



Herpetofaunal diversity in Manaslu Conservation Area, Nepal

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Abstract

Herpetofauna is the least studied subject in the Nepal Himalaya. Most of the studies in wildlife are focused on mammals and birds. This paper presents the results of the herpetofauna survey in Manaslu Conservation Area in the Central Nepal, conducted with the aim of establishing the baseline on herpetofauna species diversity. The study recorded 16 species of herpetofauna, indicating a highly potential abundance of herpetofauna in the region. The study is first of its kind in establishing the baseline. The information, thus, obtained can be useful for implementing a biodiversity monitoring activities, and current and future conservation efforts. The study also underlines a need of an extensive study of herpetofauna in this region.

Key words: Amphibian, Inventory, Monitoring, Reptile, Himalaya

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Introduction

Herpetofauna represents species of reptiles and amphibians, like snakes, lizards, frogs, turtles, alligators, and salamanders. Amphibians and reptiles are considered as beneficial faunal group due to the unique role they play in the ecosystem (Chaudhary, 1998; Shrestha, 2001). They have a very significant function in the food chain and

control a wide variety of agricultural pests. In recent decades, Amphibians and reptiles population have suffered widespread declines and extinctions (Blaustein and Wake, 1995; Kiesecker *et al.*, 2001). Limited dispersal ability may further increase the vulnerability of amphibians and reptiles to changes in climate. Slight changes in water level in breeding ponds can trigger repro-

ductive failure and, in a single year, cause a severe drop in the population size of short-lived species; persistent changes can lead to extinctions of species (Araujo *et al.*, 2006). Amphibian decline problem is a serious threat and reptiles appear to be in even greater danger of extinction worldwide (Gibbons *et al.*, 2000). So, the assessments of amphibian and reptile diversity require exploration of previously unvisited areas, comprehensive surveys of poorly known areas, and revisiting of localities that have not been assessed in the last decade (Parra *et al.*, 2007).

Nepal is extremely rich in habitat diversity, therefore a variety of habitats occurring in the Tropical to Nival zone are available for the native amphibians and reptiles. Based on their distribution and habits they utilize forests, grasslands, alpine meadows, trees, tunnels, cliffs, rocks, different aquatic bodies, agricultural lands and even houses as macro and microhabitats. Nepalese herpetofauna have a wide range of vertical (60-5,490 m) and horizontal (Mechi to Mahakali) distribution. Studies to date have confirmed that Nepal's herpetofauna embraces Palearctic, Oriental, Indo-Chinese and Himalayan elements (Shah and Tiwari, 2004). Fourteen species of herpetofauna are endemic to Nepal. Seventeen species of the herpetofauna are nationally threatened, of which six species are globally threatened (ICIMOD and MOEST-GON, 2007). A recent publication - Amphibians and Reptiles of Nepal, edited by Schleich and Kastle (2002) - provides an account of 50 amphibians and 123 reptiles. The herpetofauna in Nepal is relatively richer compared to other South Asian countries-well over 206 species and sub-species, including 59 amphibian species of which 15 are listed as

globally threatened. However, Amphibian and reptiles of Nepal face severe threat of extinction. Major threats include rapid deforestation, soil and water pollution, land use changes, habitat loss and unplanned resource extraction. As herpetofauna is the poorly studied group in the country, their present status is also poorly known (CEPF, 2005), however according to IUCN Global Amphibian Assessment 2006, Nepal has 4% endemic species and the species composition had reduced compared to 2001 IUCN checklist (Molur, 2008). Very few species have been described from disturbed habitats, indicating a diminished species composition when compared with the original habitat (Molur, 2008). And, from a conservation point of view also, herpetofauna conservation efforts have been limited (Shah and Tiwari, 2004; Rai *et al.*, 2006). Even these days all snakes (reptile) are considered to be poisonous and killed at sight. The tendency of indiscriminate exploitation of amphibians and reptiles species in the country has threatened the survival of some of the species so much (Shah, 1995).

In this context, a brief survey of herpetofauna has been conducted to explore their diversity, identify the species composition and assemblage and to sensitize the conservation efforts in in Manaslu Conservation Area (CA), Nepal. Additionally, the habitat situation and species association analyses are expected to add a new dimension in herpetological research in Nepal. Further, it is expected to fulfill the gap in herpetological species and site conservation point of view in Nepal as no scientific exploration of herps has been conducted so far in the area.

Study area

The study area (longitude 84.48 to 85.20 E; latitude 28.34 to 28.75 N), Manaslu CA (Fig. 1), was declared as a conservation area in 1998. It covers 7 Village Development Committees of Gorkha district in Central Nepal, with an area of 1,663 km², ranging from 1360 to 8163 m in altitude. The

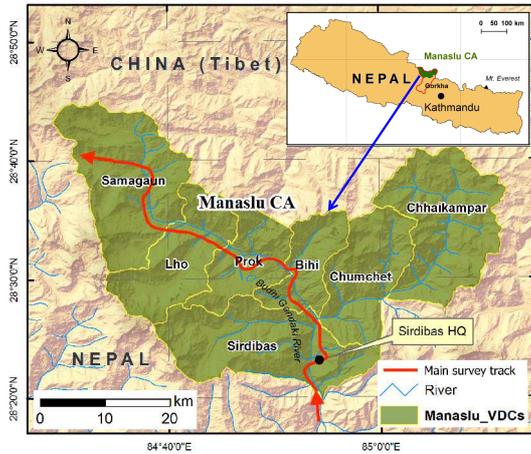


Figure 1. Location of Manaslu Conservation Area (CA) with the hill shade in the background

area is bordering the Annapurna Conservation Area to the west, the Tibetan part of China to the north and east, and the Ghyachok, Warpak, Uhiya, and Kerauja VDCs of Gorkha district to the south. The region harbors a mosaic of habitats for various species of wildlife. About 2,000 species of plants, 33 mammals, 110 birds, and 11 butterflies in 11 types of forests reported from the area (NTNC, 2016). As Manaslu CA covers mountain areas, the mountain biodiversity is not only a scientific theme of high interest, but also is perhaps the best indicator value of the integrity of mountain ecosystem (Körner, 2002). The climate variation in term of temperature, precipitation, and humidity is clearly noticeable with in a short latitudinal difference. The climate of

the region ranges from the subtropical in the south (mean around 30°C in the summer and 10°C in the winter) to extremely cold alpine and nival in the north (below freezing point). As a consequence of physical heterogeneity of the mountains and climatic conditions, the mountain regions typically possess higher levels of biodiversity than plains, making it possible to conserve large amounts of diversity in relatively small areas (Lafon, 2004).

Materials and methods

This study was mainly based on the field survey of the Manaslu CA. Stream survey and trail survey was conducted. Random transect method has been applied in order to sampling in the area for intensive study. In each transect along the forest trail and streams two persons walked covering a distance of 5 m on both sides from the south to Northeast of the CA (Fig. 1) Opportunistic survey has also be conducted in other parts from transect lines based on (Gardner and Fitzherbert, 2007). Amphibians and reptiles were surveyed by using hand picking (using equipment for handling the reptiles and amphibians) in the sites (Fig. 2). For nocturnal survey a torch beam was used to locate the animal (Behangana and Arusi, 2004). Species caught during survey were



Figure 2. Identification of species at the site.

identified on spot using field guide of Shah and Tiwari (2004) and released in-situ. The species encounter locations were recorded by using Garmin eTrex-10 Handheld GPS. The field activities were completed with a two weeks of survey in September, 2010.

The local residents were also contacted to collect information regarding herps in the area. Colored photographs from field manual of the potential amphibians and reptiles of the area were displayed to the local residents and asked to explain the features.

Results and discussion

Species inventory

Altogether 16 species of herpetofauna (7 amphibians and 9 reptiles) were recorded in the Manaslu CA (Plates 1-2). Among them, 12 (5 amphibians and 7 reptiles) were recorded through direct observation and other 4 species were verified through literature (Shrestha, 2001; Tab. 1). Table 2 and Table 3 below shows the list of herps recorded through direct observation in the area. *Laudakia tuberculata* (>100) is most abundant species in the area followed by *Duttaphrynus microtympanum* (11), *Asymblepharus sikimensis* (9), *Mabuaya carinata* (7), *Duttaphrynus stomaticus* (6), *Amolops formosus* (5), and others.

According to local people *Paa blanfordii* and *Paa liebigii* are also found in the streams of Phillim and Dyang areas (Table 1). We have made several attempts to observe these species, but we were unable to record during the field. Local people suggested to make the field visit in May-July to record these species from the area when streams have less amount of water. Species records were also made through local information and communication with conservation area staff and expert.

Species composition and assemblage

We recorded *Bufo* species (*D. himalayanus*, *D. microtympanum*, and *D. stomaticus*) mainly from settlement areas, agricultural land and forest areas. *Paa* (*O. sikimensis*) and *Amolops* species were recorded from small streams of the areas. We observed *Laudakia tuberculata* everywhere in the trail from Jagat (starting point of MCA) to Prok. In Phillim, we found the highest number of *L. tuberculata*. They were common in cultivated land, wall of houses, rocks etc in this place. Most of the amphibian species were found in trails and streams of Phillim, Nyak, and Dyang areas. After Lihi (2,927 m), we didn't find any species up to Larke (5,106 m), the heightened location survey. However, an intensive study is necessary in these areas as we just made trail survey. We didn't make any transect survey and stream survey without any evidence of herpetofauna occurrence from local people in the area.

Based on the GPS positions recorded during species survey in the field, the distributions of herps in the areas are demonstrated in the map below (Fig. 3).

Conclusion

The survey of herpetofauna in Manaslu CA has been conducted within short period of time. Within this short period of time we are able to record 16 species of herpetofauna with other important information in the area so, the area is highly potential for herpetofauna studies. People consume *Paa* frog as a food. We have recorded *Paa* frogs (such as, *P. blanfordii*, *P. liebigii*, *O. sikimensis*) that people used as food in the area (Plate 2). Phillim, Nyak, and Dyang area have high density of frogs. We have recorded all types in the list from these areas.



Amolops formosus



Duttaphrynus himalayanus



Duttaphrynus microtypanum



Duttaphrynus stomaticus



Ombrana sikimensis



Mabuya carinata

Plate 1. Herpetofauna recorded from Manaslu Conservation Area.



Asymblepharus sikkimensis



Laudakia tuberculata



Orioliaris tricarinata



Calotes versicolor



Amphiesma platyceps



A local women with *O. sikkimensis*: Species of herpetofauna, particularly *O. sikkimensis* are used as supplement food by some local communities

Plate 2. Herpetofauna recorded from Manaslu Conservation Area.

Table 1. Species record from secondary sources.

SN Species	IUCN status	Source
1 <i>Paa blanfordii</i> (Boulenger, 1882)	LC	Local people
2 <i>Paa liebigii</i> (Gunther, 1860)	LC	Local people
3 <i>Trimeresurus albolabris</i> (Gray, 1842)	Not listed	Local people
4 <i>Oligodon erythrogaster</i> Boulenger, 1907	Not listed	Shah and Tiwari (2004)

Table 2. Amphibian species encountered during field survey.

SN Species	Common name	IUCN status	No. of individual observed
1 <i>Duttaphrynus himalayanus</i> (Gunther, 1864)	Himalayan Toad	LC	3
2 <i>Duttaphrynus microtypanum</i> (Boulenger, 1882)	Small-eared toad	VU	11
3 <i>Duttaphrynus stomaticus</i> (Lutken, 1862)	Indus Valley toad	LC	6
4 <i>Amolops formosus</i> (Gunther, 1875)	Hill stream frog	LC	5
5 <i>Ombrana sikimensis</i> (Jerdon, 1870)	Frog	LC	4
Total individuals			26

Table 3. Reptile species encountered during field survey.

SN Species	Common name	IUCN status	No. of individual observed
1 <i>Calotes versicolor</i> (Daudin, 1802)	Common garden lizard	Not listed	2
2 <i>Laudakia tuberculata</i> (Hardwicke and Gray, 1827)	Himalayan Rock Lizard	Not Listed	>100
3 <i>Orioliaris tricarinata</i> (Kastle et al., 2013)	Mountain Lizard	LC	2
4 <i>Asymblepharus sikkimensis</i> (Blyth, 1853)	Sikkim skink	DD	9
5 <i>Mabuya carinata</i> (Schneider, 1801)	Keeled Indian Mabuya	LC	7
6 <i>Boiga multifasciata</i> (Blyth, 1861)	Many-banded tree snake	DD	1
7 <i>Amphiesma platyceps</i> (Blyth, 1854)	Himalayan keelback	Not listed	3
Total Individuals			>124

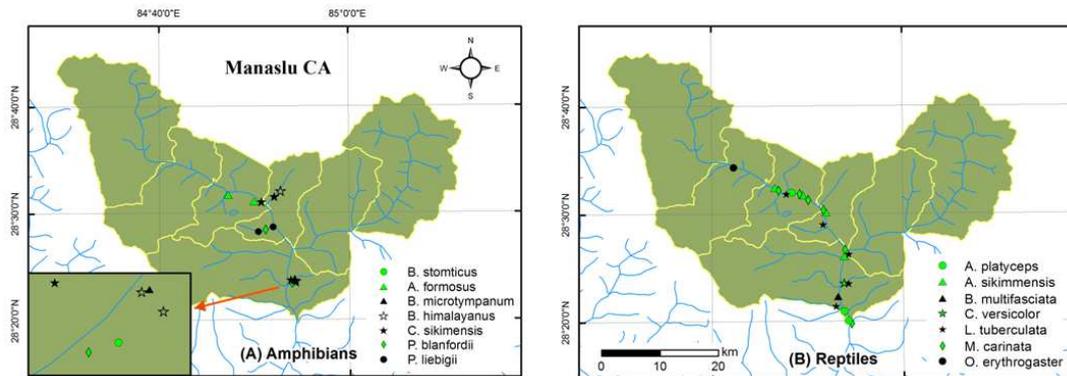


Figure 3. Spatial distribution recorded of (A) Amphibians and (B) Reptiles species in Manaslu Conservation Area (CA).

Since, this study was carried out for short period for inventory purpose and thus, not possible to make a complete species occurrence and populations. Thus, detail study of herpetofaunal species in the region should be carried out based on the threats including population and habitat to get a regional perspective.

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