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Herpetofauna of Uttar Pradesh, India

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ABSTRACT: Herpetofauna (Amphibians and Reptiles) also play a crucial role in ecosystem function. They are important predators of many insects and agricultural pests and are therefore, valuable for natural biological pest control. Herpetofauna are poikilothermic (cold blooded) vertebrates with smooth skin. The study was carried out during March 2011 through March 2013, with an aim to determine the diversity, distribution and natural history information in Uttar Pradesh. Present study revealed the presence of an authentic, annotated and illustrated checklist of herpetofauna occurring within the political boundaries of Uttar Pradesh. A total 93 species of herpetofauna including 70 species of Reptiles of 3 orders (Squamata, Testudines, Crocodilia), 3 Suborders (Ophidia, Cryptodira, Sauria/ Lacertilia), 15 Familiesand 23 species of Amphibians including 1 order (Anura), 5 families. Among the reptiles 38 are snakes (18 venemous, 20 non-venemous), Crocodile and Gharials, 18 turtles and 12 lizards. Such work should make special efforts to identify distinctive and representative herpetological taxa of protected areas or unique habitats to enhance and highlight their conservation value. A large number of species still being described, highlight the need for a more concerted scientific study in Uttar Pradesh as well as a need for greater protection of the habitat that remains.

Keywords: Herpetofauna, Uttar Pradesh, Amphibians, Reptiles, India

INTRODUCTION

There have been several efforts to create inventories of Indian reptiles which are collations of documentation, findings and records of individual herpetologists (Smith 1931, Whitaker and Captain 2004). Herpetofauna include amphibians and reptiles. Amphibians are poikilothermic (cold blooded) vertebrates with smooth skin leading a bimodal life i.e. life in water as well as land. The three modern orders of amphibians are Anura (tailless and limbless animals like toads and frogs), Caudata (tailless animals e.g. salamanders and newts), and Gymnophiona (caecilians, limbless amphibians that resemble snakes). Reptiles, found in almost all parts of the world, except the very cold regions. In India, reptiles have their three representative's orders- Crocodylia (crocodiles), Testudines (turtles and tortoises) and Squamata (lizards and snakes). The diversified climate, varying vegetation and different types of soil in the country form a wide range of biotopes, that support a highly diversified herpetofauna. The Western Ghats, Eastern Himalaya, and the Andaman and Nicobar Islands are endowed with varied and unique herpetofauna.

Herpetofauna (Amphibians and Reptiles) also play a crucial role in ecosystem function. They are important predators of many insects and agricultural pests and are therefore, valuable for natural biological pest control.

According to Zoological Survey of India (ZSI) there are 860 species of herpetofauna occurring in India. Out 860 species, 518 species of reptiles which include three species of crocodiles, 34 species of turtles and tortoises, 202 species of lizards and 279 species of snakes belonging to 28 families. Of the 518 species of reptiles found in India, nearly192 species are endemic to India. Out of these, 26 species have been listed as 'Threatened' in the IUCN Red List of Threatened Animals (IUCN 2006). Out of the 342 species of Amphibians known from India, 161 are still under the data deficient category. As per the IUCN Red List of Threatened Species, the global status of Indian amphibians is- 24% Data deficient; 30% Least concern; 9% Endangered; 6% Threatened; 5% Critically endangered; 2% Near threatened and 0.3 % extinct. Only two Indian species of frogs are included in Appendix-II.

Several workers have been published either on the Indian orregional snakes by K. G. Gharpurey (1954) in "Snakes of India". P. J. Deoras (1965) in "Snakes of India"; R. Whitaker (1978) in "Common Indian snakes: a field guide", Murthy (1986) in "Snake book of India", J. C. Daniel (1983) in "The book of Indian reptiles" and "The book of Indian reptiles and amphibians". R. C. Sharma (2004) in "Handbook: Indian snakes".

Most comprehensive and authoritative guide on Snakes of India is by Whitaker and Captain (2004) as "Snakes of India- the field guide". The book describes 157 species of snakes out of the 272 species found in present India. Indraneil Das (1997, 2002) produced diverse works of national and international importance including books such as "Biogeography of the reptiles of South Asia" (1996) and "A Photographic Guide to the snakes and other reptiles of India" (2002). The Turtles and Tortoises of Indian subcontinent by Das (1995), is still considered as one of the most comprehensive works on Indian testudines.

There is little literature, specifically on squamate reptiles of Uttar Pradesh and this includes the publications ofA. Das *et al.,* (2012), Hallermann *et al.,* (2001), Basu (1989), R.Sankaran, (1989), S. K. Talukdarand G. Dasgupta (1977).

There is an urgent need to compile and collate existing data as well as initiate systematic cataloguing and documentation of abundance, distribution, habitat preferences and natural history of herpetofauna of the state to produce an authentic, annotated and illustrated checklist of reptiles occurring within the political boundaries of Uttar Pradesh, which can serve as a reliable baseline for monitoring biodiversity and environmental change.

A. Study Area

Uttar Pradesh is bounded on the Shivalik Range which forms the southern foothills of the Himalayas, slopes down in to a boulder bed called Bhabhar, the transitional belt running along the entire length of the state is called the Terai and bhabhar area. It has rich forests, cutting across it are innumerable streams which swell into raging torrents during the monsoon. The climate of the state is tropical monsoon. The average temperature varies in the plains from 3 to 4 °C in January to 43 to 45 °C in May and June. There are three distinct seasons - winter from October to February, summer from March to mid-June, and the rainy season from June to September.

The study includes the whole of Uttar Pradesh which will be divided in to four different zones namely central (zone 1) east (zone 2), west (zone 3), and Bundelkhand zone U.P. (zone 4) shown in Fig. 1. Each district of a zone will be further divided into different habitat types *viz.* forests, croplands, aquatic bodies (ponds, lakes, along river banks & wet lands), hilly areas, rural areas and urban areas. The study area included protected areas, non-protected areas, rivers, lakes, forest streams, temple ponds and the fringe areas including tea gardens, paddy and human habitations.

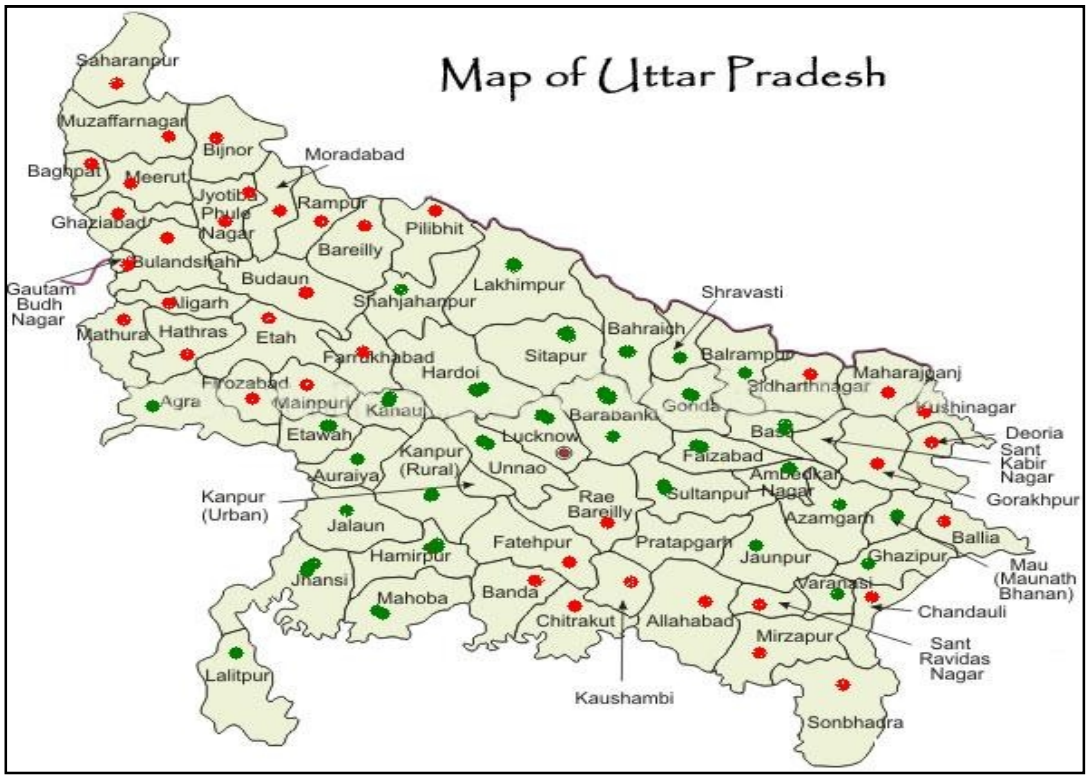


Fig. 1. Map of Study Area (Uttar Pradesh).

MATERIALS AND METHODS

The study was carried out during March 2011 through March 2013, with an aim to determine the diversity, distribution and natural history information in Uttar Pradesh. Field surveys were carried out during day time. During the extensive survey, we carried out visual inspection of forest floor, shrubberies, grasses and wetlands. All possible ecotones were searched thoroughly including such microhabitat as puddles and springs and such areas which often attract amphibians and reptiles for food, shelter or breeding. We go through all the grey literature, Museums and Zoos, record the data from previous work which helped us to make the authentic record of herpetofauna.

We looked for turtles and tortoise during 08:00 am to 12:00 pm and in the afternoon 14:00 pm till dusk. While looking for basking or active reptiles we visually recorded the habitat to be surveyed in the afternoon. Occasionally turtles at distant were observed through binoculars (20x50) and spotting scope (30X). Whenever possible individuals were caught, photographed with aid of 1100 D SLR Camera and measured for future reference and released back. Turtle shells were observed at different localities- protection camps inside the park and also from the villages. Data sheet was filled in to record- date, time, specific locality, latitude, longitude and altitude (recorded using a Garmin GPS), habitat type, habitat description, morphological measurements, weather such as temperature and humidity, detailed live coloration and natural history as well as other important field notes were taken for most of the animals we observed. Photographs were taken in natural condition for additional information.

Snake Charmer helped us to locate the particular area or conditions of snakes' habitats or presence or absence of snakes. Forest staffs based in the camps inside the park and communities living on the fringe villages were interviewed to get more information about herpetofauna.All species encountered are identified up to species level using keys and other publications (Gunther 1864; Boulenger 1890; Smith 1931, 1935, 1943; Dutta 1997; Bossuyt 2002; Daniels 2002; Daniels RJR 2005; Giri & Bauer 2008; Whitaker & Captain 2008; Aengals *et al.* 2012; Gururaja 2012) and the assessment of threat status of the observed species in the area was based on IUCN red list (2013).

RESULTS AND DISCUSSION

Present study revealed the presence of an authentic, annotated and illustrated checklist of herpetofauna occurring within the political boundaries of Uttar Pradesh. A total 93 species of herpetofauna including 70 species of Reptiles of 3 orders (Squamata, Testudines, Crocodilia), 3 Suborders (Ophidia, Cryptodira, Sauria/ Lacertilia), 15 Families (Colubridae (23), Varanidae (3), Geogmydidae (13), Crocodylidae (1), Pythonidae (3), Testudinoidea (1), Boidae (3), Gechoidae (4), Agamidae (3), Scincidae (2), Trionychidae (4), Geomydidae (13), Viperidae (2), Gavialidae (1) and Elapidae (5) and 23 species of Amphibians including 1 order (Anura), 5 families (Bufonidae (6), Dicroglossidae (3), Microhylidae (5), Ranidae (6) and Rhacophoridae (3) Table 1 & 2 and Fig. 2.

Table 1: List of Herpetofauna reported from Uttar Pradesh.

SN	Order	Family	Common Name	Scientific Name	IUCN Status	V/ NV
Reptiles (38 Snakes)						
1.	Squamata	Boidae(Gray, 1825) (3)	Common Sand Boa	*Gongylophis conicus*(Wagler, 1830)	NA	NV
2.			Red Sand Boa	*Eryx johni* (Smith, 1943)	NA	NV
3.			Rough-tailed Sand Boa (The record of the species is based on *Hallermann et al.* (2001) and A. Das *et al*. (2012)	*Eryx conicus*(Schneider, 1801)	NA	NV
4.		Colubridae(Oppel, 1811) (23)	Siebold's Smooth- scaled water Snake	*Enhydris sieboldii*(Schlegel, 1837*)*	LC	V
5.			Common Wolf Snake	*Lycodon aulicus* (Linnaeus, 1758)	NA	NV
6.			Common Smooth-scaled Water Snake	*Enhydris enhydris*(Schneider, 1799)	LC	V
7.			Common Vine Snake	*Ahaetulla nasauta*(Lacepede,1789)	NA	V

SN	Order	Family	Common Name	Scientific Name	IUCN Status	V/ NV
8.			Leith's Sand Snake	*Psammophis leithii*(Gunther, 1869)	NA	V
9.			Condanarus sand snake	*Psammophis condanarus*(Merrem, 1820)	LC	V
10.			Checkered Keelback	*Xenochrophis piscatorn*(Schneider, 1799)	NA	NV
11.			Barred wolf Snake	*Lycodon striatus*(Shaw, 1802)	NA	NV
12.			Golden Flying Snake	*Chrysopelia ornata*(Shaw, 1802)	NA	V
13.			Banded Racer	*Argyrogena fasciolata*(Shaw, 1802)	NA	NV
14.			Common Trinket Snake	*Coelognathushelena helena*(Daudin, 1803)	NA	NV
15.			Forsten's Cat snake	*Boigaforsteni* (Duméril, Bibron & Duméril, 1854)	LC	V
16.			Common Cat Snake	*Boiga trigonata* (Schneider, 1802)	LC	V
17.			Olive Keelback	*Atretium schistosum* (Daudin, 1803)	LC	V
18.			Striped Keelback	*Amphiesma stolatum*(Linnaeus, 1758)	NA	NV
19.			Russell's Kukri Snake	*Oligodon taeniolatus* (Jerdon,1853)	LC	NV
20.			Banded Racer	*Argyrogena fasciolata*(Shaw, 1802)	NA	NV
21.			Indian Rat Snake	*Ptyas mucosa*(Linnaeus, 1758)	NA	NV
22.			Common Brenzeback Tree Snake	*Dendrelephis tristis(Daudin, 1803)*	NA	NV
23.			Yellow-speckled Wolf Snake	*Lycodon jara*(Shaw, 1802)	LC	NV
24.			Mock Viper	*Psammodynastes pulverulentus* (Boie, 1827)	NA	V
25.			Cantor's black-headed Snake	*Sibynophis sagitarious*(Cantor, 1839)	NA	NV
26.			Bar-necked keelback	*Xenoehrophis schnurrenbergeri*(Kramer, 1977)	NA	NV
27.		Elapidae (Boie, 1827) (5)	King Cobra	*Ophiophagus hannah* (Cantor, 1836)	V	V
28.			Spectacled Cobra	*Naja naja*(Linnaeus, 1758)	V	V
29.			Wall;s Sind Krait	*Bungarussindanuswalli*(Wall, 1907)	NA	V
30.			Common Krait	*Bangarus caeruleus*(Schneider, 1801)	NA	V
31.			Banded Krait	*Bungarus fasciatus*(Schneider, 1801)	LC	V
32.		Pythonidae(Fitzinger, 1826) (3)	Indian Rock Python	*Python molurusmolurus*(Barone, 2004)	NA	NV
33.			Reticulated Python	*Malayopython reticulatus* (Schneider, 1801)	NA	NV
34.			Burmese Python	*Python bivittatus*(Kuhl, 1820)	V	V
35.		Typhlopidae (Merrem, 1820) (2)	Beaked Worm Snake	*Grypotyphlops acutus* (Duméril & Bibron, 1844)	LC	NV
36.			Brahminy Worm Snake	*Ramphotyphlops braminus* (Nussbaum, 1980)	NA	NV

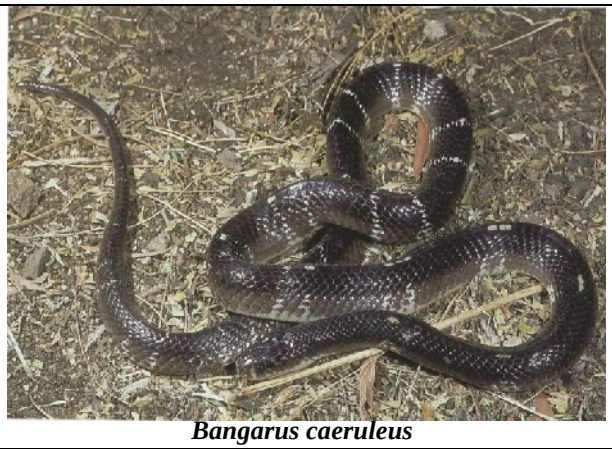
S.No.	Order	Family	Common Name	Scientific Name	IUCN Status	V/ NV
37.		Viperidae(Boie, 1827) (2)	Himalayan Pit Viper	*Gloydius himalayanus*(Gunther, 1864)	NA	V
38.			Russell's Viper	*Daboia russelii*(Shaw &Nodder, 1797)	LC	V
	Turtles & Tortoises (18 Species)					
1.	Testudines	Geogmydidae (Theobald, 1868) (13)	Deccan Sawback or Indian Tent Turtle	*Kachuga tentoria* (Gray, 1834)	LC	
2.			Tricarinate Hill Turtle	*Melanochelys tricarinata*(Blyth, 1856)	V	
3.			Brown Roofed turtle	*Pangshura tentoria (*Gray, 1834)	NA	
4.			Brahminy River Turtle.or Crowned River Turtle	*Hardellat hurjii* (Gray, 1831)	V	
5.			The Assam leaf turtle (Fritz *et al*. (2008) showed that sub adult female collected from Nishangada, Bahraich, Uttar Pradesh, India)	*Cyclemys gemeli* **(**Fritz, Guicking, Auer, Sommer, Wink & Hundsdörfer, 2008)	NA	
6.			Three Striped Roofed Turtle	*Batagur dhongoka* (Gray, 1832)	E	
7.			Spotted Pond Turtle	*Geoclemys hamiltonii*(Gray, 1831)	V	
8.			Painted roofed turtle	*Batagurkachuga* (Gray, 1831)	LC	
9.			Indian Eyed turtle	*Morenia petersi*(Anderson, 1879)	V	
10.			Indian black Turtle	*Melanochelys trijuga*(Schweigger, 1914)	NT	
11.			Indian roofed Turtle	*Pungshura tectum*(Gray, 1831)	LC	
12.			Brown roofed Turtle	*Pangshura smithii*(Gray, 1863)	NT	
13.			Elongated tortoise	*Indotestudo elongate* (Blyth, 1853)	E	
14.		Testudinoidea (1)	Starred Tortoise	*Geochelone elegans* (Schoepf, 1795)	V	
15.		Trionychidae(Fitzinger, 1826) (4)	Chitra Turtle	*Chitra indica***(**Gray, 1831)	E	
16.			Indian soft shell turtle	*Nilssonia gangeticus*(Cuvier, 1825*)*	V	
17.			Indian peacock soft shell turtle *(N. hurum*has been reported from other parts of the Terai by Das *et al*. (2010) and in Katernighat wildlife sanctuary 2012)	*Nilssonia hurum*(Gray, 1831)	V	

S.No.	Order	Family	Common Name	Scientific Name	IUCN Status	V/NV
18.			Indian Mud Turtle	*Lissemys punctata andersoni*(Webb, 1980)	LC	
	Lizards (12 Species)					
1.	Squamata	Agamidae (Gray, 1827) (3)	Common garden lizard	*Calotes versicolor* (Daudin, 1802)	NA	
2.			Forest calotes	*Calotes rouxi*(Manthey& Schuster, 1999)	NA	
3.			Jordon's blood sucker	*Calotes jerdoni*(Gunther, 1870)	NA	
4.		Gecknoidae(Gray, 1825) (4)	Northern House Gecko	*Hemidactylus flaviviridis*(Ruppell, 1835)	NA	
5.			Frilled house gecko	*Cosymbotus platyurus*(Steindacher, 1867)	NA	
6.			Southern House Gecko	*Hemidactylus frenatus*	LC	
7.			Brook's Gecko	*Hemidactylus brookii*(Gray, 1845)	NA	
8.		Scincidae(Gray, 1825) (2)	Common Brahminy Skink	*Eutropis carinata*(*Schneider, 1801)*	LC	
9.			Snake Skink	*Lygosoma punctatus* (Das, 1996)	NA	
10		Varanidae (Merrem, 1820) (3)	Monitor Lizard	*Varanus bengalensis*(Daudin, 1802)	LC	
11.			Yellow monitor	*Varanus flavescens*(Hardwicke & Gray, 1827*)*	LC	
12.			Desert monitor	*Varanus griseus*(Daudin, 1803)	NA	
	Crocodiles & Gharials (2 species)					
1	Crocodilia	Crocodylidae**(**Cuvier, 1807) (1)	Crocodile	*Crocodylus palustris*(Lesson, 1831*)*	E	
2.		Gavialidae(Gmelin, 1789) (1)	Gharial	*Gavialis gangeticus*(Gmelin, 1789)	E	
	Amphibians (23 species)					
1.	Anura	Bufonidae(Gray, 1825) (6)	Common Indian Toad	*Duttaphrynus melanostictus*(Schneider, 1799)	LC	
2.			Marbled Toad	*Bufo stomaticus*(Lutken, 1864)	LC	
3.			Himalayan Toad	*Bufo himalayanus*(Gunther, 1864)	LC	
4.			Beautiful stream frog	*Amolops formosus* (Gunther, 1876)	LC	
5.			Stoliczka's frog	*Nanoana vicina*(Stoliczka, 1872)	LC	
6.			Marbled Toad	*Duttaphrynus stomaticus*(Lütken, 1862)	LC	
7.		Dicroglossidae (Anderson, 1871) (3)	Skipper frog	*Euphlyctis cyanophlyctis* (Schneider, 1799**)**	LC	
8.			Indian Bullfrog	*Hoplobatrachus tigerinus*(Daudin, 1803)	LC	
9.			Common Pond Frog	*Fejervarya limnocharis*(Gravenhorst, 1829)	LC	
10.		Microhylidae (Günther, 1858) (5)	Ornamented Pygmy Frog	*Microhylaornate* (Duméril & Bibron, 1841)	LC	
11.			Gray Balloon Frog	*Uperodon globulosum*(Gunther, 1864)	LC	
12.			Marbled Baloon Frog.	*Uperodon systoma*(Schneider, 1799)	LC	

S.No.	Order	Family	Common Name	Scientific Name	IUCN Status	V/ NV
13.			Assam Narrowmouth Toad	*Kaloula assamensis* (Das, Sengupta, Ahmed, and Dutta, 2005)	LC	
14.			Sri Lankan Bullfrog	*Kaloula taprobanica*(Parker,1934)	LC	
15.		Ranidae (6)	Jerdon's Bull Frog	*Hoplobatrachus crassus*(Jerdon, 1854)	LC	
16.			Terai Cricket Frog	*Fejervary ateraiensis*(Dubois, 1984)	LC	
17.			Indian Burrowing Frog.	*Sphaerotheca breviceps*(Schneider, 1799)	LC	
18.			Roland's Burrowing Frog.	*Sphaerotheca rolandae(*Dubois, 1983)	LC	
19.			Field frog	*Fejervary ateraiensis*(Dubois, 1984)	LC	
20.			Common Sand Frog	*Tomopterna species* (Dumeril & Bibron, 1841)	LC	
21.		Rhacophoridae(Hoffman, 1932) (3)	Common Tree Frog	*Polypedates maculates* (Gray, 1834)	NA	
22.			Dudhwa Tree Frog	*Chirixalus dudhwaensis* (Ray, 1992)	DD	
23.			Not Known	*Polypedates taeniatus*(Boulenger, 1906)	LC	

(Legends: LC- Least Concern, V- Vulnerable, DD- Data Deficient, E= **Endangered, NT= Near Threatened, NA= Not Accessed, V= Venomous, NV= Non-venomous)**

Table 2: Some glimpses of Herpetofauna reported from Uttar Pradesh.



Bangarus caeruleus

Argyrogena fasciolata

Python reticulated

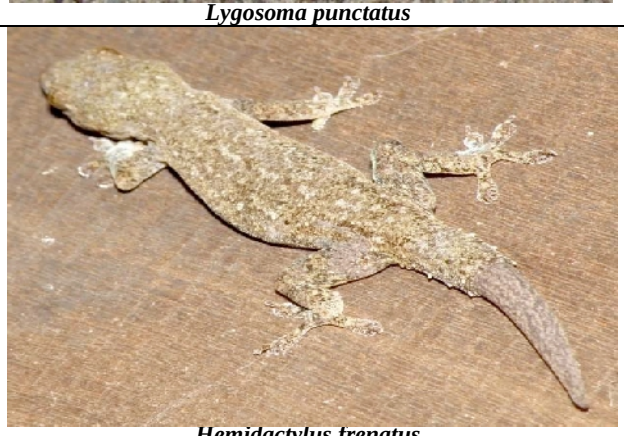
Python molurusmolurus

Eryx johni

Lycodon aulicus

Lygosoma punctatus

Eutropis carinata



Hemidactylus frenatus

Hemidactylus brookii

Hemidactylus flaviviridis

Gavialis gangeticus

Crocodylus palustris

Lissemys punctata

Kachuga tentoria

Geochelone elegans

Chitra indica

Duttaphrynus melanostictu

Bufo stomaticus

Euphlyctis cyanophlyctis

Hoplobatrachus tigerinus

Fejervarya limnocharis

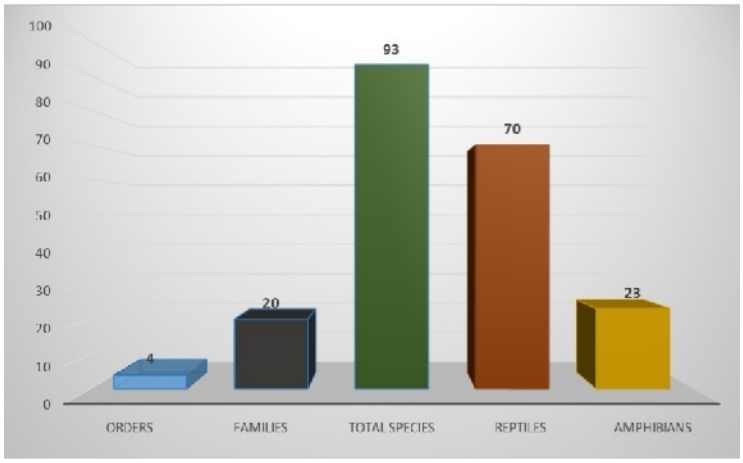


Fig. 2. Overview of taxonomic status of Herpetofauna of Uttar Pradesh.

Amongst all the families Colubridae (23) have the maximum number of species and Testudinoidea, Crocodylidae, Gavialidae with the lowest number of species i.e. 1 species each. Family wise percentage composition of herpetofauna is shown in Fig. 3.

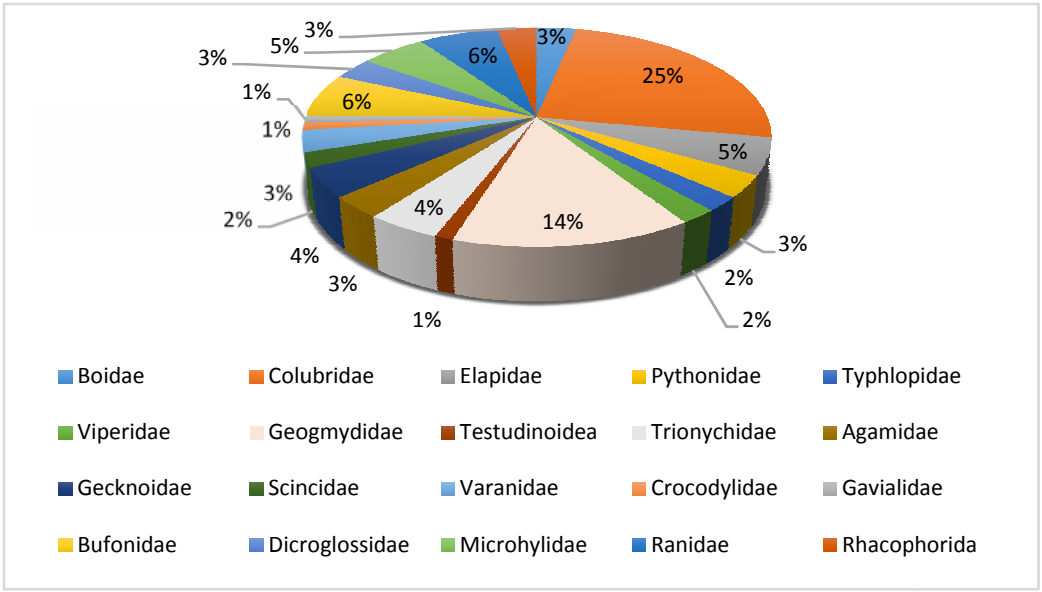


Fig. 3. Family wise Percentage composition of Herpetofauna of Uttar Pradesh.

A Das *et al*., (2012) aherpetofaunal study in Katerniaghat Wildlife Sanctuary and its environs, situated in the Terai region of Uttar Pradesh, India and total of 10 species of amphibians and 42 species of reptiles recorded from the area. Other workers in Past also studies on herpetofauna in Uttar Pradesh include Hallermann *et al*. (2001), Basu (1989) and Talukdar & Dasgupta (1977).

Among the reptiles 38 are snakes (18 venemous, 20 non-venemous), Crocodile and Gharials, 18 turtles and 12 lizards (Fig. 4). According to percentage distribution of herpetofauna of Uttar Pradesh Snakes contribute maximum (41%) and Crocodiles and Gharials contribute least (2%) shown in Fig. 5.

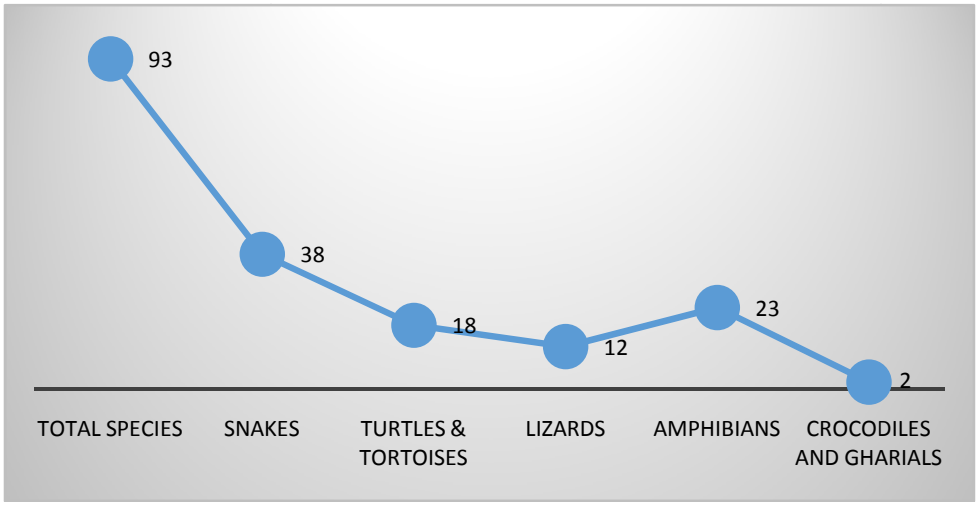


Fig. 4. Overview of Herpetofauna in Uttar Pradesh.

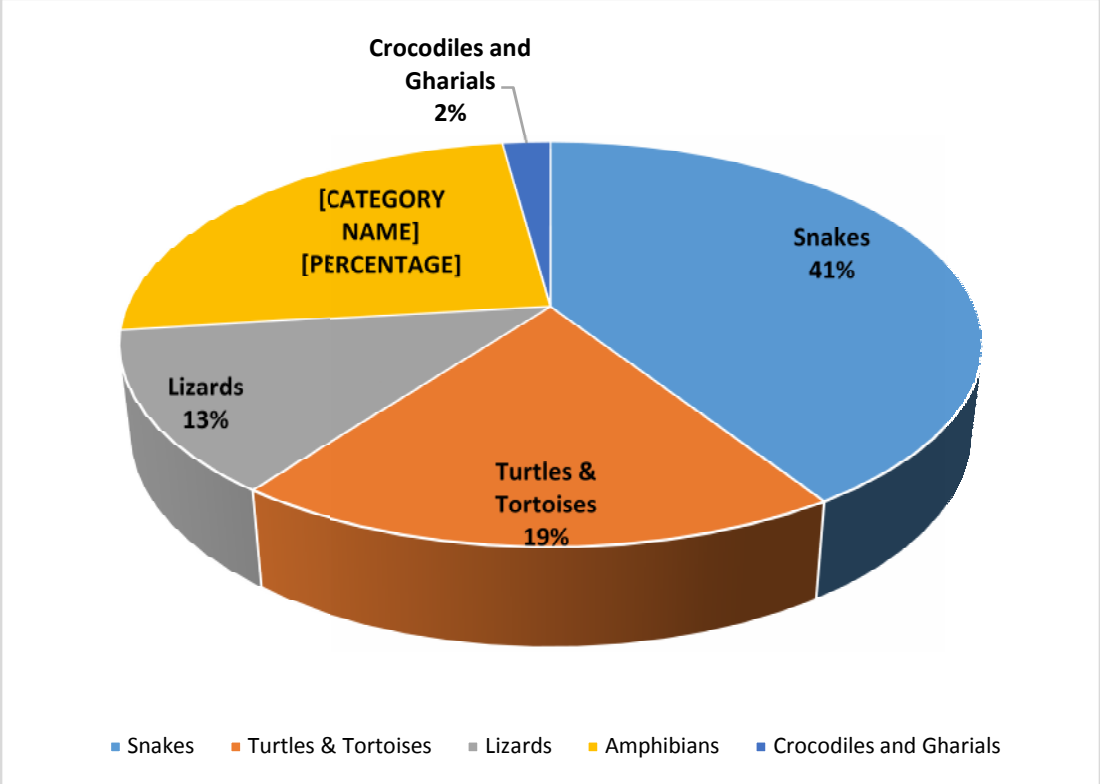


Fig. 5. Group wise Percentage composition of Herpetofauna of Uttar Pradesh.

According to IUCN status out of 93 species of herpetofauna 43% were Least Concern, 38% Not Accessed, 11% Vulnerable, 5% Vulnerable, 2% Near Threatened and 1 % were Data Deficient (Fig. 6 & 7). The comparison of herpetofauna of Uttar Pradesh with respect to World and India is shown in Fig. 8. Loss of habitat, rapid growth of urbanization, road kills and poor knowledge about the herpetofauna were the major threats which was observed.

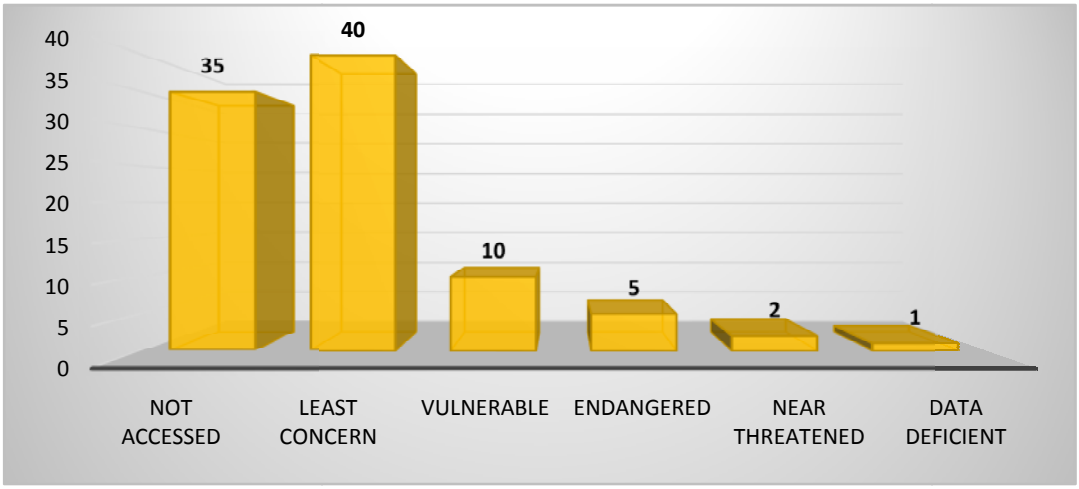


Fig. 6. Herpetofauna composition in Uttar Pradesh according to IUCN Status.

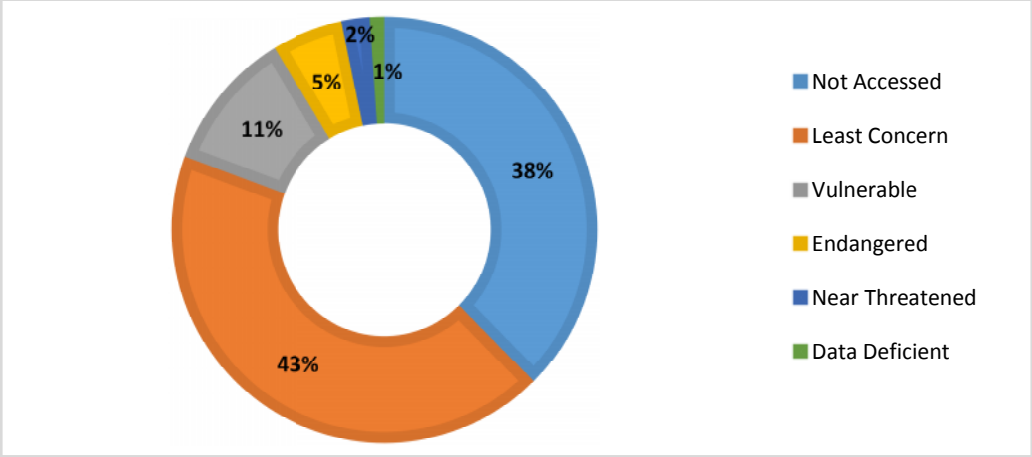


Fig. 7. Percentage composition Herpetofauna in Uttar Pradesh according to IUCN Status.

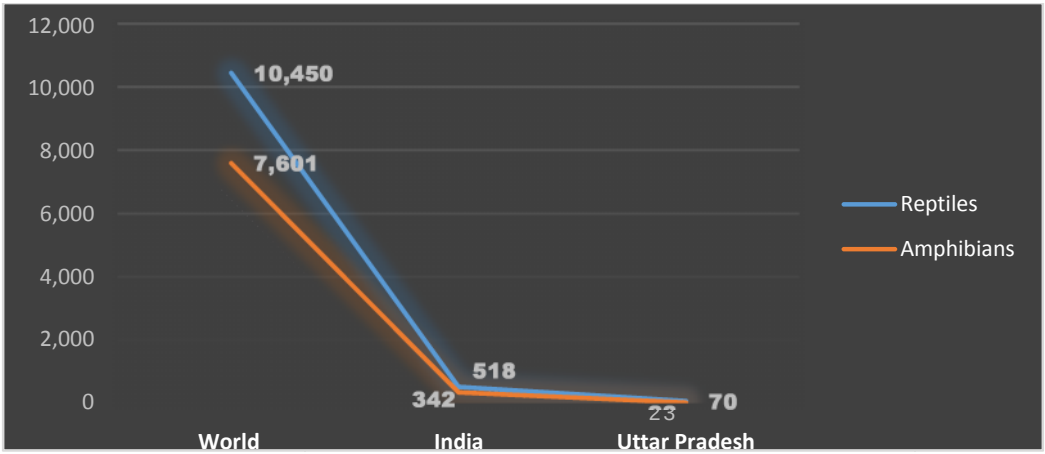


Fig. 8. Herpetofauna of Uttar Pradesh with respect to World and India.

CONCLUSION

Such work should make special efforts to identify distinctive and representative herpetological taxa of protected areas or unique habitats to enhance and highlight their conservation value. Such key taxa can serve as "indicator species" for assessing the future conservation priorities and requirements of these areas. Though the conclusions are prepared based on the results of the present study, we endorse more research should be carried out in future in the present study area. Seasonal variation for amphibians and reptiles was projected to expand for the majority of species. A large number of species still being described, highlight the need for a more concerted scientific study in Uttar Pradesh as well as a need for greater protection of the habitat that remains.

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