult rhinos, particularly the males. In the past, the rhinos confined to the grassland habitat between the Rivers Sankosh and Rydak moved freely between Assam and West Bengal. Similarly, the rhinos of Jaldapara and Chilapata travelled to the neighbouring Bhutri forests on the east and also to Cooch Behar on the south. The Patlakhawa subpopulation also ranged further up to Pundibari near Cooch Behar. The rhinos were distributed across the forest of upper Tondu, lower Tondu and in the floodplains of the Rivers Diana and Jaldhaka on the north-east or Hiljhora forest on the north-west of Gorumara. They further moved up to Indo-Bhutan border on the |

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| | | | north and Mynaguri (now non-forest civil area) on the south. In March 1989, one female rhino strayed up to the Bangladesh border and was later brought back. In 1992, another female strayed out to Mahananda Sanctuary by crossing the River Tista and died due to exertion of such longest journey.<br>Whereas there are contiguous reserve forests in the eastern side of Jaldapara, some older or subordinate male rhinos, after being chased out of the prime habitat by the dominant male, used to move towards the secondary habitat at their range-edge and settle in Bania-Mendabari-Chilapata or southern Patlakhawa forests of Cooch Behar.. |
| **ORDER ARTIODACTYLA** INFRA-ORDER CETACEA SUB-ORDER MYSTICETI<br>**FAMILY** BALAENOPTERIDAE SUB-FAMILY BALAENOPTERINAE | | | |
| 149. Bryde Whale or Smaller Indian Fin Whale | | | |
| ***Balaenoptera*** | *edeni* | - | Rare. The skeleton of a 42-feet male, which was stranded on Digha coast since December 2012, is now preserved by noted Odisha taxidermist Siba Prasad Parida. |
| 150. Fin Whale or Common Rorqual | | | |
| | *physalus* | - | Rare. Stranding recorded by Yennawar (2009). |
| Unidentified sp. | - | - | Jambudwip in Sundarbans (Jones 1953). |
| SUB-ORDER CETARTIODACTYLA **FAMILY DELPHINIDAE** SUB-FAMILY GLOBICEPHALINAE | | | |
| 151. Pilot or Ca'ing Whale | | | |
| ***Globicephala*** | *macrorhynchus* | - | Rare. Recorded in July, 1852 in Salt Lake near Kolkata and another killed in the river Hooghly near Serampur. No further record. |
| SUB-FAMILY ORCAELLINAE | | | |
| 152. Irrawaddy or Snubfin Dolphin | | | |
| ***Orcaella*** | *brevirostris* | *brevirostris* | Occasional. Specimen collected from circular canal in Kolkata during late 19$^{th}$ century. Also recorded from the Hooghly river near Srirampur and Budge Budge. Now restricted to STR (Rivers Raimangal, Jhilla, Amlamati), and East Midnapore (Digha). |
| SUB-FAMILY CEPHALORHYNCHINAE | | | |
| 153. Indo-pacific Hump-backed or Plumbeous Dolphin | | | |
| ***Sousa*** | *chinensis* | *plumbea* | Rare. First photographic record of three individuals (male, female and baby) swimming in Gommor river of Sundarbans (Sajnakhali) by Saha and Palchowdhury (2008) and Mukherjee (2017). |
| SUB-FAMILY DELPHININAE | | | |
| 154. Pantropical Spotted Dolphin | | | |
| ***Stenella*** | *attenuata* | *attenuata* | Rare. Restricted to Sundarbans. Earlier recorded as *S. malayana.* |
| 155. Bottlenose Dolphin | | | |
| ***Tursiops*** | *truncatus* | - | Rare. Recorded by Kar (1996). |
| **FAMILY PHOCOENIDAE** SUB-FAMILY PHOCOENINAE | | | |
| 156. Little Black Finless Porpoise | | | |
| ***Neophocaena*** | *phocaenoides* | - | Rare. 19$^{th}$ century record from Hooghly river near Kolkata during high tide. Also recorded from Sundarbans. No recent sighting. |

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| **FAMILY PLATANISTIDAE** | | | |
| 157. Gangetic Dolphin | | | |
| ***Platanista*** | *gangetica* | *gangetica* | Found in three disjunct habitats in West Bengal (a) Freshwater distributaries of the Ganges, *i.e.* the Bhagirathi-Hooghly and their tributaries;<br>(b) Tidal distributaries in the Hooghly-Matla river systems (downstream limit depending on low salinity); and<br>(c) Tributaries of the river Brahmaputra in northern Bengal (*e.g.* Raidak, Sankosh, Dima, Checko, Kaljani and Torsa; extinct in the Teesta). During this study, four prominent braid reaches (21 km) were identified in the prime dolphin habitat between Jangipur and Tribeni-Bansberia. They are-<br>(i) The outfall of Raghunathpur (24.46° N and 88.05° E) in Murshidabad district: 3 km;<br>(ii) Chowrigachha (23.93° N and 88.18° E) to Suti (24.37° N and 88.01° E) in Murshidabad district: 3 km;<br>(iii) Katwa (23.39° N and 88.08° E) in Burdwan district (right bank) to Beldanga (23.51° N and 88.11° E) in Murshidabad district (left bank): 12 km; and<br>(iv) Jirat (23.5° N and 88.27° E) to Bansberia (22.56° N and 88.24° E) (right bank) in Hooghly district (opposite Nadia district): 3 km.<br>Site-Specific Encounters with the Ganges Dolphin in the Study Area<br>River Bhagirathi (Murshidabad, Nadia)<br>Jangipur (20 km south)<br>Azimganj (10 km north)<br>Bazarpara, Berhampur<br>South Berhampur<br>Goaljan, Budurpara, Berhampur<br>Arpara beel, Nakashipara<br>Kulepota, Nakashipara<br>Mithipur, Raghunathganj II<br>Hulorghat, Mayapur (confluence of Jalangi.<br>**River Jalangi (Nadia)**<br>Haldarghat near Baro Andulia<br>**River Hooghly (Burdwan, Hooghly, Nadia, North 24-Parganas, Kolkata, South 24-Parganas)**<br>Samudragarh, Kalna, Sabujdwip, Somrabazar, Khayaramarirchar, Khamargachhi. Kalyanpurghat, Bansberia, Hooghlyghat (Jubilee bridge), Chinsurah, Chandannagar (Collegeghat), Debitalaghat, Icchapore, Shrirampur, Lalbabar Ashram ghat, Belur, Ahiritolaghat, Near Howrah ferryghat, Chandpalghat, Babughat. Budge Budge, Botanical Gardens near ferryghat, Diamondharbour, Kakdwip, River Haldi (Purba Medinipur), Haldia, River Rupnarayan (Howrah), Kolaghat, Irrigation canal, Tilkhoja, 42km away from the river, Purba Medinipore<br>**River Damodar (Burdwan, Howrah)**<br>Irrigation channel at Rondiha<br>Gargchumuk near Uluberia<br>**River Icchamati (North 24-Parganas)**<br>Faridkati, Basirhat |

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| | | | **River Raimangal (South 24-Parganas)**<br>Exact location not available<br>**River Matla (South 24-Parganas)**<br>Canning<br>**River Bidyadhari (South 24-Parganas)**<br>Akandaberia, Haroa<br>**River Shilabati (Purba Medinipur)**<br>Sitakunda, Daspur, Ghatal.<br>Sixteen important sandbars or *chars,* some of which also create oxbow lakes, in the Bhagirathi-Hooghly from Jangipur up to Chandannagar, are the foraging rounds of this dolphin. The meander loops along this stretch with high tortuosity ratio are mostly preferred by the Ganges dolphins. But dolphin encounters along the comparatively polluted tracts in the Hooghly river are infrequent and these tracts are used by the dolphins only for seasonal migration. To sum up, the following five segments were found to be the preferred habitats of the Ganges dolphin in the study area:<br>(i) In the Bhagirathi, between Plassey on the left bank (23.47° N and 88.15° E) in Nadia district and Ballavpara opposite confluence at Katwa on the right bank (23.38° N and 88.7° E) in Burdwan district.<br>(ii) Mayapur on the left bank (23.26° N and 88.23° E) and Nabadwip on the right bank (23.24° N and 88.23° E) in Nadia district, *i.e.* around the confluence of the Jalangi and the Bhagirathi. This habitat is the best one not only in Nadia district but also in the whole study area.<br>(iii) Ketugram-II on the right bank (23.70 N and 88.05 E) downstream in Burdwan district: Best congregation in the district and second best in the whole study area, where highest encounters took place at four locations-<br>(a) Purbasthali or Chupichar with oxbow lakes (23.28° N and 88.17° E): three individuals,<br>(b) Nayachar (23.37° N and 88.10° E): six individuals, Shankai: four individuals and Kalyanpur Ghat: seven individuals.<br>(iv) Pyradanga (left bank) in Nadia district and Jirat (right bank) in Hooghly district; best encounters near the sandbanks at Sabujdwip (23.8° N and 88.26° E) opposite Somrabazar ferry ghat and a tourist spot in Hooghly district: three individuals, Mongaldwip (23.7° N and 88.30° E) near Pyradanga, Rajdwip (23.6° N and 88.29° E) near Balagarh.<br>(v) Jirat to Bansberia: Best encounter including a breeding pod at Khayaranarur *char* near Khamargachi in Hooghly district: four individuals including two calves.<br>At the lower stretch of the Hooghly, dispersed single individuals were sighted from Kalyani to Kakdwip. No pods were sighted in any of the tributaries in the study area.<br>The uppermost stretch of the Bhagirathi-Hooghly exhibited better quality of water in comparison to the downstream stretch. The water quality was found to be poorest during the monsoon when the dolphins used to migrate from the main river to |

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| | | | the tributaries.<br>The habitat preferences of the Ganges dolphin in the study area appear to have changed during the last two decades. Whereas during early 1980s the lower stretch of the Hooghly river from Palta (North 24-Parganas) downstream was their known preferred habitat, now the habitats in the upper stream are being preferred by them for foraging as well as breeding. The size and nature of their habitats, temporary or permanent, depending on presence of adequate food resources vis-à-vis their migratory pattern, are the most important criteria related to their ecology. Two typical dolphin habitats were identified during the present study:<br>**(i) Primary or Dry Season Habitat**<br>This habitat is determined by an eddy counter-current system in the main river flow caused by a fine sand/silt point bar formed from sediment and deposits, a convergent stream branch or an upstream meander. The dolphins concentrate in the locations of high prey (fishes and prawns) availability and reduced flow. Relatively high density of dolphins was found at the confluences in the main river and its tributaries or just downstream of shallow stretches where the current is relatively weak, off the mouths of the irrigation canals, and low density was observed near the disturbed human settlements and ferry routes. Dolphins were also found below the sand bars and the bridge-pilings where eddies are formed.<br>**(ii) Marginal or Rainy Season Habitat**<br>The Ganges dolphins migrate to the tributaries of the Bhagirathi-Hooghly during the high flood situation, particularly during the rainy season. These marginal habitats are determined by a smaller eddy counter-current system caused by an upstream meander. The marked seasonal changes in *susu* distribution and density over much of its range are due, at least in large part, to fluctuations in water levels. During the dry season from October to April, when the floodwaters recede, the dolphins leave the tributaries to congregate in the main channels, only to return to the tributaries the following rainy season or often during the high tides. They are often stranded in the canals, pools and river branches during this period.<br>**Seasonal Migration**<br>The Ganges dolphins mostly inhabit the non-protected areas and also to meet their habitat requirements, they often prefer the areas where commercial fishing is most intense. Though presence of the dolphin is reported throughout the year in the Bhagirathi-Hooghly, it is found more frequently in the cold weather than during the height of summer and the rains. It is exceedingly rare from May to the end of June. Appearance of this species in lower stretches of the river Hooghly has been explained as seasonal migration (Gupta, 1986). However, the fishermen also stated that traditionally with the approach of |

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| | | | the hot weather the dolphins used to ascend the river, returning with the rains. In July and up to the end of September, its existence was demonstrated by its being frequently caught in the fine-mesh gillnets of the fishermen. In the tidal zone, it usually descends during the monsoon season, when salinity is low, but appears to decrease in number with the advent of summer. This migration also seemed to be associated with the migration and dispersal of fishes, which are their main prey. In course of their upstream migration, they often enter the tributaries or irrigation canals during high tide and get trapped during the low tide. Earlier, the dolphins used to migrate during the breeding season. But since the construction of the Farakka barrage, their upstream journeys crossing the boundary of West Bengal have been halted.<br>Status: Originally, two specimens (1 male and 1 female) were collected from the Hooghly river near Kolkata (Roxburgh 1801). Even during the early 1960s, it was common throughout the Hooghly river. After construction of Farakka barrage and gradual pollution of the river, their numbers dwindled. Now occasional in South Bengal including Sundarbans (Kolaghat in Rupnarayan river, Gadiara at the confluence of Hooghly and Rupnarayan, Tribeni, Balagarh, Raichak, Purbasthali, Barrackpore, Kolkata up to Batanagar in Hooghly river, Bandar at the confluence of Dwarakeshwar and Shilabati, Nabadwip at the confluence of Bhagirathi and Jalangi, Ranaghat at the confluence of Hooghly and Churni, Farakka, Ahiron and adjacent areas in the Ganga and feeder canal) and North Bengal (Rivers Rydak, Kaljani, Torssa, Jaldhaka). |
| SUB-ORDER SUINA **FAMILY SUIDAE** SUB-FAMILY SUINAE TRIBE SUINI | | | |
| 158. Wild Boar | | | |
| ***Sus*** | *scrofa* | *cristatus* | Common. Throughout. |
| 159. Pigmy Hog | | | |
| ***Porcula*** | *salvania* | - | Extinct from north Bengal. Holotype probably from Darjeeling. Specimens obtained from plains of Darjeeling (from Darjeeling terai by J. Anderson on 19 May 1870 and 28 September 1869) as well as Jalpaiguri (originally recorded as Bhutan duars and Bhutan terai; from Neora 'Karanti Duars' and Dam Dim Duars by F.A Moller in 1883). No recent report. Genus removed from *Sus* and placed in the monotypic genus *Porcula*. |
| SUB-ORDER RUMINANTIA **FAMILY TRAGULIDAE** | | | |
| 160. Indian Spotted Chevrotain | | | |
| ***Moschiola*** | *indica (meminna)* | - | Recorded in south West Bengal (Purulia, Bankura) in the past. Extinct. Introduced population in the parks of Midnapore and Birbhum also did not survive. |
| **FAMILY MOSCHIDAE** SUB-FAMILY MOSCHINAE | | | |
| 161. Alpine Musk Deer | | | |
| ***Moschus*** | *chrysogaster* | *leucogaster* | Extinct from SNP. Taxonomy of the genus is disputed. In the past, it was considered M. moschiferous with several subspecies. Flerov |

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| | | | suggests three species: *moschiferous* (Siberian), *chrysogaster* (Himalayan) and *berezovskii* (Chinese). Groves recognises two subspecies: alpine form-*chrysogastor* and forest form-*sifanicus* (Anon., 1994). Groves mentions it as *M. leucogaster* in Bhutan. |
| **FAMILY CERVIDAE**<br>SUB-FAMILY CERVINAE TRIBE CERVINI | | | |
| 162. Cheetal or Spotted Deer | | | |
| ***Axis*** | *axis* | *axis* | Common. Throughout. All PAs excepting those in higher altitudes. Essentially an animal of 'edges' usually prefering eco-tonal region between the forests and the grass patches. Present in swampy meadows, scrublands, mangroves, riparian forests, moist and dry deciduous forests, grasslands especially around forest fringes. Avoids hilly terrain and thicker forests with closed canopy. In Sundarbans, prefer Keora (***Sonneratia*** *apetala*) leaves and fruits, which are plentiful. This forest has no undergrowth and the pneumatophores of the Keora trees are not very prominent. They also browse in the forests on Keora leaves. Cheetal also visit the riverbank habitat twice daily during low tide. Their track density is comparatively higher in this habitat compared to the other habitats. This riverbank is adjacent to Keora forests. Even some feeding materials are also found washed on to the river banks during high tide and the deer consume these during low tide. They are feed on the Gewa (*Excoecaria agallocha)* leaves. Gewa forest is also not very dense as the undergrowth is sparse and this tree has no pneumatophores. The Gewa forest is adjacent to the grassland on the river banks.The deer use this forest for resting under the shade of this tree. On the same ground, the deer sometimes use the Kankra *(Bruguiera gymnorrhiza*) forests as a resting place. In case of the grassland habitat, the highest number of deer track are found in *Cyperus* dominated patches. But the deer may avoid in the grassland with *Acanthus* and *Pandanus* because of their bushy and thorny features. Cheetal graze in the grassland composed of *Imperata cylindrica* (Sungrass) They mostly avoid the Sundari (*Heritiera fomes*) because it is difficult for them to move through the pneumatophores and dense undergrowth in this type of forest. Their preference is based on the height of the pneumatophores, which is big in case of Sundari. Since this is the preferred habitat of tiger, it is also not safe for them to stay here. The Goran (*Ceriops decandra*) is also bushy with dense vegetation, which makes it difficult for the deer to move through this habitat and, naturally, avoid this. Besides, there is more probability of tiger attack here. The deer also visit the sea beach less due to the long impact of the high tides in this zone. Cheetal frequently visits the sweet waterholes, particularly during the dry weather. |
| 163. Hog Deer | | | |

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| *Axis* | *porcinus* | *porcinus* | Common in foothills of north Bengal. PAs MWLS, GNP, CWLS, JNP, BTR. Albinism recorded. Extinct from Malda, Dinajpur and Sundarbans. Favours swamps and river flats with a cover of grass of moderate height. Partial to grass lands, hardly found in the forests, and never went up into hills. |
| 164. Swamp Deer or Barasingha | | | |
| ***Rucervus*** | *duvauceli* | *duvaucelii* | Extinct from Jalpaiguri, Alipurduar as well as plains of Darjeeling. Koch Behar, Malda, Dinajpur as well as Sundarbans (early 20th century). Present in JNP up to 1960s. Last seen in Cooch Behar in 1973. Inhabited moist deciduous, semi- and wet-evergreen forests with swampy places in the plains. The name 'Swamp deer' due to preference of swampy habitat. Prefers high ground in the proximity of water. Occurrence restricted in areas where grasses relatively thinner and smaller. |
| 165. Sambar | | | |
| ***Rusa*** | *unicolor* | *niger* | Common in north Bengal PAs (MWLS, CWLS, GNP, JNP, BTR, NVNP). Also recorded from south West Bengal, now extinct. Most 19th and 20th century sources placed the species in the genus Cervus, but was resurrected the genus Rusa for this, based on a variety of morphological differences. Inhabits dense semi-evergreen forests with grassy slope, ravines, glades and plenty of water; retiring at daybreak into dense forest or thickets, not leaving the seat till dusk. Favours relatively drier areas and hence, most common in plantations and forests where burning resorted. |
| SUB-FAMILY MUNTIACINAE TRIBE MUNTIACINI | | | |
| 166. Barking Deer or Muntjac | | | |
| ***Muntiacus*** | *vaginalis* | - | The non-Sundaic forms of *M. muntjak* raised from subspecific taxa to the species *M. vaginalis*, leaving the Sundaic forms to constitute *M. muntjak*. Common in north Bengal PAs (NVNP, CWLS, BTR, SWLS, JNP, GNP, MWLS, SNP). Probably extinct from Sundarbans (last recorded from HIWLS and Bulchery Island). A dark brown variety has been found near Darjeeling by Kinloch, and a still darker form is figured in Hodgson's MS. drawings. Inglis (1952) referred to melanistic ("very dark brown") muntjacs, sometimes almost black, in the Darjeeling district (27°02′N, 88°16′E), One was at this time mounted in the Darjeeling museum. Whether this specimen is still extant is unclear, and no analysis more substantial seems to have been published on these animals. However, recently such animals have apparently been camera-trapped in the SWLS, Darjeeling, with speculation that they could be *M. crinifrons* or *M. gongshanensis* (Mukherjee 2013). A search of the internet revealed a number of photographs of captive 'black' muntjacs from the Darjeeling and adjacent Sikkim region, these animals are completely blackish all over including the underside of the tail, and essentially have no features in common with *M. gongshanensis* or *M. crinifrons*, it seems |

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| | | | most probable that they are melanistic *M. vaginalis* (Timmins & Duckworth 2016). Inhabits densely vegetated areas. Confined to forested areas up to an elevation of 2500m except mangroves and desert. Prefers Sal/riverine forest/grassland; prefering thicker cover to open scrub, although comes out in early morning and evening along forest glades and lower hill tracks. |
| **FAMILY BOVIDAE** SUB-FAMILY ANTILOPINAE TRIBE ANTILOPINI | | | |
| 167. Blackbuck or Indian Antelope | | | |
| ***Antilope*** | *cervicapra* | *rupicapra* | Extinct from coastal area of Midnapore, Murshidabad, Nadia, Alipurduar (present JNP and BTR areas). Last refuse BWLS during end of 20$^{th}$ century. Lived in open plains covered with scrub or cultivation and avoided dense forests or hilly tracts; never found above an altitude of 1000 m. Normally prefered a hard surface. Entered open forests containing wide expanses of grass and adequate cover. Scrub grasslands close to a tank, river, ravine or canal most preferred habitat. |
| 168. Chinkara or Indian Gazelle | | | |
| ***Gazella*** | *bennettii* | *bennettii* | Extinct from Midnapore during 19$^{th}$ century. Frequented broken ground with sandy nullah bordered by scrub jungle. |
| SUB-FAMILY BOVINAE TRIBE BOVINI | | | |
| 169. Gaur or Indian Bison | | | |
| *Bos* | *gaurus* | *gaurus* | Common in northern Bengal PAs (BTR, CWLS, GNP, JNP, MWLS, NVNP) and surrounding forests. Originally, binomial *Bos frontalis* was applied to a domestic specimen, probably from Chittagong. In 1827, Charles Hamilton Smith applied the binomial *Bos gaurus* to the wild species occurring near Mainpat in the Sarguja Tributary States of India. Most authors have adopted the binomial *Bos gaurus* for the wild species as valid for the taxon. Live on gentle, undulating terrain with natural mineral licks, gaps in the forest, such as abandoned clearings in deciduous and semi-deciduous hill and mountain forests with light bush and many grassy clearings. In the lowlands, they live in open bamboo jungles, grassy plains near forests, or dense forests broken by glades or open meadows. Use large habitat from typical tree jungles to tree-dotted savannah. Ascends hill up to 1800 m or so. Moves towards higher and drier place during rainy season from low land, swampy areas or riverbeds and again come down when floodwater recedes. |
| 170. Mithun or Gayal or Bunerea goru | | | |
| *Bos* | *frontalis* | - | Extinct from foothills (*duars*) between R. Torsa and R. Rydak. DHE Sunder's Settlement Report (1895) mentions presence in Jalpaiguri along foothills between Torsa and Rydak rivers. Hunter (1876) also mentions Jalpaiguri. Baker (1886) mentions presence of gayals in Himalayan foothills in Bengal. Annual Report of Wildlife Preservation in West Bengal for 1967-68 shows this species in Buxa Division. Introduced population (2 males and 4 females), brought from Assam, in Jaldapara in 1963-64, released among |

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| | | | wild gaur herd, wiped out due to rinderpest (Das 1964, Bist 1997). |
| 171. Wild or Water Buffalo | | | |
| ***Bubalus*** | *arnee* | *arnee* | Extinct. Once common all over Jalpaiguri and Alipurduar dists, parts of Koch Behar and plain areas of Darjeeling dist. Stray individuals recorded till 1970s in BTR (Bholka). Last seen in 1976. The type specimen of arnee was in all probability from Koch Behar dist. Also extinct from Sundarbans. A specimen of hipbone of the species found from a pond excavation in STR during 1980 identified by ZSI. In fact, by the end of 19$^{th}$ century, whole population was wiped out from Sundarbans (Ghosh, 1992). Gupta (1966) mentions his uncle shot a wild buffalo in Sundarbans in 1890. Hunter (1876) reports presence in jungle tracts along western boundary of Midnapore. Blanford (1891) also records this species from coastal region of Midnapore. WP of Baikunthpur division mentions report of Dr. F.B. Hamilton in 1810 on presence of wild buffalo in the area. Ralph Fitch, a British traveller in India, during 1583-91 reported wild buffaloes common in regions round Malda (Foster, 1921). According to Allen et al. (1993) it had become rare about the end of nineteenth century. Hunter also records that even as late as 1876, this species included in the list of big games in Malda district (Banerjee, 1966c). In Murshidabad, a treeless tract then, a surveyor reported presence of a few wild buffaloes (*Ibid*.). In March 2003, the International Commission on Zoological Nomenclature achieved consistency in the naming of wild and domestic water buffalo by ruling that the scientific name *Bubalus arnee* is valid for the wild form. *B. bubalis* continues to be valid for the domestic form and applies also to feral populations. Habitat: Tall grass jungles and reed brakes in the neighbourhood of swamps both for food and shelter, pools of water to lie in and mud wallows to roll and getting cake with earth. Usually inhabited swampy areas. |
| TRIBE BOSELAPHINI | | | |
| 172. Nilgai or Blue Bull | | | |
| ***Boselaphus*** | *tragocamelus* | - | Extinct from Malda-Dinajpur. Dense forest not preferred. Inhabited open country with scrub or scanty tree jungle and also low hilly tracts with open glades and valleys. |
| 173. Fourhorned Antelope or Chousingha | | | |
| ***Tetracerus*** | *quadricornis* | - | O'Malley (1911) reported rare occurrence in north and west of Midnapore district. Found in wooded country, in the proximity of open grassland. Much dependent on water and never far from it. Never seen in dense forests. Extinct from Midnapore and also Panchet Hills in Purulia Rrduring 19$^{th}$ century. |
| SUB-FAMILY CAPRINAE TRIBE CAPRINI | | | |
| 174. Himalayan Tahr | | | |
| ***Hemitragus*** | *jemlahicus* | *schaeferi* | Rare in north Bengal. A cliff-dwelling terrestrial goat antelope; chooses inaccessible steep precipices, unsuitable for most other mammals. |

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| | | | Inhabits several forest types, ranging from broad-leaved forests to sub-alpine meadows. Found in towering and grass covered cliffs on steep rocky slopes of dense scrub forests covered with oak, ringal and cane in upper reaches of Darjeeling, Kalimpong and Alipurduar districts. SNP, NVNP, BTR, A stray record from MWLS when one came down to as low as 100m elevation in winter. Coughley did not recognise *schaeferi* as a separate subspecies and opined that the differentiating pelage characters as mentioned by Pohle are only seasonal (Agrawal et al. 1992). |
| 175. Bharal or Blue Sheep | | | |
| ***Pseudois*** | *nayaur* | *nayaur* | In winter grazed around Phalut in Darjeeling (Dutt Mazumdar 1954). No recent sighting record. Extinct. |
| TRIBE NAEMORHEDINI | | | |
| 176. Himalayan Goral | | | |
| ***Naemorhedus*** | *goral* | *hodgsoni* | Occasional in North Bengal hills. SNP, SWLS, MWLS, NVNP, BTR (Chunabhari and Buxa Fort areas, especially in winter). A cliff-dwelling goat-antelope, found at an altitude between 900 and 2750 m. Usually seen on the ragged, grassy hillsides or sparse vegetation of rocky slopes. Often invades terraced cultivation. |
| 177. Himalayan Serow | | | |
| ***Capricornis*** | *thar* | *jamrachi* | Occasional in North Bengal. High forests of SNP, SWLS, MWLS, NVNP, BTR (Chunabhari and Buxa Fort areas, especially in winter). Monotypic, but Wilson and Mittermeier (2011) believe the light-red serow from Northeastern India is actually much closer to the Himalayan Serow *(C. thar)*. Subspecies *jamrachi* is accepted for northern Bengal. Lives in recesses of thickly wooded gorges with boulder-strewn slopes and shallow caves. |
| **ORDER PHOLIDOTA** SUB-ORDER EUPHOLIDOTA **FAMILY MANIDAE** SUB-FAMILY MANINAE | | | |
| 178. Indian Pangolin | | | |
| ***Manis*** | *crassicaudata* | - | Rare. Found in Jalpaiguri and Koch Behar. Possible overlapping with pentadactyla in some areas of northern Bengal. SWLS, CWLS, JNP, GNP, NVNP, BTR. Mostly found in south West Bengal. Lives in forests, open grassland and near villages. |
| 179. Chinese Pangolin | | | |
| *Manis* | *pentadactyla* | *aurita* | MWLS, BTR, NVNP. Rare in northern Bengal, both plains and hills. They are found across a wide range of habitats including coniferous, tropical, evergreen and bamboo forests, agricultural fields and grasslands. |
| **ORDER RODENTIA** SUB-ORDER SCIUROMORPHA **FAMILY SCIURIDAE** SUB-FAMILY SCIURINAE TRIBE NANNOSCIURINI | | | |
| 180. Golden-backed or Grey-bellied Squirrel | | | |
| ***Callosciurus*** | *caniceps* | *crumpi* | Occasional. Restricted to North Bengal. MWLS. Found in forests and fringe areas. |
| 181. Brown-bellied Himalayan Squirrel or Pallas Squirrel | | | |
| *Callosciurus* | *erythraeus* | *erythraeus* | Occasional. Recorded in BTR. Inhabits mixed moist deciduous to temperate forests. |
| 182. Plantain Squirrel | | | |
| *Callosciurus* | *notatus* | - | Rare. Recorded in BTR. Museum specimen. Inhabits primary forests, bush lands, gardens and |

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| | | | plantations. |
| 183. Hoary-bellied Himalayan or Irrawaddy Squirrel | | | |
| *Callosciurus* | *pygerythrus* | *lokroids* | Common. Kumai (Kalimpong). Albinism in Kalimpong recorded. NVNP, MWLS, SNP, GNP. Lives in riverine, subtropical, mixed moist deciduous and temperate dense forest, thich to moderate evergreen forests and also about villages. Occupy mid-canopy. |
| 184. Orange-bellied Himalayan Squirrel | | | |
| ***Dremomys*** | *lokriah* | *lokriah* | Common in Darjeeling and rare in Jalpaiguri. MWLS, NVNP, SWLS, SNP, GNP, BTR. Occupy larger tree hollows in mid-high canopy of dense oak, bamboo, fir, rhododendron and pine forest patches. at 1,000-1,800 m elevations in Darjeeling. Also reported from Montane sub-tropical forest. Specimens, collected from Darjeeling, generally met with in drier place where forest thinner (Khajuria & Ghose 1970). |
| | | *motuoensis* | Found in Lava, Kalimpong. Present status not known. |
| 185. Himalayan Striped Squirrel | | | |
| ***Tamiops*** | *macclellandi* | *macclellandi* | Common in northern Bengal. NVNP, GNP. Occur in montane forests above 1500 m; also at lower altitude, almost at plains level. |
| TRIBE FUNAMBULINI | | | |
| 186. Indian Three-striped Palm Squirrel | | | |
| ***Funambulus*** | *palmarum* | *palmarum* | Occasional. South Bengal. Midnapore and Purulia (Agrawal et al. 1992). 24-Parganas (Sanyal 1892). Based on a specimen, Blyth (1863) records this species from Kolkata, but on examination, the same found to be a specimen of *F. pennati*. Keeps to wood, although occasionally approaches houses. |
| 187. Five-striped Northern Palm Squirrel | | | |
| *Funambulus* | *pennanti* | *pennanti* | North Bengal (Darjeeling, Jalpaiguri, Alipurduar, Cooch Behar). South Bengal: Malda, Birbhum, Murshidabad, Nadia, Burdwan, Bankura, Purulia, Midnapore, Hooghly, Howrah, Kolkata, and N. & S. 24-Parganas. Common near human habitations. Found in forest, villages and orchards and suburbs of cities. Occurs in tropical and subtropical dry deciduous forest, montane forests, grasslands, scrublands, plantations, arable land, rural gardens, urban areas, introduced vegetation. MWLS, CWLS, JNP, GNP, BTR. |
| | | *chattisgarhi* | Occasional. New Subspecies. Found in forest, villages and orchards and suburbs of cities. Restricted to Purulia in south-western region up to Southeastern region (Ghose et al. 2004). |
| | | *gangutrianus* | Occasional. New Subspecies. Restricted to Kolkata, Howrah and Hooghly, excluding south-western region (Ghose et al. 2004). More urban than *palmarum*. Lives in forests, human dwellings, fields, gardens, groves, hedges and on roadside trees. |
| TRIBE MARMOTINI | | | |
| 188. Himalayan Marmot | | | |
| ***Marmota*** | *himalayana* | *himalayana* | Rare. No recent sighting record. Lives among dwarf rhododendron and dwarf juniper. Ellerman and Morrison-Scott (1951) and Corbet (1978) have placed the species under *M. bobak* Muller. |

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| TRIBE RATUFINI | | | |
| 189. Black Malayan Giant Squirrel | | | |
| ***Ratufa*** | *bicolor* | *gigantea* | Common in northern Bengal. Seen in Khuntimari in Jalpaiguri district. MWLS, NVNP, SWLS, SNP, CWLS, GNP, BTR, JNP. Lives in tropical moist deciduous, semi-evergreen and evergreen dense forests. Lives both in hills and in plains, only in forests up to an altitude of 2000 m. |
| 190. Indian Giant Squirrel | | | |
| *Ratufa* | *indica* | *bengalensis* | Occasional. North and South Bengal. BTR. They prefer mixed deciduous, most evergreen, tropical and rain forests. |
| SUB-FAMILY PTEROMYINAE | | | |
| 191. Hairy-footed Flying Squirrel | | | |
| ***Belomys*** | *pearsoni* | *pearsoni* | Rare in Darjeeling. SNP, NVNP, BTR, SWLS. Found in moist, montane temperate and subtropical dry deciduous forests. Occupy tree hollows of dense broadleaved forest patches and also in rock crevices. |
| 192. Particoloured Flying Squirrel | | | |
| ***Hylopetes*** | *alboniger* | *alboniger* | Restricted to northern Bengal. Specimens at ZSI from Kurseong, Pashok, Selimbong and Jalpaiguri. MWLS, NVNP, SWLS, SNP, GNP, BTR. Found in tropical and subtropical montane forests, and in more temperate oak and rhododendron forests at middle to high elevations (1,500 to 3,400 m). Populations can be found in primary forests as well as secondary, degraded forests and scrubby habitat. Reported from mid-hilly Oak-Rhododendron forest. |
| 193. Lesser Giant Grey-headed Flying Squirrel | | | |
| ***Petaurista*** | *elegans* | *caniceps* | Common. Restricted to northern Bengal. Specimens at ZSI from Darjeeling Dist (Ghoombhanjan, Phalut in SNP, and Tonglu). MWLS, SNP, GNP, NVNP, SWLS. Ellerman & Morrison-Scott (1951) and Hoffmann et al. (1993) included it in *P. elegans*. *P. caniceps* differs from *P. elegans* In having a distinct grey head and molecular evidences too have proved it to be a separate species. Found in temperate forests at higher altitudes and montane sub-tropical forest though they are sometimes observed at lower elevations in the spring in search of food. Reported from Oak-Rhododendron forest |
| 194. Hodgson's Common Giant Flying Squirrel | | | |
| *Petaurista* | *magnificus* | *hodgsoni* | Restricted to northern Bengal. Holotype of hodgsoni from Ghoombhanjan, 2117m, Darjeeling Dist (now in ZSI). MWLS, SNP, GNP, NVNP, SWLS. Last year photographed in SNP. Lives in evergreen tropical and subtropical and broad-leaved forests from the lowlands up to 3,000 m. Reported from Oak-Rhododendron forest and montane sub-tropical forest. Prefers dry deciduous to evergreen forests at higher altitude. In winter or spring sometimes come down to lower altitude. Blanford (1888-91) regarded *Petaurista nobiris* and *P. chrysotrix* as synonyms of *P. magnificus* in which dorsal corour changes seasonaily. He believed that *nobilis* and *chrysotrix* to be summer grab with a |

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| | | | more or ress well-marked dorsal yeilow median line, while *magnificus* as the winter grab having no median dorsal line. Wroughton (1911) retained only *nobitis* considering *magnificus* to be synonym of *P. arbiventer*. Robinson and Kross (1918) reverted to Branford's nomencrature and so also Ellerman (1961). Chakraborty (1975) from the examination of a series of specimens from Bhutan and also the Paratype of *magnificus* opined that there is no seasonal change in the colour and all the specrmen fit well the description of summer grab of *magnificus*, i.e., having a dorsal median line. He kept *noblis* and *chrysotrix* as synonyms of magnificus. Ghose and saha (1981) recognised *magnificus* and *nobilis* as distinct species, in the former shoulder patch confined to pectorals, while in the latter it extends beyond pectorals along the sides of the body isolating a distinct saddle. Further, Dar.leering popuration of *P. magnificus* was considered as new subspecies, viz. *P m hodgsoni* by them, which occur sympatricaily with *P. nobitis.* Robert et al. (1993) arso treated *magnificus* and *nobilis* as distinct. |
| 195. Himalayan Gray's Giant Flying Squirrel, Bhutan Giant Flying Squirrel, Noble Giant Flying Squirrel | | | |
| *Petaurista* | *nobilis* | *nobilis* | Holotype of *nobilis* from Darjeeling. Most common of all the flying squirrels found in higher altitudes of Darjeeling dist. SWLS. Habitat: Temperate broadleaf forests typically recorded between 1500 m and 3000 m elevation. Found in tropical and subtropical montane, montane pine and rhododendron forests. |
| | | *singhei* | Rare. Restricted to upper reaches of NVNP adjoining Bhutan. |
| 196. Elliot's Common Giant Flying Squirrel | | | |
| *Petaurista* | *petaurista* | - | Rare. Recorded from Midnapore and Purulia in south Bengal and PAs of North Bengal- NVNP, BTR. Confusing with *philippensis.* Occurs in moist evergreen broadleaf forest, temperate forest, coniferous forests, scrub forest, rocky areas as inland cliffs, mountain peaks. Lives in hollows of old trees, often within villages. Found at an elevation of 50-1800 m. |
| 197. Indian Giant Flying Squirrel | | | |
| *Petaurista* | *philippensis* | *grandis* | Rare. Recorded by Menon 2003. Formerly included in *petaurista* (Ellerman & Morrison-Scott 1951). Inhabits deciduous, semi-evergreen and evergreen forests. |
| SUB-ORDER MYOMORPHA **FAMILY CRICETIDAE** SUB-FAMILY ARVICOLINAE TRIBE ARVICOLINI | | | |
| 198. Sikkim Vole | | | |
| ***Neodon*** | *sikimensis* | *sikimensis* | Occasional. Restricted to Darjeeling. Specimens at ZSI from Sandakphu, c. 3600m, in SNP. NVNP. Habitat grasslands, rocks and forests. |
| **FAMILY MURIDAE** SUB-FAMILY MURINAE | | | |
| 199. Indian Mole-rat | | | |
| ***Bandicota*** | *bengalensis* | *bengalensis* | Common. Throughout. Specimens collected from Darjeeling (Tarkhola, Takdah and Sandakphu), Kalimpong, Jalpaiguri, Alipurduar, Koch Behar, Malda and south West Bengal. MWLS, CWLS, GNP, BTR, RBWLS, STR. Lives in cultivated |

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| | | | plains, godowns, wastelands, warehouses, gardens, mangrove swamps and pasturelands. Also found in deciduous as well as evergreen forests. |
| 200. Large Bandicoot rat | | | |
| *Bandicota* | *indica* | *nemorivaga* | Common (Kolkata, Burdwan, Hooghly, Howrah, Medinipur, North and South 24 Parganas, Jalpaiguri), GNP (grassland on the slopes of swamps and streams), STR. Occupies outskirts of human dwelling, cultivated fields, swampy areas, forest fringes and drainage system in urban areas. |
| 201. Millard's or Large-toothed Rat | | | |
| ***Dacnomys*** | *millardi* | *millardi* | Occasional. Restricted to Darjeeling. Type locality Gopaldhara. Recorded from upper montane tropical and subtropical primary evergreen moist forest at elevations above 1,000 m |
| 202. Indian Coarse-haired Bush Rat | | | |
| ***Golunda*** | *ellioti* | *ellioti* | Common in northern Bengal. Found in Kurseonng and Hasimara. MWLS, BTR. JNP. Lives entirely in jungle, choosing habitation in a thick bush. Found up to 2000 m elevations. |
| | | *coenosa* | Jalpaiguri. |
| 203. Edward's Rat | | | |
| ***Leopoldamys*** | *edwardsi* | *edwardsi* | Rare in Darjeeling. MWLS. Inhabits forests at hilly region at an elevation of 2000 m. |
| 204. Blanford's White-tailed Wood Rat | | | |
| ***Madromys*** | *blanfordi* | - | Occasional. Restricted to Purulia (Ajodhya, Matha) and also Burdwan. RBWLS. Earlier recorded as *Cremnomys blanfordi*. Inhabits dry or moist deciduous forests, evergreen forest zones, sometimes among rocks and scrubs. |
| 205. Metad or Soft-furred Field Rat | | | |
| ***Millardia*** | *meltada* | *singuri* | Occasional. Restricted. Found only in Singur, Hooghly. Lives in extensive burrow system made in cultivable field. |
| 206. Little Indian Field Mouse | | | |
| ***Mus*** | *booduga* | *booduga* | Common (Duars & south Bengal). JNP, BTR, RBWLS, STR. Found in grasslands, crop fields and forest fringes. |
| 207. Fawn-coloured Mouse | | | |
| *Mus* | *cervicolor* | *cervicolor* | Common (Hooghly, Jalpaiguri, Medinipur, North & South 24-Parganas and West Dinajpur). JNP. Found in cultivated fields and adjacent areas and also house godowns. |
| 208. Ryley's Spiny or Cook's Mouse | | | |
| *Mus* | *cookii* | *nagarum* | Restricted. Found in Darjeeling and near Kolkata. Habitat: Subtropical dry deciduous forests, grasslands, temperate coniferous and broadleaved forests, |
| 209. House Mouse | | | |
| *Mus* | *musculus* | *castaneus* | Common. South West Bengal. Lives chiefly in houses, but sometimes in gardens and fields near villages and towns. |
| | | *homourus* | Occasional. Restricted. Found in Darjeeling and Jalpaiguri. Tarkhola, Takdah and Sandakphu |
| | | *tytleri* | Common. Restricted. Jalpaiguri and Midnapore. |
| | | *urbanus* | Common. Throughout. Specimens collected from Tarkhola and Takdah. |
| 210. Sikkim Mouse or Gardner's Shrew Mouse | | | |
| *Mus* | *pahari* | *pahari* | Occasional. Restricted to Darjeeling. Specimens collected from forests. Found in Batasia c.1830 m, |

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| | | | Pashok, Takda. NVNP. Occurs mostly in montane forests, both primary and secondary forest, forest edge |
| 211. Brown Spiny Field Mouse | | | |
| *Mus* | *platythrix* | - | Occasional. Restricted to Ajodhya Hills, Purulia. Occurs in tropical and sub tropical dry deciduous, scrub forest. ZSI collected all specimens from forests. |
| 212. Elliot's Brown Spiny Mouse | | | |
| *Mus* | *saxicola* | *gurkha* | Common in south-west Bengal (Purulia, Bankura, Birbhum and Medinipur). Specimens collected from forests Habitat includes grassland, scrubland and dry cultivation. |
| 213. Dunni or Earth-colored Mouse | | | |
| *Mus* | *terricolor* | *dunni* | Occasional. Found in the foothills (*terai-duars*) of northern Bengal and Bankura (Susunia) in south-west Bengal in 1985. |
| 214. Little Himalayan or Smoke-bellied Rat | | | |
| ***Niviventer*** | *eha* | *eha* | Occasional. Restricted to Darjeeling (Palmajua c 2250 m; Sandakphu c 3600 m). Habitat includes wet forests at higher altitude. Both male and female specimens collected from Palmajua and Sandakphu in Rhododendron forests in July 1958 (Khajuria & Ghose 1970). MWLS, SNP. |
| 215. Chestnut Rat | | | |
| *Niviventer* | *fulvescens* | *fulvescens* | Occasional. Restricted to Darjeeling c 1066-2286 m. Found in Selimbong, Pashok, Palmajua, Takdah. MWLS. Holotype recorded as *Leggada jerdoni*: Darjeeling, no date, T. C. Jerdon collector. Found in forests and cultivated fields. Inhabits grass and bushy lands and riverbeds in hilly forests. |
| 216. White-bellied House Rat | | | |
| *Niviventer* | *niviventer* | *monticola* | Occasional. Restricted to high altitude of Darjeeling (Palmajua, Sandakphu), 2250-3600 m. MWLS. Occurs in wet evergreen forests with abundant undergrowth or forests consisting of Rhododendron and Silver fir. |
| | | *niviventer* | Occasional. Darjeeling: Ghoombhanjan and Selimbong. |
| | | *lepcha* | Occasional. Agrawal (2000) considered *monticola* as synonym of *lepcha*. |
| 217. Shining Brown or Himalayan Rat | | | |
| ***Rattus*** | *nitidus* | *nitidus* | Common in Darjeeling (Khajuria & Ghose 1970, Agrawal et al. 1992, Ellerman 1961). Specimens collected from Takda and Palmajua. MWLS. Inhabits village houses, cultivated fields, evergreen forests and rocky situation. |
| 218. Brown Norway Rat | | | |
| *Rattus* | *norvegicus* | *norvegicus* | Common in south Bengal. RBWLS, STR. Found in temperate region as well as cities and agricultural land. |
| 219. Himalayan Rat | | | |
| *Rattus* | *pyctoris* | *khumbuensis* | Rare. Formerly listed as *Rattus turkestanicus* or *R. rattoides*, but *R. pyctoris* has priority over both names. Found in Ghoom c.2246 m, Darjeeling (Agrawal 2000). Occurs in montane areas, rocky habitats and frequently near or on cultivated or residential land. |
| 220. Common Black House Rat | | | |
| *Rattus* | *rattus* | *rufescens* | Common. Darjeeling, Jalpaiguri, Murshidabad, Howrah, Kolkata and N. 24-Parganas. Found in |

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| | | | godowns, shops, and residential complexes. |
| | | *brunneusculus* | Common. Darjeeling, Jalpaiguri. Found in forests, fields and residential complexes. |
| | | *arboreus* | Throughout except hills. Found in rural grasslands areas. Usually lives in coconut and palm trees and also in huts. |
| | | *bhotia* | Common. Type locality: Hasimara. |
| | | *khyensis* | Common. Jalpaiguri. |
| | | *tistae* | Common. Type locality Pashok, Darjeeling. Found in forests, cultivated fields and houses. |
| 221. Sikkim Rat | | | |
| *Rattus* | *sikkimensis* | *sikkimensis* | Occasional. Restricted to Darjeeling. Found in cultivated fields and adjacent forests up to an altitude of 2000 m. |
| 222. Japan Rat | | | |
| *Rattus* | *tanezumi* | | Rare. No site-specific record is available. Earlier it was included in *Rattus rattus*. Found in and around villages and agricultural areas, disturbed lowland and montane forest up to 1,800 m. |
| 223. Indian Longtailed Tree Mouse | | | |
| ***Vandeleuria*** | *oleracea* | *dumeticola* | Common North Bemgal: Pashok, Hansimara, Bharnabari. South West Bengal:Purulia, BTR, GNP. Prefers forested tracts, adjacent to cultivated areas and human habitations. |
| 224. Short-tailed Mole Rat | | | |
| ***Nesokia*** | *indica* | *indica* | Occasional. Restricted. Found in Nadia only. Two specimens collected by ZSI in Nadia in 1987 by digging burrows adjacent to a sugarcane field on the bank of river Ganga. Habitat includes natural grasslands, cultivated fields in arid and semi-arid zones and also forested tracts near riverbeds. |
| SUB-FAMILY GERBILLINAE TRIBE TATERILLINI | | | |
| 225. Indian Gerbil or Antelope rat | | | |
| ***Tatera*** | *indica* | *indica* | Common. Found in South Bengal (Medinipur, Bankura, Hooghly, Nadia, Murshidabad and N. 24-Parganas). Habitat:Tropical and subtropical dry deciduous forests, scrub forests, grasslands, rocky areas, arid and semi-arid regions, riverbank, cultivated lands. Found up to an elevation of 2000 m. |
| SUB-FAMILY RHIZOMYINAE TRIBE RHIZOMYINI | | | |
| 226. Bay Bamboo Rat | | | |
| ***Cannomys*** | *badius* | *badius* | Found in *terai* (Darjeeling) and *duars* (Hasimara). Occasional. MWLS, BTR. Prefers to live in bamboo thickets in subtropical forest tracts and montane temperate forest, cultivated land, and other disturbed areas. |
| SUB-ORDER HYSTRICOGNATHI **FAMILY HYSTRICIDAE** SUB-FAMILY ATHERURINAE | | | |
| 227. Bengal or Brush-tailed Porcupine | | | |
| ***Atherurus*** | *macrourus* | *assamensis* | Rare. Restricted to south Bengal. No recent sighting. May be extinct. Habitat:Tropical and subtropical forests, especially with palms, cane and bamboo. |
| SUB-FAMILY HYSTRICINAE | | | |
| 228. Crestless Himalayan Porcupine | | | |
| ***Hystrix*** | *brachyura* | *hodgsoni* | Rare. Found in north Bengal. Habitat: Forest fringes and forests in rocky outcrops. Also occurs in larger village woodlands. BTR, SWLS, NVNP, CWLS, JNP, GNP, MWLS, SNP, SWLS. No recent sighting record. Lekagul & McNeely stated that "*H. hodgsoni* is very similar to *H. brachyura*, though the crest is said to be lower (an aged-linked |

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| | | | character) and quills have a wider black band than in *brachyura* (though this may be individually variable character). The nasals are comparatively large, averaging 55.6% of the occipitionasal length. The sagittal crest rather well developed." At present due to lack of specimens *H. hodgsoni* is maintained (Agrawal et al.. 1992) |
| 229. Indian Crested Porcupine | | | |
| *Hystrix* | *indica* | *indica* | Found throughout state from Himalayan foothills southwards. Common in South Bengal (Bankura, Purulia and S. 24 Parganas), STR, BDWLS. Also PAs of North Bengal-BTR, SWLS, NVNP, JNP, MWLS, SNP. Lives in rocky hillsides, hill slopes, plain ground among bushes, open land and forest up to an elevation of 2400 m. Prefers dry riverbed or Rocky River bank. Sometimes, also remains in thick scrubs near cultivation. |
| **ORDER** LAGOMORPHA **FAMILY** OCHOTONIDAE | | | |
| 230. Himalayan Mouse hare | | | |
| ***Ochotona*** | *roylei* | *roylei* | Rare. Recorded in SNP (Pradhan et al 1998). No recent sighting record. Inhabit pine forests and steep slopes in burrows dug under the roots of trees. Found in rocky ground, burrows, rocks and coarse stones. |
| 231. Moupin Pika | | | |
| ***Ochotona*** | ***thibetana*** | *sikimaria* | Rare. Restricted to highlands of Darjeeling(Khajuria & Ghosh 1970, Agrawal et al. 1992). Specimens from Sandakphu in SNP kept at ZSI. Inhabits pine forests and steep slopes. Found in rocky ground burrowing and hiding amongst rocks and stones at an altitude of 2500-3500 m. |
| **FAMILY LEPORIDAE** | | | |
| 232. Hispid Hare or Assam Rabbit | | | |
| ***Caprolagus*** | *hispidus* | - | Occasional. Extinct from Darjeeling and Jalpaiguri. Now survived only in JNP. Maheswaran (2002) captured and confirmed its presence JWLS (not more than 25-30 and density 1/0.115 $km^2$). Extinct from BTR. Inhabits grasslands in primeval Sal forest region. Uses tall grasses (comprising *Saccharum spontaneum*, *S. narenga*, and *Arundo donax*) more extensively than short or recently burnt grasses. |
| 233. Indian Rufous-tailed Hare or Black-naped Hare | | | |
| ***Lepus*** | *nigricollis* | *ruficaudatus* | Common. Habitat: Occupies a wide range of habitats. Tropical dry deciduous forests, montane sub-tropical forests. CWLS, BTR, JNP, GNP, MWLS. Generally found in large open scrub, short grassy patches, often on river banks or in neighbourhood of villages and cultivation. Ascends hills to some height. In hilly areas, particularly the depressions at the foothills, are preferred habitats. Less numerous in forests. During hot weather, grass being scanty, comes to roadsides or even enters compounds to feed on grass growing there. |
| 234. Woolly Hare | | | |
| *Lepus* | *oiostolus* | *oiostolus* | Rare. Darjeeling (Mukherjee et al. 1982). Recorded in SNP. Tonglu. Habitat: High altitude meadows inside the valley, montane grasslands, grassy marshlands, shrubs, evergreen forests, temperate forests. Lives amidst dwarf Juniper, dwarf rhododendron, valleys, undisturbed vegetation. |

There are some common features in habitats of mammals within the same family. This common narration is not repeated. All the species mentioned in the checklist, which the authour has gone through as mentioned in the reference, have been covered here. If one finds some species missing, it means that the scientific name of that particular species is changed. One will find the species with new scientific name (genus or species or both) covered here.

**Fig. 2.** Mammals in different habitats (Leopard, fruit bat, wolf, camera trapped fishing cat, camera trapped wild pig, camera trapped jackal, swimming tiger)

**Fig. 3.** Mammals in different habitats (diurnal Axis deer herd with shed antlers scattered in front, foraging small Indian civet camera trapped at night, barking deer, Indian Bison or gaur)

**Fig. 4.** Mammals in different habitats (Jungle cat, Indian elephant (loner tusker), Indian rhino, Binturong drinking water from a *pokhri*)

## CONCLUSION

Regular monitoring and research on abundance /distribution/status of mammalian species involving the local communities and all stakeholders in the conservation works is considered most important in securing long-term sustenance of mammalian fauna in the state. Future action plans should include shifting and rehabilitation of the in-forest settlements, eviction of unauthorized occupants, developing institutional conservation capacity, ensuring effective patrolling force with modern arms and ammunitions to prevent illegal activities like poaching or exploitation of natural resources, regular evaluation of occupancy, connectivity and population size, reduction of unsustainable use of forest resources, implementation of prioritized conservation activities.

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