ISSN 0970-4450

PRANIKEE

Journal of Zoological Society of Orissa

Volume- XXXI
2019

MONOGRAPH

MAMMALS OF ODISHA, INDIA
UPDATED CHECKLIST, DISTRIBUTION AND CONSERVATION STATUS

ISSN 0970-4450

PRANIKEE

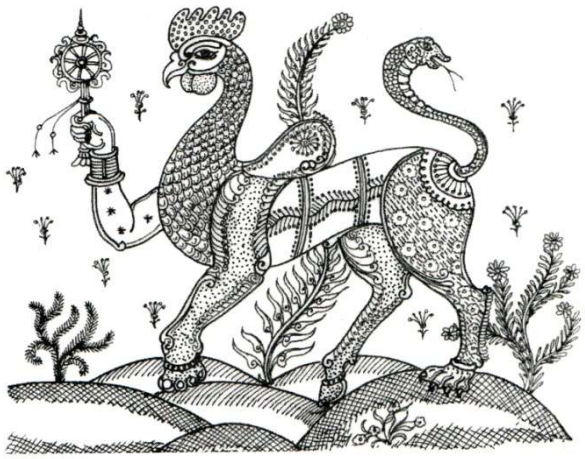
Journal of Zoological Society of Orissa

Post Graduate Department of Zoology
Utkal University, Vani Vihar
Bhubaneswar - 751 004, Odisha, India

Volume XXXI, 2019

ISSN 0970-4450

The emblem of Pranikee



The emblem "***NABAGUNJARA***" is a chimeric animal and a common motif of Odishan art and literature. It literally means "Nine form". This form has been described by poet Sarala Das in the Odia version of the epic Mahabharata. Apparently, Lord Krishna appeared in Nabagunjara form consisting of the body of an elephant, a leg each of a horse, a deer and a tiger respectively; throat of a peacock, tail in the form of a serpent, waist of a lion, hump of a bull and head of a cock, to fool his friend Arjuna. The Chimera was holding a lotus flower in a human hand. Arjuna had never seen such a creature in his life and guessed that this could not be a real animal but a form assumed by Lord Krishna and immediately bowed down at his feet. It is said that the human hand with the lotus provided the clue. In the paintings and sculptures however, the lotus is often replaced by a "Chakra" or the "stylized discus" of Lord Krishna. Chimeric forms are encountered in literature and art all over the world. However, a chimera of nine animals is uniquely Odishan. Therefore, it was considered to be an appropriate emblem for the Journal of Zoological Society of Odisha.

Padma Shri Prof. Priyambada Mohanty-Hejmadi

Former Editor

From the Editor's desk

The present edition of the journal (Volume XXXI) describes mammals of the state of Odisha, India in the form of a monograph.

P. K. Mahapatra

PRANIKEE
Journal of Zoological Society of Orissa
Abbreviation: Pranikee
Volume 31, Year – 2019

MAMMALS OF ODISHA, INDIA: UPDATED CHECKLIST, DISTRIBUTION AND CONSERVATION STATUS

Pratyush P. Mohapatra, Satya R. Behera, Sushil K. Dutta, Cuckoo Mahapatra and Hari S. Upadhyay

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ABSTRACT

An updated checklist of extant mammals of Odisha has been presented based on a compilation of published literature and extensive field surveys undertaken during the past fifteen years. Mammalian diversity of the state is represented by 103 species under 11 orders, 34 families and 69 genera including 15 species of Cetaceans. Global conservation status, regional status, and species included under various schedules of the Wild Life (Protection) Act, 1972 have been provided. Current threats and conservation gaps for each species have been summarized to flag conservation issues. A consolidated list of terrestrial mammalian species recorded from sixteen out of 19 sanctuaries has been provided to update our understanding of the spatial distribution of species in various Protected Areas. Furthermore, we report Anderson's shrew - *Suncus stoliczkanus* (Anderson, 1877) for the first time from the state based on a specimen collected and observed from various localities.

Keywords: Checklist, Conservation, Eastern Ghats, *Suncus stoliczkanus,* Threats.

1. INTRODUCTION

Mammals are the most advanced creatures in animal evolution and to date, 5,750 species of mammals have been documented worldwide (Wilson and Reeder, 2011). The class Mammalia is represented by two subclasses, namely Prototheria and Theria, of which the latter is distributed in India. Class Theria comprises two infraclasses: Marsupialia and Placentalia comprising 7 and 21 extant orders, respectively. Marsupialia is endemic to Australasia and the Americas while Placentalia is cosmopolitan in distribution. India has a total of 428 species of wild mammals, representing 48 families and 14 orders, that constitute about 7.44% of the global mammalian species (Sharma *et al*., 2014). Since then, there have been some major taxonomic revisions in the Class Mammalia including validation of subspecies, resurrection of species and even generic allocation of some groups. Furthermore, recent

genetic data have dramatically reduced confusion in understanding species at infraspecific and population levels.

The mammalian fauna of Odisha was explored sporadically by various workers since the late nineteenth and early twentieth century. Notably, Blyth (1863), Anderson (1881), Sclater (1891), Annandale (1915), Wroughton (1995), Thomas (1915 a and b), Robinson and Kloss (1918) and Hilton and Lindsay (1926) did the earliest recognizable works. However, the first-ever compilation of data on mammals of Odisha was by Ball (1877), where the author mentioned about eight species, namely, Madras tree shrew, Cheetah, giant Indian flying squirrel, giant flying squirrel, elephant, rhinoceros, hog deer, and blackbuck. Behura and Guru (1969) compiled a checklist of mammals of the state, mostly the large mammals, based on historical records and information collected by the authors from primary sources. This work was followed by Das and Agrawal (1973), Acharjyo and Mishra (1975) and Acharjyo and Pattnaik (1987) who added few more species to this list. Later on, updated checklists presenting detailed information on mammals of the state were periodically done by Das *et al.* (1993) and Mishra *et al.* (1996). A major addition of Cetaceans (11 species) was made to the list based on the works of James *et al.* (1989), Jayaprakash *et al*. (1995), John *et al*. (2012) and Khan *et al*. (2015). Recently, Palei and Debata (2018, 2019), Palei *et al.* (2018, 2019) provided distribution information on rusty-spotted cat and fishing cat, based on historical data, media reports and personal observations by the authors. Besides, Alfred and Chakraborty (2002), Debata *et al.* (2013), Mohapatra *et al.* (2014), Panda *et al*., (2014), Nayak *et al.* (2014), Debata *et al.* (2015), Debata and Palita (2019) and Mohapatra *et al.* (in press) have also made significant contributions to the records of mammalian fauna of the state.

During the early revisionary studies of rodents in the collection of Zoological Survey of India (formerly Indian museum), Robinson and Kloss (1918), Ellerman (1961), Agrawal and Chakraborty (1979), mentioned about *Ratufa indica centralis, Funambulus pennant pennanti, Petaurista philippensis*, *Funambulus palmarum* and *Bandicota indica* collected from various localities of the state. Among various taxa, the bat fauna of the state was systematically explored and compiled by Das and Agrawal (1973), Das *et al.* (1993), Khaparde (1977, 1980), Debata *et al.* (2013); Debata *et al.* (2015, 2016) and Debata and Palita (2017, 2019). Most recently, Debata and Palita (2019) reported a species of free-tailed bat (molossid) from Similipal Biosphere Reserve (SBR) based on a pup that was spotted lying over a rock adjoining Sitakund Waterfall in the northeastern side of SBR. However, the authors were unable to allocate generic status to the animal and future survey in the area was proposed.

Regarding mammalian diversity of Protected Areas of Odisha, publications by Saha (1995) from Chilika; Tiwari *et al.* (1997; 2002) from Chandaka wildlife sanctuary; Kar (1999), Chadha and Kar (1999) and Venkatraman *et al.* (2016) from Bhitarkanika National Park; Anonymous (1999), Ramakrishna *et al.* (2006) and Palei *et al.* (2015) from Similipal biosphere reserve; Sahu *et al.* (2012) and Murmu *et al.* (2013) from Hadgarh wildlife sanctuary; Murmu *et al.* (2013) and Sahu *et al.* (2014) from Kuldiha wildlife sanctuary are important from conservation and management point of view.

Studies on population estimation, habitat management, population dynamics and various biological requirements of mammalian fauna have been undertaken on large carnivores and elephants. But, such studies are mostly confined to Similipal Tiger Reserve (Choudhury, 1970, 1971, 1972 and 1974; Singh,

1993, 1995, 1997, 1999 and 2000; Srivastava and Singh, 1997, 1998; Srivastava *et al*., 1998; Singh and Swain, 2003; Palei *et al*., 2016 a and b). Besides, ecological studies on bats (Debata and Palita, 2019; Debata *et al.* 2019); primates (Chaudhuri *et al.,* 2007, Ramakrishna *et al.,* 2008, Murmu *et al.,* 2011); blackbucks (Kar, 2001; Mahato *et al.,* 2010; Das and Kar, 2011; Murmu *et al*., 2013); gaur (Parida *et al*., 2015); dolphins (Dandapani, 1992; 1997; Sahu *et al*., 1998; Sutaria and Jefferson, 2004; Khan *et al*., 2011) are of immense importance in addressing conservation issues in the state. Srivastava (2009) published a note on a status survey of wild buffalo in the state that infers uncertainty over the existence of wild buffalo in the state with a possibility, as also opined by Moone (1930), that some individuals might be still visiting the borders of Odisha and Chhattisgarh. A study conducted on the population structure of gaur in Kuldiha wildlife sanctuary from 2007 to 2013 indicated that adult females were found to be more in number than males, calves, and juveniles and their overall population was double than the adult males (Parida *et al*., 2015). The state forest department also conducts periodic census for mammalian species like elephant, tiger, leopard, dolphins, and blackbuck to monitor their status for conservation and management purposes which are available through the annual publication of Wildlife Odisha, the annual activity report of the Wildlife Wing of the department.

After the checklist on mammals of Odisha by Das *et al*. (1993) and Mishra *et al*. (1996), there was no consolidated information on this group from the state. The present work is a compilation of updated information on mammals of Odisha after a gap of more than two decades. The prime objectives of the study are to present a state-of-the-art report on extant mammals of Odisha highlighting the conservation status of each species. Updated information on distribution and population trends has been provided towards a better understanding of the spatial distribution of the mammalian species in and outside the Protected Areas. Underlying threats and conservation needs are discussed briefly.

2. STUDY AREA AND METHODOLOGY

The information given here is based on field studies carried out in various parts of Odisha including Protected Areas for over 15 years. Odisha represents an amalgamation of three biogeographic zones: the Deccan Peninsula (Chotanagpur and Eastern Highlands), Lower Gangetic Plain and East Coast (Rodgers *et al.* 2002). Also, the state has been divided into three phytogeographic regions namely, Deccan Plateau, Eastern Ghats and the Coastal Plains (Meher-Homji, 2001) making it a rich biodiversity repository. The state has an area of 1, 55,707 km^2 with a coastline of nearly 480 km and most parts of the state are covered with mountain ranges with the highest peak of 1672m at Deomali in Koraput district. As per FSI (2019), the forest cover of the state is 33.15 % comprising 4.47 % very dense forest, 13. 84 % moderately dense forest, 14.83 % open forest and 2.84 % scrub forest. The vegetation of Odisha falls under four types such as Semi-evergreen forests, Tropical moist deciduous forests, Tropical dry-deciduous forests, and Littoral and Tidal swamp forests (Champion and Seth, 1968; Panigrahi, 1983) with moist deciduous Sal forest being the most dominating area-wise.

The broken hilly terrain running parallel to the east coast of India is popularly known as Eastern Ghats (Mani, 1974; Jaykumar *et al*., 2008). Geology and unique biodiversity give a special status to the Eastern Ghats that comprise a major portion of Odisha (Mani, 1974). The Ghats (11° 31'and 21° 0'

North and 77° 22'and 85° 21' East) extend over 1,750 km between the rivers Mahanadi in Odisha and Vaigai in Tamil Nadu. It is spread over 75000 km^2 with an average width of 200 km in the north and 100 km in the south (Pullaiah, 2002). The mountain ranges are of mid-elevation with the highest peak of 1750m at the Biliriangan Hills, Tamil Nadu (Das, 1998). Mahanadi basin forms the northernmost boundaries while the Nilgiri Hills form the southern boundary of the Eastern Ghats (Das and Baur, 2000). The Eastern Ghats merge with the tips of the Bastar, Telangana and Karnataka plateaux and Tamil Nadu uplands in the west, while it is limited in the east by the coastal areas (Pullaiah, 2002). In the state, Eastern Ghats spreads across fifteen out of 30 districts of Odisha namely, Angul (part), Dhenkanal (part), Sambalpur (part), Bolangir (part), Nayagarh, Khurdha, Cuttack (part), Puri (part), Boudh, Kandhamal, Kalahandi, Ganjam, Gajapati, Koraput, and Rayagada.

Eastern Ghats landscape has a unique geological history and is older than the Western Ghats and Himalayas. Geologically, the Eastern Ghats Belt (EGB) is a high-grade terrain bounded by the Singhbhum craton in the north and the Bastar craton, the Dharwar craton and the Nellore-Khammam Schist Belt in the west (Mukhopadhaya and Basak, 2009). Based on geological history, Dobmeier and Raith (2003) divided EGB into four provinces *viz*. Jeypore Province, Krishna Province, Eastern Ghats Province, and Rengali Province.

Protected Areas of Odisha include 19 wildlife sanctuaries, one national park, one biosphere reserve, two tiger reserves (Similipal and Satkosia Tiger Reserves) and three elephant reserves (Mayurbhanj ER, Mahanadi ER, and Sambalpur ER). Additionally, one National Park (Similipal), one Tiger Reserve (Sunabeda) and two Elephant Reserves (Baitarani and South Odisha) are pending for approval. The protected area network spans over 10.37% of the total forest area and 5.36% of the total geographical area of the State. Apart from these, significant areas of forests are managed by local communities along with the forest department. There are also eight Important Bird Areas (IBAs) in Odisha namely, Bhitarkanika, Chilika, Chandaka-Dampara, Similipal, Satkosia, Sunabeda, Mangalajodi and Hirakud Reservoir (Debrigarh). As per the provision of the Biodiversity Act, 2002, section 37, there is one Biodiversity Heritage Site in Odisha (Mandasaru, Phulbani Forest Division) and five are pending approval.

The data presented here is a comprehensive output of information based on field surveys carried out by the authors and extensive study of relevant literature. The management plans of the protected areas were reviewed to make it pragmatic and conservation oriented. Interviews with the local community, forest department staff, conservationists and NGO bodies (n=342) helped to document information on poaching, the status of mammals and peoples' perspective towards conservation of wild mammals in the study area. During the survey, some species of small mammals were also collected from outside protected areas for further taxonomic studies and the ones sighted in the protected areas were photo-documented. Threats to a particular species of mammal were assessed based on information collected during field visits, interviews with various stakeholders, media reports and forest department records. The distribution pattern of each species was provided based on primary and secondary data and available vernacular names were provided for some of the species. The work follows the current taxonomic status as per Wilson and Reeder (2011). The online edition Wilson and Reeder (2005) was referred for most of the species from https://www.departments.bucknell.edu/biology/resources/msw3/ along with more recent published taxonomic literature for some species. Current conservation status

and taxonomic notes for some species were also adopted from the IUCN website (https://www.iucnredlist.org/), which were referred for individual species and cited in the reference. Species listed under various schedules were referred from the Wild Life (Protection) Act, 1972. The local status of the species was provided based on the sighting records in the study area. The common English name and the vernacular Odia name for each species were mentioned as abbreviations, such as 'E' for English and 'O' for Odia.

3. RESULTS AND DISCUSSION

Table-1 details the list of mammal species found in Odisha belonging to various orders and families. Table-2a depicts a list of mammal species earlier recorded by their old names against their current nomenclature as per Wilson and Reeder (2011) and current taxonomic status. Table 2b lists mammalian species that are already extinct but mentioned in the earlier checklists or were wrongly reported by various workers and are not included in the present checklist.

Table 1. Composition of wild mammalian species of Odisha

Sl. No.	Order	Family	Species
1	Proboscidea	Elephantidae	1
2	Scandentia	Tupaiidae	1
3	Primates	Cercopithecidae	3
4	Rodentia	Sciuridae	4
		Muridae	12
		Hystricidae	1
5	Logomorpha	Leporidae	1
6	Soricomorpha	Soricidae	3
7	Chiroptera	Pteropodidae	3
		Rhinolophidae	2
		Hipposideridae	5
		Megadermitidae	2
		Rhinopomatidae	2
		Emballonuridae	3

		Vespertilionidae	8
8	Pholidota	Manidae	1
9	Carnivora	Felidae	6
		Viverridae	3
		Hyaenidae	1
		Herpestidae	4
		Canidae	4
		Ursidae	1
		Mustelidae	3
10	Artiodactyla	Suidae	1
		Tragulidae	1
		Cervidae	4
		Bovidae	5
		Antilocarpidae	1
11	Cetacea	Balenopteridae	3
		Delphinidae	11
		Phocoenidae	1
		Physeteridae	1
		Kogiidae	1
		Platanistidae	1
	Total	**34 families**	**103 species**

Table 2a. Mammal species as mentioned by various authors based on old names and their current nomenclature.

Sl. No	Name of the species (Old name)	References	Current name/ Current taxonomic status
1	*Taphozous saccolaimus crassus* (Blyth, 1844)	Wroughton (1915)	*Saccolaimus saccolaimus* (Temminck, 1838)
2	*Pipistrellus mimus* Wroughton, 1899	Wroughton (1915); Das and Agrawal (1973); Das *et al*. (1993).	*Pipistrellus tenuis* (Temminck, 1840)
3	*Cervus unicolor niger* Blainville, 1816	Das *et al*. (1993); Mishra *et al*. (1996)	*Rusa unicolor* (Kerr, 1792)
4	*Cervus duvauceli* Cuvier, 1823	Das *et al*. (1993); Mishra *et al*. (1996)	*Rucervus duvaucelii* (G. Cuvier, 1823)
5	*Tragulus menina* (Erxleben, 1777)	Behura and Guru (1969); Das *et al*. (1993); Mishra *et al.* (1996)	*Moschiola indica* (Gray, 1852)
6	*Muntiacus muntjak malabaricus* Lydekker, 1915	Behura and Guru (1969); Das et al. (1993); Mishra et al. (1996); Sahu et al. (2012); Sahu et al (2014)	*Muntiacus vaginalis* (Boddaert, 1785)
7	*Bubalus bubalis* (Linnaeus, 1758)	Behura and Guru (1969); Das *et al*. (1993); Mishra *et al.* (1996)	*Bubalus arnee* (Kerr, 1792)
8	*Herpestes auropunctatus* (Hodgson)	Behura and Guru (1969); Das *et al*. (1993); Mishra *et al.* (1996), Tiwari et al., (2002)	*Urva auropunctatus* (Hodgson, 1836)
9	*Herpestes edwardsi* (Geoffroy)	Mishra *et al.* (1996), Tiwari et al. (2002), Sahu et al., (2012);	*Urva edwardsi* (I. Geoffroy S-H, 1818)
10	*Herpestes smithii* (Gray)	Sahu *et al*., (2012)	*Urva smithii* Gray, 1837
11	*Herpestes vitticollis* (Bennet)	Mishra *et al.* (1996), Nayak *et al.,* (2014)	*Urva vitticollis* Bennet, 1835
12	*Felis bengalensis* Kerr, 1792	Das *et al*. (1993); Mishra *et al*. (1996)	*Prionailurus bengalensis* (Kerr, 1792)
13	*Felis viverrina* Bennett, 1833	Das *et al*. (1993); Mishra *et al*. (1996)	*Prionailurus viverrinus* (Bennett, 1833)

Table 2b. Doubtful and locally extinct species reported from Odisha.

Sl. No.	Name of the species	References	Current name/ Current status
1	*Felis caracal schmitzi* Matschie, 1912	Behura and Guru (1969), Das *et al*. (1993)	The species was recorded based on news paper report from Mayurbhanj. Its occurrence in the state is highly unlikely.
2	*Acinonyx jubatus venaticus* (Griffith, 1821)	Behura and Guru (1969); Mukherjee (1982); Das *et al*. (1993); Mishra *et al*. (1996).	Extinct from Odisha and India.
3	*Felis marmorata* (Martin, 1836)	Mishra *et al*. (1996)	*Pardofelis marmorata* (Martin, 1836) highly unlikely to occur in Odisha
4	*Dugong dugong* Müller, 1776	Mishra *et al*. (1996), Sarkar *et al*. (2015)	Locally extinct from Odisha, not reported for more than a century.

3.1. SYSTEMATIC ACCOUNT AND DISTRIBUTION OF MAMMALS OF ODISHA

In this paper, an annotated checklist, distribution and status of the extant species of mammals of Odisha has been provided. Information on distribution localities recorded by various authors has been cited as and where possible and new information on localities has been presented based on the present study. Information on the worldwide species diversity at higher taxonomic levels and the number of species and subspecies recorded from India has also been provided. Conservation status comprising status as per the Indian Wild Life (Protection) Act, 1972, IUCN red list, CITES and the local status of each species has been given. Known distribution with locality information has been provided based on previously published literature and surveys undertaken during the study period. Additionally, remarks have been provided on taxonomy, ecological and natural history aspects as and where required.

ORDER PROBOSCIDEA ILLIGER, 1811

Elephant

(Worldwide distribution: 1 family)

FAMILY ELEPHANTIDAE GRAY, 1821

(Worldwide distribution: 2 genera, 3 species)

GENUS *ELEPHAS* LINNAEUS, 1758

(Worldwide distribution: 1 species and 3 subspecies; India: 1 species and 1 subspecies)

1. *Elephas maximus indicus* (Cuvier, 1798)

Asian Elephant (E); Hati (O)

Conservation status: IW (P) A, 1972- Schedule- 1; IUCN- EN; CITES: Appendix-I; Local status- Common.

Distribution: Odisha's elephants belong to the eastern region population (Sar and Varma, 2004) and the distribution range of this population in the state spans over 57% of the total geographical area. Till the nineteenth century, the elephants of Odisha were only confined to northern parts but presently they range across 47 out of 55 terrestrial forest divisions of the state. As per the latest state-wide elephant census conducted in 2017, a total of 1976 elephants were recorded from the state comprising 344 adult males, 1092 adult females, 38 of unknown sex and 502 calves. The elephant population was highest in Angul circle (665), followed by Baripada circle (635), Rourkela circle (187), Sambalpur circle (182), Berhampur circle (148), Bhawanipatna circle (95), Bhubaneswar circle (48) and Koraput circle (16).
India: North East, South India, Bihar, Jharkhand, Uttarakhand, Uttar Pradesh, and West Bengal. *Elsewhere*: Bangladesh, China, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Sri Lanka, Thailand, and Vietnam.

ORDER SCANDENTIA WAGNER, 1855

Treeshrew

(Worldwide distribution: 2 families)

FAMILY TUPAIIDAE GRAY, 1825

(Worldwide distribution: 4 genera, 19 species)

GENUS *ANATHANA* LYON, 1913

(Worldwide distribution: 1 species; India: 1 species; Odisha: 1 species)

2. *Anathana ellioti* (Waterhouse, 1850)

Madras treeshrew (E); Gacha chuchundra (O)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Appendix- II; Local status- Uncommon.

Distribution: The Odisha population is referred to the subspecies *A. elliotii palida* Lyon, 1913, which has been recorded from Sambalpur and Khariar forests by Ball (1877); Chilika lake, Puri district by Hinton and Lindsay (1926); Satkosia Wildlife Sanctuary, Kotagarh Wildlife Sanctuary and Kalahandi Forest Division (Madanpur-Rampur) by Das *et al.,* (1993); Chandaka Wildlife Sanctuary by Tiwari *et al.* (2002). The present study reports occurrence of the species from Similipal Tiger Reserve (Pithabata, Bangiriposi, Dudhiani, Kendumundi, Thakurmunda, Kaptipada, and Udala ranges); Kuldiha wildlife sanctuary and Nilagiri of Balasore district; Keonjhar district (Sana ghagara, Kanjipani, Gandhamardan,

and Bada ghagara); Cuttack division (Choudwar, Chandikhol and Tangi forests); Athagarh forest division (Athagarh, Narsinghapur, Budhabudhi ghati); Dhenkanal division (Saptasajya, Kaiplas Wildlife Sanctuary and Kamakhyanagar forests); Khurdha division (Barbara RF); Angul division (Mandaragiri, Chendipada and Malyagiri RF); Boudh district; Berhampur division (Kerandimal RF and Singharaj RF); Parelakhemundi division (Mahendragiri and adjacent forests); Bolangir division (Nrusinghanath and Harisankar hills); Karlapat Wildlife Sanctuary of Kalahandi (S) division; Koraput division (Deomali, Panchapatmali, Nandapur (Ranijhar) and Potangi hills); Rayagada division (Gumma RF); and Bonai division (Khandadhar hill).

*India***:** South of Ganges river, eastern, central, southwestern and southern parts of peninsular India. Endemic to India.

Bionomics: This species inhabits deciduous forests and mostly sighted in the fringe forests. Ball (1877) mentioned that this species is more commonly found in sal forests.

Remarks: Chorazyna and Kurup (1975) mentioned that *Anathana ellioti* is rare in the wild as well as in captivity and is of no economic importance to humans. However, in Similipal this species is incidentally poached as bushmeat by using catapult as and when encountered by the hunters. This species was earlier considered as a primitive primate. They were popular experimental subjects in neurobiology and neuro-anatomy.

ORDER PRIMATES LINNAEUS, 1758

Monkeys and Leaf monkey

(Worldwide distribution: 2 suborders, 15 families)

FAMILY CERCOPITHECIDAE GRAY, 1821

(Worldwide distribution: 21 genera, 135 species)

GENUS *MACACA* LACÉPÈDE, 1799

(Worldwide distribution: 21 species; India: 8 species; Odisha: 2 species)

3. *Macaca mulatta* (Zimmermann, 1780)

Rhesus macaque (E); Paatimankada (O)

Conservation status: IW(P)A, 1972- Schedule- II (Part-1); IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: Widely distributed across the state in forests (including mangrove swamps) and human-dominated landscapes.

India: North and North East India. *Elsewhere*: Afghanistan, Nepal, Pakistan, Bhutan to Thailand including China.

4. *Macaca radiata* (É. Geoffroy, 1812)

Bonnet macaque (E)

Conservation status: IW(P)A, 1972- Schedule- II (Part-1); IUCN- LC; CITES: Not listed; Local status- Very rare.

Distribution: Rare in the state and only recorded from Malkanigiri district (Mishra *et al*., 1996).

India: South India, Gujarat and Maharashtra. Endemic to India.

Remarks: Present status unknown and a status survey may be carried out to locate the population.

GENUS *SEMNOPITHECUS* DESMAREST, 1822

(Worldwide distribution: 7 species; India: 7 species; Odisha: 1 species)

5. *Semnopithecus entellus* (Dufresne, 1797)

Northern plains langur (E); Hanumankada (E)

Conservation status: IW(P)A, 1972- Schedule- II (Part-1); IUCN- LC; CITES: Appendix- I; Local status- Common.

Distribution: Widely distributed in the state.

India: Throughout India, except North East India, Himalayas, and Uttar Pradesh. Endemic to India.

ORDER RODENTIA BOWDICH, 1821

Palm squirrels, rats, mice and porcupine

(Worldwide distribution: 5 suborders, 34 families, 2337 species)

This is the largest mammalian order comprising nearly 41% of total mammalian species recorded. In Odisha, the order is represented by 15 species under three suborders (Sciuromorpha, Myomorphs, and Hystricomorpha), three families and 11 genera.

SUBORDER SCIUROMORPHA BRANDT, 1855

FAMILY SCIURIDAE FISCHER, 1817

(Worldwide distribution: 58 genera, 285 species)

GENUS *FUNAMBULUS* LESSON, 1835

(Worldwide distribution: 5 species; India: 5 species; Odisha: 2 species)

6. *Funambulus palmarum* (Linnaeus, 1766)

Three-striped squirrel (E); Tinigaria gunduchi (O)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: Sporadically distributed; common in the southern parts of the state. Records of the species are from Balugaon and Chilika lake area of Puri district, Tikarpada of Angul district, Kotagarh Wildlife Sanctuary of Phulbani district, Tarasingi forest of Berhampur division, Madanpur-Rampur of Kalahandi (N) division and Kashipur of Rayagada division by Das *et al.* (1993). Mishra *et al.* (1996) mentioned its distribution throughout the state, which might not stand true as both three and five-striped squirrels generally do not occur in sympatry. Apart from the above-mentioned reports by Das *et al.* (1993), this species is known with certainty from Ganjam district (Chatrapur, Khallikote, Aska, Digapahandi, Sorada); Kandhamal district (Daringbadi, Simonbadi, Phulbani, Kalinga ghati, Baliguda, Kotagarh Wildlife Sanctuary, and Raikia); Nayagarh district (Daspalla, Banigocha, Nayagarh town, Charichaka); Khurdha district (Barbara, Chandaka Wildlife Sanctuary, Balugaon and RPRC campus and Unit-IV market of Bhubaneswar) and Gajapati district (Parelakhemundi, Gandahati, Mohana and Chandragiri).

India: South India, Bihar, Maharashtra, Madhya Pradesh, and West Bengal. *Elsewhere*: Sri Lanka.

7. *Funambulus pennantii* Wroughton, 1905

Five-striped squirrel (E); Gunduchi musa (O)

Conservation status: IW(P)A, 1972- Schedule- IV; IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: Throughout the state. More commonly distributed than that of three-striped squirrel and is found associated with human habitation.

India: Central, North and North East India and Andaman and Nicobar Islands. *Elsewhere*: Iran, Nepal, and Pakistan.

Threats: As such, no threats are presently envisaged but historically (till 90's) nomadic tribe from Central India used to hunt them on large-scale and after consuming the meat the stuffed animals were sold as trophies. Although in recent days no such mass hunting incidents are recorded, sporadic hunting for bushmeat by the forest-dwellers continues.

GENUS *RATUFA* GRAY, 1867

(Worldwide distribution: 4 species; India: 3 species; Odisha: 1 species)

8. *Ratufa indica* (Erxleben, 1777)

Indian giant squirrel (E); Nepali musa/ Belari musa (O)

Conservation status: IW(P)A, 1972- Schedule- II (Part-II); IUCN- LC; CITES: Appendix- II; Local status- Common.

Distribution: This species is an inhabitant of woodlands with fair canopy connectivity and prefer microhabitat along the riparian zones. Records are from Balasore district (Daripokhari); Similipal tiger reserve; Satkosia Wildlife Sanctuary (Baghamunda, Purunakote, and Tikarpada); Badrama Wildlife Sanctuary; Khurdha district (Barbara and Dhuannali RF); Kotagarh Wildlife Sanctuary; and Berhampur division (Taptapani and Tarasingi RF) by Das *et al*. (1993). Protected areas and Reserve forests and are rarely seen outside Protected Areas.

India: Odisha, Andhra Pradesh, Chhattisgarh, Gujarat, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra and Tamil Nadu. Endemic to India.

Bionomics: It is a canopy dwelling arboreal species, diurnal in habit and has a wide preference for food choice. Several studies have been undertaken on feeding and nesting habits of this species in Similipal, Karlapat, Kapilas, and Kuldiha Wildlife Sanctuaries (Rout and Swain, 2006; Pradhan *et al.,* 2012; Nayak, 2012; Nayak *et al*., 2015).

Threats: Poaching for bushmeat and habitat destruction in terms of deforestation and large scale logging leading to discontinuous habitat are the major threats to the species. Anthropogenic disturbances, hunting for traditional medicine and forest fire are also serious threats to the species. Poachers, including teenagers, were observed poaching for this species for bushmeat with catapults, trained dogs and with bow and arrow, a common phenomenon throughout the state including Protected Areas such as Similipal, Kuldiha and Lakharivalley.

GENUS *PETAURISTA* LINK, 1795

(Worldwide distribution: 8 species; India: 5 species; Odisha: 1 species)

9. *Petaurista philippensis* (Elliot, 1839)

Giant Indian flying squirrel (E); Udantaa gunduchi/ Masaan chadei (O)

Conservation status: IW(P)A, 1972- Schedule- II (Part-II); IUCN- LC; CITES: Not listed; Local status- Uncommon.

Distribution: Sundargarh, Nuapada, Dhenkanal, Angul, Sambalpur, Kalahandi and Rayagada districts and from Protected Areas the species is present in Similipal TR, Satkosia TR, Badrama WLS, Lakhari Valley WLS, Rairakhol division, Malyagiri, Barbara RF, Niyamgiri RF (Ball, 1877, Behura and Guru, 1969, Das *et al*., 1993, Mishra *et al.*, 1996). This species is uncommon, though distributed in a wider landscape. Because of its nocturnal and cryptic habit, it remains unnoticed.

India: South India, Assam, Bihar, Odisha, Madhya Pradesh, Maharashtra, Gujarat, Goa, Rajasthan, and West Bengal. *Elsewhere*: China, Laos, Myanmar, Sri Lanka, Taiwan, Thailand, and Vietnam.

Bionomics: This species is nocturnal in habit, inhabiting dry and moist deciduous forests, orchards and grooves. During the study, several populations were observed across the state residing in large trees at the village outskirts or orchards. However, it goes unnoticed by the villagers owing to its secretive habit.

SUBORDER MYOMORPHA BRANDT, 1855

FAMILY MURIDAE ILLIGER, 1811

(Worldwide distribution: 150 genera, 752 species)

This family is represented by 12 species under 8 genera. Das *et al.* (1993) reported 9 species under this family whereas Mishra *et al*. (1996) mentioned about 9 species excluding *M. blanfordi* but included *R. norvegicus*. In the present work, 12 species are enlisted based on the previous reports and additional observations by the authors.

GENUS *BANDICOTA* GRAY, 1873

(Worldwide distribution: 3 species; India: 3 species; Odisha: 2 species)

10. *Bandicota bengalensis* (Gray and Hardwicke, 1833)

Lesser bandicoot rat (E); Gatua musa (O)

Conservation status: IW(P)A, 1972- Schedule- V; IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: Throughout the state (Mishra *et al.,* 1996).

India: Almost throughout the country. *Elsewhere*: Malaysia, Myanmar, Nepal, Pakistan, Sri Lanka, and Thailand.

11. *Bandicota indica* (Bechstein, 1800)

Large bandicoot rat (E); Bada gatua musa (O)

Conservation status: IW(P)A, 1972- Schedule- V; IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: Throughout the state (Mishra *et al.,* 1996).

India: Almost throughout the country. *Elsewhere*: Bangladesh, Cambodia, China, Hong Kong, Laos, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, and Vietnam.

GENUS *MADROMYS* SODY, 1941

(Worldwide distribution: 1 species; India: 1 species; Odisha: 1 species)

12. *Madromys blanfordi* (Thomas, 1881)

Blanford's rat (E)

Conservation status: IW(P)A, 1972- Schedule- V; IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: Chandaka-Dampara Wildlife Sanctuary, Similipal BR, Hadgarh WLS, Kuldiha WLS, Satkosia WLS, Kapilas WLS, Kotgarh WLS, Sunabeda WLS, Keonjhar and Mayurbhanj districts (Tiwari *et al*., 2002; Agrawal, 2000; present study).

India: South India, Bihar, Goa, Madhya Pradesh, Maharashtra, Odisha and West Bengal. *Elsewhere*: Bangladesh and Sri Lanka.

GENUS *GOLUNDA* GRAY, 1837

(Worldwide distribution: 1 species; India: 1 species; Odisha: 1 species)

13. *Golunda ellioti* Gray, 1837

Indian bush rat (E); Dalua musa (O)

Conservation status: IW(P)A, 1972- Schedule- V; IUCN- LC; CITES: Not listed; Local status- Uncommon.

Distribution: Chandaka-Dampara Wildlife Sanctuary and Puri district (Tiwari *et al.*, 2002; Das *et al.*, 1993 and Agrawal, 2000).

India: Almost throughout the country. *Elsewhere*: Iran, Nepal, Pakistan, and Sri Lanka.

GENUS *MUS* LINNAEUS, 1758

(Worldwide distribution: 38 species; India: 10 species; Odisha: 3 species)

14. *Mus booduga* (Gray, 1837)

Little Indian field mouse (E)

Conservation status: IW(P)A, 1972- Schedule- V; IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: Throughout the state (Mishra *et al.,* 1996).

India: Almost throughout the country. *Elsewhere*: Bangladesh, Myanmar, Nepal, Pakistan, and Sri Lanka.

15. *Mus musculus* Linnaeus, 1758

House Mouse (E)

Conservation status: IW(P)A, 1972- Schedule- V; IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: Throughout the state (Mishra *et al.,* 1996).

India: Almost throughout the country. *Elsewhere*: Cosmopolitan. Spread throughout most of the world in association with humans.

Remarks: Non-native/ introduced species (Ommer, 2000).

16. *Mus phillipsi* Wroughton, 1912

Wroughton's Small Spiny Mouse (E)

Conservation status: IW(P)A, 1972- Schedule- V; IUCN- LC; CITES: Not listed; Local status- Rare.

Distribution: Mahendragiri hills of Gajapati District (Mohapatra *et al.*, 2019, in press).

India: Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Odisha, Rajasthan and Tamil Nadu. Endemic to India.

Remarks: First report from the state (Mohapatra *et al*., in press).

GENUS *RATTUS* FISCHER, 1803

(Worldwide distribution: 66 species; India: 11 species; Odisha: 2 species)

17. *Rattus norvegicus* (Berkenhout, 1769)

Brown rat (E)

Conservation status: IW(P)A, 1972- Schedule- V; IUCN- LC; CITES: Not listed; Local status- Uncommon/ doubtful.

Distribution: Throughout the state (Mishra *et al.,* 1996).

India: Almost throughout the country (Alfred *et al.,* 2002, 2006; Pradhan and Talmale, 2011; Sharma *et al.,* 2013). *Elsewhere*: South-east Siberia, north-east China and parts of Japan, but it occurs worldwide as an introduced species.

Remarks: Non-native/ introduced species (Ommer, 2000). The distribution record of the species throughout the state by Mishra *et al.,* (1996) and its distribution throughout the country is debatable.

18. *Rattus rattus* (Linnaeus, 1758)

House rat (E)

Conservation status: IW(P)A, 1972- Schedule- V; IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: Throughout the state (Mishra *et al.,* 1996).

India: Almost throughout the country. *Elsewhere*: Introduced worldwide in the tropics and temperate zones.

GENUS *VANDELEURIA* GRAY, 1842

(Worldwide distribution: 3 species; India: 2 species; Odisha: 1 species)

19. *Vandeleuria oleracea* (Bennett, 1832)

Indian long-tailed tree mouse (E)

Conservation status: IW(P)A, 1972- Schedule- V; IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: Throughout the state (Mishra *et al.,* 1996).

India: Almost throughout the country. *Elsewhere*: Bangladesh, Bhutan, Cambodia, China, Myanmar, Nepal, Sri Lanka, Thailand and Vietnam.

GENUS *CREMNOMYS* WROUGHTON, 1912

(Worldwide distribution: 2 species; India: 2 species; Odisha: 1 species)

20. *Cremnomys cutchicus* Wroughton, 1912

Cutch Rat (E); Pahadi musa (O)

Conservation status: IW(P)A, 1972- Schedule- V; IUCN- LC; CITES: Not listed; Local status- Very rare.

Distribution: This species has been known from Odisha without any specific locality (Ellerman 1961, Alfred and Chakraborty, 2002). However, in the subsequent literature (Das *et al.*, 1993; Mishra *et al.*, 1996 and Molur *et al.*, 2005) the authors remained silent about its distribution in the state. During the survey, this species was recorded from Khandadhar area of Bonai forest division (pers. obs.).

India: Andhra Pradesh, Bihar, Gujarat, Jharkhand, Karnataka, Odisha, Rajasthan and Tamil Nadu. Endemic to India.

GENUS *TATERA* LATASTE, 1882

(Worldwide distribution: 1 species; India: 1 species; Odisha: 1 species)

21. *Tatera indica* (Hardwicke, 1807)

Antelope rat (E)

Conservation status: IW(P)A, 1972- Schedule- V; IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: Throughout the state (Mishra *et al.,* 1996).

India: South India, Bihar, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Madhya Pradesh, Maharashtra, Odisha, Punjab, Uttar Pradesh and West Bengal. *Elsewhere*: Afghanistan, Iran, Iraq, Kuwait, Nepal, Pakistan, Sri Lanka, Syrian Arab Republic and Turkey.

SUBORDER HYSTRICOMORPHA BRANDT, 1855
FAMILY HYSTRICIDAE G. FISCHER, 1817
(Worldwide distribution: 3 genera, 11 species)
GENUS *HYSTRIX* LINNAEUS, 1758

22. *Hystrix indica* Kerr, 1792
(Worldwide distribution: 8 species; India: 2 species; Odisha:1 species)
Indian Crested porcupine (E), Jhinka (O)

Conservation status: IW(P)A, 1972- Schedule- IV; IUCN- LC; CITES: Not listed; Local status- Common.
Distribution: Throughout the state.
India: Almost throughout the country. *Elsewhere*: Afghanistan, Armenia, Azerbaijan, China, Georgia, Iran, Iraq, Israel, Jordan, Kazakhstan, Nepal, Pakistan, Saudi Arabia, Sri Lanka, Turkey, Turkmenistan and Yemen.
Bionomics: This species inhabits grasslands, deciduous forest and is also found in mangrove forests. Porcupines are colonial and make their warrens by digging tunnels under bushes or in caves.
Threats: This species is poached for the meat; quills, intestine and bezoar in traditional medicine. Hunting methods involve beating by stick, trapping by snares and by smoking the dens. Tribal people in south Odisha smoke the holes by closing it from all sides and after several hours the carcasses are collected by entering inside the den. The trafficking of this animal to China and Vietnam has increased manifold in recent years

ORDER LAGOMORPHA BRANDT, 1855
Hare
(Worldwide distribution: 3 families, 92 species)
FAMILY LEPORIDAE FISCHER, 1817
(Worldwide distribution: 11 genera, 61 species)
GENUS *LEPUS* LINNAEUS, 1758
(Worldwide distribution: 32 species; India: 3 species; Odisha: 1 species)

23. *Lepus nigricollis* F. Cuvier, 1823
Indian hare (E); Thekuaa/ Karia/ Kudara (O)
Conservation status: IW(P)A, 1972- Schedule- IV; IUCN- LC; CITES: Not listed; Local status- Common.
Distribution: This species is commonly distributed throughout the state.
India: Almost throughout the country. *Elsewhere*: Bangladesh, Indonesia, Mauritius, Réunion, Pakistan, Nepal, Seychelles, and Sri Lanka.

ORDER SORICOMORPHA GREGORY, 1910

Shrews

(Worldwide distribution: 3 families, 428 species)

The earlier Order Insectivora assigned to the species of shrews is now replaced by Soricomorpha based on phylogenetic studies (Wilson and Reeder, 2005).

FAMILY SORICIDAE FISCHER, 1814

(Worldwide distribution: 26 genera, 385 species)

GENUS *SUNCUS* EHRENBERG, 1832

(Worldwide distribution: 18 species; India: 5 species; Odisha: 3 species)

24. *Suncus murinus* (Linnaeus, 1766)

Gray musk shrew (E); Chuchundra (O)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: Common throughout Odisha.

India: Almost throughout. *Elsewhere*: Throughout Asia.

Bionomics: This species is mostly encountered near human habitation, abandoned settlements and often takes refuge in the sewage systems and drains.

25. *Suncus stoliczkanus* (Anderson, 1877)

Anderson's shrew (E)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Uncommon.

Distribution: Known from few localities in Odisha, mostly in the well wooded forest. The present study reports occurrence of the species for the first time from Odisha, from Barbara RF (Khurdha district) and Satkosia TR.

India: Peninsular India as far north to Punjab. *Elsewhere*: Nepal, Pakistan and doubtful record from Bangladesh (Molur, 2016).

Bionomics: This species was mostly observed in forested areas, close to the waterbody and seen to take refuge under large rock boulders. One individual was also encountered in the Tikarpada forest rest house during a cloudy day in October 2018.

26. *Suncus etruscus* (Savi, 1822)

White-toothed pigmy shrew (E); Bamana chuchundra (O)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: Agarwal *et al*. (1993) and Mishra *et al*. (1996) reported occurrence of this species in Puri and Sundargarh districts. During the present survey, this species was observed from various localities such as Dhenkanal (Kamakhyanagar, Kapilas WLS, Hindol, Anantapur RF and Dhenkanal town); Keonjhar (Sadar, Ghatgaon, Anandapur and Kanjipani), Koraput (Deomali, Jeypore, Nandapur, Koraput town and Potangi), Kalahandi (Karlapat WLS), Khordha (Khandagiri, Chandaka, Rameswar and Barbara RF), Kandhamal, Phulbani, Sambalpur (Rerhakhol, Debrigarh WLS), Nayagarh

(Maninaga hill), Ganjam (Kalua hill, Ghodahada and Humma-Jhadeswar temple), Cuttack (Athagarh, Narsinghapur, Budha-Budhi ghat road), Gajapati (Mahendragiri), Balasore, Mayurbhanj and Angul districts. This species appears to be distributed throughout except coast and mangrove forests.

India: Almost throughout the country. *Elsewhere*: Widespread from Southern Europe and North Africa, through parts of the Near East and Arabian Peninsula, Central Asia, South Asia and mainland Southeast Asia, to the island of Borneo in the east.

Bionomics: This species inhabits scrub forests, grasslands and deciduous forests. The White-toothed pigmy shrew is one of the smallest terrestrial mammals and is a voracious insect eater, often overpowering insects larger than its size.

ORDER CHIROPTERA BLUMENBACH, 1779

Bats

(Worldwide distribution: 18 families, 1171 species)

This is one of the largest orders accommodating the maximum number of species. Out of 105 species reported from India, 25 species are distributed in Odisha. Das *et al*. (1993) reported 23 species of Chiroptera from different parts of Odisha comprising 3 species of family Pteropidae, 2 species of Rhinopomatidae, 3 species of Emballonuridae, one species Megadermatidae, six species of Rhinolophidae and 8 species of Vespertilionidae. The present documentation reports 25 species based on additional records by Debata *et al.* (2013) and Debata *et al.* (2015).

FAMILY PTEROPODIDAE GRAY, 1821

(Worldwide distribution: 42 genera, 190 species)

GENUS *CYNOPTERUS* F. CUVIER, 1824

(Worldwide distribution: 7 species; India: 2 species; Odisha: 1 species)

27. *Cynopterus sphinx* (Vahl, 1797)

Short-nosed fruit bat (E); Badudi (O)

Conservation status: IW(P)A, 1972- Schedule- V; IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: Throughout the state (Hinton and Lindasay, 1926; Das and Agrawal, 1973; Khaparde, 1980; Das *et al*., 1993; Mishra *et al*., 1996; Debata *et al.,* 2016).

India: Throughout Peninsular India, North East and South India, Andaman and Nicobar Islands.

GENUS *PTEROPUS* BRISSON, 1762

(Worldwide distribution: 65 species; India: 4 species; Odisha: 1 species)

28. *Pteropus giganteus* (Brunnich, 1782)

Indian flying fox (E); Badudi (O)

Conservation status: IW(P)A, 1972- Schedule- V; IUCN- LC; CITES: Appendix-II; Local status- Common.

Distribution: Throughout the state (Hinton and Lindasay, 1926, Das and Agrawal, 1973, Khaparde, 1980, Das *et al*., 1993, Mishra *et al*., 1996, Debata *et al.,* 2016).

India: Throughout the country. *Elsewhere*: Bangladesh, Bhutan, China, Maldives, Myanmar, Nepal, Pakistan and Sri Lanka.

GENUS *ROUSETTUS* GRAY, 1821

(Worldwide distribution: 10 species; India: 2 species; Odisha: 1 species)

29. *Rousettus leschenaulti* (Desmarest, 1820)

Indian fulvous bat (E); Badudi (O)

Conservation status: IW(P)A, 1972- Schedule- V; IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: Throughout the state (Hinton and Lindasay, 1926, Das and Agrawal, 1973, Khaparde, 1980, Das *et al*., 1993, Mishra *et al*., 1996, Debata *et al.,* 2016).

India: Throughout. *Elsewhere*: Bangladesh, Bhutan, Cambodia, China, Indonesia, Laos, Malaysia, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand and Vietnam.

FAMILY RHINOLOPHIDAE GRAY, 1825

(Worldwide distribution: 1 genus, 80 species)

GENUS *RHINOLOPHUS* LACÉPÈDE, 1799

(Worldwide distribution: 77 species; India: 17 species; Odisha: 2 species)

30. *Rhinolophus lepidus* Blyth, 1844

Little Indian horseshoe bat (E)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: Northern, western and eastern parts of the state (Debata *et al.,* 2016), specifically from Bhubaneswar (Khandagiri caves); Puri district; Chandaka WLS; Satkosia TR; Kapilas WLS, Dhenkanal district; Malyagiri, Angul district; Debrigarh WLS; Koira and Bonai of Sundargarh district; Keonjhar; Badrama WLS; Mohana, Gajapati district (Das and Agrawal, 1973; Das *et al*., 1993 and present study).

India: Throughout. *Elsewhere*: Nepal, Pakistan, Bangladesh, Afghanistan, Myanmar, Thailand, Cambodia, Vietnam, Peninsular Malaysia, and Indonesia (Sumatra).

31. *Rhinolophus rouxii* Temminck, 1835

Rufous horseshoe bat (E)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: Mayurbhanj, Balasore, Sundargarh, Puri, Ganjam, Khordha, Kandhamal, Koraput and Bolangir districts (Das *et al.,* 1993; Murmu *et al*., 2013; Debata *et al.,* 2016).

India: North and South India, Chhattisgarh, Goa, Himachal Pradesh, Madhya Pradesh, Maharashtra, Odisha, Sikkim, Uttarakhand and West Bengal. *Elsewhere*: China, Myanmar, Nepal and Sri Lanka.

FAMILY HIPPOSIDERIDAE LYDEKKER, 1891

(Worldwide distribution: 9 genera, 85 species)

GENUS *HIPPOSIDEROS* GRAY, 1831

(Worldwide distribution: 67 species; India: 12 species; Odisha: 5 species)

32. *Hipposideros ater* Templeton, 1848

Dusky Leaf-nosed Bat (E)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Uncommon.

Distribution: Konark temple, Puri district; Gupteswar lime stone caves, Koraput district (Das *et al.,* 1993; Debata *et al.,* 2016).

India: South India, Madhya Pradesh, Maharashtra, Meghalaya, Odisha and Andaman and Nicobar Is. *Elsewhere*: Australia, Indonesia, Malaysia, Myanmar, Papua New Guinea, Philippines, Sri Lanka and Thailand.

33. *Hipposideros fulvus* Gray, 1838

Fulvous leaf-nosed bat (E)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Uncommon.

Distribution: Bhubaneswar, Khurdha district; Harishankar, Bolangir district (Das *et al.,* 1993; Debata *et al.*, 2016).

India: South India, Bihar, Gujarat, Jharkhand, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan and Uttar Pradesh. *Elsewhere*: Afghanistan, Bangladesh, China, Pakistan and Sri Lanka.

34. *Hipposideros galeritus* Cantor, 1846

Cantor's leaf-nosed bat (E)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Uncommon.

Distribution: Sundargarh; Koraput districts and Satkosia TR (Debata *et al.,* 2016; present study).

India: Andhra Pradesh, Bihar, Gujarat, Karnataka, Madhya Pradesh, Maharashtra and Odisha. *Elsewhere*: Bangladesh, Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Sri Lanka, Thailand and Vietnam.

35. *Hipposideros lankadiva* Kelaart, 1850

Sri Lanka gigantic leaf-nosed bat (E)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Uncommon.

Distribution: Bhubaneswar, Chandaka WLS, Khordha district; Similipal Biosphere Reserve; Satkosia TR (Das *et al.,* 1993; Debata *et al.,* 2016).

India: Andhra Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Meghalaya, Odisha, Rajasthan, West Bengal. *Elsewhere*: Bangladesh and Sri Lanka.

36. *Hipposideros speoris* (Schneider, 1800)

Schneider's leafnosed bat (E)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Uncommon.

Distribution: Bhubaneswar, Chandaka wildlife sacnctuary, Khordha district; Mahendragiri hills, Gajapati district; Gupteswar lime stone caves, Koraput district (Khaparde, 1980; Debata *et al.*, 2016).

India: Andhra Pradesh, Gujarat, Karnataka, Kerala, Maharashtra, Tamil Nadu, Odisha and Uttar Pradesh. *Elsewhere*: Sri Lanka.

FAMILY MEGADERMATIDAE ALLEN, 1864

(Worldwide distribution: 4 genera, 5 species)

GENUS *MEGADERMA* E. GEOFFROY, 1810

(Worldwide distribution: 2 species; India: 2 species; Odisha: 2 species)

37. *Megaderma lyra* E. Geoffroy, 1810

Greater false vampire bat (E)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: Puri, Khurdha, Cuttack, Dhenkanal, Angul, Ganjam and Kendrapada districts (Hinton and Lindsay, 1926; Das and Agrawal, 1973; pers. obs.); Koraput district (Debata *et al.*, 2016). Panda *et al.* (2012) reported it from RPRC campus.

India: North East and South India, Bihar, Chhattisgarh, Gujarat, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Uttar Pradesh and West Bengal. *Elsewhere*: Afghanistan, Bangladesh, Cambodia, China, Laos, Malaysia, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand and Vietnam.

Bionomics: This species lives in colonies comprising few individuals to as large as thousands of individuals and prefer humid areas or caves and abandoned human dwellings near water bodies. At Hukitola, Kendrapara district and Gundalava village, Astaranga of Puri district large colonies were observed.

38. *Megaderma spasma* (Linnaeus, 1758)

Lesser false vampire bat (E)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Uncommon.

Distribution: Bonai, Sundargarh district and Gupteswar, Koraput district (Debata *et al.*, 2015; Debata *et al.*, 2016).

India: South India, Andaman and Nicobar Is., Assam, Goa, Madhya Pradesh, Maharashtra, Meghalaya, Mizoram, Odisha and West Bengal. *Elsewhere*: Bangladesh, Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Sri Lanka, Thailand and Vietnam.

Bionomics: This species lives in colonies comprising few individuals to larger groups of up to 30 individuals and the group size varies as per season. In Odisha, this species was found residing in caves in dense and primary forests.

FAMILY RHINOPOMATIDAE BONAPARTE, 1838

(Worldwide distribution: 1 genus, 4 species)

GENUS *RHINOPOMA* E. GEOFFROY, 1818

(Worldwide distribution: 4 species; India: 3 species; Odisha: 2 species)

39. *Rhinopoma hardwickii* Gray, 1831

Lesser rat-tailed bat (E)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: Bhubaneswar, Ganjam, Mayurbhanj and Gajapati districts (Das and Agrawal, 1973; Khaparde, 1980; Das *et al.*, 1993; Debata *et al.*, 2016; present study). Good populations were observed in Puri temple; Khandagiri and Udaygiri caves, Bhubaneswar, Khurdha district; Palur hills and Kerandimal hills, Mahuri kalua temple, Berhampur, Ganjam district; Mahendragiri and Gandahati of Gajapati and Similipal of Mayurbhanj district.

India: Andhra Pradesh, Assam, Bihar, Gujarat, Jammu and Kashmir, Karnataka, Madhya Pradesh, Maharashtra, Manipur, Nagaland, Odisha, Rajasthan, Uttar Pradesh and West Bengal. *Elsewhere*: Widespread across central and northern Africa through Arabia and southern Asia.

Bionomics: Inhabits caves, temples and abandoned buildings and takes refugees in darker zones. They live in colony comprising few individuals to as large as hundreds.

40. *Rhinopoma microphyllum* (Brunnich, 1782)

Larger rat-tailed bat (E)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Uncommon.

Distribution: Bhubaneswar (Khaparde, 1980; Das *et al.,* 1993; Debata *et al.*, 2016).

India: Bihar, Gujarat, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Uttar Pradesh and West Bengal. *Elsewhere*: Extends from northern Africa through southwest Asia to Afghanistan and Pakistan.

Bionomics: Inhabits caves, temples and abandoned buildings and can tolerate light.

FAMILY EMBALLONURIDAE GERVAIS, 1855

(Worldwide distribution: 13 genera, 51 species)

GENUS *SACCOLAIMUS* TEMMINCK, 1838

(Worldwide distribution: 4 species; India: 1 species; Odisha: 1 species)

41. *Saccolaimus saccolaimus* (Temminck, 1838)

Pouch bearing bat (E)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Very rare.

Distribution: Koira, Sundargarh district; Mayurbhanj district (Wroughton, 1915; Das *et al.*, 1993; Debata, pers. comm., 2019).

India: Andaman and Nicobar Is., Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Odisha, Uttar Pradesh and West Bengal. *Elsewhere*: Australia, Bangladesh, Brunei

Darussalam, Cambodia, Indonesia, Malaysia, Myanmar, Papua New Guinea, Philippines, Solomon Islands, Sri Lanka, Thailand and Vietnam.

Remarks: The pouch bearing bat *Taphozous saccolaimus* earlier collected from Koira (vide Wroughton, 1915) is now considered as *Saccolaimus saccolaimus* as per recent taxonomic amendation.

GENUS *TAPHOZOUS* E. GEOFFROY, 1818

(Worldwide distribution: 14 species; India: 5 species; Odisha: 2 species)

42. *Taphozous longimanus* Hardwicke, 1825

Long-armed seath-tailed bat (E)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Uncommon.

Distribution: Bhubaneswar, Konark temple, Khordha district; Puri district; Kopaput district (Das *et al*., 1993; Debata *et al*., 2016).

India: South India, Assam, Bihar, Gujarat, Jharkhand, Madhya Pradesh, Maharashtra, Nagaland, Odisha, Rajasthan, Tripura, Uttar Pradesh and West Bengal. *Elsewhere*: Bangladesh, Cambodia, Indonesia, Malaysia, Myanmar, Nepal, Sri Lanka and Thailand.

43. *Taphozous melanopogon* Temminck, 1841

Black-bearded seath-tailed bat (E)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Uncommon.

Distribution: Sambalpur; Cuttack; Bhubaneswar; Konark, Puri district; Gupteswar limestone caves, Koraput district (Anderson, 1881; Khaparde, 1977; Das *et al*., 1993; Dash *et al.,* 2015; Debata *et al*., 2016).

India: South India, Andaman and Nicobar Is., Bihar, Chhattisgarh, Goa, Gujarat, Madhya Pradesh, Maharashtra, Odisha, Rajasthan. *Elsewhere*: South and Southeast Asia.

FAMILY VESPERTILIONIDAE GRAY, 1821

(Worldwide distribution: 48 genera, 425 species)

GENUS *HESPEROPTENUS* PETERS, 1868

(Worldwide distribution: 5 species; India: 1 species; Odisha: 1 species)

44. *Hesperoptenus tickelli* (Blyth, 1851)

Tickell's bat (E)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Rare.

Distribution: Sundargarh district; Kasipur, Koraput district (Wroughton, 1915; Das and Agrawal, 1973; Das *et al.*, 1993), Rayagada district.

India: Andaman and Nicobar Is., Andhra Pradesh, Assam, Goa, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Tamil Nadu and West Bengal. *Elsewhere*: Nepal, Bhutan, Bangladesh, Sri Lanka, Thailand, Laos, Cambodia, Myanmar and Vietnam.

GENUS *PIPISTRELLUS* KAUP, 1829

(Worldwide distribution: 31 species; India: 10 species; Odisha: 3 species)

45. *Pipistrellus ceylonicus* (Kelaart, 1852)

Kelaart's pipistrelle (E); Chhota Chemeni (O)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: Throughout the state (Das and Agrawal, 1973; Das *et al.*, 1993; Debata *et al.,* 2016; present study).

India: South India, Bihar, Goa, Gujarat, Jharkhand, Madhya Pradesh, Maharashtra, Odisha, Rajasthan and West Bengal. *Elsewhere*: Bangladesh, China, Indonesia, Malaysia, Myanmar, Pakistan, Sri Lanka and Vietnam.

Bionomics: This is a common evening bat found in all possible habitats. It also takes refuge in any small crevices, wooden poles in houses, tree holes etc.

46. *Pipistrellus coromandra* (Gray, 1838)

Indian pipistrelle (E); Chemeniaa/ Chemeni (O)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: Throughout the state (Wroughton, 1915; Das and Agrawal, 1973; Das *et al.,* 1993; Debata *et al.,* 2016).

India: Andaman and Nicobar Is., North East and South India, Bihar, Goa, Gujarat, Jammu and Kashmir, Jharkhand, Madhya Pradesh, Maharashtra, Odisha, Sikkim, Uttarakhand, Uttar Pradesh and West Bengal. Endemic to India.

Bionomics: This is a common evening bat found near human habitations. It also takes refuge in small crevices, wooden poles in houses, tree holes etc.

47. *Pipistrellus tenuis* (Temminck, 1840)

Indian pigmy pipistrelle (E)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: Khurdha, Mayurbhanj, Keonjhar, Sundargarh, Sambalpur, Ganjam, Puri, Dhenkanal, Koraput, Rayagada, Kalahandi, Nayagarh and Kendrapada districts (Wroughton, 1915; Das and Agrawal, 1973; Das *et al*., 1993; present study).

India: Throughout. *Elsewhere*: Throughout much of South Asia, southeastern China and Southeast Asia.

GENUS *SCOTOZOUS* DOBSON, 1875

(Worldwide distribution: 1 species; India: 1 species; Odisha: 1 species)

48. *Scotozous dormeri* Dobson, 1875

Dormer's bat (E)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Rare.

Distribution: Sundargarh, Ganjam, Sambalpur and Bolangir districts (Wroughton, 1915; Das and Agrawal, 1973; Das *et al*., 1993).

India: Almost throughout the country. *Elsewhere*: Bangladesh, Nepal and Pakistan.

GENUS *SCOTOPHILUS* LEACH, 1821

(Worldwide distribution: 12 species; India: 2 species; Odisha: 2 species)

49. *Scotophilus heathii* (Horsfield, 1831)

Greater yellow bat (E)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Uncommon.

Distribution: Nilagiri, Balasore district; Kujanga, Cuttack district; Rerhakhol, Sambalpur district; Barbara RF, Khurdha district; Nayagarh district; Sundargarh; Chilika, Puri district (Annandale, 1915; Wroughton, 1915; Das and Agrawal, 1973; Das *et al*., 1993; Debata *et al.*, 2016).

India: North East, South India, Bihar, Gujarat, Haryana, Jharkhand, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Uttarakhand, Uttar Pradesh and West Bengal. *Elsewhere*: Afghanistan, Bangladesh, Cambodia, China, Indonesia, Laos, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand and Vietnam.

50. *Scotophilus kuhlii* Leach, 1821

Lesser yellow bat (E)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Uncommon.

Distribution: Daripokhari, Balasore district; Kaptipada, Mayurbhanj district; Jashipur, Keonjhar district; Angul; Chilika, Khurdha and Puri districts; Kotagarh WLS, Phulbani district; Tarasingh, Ganjam district (Annandale, 1915; Hinton and Lindsay, 1926; Das and Agrawal, 1973; Das *et al*., 1993; Debata *et al*., 2016).

India: South India, Andaman and Nicobar Is., Assam, Bihar, Gujarat, Jharkhand, Madhya Pradesh, Maharashtra, Meghalaya, Odisha, Rajasthan, Tripura, Uttar Pradesh, Uttarakhand and West Bengal. *Elsewhere*: Bangladesh, Cambodia, China, Hong Kong, Indonesia, Laos, Malaysia, Myanmar, Pakistan, Philippines, Sri Lanka, Taiwan, Thailand, Timor-Leste and Vietnam.

GENUS *KERIVOULA* GRAY, 1842

(Worldwide distribution: 19 species; India: 3 species; Odisha: 1 species)

51. *Kerivoula picta* (Pallas, 1767)

Painted bat (E)

Conservation status: IW(P)A, 1972- Not listed; IUCN- LC; CITES: Not listed; Local status- Rare.
Distribution: Barbara RF, Khordha district; Jeypore, Koraput district; Khallikote RF, Ganjam district; Mahendragiri, Gajapati districts (Blyth, 1863; Das *et al.*, 1993; Debata *et al*., 2016 and present study).
India: Andhra Pradesh, Assam, Goa, Karnataka, Kerala, Maharashtra, Odisha, Rajasthan, Sikkim, Tamil Nadu and West Bengal. *Elsewhere*: Bangladesh, Cambodia, China, Indonesia, Laos, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand and Vietnam.

ORDER PHOLIDOTA WEBER, 1904

Scaly ant eater

(1 family, 8 species)

FAMILY MANIDAE GRAY, 1821

(Worldwide distribution: 1 genus, 8 species)

GENUS *MANIS* LINNAEUS, 1758

(Worldwide distribution: 8 species; India: 2 species; Odisha: 1 species)

52. *Manis crassicaudata* Gray, 1827

Indian pangolin (E); Bajrakapta (O)

Conservation status: IW(P)A, 1972- Schedule 1; IUCN- EN; CITES: Appen. I; Local status- Rare.
Distribution: The Indian Pangolin is a widely distributed species on Peninsular India and occurs in forested areas of the state except for the mangrove and coastal swamps. Recent documentation on the distribution of this species based on rescue and seizure data reviled presence of this species in 14 out of 30 districts of Odisha, namely Cuttack, Ganjam, Jajpur, Puri, Balasore, Nayagarh, Khurdha, Dhenkanal, Kalahandi, Keonjhar, Mayurbhanj, Koraput, Sambalpur and Nawarangpur districts (Mishra and Panda, 2012). Additionally, this species is known from Sambalpur, Nuapada, Boudh, Balasore, Rayagada and Gajapati districts of Odisha.
India: Widely distributed from the plains and lower hills south of the Himalayas to South India. *Elsewhere*: Bangladesh, Pakistan and Sri Lanka.

ORDER CARNIVORA BOWDICH, 1821

Canids, Felids and other lesser carnivores

(Worldwide distribution: 2 suborders, 16 families, 284 species)

Das *et al.* (1993) mentioned about 19 species occurring in Odisha, whereas Mishra *et al*. (1996) reported 22 species including Asiatic Cheetah (which is now extinct from India), Marbled cat and Carcal (which are hitherto believed as mistaken identity). In this work, a total of 22 species are reported excluding the Asiatic cheetah, marbled cat and carcal. Furthermore, the Stripe necked mongoose,

which was recorded by Mishra *et al.* (1996) and further considered mistaken identity by Acharjyo (1999) was included based on Nayak *et al*. (2014). This order is represented by two sub-orders, namely Feliformis comprising 4 families and 14 species and Caniformia comprising 3 families and 8 species in the state. Brief descriptions of the species belonging to these seven families are as follows.

SUBORDER FELIFORMIA KRETZOI, 1945

(Worldwide distribution: 6 families; India: 4 families; Odisha: 4 families)

FAMILY FELIDAE FISCHER, 1817

(Worldwide distribution: 14 genera, 40 species)

GENUS *FELIS* LINNAEUS, 1758

(Worldwide distribution: 7 species; India: 2 species; Odisha: 1 species)

53. *Felis chaus* Schreber, 1777

Jungle cat (E); Katasa/ Banabhuan (O)

Conservation status: IW(P)A, 1972- Schedule- II (Part-II); IUCN- LC; CITES: Appendix-II; Local status- Common.

Distribution: Throughout the state (Behura and Guru, 1969; Das *et al.,* 1993; Mishra *et al.,* 1996).

India: South India, Gujarat, Jammu and Kashmir, Madhya Pradesh, Odisha, Rajasthan, Sikkim, Uttar Pradesh and West Bengal. *Elsewhere*: Egypt, West and Central Asia, South and Southeast Asia.

Bionomics: This species inhabits forested areas, scrublands, agricultural fields and is also found near human habitation. This species is considered as a pest to poultry in some areas of Odisha and there are several unreported cases of depredation by this species in forest fringe villages. Road accident is a major threat to the species and such cases are very high during winter months.

GENUS *PRIONAILURUS* SEVERTZOV, 1858

(Worldwide distribution: 5 species; India: 3 species; Odisha: 3 species)

54. *Prionailurus bengalensis* (Kerr, 1792)

Leopard cat (E); Chitra biradi (O)

Conservation status: IW(P)A, 1972- Schedule- I; IUCN- LC; CITES: Appendix-II; Local status- Uncommon.

Distribution: In most of the deciduous forests of Odisha. This species is known with certainty from Similipal; Kuldiha; Hadagarh; Kapilas; Debrigarh; Satkosia; Baisipalli; Kotagarh; Badrama; parts of Keonjhar forest division; Phulbani, Dhenkanal, Angul, Khurdha, Cuttack, Athagarh, Sambalpur, Koraput, Kalahandi, Jeypore, Rayagada, Ganjam, Ghumsar north and south, Sundargarh and Bonai forest divisions.

India: Central, North East and North West India. *Elsewhere*: South and East Asia

Remarks: Earlier record of two marbled cat kittens collected from Phulbani forests during 1956 (Mishra *et al.,* 1996) corresponds to Leopard cat (L. N. Acharjyo: pers. comm.).

55. *Prionailurus rubiginosus* (I. Geoffroy S-H, 1831)

Rusty-spotted cat (E)

Conservation status: IW(P)A, 1972- Schedule- I; IUCN- VU; CITES: Appendix-I; Local status- Rare.

Distribution: Kotagarh WLS, Phulbani district; Similipal Tiger Reserve; Debrigarh WLS (Acharjyo *et al.,* 1997; Annual Report of Similipal Tiger Reserve, 2013; M. V. Nair: pers. comm.). During July 2018, a road-killed specimen was observed by a researcher near K. Nuagaon village under Baliguda Forest Division. Palei *et al*. (2019) and Palei and Debata (2019) reported the species from Sundargarh, Debrigarh WLS, Bargarh forest division, Bolangir forest division, Sunadeda WLS, Hadgarh WLS, Kuldiha WLS, Karlapat WLS, Kalahandi north forest division, Rourkela forest division, Bonai forest division, Khariar forest division, Khalasuni WLS and Badrama WLS.

India: Andhra Pradesh, Gujarat, Jammu and Kashmir, Madhya Pradesh, Odisha and Tamil Nadu. *Elsewhere*: Sri Lanka.

56. *Prionailurus viverrinus* (Bennett, 1833)

Fishing cat (E); Macha-ranka biradi (O)

Conservation status: IW(P)A, 1972- Schedule- I; IUCN- EN; CITES: Appendix- II; Local status- Rare.

Distribution: This species is relatively rare in Odisha and has been known from Bhitarkanika WLS, Similipal TR; Hadagarh WLS, Chilika including Mangalajodi marshland, coastal Puri district, Ganjam division; Ghumsar (N) forest division and coastal Kendrapara district. There are several unpublished reports on fishing cat related incidents from Brahmagiri area of Puri district.

India: South India, Assam, Maharashtra, Odisha, Uttar Pradesh and West Bengal. *Elsewhere*: Bangladesh, Bhutan, Cambodia, Indonesia, Laos, Myanmar, Nepal, Sri Lanka, Thailand and Vietnam.

GENUS *PANTHERA* OKEN, 1816

(Worldwide distribution: 4 species; India: 3 species; Odisha: 2 species)

57. *Panthera pardus* (Linnaeus, 1758)

Leopard/ Panther (E); Kalarapataria bagha/ Pendra (O)

Conservation status: IW(P)A, 1972- Schedule I; IUCN- VU; CITES: Appendix- I; Local status- Uncommon.

Distribution: Throughout the forested areas of the state except the coastal districts; locally got extinct from Bhitarkanika mangrove forest since mid-80s'. During the 2016 census, a total of 318 leopards were reported from the state comprising 144 males, 154 females and 20 cubs.

India: Throughout, in suitable habitats. *Elsewhere*: Sri Lanka, Southwestern China to south-eastern China, Bangladesh, eastern Pakistan and western Myanmar.

58. *Panthera tigris* (Linnaeus, 1758)

Royal Bengal Tiger (E); Mahaabala baagha (O)

Conservation status: IW(P)A, 1972- Schedule-I; IUCN- EN; CITES: Appendix- I; Local status- Rare, population declining at a faster rate.

Distribution: Once distributed throughout the forested areas of Odisha including coastal mangrove forests of Bhitarkanika, is now restricted to few pockets. Tiger distribution in the state is scattered with the source population in the two tiger reserves of Odisha namely Similipal and Satkosia. Apart from these TRs, tigers are presently distributed in Sunabeda, Khariar, Anandpur (WL), Sundargarh, Keonjhar, Karanjia forest divisions of the state. As per the recent tiger census report released by National Tiger Conservation Authority, a total of 28 (in a range of 26 - 30) tigers were recorded from the state (Jhala et al., 2019)
India: Throughout the country in suitable habitats except for desert and extreme cold region. *Elsewhere*: Nepal Terai, southwards to South Myanmar in Tenasserim, east to Indochina.

FAMILY VIVERRIDAE GRAY, 1821

(Worldwide distribution: 14 genera, 34 species)

GENUS *PARADOXURUS* F. CUVIER, 1821

(Worldwide distribution: 3 species; India: 2 species; Odisha: 1 species)

59. *Paradoxurus hermaphrodites* (Pallas, 1777)

Common palm civet (E); Salia patani/ Sariapatani (O)

Conservation status: IW(P)A, 1972- Schedule- II (Part-II); IUCN- LC; CITES: Appendix-III; Local status- Common.

Distribution: This is the most common among the civet species reported from the state. Mishra *et al*. (1996) mentioned the distribution of the species throughout Odisha including coastal areas.
India: Almost throughout the country except the desert part of Rajasthan and Gujarat. *Elsewhere*: Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Singapore, Sri Lanka, Thailand and Vietnam.

Remarks: Apart from the usual morph, a black and white patterned morph is also known from various parts of the state, which is now considered as a distinct subspecies as *P. hermaphrodites nictitans* (Taylor, 1891) (see Srinivasulu and Srinivasulu, 2012). Based on body color pattern, this species was once described as a new species as *P. jorandensis* (Ali *et al.* 1988) whereas the authors ignored the earlier assigned name *P. nyctitans* Taylor, 1891 (Regd. No. BMNH 98.8.25.1). *P. hermaphrodites nictitans* has been recorded from Kandhamal (Type locality: Kondmals), Similipal Biosphere Reserve (Ali *et al.,* 1988;1991), Baripada, Barbara RF and Boudh districts (this study).

GENUS *VIVERRA* LINNAEUS, 1758

(Worldwide distribution: 4 species; India: 2 species; Odisha: 1 species)

60. *Viverra zibetha* Linnaeus, 1758

Large Indian civet (E)

Conservation status: IW(P)A, 1972- Schedule- II (Part-II); IUCN- LC; CITES: Appendix-III; Local status- Very rare.

Distribution: This species is known by few records in Odisha from Phulnakhara of Cuttack district, Satapada of Puri district and Hindol area of Dhenkanal district (Acharjyo and Pattnaik, 1987; Saha, 1995; and Mohapatra and Palei, 2014). Jerdon (1867) and McMaster (1870) mentioned the occurrence of this species in Cuttack, which was overlooked by subsequent authors. This species might have a

wider distribution than the known localities because provisional sighting records are from Kapilas wildlife sanctuary, Nagira of Angul forest division and Athagarh forest division.
India: North East India, Odisha, Sikkim and West Bengal. *Elsewhere*: Bhutan, Cambodia, China, Laos, Malaysia, Myanmar, Nepal, Singapore, Thailand and Vietnam.

GENUS *VIVERRICULA* HODGSON, 1838

(Worldwide distribution: 1 species; India: 1 species; Odisha: 1 species)

61. *Viverricula indica* (Desmarest, 1804)

Small Indian civet (E); Dali odha (O)

Conservation status: IW(P)A, 1972- Schedule- II (Part-II); IUCN- LC; CITES: Appendix-III; Local status- Common.
Distribution: This is also a commonly occurring species throughout the state except the mangrove swamps (Mishra *et al*., 1996).
India: Throughout. *Elsewhere*: Bangladesh, Bhutan, Cambodia, China, Indonesia, Laos, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand and Vietnam.

FAMILY HERPESTIDAE BONAPARTE, 1845

(Worldwide distribution: 15 genera, 34 species)

Recent molecular studies have shown that the nine species of Asian mongooses form a monophyletic group (Veron *et al*., 2004), and that they should be placed in the genus *Urva* (Patou *et al*., 2009; Veron *et al*., 2015). Hence, all the earlier referred genus name of mongoose (*Herpestes*) species of Odisha are now placed under *Urva*.

GENUS *URVA* HODGSON, 1837

(Worldwide distribution: 9 species; India: 6 species; Odisha: 4 species)

62. *Urva edwardsi* (I. Geoffroy S-H, 1818)

Indian Grey Mongoose (E); Pahadi neula (O)

Conservation status: IW(P)A, 1972- Schedule- II (Part-II); IUCN- LC; CITES: Appendix-III; Local status- Common.
Distribution: Das *et al.* (1993) provided distribution records of the species from Puri, Balasore, Mayurbhanj, Keonjhar, Ganjam and Kalahandi districts and Mishra *et al.* (1996) reported its occurrence from all over the state. Acharjyo (1999) mentioned that this species is very common in Nandankanan Zoological Park and based on the animals received from various parts of Odisha this species is considered to be common throughout the state both in the forested areas as well as areas adjoining human habitations.
India: Throughout. *Elsewhere*: Afghanistan, Bahrain, Bhutan, Indonesia, Iran, Japan, Kuwait, Malaysia, Mauritius, Nepal, Pakistan, Saudi Arabia and Sri Lanka.
Bionomics: This medium sized mongoose can be easily identified based on its grayish coat and a pale tail-tip. This species is found in diverse habitat types including open grass lands, deciduous forests and also near human habitation.

63. *Urva auropunctatus* (Hodgson, 1836)

Small Asian mongoose (E); Kuji neula (O)

Conservation status: IW(P)A, 1972- Schedule- II (Part-II); IUCN- LC; CITES: Appendix-III; Local status- Common.

Distribution: This species is very common in the state and found in all habitat types up to 1000m altitude. Although Menon (2014) did not mention its distribution in Odisha, this species is found throughout the state including coastal areas.

India: Most of North, Northeast and eastern India states. *Elsewhere*: Afghanistan, Bangladesh, Bhutan, Iran, Iraq, Jordan, Myanmar, Nepal, Oman, Pakistan, and Saudi Arabia (Jennings and Veron 2016).

Bionomics: This species inhabits a wider range of habitats including deciduous forests, plantation, agricultural land, coastal areas, natural forests, grassland, wetland areas and near human habitations in rural and urban areas.

Remarks: Wozencraft (2005) considered *Herpestes* (=*Urva*) *auropunctatus* to be conspecific with *Herpestes* (=*Urva*) *javanicus*, but Veron *et al*. (2006) suggest a specific status for the species based on phylogenetic studies. Hence the later citation is followed, which is supported by molecular evidence. Mentioned as *H. javanicus* by Sharma *et al*. (2014).

64. *Urva smithii* Gray, 1837

Ruddy mongoose (E); Kala-lanjia pahadi neula (O)

Conservation status: IW(P)A, 1972- Schedule- II (Part-II); IUCN- LC; CITES: Appendix-III; Local status- Uncommon.

Distribution: Sahu *et al.* (2012) recorded this species for the first time from the state from Hadgarh WLS, without any photographic evidence or voucher specimen. Herewith, we present photographic evidence of the species for the first time from various localities of the state. This species can be diagnosed based on large body size and have a black-tipped and upwardly curved tail. It has been recorded with certainty from Debrigarh WLS, Kalahandi, Similipal TR, Keonjhar, Athagarh, Satkosia TR, Narayani hill of Berhampur forest Division, Rayagada and Koraput forest divisions of Odisha. This is the second-largest mongoose species of Odisha.

India: South India, Madhya Pradesh, Odisha, Rajasthan and Uttar Pradesh. *Elsewhere*: Sri Lanka.

65. *Urva vitticollis* Bennet, 1835

Stripe-necked mongoose (E); Beka-dagia pahadi neula (O)

Conservation status: IW(P)A, 1972- Schedule- II (Part-II); IUCN- LC; CITES: Appendix-III; Local status- Rare.

Distribution: This species is the largest Asian mongoose and has been known from very few localities of Odisha. Earlier considered to be endemic to the Western Ghats, there was however an anecdotal record of the species from Horsley Konda (tentative location: 13°39′N, 78°25′E; perhaps about 750 m asl) in the Eastern Ghats (Allen, 1911), which was considered to be an unconfirmed report by various workers (Pocock, 1941, Van Rompaey and Jayakumar, 2003, Menon, 2014). The earlier report of Stripe-necked mongoose by Mishra *et al*. (1996) was doubted by Acharjyo (1999) but later its occurrence was confirmed and supported by Nayak *et al.* (2014) based on photographic evidence. This species is known with certainty from Similipal, Kuldiha and Niyamgiri RF of Rayagada and Kalahandi districts.

India: Odisha, Karnataka, Kerala, Tamil Nadu and Andhra Pradesh. *Elsewhere*: Sri Lanka.

FAMILY HYAENIDAE GRAY, 1821

(Worldwide distribution: 4 genera, 4 species)

GENUS *HYAENA* BRISSON, 1762

(Worldwide distribution: 2 species; India: 1 species; Odisha: 1 species)

66. *Hyaena hyaena* (Linnaeus, 1758)

Striped hyaena (E); Hundalia/ Nekeda (O)

Conservation status: IW(P)A, 1972- Schedule- III; IUCN- NT; CITES: Not listed; Local status- Uncommon.

Distribution: This species has been reported from all the districts of Odisha (Das *et al.*, 1993 and Mishra *et al*., 1996). Hyaenas prefer forest fringes, cultivated lands, plantations, caves and scrub forests even near human habitations. It is nocturnal and scavenger by habit, devouring a wide variety of food. In cities and towns, this species is highly dependent on garbage. It prefers to live in small groups inside rock caves or in bush patches, sometimes seen in burrows along with the coastal forests. A study on population structure, distribution, habitat preference and home range of hyaena in Athagarh forest division revealed interesting findings (V. Sarkar and A. Mishra: pers. obs.).

India: Throughout Peninsular India (except Western Ghats), not found in North East India, Himalayas and desert. *Elsewhere*: North and East Africa, the Caucasus, the Middle East, Middle and Central Asia.

SUBORDER CANIFORMIA KRETZOI, 1938

(Worldwide distribution: 9 families; India: 4 families; Odisha: 3 families)

FAMILY CANIDAE FISCHER, 1817

(Worldwide distribution: 13 genera, 35 species)

GENUS *CANIS* LINNAEUS, 1758

(Worldwide distribution: 2 species; India: 2 species; Odisha: 2 species)

67. *Canis aureus* Linnaeus, 1758

Golden jackal (E); Bilua/ Siaala/ Srugala (O)

Conservation status: IW(P)A, 1972- Schedule- II (Part-II); IUCN- LC; CITES: Appendix-III; Local status- Common.

Distribution: This species is distributed throughout the state and inhabits agricultural fields, forest fringes, scrub forest and coastal plantations. They are also well acquainted with human habitation and are highly vocal during evening hours.

India: Almost throughout the country. *Elsewhere*: Afghanistan, Central, Southwestern and South Asia, North and East Africa, Southeastern Europe, Iran, Nigeria, Tanzania, Thailand, Transcaucasus and Sri Lanka.

68. *Canis lupus* Linnaeus, 1758

Gray wolf (E); Gadhia/ Rama siaala (O)

Conservation status: IW(P)A, 1972- Schedule- I; IUCN- LC; CITES: Appendix I (Indian population); Local status- Rare.

Distribution: This is one of the most elusive canids and though it is distributed in many parts of the state, their presence is hardly noticed. Wolves prefer dry, xeric habitats with rocky outcrops. They are

highly nomadic and in Odisha they were observed solitary or in pairs during breeding seasons. Palai *et al*. (2013) reported depredation of livestock by wolves in Hadagarh Wildlife sanctuary. They are known to occur in Athagarh, Baisipalli, Satkosia, Debrigarh, Lakharivally, Kuldiha and Similipal protected areas. During May, 2018, a loan wolf was sighted in Baripada division (PPM: pers. Obs.). Wolves were also sighted in Koraput, Jeypore, Malkanagiri, Sambalpur, Bonai, Sundargarh and Rairangpur forest divisions during the survey period. Wolves were widely recorded in past, a pair of wolf was sighted in Hemgir forest, Sundargarh division in 1998 and a lone wolf was sighted in Barheipani area of Similipal TR in 2009 (HSU *pers. obs.*).

India: Throughout the country except extreme south. *Elsewhere*: Throughout the northern hemisphere north of 15°N latitude in North America and 12°N in India; extinct in much of Western Europe, Mexico and much of the USA and Japan (Biotani *et al.*, 2018).

GENUS *CUON* HODGSON, 1838

(Worldwide distribution: 1 species; India: 1 species; Odisha: 1 species)

69. *Cuon alpinus* (Pallas, 1811)

Wild dog/ Dhole (E); Jangali kukura/ Baliaa kukura (O)

Conservation status: IW(P)A, 1972- Schedule-II; IUCN- EN; CITES: Appendix II; Local status- Rare.

Distribution: Behura and Guru (1969) and Mishra *et al.* (1994) reported this species occurring all over the hilly tracts except mangrove swamps and coast. Wild dogs were last seen in Similipal during the mid 1980s but their population locally got extinct from Similipal as well as much of the distribution range by the year 2000. Now wild dogs are seen only as scattered populations distributed in Kuldiha, Satkosia, Debrigarh, Sunabeda and a small patch in Ghumsar (S) and Barbara RF of Khurdha division. Very recently an individual was sighted in Similipal.

India: Throughout the country except extreme south. *Elsewhere*: Bangladesh, Bhutan, Cambodia, China, Indonesia, Kazakhstan, Kyrgyzstan, Laos, Malaysia, Mongolia, Myanmar, Nepal, Russian Federation, Tajikistan, Thailand and Vietnam.

GENUS *VULPES* FRISCH, 1775

(Worldwide distribution: 12 species; India: 4 species; Odisha: 1 species)

70. *Vulpes bengalensis* (Shaw, 1800)

Bengal fox (E); Kokisiali (O)

Conservation status: IW(P)A, 1972- Schedule- II (Part-II); IUCN- LC; CITES: Appendix III; Local status- Uncommon.

Distribution: the smallest of the Canids found in Odisha and has been recorded throughout the state. The species can well adapt to agricultural fields in the outskirts of human settlements and live in sympatry with the golden jackal.

India: Throughout, except North-east India and Western Ghats. *Elsewhere*: Bangladesh, Nepal and Pakistan.

FAMILY URSIDAE FISCHER, 1817

(Worldwide distribution: 5 genera, 8 species)

GENUS *MELURSUS* MEYER, 1793

(Worldwide distribution: 1 species; India: 1 species; Odisha: 1 species)

71. *Melursus ursinus* (Shaw, 1791)

Sloth bear (E); Bhalu (O)

Conservation status: IW(P)A, 1972- Schedule- I; IUCN- VU; CITES: Appendix I; Local status- Uncommon.

Distribution: This species has been reported from all over the state except coastal mangrove forests in northern parts of the state.

India: Throughout the Peninsular India including Gujarat and Rajasthan. in suitable habitats; Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal; Assam, also in Manipur, Megalaya and Arunachal Pradesh to the east. *Elsewhere*: Bhutan, Nepal and Sri Lanka.

Bionomics: This species inhabits deciduous forest and is an omnivorous predator. Sloth bears are synanthropic species as they can easily adapt to the human-dominated landscapes. They possess behavioral traits that allow the use of these novel environments including generalized diets, high learning capacity, and behavioral plasticity. Sloth bears have an important role in seed dispersal and in controlling insect pests such as termites. It is observed that illegal timber felling is reduced in bear habitats. Palei *et al*. (2012) reported the feeding habit of the species from Hadagarh Wildlife sanctuary. Sloth bears are threatened due to poaching, retaliation killing, habitat destruction and cub trade. Although trading of bear body parts and live cub have been curbed effectively in many forest divisions of Odisha, there are still reports of hunting and poaching.

FAMILY MUSTELIDAE FISCHER, 1817

(Worldwide distribution: 22 genera, 57 species)

GENUS *MELLIVORA* STORR, 1780

(Worldwide distribution: 1 species; India: 1 species; Odisha: 1 species)

72. *Mellivora capensis* (Schreber, 1776)

Honey badger (E); Gada bhalu/ Jangi bhalu (O)

Conservation status: IW(P)A, 1972- Schedule- I; IUCN- LC; CITES: Appendix III; Local status- Uncommon.

Distribution: Behura and Guru (1969) mentioned about occurrence of the species in Ganjam district and there is another record from Khurda (Khurda district) based on a skin sample donated during 1912 and housed in Zoological Survey of India, Kolkata (Das *et al.*, 1993). Mishra *et al.* (1996) reported that the species is found throughout the state and Acharjyo (1999) mentioned that this animal is believed to be rare in the state. Based on the present study this species is known with certainty from the Protected Areas such as Similipal, Kuldiha, Hadgarh, Kapilas, Chandaka, Satkosia, Baisipalli, Debrigarh, Badrama, Karlapat, Kotagarh, Lakhari valley and Sunabeda. Apart from these localities, this species has also been observed in most of the forested areas including semi-urban landscapes such as Bhubaneswar (two individuals were killed during 2005 from OUAT farms) and Barbara of Khurdha district; Anantapur RF of Dhenkanal district; Chandikhol of Cuttack district; Rebena RF and Ghatgaon

of Keonjhar district; Bhanjanagar, Chandragiri and Khhalikote of Ganjam and Gajapati districts; and Bonai of Sundargarh district.

India: Throughout the country except North East India, Jammu and Kashmir. *Elsewhere*: Most of sub-Saharan Africa from the Western Cape, South Africa, to southern Morocco and south-western Algeria, and outside of Africa through Arabia, Iran and western Asia to Turkmenistan.

GENUS *AONYX* LESSON, 1827

(Worldwide distribution: 3 species; India: 1 species; Odisha: 1 species)

73. *Aonyx cinereus* (Illiger, 1815)

Asian small- clawed otter; Oodha (O)

Conservation status: IW(P)A, 1972- Schedule- I; IUCN- VU; CITES: Appendix II; Local status- Rare.

Distribution*:* This species has been recorded from Protected Areas namely Karlapat, Kotagarh and Similipal and also outside Protected Areas such as Muniguda of Rayagada district, Gandahati of Parelakhemundi district; Gadadi, Raikia of Kandhamal district by Mohapatra *et al.* (2014) and later recorded from Deomali and other mountain ranges of Koraput district.

India: Arunachal Pradesh, Assam, Himachal Pradesh, Karnataka, Kerala, Andhra Pradesh, Odisha, Tamil Nadu and West Bengal. *Elsewhere*: Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Singapore, Taiwan, Thailand, Vietnam.

Bionomics: Unlike other otters, this species mostly predates on crabs and is essentially a hill stream-dwelling species. They live near water edges inside rock boulders or little far from the stream in self-made burrows or hollows in rocks.

GENUS *LUTROGALE* GRAY, 1865

(Worldwide distribution: 1 species; India: 1 species; Odisha: 1 species)

74. *Lutrogale perspicillata* (I. Geoffroy S-H, 1826)

Smooth-coated otter (E); Pani Oodha (O)

Conservation status: IW(P)A, 1972- Schedule- II (Part-II); IUCN- VU; CITES: Appendix II; Local status- Rare.

Distribution: They are reported from all river systems in most parts of the state including Bhitarkanika and Chilika estuaries. Mishra *et al.* (1996) mentioned about the distribution of this species throughout the state, including mangrove swamps and coastal plains. As per Acharjyo (1999), from 1964 to 1999, eleven young specimens of both sexes of smooth-coated otters were received at Nandankanan Zoological Park mostly from nearby water bodies like river Mahanadi and its tributaries, Puri main canal originating from river Mahanadi, lakes and large ponds. During the present surveys, a good population of the smooth-coated otter was found in Jaleshwar area of Balasore district. However, their population in Mahanadi and its tributaries has probably drastically reduced in comparison to the scenario before two decades.

India: Throughout the country except high regions of Himalayas. *Elsewhere*: Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Indonesia, Iraq, Laos, Malaysia, Myanmar, Nepal, Pakistan, Thailand and Vietnam.

Bionomics: The smooth-coated otter is a fish eater and inhabits rivers, lakes, estuaries, large water reservoirs and even low land agricultural fields. Acharjyo and Mishra (1983) reported on the longevity of *Lutra lutra* and *Lutrogale perspicillata* received by Nandankanan Zoological Park, Bhubaneswar from unknown sources to be 14 years 7 months and 17 years 9 months respectively, in captivity.
Remarks: Jerdon (1867) provided an elaborate account on Eurasian otter*, Lutra lutra* (Linnaeus, 1758) (mentioned as *Lutra nair* Cuvier, 1823:247), which he had sighted in Chilka Lake. He also mentioned about a party of six otters, one of which he had shot, and the remaining went back in to the Bay of Bengal. However, no one has thereafter mentioned Eurasian otters from Odisha coast (see Acharjyo, 1999; Ross *et al*., 2015).

ORDER ARTIODACTYLA OWEN, 1848
Deer, bovid and antelope
(Worldwide distribution: 10 families, 381 species)

This order comprises even-toed herbivore mammals and is represented by 5 families, 11 genera and 11 species. In this group, there are some major taxonomic revisions and species resurrection.

FAMILY SUIDAE GRAY, 1821
(Worldwide distribution: 6 genera, 17 species)
GENUS *SUS* LINNAEUS, 1758
(Worldwide distribution: 10 species; India: 1 species; Odisha: 1 species)

75. *Sus scrofa* Linnaeus, 1758
Wild boar (E); Barha/ Barhia (O)

Conservation status: IW(P)A, 1972- Schedule- III; IUCN- LC; CITES: Not listed; Local status- Common.
Distribution: This species is widely distributed across the forested landscapes of Odisha (Behura and Guru, 1969; Das *et al*., 1993; and Mishra *et al*., 1996).
India: Throughout. *Elsewhere*: All continents except Antarctica, and on many oceanic islands.
Bionomics: It is considered as a pest in many parts and known to depredate on tuberous crops in forest fringe villages. Wild boar is a prolific breeder and manages to adapt to all kinds of landscapes. This species is recorded from sea level to an altitude of 1600m. Threats to the species are from poaching for meat. Various hunting techniques are deployed to kill this species such as by gun and arrow shot, snares, electrocution, transplanting bombs in bait, netting, top-loaded trap and pit-fall trap (pers. obs.). In many places, including villages adjacent to Protected Areas, wild boar piglets are reared at home for meat.

FAMILY TRAGULIDAE MILNE-EDWARDS, 1864
(Worldwide distribution: 3 genera, 10 species)
GENUS *MOSCHIOLA* GRAY, 1852
(Worldwide distribution: 1 species; India: 1 species; Odisha: 1 species)

76. *Moschiola indica* (Gray, 1852)
Indian mouse deer/ Indian chevrotain (E); Gurandi (O)

Conservation status: IW(P)A, 1972- Schedule- I; IUCN- LC; CITES: Not listed; Local status- Uncommon.
Distribution: This species has been recorded from Balasore district (Das *et al*., 1993) and Mishra *et al.* (1996) mentioned that this species is distributed in better-protected forests of Similipal, Satkosia, Ushakothi, Badrama, Kotagarh, Kapilas hills etc. Additionally, it has been observed in forested areas of Dhenkanal, Angul, Athagarh, Cuttack, Berhampur, Bolangir, Koraput, Jeypore, Malkanagiri, Boudh, Phulbani, Kalahandi, Parlakhemundi and Sambalpur forest divisions (present study). A good population thrives at Debrigarh, Satkosia and Similipal sanctuaries.
India: Peninsular India, Uttar Pradesh and Bihar. *Elsewhere*: Nepal (?), probably locally extinct (Duckworth and Timmins, 2015). More or less endemic to India.
Taxonomic remarks: The earlier names for the mouse deer, *Tragulus meminna* and *Moschiola memina* are now replaced by *Moschiola indica* based on phylogenetic studies and the name *M. meminna* is reserved for animals from parts of Sri Lanka (Groves and Meijaard, 2005).

FAMILY CERVIDAE GOLDFUSS, 1820
(Worldwide distribution: 18 genera, 53 species)
GENUS *AXIS* C. H. SMITH, 1827
(Worldwide distribution: 4 species; India: 2 species; Odisha: 1 species)

77. *Axis axis* (Erxleben, 1777)
Spotted deer/ Chital (E); Chitra harina/ harina (O)
Conservation status: IW(P)A, 1972- Schedule- III; IUCN- LC; CITES: Not listed; Local status- Common.
Distribution: This species occurs throughout the state including coastal mangrove forests (Behura and Guru, 1969; Das *et al*., 1993; Mishra *et al*., 1996; Chadha and Kar, 1999).
India: Peninsular India, northwards Kumaon and Sikkim including Andaman and Nicobar islands and West Bengal. *Elsewhere*: Nepal, Sri Lanka, and introduced in many parts of the world.

GENUS *RUCERVUS HODGSON, 1838*

(Worldwide distribution: 3 species; India: 1 species; Odisha: 1 species)

78. *Rucervus duvaucelii* (G. Cuvier, 1823)

Barasingha (E/O)

R. duvaucelli branderi Pocock, 1943, Hard Ground barasingha (E)

Conservation status: IW(P)A, 1972- Schedule- I; IUCN- VU; CITES: Appendix I; Local status- Very rare/ dubious.

Distribution: Records of the species from Odisha are mostly based on historical reports. This species was known to occur in Khariar forests of Kalahandi district and Padmapur forests of Sambalpur District (Mishra *et al*., 1996). According to Behura and Guru (1969), this species was once common in restricted areas of Sambalpur district and about twenty-five years (i.e., by 1945) they became locally extinct from the state. This species was also known to migrate to the Sunabeda plateau of Khariar from the neighboring Chahtishgarh forests (Mishra *et al*., 1996).

India: *R. duvaucelli* is distributed in isolated localities in north, central India and Brahmaputra plains. The hard ground barasingha *R. duvaucelli branderi* was historically known to be distributed between the rivers Ganges and Godavari, is presently known only from Madhya Pradesh.

Remarks: There are two extant subspecies of Barasingha occurring in India, of which *R. duvaucelli branderi* or hard Ground barasingha is distributed in Central India and parts of Odisha.

GENUS *RUSA* C. H. SMITH, 1827

(Worldwide distribution: 4 species; India: 1 species; Odisha: 1 species)

79. *Rusa unicolor* Kerr, 1792

Sambar (E/O)

Conservation status: IW(P)A, 1972- Schedule- III; IUCN- VU; CITES: Not listed; Local status- Uncommon.

Distribution: Sambar is the state animal of Odisha and it mostly inhabits hilly areas throughout the state including a small population in Bhitarkanika mangrove forest (Mishra *et al*., 1996; Chadha and Kar, 1999; Bijoy K. Das pers. comm.).

India: Tamil Nadu, northwards to Uttar Pradesh, east to North East India. *Elsewhere*: Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Indonesia, Laos, Malaysia, Myanmar, Nepal, Sri Lanka, Taiwan, Thailand and Vietnam.

Remarks: This species is the major prey for tiger and threats for its survival are due to poaching, habitat loss and diseases. The earlier referred name *Cervus unicolor* has been replaced by *Rusa unicolor* based on a variety of morphological differences. The South Asian Sambar is now called as *Rusa unicolor* and that of the SE Asian along with NE Indian population is referred to as *R. equinus* (Groves and Grubb, 2011). Sambars breed mostly during winter months but in Similipal Tiger Reserve, the main breeding season for sambar is the rainy season i.e., September–October (Savanth *et al.,* 2011). In Similipal, the frequency of sighting very young fawns is very high during the last week of March to the end of April.

GENUS *MUNTIACUS* RAFINESQUE, 1815

(Worldwide distribution: 13 species; India: 2 species; Odisha: 1 species)

80. *Muntiacus vaginalis* (Boddaert, 1785)

Northern red muntjac/ barking deer (E); Kutra (O)

Conservation status: IW(P)A, 1972- Schedule- III; IUCN- LC; CITES: Not listed; Local status- Common.

Distribution: This species has been recorded all over the state, especially in the hilly areas, absent from coastal zones (Behura and Guru, 1969; Das *et al*., 1993; Mishra *et al*., 1996).

India: Almost throughout the country except Jammu and Kashmir and desert region. *Elsewhere*: Bangladesh, Bhutan, China, Indonesia, Malaysia, Nepal, Pakistan and Sri Lanka.

Remarks: The earlier available name for barking deer, *M. muntjak,* has now been reserved for the Sundaic forms and Groves (2003) resurrected *M. vaginalis* for the non-sundaic forms. Hence, the Indian Barking deer is now treated as *M. vaginalis*.

FAMILY BOVIDAE GRAY, 1821

(Worldwide distribution: 54 genera, 280 species)

GENUS *ANTILOPE* PALLAS, 1766

(Worldwide distribution: 1 species; India: 1 species; Odisha: 1 species)

81. *Antilope cervicapra* (Linnaeus, 1758)

Blackbuck (E); Krushnasaara mruga/ Kalaabahutiaa (O)

Conservation status: IW(P)A, 1972- Schedule- I; IUCN- LC; CITES: Not listed; Local status- Locally common.

Distribution: Earlier records of this species across the southern and western parts of Odisha are now locally extinct but a sizeable population exists in the Ganjam district (Kar, 2000 and 2001; Mahato *et al.,* 2008; Das and Kar, 2011 and Murmu *et al.,* 2013). Before 1990 there were scattered populations of blackbucks in Balipadar-Bhetnoi wildlife reserve of Ganjam district. The population was confined to the Babanpur area and Bhetnoi gahira after the flood in the Aska during 1992. The blackbuck population dispersed to the north of the habitat towards Balipadar and subsequently reached Ramunda area close to Buguda town during 1998 survey. Some populations in Purusottampur area dispersed to Talarampalli area near Krishnagiri hill and the present population reached the eastern frontier of the Khandadeuli region, 5 km from the Humma town (close to sea coast). The distribution during 2008 was found to be 5 times more than the distribution during 1998 (Das and Kar, 2011).

India: Throughout Peninsular India (except Western Ghats), including Uttar Pradesh, Bihar and Jharkhand. *Elsewhere*: Pakistan. Introduced in Argentina and United States.

Bionomics: Blackbuck is predominantly a grazer and mostly found in the drier parts of the state, most preferably in the agricultural fields. This species is generally not killed in its distribution range as people believe them as vehicles of Lord Vishnu. People in this region are highly tolerant of the crop raids by this species. However, there are occasional records of buck hunting in Berhampur and Ghumsar forest divisions and cases of animals being killed by dogs and road accidents are increasing. On the other hand, this species is now locally extinct from Balukhand-Konark Wildlife sanctuary.

GENUS *BOS* LINNAEUS, 1758

(Worldwide distribution: 3 species; India: 3 species; Odisha: 1 species)

82. *Bos gaurus* Smith, 1827

Gaur/ Indian bison (E); Gayala (O)

Conservation status: IW(P)A, 1972- Schedule- I; IUCN- VU; CITES: Appendix I; Local status- Uncommon.

Distribution: Mishra *et al*. (1996) reported the occurrence of the species all over the hill forests of the state except Bolangir. Specifically, this species is currently distributed in Similipal tiger reserve, Kuldiha WLS, Hadagarh WLS, Debrigarh WLS, Badrama WLS, Ushakothi WLS, Nayagarh forests, Barbara, Satkosia tiger reserve, Ghumsar South forest division, Karlapat WLS, forests of Rayagada division, Narayanpatna of Koraput forest division and Sunabeda WLS.

India: South India, Assam, Arunachal Pradesh, Bihar, Goa, Madhya Pradesh, Maharashtra, Odisha and West Bengal. *Elsewhere*: Bangladesh, Bhutan, Cambodia, China, Laos, Malaysia, Myanmar, Nepal, Thailand, and Vietnam.

Bionomics: Gaur is the largest among all the bovids in India. The species inhabits woodlands, moist deciduous forests with open grasslands, dry deciduous forests and semi-evergreen forest tracts of Peninsular India. They live in herds and the size of herd varies temporally. During the summer season, large congregations comprising more than 45 individuals can be seen near the water bodies in Debrigarh WLS. During 2012 a large herd comprising 32 individuals was observed in Barbara reserve forest.

Threats: Gaurs in Odisha are poached for meat and cases are registered in Similipal and Satkosia tiger reserves. Being a large and massive animal, gaur is the major prey for tigers in its distribution range. Apart from habitat loss, this species is also in danger due to epidemics such as foot and mouth disease and anthrax, which is prevalent in the transitional zones shared by domestic cattle.

Taxonomic remarks: Wilson and Reeder (2005) placed *gaurus* as a subspecies under *B. frontalis* Lambert, 1804. However, vide Duckworth *et al*. (2016), the International Commission on Zoological Nomenclature (2003) ruled that the name for this wild species is not invalid by being antedated by the name based on the domestic form. Therefore, IUCN considers the wild species of Gaur under *Bos gaurus*, while referring to the domestic form (Mythun, Mithan or Gayal) as *Bos frontalis* Lambert, 1804 (Gentry *et al*., 2004).

GENUS *BOSELAPHUS* DE BLAINVILLE, 1816

(Worldwide distribution: 1 species; India: 1 species; Odisha: 1 species)

83. *Boselaphus tragocalamus* (Pallas, 1766)

Nilgai (E); Nilagaai/ Ghodiaan (O)

Conservation status: IW(P)A, 1972- Schedule- III; IUCN- LC; CITES: Not listed; Local status- Very rare.

Distribution: Nilgai is one of the rare mammals in Odisha. This species was earlier recorded from forests of Dhenkanal, Keonjhar, Mayurbhanj, Sambalpur, Phulbani, Puri, Ganjam and Koraput districts (Mishra *et al*., 1996). However, the present distribution is only limited to Badrama, Debrigarh and Sunabeda wildlife sanctuaries and probably represented by very few individuals. Nilgais got extinct

from Mayurbhanj and Keonjhar forests before 1965 and probably vanished from other localities except for Sambalpur by the late 80's. Although this species is common in central and western India, the exact cause of its (local) extinction from many parts of Odisha is unknown. McMaster (1870) mentions that as per Jerdon, the natives of Odisha always speak of them as "wild horses", for which it is locally known as "Ghodiaan" in the state.

India: From the base of Himalayas to Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, and Uttar Pradesh. *Elsewhere*: Nepal, Pakistan and introduced in the United States.

GENUS *BUBALUS* C. H. SMITH, 1827

(Worldwide distribution: 4 species; India: 1 species; Odisha: 1 species)

84. *Bubalus arnee* Kerr, 1792

Wild buffalo (E); Aranaa mainsi (O)

Conservation status: IW(P)A, 1972- Schedule- I; IUCN- EN; CITES: Not listed; Local status- Very rare/ dubious.

Distribution: Behura and Guru (1969) mentioned about two herds of wild buffalo in Odisha, one in Kalahandi district and in Koraput district. Mishra *et al*. (1996) considered it deemed to be locally extinct in all the habitats of the state except in Konda-Kamberu area of undivided Koraput district. However, based on the information collected from local villagers and forest department staff of Sunabeda WLS, they were known to migrate to the Sanctuary from the neighboring Udanti Wildlife Sanctuary of Chhattisgarh through Sarai-Palli and the Jhonk Valley till the year 2000. During June 2011 one male individual was rescued from Kundura block of Koraput district bordering Chhatishgarh and kept in Nandankanan but it died after 3 days in captivity.

India: Assam, Meghalaya, Arunachal Pradesh (?), Maharashtra (?), Chhattisgarh, Odisha. Historical population from West Bengal and Bihar are now considered to be locally extinct. *Elsewhere*: Bhutan, Cambodia, Myanmar, Nepal, and Thailand.

GENUS *TETRACERUS* LEACH, 1825

(Worldwide distribution: 1 species; India: 1 species; Odisha: 1 species)

85. *Tetracerus quadricornis* (Blainville, 1816)

Four-horn antelope (E); Chousinghaa (O)

Conservation status: IW(P)A, 1972- Schedule- I; IUCN- VU; CITES: Not listed; Local status- Uncommon.

Distribution: From the three known subspecies reported from India, *T. quadricornis quadricornis* is distributed in Odisha. This species is fairly distributed in the state and has been recorded from Dhenkanal, Mayurbhanj, Phulbani, Khordha, Sundargarh, Bolangir, Sambalpur, Debrigarh, Deogarh and Koraput districts (Mishra *et al*., 1996). Specifically, this species has been recorded from Similipal TR, Bonai, Sundargarh, Deogarh, Kalahandi south and north divisions, Ghumsar north and south divisions, Debrigarh WLS, Karlapat WLS, Sunabeda WLS, Satkosia TR, and Lakhari valley WLS. Choudhury (1974) and Singh and Swain (2003) provided a detailed account of the distribution of the species in Similipal TR.

India: From the Himalayan foothills to peninsular India. *Elsewhere*: Nepal.

Bionomics: This is the smallest among the five species of antelopes distributed in Odisha and is the only member of this group with two pairs of horns. Like Nilgais, this species has a habit of defecating in one place.

ORDER CETACEA BRISSON, 1762

Whales, dolphins and Porpoise

(Worldwide: 2 suborders; 11 families)

This order comprises two suborders by Flower (1864), based on their feeding apertures, namely Mysticeti (comprising Baleen whales) and Odontoceti (consists of toothed whales, dolphins, and porpoises). Among the Baleen whales, three species under family Balaenopteridae are recorded from Odisha. Similarly, 15 species of Odontoceti under five families are known from the state.

SUBORDER MYSTICETI FLOWER, 1864

(Worldwide: 4 families; India: 1 family; Odisha: 1 family)

FAMILY BALAENOPTERIDAE GRAY, 1864

(Worldwide: 2 genera, 8 species)

Three species of Baleen whales are known from Odisha and as they are deep-sea species, only based on stranding reports these species are included in the present checklist. See Khan *et al*. (2015) for detailed information on cetaceans of Odisha.

GENUS *BALAENOPTERA* LACÉPÈDE, 1804

(Worldwide distribution: 6 species; India: 5 species; Odisha: 3 species)

86. *Balaenoptera acutorostrccata* Lacépède, 1804

Minke whale (E); Timi (O)

Conservation status: IW(P)A, 1972- Schedule- I/ Sch. II (Part I); IUCN- LC; CITES: Appendix I; Local status- Very rare, only stranding records.

Distribution: Carcass of Minke whale was found from Arakhakuda on 19th November 2011 (Skull at Regional Museum of Natural History, Bhubaneswar).

India: Occasional stranding reports from East and West coast, specifically from Gujarat, Odisha and Tamil Nadu. *Elsewhere*: Worldwide, the Arctic to tropical waters.

87. *Balaenoptera borealis* Lesson, 1828

Sei whale (E); Timi (O)

Conservation status: IW(P)A, 1972- Schedule- I/ Sch. II (Part I); IUCN- EN; CITES: Appendix I; Local status- Very rare, only stranding records.

Distribution: A 12.8m long animal from Nakaram (Indrakhi) of Ganjam coast; Bryde's whale stranding report from Astarang and Ganjam coast.

India: Off the coast in the Bay of Bengal and washed ashore on the west coast of India in Karnataka and Kerala. *Elsewhere*: Southern Hemisphere Ocean (South Pacific, South Atlantic).

88. *Balaenoptera edeni* Anderson, 1879

Bryde's whale (E); Timi (O)

Conservation status: IW(P)A, 1972- Schedule- I/ Sch. II (Part I); IUCN- DD; CITES: Appendix I; Local status- Rare.

Distribution: This species was recorded offshore for the first time from Odisha coast by John *et al.* (2012) based on several sightings between Rushikulya river mouth and Chilika (see Khan *et al.,* 2015 for detailed report).

India: Off the coast in the Bay of Bengal and washed ashore on the west coast of India in Karnataka and Kerala. *Elsewhere*: Worldwide: warm temperate to tropical waters.

SUBORDER ODONTOCETI FLOWER, 1867

(Worldwide: 7 families; India: 6 families; Odisha: 5 families)

FAMILY DELPHINIDAE GRAY, 1821

(Worldwide: 17 genera, 36 species)

Eleven species of dolphins are known to occur in the Bay of Bengal along Odisha coast. Earlier consideration of the Ganges river dolphin under this family is now treated under a separate family Platanistidae (Wilson and Reeder, 2011).

GENUS *DELPHINUS* LINNAEUS, 1758

(Worldwide distribution: 6 species; India: 5 species; Odisha: 1 species)

89. *Delphinus delphis* Linnaeus, 1758

Common dolphin (E)

Conservation status: IW(P)A, 1972- Schedule- I/ Sch. II (Part I); IUCN- LC; CITES: Appendix II; Local status- Very rare.

Records: This species was recorded offshore for the first time from Odisha coast by John *et al.* (2012) based on several sightings between Rushikulya river mouth and Chilika (see Khan *et al.,* 2015 for detailed report).

India: Offshore and open water of east and west coasts; around Andaman and Nicobar Is. and Lakshadweep Is. *Elsewhere*: Worldwide: temperate to tropical waters including the black sea.

GENUS *GRAMPUS* GRAY, 1828

(Worldwide distribution: 1 species; India: 1 species; Odisha: 1 species**)**

90. *Grampus griseus* (G. Cuvier, 1812)

Risso's dolphin (E)

Conservation status: IW(P)A, 1972- Schedule- I/ Sch. II (Part I); IUCN- LC; CITES: Appendix II; Local status- Very rare.

Records: This species was recorded offshore for the first time from Odisha coast by John *et al.* (2012) based on several sightings between Rushikulya river mouth and Chilika (see Khan *et al.,* 2015 for detailed report).

India: Indian ocean. *Elsewhere*: Worldwide: temperate to tropical waters.

GENUS *ORCAELLA* GRAY, 1866

(Worldwide distribution: 1 species; India: 1 species; Odisha: 1 species)

91. *Orcaella brevirostris* (Owen in Gray, 1866)

Irrawaddy dolphin (E); Sisumaara (O)

Conservation status: IW(P)A, 1972- Schedule- I; IUCN- VU; CITES: Appendix I; Local status- Common (best sighted at Chilika Lagoon).

Distribution: Inhabits Chilika lagoon, Bhitarkanika, and Gahirmatha marine sanctuary. Also found along the Bay of Bengal (Khan *et al*. 2015).

India: East coast, estuaries of Krishna and Ganga and in the Chilka Lake (Odisha). *Elsewhere*: Tropical coastal waters and large rivers, in southeast Asia, Indonesia, Irrawaddy river in Myanmar, Malaysia, northern Australia, Papua New Guinea.

Bionomics: Irrawaddy dolphin is most well known among cetaceans of Odisha through a series of studies on biology, population dynamics and conservation carried out by Chilika Development Authority and other researchers. The annual census of this species (see Khan *et al*., 2015) reveals a steady population in Chilika (80 in 2003 to 142 in 2014) and a healthy population in Bhitarkanika (52 in 2005 and 62 during 2013 and 2014). The 2015 cetacean census along 480km of Odisha coast provided detail distribution range of this species: 144 in Chilika; 58 in Bhitarkanika, Gahirmatha, and adjoining waters; and 4 individuals from Baitarani and Bhadrak coast.

GENUS *PSEUDORCA* REINHARDT, 1862

(Worldwide distribution: 1 species; India: 1 species; Odisha: 1 species)

92. *Pseudorca crassidens* (Owen, 1846)

False killer whale (E)

Conservation status: IW(P)A, 1972- Schedule- I/ Sch. II (Part I); IUCN- DD; CITES: Appendix II; Local status- Very rare.

Records: This species is known from one record of a carcass found at Sanapatna Beach of Chilika Lake on 18th April 2003, which was 3.2m in length (Khan *et al*., 2015).

India: East and West coasts, including Andaman and Nicobar Is. *Elsewhere*: Worldwide: temperate to tropical waters.

GENUS *SOUSA* GRAY, 1866

(Worldwide distribution: 3 species; India: 2 species; Odisha: 2 species)

93. *Sousa chinensis* (Osbeck, 1765)

Indo-Pacific humpback dolphin (E)

Conservation status: IW(P)A, 1972- Schedule- II (Part I); IUCN- NT; CITES: Appendix I; Local status- Common.

Distribution: The Bay of Bengal along the Odisha coast. Khan *et al*. (2015) mentioned that they might have seasonal migration in response to prey abundance. A total of 125 individuals were sighted during the 2015 census, two individuals were sighted from Buxipalli-Ganjam coast and 123 individuals from Kendrapara coast (source: Forest Department: Wildlife Wing).

India: East and West coasts of Andaman Islands, the mouth of Ganges, Bay of Bengal, Arabian Sea and the Indian Ocean. *Elsewhere*: Coastal waters and rivers from False Bay, South Africa, east to southern China and Moreton Bay, Queensland, Australia.

94. *Sousa plumbea* (G. Cuvier 1828)

Indian Ocean humpback dolphin (E)

Conservation status: IW(P)A, 1972- Schedule- I/ Sch. II (Part I); IUCN- EN; CITES: Appendix I; Local status- Uncommon/ rare.

Distribution: Both species occur sympatrically (Khan *et al*., 2015).

India: East and West coast and the Andaman Sea. *Elsewhere*: In a narrow strip of shallow, coastal waters from False Bay, South Africa, in the west, through the coastal waters of South, East and North Africa, and the Middle East to East coast of India (Braulik *et al*., 2017).

Remarks: Indian ocean humpback dolphin can be distinguished from the former in having more conspicuous hump and larger dorsal fin.

GENUS *STENELLA* GRAY, 1866

(Worldwide distribution: 5 species; India: 3 species; Odisha: 3 species)

95. *Stenella attenuta* (Gray, 1846)

Pantropical spotted dolphin (E)

Conservation status: IW(P)A, 1972- Schedule- I/ Sch. II (Part I); IUCN- LC; CITES: Appendix II; Local status- Very rare.

Records: Known from a stranded individual at Puri beach on 5th April 2011. During the 2015 Caetacean census, 15 animals were sighted along Kendrapada coast (Khan *et al.,* 2015).

India: Bay of Bengal. *Elsewhere*: Temperate to tropical waters.

96. *Stenella longirostris* (Gray, 1828)

Spinner dolphin (E)

Conservation status: IW(P)A, 1972- Schedule- I/ Sch. II (Part I); IUCN- DD; CITES: Appendix II; Local status- Very rare.

Records: A carcass was recorded from Puri beach (Khan *et al.,* 2015) and the species has been observed at the Ganjam coast during June 2014. As per the local fishermen, it is more common at the Ganjam coast during August-December.

India: East and west coasts of India. *Elsewhere*: Worldwide: tropical oceans, Maldives islands, Sri Lanka, Western Pacific including the Gulf of Thailand, the Moluccas and the Java Seas.

97. *Stenella coeruleoalba* (Meyen, 1833)

Striped dolphin (E)

Conservation status: IW(P)A, 1972- Schedule- I/ Sch. II (Part I); IUCN- LC; CITES: Appendix II; Local status- Very rare.

Records: This species is recorded, based on a carcass from Konark beach on 9th April 2008 (Khan *et al*., 2015).

India: The Arabian Sea, Bay of Bengal, Indian ocean. *Elsewhere*: Worldwide: temperate to tropical waters.

GENUS *TURSIOPS* GERVAIS, 1855

(Worldwide distribution: 2 species; India: 2 species; Odisha: 2 species)

98. *Tursiops aduncus* (Ehrenberg, 1833)

Indo-Pacific bottlenose dolphin (E)

Conservation status: IW(P)A, 1972- Not listed; IUCN- NT; CITES: Appendix II; Local status- Common.

Distribution: Commonly seen dolphins at Devi river mouth. A group of 38 individuals was once observed there during December 2003 and during the same period groups of 3-27 individuals were observed from November 2003 to February 2004 along with humpback dolphin and finless porpoise (*pers. obs.*). They were seen in large groups during low tide, close to the coast and were observed through binoculars. Khan *et al*. (2015) mentioned about an injured individual of the species from Nuanai and another carcass from Puri beach, Sutaria and Jefferson (2004) mentioned about several sightings near Gahirmatha coast during 1998-99.

India: Indian Ocean. *Elsewhere*: Pacific Ocean, Japan, Northern China, Southern Australia, and Southern Africa.

99. *Tursiops truncates* (Montagu, 1821)

Common bottlenose dolphin (E)

Conservation status: IW(P)A, 1972- Schedule- I/ Sch. II (Part I); IUCN- LC; CITES: Appendix II; Local status- Very rare.

Distribution: This species is only known from a carcass recorded from Puri beach on 13th December 2012 (Khan *et al*., 2015).

India: Arabian Sea and Bay of Bengal off Andhra Pardesh, Kerala and Tamil Nadu. *Elsewhere*: Worldwide: warm and temperate seas, mainly but not exclusively in coastal waters, including the northern and eastern coasts in the Indian ocean and around the Sunda Islands and Taiwan.

FAMILY PHOCOENIDAE GRAY, 1825

(Worldwide: 3 genera, 6 species)

GENUS *NEOPHOCAENA* PALMER, 1899

(Worldwide distribution: 2 species; India: 1 species; Odisha: 1 species)

100. *Neophocaena phocaenoides* (G. Cuvier, 1829)

Finless porpoise (E)

Conservation status: IW(P)A, 1972- Schedule I; IUCN- VU; CITES: Appendix I; Local status- Uncommon.

Distribution: This species lives near the shallow coastal waters of 50m depth and often enters estuaries. The type locality is the Malabar Coast of India (Rice, 1998). Khan *et al.* (2015) mentioned the occurrence of the species in Bhitarkanika and near Devi river mouth of Puri Division. Additionally, there are confirmed sighting records from the Ganjam coast of Berhampur Division (*pers. obs.*).

India: East and west coasts of India, Andaman and Nicobar Is. Lakshadweep and Hugli estuary in West Bengal. *Elsewhere*: Indo-pacific: warm temperate to tropical waters, the Persian Gulf to Malaysia, North coast of Java, China and Japan: coastal waters and some rivers.

FAMILY PHYSETERIDAE GRAY, 1821

(Worldwide: 1 genus, 1 species)

GENUS *PHYSETER* LINNAEUS, 1758

(Worldwide distribution: 1 species; India: 1 species; Odisha: 1 species)

101. *Physeter macrocephalus* Linnaeus, 1758

Sperm whale (E)

Conservation status: IW(P)A, 1972- Schedule II (Part-II); IUCN- VU; CITES: Appendix I; Local status- Very rare.

Records: This species is known from one stranded record. Khan *et al*. (2015) mentioned about a live Sperm whale measuring 9.8m which was washed ashore near Keluni River near Konark beach on 4th December 2015.

India: Arabian Sea, Bay of Bengal (Andaman and Nicobar Is., Lakshadweep Is., Gujarat, Keral, Maharashtra and Tamil Nadu. *Elsewhere*: Worldwide: The Antarctic and cold-temperate waters (Northern hemisphere) to tropical waters.

FAMILY KOGIIDAE GILL, 1871

(Worldwide: 1 genus, 2 species)

GENUS *KOGIA* GRAY, 1846

(Worldwide distribution: 2 species; India: 2 species; Odisha: 1 species)

102. *Kogia sima* (Owen, 1866)

Dwarf sperm whale (E)

Conservation status: IW(P)A, 1972- Schedule- I/ Sch. II (Part I); IUCN- DD; CITES: Appendix II; Local status- Very rare.

Records: Occurrence of Dwarf sperm whale was also ascertained based on a carcass from near Chilika Lake on 18th April 2003. The animal was 3.2m in length (Khan *et al*., 2015).

India: East and west coasts. *Elsewhere*: Throughout the tropical and subtropical regions including Sri Lanka, Lesser Sunda Island, Taiwan and Okinawa.

Taxonomic remarks: This species was earlier considered under family Physeteridae but now Kogiidae is considered as a distinct family comprising one genus and two species (Wilson and Reeder, 2011; IUCN, 2015).

FAMILY PLATANISTIDAE GRAY, 1846

(Worldwide: 1 genus, 2 species)

GENUS *PLATANISTA* WAGLER, 1830

103. *Platanista gangetica* (Roxburgh, 1801)

Ganges river dolphin (E)

Conservation status: IW(P)A, 1972- Schedule- I; IUCN- EN; CITES: Appendix I; Local status- Very rare.

Distribution: Odisha is the southernmost distribution limit of this species. In Odisha, it is mostly confined to Budhabalanga, Brahmani and Baitarani rivers. Based on Khan *et al.* (2015), it was first

reported from Odisha based on observations made by the research officers of Odisha Forest Department, Wildlife wing way back in the 1980s. Later Chadha and Kar (1999) mentioned the occurrence of this species from Bhitarkanika. During October 2005 a male individual was rescued from Budhabalanga River under the territory of the Baripada forest Division and was relocated successfully. On 17th December 2015, a carcass of this species measuring about 1.9 meters in length and weighing 31 kg was recovered from Budhabalanga at Sahupada in Balasore district. Earlier on 19th December 2010, another carcass was recovered from Bhitakanika. During the 2015 Cetacean census, one individual was reported from the Subarnarekha river in Baripada division.

India: The rivers Brahmaputra, Ganges, Hoogley Karnaphuli, Meghna and their tributaries and Indian seas. *Elsewhere*: Bangladesh, Bhutan, and Nepal.

Bionomics: This is a freshwater dolphin species entering into the brackish water of salinity not more than 10ppt (Khan *et al.,* 2015).

3.2. RARE AND THREATENED MAMMALS OF ODISHA

Out of 428 species of mammals recorded from India, 10 species are Critically Endangered, 39 Endangered, 46 Vulnerable, 28 Near Threatened, 274 Least Concerned and 34 species are assessed as Data Deficient category (IUCN, 2019). Among the species listed under Threatened and Near-threatened category eight Endangered, twelve Vulnerable and four Near Threatened species are distributed in the state. A consolidated list of species enlisted under the various threatened categories is presented in Table-3.

Other than the mammals listed under Threatened and Near Threatened category, terrestrial species such as bonnet macaque, Cutch rat, rusty-spotted cat, large Indian civet, strip-necked mongoose, and blue bull/ nilgai, listed as Least Concern by IUCN, are rare in the state of Odisha. Hence, attention is needed on these regionally rare mammalian species along with the threatened ones, while developing Conservation Action Plans on this group.

As per the Wild Life (Protection) Act, 1972, twenty species are listed in Schedule-I (comprising 1 species from family Elephantidae, 1 Manidae, 1 Canidae, 5 Felidae, 1 Ursidae, 2 Mustalidae, 1 Tragulidae, 3 Bovidae, 1 Antelocarpidae, 2 Delaphidae, 1 Phoconidae and 1 species of Platanistidae), thirty-one in Schedule-II, six in Schedule-III, three in Schedule-IV, fifteen in Schedule-V and twenty-eight species are not listed in any of the schedules of the Act. Summary of the current status and threats onmammals of Odisha based on global and Indian perspectives are provided in Table-4.Local status of each species has been designated as common, uncommon, rare and very rare based on the sighting records. The data has been generated based on information collected from the key informants such as, forest managers, frontline forest department staff, local community and the authors. A species was treated as common when it was sighted commonly and was widely distributed across the state. An uncommon status was given based on infrequent sighting records and widely distributed species and for the species which was found only in few localities and is sparsely distributed was treated as rare. Similarly, very rare category was given for the species which was occasionally sighted during past decades. Based on the consolidated information, 40 species of mammals in the state are common and 31 species are uncommon, of which status of *Rattus norvegicus* is taxonomically unclear and hence provisionally kept as uncommon/ doubtful. On the other hand, 13 species have been treated as rare and

19 very rare including 12 species of cetaceans. Among the very rare category, cutch rat, pouch bearing bat and large Indian civet were recorded only from very few localities and the status of barasingha and wild buffalo has been treated as very rare/ dubious, as these species were occasionally migrating from the adjoining Chhattishgarh forests.

3.3. CONSERVATION OF MAMMALS IN ODISHA

Various conservation programs have been undertaken by the Odisha state forest department either in collaboration with the central government or as self-initiative of the state government. Such *ex-situ* and *in-situ* conservation programs include conservation breeding programs and habitat conservation practices such as declaration of protected areas, Tiger reserves, Elephant reserves, Community reserves as per the provision under Wild Life (Protection) Act, 1972. More recently, Biodiversity heritage sites have been declared as per provision under the Biological Diversity Act (2002). The state government of Odisha publishes Annual reports namely "Wildlife Odisha" where such success stories can be accessed. Some important schemes are highlighted below in a nutshell.

3.3.1. Ongoing species-specific conservation plans in the state:

Project Tiger

Project Tiger was launched in 1973 intending to conserve the habitat for ensuring a viable population of Royal Bengal Tiger along with its prey base. Odisha has two tiger reserves namely Similipal and Satkosia and Sunabeda is a proposed tiger reserve and Similipal is one among the first nine Tiger Reserves declared during 1973.

Project Elephant

Three Elephant Reserves (ER) namely, Mayurbhanj ERs, Mahanadi ERs, and Sambalpur ERs were created in the state in the years 2001 and 2002. The project aims to define the prime elephant habitats and to launch various management interventions for the conservation of the elephants. Also, Elephant Reserves offer hope to rejuvenate some of the fragmented habitats. The Baitarani and south Odisha are proposed elephant reserves.

Pangolin Conservation and Breeding Programme

The Pangolin Conservation Breeding Centre was established in the year 2009 at Nandankanan Biological Park for scientific management and research on conservation breeding of Indian pangolins. The center is the only conservation breeding center for the endangered Indian pangolin (*Manis crassicaudata*) in the world. The center has developed protocols for housing, husbandry and conservation breeding of the endangered Indian pangolins. Scientific studies at the center are helping to understand their biology which is otherwise difficult in the wild because of their nocturnal and burrowing habits (Mohapatra and Panda, 2019). At present, the Pangolin population in the center is around 15-20.

Four - horned antelope Breeding Programme

The captive breeding program for this species has been undertaken in the Wild Animal Conservation Centre (WACC) at Motijharan mini zoo of Sambalpur. Approximately 20 individuals are now breeding in WACC.

3.3.2. Census of various mammals in Odisha

The state government is meticulously carrying out a periodic census of mega animals of which figures of wild mammals for the last seven years are provided in Table 6.

3.4. DISTRIBUTION OF MAMMALS IN VARIOUS PROTECTED AREAS OF ODISHA

Table-5 provides consolidated data on the distribution of various species of mammals in the major Protected Areas of Odisha. Based on presence and absence data of 85 species of terrestrial mammals reported from the state in 15 protected areas (excluding Nandankanan, Nalabana, and Gahirmatha), 60 species are distributed in Similipal, 54 in Kuldiha, 51 in Hadgarh, 32 in Bhitarkanika, 44 in Kapilas, 56 in Satkosia, 56 in Baisipalli, 51 in Chandaka, 40 in Balukhand, 50 in Debrigarh, 46 in Badrama, 44 in Khalasuni, 51 in Karlapat, 51 in Lakhari Valley, 53 in Kotagarh and 51 species are known to be distributed in Sunabeda Wildlife sanctuary.

Table 3. Threatened and Near-threatened mammals of Odisha and their estimated population (as per available data)

Threat category	Name of Species	Approximate population size in the state and remarks
Endangered	**Asian Elephant** *Elephas maximus*	1976 (2016-17 census)
	Indian pangolin *Manis crassicaudata*	Not assessed, population decreasing at a faster rate.
	Royal Bengal tiger *Panthera tigris*	28 (2018 -19)
	Dhole *Cuon alpinus*	No census data, but very low population.
	Wild Water Buffalo *Bubalus arnee*	No report since 2013; status highly dubious.
	Indian Ocean humpback dolphin *Sousa plumbea*	6[#] (2018-19); chances of confusion with Indo-Pacific humpback dolphin
	Irrawaddy dolphin *Orcaella brevirostris*	130 (2018-19)
	Ganges River Dolphin *Platanista gangetica*	01 (2015). No sighting records during the subsequent census, population decreasing at a faster rate.
Vulnerable	**Fishing cat** *Prionailurus viverrinus*	Not assessed. Widely distributed in the state than previously assessed.
	Leopard *Panthera pardus*	318 (2015-16)
	Sloth bear *Melursus ursinus*	Not assessed, population decreasing
	Asian small-clawed otter *Aonyx cinereus*	Not assessed, population decreasing
	Smooth-coated otter *Lutrogale perspicillata*	Not assessed, population decreasing
	Barasingha *Cervus duvaucelii*	Not assessed, status highly dubious.
	Sambar *Rusa unicolor*	Not assessed
	Gaur *Bos gaurus*	Not assessed
	Four horn antelope *Tetracerus quadricornis*	Not assessed
	Indo-Pacific humpback dolphin *Sousa chinensis*	107 (2018-19), chances of confusion with Indian Ocean humpback dolphin.
	Indo Pacific finless porpoise *Neophocaena phocaenoides*	No sighting during the last census
	Sperm Whale *Physeter macrocephalus*	No sighting during the past census, migratory to the deep coastal water.
Near Threatened	**Rusty spotted cat** *Prionailurus rubiginosus*	Not assessed, sighting records increasing in contrast to very rare in the past.
	Striped hyaena *Hyaena hyaena*	Not assessed but probably their population is stable in the state.
	Indo-Pacific Bottlenose Dolphin *Tursiops aduncus*	16 (2018-19)
	False Killer Whale *Pseudorca crassidens*	Not assessed, migratory to the deep coastal water.

Source for census figures: Wildlife Odisha, 2015-2019

Table: 4. Summary of current status and threats to mammals of Odisha

Sl No	Common English name and Scientific name	WPA	IUCN	Local status	Present status, threats and actions
1	Asian Elephant *Elephas maximus* Linnaeus, 1758	Schedule-I	EN	Common	Population stable. Threats include habitat destruction, habitat alteration, disruption of corridors and migratory paths, forest fire, poaching, electrocution road and rail accidents.
2	Madras treeshrew *Anathana ellioti* (Waterhouse, 1850)	Not listed	LC	Uncommon	Population stable. Threats from poaching at some of its distribution range.
3	Rhesus monkey *Macaca mulatta* (Zimmermann, 1780)	Schedule-II	LC	Common	Population increasing in urban areas. Menace at some places, leading to conflicts; depredate crops at forest fringe villages, urban and rural areas.
4	Bonnet monkey *Macaca radiata* (E. Geoffroy, 1812)	Schedule-II	LC	Very Rare/ dubious	Present status unknown.
5	Northern plain's langur *Semnopithecus entellus* (Dufresne, 1797)	Schedule-II	LC	Common	Population increasing in urban areas. Menace at some places, leading to conflicts; depredate crops at forest fringe villages, urban and rural areas.
6	Three-striped squirrel *Funambulus palmarum* (Linnaeus, 1766)	Not listed	LC	Common	Population stable. More common south of Mahanadi and sparsely distributed towards northern Odisha.
7	Five-striped squirrel *Funambulus pennantii* Wroughton, 1905	Schedule-IV	LC	Common	Population stable. Till the late 90s this species was largely poached by nomadic tribal communities for meat and selling of stuffed animals as trophy.
8	Giant Indian flying squirrel *Petaurista philippensis* (Elliot, 1839)	Schedule-II	LC	Uncommon	Threats are largely due to habitat destruction, logging; occasional poaching cases are reported.

Sl No	Common English name and Scientific name	WPA	IUCN	Local status	Present status, threats and actions
9	Lesser bandicoot *Bandicota bengalensis* (Gray and Hardwicke, 1833)	Schedule-V	LC	Common	No immediate threats envisaged. Poached by certain tribal communities in the state.
10	Large bandicoot *Bandicota indica* (Bechstein, 1800)	Schedule-V	LC	Common	No immediate threats envisaged. Poached by certain tribal communities in the state.
11	Blanford's rat *Madromys blanfordi* (Thomas, 1881)	Schedule-V	LC	Common	No immediate threats envisaged.
12	Indian bush rat *Golunda ellioti* Gray, 1837	Schedule-V	LC	Uncommon	No immediate threats envisaged.
13	Little Indian field mouse *Mus booduga* (Gray, 1837)	Schedule-V	LC	Common	No threat.
14	House mouse *Mus musculus* Linnaeus, 1758	Schedule-V	LC	Common	No threat.
15	Wroughton's Small Spiny Mouse *Mus phillipsi* Wroughton, 1912	Schedule-V	LC	Rare	No immediate threat envisaged.
16	Brown rat *Rattus norvegicus* (Berkenhout, 1769)	Schedule-V	LC	Uncommon/ doubtful	No threat.
17	House rat *Rattus rattus* (Linnaeus, 1758)	Schedule-V	LC	Common	No threat.
18	Indian long-tailed tree mouse *Vandeleuria oleracea* (Bennett, 1832)	Schedule-V	LC	Common	No threat.
19	Cutch rat *Cremnomys cutchicus* Wroughton, 1912	Schedule-V	LC	Very rare	Not known.
20	Antelope rat *Tatera indica* (Hardwicke, 1807)	Schedule-V	LC	Common	No threat envisaged.
21	Indian crested porcupine *Hystrix indica* Kerr, 1792	Schedule-IV	LC	Common	Habitat destruction, poaching for meat and medicinal use of intestine are major threats.

Sl No	Common English name and Scientific name	WPA	IUCN	Local status	Present status, threats and actions
22	Indian hare *Lepus nigricollis* F. Cuvier, 1823	Schedule-IV	LC	Common	Large scale poaching and forest fire are major threats.
23	Gray musk shrew *Suncus murinus* (Linnaeus, 1766)	Not listed	LC	Common	Commonly distributed in forests and near human habitation, no immediate threats envisaged.
24	Anderson's Shrew Suncus stoliczkanus (Anderson, 1877)	Not listed	LC	Uncommon	Not known.
25	White-toothed pigmy shrew *Suncus etruscus* (Savi, 1822)	Not listed	LC	Uncommon	Commonly distributed, no immediate threats envisaged.
26	Short-nosed fruit bat *Cynopterus sphinx* (Vahl, 1797)	Schedule-V	LC	Common	Poaching by certain tribal communities for meat and traditional medicine. Till 2000 large scale poaching was observed but now occasional poaching reported.
27	Indian flying fox *Pteropus giganteus* (Brunnich, 1782)	Schedule-V	LC	Common	Poaching for meat and use in traditional medicine.
28	Indian fulvous bat *Rousettus leschenaulti* (Desmarest, 1820)	Schedule-V	LC	Common	Same as other fruit-eating bats.
29	Little Indian horseshoe bat *Rhinolophus lepidus* Blyth, 1844	Not listed	LC	Common	No threat envisaged.
30	Rufous horseshoe bat *Rhinolophus rouxii* Temminck, 1835	Not listed	LC	Common	No threat envisaged.
31	Dusky leaf-nosed bat *Hipposideros ater* Templeton, 1848	Not listed	LC	Uncommon	No threat envisaged.
32	Fulvous leaf-nosed bat *Hipposideros fulvus* Gray, 1838	Not listed	LC	Uncommon	No threat envisaged.
33	Cantor's leaf-nosed bat *Hipposideros galeritus* Cantor, 1846	Not listed	LC	Uncommon	No threat envisaged.

Sl No	Common English name and Scientific name	WPA	IUCN	Local status	Present status, threats and actions
34	Sri Lanka leaf-nosed bat *Hipposideros lankadiva* Kelaart, 1850	Not listed	LC	Uncommon	No threat envisaged.
35	Schneider's leaf-nosed bat *Hipposideros speoris* (Schneider, 1800)	Not listed	LC	Uncommon	No threat envisaged.
36	Greater false vampire *Megaderma lyra* E. Geoffroy, 1810	Not listed	LC	Common	No threat envisaged.
37	Lesser false vampire *Megaderma spasma* (Linnaeus, 1758)	Not listed	LC	Uncommon	No threat envisaged.
38	Lesser rat-tailed bat *Rhinopoma hardwickii* Gray, 1831	Not listed	LC	Common	No threat envisaged.
39	Larger rat-tailed bat *Rhinopoma microphyllum* (Brunnich, 1782)	Not listed	LC	Uncommon	No threat envisaged.
40	Pouch bearing bat *Saccolaimus saccolaimus* (Temminck, 1838)	Not listed	LC	Very rare	No threat envisaged.
41	Long-armed seath-tailed bat *Taphozous longimanus* Hardwicke, 1825	Not listed	LC	Uncommon	No threat envisaged.
42	Black-bearded seath-tailed bat *Taphozous melanopogon* Temminck, 1841	Not listed	LC	Uncommon	No threat envisaged.
43	Tickell's bat *Hisperoptenus tickelli* (Blyth, 1851)	Not listed	LC	Rare	No threat envisaged.
44	Kelaart's pipistrelle *Pipistrellus ceylonicus* (Kelaart, 1852)	Not listed	LC	Common	No threat envisaged.
45	Indian pipistrelle *Pipistrellus coromandra* (Gray, 1838)	Not listed	LC	Common	No threat envisaged.

Sl No	Common English name and Scientific name	WPA	IUCN	Local status	Present status, threats and actions
46	Indian pigmy pipistrelle *Pipistrellus tenuis* (Temminck, 1840)	Not listed	LC	Common	No threat envisaged.
47	Dormer's bat *Scotozous dormer* (Dobson, 1875)	Not listed	LC	Rare	No threat envisaged.
48	Greater yellow bat *Scotophilus heathii* (Horsfield, 1831)	Not listed	LC	Uncommon	No threat envisaged.
49	Lesser yellow bat *Scotophilus kuhlii* Leach, 1821	Not listed	LC	Uncommon	No threat envisaged.
50	Painted bat *Kerivoula picta* (Pallas, 1767)	Not listed	LC	Rare	No threat envisaged. On one occasion a specimen was found with some tribal boys at Koraput (Subrat Debata: pers. Obs.)
51	Indian pangolin *Manis crassicaudata* Gray, 1827	Schedule-I	EN	Rare	International trade of pangolin and their body parts now account for about 20% of all illegal Wildlife trade (IUCN) and pangolins are most trafficked animls in the world. Poaching for trafficking of scales has increased in the state. This along with local demand for its meat coupled with destruction of habitats due to stone quarries in various parts of the state are major threats. Population declining at a faster rate.
52	Jungle cat *Felis chaus* Schreber, 1777	Schedule-II	LC	Common	Road accidents and at times persecution by people due to poultry predation. Hybridization with domestic cats is probably another emerging problem for this species.
53	Leopard cat *Prionailurus bengalensis* (Kerr, 1792)	Schedule-I	LC	Uncommon	Habitat loss and poaching are the major threats to the species.

Sl No	Common English name and Scientific name	WPA	IUCN	Local status	Present status, threats and actions
54	Rusty spotted cat *Prionailurus rubiginosus* (I. Geoffroy S-H, 1831)	Schedule-I	VU	Rare	Road accident, habitat destruction and poaching are major threats to the species.
55	Fishing cat *Prionailurus viverrinus* (Bennett, 1833)	Schedule-I	EN	Rare	Habitat loss, conversion/ alteration of wetlands and road mortality are the major threats. Every year 3-5 individuals are reported to have died due to road accidents.
56	Leopard *Panthera pardus* (Linnaeus, 1758)	Schedule-I	NT	Uncommon	Poaching for body parts, retaliation killing, habitat loss are major threats.
57	Royal Bengal tiger *Panthera tigris* (Linnaeus, 1758)	Schedule-I	EN	Rare	Habitat loss, fragmentation, decrease in prey population, poaching, poisoning are some of the major threats.
58	Common palm civet *Paradoxurus hermaphrodites* (Pallas, 1777)	Schedule-II	LC	Common	Actual threats unknown, but occasional hunting by local tribal communities for bushmeat and road mortality are perceived threats to the species.
59	Large Indian civet *Viverra zibetha* Linnaeus, 1758	Schedule-II	NT	Very rare	Threats not accessed.
60	Small Indian civet *Viverricula indica* (Desmarest, 1804)	Schedule-II	LC	Common	Actual threats unknown, but occasional hunting by local tribal communities for bushmeat and road mortality are perceived threats to the species.
61	Small Asian mongoose *Urva auropunctatus* (Hodgson, 1836)	Schedule-II	LC	Common	Occasional hunting by local tribal communities for bushmeat and road mortality are perceived threats to the species. Poaching for fur and live pet trade has not been recorded in recent times.

Sl No	Common English name and Scientific name	WPA	IUCN	Local status	Present status, threats and actions
62	Ruddy mongoose *Urva smithii* Gray, 1837	Schedule-II	LC	Uncommon	No serious threats envisaged.
63	Stripe-necked mongoose *Urva vitticollis* Bennet, 1835	Schedule-II	LC	Rare	No serious threats envisaged.
64	*Hyaena hyaena* (Linnaeus, 1758)	Schedule-III	NT	Uncommon	Habitat degradation and road accidents are major threats
65	Golden jackal *Canis aureus* Linnaeus, 1758	Schedule-II	LC	Common	Road mortality is currently a major threat to the species. In past poaching for pelt was prevalent in many parts of the state.
66	Gray wolf *Canis lupus* Linnaeus, 1758	Schedule-I	LC	Uncommon	No major threat envisaged.
67	Wild dog/ Dhole *Cuon alpinus* (Pallas, 1811)	Schedule-II	EN	Rare	Threats not accessed, very small populations exist sporadically in some protected areas of the state. Their population in some prime Protected Areas like Similipal and Kuldiha is locally extinct for many decades except for visit by some stary individuals in small groups in recent times.
68	Bengal fox *Vulpes bengalensis* (Shaw, 1800)	Schedule-II	LC	Uncommon	Widely distributed in the state but the population is dwindling at a faster rate due to persecution and occasional poaching for the pelt.
69	Honey badger *Mellivora capensis* (Schreber, 1776)	Schedule-I	LC	Uncommon	Threats not accessed, but the current population is decreasing
70	Asian small-clawed otter *Aonyx cinereus* (Illiger, 1815)	Schedule-I	VU	Rare	Poaching for meat and pelt; habitat destruction and reduction of prey population are major threats to this species.

Sl No	Common English name and Scientific name	WPA	IUCN	Local status	Present status, threats and actions
71	Smooth-coated otter *Lutrogale perspicillata* (I. Geoffroy S-H, 1826)	Schedule-II	VU	Rare	Major threats to Asian otter populations are loss of wetland habitats due to the construction of large-scale hydroelectric projects, reclamation of wetlands for settlements and agriculture, reduction in prey biomass, poaching and contamination of waterways by pesticides.
72	Wild boar *Sus scrofa* Linnaeus, 1758	Schedule-III	LC	Common	No major threat to the species, the population is stable or increasing. Poached for meat and persecuted for crop depredation.
73	Indian mouse deer/ Indian chevrotain *Moschiola indica* (Gray, 1852)	Schedule-I	LC	Uncommon	Habitat loss, poaching, forest fire are the major threats to the species.
74	Sloth bear *Melursus ursinus* (Shaw, 1791)	Schedule-I	VU	Uncommon	Poaching for use of bile in traditional medicine, meat and use of body parts for other uses; retaliation killing and persecution; poisoning; electrocution; cub trade; increasing human-sloth bear conflict; habitat degradation are the realtime threats to the species in the state. Probably locally extinct from Kapilas, Chandaka and Kotagarh Wildlife Sanctuaries.
75	Spotted deer/ Chital *Axis axis* (Erxleben, 1777)	Schedule-III	LC	Common	No major threat to the species, the population is stable or increasing. Poached for meat and persecuted for crop depredation.

Sl No	Common English name and Scientific name	WPA	IUCN	Local status	Present status, threats and actions
76	Barasingha *Rucervus duvaucelii* (G. Cuvier, 1823)	Not listed	VU	Very rare/ dubious	Habitat loss/ degradation, spreading of diseases and poaching could be the major threats to this species. Present status dubious.
77	Sambar *Rusa unicolor* Kerr, 1792	Schedule-III	VU	Uncommon	Habitat loss, poaching for meat and local trade are the major threats to the species.
78	Northern red muntjac/ barking deer *Muntiacus vaginalis* (Boddaert, 1785)	Schedule-III	LC	Common	No threat envisaged.
79	Blackbuck *Antilope cervicapra* (Linnaeus, 1758)	Schedule-I	LC	Common	No major threat. Once locally extinct from many parts of south Odisha, their population is increasing due to community protection, traditional beliefs and active conservation planning by the state forest department.
80	Gaur/ Indian bison *Bos gaurus* Smith, 1827	Schedule-I	VU	Uncommon	Poaching, habitat degradation/ loss, spreading of epidemics from livestock and competition from livestock grazing are the major threats to the species
81	Nilgai *Boselaphus tragocalamus* (Pallas, 1766)	Schedule-III	LC	Rare	No threat envisaged. Locally extinct from many parts of the state. Population status unknown but is very low.
82	Wild buffalo *Bubalus arnee* Kerr, 1792	Schedule-I	EN	Very rare/ dubious	Habitat loss, diseases (?) and hybridization with domestic buffalo are some of the major threats to the species in the state. Present status dubious.
83	Four-horn antelope *Tetracerus quadricornis* (Blainville, 1816)	Schedule-I	VU	Uncommon	Poaching and habitat loss are the threats to this species.

Sl No	Common English name and Scientific name	WPA	IUCN	Local status	Present status, threats and actions
84	Minke whale *Balaenoptera acutorostrccata* Lacépède, 1804	Schedule-II	LC	Very rare	No threat envisaged.
85	Sei whale *Balaenoptera borealis* Lesson, 1828	Schedule-II	EN	Very rare	No threat envisaged
86	Bryde's whale *Balaenoptera edeni* Anderson, 1879	Schedule-II	DD	Rare	No threat envisaged
87	Common dolphin *Delphinus delphis* Linnaeus, 1758	Schedule-II	LC	Very rare	No threat envisaged
88	Risso's dolphin *Grampus griseus* (G. Cuvier, 1812)	Schedule-II	LC	Very rare	No threat envisaged
89	Irrawaddy dolphin *Orcaella brevirostris* (Owen in Gray, 1866)	Schedule-I	VU	Common	Population stable.
90	False killer whale *Pseudorca crassidens* (Owen, 1846)	Schedule-II	LC	Very rare	No threat envisaged
91	Indo-Pacific humpback dolphin *Sousa chinensis* (Osbeck, 1765)	Schedule-II	NT	Common	The Indian humpback dolphins face threats from by-catch, incidental catch in gillnets, driftnets, purse seines, trawls, long-lines, and hook net.
92	Indian Ocean humpback dolphin *Sousa plumbea* (G. Cuvier 1828)	Schedule-I	LC	Uncommon	No threat envisaged
93	Pantropical spotted dolphin *Stenella attenuta* (Gray, 1846)	Schedule-II	LC	Very rare	No threat envisaged
94	Spinner dolphin *Stenella longirostris* (Gray, 1828)	Schedule-II	DD	Very rare	No threat envisaged
95	Striped dolphin *Stenella coeruleoalba* (Meyen, 1833)	Schedule-II	LC	Very rare	No threat envisaged
96	Indo-Pacific bottlenose dolphin *Tursiops aduncus* (Ehrenberg, 1833)	Schedule-II	LC	Common	No threat envisaged

Sl No	Common English name and Scientific name	WPA	IUCN	Local status	Present status, threats and actions
97	Common bottlenose dolphin *Tursiops truncates* (Montagu, 1821)	Schedule-II	LC	Very rare	No threat envisaged
98	Finless porpoise *Neophocaena phocaenoides* (G. Cuvier, 1829)	Schedule-I	VU	Uncommon	Incidental entanglement in the fishing net, coastal poisoning and accidental impact of propeller
99	Sperm whale *Physeter macrocephalus* Linnaeus, 1758	Schedule-II	VU	Very rare	One live female sperm whale breached on the beach near Keluni river of Konark beach in December 2015. Entanglement in fishing nets and collisions with ships are the greatest threats to the whale population.
100	Dwarf sperm whale *Kogia sima* (Owen, 1866)	Schedule-II	DD	Very rare	No threat envisaged.
101	Ganges river dolphin *Platanista gangetica* (Roxburgh, 1801)	Schedule-I	EN	Very rare	Construction of dams and barrage on rivers directly threatens the natural habitat of species and accidental capture in fishing nets.
102	Indian giant squirrel *Ratufa indica* (Erxleben, 1777)	Schedule-II	LC	Common	Mostly distributed in protected areas excluding coastal zone. Threats due to poaching, timber felling, forest fire, monoculture plantation and conversion of forest land for mining and agricultural purposes.
103	*Urva edwardsii* (I. Geoffroy S-H, 1818)	Schedule-II	LC	Common	Occasional hunting by local tribal communities for bushmeat and road mortality are perceived threats to the species. Poaching for fur and live pet trade has not been recorded in recent times.

Table 5. Consolidated list on the distribution of terrestrial mammals in the major Protected Areas of Odisha. Present (1); absent/ not recorded (0).

Sl. No	COMMON ENGLISH NAME AND SCIENTIFIC NAME	STR	KLD	HDG	BTK	KPL	STK	BSP	CHN	BLK	DBG	BDR	KHS	KLP	LKV	KTG	SBD
1	Asian Elephant *Elephas maximus* Linnaeus, 1758	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0
2	Madras treeshrew *Anathana ellioti* (Waterhouse, 1850)	1	1	1	0	1	1	1	1	0	1	0	0	1	1	1	1
3	Rhesus monkey *Macaca mulatta* (Zimmermann, 1780)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	Bonnet monkey *Macaca radiata* (E. Geoffroy, 1812)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Northern plain's langur *Semnopithecus entellus* (Dufresne, 1797)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	Three-striped squirrel *Funambulus palmarum* (Linnaeus, 1766)	0	0	0	0	0	1	1	1	0	1	0	0	0	1	1	0
7	Five-striped squirrel *Funambulus pennantii* Wroughton, 1905	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	Indian giant squirrel *Ratufa indica* (Erxleben, 1777)	1	1	1	0	1	1	1	0	0	0	1	1	1	1	1	1
9	Giant Indian flying squirrel *Petaurista philippensis* (Elliot, 1839)	1	1	1	0	1	1	1	0	0	0	1	1	1	1	1	1
10	Lesser bandicoot *Bandicota bengalensis* (Gray and Hardwicke, 1833)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11	Large bandicoot *Bandicota indica* (Bechstein, 1800)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12	Blanford's rat *Madromys blanfordi* (Thomas, 1881)	1	1	1	0	0	1	1	1	0	0	0	0	0	0	0	1
13	Indian bush rat *Golunda ellioti* Gray, 1837	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
14	Little Indian field mouse *Mus booduga* (Gray, 1837)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
15	House mouse *Mus musculus* Linnaeus, 1758	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
16	Wroughton's Small Spiny Mouse *Mus phillipsi* Wroughton, 1912	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	Brown rat *Rattus norvegicus* (Berkenhout, 1769)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sl. No	COMMON ENGLISH NAME AND SCIENTIFIC NAME	STR	KLD	HDG	BTK	KPL	STK	BSP	CHN	BLK	DBG	BDR	KHS	KLP	LKV	KTG	SBD
18	House rat *Rattus rattus* (Linnaeus, 1758)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
19	Indian long-tailed tree mouse *Vandeleuria oleracea* (Bennett, 1832)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
20	Cutch rat *Cremnomys cutchicus* Wroughton, 1912	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	Antelope rat *Tatera indica* (Hardwicke, 1807)	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1
22	Indian crested porcupine *Hystrix indica* Kerr, 1792	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
23	Indian hare *Lepus nigricollis* F. Cuvier, 1823	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
24	Gray musk shrew *Suncus murinus* (Linnaeus, 1766)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
25	Anderson's Shrew Suncus stoliczkanus (Anderson, 1877)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
26	White-toothed pigmy shrew *Suncus etruscus* (Savi, 1822)	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1
27	Short-nosed fruit bat *Cynopterus sphinx* (Vahl, 1797)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
28	Indian flying fox *Pteropus giganteus* (Brunnich, 1782)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
29	Indian fulvous bat *Rousettus leschenaulti* (Desmarest, 1820)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
30	Little Indian horseshoe bat *Rhinolophus lepidus* Blyth, 1844	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
31	Rufous horseshoe bat *Rhinolophus rouxii* Temminck, 1835	1	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0
32	Dusky leaf-nosed bat *Hipposideros ater* Templeton, 1848	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
33	Fulvous leaf-nosed bat *Hipposideros fulvus* Gray, 1838	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	Cantor's leaf-nosed bat *Hipposideros galeritus* Cantor, 1846	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
35	Sri Lanka leaf-nosed bat *Hipposideros lankadiva* Kelaart, 1850	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0

Sl. No	COMMON ENGLISH NAME AND SCIENTIFIC NAME	STR	KLD	HDG	BTK	KPL	STK	BSP	CHN	BLK	DBG	BDR	KHS	KLP	LKV	KTG	SBD
36	Schneider's leaf-nosed bat *Hipposideros speoris* (Schneider, 1800)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
37	Greater false vampire *Megaderma lyra* E. Geoffroy, 1810	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0
38	Lesser false vampire *Megaderma spasma* (Linnaeus, 1758)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	Lesser rat-tailed bat *Rhinopoma hardwickii* Gray, 1831	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
40	Larger rat-tailed bat *Rhinopoma microphyllum* (Brunnich, 1782)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
41	Pouch bearing bat *Saccolaimus saccolaimus* (Temminck, 1838)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	Long-armed seath-tailed bat *Taphozous longimanus* Hardwicke, 1825	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
43	Black-bearded seath-tailed bat *Taphozous melanopogon* Temminck, 1841	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
44	Tickell's bat *Hisperoptenus tickelli* (Blyth, 1851)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	Kelaart's pipistrelle *Pipistrellus ceylonicus* (Kelaart, 1852)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
46	Indian pipistrelle *Pipistrellus coromandra* (Gray, 1838)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
47	Dormer's bat *Pipistrellus dormer* (Dobson, 1875)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
48	Indian pigmy pipistrelle *Pipistrellus tenuis* (Temminck, 1840)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
49	Greater yellow bat *Scotophilus heathii* (Horsfield, 1831)	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0
50	Lesser yellow bat *Scotophilus kuhlii* Leach, 1821	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0
51	Painted bat *Kerivoula picta* (Pallas, 1767)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52	Indian pangolin *Manis crassicaudata* Gray, 1827	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1

Sl. No	COMMON ENGLISH NAME AND SCIENTIFIC NAME	STR	KLD	HDG	BTK	KPL	STK	BSP	CHN	BLK	DBG	BDR	KHS	KLP	LKV	KTG	SBD
53	Jungle cat *Felis chaus* Schreber, 1777	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
54	Leopard cat *Prionailurus bengalensis* (Kerr, 1792)	1	1	1	1	0	1	1	0	0	1	0	0	1	1	1	1
55	Rusty spotted cat *Prionailurus rubiginosus* (I. Geoffroy S-H, 1831)	1	1	1	0	0	0	0	0	0	1	1	1	1	0	1	1
56	Fishing cat *Prionailurus viverrinus* (Bennett, 1833)	1	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0
57	Leopard *Panthera pardus* (Linnaeus, 1758)	1	1	1	0	0	1	1	0	0	1	1	1	1	1	1	1
58	Royal Bengal tiger *Panthera tigris* (Linnaeus, 1758)	1	1	1	0	0	1	1	0	0	0	0	0	1	0	1	1
59	Common palm civet *Paradoxurus hermaphrodites* (Pallas, 1777)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
60	Large Indian civet *Viverra zibetha* Linnaeus, 1758	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
61	Small Indian civet *Viverricula indica* (Desmarest, 1804)	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1
62	*Urva edwardsii* (I. Geoffroy S-H, 1818)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
63	Small Asian mongoose *Urva auropunctatus* (Hodgson, 1836)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
64	Ruddy mongoose *Urva smithii* Gray, 1837	1	1	1	0	1	1	1	0	0	1	0	0	1	1	1	1
65	Stripe-necked mongoose *Urva vitticollis* Bennet, 1835	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66	*Hyaena hyaena* (Linnaeus, 1758)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
67	Golden jackal *Canis aureus* Linnaeus, 1758	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
68	Gray wolf *Canis lupus* Linnaeus, 1758	1	1	1	0	0	1	1	1	0	1	1	0	1	1	1	1
69	Wild dog/ Dhole *Cuon alpinus* (Pallas, 1811)	1	1	1	0	0	1	1	0	0	1	0	0	0	0	0	1
70	Bengal fox *Vulpes bengalensis* (Shaw, 1800)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
71	Sloth bear *Melursus ursinus* (Shaw, 1791)	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1
72	Honey badger *Mellivora capensis* (Schreber, 1776)	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1

Sl. No	COMMON ENGLISH NAME AND SCIENTIFIC NAME	STR	KLD	HDG	BTK	KPL	STK	BSP	CHN	BLK	DBG	BDR	KHS	KLP	LKV	KTG	SBD
73	Asian small-clawed otter *Aonyx cinereus* (Illiger, 1815)	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
74	Smooth-coated otter *Lutrogale perspicillata* (I. Geoffroy S-H, 1826)	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0
75	Wild boar *Sus scrofa* Linnaeus, 1758	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
76	Indian mouse deer/ Indian chevrotain *Moschiola indica* (Gray, 1852)	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1
77	Spotted deer/ Chital *Axis axis* (Erxleben, 1777)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
78	Barasingha *Rucervus duvaucelii* (Cuvier, 1823)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
79	Sambar *Rusa unicolor* Kerr, 1792	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1
80	Northern red muntjac *Muntiacus vaginalis* (Boddaert, 1785)	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1
81	Blackbuck *Antilope cervicapra* (Linnaeus, 1758)	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0
82	Gaur/ Indian bison *Bos gaurus* Smith, 1827	1	1	1	0	0	1	1	0	0	1	1	1	1	1	1	1
83	Nilgai *Boselaphus tragocalamus* (Pallas, 1766)	0	0	0	0	0	1	1	0	0	1	1	0	1	0	0	1
84	Wild buffalo *Bubalus arnee* Kerr, 1792	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
85	Four-horn antelope *Tetracerus quadricornis* (Blainville, 1816)	1	1	1	0	0	1	1	0	0	1	1	1	1	1	1	1
	Total number of terrestrial mammalian species recorded	60	53	50	32	44	56	56	51	40	50	45	43	50	51	53	50

Abbreviations: **STR**: Similipal Tiger Reserve, **KLD**: Kuldiha WLS, **HDG**: Hadgarh WLS, **BTK**: Bhitarkanika WLS, **KPL**: Kapilas WLS, **STK**: Satkosia WLS, **BSP**: Baisipalli WLS, **CHN**: Chandaka WLS, **BLK**: Balukhand WLS, **DBG**: Debrigarh WLS, **BDR**: Badrama WLS, **KHS**: Khalasuni WLS, **USK**: Ushakothi WLS, **KLP**: Karlapat WLS, **LKV**: Lakhari Valley WLS, **KTG**: Kotagarh WLS, **SBD**: Sunabeda WLS.

Table 6. Wildlife Census Results (As per census report of Wildlife wing of Odisha, Govt. of Odisha)

Species	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Irrawady dolphin (Chilika population)	152	158	144	-	121	114	113
Bottlenose (Chilika population)	-	-	-	-	13	12	0
Other dolphins in Odisha coast (including Chilika)	-	-	450	-	257	469	259
Blackbuck (Ganjam district)	-	-	3806	-	-	4082	-
Elephant	1930	-	1954	-	1976	-	-
Tiger	-	-	28 (only camera trap result by NTCA)	40 (Camera trap and pubmark census by state forest dept.)	-	-	28 (26-30)
Leopard	-	-	-	318	-	-	-

Source: Wildlife Odisha, 2019. (-): no data or nil record.

Table 7. Species wise recorded mortality of mammals (2011-12 to 2018-19)

SL No.	Common English name and Scientific name	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
1	Asian Elephant	68	82	70	55	85	75	78	93
2	Langur	1	8	12	5	6	22	25	7
3	Squirrels	-	-	1	1	6	4	2	2
4	Flying squirrel	-	-	-	-	-	1	-	-
5	Porcupine	4	2	1	4	1	7	5	4
6	Hare	2	-	-	6	4	4	9	-
7	Bats	-	95	-	-	-	-	-	-
8	Indian pangolin	2	2	-	1	2	5	1	1
9	Jungle cat	2	-	-	-	1	4	4	-
10	Fishing cat	-	4	-	-	2	3	2	2
11	Leopard	1	3	4	5	8	4	2	6
12	Royal Bengal tiger	-	1	-	1	-	1	1	2
13	Civets	2	4	3	-	-	2	4	1
14	Hyena	16	8	10	4	5	9	7	4
15	Jackal	-	1	1	-	2	-	2	-
16	Wolf	-	-	1	2	2	4	4	-
17	Sloth bear	17	25	38	32	38	34	39	33
18	Ratel	3	5	1	1	-	1	4	5
19	Wild boar	27	36	32	49	64	81	96	104
20	Mouse deer	2	-	-	1	4	6	7	1
21	Spotted deer	41	33	40	42	78	70	103	79
22	Sambar	9	14	9	18	25	27	23	31
23	Barking deer	26	37	34	52	35	62	46	42
24	Gaur	1	2	-	1	3	7	13	6
25	Nilgai	1	1	-	1	1	-	1	-
26	Four-horn antelope	-	2	-	1	4	2	5	1
27	Wild buffalo	0	3	-	-	-	-	-	-
28	Black buck	5	10	18	16	21	18	40	38
29	Whales	0	0	0	2	2	2	1	2
30	Dolphins	14	16	2	7	8	6	5	10
31	Porpoise	-	-	-	-	-	-	2	1

Source: Wildlife Odisha- (2013-2019)

3.5. THREATS

Major threats to wild mammals include habitat destruction due to developmental activities, poaching, illegal encroachment in forests, increasing forest dependency and a decrease in prey biomass due to over-exploitation. Specific threats to the tiger, leopard, otters etc. are from illegal hunting for their pelt and other body parts. There are also underlining threats to most of the large and small mammals, specifically tigers, elephants, leopards and pangolins for use of their body parts in various traditional medicines, for which international smuggling is continuing in the state. Apart from these, road mortality, electrocution and unnatural death of animals are also a major concern for wildlife conservation. Table-7 depicts species-wise mortality data for various mammals recorded in Odisha (Wildlife census 2019), due to poaching, road kills and death in their habitat. However, the actual causes of mortality are far more in number, as many such cases go unregistered.

3.5.1. Poaching

It is a fact that the population of wild mammals has been declining at a faster rate due to two major threats, direct exploitation and habitat destruction. Most of the mammals (except the rats and bats) enlisted under various schedules of Wildlife (Protection) Act, 1972, are poached for bushmeat and illegal trade of their body parts. Hunting rituals observed by many tribal communities such as Akhand Shikar (mass hunting) and pardhi are prevalent in the state for bushmeat. In such incidents, men in small to large groups equipped with various hunting equipment such as bow and arrow, axe, sticks etc., flush the animals by making noises, occasionally beating drums and beating bushes. The hunting party placed at strategic location aim for the flushed animals and kill them. In this process animals like wild boar, barking deer, mouse deer etc. are killed and are later shared among the participants. As per rule, the person who has first shoot the animal gets the preferred share from the meat. In this process large number of animals also get injured and die afterwards depending upon severity of injury. Casual hunting is also observed as a favorite pastime for many tribal communities like the Santhals, Kolhas and to some extent the Bhunyas and Kondhs. Many tribal communities enter the forest with trained hunting dogs. The hunting dogs are so trained that, a pack of 2-4 individuals can knock down a large deer. Apart from killing small to large ungulates, these dogs are used specifically for hunting otters, hare and other animals like monitor lizards.

Poisoning is a very easy method for poachers to kill wild animals and is in practice for over a long period in various parts of Odisha, especially Similipal. Poison extracted from plant products as well as various pesticides are used in different media (such as fruits, salt licks etc.) at strategic points to kill the

wild mammals. The salt licks (natural and artificial) are prone to poisoning. Sometimes the poachers also create an artificial salt lick near the animal congregation area by regularly putting salt at one place and when the animals get acclimatized, a poison is mixed with salt or with fruits. Recent tactics includes injecting poison inside fruits, which leave no pungent smell.

In Karlapat Wildlife Sanctuary the local *Kondh* tribe hunt otters using dogs. Small-clawed otters are also caught/ trapped by locating the dens and then surrounding the den with nets. Some people also catch them during night time by using spotlights. Consequently, the local communities have witnessed a drastic drop down in the population of small-clawed otters in their distribution range in the last decade. In non-protected areas, mostly in south Odisha, otters are deliberately hunted for skin and meat; while the meat is consumed, the skin is sold to the local traders for Rs300-Rs500. In Phulbani and many other villages in Kandhamal district, local communities were observed keeping otter pops as pet.

There are also instances of involvement of other tribes from Central India and Northeast India in poaching of wild animals like elephant, tiger, leopard, fox, jackal, otters etc. As per the information collected from south Odisha, pardhi tribe from Central India occasionally camp in various localities, mostly at the village outskirts. Most of them are blacksmiths and sell agricultural tools. They are also known to poach wild animals. They use leg traps for tigers and leopards and also use some kind of traps for otters. Lisu tribe of Arunanchal was once actively involved in the killing of elephants in Similipal (1996-97) and other parts of the state. This tribe used arrow applied with aconite poison to kill elephants and as a signature, elephants killed by these people were found with their ankles slitted with a sharp weapon.

Mongooses are in trade, majorly for their fur. Earlier, till 2008, mongoose trade was rampant in Cuttack forest division and brought to control due to intervention by wildlife conservationists. Mongooses are regarded as an auspicious animal in Odisha and are highly respected for their courage to kill snakes. Recently, pangolin has become the most traded animal for their scales. Inter-state and international gangs are mostly involved and many poachers have been apprehended in Odisha by the forest department, police and Wildlife Crime Control Bureau (WLCCB) in recent years.

3.5.2. Trading of live mammals and incarceration

Sloth bear cubs were traded on a large scale from various parts of Odisha from Keonjhar, Angul, Rerhakhole, Sambalpur and Dhenkanal districts. Such trades have now almost come to an end due to active intervention of the state forest department, the local conservationists and various Wildlife related NGOs. Similarly live trade of mongooses was rampant till the end of the twentieth century, which has been reduced to a much greater extent. Apart from this, local communities are sometimes seen keeping wild mammals such as spotted deer, blackbuck, mongooses, wild boar, etc.as pet, which can be completely stopped through awareness.

3.5.3. Road mortalities

Lesser cats, mongooses, civets, jackal, fox, many small to medium-sized deer species, langurs, rhesus monkeys, and even elephants are victimized due to road and rail traffic. Such cases are also recorded for small mammals. Road accidents are more often seen along roads passing through or adjacent to Protected Areas and also through any good patch of forest. Although it is practically impossible to stop

such accidents, measures have been taken by the state government for large mammals like elephants, which often get hit by trucks and trains.

3.5.4. Habitat loss

Habitat loss is a very general and prevailing condition affecting most of the biodiversity, but it becomes worst for habitat specialists. All the large mammals and smaller ones like small cats, otters, pangolin etc. mostly suffer from habitat degradation.

3.5.5. Resource sharing with humans and unsustainable harvesting of resources

Sloth bears, all over their distribution ranges, are facing high competition due to resource sharing leading to conflict with humans. Large-scale collection of Mahua flowers, unsustainable harvesting of honey and other forest produces and human activities during the early evening and morning hours in the bear prone areas are major causes for sloth bear-human conflicts.

Apart from poaching, otters in the state face threats due to large scale fishing activities (even during the night), poisoning of water for fishing and large scale collection of hill stream crabs and molluscs. It was also observed that some local communities extensively hunt for crabs in the small-clawed otter habitats, which is a major threat for survival of the species.

3.6. MAMMAL-HUMAN CONFLICT IN ODISHA

The growing intrusion of animal habitats by human and vice-versa and lack of awareness often disrupts the ecological balance leading to an intense human-wildlife conflict (HWC). Such conflicts once considered as a problem around villages close to the forests, has now become common incidence in urban and sub-urban areas (Messmer, 2000; Anand and Radhakrishna, 2017). While HWC has been recognized as a central issue to wildlife management it is mostly caused due to habitat destruction, population explosion of a few species of wildlife due to availability of food, and largescale environmental changes (Treves, 2008). Like other parts of the country, many species of wild mammals in Odisha are in conflict with humans causing loss of life, property and other casualties. In recent years, man-animal conflicts have been particularly acute in the case of wild elephants and sloth bears. There are cases of human kills and injury, cattle kill, house damage and crop damage by wild animals, followed by their retaliatory killing.

3.6.1. Man-elephant conflict

Habitat loss, disruption of corridors and migratory routes, degradation of forests and easy availability of palatable crops near their habitat are the major underlying reasons for human-elephant conflict in the state. With increasing green cover in Odisha, many good shelters (tree cover/ bushes) are available for elephants outside their traditional shelters and elephants are moving to non-traditional areas e.g. recent cases of elephants venturing to Pipili (Puri district) and Jajpur. Sometimes in these areas, the local inhabitants, who never had an elephant neighbor in their recent past become clueless and become easy victims of depredation. Palei *et al.* (2013) reported major threats to elephants in the Sambalpur Elephant Reserve. Similarly, another study by Palei *et al.* (2014) analyzed a total of 118 elephants killed in 91 incidences of electrocution during 2001–2012. During the study period, the cases were

registered in 28 of 30 elephant range districts in Odisha and most of the deaths (73.68%) were because of accidental contact with electric power lines.

In the last five years (2014-15 to 2018-19) a total of 410 persons were killed, 264 persons were injured, 114 cattle were killed by elephants and a total of 386 elephants died due to various causes. The elephant deaths during the said five years can be classified as; 12 due to poaching, 2 due to poisoning, 57 due to electrocution, 12 due to rail and road accident, 76 due to other accidents, 136 due to diseases, 32 natural deaths and 59 due to causes unknown. Details of such activities and the amount of compassionate grants disbursed have been provided in the official document Wildlife Wealth, published by PCCF (WL), Government of Odisha.

To prevent such conflicts, the state government has taken steps like creation of elephant-proof trenches, rubble-walls and energized fences etc. with the support of local villagers. Extensive fodder plantations andcreation of waterbodies have been taken in forest areas. Anti-depredation squads have been deployed in various divisions to drive away elephants by using search lights, firecrackers and scare-away guns. Advance information on elephant movement is passed on to villagers, electricity department and railway authorities to make them aware for taking suitable measures. In rare cases, elephants causing incessant damage to humans have been removed physically from the particular site. In Talcher range, a lone tusker, which had killed five persons in a day, was detusked in 2019 but had to be tranquilized and taken to Kapilash elephant rescue center after it restarted going into human habitation. In another instance, an elephant which had strayed in Jajpur area and killed five persons had to be tranquilized and taken away to Chandaka rescue center.

3.6.2 Man-other mammal conflict

At par with elephants, sloth bears are in conflict with humans in the state. As per a report published in Down to Earth (online published on 25th March 2019) "based on the data provided by the office of PCCF (WL), 716 bear attacks were recorded between 2014 and 2018". Nevertheless, sloth bear attacks cause far more seriously injured human beings than any other large wild fauna. Reports of Mardaraj and Dutta (2011), Mardaraj *et al*. (2012), Debata *et al*. (2016), Mardaraj and Udgata (2017) elucidate causes and extent of sloth bear-human conflicts in the state.

Depredation instances due to leopards and tigers are not so grievous but a considerable number of deaths of these big cats are recorded accounting for 25 leopard and 5 tiger deaths in the past five years. Of late, reports of wolf depredating sheep and goats have been reported accounting for 178 killed and 10 injured during 2017-18 and 30 killed during 2018-19. Another report published by Palei *et al*. (2013) reported 96 goats and sheep killed by wolves in one year (2011-12) only from Hadgarh Wildlife Sanctuary. However, none of the cases were officially reported by the villagers.

Other emerging HWCs are due to monkeys and wild boars. Whereas wild boar depredation cases are acute in forest fringe villages, instances of monkey-menace have been reported mostly from Kendrapada, Jagatsinghpur, Puri, Khurda and Cuttack districts including Bhubaneswar, Cuttack and Jajpur towns. Complains about monkey menace in Kendrapada and Jagatsinghpur districts went up very high during the year 2000 which ultimately caught the attention of concerned district

administration and the state administration. Monkeys pose problems like bites to the people or destruction of fruit orchards, vegetable fields, and the thatched and asbestos roofs of houses.

3.6.3. Steps taken by the state forest department

Various need-based, site-specific constructive measures have been taken up by the state forest deparrtment to prevent, control and handle situations arising out of HWC. Prompt disbursement of the compassionate grant has controlled the people outrage to a greater extent, but more innovative mitigative measures are needed to address these never-ending problems. Technological solutions being used elsewhere are also being evaluated for their suitability in Odisha conditions.

3.7. TAXA SPECIFIC CONSERVATION PLANS REQUIRED/ PROPOSED

Some long-term projects can be undertaken in the state along with the ongoing programmes such as census and time to time status evaluation (wildlife monitoring) conducted by the state forest department towards effective conservation and management of wild mammals. To flag off the issues, some need-based programmes are proposed under the following headings.

- Status survey of Barasingha and Wild buffalo in Odisha and their reintroduction.
- Documentation of small mammals, specifically rodents, bats and shrews and evaluation of their status.
- Study on conservation and reintroduction of pangolins in Odisha.
- Status evaluation of Otters in the state.
- State-level conservation action plans for threatened mammals of Odisha.

4. CONCLUSIONS

Odisha supports a high diversity of mammals due to varied habitat diversity. While Odisha accounts for 4.87% of the total geographical area of India, it is home to nearly 24 % of the known mammalian diversity of the country. However, lesser-known groups such as rodents, bats and shrews need more attention from scientific and taxonomic perspectives. The advancement of modern taxonomy and the use of molecular tools have helped to explore cryptic species vis-à-vis gene flow in metapopulation dynamics. Many areas in the state are still unexplored in terms of small mammals, which need systematic and long-term surveys. Status survey of wild water buffalo and barasingha in Sunabeda-Koraput landscape and reintroduction of these species need to be taken up on a priority basis by developing a conservation action plan for these threatened species.

ACKNOWLEDGMENTS

PPM express a deep sense of gratitude to Dr. Kailash Chandra, Director Zoological Survey of India, Kolkata for encouragement. PPM would like to thank Dr. S. Sambath, Officer-in-Charge, ZSI-CZRC, Jabalpur for all kinds of support and encouragement in compilation of this paper. The authors would like to thank Prof. (Mrs.) Pravati Kumari Mahapatra, Editor of the journal for her kind cooperation and meticulous editing of the manuscript. Thanks are also due to Dr. S.S. Talmale, Scientist-B, ZSI, WRC,

Pune for verification of *Suncus stoliczkanus* (Anderson, 1877) specimen from Odisha and other help in identification of small mammals. We are thankful to Himanshu S. Palei, Subrat Debata, Vivek Sarkar, Aditya C. Panda, Satyanarayan Mishra, Nimai C. Palei, Bhakta P. Rath, Prashad K. Dash, Asish K. Das, Rakesh Mohalik, Ashok K. Biswal, Biswajit Mohanty, Ranjit K. Pattnaik, Uday K. Das, Sanjib K. Behera, Bijoy K. Das and Bibhuti P. Barik for accompanying in various field surveys. We are thankful to the forest officers, specifically Dr. Manoj V. Nair, Dr. Arun K. Mishra, Dr. Akhya K. Pattnaik and Dr. J. D. Pati for support in various ways.

Plate 1

Photo. Pratyush P. Mohapatra

A herd of sambar- *Rusa unicolor* Kerr, 1792 at Similipal TR

Photo. Pratyush P. Mohapatra

Habitat of Small clawed otter- *Aonyx cinera* (Illiger, 1815) at Karlapat WLS.

Plate 2

A herd of subadult elephants at Satkosia TR

Photo. Pratyush P. Mohapatra

Photo. Pratyush P. Mohapatra

An elephant family at Similipal TR

Photo. Pratyush P. Mohapatra

Northern plains langur
Semnopithecus entellus (Dufresne, 1797)

Photo. Cuckoo Mahapatra

Rhesus monkey
Macaca mulatta (Zimmermann, 1780)

Plate-3

Photo. Pratyush P. Mohapatra

Indian giant squirrel
Ratufa indica (Erxleben, 1777)

Photo. Pratyush P. Mohapatra

Three-striped squirrel
Funambulus palmarum (Linnaeus, 1766)

Photo. Pratyush P. Mohapatra

Five-striped squirrel
Funambulus pennantii Wroughton, 1905

Photo. Pratyush P. Mohapatra

Giant Indian flying squirrel
Petaurista philippensis (Elliot, 1839)

Plate 4

Photo. Vivek Sarkar

Large bandicoot rat
Bandicota indica (Bechstein, 1800)

Photo. Pratyush P. Mohapatra

Lesser bandicoot rat
Bandicota bengalensis (Gray & Hardwicke, 1833)

Photo. Pratyush P. Mohapatra

Blanford's rat
Madromys blanfordi (Thomas, 1881)

Photo. Pratyush P. Mohapatra

Little Indian field mouse
Mus booduga (Gray, 1837)

Plate 5

House rat
Rattus rattus (Linnaeus, 1758)
Photo. Vivek Sarkar

Indian long tailed tree mouse
Vandeleuria oleracea (Bennett, 1832)
Photo. Pratyush P. Mohapatra

Antelope rat
Tatera indica (Hardwicke, 1807)
Photo. S.Mishra/ P. P. Mohapatra

Indian Crested porcupine
Hystrix indica Kerr, 1792
Photo. Satyanarayan Mishra

Plate 6

Indian hare
Lepus nigricollis F. Cuvier, 1823

Photo. Vivek Sarkar

Anderson's shrew
Suncus stoliczkanus (Anderson, 1877)

Photo. Pratyush P. Mohapatra

Photo. Pratyush P. Mohapatra

Gray musk shrew
Suncus murinus (Linnaeus, 1766)

Photo. Pratyush P. Mohapatra

White-toothed pigmy shrew
Suncus etruscus (Savi, 1822)

Plate 7

Photo: Pratyush P. Mohapatra

Indian flying fox
Pteropus giganteus (Brunnich, 1782)

Photo: Pratyush P. Mohapatra

Indian fulvous bat
Rousettus leschenaulti (Desmarest, 1820)

Plate 8

Short-nosed fruit bat
Cynopterus sphinx (Vahl, 1797)

Photo. Vivek Sarkar

A colony of Little Indian horseshoe bat at Khandagiri, Bhubaneswar.

Photo. Pratyush P. Mohapatra

Plate 9

Photo: Pratyush P. Mohapatra

Little Indian horseshoe bat
Rhinolophus lepidus Blyth, 1844

Photo: Subrat Debata

Rufous horseshoe bat
Rhinolophus rouxii Temminck, 1835

Photo: Pratyush P. Mohapatra

Dusky Leaf-nosed bat
Hipposideros ater Templeton, 1848

Photo: Vivek Sarkar

Cantor's leaf-nosed bat
Hipposideros galeritus Cantor, 1846

Photo: Pratyush P. Mohapatra

Sri Lanka gigantic leaf-nosed bat
Hipposideros lankadiva Kelaart, 1850

Photo: Pratyush P. Mohapatra

Hipposideros lankadiva Kelaart, 1850
Breeding male

Plate 10

Greater false vampire bat
Megaderma lyra E. Geoffroy, 1810

Lesser false vampire bat
Megaderma spasma (Linnaeus, 1758)

Lesser rat-tailed bat
Rhinopoma hardwickii Gray, 1831

Rhinopoma hardwickii Gray, 1831

Black-bearded seath-tailed bat
Taphozous melanopogon Temminck, 1841

a. Indian pipistrelle *Pipistrellus coromandra* (Gray, 1838); b. Indian pigmy pipistrelle *Pipistrellus tenuis* (Temminck, 1840); Kelaart's pipistrelle *Pipistrellus ceylonicus* (Kelaart, 1852). Photos. Subrat Debata

Plate 11

Painted bat
Kerivoula picta (Pallas, 1767)

Photo: Forester, Barbara RF

Indian pangolin
Manis crassicaudata Gray, 1827

Photo: Satyanarayan Mishra

Plate 12

Jungle cat (Road killed)
Felis chaus Schreber, 1777
Photo. Ptayuush P. Mohapatra

Leopard cat
Prionailurus bengalensis (Kerr, 1792)
Photo. Bijoy K. Das

Rusty spotted cat
Prionailurus rubiginosus (I. Geoffroy S-H, 1831)
Photo. Ashis K. Das

Fishing cat
Prionailurus viverrinus (Bennett, 1833)
Photo. Vivek Sarkar

Plate 13

Royal Bengal Tiger Photo. Pratyush P. Mohapatra
Panthera tigris (Linnaeus, 1758)

Leopard Photo. Pratyush P. Mohapatra
Panthera pardus (Linnaeus, 1758)

Small Indian civet Photo. Subrat Debata
Viverricula indica (Desmarest, 1804)

Photo. Pratyush P. Mohapatra
Viverricula indica (Desmarest, 1804) road killed

Taylor's palm civet Photo. Pratyush P. Mohapatra
Paradoxurus hermaphrodites nictitans (Taylor, 1891)

Plate 14

Indian Grey Mongoose
Urva edwardsii (I. Geoffroy S-H, 1818)
Phot: Udit Pratap Das

Small Asian mongoose
Urva auropunctatus (Hodgson, 1836)
Phot. Pratyush P. Mohapatra

Stripe-necked mongoose
Urva vitticollis Bennet, 1835
Phot. Similipal Tiger Reserve

Ruddy mongoose
Urva smithii Gray, 1837
Phot. Pratyush P. Mohapatra

Plate 15

Striped hyaena
Hyaena hyaena (Linnaeus, 1758)
Photo. Vivek Sarkar, S. K. Sajan and Pratyush P. Mohapatra

Golden jackal
Canis aureus Linnaeus, 1758
Photo. Pratyush P. Mohapatra

Gray wolf
Canis lupus Linnaeus, 1758
Photo. Manoj V. Nair

Dhole
Cuon alpines (Pallas, 1811)
Photo. Pratyush P. Mohapatra

Bengal fox
Vulpes bengalensis (Shaw, 1800)
Photo. Udit Pratap Das

Plate 16

Sloth bear
Melursus ursinus (Shaw, 1791)
Photo. Pratyush P. Mohapatra

Honey badger
Mellivora capensis (Schreber, 1776)
Photo. Vivek Sarkar

Smooth-coated otter
Lutrogale perspicillata (I. Geoffroy S-H, 1826)
Photo. Bijoy K. Das

Asian small-clawed otter
Aonyx cinera (Illiger, 1815)
Photos. Pratyush P. Mohapatra
a. Pug mark and b. spraint of Asian small-clawed otter

Plate 17

Wild boar
Sus scrofa Linnaeus, 1758

Photo. Pratyush P. Mohapatra

Indian chevrotain
Moschiola indica (Gray, 1852)

Photo. Pratyush P. Mohapatra

Plate 18

Spotted deer
Axis axis (Erxleben, 1777)
Photo. Pratyush P. Mohapatra

Sambar
Rusa unicolor Kerr, 1792
Photo. Pratyush P. Mohapatra

Northern red muntjac (female)
Muntiacus vaginalis (Boddaert, 1785)
Photo. Pratyush P. Mohapatra

Northern red muntjac (male)
Muntiacus vaginalis (Boddaert, 1785)
Photo. Pratyush P. Mohapatra

Blackbuck
Antilope cervicapra (Linnaeus, 1758)
Photo. Pratyush P. Mohapatra

Plate 19

Gaur
Bos gaurus Smith, 1827
Photo. Pratyush P. Mohapatra

Nilgai
Boselaphus tragocalamus (Pallas, 1766)
Photo. Pratyush P. Mohapatra

Wild buffalo
Bubalus arnee Kerr, 1792
Photo. Himanshu S. Palei

Four-horn antelope
Tetracerus quadricornis (Blainville, 1816)
Photo. Vivek Sarkar

Four-horn antelope (Fawn)
Tetracerus quadricornis (Blainville, 1816)
Photo. Shanti B. Sahu

Plate 20

Photo. Aditya C. Panda

Irrawaddy dolphin
Orcaella brevirostris (Owen in Gray, 1866)

Photo. Pratyush P. Mohapatra

Indo-Pacific humpback dolphin
Sousa chinensis (Osbeck, 1765)

Plate 21

A traditional hunting practice used in Kotagarh to kill wild boars. Location: Demul, Baliguda.

Use of smoke to kill porcupines in their den. Location: Krishna mali, Kalahandi.

Wire noose traps for hare. Location: Dhenkanal.

Hunting/ trapping implements, as seen in a rural village. Location: Sundargarh.

People carrying a trapped wild boar. Location: Sundargarh.

Plate 22

A variety of mammal body parts like Skin of sloth bear, leopard, antlers etc. sold for use in various traditional medicinal practices.

Sloth bear claw and skull of monkeys are kept at home or in cattle shed for some traditional beliefs.

Tusker poached at Karlapat WLS.

Assorted meat and skulls confiscated by Forest staff from Baldiha, Baripada Division.

Retaliation killing of sloth bear at Ganjam.

Sloth bear cubs confiscated by forest staff from Talcher range, Angul division.

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