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COMMUNICATION

Herpetofauna of Shuklaphanta National Park, Nepal

Yam Bahadur Rawat [1], Santosh Bhattarai [2], Laxman Prasad Poudyal [3] & Naresh Subedi [4]

[1,3] Department of National Parks and Wildlife Conservation, Shuklaphanta National Park, Kanchanpur, Nepal.
[2] National Trust for Nature Conservation-Biodiversity Conservation Center, Ratnanagar-06, Chitwan 44204, Nepal.
[4] National Trust for Nature Conservation, Khumaltar, Lalitpur, P.O.Box 3712, Nepal.
[1]yamrawat0000@gmail.com, [2]santosh.bhattarai@hotmail.com (corresponding author), [3]laxpoudyal@gmail.com, [4]nareshsubedi@gmail.com

Abstract: We present 71 herpetofauna species in Shuklaphanta National Park (ShNP) and its buffer zone based on field surveys, rescue records, photo, and literature records. The list comprises 15 currently known species of amphibians and 56 species of reptiles. We recorded Laudanka Vine Snake *Ahaetulla laudankia* as a new species record for Nepal. Likewise, four frog species, namely, *Uperodon globulossus*, *Polypedates taeniatus*, *Hoplobatrachus crassus*, and *Minervarya peirrei*; and one skink, *Sphaenomorphus maculatus*; one agamid, *Laudakia tuberculata*; one turtle, *Pangshura tentoria circumdata*; and 10 snakes, *Eryx conicus*, *E. johnii*, *Coelognathus helena, C. radiatus, Chrysopelea ornata, Dendrelaphis tristis, Lycodon striatus, Oligodon arnensis, Psammophis cf condanarus*, and *Ophiophagus hannah* are new records for ShNP. Unregulated and illegal collection, road mortality, intentional killing are the observed threats to the herpetofauna. Our aim of this study is to compile species richness and advocate for more rigorous inventories in future providing updated information of herpetofauna of ShNP.

Keywords: *Ahaetulla laudankia*, amphibians, new records, reptiles, Terai-Arc Landscape.

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Author details: Yam Bahadur Rawat is a graduate from Institute of Forestry, Pokhara Campus, and currently working as a Park Ranger at Shuklaphanta National Park, Nepal. His research interest includes documentation, biology and conservation status of wildlife especially herpetofauna. Santosh Bhattarai works as Conservation Officer at National Trust for Nature Conservation (NTNC) based at Biodiversity Conservation Center (BCC), Chitwan. He is focused on herpetofauna researh and conservation in Nepal. Laxman Prasad Poudyal holds an MSc in Natural Resource Management and Rural Development. He currently heads the Shuklaphanta National Park where he had worked as a Park Ranger during 1994–1998. Naresh Subedi is a Conservation Program Manager at National Trust for Nature Conservation (NTNC). He primarily designs and oversees all conservation projects for Terai Protected Areas in Nepal.

Author contribution: All authors have made equal contributions. YBR and SB collected and compiled field data; SB wrote the manuscript; SB, LPP, YBR and NS reviewed and approved the final draft.

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INTRODUCTION

Protected area systems (PAs) are treated as conservation tools for the protection of habitat and species (Geldmann et al. 2013) and have been established for the conservation of ecosystems, constituent species, and services provided by them (Campos & Nepstad 2006; Dudley 2008). Several PAs in Nepal have been successful in achieving international conservation targets such as Aichi Biodiversity Targets. The success of the PAs in Nepal is primarily measured by increment to the charismatic species. Hence, management interventions inside the PAs have been prioritized only for species such as Tiger *Panthera tigris*, Greater One-horned Rhinoceros *Rhinoceros unicornis*, Asian Elephant *Elephas maximus*, and Snow Leopard *Panthera uncia*. Protected areas with such charismatic species are considered higher conservation value while taxa like amphibians and reptiles even within the same PAs are dubbed as low priority species (Bhattarai et al. 2017a). The Gharial, however, is the only reptile which has gained conservation focus in Nepal (Acharya et al. 2017; Bhattarai et al. 2018a) and none of the amphibians have been accorded with the highest degree of protection under National Parks and Wildlife Conservation Act, 1973 of Nepal.

Shuklaphanta National Park (ShNP) is located in the southwestern corner of lowland (known as Terai) Nepal. The Terai is the most productive fertile land with the highest succession rate of plant communities that govern the dispersal and dynamics of faunal species. The change in plant and animal communities due to succession, stochastic events, introduction of exotics, management interventions, and other factors (e.g., climate change) may locally extirpate some species before their formal documentation (Bhattarai et al. 2017a). Because amphibians and reptiles are overlooked species for conservation, their distribution pattern, conservation status, and ecological information from many PAs including ShNP are poorly documented. To understand changes in herpetofauna communities and to propose management strategies to reduce risks demands data on amphibians and reptiles of the park. The knowledge of site specific species richness is the first step to collate data, categorize status, trends of the species, and develop long-term population research and monitoring (Tuberville et al. 2005). Therefore, herein we provide a current update of amphibians and reptiles of the ShNP that will help in formulating their future conservation strategies and conservation management intervention.

MATERIALS AND METHODS

Study Area

The Shuklaphanta National Park (ShNP) (80.095–80.361 ^{0}N, 28.763–29.047 ^{0}E), was established in 1976 as a Royal Shuklaphanta Wildlife Reserve and accorded to a national park in 2017; it covers 305km^2 with open grasslands, river beds, and mixed forests (Figure 1). The buffer zone of the park was declared with an additional area of 243.5km^2 in 2004 (Poudyal & Chaudhary 2019). The climate of ShNP is subtropical with an average maximum temperature of 37^{0}C and the average minimum of 7^{0}C. Annual rainfall may range over 2,016mm (DNPWC 2003).

The park is connected to the Pilibhit Tiger Reserve in India, and Dudhwa Tiger Reserve towards the south-east via Laljhadi forest corridor and to Nandhaur Wildlife Sanctuary in India towards the north-west via Boom-Brahmadev forest corridor and Mahakali River. The aquatic and terrestrial habitats of ShNP contain more than 665 plant species belonging to 438 genera and 118 families (DNPWC 2003).

The ShNP comprises the Terai, Bhabar, and Chure/ Sivaliks, and its vegetation can be broadly classified into forests, grassland, and aquatic habitat (wetlands). Although several variations in species association may lead to formation of many forest types, they are primarily grouped into Sal forest and deciduous riverine forest. The vegetation is dominated by Sal *Shorea robusta* and includes other associated plants such as *Terminalia tomentosa*, *T. bellirica*, and *Lagestromea parviflora*. The ShNP has the largest herd of Swamp Deer *Rucervus duvaucelii* in the world, provides prime habitat for Hog Deer *Axis porcinus*, Spotted Deer *Axis axis*, and many endangered species such as the Hispid Hare, Royal Bengal Tiger, Greater One-horned Rhinoceros, and Asian Elephants (DNPWC & DFSC 2018).

Field Methods

We recorded all the amphibians and reptiles during regular anti-poaching operations and wildlife monitoring in ShNP. Regular day and night field patrolling is conducted to increase the deterrence against possible poaching of wildlife. We included all the opportunistic observations of herpetofauna during anti-poaching field operation and wildlife monitoring (such as camera traps for large carnivores, rhino monitoring, swamp deer translocation, and census) from January 2017 to September 2019 in and around the ShNP. We also incorporated literature records, reliable photographs, and rescue records from the buffer zone. The nocturnal

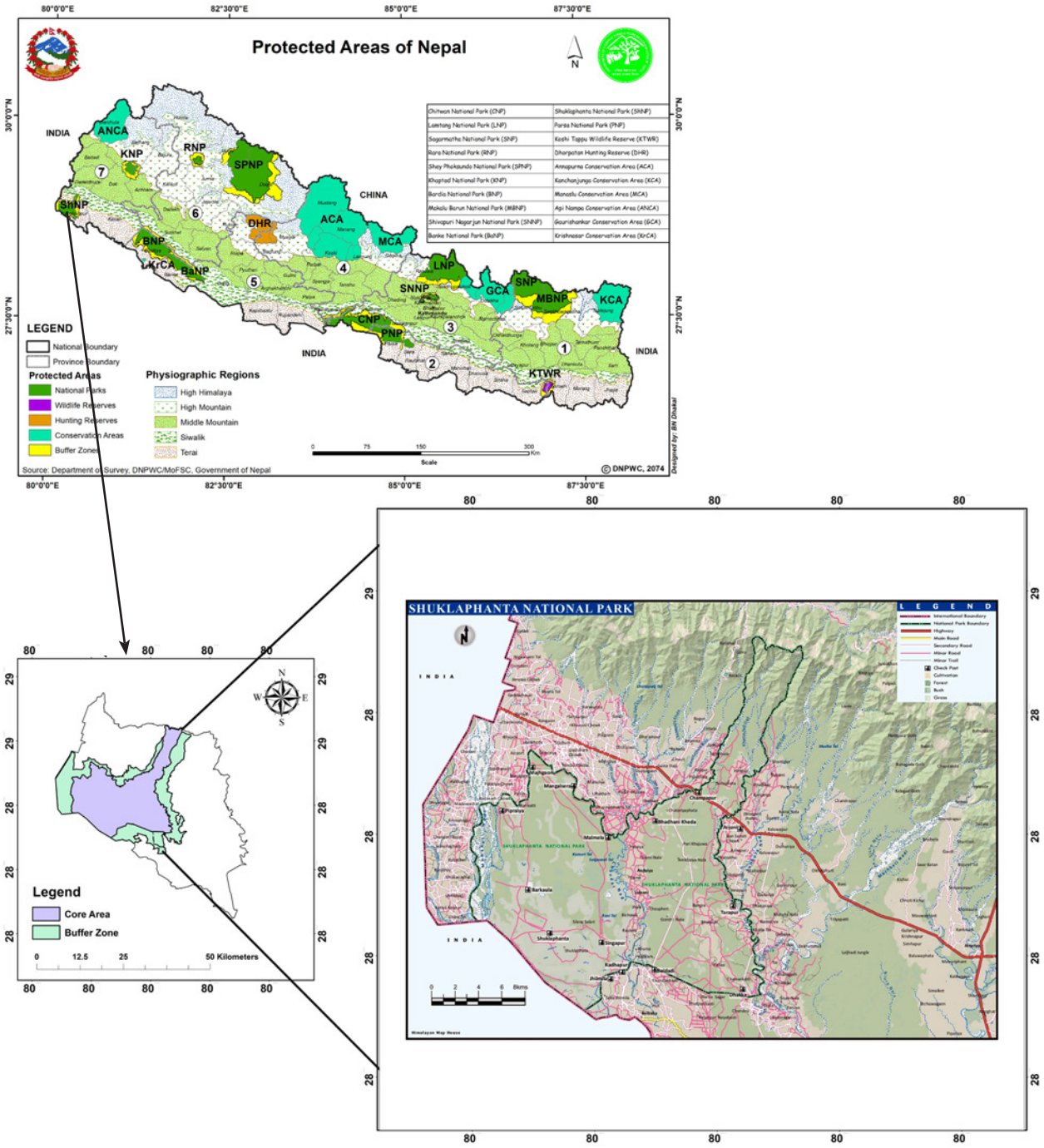

Figure 1. Shuklaphnata National Park.

anti-poaching patrolling activities aided with flashlights helped us in detecting calling frogs. A national east-west highway runs through the ShNP; we incorporated opportunistic road kill data of herpetofauna in our study. Upon detection, the individuals were either captured by hand or photographed using Canon1300D. Crocodiles were monitored along the river bank. We used published literature and field guides (Smith 1935, 1943; Schleich & Kästle 2002; Shah & Tiwari 2004; Ahmed et al. 2009; Vasudevan & Sondhi 2010; Das & Das 2017) to identify the herpetofauna.

RESULTS

With a combination of field surveys, rescue records, photographic evidence, and literature records, the herpetofauna of the ShNP accounted for 71 species (15

Table 1. Collated list of herpetofauna of Shuklaphanta National Park. The plus sign (+) refers to presence and minus sign (-) refers to absence of the species by the authors.

	Species Name	Common Name	This study	Schleich & Kästle (2002)	Shah & Tiwari (2004)	Kästle et al. (2013)	IUCN Red List status	Remarks
AMPHIBIANS								
Family: Bufonidae								
1	*Duttaphrynus melanostictus*	Common Asian Toad	+	-	+	-	LC	
2	*Duttaphrynus stomaticus*	Marbled Toad	+	-	+	-	LC	
Family: Microhylidae								
3	*Microhyla* sp.	Narrow Mouth Frog	+	-	+	-	-	
4	*Uperodon globulosus*	Globular Balloon Frog	+	-	-	-	LC	New for ShNP
5	*Uperodon systoma*	Marbled Balloon Frog	+	+	+	+	LC	
6	*Uperodon taprobanicus*	Painted Frog	+	+	+	+	LC	
Family: Dicroglossidae								
7	*Euphlyctis cyanophlyctis*	Skittering Frog	+	+	+	-	LC	
8	*Minervarya pierrei*	Pierre's Cricket Frog	+	-	-	-	-	New for ShNP
9	*Minervarya syhadrensis*	Syhadra Cricket Frog	-	-	+	-	-	
10	*Minervarya teraiensis*	Terai Cricket Frog	+	-	+	-	-	
11	*Hoplobatrachus crassus*	Jerdon's Bull Frog	+	-	-	-	LC	New for ShNP
12	*Hoplobatrachus tigerinus*	Indian Bull Frog	+	+	+	-	LC	
13	*Sphaerotheca* sp.	Burrowing Frog	+	+	-	-	LC	
Family: Rhacophoridae								
14	*Polypedates maculatus*	Common Tree Frog	+	+	+	-	LC	
15	*Polypedates taeniatus*	Terai Bush Frog	+	-	-	-	LC	New for ShNP
REPTILES								
Family: Crocodylidae								
16	*Crocodylus palustris*	Mugger Crocodile	+	+	+	+	VU	
Family: Geoemydidae								
17	*Melanochelys tricarinata*	Sal Forest Turtle	+	-	-	+	VU	
18	*Melanochelys trijuga*	Black Pond Turtle	+	+	+	+	NT	
19	*Pangshura tecta*	Indian-roofed Turtle	+	-	-	+	LC	
20	*Pangshura tentoria*	Indian Tent Turtle	+	-	-	-	LC	New for ShNP
Family: Testudinidae								
21	*Indotestudo elongata*	Elongated Tortoise	+	+	+	-	CR	
Family: Trionychidae								
22	*Chitra indica*	Narrow-headed Softshell Turtle	-	-		+	EN	
23	*Lissemys punctata*	Indian Flapshell Turtle	+	-	+	+	LC	
24	*Nilssonia gangetica*	Gangetic Softshell Turtle	+	-	+	+	VU	
25	*Nilssonia hurum*	Peacock Softshell Turtle	+	-	-	+	VU	
Family: Agamidae								
26	*Calotes versicolor*	Common Garden Lizard	+	+	+	-	LC	
27	*Laudakia tuberculata*	Rock Lizard	+	-	-	-	LC	New for ShNP
28	*Sitana schleichi*	Shuklaphanta Sitana		+	+	+	NA	
29	*Sitana sivalensis*	Shivalik Sitana	+	-	+	-	NA	

	Species Name	Common Name	This study	Schleich & Kästle (2002)	Shah & Tiwari (2004)	Kästle et al. (2013)	IUCN Red List status	Remarks
Family: Gekkonidae								
30	*Hemidactylus* cf. *brookii*	Brook's Gecko	+	-	+	+	NA	
31	*Hemidactylus flaviviridis*	Yellow-bellied Gecko	+	+	+	+	NA	
32	*Hemidactylus frenatus*	Common House Gecko	+	-		-	LC	
33	*Hemidactylus garnotii*	Indo-pacific Gecko	-	+	+	-	NA	
Family: Scincidae								
34	*Asymblepharus sikimmensis*	Sikkim Ground Skink	-	-	+	-	NA	
35	*Eutropis carinata*	Common Grass Skink	+	-	+	-	LC	
36	*Eutropis dissimilis*	Striped Skink	+	-	+	-	NA	
37	*Eutropis macularia*	Bronze Grass Skink	+	+	+	+	NA	
38	*Lygosoma albopunctata*	Suppled Grass Skink	+	+	+	+	NA	
39	*Sphenomorphus maculatus*	Sal Forest Skink	+	-	-	-	NA	New for ShNP
Family: Varanidae								
40	*Varanus bengalensis*	Bengal Monitor Lizard	+	-	+	-	LC	
41	*Varanus flavescens*	Golden Monitor Lizard	+	-	+	-	LC	
Family: Erycidae								
42	*Eryx conicus*	Common Boa	+	-	-	-	NA	New for ShNP
43	*Eryx johnii*	Red Sand Boa	+	-	-	-	NA	New for ShNP
Family: Pythonidae								
44	*Python bivittatus*	Burmese Python	+	+	+	+	VU	
Family: Colubridae								
45	*Ahaetulla laudankia*	Laudanka Vine Snake	+	-	-	-	NA	New for Nepal
46	*Ahaetulla nasuta*	Common Vine Snake	+	-	+	-	NA	
47	*Boiga forsteni*	Forsten's Cat Snake	+	+	+	+	LC	
48	*Boiga trigonata*	Common Cat Snake	+	-	+	-	LC	
49	*Chrysopelea ornata*	Ornate Gliding Snake	+	-	-	-	NA	New for ShNP
50	*Coelognathus helena*	Common Trinket Snake	+	-	-	-	NA	New for ShNP
51	*Coelognathus radiatus*	Copper-headed Trinket Snake	+	-	-	-	LC	New for ShNP
52	*Dendrelaphis tristis*	Bronzeback Tree Snake	+	-	-	-	NA	New for ShNP
53	*Lycodon aulicus*	Common Wolf Snake	+	+	+	+	LC	
54	*Lycodon jara*	Twin-spotted Wolf Snake	+	+	+	-	LC	
55	*Lycodon striatus*	Barred Wolf Snake	+	-	-	-	NA	New for ShNP
56	*Oligodon arnensis*	Banded Kukri Snake	+	-	-	-	NA	New for ShNP
57	*Oligodon kheriensis*	Red kukri Snake	+	+	+	+	NA	
58	*Ptyas mucosa*	Rat Snake	+	+	+	+	NA	
59	*Sibynophis sagittarius*	Cantor's Black-headed Snake	+	-	+	-	NA	
Family: Homalopsidae								
60	*Enhydris enhydris*	Common Smooth Water Snake	-	-	+	-	LC	
61	*Ferania sieboldii*	Siebold's Water Snake	-	-	+	-	LC	
Family: Lamprophiidae								

	Species Name	Common Name	This study	Schleich & Kästle (2002)	Shah & Tiwari (2004)	Kästle et al. (2013)	IUCN Red List status	Remarks
62	*Psammophis condanarus*	Sand Snake	+	-	-	-	LC	New for ShNP
Family: Natricidae								
63	*Amphiesma stolatum*	Striped Keelback	+	+	+	+	NA	
64	*Fowlea piscator*	Checkered Keelback	+	+	+	-	NA	
Family: Elapidae								
65	*Bungarus caeruleus*	Common Krait	+	-	+	-	NA	
66	*Bungarus fasciatus*	Banded Krait	+	+	+	-	NA	
67	*Naja kaouthia*	Monocled Cobra	-	+	+	+	LC	
68	*Naja naja*	Common Cobra	+	-	+	-	NA	
69	*Ophiophagus hannah*	King Cobra	+	-	-	-	VU	New for ShNP
Family: Typhopidae								
70	*Indotyphlops braminus*	Brahminy Blind Snake	+	-	+	-	NA	
Family: Viperidae								
71	*Daboia russelii*	Russell's Viper	+	+	+	+	LC	

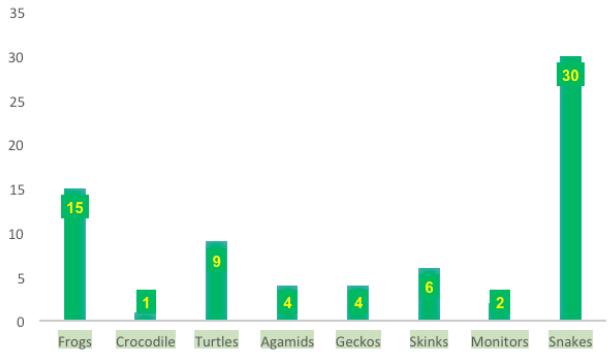

Figure 2. Herpetofaunal species richness in the ShNP

species of amphibians represented by eight genera in four families and 56 species of reptiles represented by 37 genera in 17 families) (Table 1).

All the recorded amphibians comprised anurans only. Among reptiles, the family Colubridae was the most speciose with 15 species followed by Scincidae with six species, Elapidae with five species, families Agamidae, Gekkonidae, Geoemydidae, and Trionychidae each with four species, Varanidae, Erycidae, Homalopsidae, and Natricidae each with two species, Crocodylidae, Testudinidae, Pythonidae, Typhlopidae, and Viperidae each with single species (Figure 2).

Our study documented 18 species of herpetofauna that have not been reported before from ShNP. We report an arboreal snake—Laudanka Vine Snake *Ahaetulla laudankia*—as a new snake species record for Nepal based on photo vouchers. Four frog species, namely, Jerdon's Bull Frog *Hoplobatrachus crassus*, Globular Balloon Frog *Uperodon globulosus*, Pierre's Cricket Frog *Minervarya pierrei*, and Six-lined Tree Frog *Polypedates taeniatus* are new records for ShNP. Similarly, we recorded the Indian Tent Turtle *Pangshura tentoria circumdata*, Sal Forest Skink *Sphaenomorphus maculatus*, Common Trinket Snake *Coelognathus helena*, Copper-headed Trinket Snake *C. radiatus*, Bronzeback Tree Snake *Dendrelaphis tristis*, Barred Wolf Snake *Lycodon striatus*, Banded Kukri Snake *Oligodon arnensis*, Sand Snake *Psammophis* cf. *condanarus*, and King Cobra *Ophiophagus hannah* as new records for ShNP. Likewise, our record of the Sand Snake *Psammophis* cf. *condanarus* in the ShNP is the third locality record for Nepal after 42 years of its first record by Kramer (1977) in Chitwan National Park. The new locality of the *Psammophis* cf. *condanarus* in the ShNP is ca. 550km west of Chitwan National Park.

Species Accounts

AMPHIBIANS

Bufonidae Gray, 1825

Common Asian Toad *Duttaphrynus melanostictus* (Schneider, 1799)

This is the most common toad in the Terai and Churia region of Nepal (Bhattarai et al. 2018a). It has dorsal skin with two series of warts, tympanum distinct, two large parotid glands (Image 1).

We observed the individuals from Majhgaun,

Arjuni, Hirapur, Shuklaphanta, Malumela, Lalpani area, Badenikheda, Mahendranagar, Chandmari (NTNC-Shuklaphanta Conservation Program office camplex), Majhgaun (ShNP headquarters). We frequently observed this species around park guard posts during the monsoon and road killed individuals on the national highway that passes through the ShNP and other roads in the buffer zone.

Marbled Toad *Duttaphrynus stomaticus* (Lütken, 1864)

This species is sympatric with *D. melanostictus* but it is comparatively smaller than *D. melanostictus*. We frequently observed the individuals around human habitation including park offices and posts, open grasslands, and river banks. The species lacks a cranial ridge and parotid glands and has irregular warts on the dorsal skins (Image 2). The juveniles were observed with red tipped warts.

Dicroglossidae Anderson, 1871

Skittering Frog *Euphlyctis cyanophlyctis* (Schneider, 1799)

It is the commonest dicroglossid frog in low land Terai of Nepal (Bhattarai et al. 2018a). We found it in all natural and constructed ponds inside ShNP and water bodies in the fringe area. Individuals from ponds and water logged areas had dark patch on their bodies which was absent on the individuals from the river (Image 3).

Pierre's Cricket Frog *Minervarya pierrei* (Dubois, 1975)

The type locality of this species is in Nepal. We observed this species at Beldandi, Hirapurphanta, and Arjuni (Image 4). The individuals of this species have longer dorso and dorso-lateral folds compared with *M. teraiensis* with dark patches on thighs and with or without mid-dorsal line. Nanhoe & Ouboter (1987) consider *M. pierrei* as a synonym of *M. limnocharis*. The Nepalese *Minervarya* spp. warrant molecular studies to resolve their taxonomy and genetic identity. This is the first record of the species from ShNP.

Syhadra Cricket Frog *Minervarya syhadrensis* (Annandale, 1919)

The record of this species in ShNP is based on Shah & Tiwari (2004).

Terai Cricket Frog *Minervarya teraiensis* (Dubois, 1984)

We recorded this species from Shuklaphanta, Majhgaun, Beldandi, Hirapurphanta, and Barkaula (Image 5). The individuals of this species had broad cream-coloured mid dorsal line and body with dorsal

Image 1. Common Asian Toad *Duttaphrynus melanostictus* from NTNC-SCP camp.

Image 2. Marbled Toad *Duttaphrynus stomaticus* from NTNC-SCP camp.

Image 3. Skittering Frog *Euphlyctis cyanophlyctis* from Chaudhar River.

Image 4. Pierre's Cricket Frog *Minervarya pierrei*.

Image 5. Terai Cricket Frog *Minervarya teraiensis* from Majhgaun.

Image 6. Jerdon's Bull Frog *Hoplobatrachus crassus*.

longitudinal folds. This species is distributed across the whole Nepalese Terai below 400m (Schleich & Kästle 2002).

Jerdon's Bull Frog *Hoplobatrachus crassus* (Jerdon, 1854)

We observed this species from Chandmari, Beldandi, and Arjuniphanta. The individuals of this species are smaller than the Indian Bull Frog *H. tigerinus* and lack mid-dorsal and dorsolateral lines. The dorsal skin is warty but ventral is smooth (Image 6). This species has been well documented from eastern Nepal (Schleich & Kästle 2002). Shah & Tiwari (2004) reported its distribution up to Bardia National Park. This is the first record of the species from ShNP.

Indian Bull Frog *Hoplobatrachus tigerinus* (Daudin, 1803)

This species is the largest among all frogs in the Terai region of Nepal (Bhattarai et al. 2018a). This species (Image 7) has cream or yellow coloured mid and dorso-lateral lines from tip of the snout to posterior end which is lacking in *H. crassus* (Image 6). This Bull Frog is also well distributed in adjoining Indian states in Uttarakhand (Vasudevan & Sondhi 2010) and Uttar Pradesh (Das et al. 2012). During the breeding season, we observed yellow coloured breeding males in chorus.

Burrowing Frog (*Sphaerotheca* sp.)

We recorded this species from Majhgaun, Beldandi (Image 8). Nepal was reported to have four species of *Sphaerotheca*, namely, *S. breviceps*, *S. maskeyi*, *S. rolandae*, and *S. swani* based on morphological characters (Schleich & Kästle 2002). Among them, recent molecular studies have delimited the distribution range of *S. rolandae* in Sri Lanka and *S. breviceps* is now confined to southern India (Karnataka, Andhra Pradesh, and Tamil Nadu) (Prasad et al. 2019) and two species, namely, *S. maskeyi* and *S. swani* were described from Nepal. Dubois (1999, 2000) synonymized *S. maskeyi* and *S. swani* as *S. pluvialis*. Later, Dahanukar et al. (2017) resurrected them as valid species. The *Sphaerotheca* spp. from Nepal were described based on morpho-taxonomy. As recent studies have delimited the distribution range of *Sphaerotheca* sp. and due to variation in colour patterns, morphological characters among *Sphaerotheca* of ShNP, we could not ascertain the species found in ShNP and advocate for genetic studies of *Sphaerotheca* of Nepal as suggested by Prasad et al. (2019).

Image 7. Indian Bull Frog *Hoplobatrachus tigerinus* a breeding male.

Image 8. Burrowing Frog *Sphaerotheca* sp.

Image 9. *Microhyla* sp.

Image 10. Globular Balloon Frog *Uperodon globulosus*.

Image 11. Marbled Balloon Frog *Uperodon systoma*.

Image 12. Painted Frog *Uperodon taprobanicus*.

Image 13. Common Tree Frog *Polypedates maculatus*.

Image 14. Terai Bush Frog *Polypedates taeniatus*.

Microhylidae (Günther, 1858)

Narrow-mouthed Frog *Microhyla* sp.

We observed *Microhyla* sp. from altered habitats at Shuklaphanta wildlife camp and home stay area (Image 9). Calls were frequently heard during July–August. The previous report of *Microhyla ornata* from the ShNP by Shah & Tiwari (2004); taxonomic revision of South Asian microhylid frogs by Garg et al. (2019) restricted the distribution range of *Microhyla ornata* in southern India. Similarly Khatiwada et al. (2017) described *Microhyla taraiensis* from Jhapa in far-east Nepal and reported occurrence of *Microhyla nilphamarensis* in Chitwan; this warrants genetic studies of *Microhyla* population from Shuklaphanta National Park to ascertain its taxonomic identity.

Globular Balloon Frog *Uperodon globulosus* (Günther, 1864)

We observed this species from Majhgaun (Image 10) being the first record from ShNP. We recorded this species in the fringe areas of the park after a heavy shower during the monsoon season. It has a globular body with a pointed snout. The earlier records of this species is restricted to central and eastern Terai and the protected areas of Terai Nepal (Schleich & Kästle 2002; Shah & Tiwari 2004; Bhattarai et al. 2017a, 2018a). We also observed individuals in Bardia National Park which implies that this species has wide distribution in Terai Nepal.

Marbled Balloon Frog *Uperodon systoma* (Schneider, 1799)

We recorded individuals of this species from the headquarters of the ShNP at Majhgaun. The dorsum of this species is marbled with dark or dark brown and the ventral side is either white or yellow (Image 11). The calls of this species is frequently heard in paddy fields in the buffer zone area during the monsoon season. The occurrence of this species in Nepal was first confirmed by Schleich & Kästle (2002) from Kanchanpur District, 15km east of Mahendranagar.

Painted Frog *Uperodon taprobanicus* (Parker, 1934)

We recorded this species from Badenikheda and Arjuni (Image 12). This is a fossorial frog but also observed in tree cavities. The occurrence of this species was first reported by (Schleich & Kästle 2002) from Mahendranagar in the far-west and Jhapa in the far-east of Nepal. Shah & Tiwari (2004) and Kästle et al. (2013) also reported this species from ShNP. Shah & Tiwari (2004) added Chitwan and Parsa; Bhattarai et al. (2017a, 2018a) recorded from Beeshazar and associated lakes, and Parsa National Park, respectively.

Rhacophoridae Hoffman, 1932

Common Tree Frog *Polypedates maculatus* (Gray, 1830)

We observed this species from Majhgaun and Badenikheda area (Image 13). It was Günther (1861) who first reported this species from Nepal. This species is widely distributed in Nepal from the entire Terai region to the mid hills (Schleich & Kästle 2002).

Terai Bush Frog *Polypedates taeniatus* (Boulenger, 1906)

We frequently observed individuals of this species from Majhgaun, 24 no. pillar of Shuklaphanta grassland, Shikari tal and Baba tal area (Image 14). In Nepal, this species was first recorded by Anders et al. (1998) from Chitwan National Park and Koshi Tappu Wildlife Reserve. Shah & Tiwari (2004) recorded it from Bardia National Park. Bhattarai et al. (2018b) recorded an amplexus between *P. maculatus* and *P. taeniatus.* Das et al.

(2012) recorded this species from Katerniaghat Wildlife Sanctuary, Uttar Pradesh India. This is the first record of *P. taeniatus* from ShNP.

REPTILES

Agamidae Gray, 1827

Oriental Garden Lizard *Calotes versicolor* (Daudin, 1802)

This is the most common agamid lizard in Nepal distributed from the Terai region to the mountain zone (Schleich & Kästle 2002). Likewise, Shah & Tiwari (2004) reported the distribution of this lizard from all protected areas of Nepal. In ShNP, we frequently observed this species from Majhgaun, Hirapurphanta, Shuklaphanta, Arjuni, Malumela and Chure/Sivalik areas of the park (Image 15).

Image 15. Oriental Garden Lizard *Calotes versicolor*.

Rock Lizard *Laudakia tuberculata* (Gray, 1827)

We recorded this species from Chure/Sivalik range along Syali River bank and other small rivulets of the park. This is the first record of *L. tuberculata* for ShNP (Image 16).

Image 16. Rock Lizard *Laudakia tuberculata*.

Shuklaphanta Fan-throated Lizard *Sitana schleichi* (Anders & Kästle, 2002)

This is an endemic lizard to Nepal described from Shuklaphanta National Park. Nepal has three species of lizards belonging to the genus *Sitana*, namely, *S. fusca*, *S. schleichi*, and *S. sivalensis*. The Nepalese *Sitana* are different from the Indian species in having small dewlaps that do not extend the forearm and no overlapping scales on dewlaps (Schleich & Kästle 2002; Deepak et al. 2016). Likewise, *S. sivalensis* has a wider distribution from central Nepal to Uttarakhand, India (Vasudevan & Sondhi 2010). Among three species of *Sitana* in Nepal, Shuklaphanta Fan-throated Lizard (*S. schleichi*) is the smallest species. Shah & Tiwari (2004) and Kästle et al. (2013) also recorded this species from ShNP.

Sivalik Fan-throated Lizard *Sitana sivalensis* (Schleich, Kästle and Shah, 1998)

This species was described from Shivpur, Kapilbastu, Nepal. It is found in open dry grass patches in Silvalik/ Churia hill range or foot hills of the Sivalik range. We recorded this species from Kuwadanda (Image 17). Shah & Tiwari (2004) also recorded the occurrence of *S. sivalensis* in ShNP. Studies on habitat use by these two related species in ShNP and genetic studies are suggested to ascertain the taxonomic ambiguity of Nepalese *Sitana* spp.

Image 17. Sivalik Fan-throated Lizard *Sitana sivalensis*.

Gekkonidae Gray, 1825

Brook's Gecko *Hemidactylus* cf. *brookii* (Gray, 1845)

We observed the individuals of this species from Kuwadanda, Majhgaun, and Barkaula areas (Image 18). The individuals of this species have strongly keeled tubercles and tails with spines. This species is regarded as species complex (Rösler & Glaw 2010; Kathriner et al. 2014; Lajmi et al. 2016) with one of the most diverse clades within *Hemidactylus* (Agarwal et al. 2019). Considering this taxonomic uncertainty, we suggest detailed molecular studies on Nepalese *H. brookii* complex.

Image 18. Brook's Gecko *Hemidactylus* cf. *brookii*.

Yellow-bellied Gecko *Hemidactylus flaviviridis* (Rüppell, 1835)

This is a common gecko in ShNP, found in park posts, army posts, and in houses in the buffer zone area (Image 19). This species is also found in cattle sheds in Chure/ Sivalik areas of the park.

Image 19. Yellow-bellied Gecko *Hemidactylus flaviviridis*.

Common House Gecko *Hemidactylus frenatus* (Dúmeril & Bibron, 1836)

We recorded this species from Majhgaun, Beldandi, Badenikheda, Radhapur, Pipariya, Hirapurphanta, Dhakka, and Champapur. It is easily identified from other *Hemidactylus* spp. having reduced inner digit and smooth skin with round scattered tubercles.

Indo-Pacific Gecko *Hemidactylus garnotii* (Dúmeril & Bibron, 1836)

This species in Nepal was first recorded from Pokhara in 1954 (Schleich & Kästle 2002). Later, colonized in other parts of the country especially in the lowlands. The record of this species in ShNP is based on Shah & Tiwari (2004).

Scincidae Gray, 1825

Sikkim Ground Skink *Asymblepharus sikimmensis* (Blyth, 1854)

The record of this species in ShNP is based on Shah & Tiwari (2004).

Common Grass Skink *Eutropis carinata* (Schneider, 1801)

This is one of the commonly sighted species in the Terai and Chure/Sivalik region of Nepal (Bhattarai et al. 2018a). We observed this species in Majhgaun, Malumela, Shuklaphanta, and Paliya areas basking on open grasslands (Image 20).

Image 20. Common Grass Skink *Eutropis carinata*.

Striped Grass Skink *Eutropis dissimilis* (Hallowell, 1857)

We observed this species from Hirapurphanta and

Image 21. Striped Grass Skink *Eutropis dissimilis*.

Image 22. Bronze Grass Skink *Eutropis macularia*.

Image 23. Sal Forest Skink *Sphenomorphus maculatus*.

Garjamani. This species is easily identified from other ***Eutropis*** spp. with a white stripe below the eyes (Image 21).

Bronze Grass Skink *Eutropis macularia* (Blyth, 1853)

Observed from Hirapurphanta, Arjuni basking on the open grassland. Individuals were also observed at Chandmari, Arjuni, Beldandi, and Shuklaphanta grassland (Image 22). This species is also frequently observed in agricultural fields during April–May.

Sal Forest Skink *Sphenomorphus maculatus* (Blyth, 1853)

We observed this species from Chure area of ShNP basking on open river beds in Sal *Shorea robusta* mixed forest (Image 23). This species is frequently observed in ShNP especially under low canopy Sal forest area. This species is a new record for ShNP.

Varanidae Merrem, 1820

Bengal Monitor Lizard *Varanus bengalensis* (Daudin, 1802)

Individuals were frequently observed at Malumela, Chandani-Dodhara, Hirapurphanta, Arjuni, Shuklaphanta grassland, Majhgaun, Chandmari, and around human habitations in the buffer zone area (Image 24). One sub-adult individual was rescued from Tilkeni Village and released inside the park. We also observed a road kill on the national highway near Arjuni post.

Golden Monitor Lizard *Varanus flavescens* (Hardwicke & Gray, 1827)

This species was frequently observed at fringe areas of the park from Pipariya, Beldandi, and Majhgaun areas (Image 25). Three individuals were rescued each from Mahendranagar, Pipariya Village and Majhgaun and released in ShNP. In Nepal, this species is facing multiple threats like habitat destruction, poaching (Bhattarai et al. 2018a), however, Ghimire & Shah (2014) mentioned that the species tolerates habitat modification in Kanchanpur.

Typhlopidae Merrem, 1820

Brahminy Blind Snake *Indotyphlops braminus* (Daudin, 1803)

We recorded the individuals during wetland management activities from Sundariphanta and one individual was also observed at Majhgaun (Image 26). This species is the smallest snake species of Nepal, is a fossorial species, and is known to have parthenogenetic reproduction.

Image 24. Bengal Monitor Lizard *Varanus bengalensis*.

Image 25. Golden Monitor Lizard *Varanus flavescens* rescued from Mahendranagar.

Image 26. Brahminy Blind Snake *Indotyphlos braminus*.

Image 27. Common Sand Boa *Eryx conicus*.

Image 28. Laudanka Vine Snake *Ahaetulla laudankia*. Top: fullbody, Bottom: close-up of head.

Erycidae Bonaparte, 1840

Common Sand Boa *Eryx conicus* (Schneider, 1801)

We recorded this species from Hirapurphanta and Parkhedi school compound, Majhgaun (Image 27). The earlier records of this species were from eastern Nepal to Bardia National Park only (Schleich & Kästle 2002; Shah & Tiwari 2004; Bhattarai et al. 2017a, 2018a; Pandey et al. 2018). Recently, Devkota et al. (2019) recorded this species from Sainamaina, Rupandehi District also. This is a new record of the species from ShNP.

Red Sand Boa *Eryx johnii* (Russell, 1801)

We recorded this individual from Pipariya. One road kill was also observed near Arjuni post during translocation of Swamp Deer from ShNP to Chitwan National Park. Shah & Tiwari (2004) reported this species from Bardia National Park. This is the first record of *E. johnii* from ShNP and the locality where the species was recorded is ca. 200km west of Bardia National Park.

Colubridae Oppel, 1811

Laudanka Vine Snake *Ahaetulla laudankia* Deepak, Narayanan, Sarkar, Dutta & Mohapatra, 2019

This is a newly described species from India by Deepak et al. (2019) based on the specimens from Odisha and Rajasthan. This is a Brown Vine Snake that looks like a dried stem of bottle gourd for which the species name has been latinized. We recorded this species from Larighat area of the ShNP (Image 28). The morphological characters of our specimen corresponded to the original description collected from Odisha and Rajasthan (for details see Deepak et al. 2019). Recently, Patel et al. (2019) also reported its occurrence from another Indian state from Gujarat. We report it as a new snake species record for Nepal. We first recorded it from ShNP. Later, we also received photographic evidence of this species from the buffer zone village Banu Gaun (gaun=village) of Bardia National Park and also observed at Patna tal and Lami tal of Chitwan National Park. This indicates that *A. laudankia* has a wider distribution in Nepal. We suggest detailed inventory of this newly described species.

Green Vine Snake *Ahaetulla nasuta* (Lacépède, 1789)

We recorded this species from Shuklaphanta and Darakphanta (Image 29). This species was also recorded by Shah & Tiwari (2004).

Forsten's Cat Snake *Boiga forsteni* (Duméril, Bibron & Duméril, 1854)

We recorded this species from Malumela and Shuklaphanta area (Image 30). Previous studies by

Image 29. Green Vine Snake *Ahaetulla nasuta*.

Image 30. Forsten's Cat Snake *Boiga forsteni*.

Image 31. Common Cat Snake *Boiga trigonata*.

Schleich and Kästle (2002); Shah & Tiwari (2004) and Kästle et al. (2013) also reported the occurrence of this species in ShNP.

Common Cat Snake *Boiga trigonata* (Schneider, 1802)

We rescued this species, one each from the buffer zone villages (Beldandi and Majhgaun) and released them in the park (Image 31). We also observed one individual at Shuklaphanta grassland.

Ornate Gliding Snake *Chrysopelea ornata* (Shaw, 1802)

A juvenile individual was observed near the bridge of Bahuni River on the way to Shuklaphanta grassland during swamp deer translocation from the ShNP to Chitwan National Park in May 2017 (Image 32). This is a new record of the species from ShNP. The nearest locality record of this snake is Bardia National Park (Shah & Tiwari 2004).

Common Trinket Snake *Coelognathus helena* (Daudin, 1803)

We observed the individuals from Garjamani, Hirapurphanta, and Beldandi. We also found one road kill near Majhgaun during swamp deer translocation from ShNP to Chitwan National Park. This is a new record from ShNP.

Copper-headed Trinket Snake *Coelognathus radiatus* (Boie, 1827)

One dead specimen probably killed by elephant staff because of its aggressive nature was found near Shuklaphanta post during swamp deer translocation in 2017. This is a new snake species record from ShNP.

Bronzeback Tree Snake *Dendrelaphis tristis* (Daudin, 1803)

This species was frequently observed at Majhgaun, Pipariya, Shuklaphanta, Singhpur, and Hirapurphanta (Image 33). This is a new snake species record from ShNP.

Common Wolf Snake *Lycodon aulicus* (Linnaeus,1758)

We recorded this species from Majhgaun, Beldandi, and Homestay areas (Image 34). It is also frequently seen at Pipariya and Mahendranagar.

Twin-spotted Wolf Snake *Lycodon jara* (Shaw,1802): We recorded this species from Shuklaphanta wildlife camp, Majhgaun, and Hirapurphanta. An individual was also rescued from a Homestay area (Image 35).

Image 32. Ornate Gliding Snake *Chrysopelea ornata* (juvenile).

Image 33. Bronzeback Tree Snake *Dendrelaphis tristis*.

Image 34. Common Wolf Snake *Lycodon aulicus*.

Image 35. Twin-spotted Wolf Snake *Lycodon jara*.

Image 36. Barred Wolf Snake *Lycodon striatus*.

Image 37. Banded Kukri Snake *Oligodon arnensis*.

Barred Wolf Snake *Lycodon striatus* (Shaw, 1802)

We recorded this species from Beldandi and Majhgaun area. This is a new snake species record from ShNP (Image 36).

Banded Kukri Snake *Oligodon arnensis* (Shaw, 1802)

We frequently observed this species from Majhgaun, Arjuni, Pipariya, and Beldandi areas (Image 37). This is a new snake species record from ShNP.

Coral Red Kukri Snake *Oligodon kheriensis* (Acharji & Ray, 1936)

We observed this species from Majhgaun, Beldandi, Jhilmila, and Arjuni post (Image 38). Individuals were also rescued from buffer zone villages. In Nepal, this species was first recorded by Schleich & Kästle (2002) from Mahendranagar, Kanchanpur District. Later, Pandey et al. (2016) provided locality records of this species from Chitwan and Jhapa showing its wider distribution in Nepal. We also received photographic evidence of this species from Gobraila Village, Bardia National Park and Dhangadhi, Kailali District.

Common Rat Snake *Ptyas mucosa* (Linnaeus, 1758)

Individuals were frequently observed within and outside of the park (Image 39). We recorded this species from Majhgaun, Beldandi, Gobraiya, Pipariya, Arjuni, and Parkhedi area. We also frequently rescued them from the buffer zone villages.

Cantor's Black-headed Snake *Sibynophis sagittarius* (Cantor, 1839)

This species was observed at Majhgaun, Dhakka and Barkaula areas (Image 40).

Homalopsidae (Jan, 1863)

Common Smooth Water Snake *Enhydris enhydris* (Schneider, 1799)

The record of this species is based on Shah & Tiwari (2004).

Siebold's Water Snake *Ferania sieboldii* (Schlegel, 1837)

The record of this species is also based on Shah & Tiwari (2004).

Lamprophiidae Fitzinger, 1843

Sand Snake *Psammophis* cf. *condanarus* (Merrem, 1820)

We recorded a dead specimen from Shuklaphanta grassland during a grassland management activity (Image 41). The first record of this snake in Nepal was from Chitwan National Park by Kramer (1977). Later,

Image 38. Coral Red Kukri Snake *Oligodon kheriensis*.

Image 39. Common Rat Snake *Ptyas mucosa*.

Image 40. Cantor's Black-headed Snake *Sibynophis sagittarius*.

Image 41. Sand Snake *Psammophis* cf. *condanarus*.

Image 42. Striped Keelback *Amphiesma stolatum*.

Image 43. Checkered Keelback *Fowlea piscator*.

Schleich & Kästle (2002) reported it from Koshi Barrage, Sunsari District ca. 340km east of Chitwan National Park. Our record in ShNP is 550km west from Chitwan National Park. This is the first record for ShNP and third locality record for Nepal; however, we suggest detailed molecular studies of this species for further validation of taxonomic identity.

Natricidae Bonaparte, 1838

Striped Keelback *Amphiesma stolatum* (Linnaeus, 1758)

This is a commonly sighted snake species in and around ShNP. We frequently observed this species at Majhgaun, Lallare, Beldandi, Pipariya, Dhakka, Arjuni, and Hirapurphanta (Image 42). Road kill individuals on national highway through the park were also observed.

Checkered Keelback *Fowlea piscator* (Schneider, 1799)

This species is frequently observed in water bodies (lakes, rivers) within the park and agricultural fields in the buffer zone (Image 43). Purkayastha et al. (2018) reallocated this species to the genus *Fowlea*.

Elapidae Boi, 1827

Common Krait *Bungarus caeruleus* (Schneider, 1801)

This species is most commonly sighted among all other kraits in ShNP. It was also frequently rescued from buffer zone villages, namely, Majhgaun, Pipariya, and Parkhedi (Image 44).

Banded Krait *Bungarus fasciatus* (Schneider, 1801)

One individual was photographed at Majhgaun (Image 45).

Monocled Cobra *Naja kaouthia* (Lession, 1831)

We recorded an individual of this species from Shuklaphanta post. The individual was spotted entering a toilet of the Shuklaphanta post. Records of this species in ShNP are also reported by Schleich & Kästle (2002), Shah & Tiwari (2004), and Kästle et al. (2013).

Common Cobra *Naja naja* (Linnaeus, 1758)

This species was recorded from Majhgaun, Hirapurphanta, Beldandi, Shuklaphanta and also rescued from Homestay area, Pipariya and Suksaal areas (Image 46). One dead individual was also observed in Garjamani Village and it was killed when it entered the kitchen.

King Cobra *Ophiophagus hannah* (Cantor, 1836)

We observed an adult individual at Bichuwa. We could only photograph posterior part of the snake as it was moving into a dense bush. We also observed a dead

Image 44. Common Krait *Bungarus caeruleus*.

Image 45. Banded Krait *Bungarus fasciatus*.

Image 46. Common Cobra *Naja naja*.

Image 47. Burmese Python *Python bivittatus* swallowing a Spotted Deer.

Image 48. Sal Forest Turtle *Melanochelys tricarinata*.

Image 49. Black Pond Turtle *Melanochelys trijuga*.

individual north of Kalapani area of ShNP. Thapa et al. (2019) mentioned the presence of the King Cobra in 37 districts of Nepal and a single locality record from Far-west/Sudoorpaschim Province. Therefore, our record is the first from the ShNP and second locality for the Far-west Province. The previous nearest King Cobra record from Nigali, Kailali by Thapa et al. (2019) is north-east, ca. 60km away by aerial distance. We also received photographs of a dead King Cobra from Godawari, Kailali District. The forests of Godawari, Kailali is contiguous with Chure/Sivalik area of ShNP with similar habitat. Therefore, it is highly likely that the King Cobra also occurs in the Chure/Sivalik range of ShNP.

Pythonidae Fitzenger 1826

Burmese Python *Python bivittatus* Kuhl, 1820

We recorded this species from Beldandi, Malumela, Majhgaun, Mangalsera, Pipariya, Arjuni, Radhapur, and Hirapurphanta (Image 47). We observed a python swallowing a Spotted Deer *Axis axis* at Shuklaphanta grassland. We also rescued more than 50 individuals from Majhgaun (n=10), Tilkeni (n=12), Khairbhatti (n=15), Gobraiya (n=4), Pipariya (n=1), Katan (n=3), and Baibaha (n=7). This is the largest snake in Nepal. This is the only snake species in Nepal which has been accorded the highest degree of protection under the National Parks and Wildlife Conservation Act, 1973. The occurrence of the Burmese Python in Nepal was first confirmed by O'Shea (1998) from Bardia National Park. Barker & Barker (2008) mentioned three disjunct populations of Burmese Python, viz., Chitwan, Bardia, and Corbett populations; however, according to Shah & Tiwari (2004) and Bhattarai et al. (2017b) the Burmese Pythons are widely distributed in Nepal from <100m to 2800m and even rescued from fringe villages of community forests outside protected areas in Nepal (Bhattarai 2012).

Viperidae Oppel 1811

Russell's Viper *Daboia russelii* (Shaw & Nodder, 1797)

We recorded this species from Barkaula area and Dakhnaghat area. The earlier studies by Schleich & Kästle (2002), Shah & Tiwari (2004), and Kästle et al. (2013) also mentioned the occurrence of Russell's Viper in ShNP.

Geoemydidae Theobald 1868

Sal Forest Turtle *Melanochelys tricarinata* (Blyth 1856)

We recorded this turtle from Malumela, Pipariya, and Shuklaphanta grassland areas. An individual was encountered crossing the patrolling route during an anti-poaching operation between Malumela and Solgaudi Lake (Image 48).

Black Pond Turtle *Melanochelys trijuga* (Schweigger, 1812)

The individuals of this species were observed basking on the banks of the lakes inside ShNP. We frequently observed them at Sikari tal (tal=lake), Rani tal, Lami tal, Tara tal, Solgaudi, and Malumela (Image 49).

Indian Roofed Turtle *Pangshura tecta* (Gray, 1831)

Frequently observed at Rani tal, Baghmara and Malumela area (Image 50). The species is also frequently seized from local communities when they collect either for food or for sale. The hard shelled turtles and elongated tortoise have higher demands in local market as the businessmen believe them to be a sign of good luck (Bhattarai et al. 2018a).

Indian Tent Turtle *Pangshura tentoria* (Gray, 1834)

We recorded this species basking on the banks of Rani tal and Bahuni River. One dead specimen was also recorded at Chaudhar Khola (Image 51). Based on Schleich & Kästle (2002), we ascertained this species as *Pangshura tentoria circumdata* having a pink ring on its carapace and yellow coloured plastron with irregular black patch. This species is a new record from ShNP.

Testudinidae Batsch 1788

Elongated Tortoise *Indotestudo elongata* (Blyth, 1854)

We recorded this species from the foot hills of Chure/ Sivalik in ShNP (Image 52). Earlier records of this species in ShNP was by Shah & Tiwari (2004). This is one of the most sought after species for the illegal pet trade in Nepal.

Trionychidae Fitzinger 1826

Narrow-headed Softshell Turtle *Chitra indica* (Gray, 1831)

The record of this species in ShNP is based on Kästle et al. (2013).

Indian Flapshell Turtle *Lissemys punctata* (Bonnaterre, 1789)

We recorded this species from Malumela, Hirapurphanta, Pipariya, Badenikheda, Rani tal, Shikari tal, and Beldandi (Image 53). Based on the description provided by Aryal et al. (2010), we ascertain this turtle as *L. punctata andersoni*.

Gangetic Softshell Turtle *Nilssonia gangetica* (Cuvier, 1825)

We recorded this species from Bahuni River and Chaudhar River. Local people are frequently arrested by

Image 50. Indian Roofed Turtle *Pangshura tecta*.

Image 51. Indian Tent Turtle *Pangshura tentoria*.

Image 52. Elongated Tortoise *Indotestudo elongata*.

Image 53. Indian Flapshell Turtle *Lissemys punctata*.

Image 56. Mugger Crocodile *Crocodylus palustris*.

Image 54. Gangetic Softshell Turtle *Nilssonia gangetica*.

Image 55. Peacock Softshell Turtle *Nilssonia hurum* (juvenile).

park authorities during illegal collection of this species (Image 54).

Peacock Softshell Turtle *Nilssonia hurum* (Gray, 1831)

We recorded this species from Rani tal, Bahuni River, and Chaudhar River (Image 55). The juveniles of this species have four to six eye rings on the carapace. This species is also heavily poached in the area.

Crocodylidae Cuvier, 1807

Mugger Crocodile *Crocodylus palustris* (Lesson, 1831)

We recorded this species from Chaudhar River, Bahuni River, Rani tal, Baba tal, Solgaudi, Mahakali River, Shikari taal, Sundariphanta khalla, and Gobriaya nullah (Image 56). We also rescued five mugger crocodiles from human habitation and private fish ponds from Bhasi (n=1), Khairbhatti (n=2), Chandani-Dodhara (n=1), and Gobraiya (n=1).

DISCUSSION

Our study provided crucial information on the species richness and distribution of herpetofauna in Shuklaphanta National Park and its buffer zone. Out of 71 recorded species, 18 species are new to ShNP. Among the newly recorded 18 species, one snake species *Ahaetulla laudankia* is new to Nepal. The herpetofauna of ShNP (n=71 species) is comparable with other protected areas of the Terai region of Nepal. For example, Zug & Mitchell (1995) and Lamsal (2014) recorded 55 species of herpetofuana from Chitwan National Park. Recently, Pandey et al. (2018) updated the list of snakes of Chitwan National Park with records of 32 species. Bhattarai et al. (2018a) recorded 51 species of herpetofauna from Parsa National Park and GoN (2015) mentioned the occurrence

of 42 species in Bardia National Park. This indicates that the species richness (n=71) in ShNP is relatively higher.

The earlier studies (such as Schleich & Kästle 2002; Shah & Tiwari 2004; Aryal et al. 2010; Kästle et al. 2013) did not provide exact locality information of species present in ShNP. Some other studies (e.g., Shrestha & Sheshtha 2008; Subedi 2011) were confined to gray literature such as dissertations and technical reports. Despite their scientific importance these have not been published for readers widely.

Conservation concerns

Among the species we compiled, 39 species have been listed in IUCN Red List threat category (Table 1). Among them, one species has been listed as Critically Endangered (CR), one as Endangered (EN), six as Vulnerable (VU), one species as Near Threatened (NT), and 30 species as Least Concern (LC) (IUCN 2019). Two reptiles, namely, Golden Monitor Lizard *Varanus flavescens* and Python *Python* sp. have been accorded the highest degree of protection under the National Parks and Wildlife Conservation Act,1973 of Nepal. ShNP is the type locality for the agamid lizard *Sitana schleichi* which is endemic to Nepal.

ShNP supports the largest herd of Swamp Deer. Active habitat management has been practiced to hold the population size of Swamp Deer and provide sufficient prey for tigers and leopards. The active habitat management interventions only for select species like tigers, rhinos, swamp deer, however, has caused to cost for survival of herpetofauna. We observed a *Python bivittatus* at Kuwadanda between Barkaula and Syauli posts and a nesting female of *Nilssonia hurum* badly injured due to intentional fire for grassland management. We also recorded several road kills of amphibians and reptiles on the national highway that passes through ShNP. Among the snakes we documented, only six species were venomous, however, all snake species have suffered vindictive killing. Reptiles (especially turtles and monitors) are poached for food. The ShNP has also the problem of feral animals inside the park, the intensity of loss due to feral animals (such as dogs, domestic cats, and cattle) are to be studied on the population dynamics of local herpetofauna. Herpetofauna face severe anthropogenic pressure due to habitat alteration and pesticide use in the buffer zone. Such pressure has extirpated the Gharial *Gavialis gangeticus* from Mahakali River.

We failed to document the endemic lizard *Sitana schleichi* in ShNP and suggest collection based detailed inventory for this species to ascertain its genetic identity with its congeners. We believe the record of False Cobra *Pseudoxenodon macrops* in ShNP by Schleich & Kästle (2002) was mistakenly included and others (such as Shah & Tiwari 2004; Subedi 2011; Kästle et al. 2013) followed Schleich & Kästle (2002). The locality records of *Pseudoxenodon macrops* in Nepal (except in ShNP) is limited to mid-mountains from >1,000m to almost 3,000m (Santosh Bhattarai pers. obs. 15.viii.2019). Therefore, we delist the occurrence of *Pseudoxenodon macrops* from ShNP. Subedi (2011) reported the occurrence of *Python molurus* in ShNP. We are confident that observations by Subedi (2011) were taxonomic misidentification and we treat all the observations as *Python bivittatus*.

Conservation implications

The ShNP supports an impressive herpetofauna species richness; however, the observed threats such as intentional killing and poaching of herpetofauna for illegal trade and consumption are of grave concern. Such illegal activities and accelerated killings have depleted some herpetofauna (e.g., the last individual of Gharial from Chaudhar River in ShNP was seized in 1993 when one of the authors of this paper (NS) filed a case against the poacher). Similarly, forest fires during April–May are also common in the area. The impacts of fire on the herpetofauna has not yet been studied in ShNP. The ShNP frequently conducts conservation awareness sessions for local communities focusing on large charismatic species only. We strongly suggest such conservation initiatives must advocate for herpetofauna as well. The east-west highway bisects ShNP and we frequently observed road kills of wildlife. Regular road survey will provide us with quantitative data on species loss due to vehicular movement. Our study provides an updated information on species richness of herpetofauna in ShNP and opens avenue for species-based detailed inventories such as population dynamics, effects of anthropogenic pressures, and forest fires on herpetofauna. The results of the study are also very useful for conservation planning of the park.

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