

Wild Animals Maintained in Jamunkhadi Mini Zoo, Conservation Status, and their Occurrence in Jhapa District, Nepal

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Abstract

The Jamunkhadi Mini Zoo has been in operation for 15 years and has maintained various species of wild animals, although the majority of them are either unidentified or misidentified on their species labels. Publications revealing the occurrence of wild animals in the Jhapa District are scanty. This study identifies wild animals maintained at the Jamunkhadi Mini Zoo and surveys its place of collection. A wild animal survey form was filled with the officials of the Jamunbari Community Forest and its zookeepers. High-resolution photographs of all the wild animals in the mini zoo were taken and identified with the help of relevant species identification guide books and experts in the various wildlife disciplines. A field survey was carried out by a team of 3-5 researchers to confirm the occurrence of indigenous wild animals in the forests of Jhapa. A total of 28 species of wild animals comprised of six reptile species, seven bird species, and 15 mammal species are identified and listed at the Jamunkhadi Mini Zoo. Of the 28 species maintained at the zoo, 9 (32.14%) are listed as globally threatened; whereas 15 species (53.57%) are listed as nationally threatened, and of those 28 species, 26 are confirmed to occur in the Jhapa. The Leopard Cat, *Prionailurus bengalensis* has probable habitat in the northern forests that connect with Ilam District in the south. The Sloth Bear, *Melursus ursinus* has not been recorded in Jhapa.

Keywords: Distribution, faunal diversity, field survey, threatened species

Introduction

Ex-situ conservation is an approach to conservation that involves the transferring of particular species away from their natural habitat (Kasso and Balakrishnan, 2013). Among the different types of *ex-situ* conservation programs, zoos are one of the important means of conserving threatened species (Conde et al., 2011; Kasso and Balakrishnan, 2013). The National Zoological Garden, a government body under the Ministry of Forests and Environment has identified 17 mini zoos in Nepal, excluding the Central Zoo in Jawlakhel, Lalitpur (National Zoological Garden, 2019). Among them is the Jamunkhadi Mini Zoo, which is operated under the Jamunkhadi wetland and tourism area by the Jamunbari Community Forest User Group (CFUG). Jamunbari CFUG was established on 12 October 1995 and has an area of 434.19 hectares; of which 5.44 hectares are wetlands (National Zoological Garden, 2019). It is located in Kankai Municipality ward number 1 and 2 of Jhapa District in Province 1 of eastern Nepal. After 10 years of its establishment, the CFUG founded the Jamunkhadi wetland and tourism area in ward 2 of Kankai Municipality (National Zoological Garden, 2019). Initially, this mini zoo was established as a rehabilitation centre to rescue injured wild animals from the surrounding area by the Division Forest Office of Jhapa. After a few years, it was opened for visitors and slowly became a popular spot for students and internal tourists (pers. comm. Khem Sitaula). Jamunkhadi was the first mini zoo to be established in Province 1, eastern Nepal (National Zoological Garden, 2019).

Nepal is a hotspot of biodiversity and it has a remarkably high number of diverse species of plants and animals in a relatively small area (Kästle et al., 2013). Nepal's rich biodiversity reflects its unique geographic position and variation in altitude and climate. Biogeographically, Nepal lies in the transitional zone between the Palaearctic realm in the north and the Palaetropic realm in the south (Paudel et al., 2012). In Nepal, 48 species of amphibians and 120 species of reptiles have been documented (Kästle et al., 2013). However, in recent years, new species of amphibians have been discovered in Nepal (Khatiwada et al., 2017; Khatiwada et al., 2019), and new species of reptiles have been recorded in the country (Rawat et al., 2019; Rai et al., 2021). Also, the occurrence of Theobald's Ranid Frog, *Hylarana tyleri* (Rai, 2019), and the Indian Eyed Turtle, *Morenia petersi* (Rai and Adhikari, 2021) have been confirmed in Nepal. Consequently, the updated checklist of the herpetofauna of Nepal is now anticipated. The Department of National Parks and Wildlife Conservation (DNPWC), in their official checklist, has documented 886 species of birds in Nepal (DNPWC and Bird Conservation Nepal, 2018). However, new bird species have been reported recently from the country and an updated checklist of birds in Nepal is expected to be published. Similarly, a total of 212 species of mammals have been recorded in Nepal (Amin et al., 2018; Baral et al., 2019). Eventually, this study will serve as a piece of baseline information on the faunal diversity of the Jhapa District.

Materials and Methods

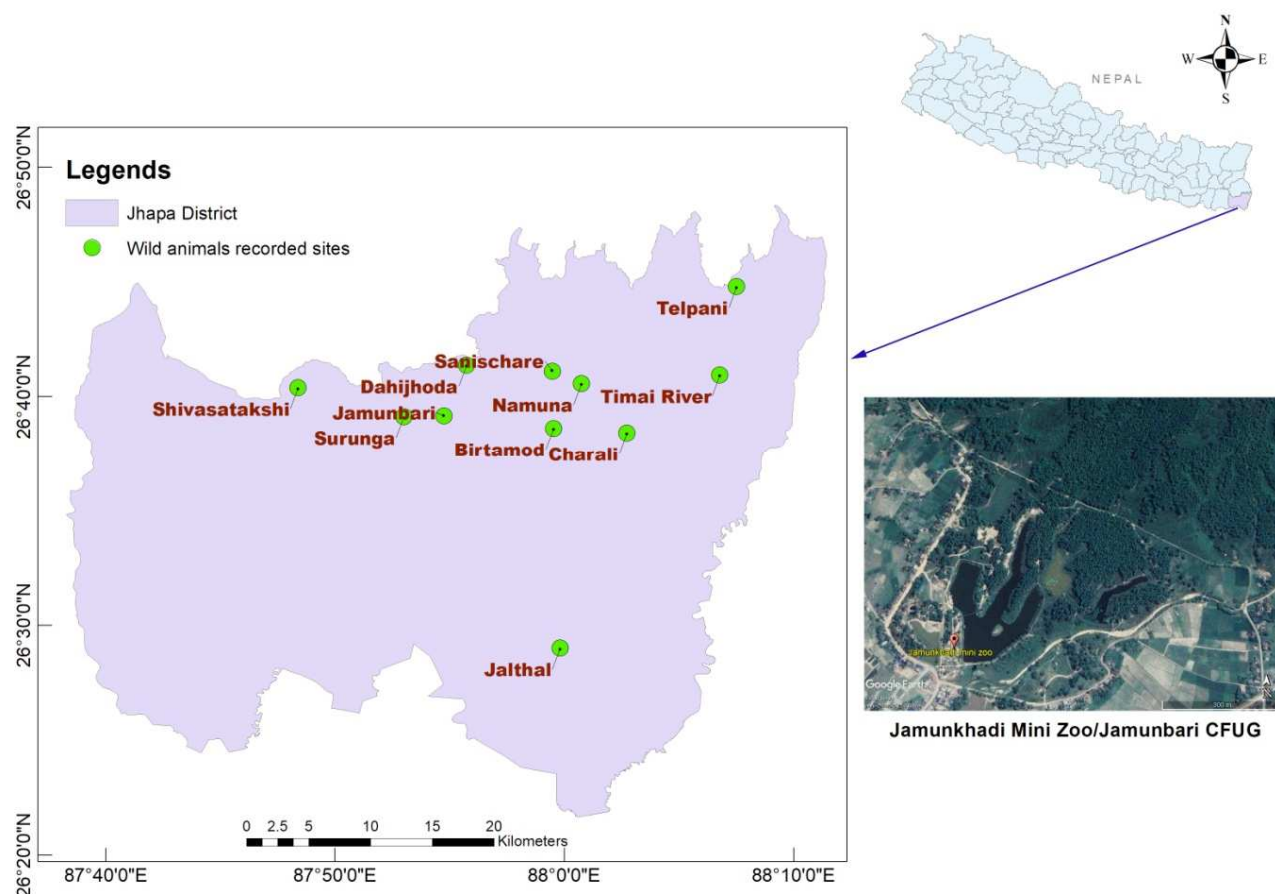
Jamunkhadi Mini Zoo is operated under Jamunkhadi Wetland and Tourism Area located in Kankai Municipality ward number 1 and 2 of Jhapa District (Figure 1). The Global Positioning System (GPS) coordinates of Jamunkhadi Mini Zoo is 26°39'08"N, 87°54'47"E at an elevation of 117 m (Garmin GPS Oregon 300). The nearest meteorological station is Gaida (Kankai) with Index No. 1421, 5.5 km west of Jamunkhadi Mini Zoo. Climatic data for that time period, (2010-2019) ranged from 1 to 39.5 °C and the average annual rainfall measured 245 mm (Department of Hydrology and Meteorology, 2021).

At the outset of the research, three separate wildlife survey forms (for reptiles, birds, and mammals) were prepared. The survey was conducted on 4 July and 18 October 2019, and lastly, on 16 November 2021, which was accompanied by several virtual communications with the staff of the mini zoo. High-resolution photographs of all wild animals in the mini zoo were taken using a Canon EOS M50 mirrorless camera and identified with the help of standard Identification Guide books and in consultation with various wildlife experts. The record book of incoming wild animals at the Jamunkhadi Mini Zoo was used as the main source in denoting the specific localities of the individual fauna housed at the facility.

The field survey team consisted of 3-5 researchers, who confirmed the occurrence of the wild animals with possible photographs in Jhapa District for the Jamunkhadi Mini Zoo in 2020 and 2021.

Figure 1

Wild Animals Recorded Sites in Jhapa District in Southeast Nepal and an Aerial View of Jamunxhadi Mini Zoo at the Inset



Results and Discussion

A total of 28 species of wild animals, comprised of six reptile species, with 23 individuals, seven bird species, with 15 individuals, and 15 mammal species, with 65 individuals are identified and reside at Jamunxhadi Mini Zoo (Table 1). Species-wise, mammals have the highest composition at 54%, followed by birds (25%) and reptiles (21%) (Figure 2).

Table 1

Wild Animals in Jamunxhadi Mini Zoo with their Number, Place of Collection, Status, and Occurrence in Jhapa District

SN	Scientific Name	Common Name	No.	Place of Collection	National Status	IUCN Categories	CITES	Occurrence in Jhapa
Class: Reptilia								
1	<i>Indotestudo elongata</i> (Blyth, 1854)	*Elongated Tortoise	2 ♀ (handover to TRCC) 1 ♂	Jamunbari CF, Jhapa	Susceptible	Critically Endangered	II	Dahijhoda CF, Jalthal CF
2	<i>Lissemys punctata</i> (Bonnaterre, 1789)	Indian Flapshell Turtle	12	Kankai Municipality 1 & 2, Jhapa	Susceptible	Vulnerable	II	Ponds, wetlands
3	<i>Nilssononia hurum</i>	Indian	1	Betana, Morang	Susceptible	Endangered	I	Timai River

	(Gray, 1830)	Peacock Softshell Turtle		District				
4	<i>#Varanus bengalensis</i> (Daudin, 1802)	Bengal Monitor Lizard	2	Jamunbari CF, Jhapa	Susceptible	Near Threatened	I	Dahijhoda CF, Jalthal forest, Shivasatakshi
5	<i>#*Varanus flavescens</i> (Hardwicke & Gray, 1827)	Yellow Monitor	2	Jamunbari CF, Jhapa	Susceptible	Endangered	I	Namuna CF, Charali forest, Mechinagar
6	<i>Python bivittatus</i> (Kuhl, 1820)	Burmese Python	5	Jalthal forest, Jhapa Charali forest, Jhapa Kankai Municipality, Jhapa	Vulnerable	Vulnerable	II	Charali forest, Jalthal forest, Arjundhara
Class: Aves								
7	<i>Pavo cristatus</i> (Linnaeus, 1758)	Indian Peafowl	1	Ilam District	Near Threatened	Least Concern	-	Dahijhoda CF, Telpani CF, Jalthal forest
8	<i>Leptoptilos javanicus</i> (Horsfield, 1821)	Lesser Adjutant	2	Surunga, Kankai Municipality, Jhapa	Vulnerable	Vulnerable	-	Jalthal forest, Arjundhara, Mechinagar
9	<i>Tyto alba</i> (Scopoli, 1769)	Common Barn Owl	3	Sarnamati, Jhapa Rural Municipality, Jhapa	Vulnerable	Least Concern	II	Birtamod, Sanischare
10	<i>Bubo nipalensis</i> (Hodgson, 1836)	Spot-bellied Eagle Owl	2	Hadiya budhabare, Buddhashanti Rural Municipality, Jhapa [Collected from nearby forest and kept as pet]	Endangered	Least Concern	II	Telpani CF
11	<i>Ketupa zeylonensis</i> (Gmelin, 1788)	Brown Fish Owl	1	Budabaray, Buddhashanti Rural Municipality, Jhapa	Vulnerable	Least Concern	II	Namuna CF
12	<i>Spilornis cheela</i> (Latham, 1790)	Crested Serpent Eagle	1	Chulachuli, Ilam District	Least Concern	Least Concern	II	Dahijhoda CF, Telpani CF
13	<i>Gyps himalayensis</i>	Himalayan Griffon	3	Damak Mun., Jhapa	Vulnerable	Near Threatened	II	Surunga

	(Hume, 1869)		2	Surunga, Kankai Mun., Jhapa				
Class: Mammalia								
14	<i>Macaca mulatta</i> (Zimmermann, 1780)	Rhesus Monkey	2	Kankai Municipality-2, Jhapa	Least Concern	Least Concern	II	Charali forest, Dahijhoda CF, Jalthal CF
15	<i>Semnopithecus hector</i> (Pocock, 1928)	Tarai Gray Langur	1	Kankai Municipality-2, Jhapa	Least Concern	Near Threatened	I	Dahijhoda CF, Shivasatakshi
16	<i>Ratufa bicolor</i> (Sparman, (1778)	Black Giant Squirrel	1	Kankai Municipality-2, Jhapa	Endangered	Near Threatened	II	Dahijhoda CF
17	<i>Felis chaus</i> (Schreber, 1777)	Jungle Cat	2	Shivasatakshi Municipality, Jhapa	Least Concern	Least Concern	II	Namuna CF, Dahijhoda CF
			1	Division Forest Office, Jhapa				
18	<i>#*Neofelis nebulosa</i> (Griffith, 1821)	Clouded Leopard	1	Buddhashanti Rural Municipality, Jhapa [Rescued by Division Forest Office, Jhapa]	Endangered	Vulnerable	I	Dense CFs that are connected to the forest in southern Ilam are probable habitat
19	<i>Panthera pardus</i> (Linnaeus, 1758)	Leopard	1	Baigundhara, Gauradaha Municipality, Jhapa	Vulnerable	Vulnerable	I	Dahijhoda CF, Mechinagar
20	<i>*Prionailurus bengalensis</i> (Kerr, 1792)	Leopard Cat	1	Buttabari, Birtamod Municipality, Jhapa [Brought from Danabari, Ilam and kept as pet]	Vulnerable	Least Concern	II	CFs that are connected to the forest in southern Ilam are probable habitat
21	<i>#Paradoxurus hermaphroditus</i> (Pallas, 1777)	Common Palm Civet	1	Kankai Municipality, Jhapa	Least Concern	Least Concern	-	Namuna CF
22	<i>Viverricula indica</i> (Geoffroy Saint- Hilaire, 1803)	Small Indian Civet	1	Sukaydangi, Kankai Municipality, Jhapa	Least Concern	Least Concern	-	Namuna CF, Dahijhoda CF, Sanischare
23	<i>Vulpes bengalensis</i> (Shaw, 1800)	Bengal Fox	1 ♀ (released) 1 ♂	Kankai Municipality, Jhapa	Vulnerable	Least Concern	-	Dahijhoda CF
24	<i>Melursus ursinus</i> (Shaw, 1791)	Sloth Bear	1	Sunsari District [Kept as circus animal]	Endangered	Vulnerable	I	No record

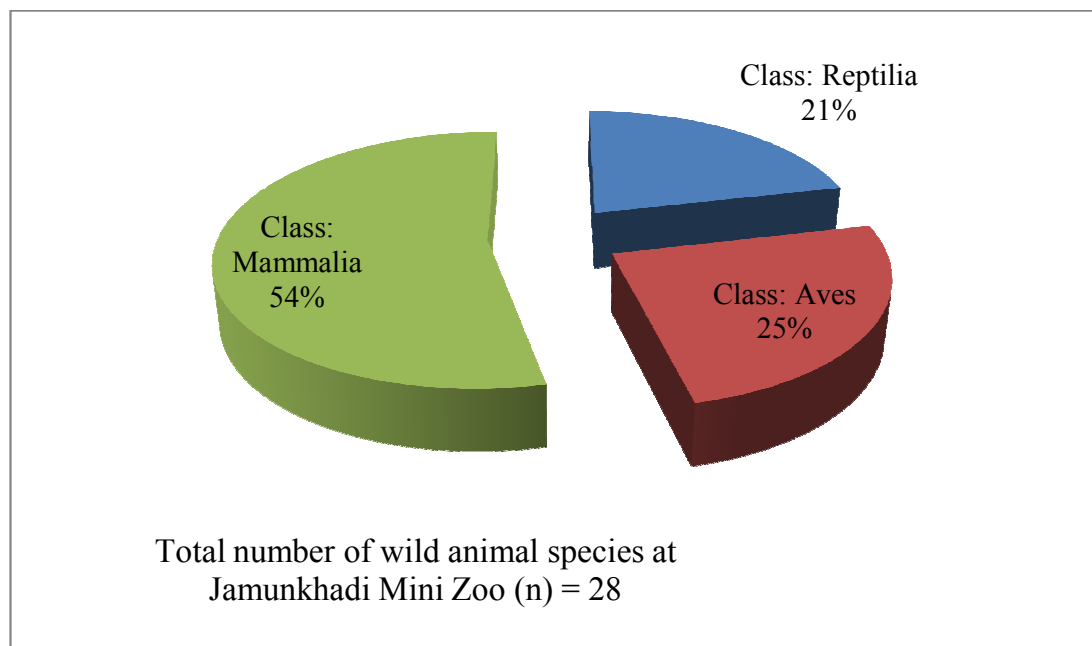
25	<i>Lepus nigricollis</i> (F. Cuvier, 1823)	Indian Hare	4	Kankai Municipality, Jhapa	Least Concern	Least Concern	-	Namuna CF, Dahijhoda CF, Jalthal forest
26	<i>Axis axis</i> (Erxleben, 1777)	Spotted Deer	35	Birtamod Municipality, Jhapa and Arjundhara Municipality, Jhapa	Vulnerable	Least Concern	-	Charali forest, Giribandhu Tea Estate, Jalthal forest
27	<i>Muntiacus vaginalis</i> (Zimmermann, 1780)	Northern Red Muntjac	10	Kankai Municipality 1 & 2, Jhapa	Vulnerable	Least Concern	-	Dahijhoda CF, Telpani CF
28	<i>Boselaphus tragocamelus</i> (Pallas, 1766)	Blue Bull	2	Himalaya Goodrick Tea Garden, Damak Municipality, Jhapa	Vulnerable	Least Concern	-	Jalthal forest

Note: Non-native wild animals in Jamunxhadi Mini Zoo are not included in the checklist.
TRCC = Turtle Rescue and Conservation Centre, Arjundhara, Jhapa; CF = Community Forest
#recorded in the last field survey on 15 November 2021

*Protected under the National Parks and Wildlife Conservation Act, 1973

Figure 2

Pie Chart Showing the Composition of Wild Animal Species at Jamunxhadi Mini Zoo



Among the six reptile species at Jamunxhadi Mini Zoo, five are considered to be globally threatened. *Indotestudo elongata* is listed as Critically Endangered on the IUCN Red List (Rahman et al., 2019). Similarly, *Nilssonina hurum* and *Varanus flavescens* are listed as Endangered (Das et al., 2021; Das, A. et al., 2021); while *Lissemys punctata* and *Python*

bivittatus are listed as Vulnerable (Rahman et al. 2021; Stuart et al., 2012). *Python bivittatus* is also listed as nationally threatened (Biodiversity Profile Project, 1995) and is a protected reptile of Nepal (National Parks and Wildlife Conservation Act, 1973). All the reptiles recorded in the Jamunxhadi Mini Zoo are included in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix I and II (CITES, 2021).

Leptoptilos javanicus, a globally threatened bird (BirdLife International, 2017) is also kept at the Jamunxhadi Mini Zoo. Of the seven bird species maintained at the mini zoo, *Tyto alba*, *Bubo nipalensis*, *Ketupa zeylonensis*, *Spilornis cheela*, and *Gyps himalayensis* are included in Appendix II of CITES (CITES, 2021). Five species of birds in the mini zoo: *Leptoptilos javanicus*, *Tyto alba*, *Bubo nipalensis*, *Ketupa zeylonensis*, and *Gyps himalayensis* are listed as nationally threatened (Inskipp et al., 2017).

Of the 15 mammal species at the Jamunxhadi Mini Zoo, *Panthera pardus*, *Melursus ursinus*, and *Neofelis nebulosa* are categorized as globally threatened (Stein et al., 2020; Dharaiya et al., 2020; Gray et al., 2021) whereas *Ratufa bicolor* and *Semnopithecus hector* are listed as Near Threatened in the IUCN Red List category (Duckworth and Molur, 2016; Singh et al., 2020). Nine species of mammals: *Ratufa bicolor*, *Neofelis nebulosa*, *Panthera pardus*, *Prionailurus bengalensis*, *Vulpes bengalensis*, *Melursus ursinus*, *Axis axis*, *Muntiacus vaginalis*, and *Boselaphus tragocamelus* are listed as nationally threatened (Amin et al., 2018). *Prionailurus bengalensis*, one of the 26 protected mammals of Nepal (National Parks and Wildlife Conservation Act, 1973) is also maintained at the Jamunxhadi Mini Zoo. Three mammal species: *Semnopithecus hector*, *Panthera pardus*, and *Melursus ursinus* are included in Appendix I of CITES, whereas *Macaca mulatta*, *Ratufa bicolor*, *Felis chaus*, and *Prionailurus bengalensis* are included in Appendix II of CITES (CITES, 2020).

Of the 28 species of wild animals housed at the Jamunxhadi Mini Zoo, 23 species were collected from different areas within the Jhapa District, whereas the remaining five species were collected from other districts. *Pavo cristatus*, *Spilornis cheela*, and *Prionailurus bengalensis* were collected from Ilam District, while *Nilssonina hurum* and *Melursus ursinus* were collected from Morang and Sunsari Districts respectively. Schleich and Kästle (2002), Shah and Tiwari (2004), and Kästle et al. (2013) have noted the records of *Indotestudo elongata*, *Lissemys punctata*, *Varanus bengalensis*, *V. flavescens*, and *Python bivittatus* from Jhapa District. During fieldwork, all these reptiles have been recorded alive in Jhapa. Likewise, the author recorded a live specimen of an adult *Nilssonina hurum* from the Timai River, Shantinagar of Mechinagar Municipality (Rai, 2016). This softshell turtle is still maintained at the mini zoo operated by the Bansbari CFUG in Mechinagar Municipality, Jhapa (pers. obs.).

The occurrence of *Pavo cristatus*, *Leptoptilos javanicus*, *Ketupa zeylonensis*, *Spilornis cheela*, and *Gyps himalayensis* are documented in Jhapa District by Grimmer et al. (2016) and Inskipp et al. (2016). These birds were also recorded in Jhapa from different places during the field survey. *Pavo cristatus* was recorded from Dahijhoda CF, Telpani CF, and Jalthal forest. Similarly, *Spilornis cheela* was recorded from Dahijhoda and Telpani CFs in northern Jhapa. The record of *Tyto alba* and *Bubo nipalensis* is new for Jhapa District. During the field survey, *Tyto alba* was recorded from Birtamod and Sanischare, while *Bubo nipalensis* was recorded from Telpani CF in northeast Jhapa. Rai (2020) recorded Great Hornbill *Buceros bicornis* after 27 years from the same forest.

Baral and Shah (2008) and Jnawali et al. (2011) have mentioned records of *Macaca mulatta*, *Semnopithecus hector*, *Felis chaus*, *Panthera pardus*, *Viverricula indica*, *Vulpes bengalensis*, *Lepus nigricollis*, *Axis axis*, and *Muntiacus vaginalis* from Jhapa District. These mammal species

were recorded from different forests in Jhapa during the field survey. Four species of mammals: *Ratufa bicolor*, *Neofelis nebulosa*, *Paradoxurus hermaphrodites*, and *Boselaphus tragocamelus* are new records for Jhapa District. *Ratufa bicolor* was recorded twice from Dahijhoda CF in January and March 2020. A wounded *Neofelis nebulosa*, by local people, was rescued by the Division Forest Office, Jhapa from Buddhashanti Rural Municipality in December 2020 and brought to Jamunkhadi Mini Zoo for treatment. Likewise, nearly two years prior, a cub of *Neofelis nebulosa* was caught at Shivapokhari CFUG in southern Ilam and brought to Haluwagad CFUG in Arjundhara Municipality for rearing (Samadarshi, 2021).

An individual of *Paradoxurus hermaphrodites* was recorded resting on a tree in March 2020 in Namuna CF. Similarly, a *Boselaphus tragocamelus* was captured in the Jalthal Forest in 2021 and is still maintained by Durgavitta CFUG in southern Jhapa. The record of *Prionailurus bengalensis* could not be verified in the Jhapa District during the field survey but the connectivity of the forest in northern Jhapa with the forest in southern Ilam serves as probable habitat. Moreover, its occurrence was confirmed by a field visit from Mai Municipality of Ilam District. With regard to *Melursus ursinus*, no clues could be found for its occurrence in Jhapa.

Conclusion

Jamunkhadi Mini Zoo is the first of its kind in Province 1, eastern Nepal. A total of 28 species of wild animals, comprised of six reptile species, seven bird species, and fifteen mammal species, are identified in the mini zoo. The total number of individuals for all 28 species is 103. Of the 28 species, six are globally threatened whereas 19 species are included in either Appendix I or II of CITES. Likewise, out of 23 species, 15 species, i.e. 60.9%, are listed as nationally threatened. Several protected wild animal species of Nepal: *Varanus flavescens*, *Python bivittatus*, *Neofelis nebulosa*, and *Prionailurus bengalensis* are also maintained at the Jamunkhadi Mini Zoo. Of the 28 wild animal species, 26 species are confirmed to occur in Jhapa District. *Prionailurus bengalensis* has probable habitat in the northern forests that connect with Ilam District in the south, and *Melursus ursinus* has no record of occurrence in Jhapa. The Jamunkhadi Mini Zoo can play a significant role in creating awareness about wildlife in the general public and contribute to the conservation of threatened species. However, the mini zoo should take concrete steps to standardize the welfare of every wildlife species with suitable habitat, proper diet and hygiene, frequent health check-ups and treatment, behaviour monitoring, species-specific enrichment, appropriate mixed-species exhibitory, sanctioned breeding, maintaining safe distances from visitors, and detailed record-keeping of all these components.

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Appendix



Photo 1: *Indotestudo elongata* at Dahijhoda CF



Photo 2: *Lissemys punctata* at Budoholi wetland, Arjundhara



Photo 3: *Nilssonina hurum* captured at Timai River



Photo 4: Juvenile *Varanus bengalensis* at Jalthal forest



Photo 5: *Varanus flavescens* at Namuna CF



Photo 6: *Python bivittatus* at Jalthal forest



Photo 7: *Pavo cristatus* at Telpani CF



Photo 8: *Leptoptilos javanicus* at Jalthal forest



Photo 9: Wounded *Tyto alba* at Sanischare, Arjundhara



Photo 10: *Bubo nipalensis* at Jamunkhadi Mini Zoo



Photo 11: Perching *Ketupa zeylonensis* at Namuna CF



Photo 12: Perching *Spilornis cheela* at Dahijhoda CF



Photo 13: *Gyps himalayensis* at Jamunkhadi Mini Zoo



Photo 14: *Macaca mulatta* at Charali forest



Photo 15: *Semnopithecus hector* at Dahijhoda CF



Photo 16: *Ratufa bicolor* at Dahijhoda CF



Photo 17: *Felis chaus* at Namuna CF



Photo 18: *Neofelis nebulosa* at Jamunkhadi Mini Zoo



Photo 19: *Panthera pardus* at Jamunkhadi Mini Zoo



Photo 20: *Prionailurus bengalensis* at Jamunkhadi Mini Zoo



Photo 21: *Paradoxurus hermaphroditus* resting on a tree at Namuna CF



Photo 22: *Viverricula indica* wounded by feral dogs at Namuna CF



Photo 23: *Vulpes bengalensis* at Jamunkhadi Mini Zoo



Photo 24: *Melursus ursinus* at Jamunkhadi Mini Zoo



Photo 25: *Lepus nigricollis* killed by hunters at Dahijhoda CF



Photo 26: *Axis axis* at Jamunkhadi Mini Zoo



Photo 27: *Muntiacus vaginalis* at Jamunkhadi Mini Zoo



Photo 28: *Boselaphus tragocamelus* captured at Jalthal forest and kept at Durgavitta CFUG