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## Diversity of herpetofauna in Dantan I, Paschim Medinipur, West Bengal, with a note on anthropogenic impact

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### Abstract

Diversity and abundance of herpetofauna are an integral part of a healthy ecological food web and indicators of environmental changes. Hence a study was conducted in Dantan I, Paschim Medinipur, West Bengal, India, from January 2020 to January 2021, to determine the diversity and prepare a checklist of herpetofauna in this area. There is hardly any comprehensive work on herpetofauna in this region. The present study provides baseline information about herpetofauna diversity in this area. A total 34 species of Herpetofauna were observed. These included 23 species of reptiles from 2 order (Squamata and Testudineus) and 8 families, represented by 14 snakes species (4 venomous and 10 non-venomous), 1 turtle and 8 lizards. Amphibians w11 species represented amphibians (Anura), 5 families have been included in this first-ever comprehensive checklist from the area. Such studies are essential from time to time to monitor the increasing impact of anthropogenic global environmental changes and frame policies accordingly to safeguard these precious organisms and prevent biodiversity degradation.

**Keywords:** Herpetofauna, amphibia, reptile, diversity, Dantan I

### Introduction

Reptiles (Class: Reptilia) are cold-blooded, tetrapod vertebrates with dry skin covered with scales or bony plates. Similarly, Amphibians (Class: Amphibia) are ectothermic, tetrapod vertebrates. They complete their life cycle in water as well as on land. Herpetology (from Greek ἑρπετόν herpetón, meaning "reptile" or "creeping animal") is the branch of zoology concerned with the study of amphibians (including frogs, toads, salamanders, newts, and caecilians (Gymnophiona)) and reptiles (including snakes, lizards, amphisbaenids, turtles, terrapins, tortoises and crocodilians. They play a crucial role in ecosystem function. Herpetofauna species occupy an important position in the food pyramid and are often both predator and prey thus help in maintaining ecosystem dynamics. They are important predators of many insects and agricultural pests and are therefore valuable for natural biological pest control. Herpetofauna are poikilothermic (isd blooded) vertebrates with smooth skin (Kanaujia *et al.*, 2017) [13]. Herpetofauna species are the indicator of healthy ecosystem. Recent population studies on herpetofauna indicate that there are 8,000 amphibians and 11,050 reptiles species reported worldwide ([www.reptile database.org](http://www.reptile database.org)>species stat). Ninety percent of the World's reptiles are estimated to be threatened with extinction as per evaluation by the Zoological Society of London (ZSL) in conjunction with experts from the IUCN Species Survival Commission (SSC). Similarly, 44% of amphibians have up to data assessment and their risk of extinction and nearly 500 species likely endangered or are critically endangered (<https://www.sciencedaily.com>> 2019105). There have been several efforts to create inventories of Indian reptiles which are collation documentation, findings and records of individuals herpetologists (Smith 1931, Whitaker and Captain 2004) [19, 21]. The three modern orders of amphibians are Anura (tailless and limbless animals e.g. Salamanders and newts) and Gymnophiona (caecilians, limbless amphibians that resemble snakes). Reptiles are found in almost all parts of the world except the very cold region (Kotpal 2017) [14]. Although in India reptiles have th,eir three representative orders Crocodylia (crocodiles), Testudines (turtles and tortoises) and Squamata (lizards and snakes) (Das and Das 2018) [7]. According to ZSI (Zoological Survey of India), there are 1004 species of herpetofauna occurring in India. Among these, there are 572 species of reptiles which include three species of crocodiles, 34

species of turtles and tortoises, 231 species of lizards and 304 species of snakes belonging to 36 families (Aengals *et al.*, 2018) <sup>[1]</sup>. There are 432 species of amphibians known from India. As per the IUCN red list threatened species the global status of Indian amphibians is 29% data deficient, 23% least concern, 8% endangered, 2% threatened, 4% critically endangered, 2% near threatened, 0.3% extinct (Dinesh *et al.*, 2020). Some of the noteworthy works done by researchers in India include either on the Indian or regional snakes by Gharpurey (1962) <sup>[12]</sup>, Pradhan and Yonle (2019) <sup>[17]</sup>, Pal *et al* (2012), Dinesh *et al* (2011) <sup>[9]</sup>.

There are very few data available on herpetofauna in Dantan I, Paschim Medinipur, West Bengal (WB). A few papers (Deuti *et al* 2017, Pratet al.and Deuti 2011, Chaudhuri *et al* 2018, Gayen *et al* 2017) <sup>[8, 18, 11]</sup> have been published by researchers from WB in general. The present study was done to understand the herpetofauna diversity and prepare the first checklist of herpetofauna in this area. This work will have significant impact on improving their conservation efforts in this area.

## Materials and Methods

### Study Area

Dantan (21.9296647° N and 87.2693° E) is a village under the Kharagpur subdivision of Paschim Medinipur district, WB, India (District census handbook: Paschim Medinipur) (Figure 1). The Dantan I block area is 257.07 km<sup>2</sup>. Dantan I, the CD block is bounded II and Mohanpur CD blocks in the east, Jaleswar CD block/tehsil, in Balasore district, Odisha, in the south and in the west. The climate in Dantan follows a hot

tropical monsoon pattern with high temperatures (mid 40s °C) in the summer (generally April to June), 30s °C during the monsoon season (June to August) and low 30s °C for most of the other times of the year. Winters (December to January) are usually with lows in the 10s °C and high in low to monsoon, which may bring over 1500 mm of rainfall. The Dantan area is a monotonous rice plain with numerous waterways and of mixed creeks intersecting. The tidal creeks are lined with embankments to prevent flooding of the field. Much of the area is waterlogged in Dantan I CD block 100% of the cultivated area highly productive deciduous type comprising of mixed forest trees, grasses and shrub, with the changing nature of soil character the natural vegetation of forest cover the area has been changed. In the western lateritic areas the plant species like sal, teak, neem, Arjun, mahua, etc. are found whereas in the eastern alluvial soil, the growing plant species are: Simul, khair, babul, etc. Besides that, the plants like casuarina, wattle and Cashew nut are growing on coastal sandy alluvial soil.

In Paschim Medinipur district, the total forest cover area is 171935 hectares out of which the protected area occupy 160179.30 hectares, the main trees are sal, teak, mahua etc.

### There are four forest divisions in Paschim Medinipur. These are

1. Medinipur forest division,
2. Jhargram forest division,
3. Kharagpur forest division
4. Rupnarayan planning and survey division.

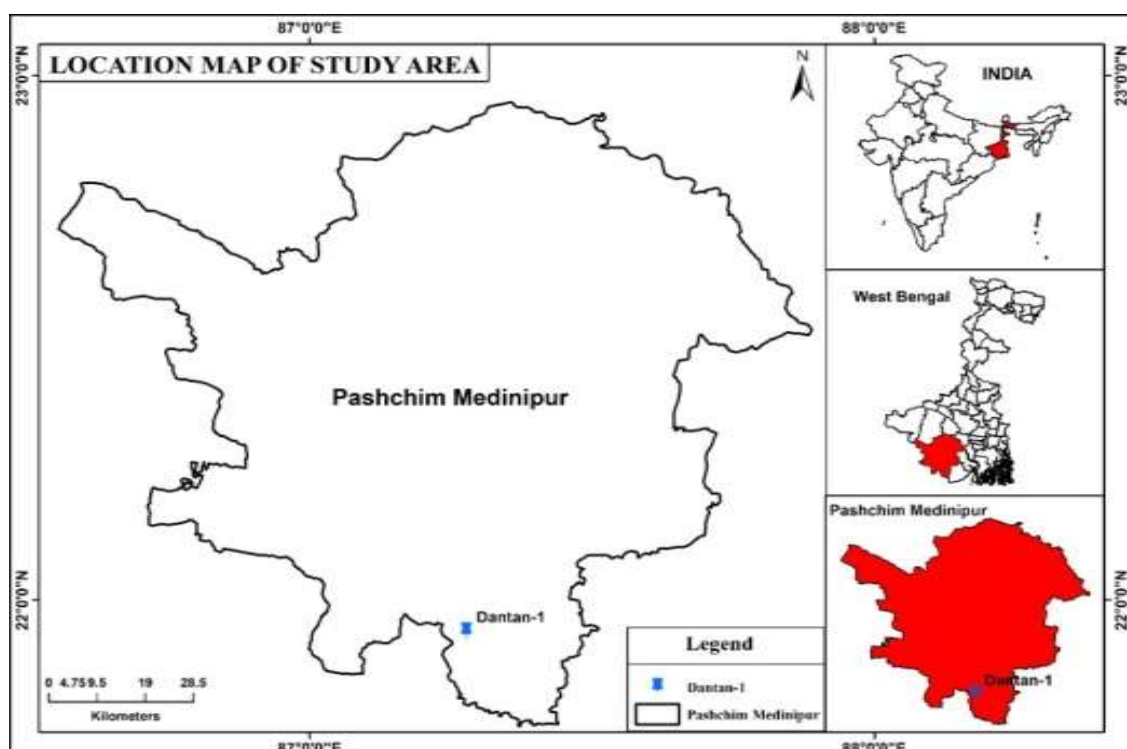


Fig 1: Map of study area, Dantan I, Paschim Medinipur district, WB, India

### Field Study

The study was carried out from January 2020 to January 2021, with an aim to determine the diversity of herpetofauna and also to prepare a checklist of herpetofauna in Dantan I. Different methods (litter cleaning method, digging loose soil, visual encounter surveys during day and night time) were adopted to study the diversity of herpetofauna in this study

area. The litter in quadrates of 2m × 2m on the surface of each terrestrial habitat was cleaned carefully and the herpetofauna was noted. After the completion of sampling, the litter were reintroduced to the area and cleaned to minimize impacts on the habitat. Similarly, a square area of 2m × 2m was carefully dug from the surface of each terrestrial habitat type to document burrowing amphibians and reptiles. Filling the area

with soil after completion of sampling minimized the impact on the habitat. Observations were made by walking through representative terrestrial habitat types and at the edge of artificial ponds during day and night time. Torch and headlamps were used to observe species during nighttime. All species were identified up to species level using keys with the aid of field guides (Whitaker and Captain 2004) [21] and released back immediately after being photographed. All specimens were photographed to capture morphological features that helped us in species identification (eg- head close up, tai, lateral, ventral and dorsal body part, full-body, tail with vent). The locations of species were recorded with a GPS instrument and the distribution of herpetofauna species in this area was enumerated using GIS technology.

**Identification of herpetofauna**

The identification of snakes was made as perusing available resources (Whitaker & Captain 2008, Daniel 2002, Daniel 1997, Gharpurey 1962) [12, 5, 6, 12] and the turtles and Tortoises were identified as per Daniel (2002) [5], Das (2002) and Das 1991. Similarly amphibians were identified using relevant literature (Daniel 2002, Chanda 2002, Dutta 1997) [5, 3, 10].

**Data Analysis**

Two diversity indices have been taken to analyse the diversity data of the study. These are *Index of Dominance (D)* was calculated by the following formula

$$D = \sum_i \left( \frac{n_i}{n} \right)^2$$

Where *n<sub>i</sub>* is a number of individuals of taxon *i*.

The following formula calculated Shannon index of diversity (*H'*)

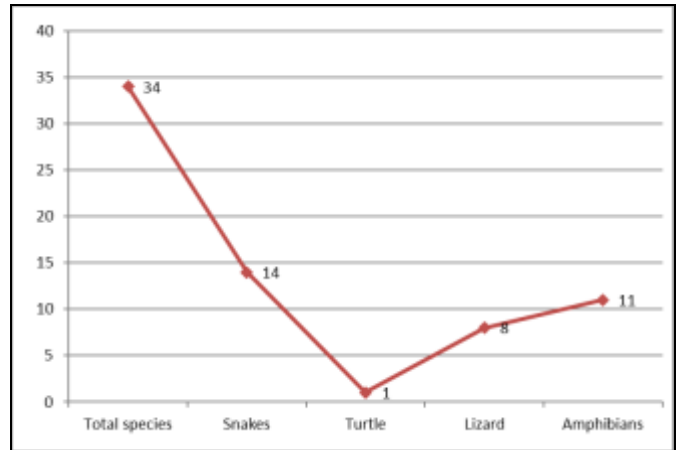
$$H = - \sum_i \frac{n_i}{n} \ln \frac{n_i}{n}$$

*H* is the species diversity index, ‘*S*’ is the number of species, and ‘*pi*’ is the proportion of individuals of each species belonging to the ‘*i*<sup>th</sup>’ species of the total no. of individuals. ‘*ln*’ is the natural logarithm.

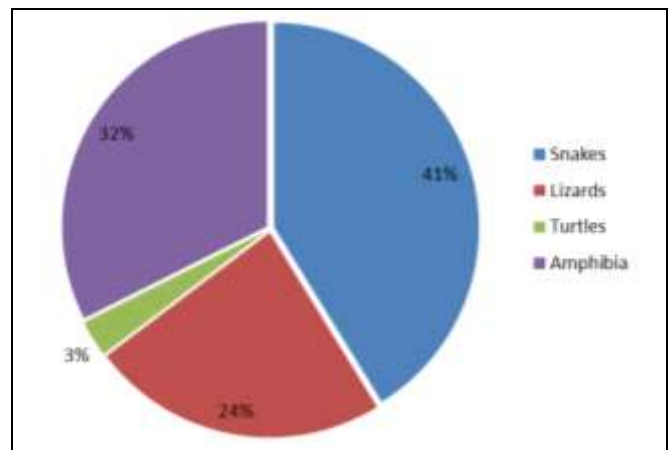
**Results**

The present study revealed the presence of 34 species of herpetofauna occurring within Dantan I (Table 1). These included 23 species of reptiles of 2 orders (Squamata and testudines), 8 families (Colubridae [9], Elapidae [3], Viperidae [1], Homalopsidae [1], Agamidae [2], Gekkonidae [2], Chamaeleonidae [1], Scincidae [2], Trichonidae [1] and 11 species of amphibian under the order Anura, 5 families (Bufonidae [2], Dicroglossidae [5], 1; Microhylidae [2], Ranidae [1], Rhacophoridae [1] (Figure 2, 3). Among the recorded species 12 species were protected under Schedule II and I. One species of lizard (*Chamaeleo zeylanicus*) comes under schedule II; single species of turtle (*Lissemys punctata*) in Schedule I and two species of amphibian (*Hoplobatrachus crassus* and *Hoplobatrachus tigerinus*) are protected under Schedule IV. Among ‘amphibian’ Dicroglossidae family was very rich with 5 species. Similarly, the family Ranidae and

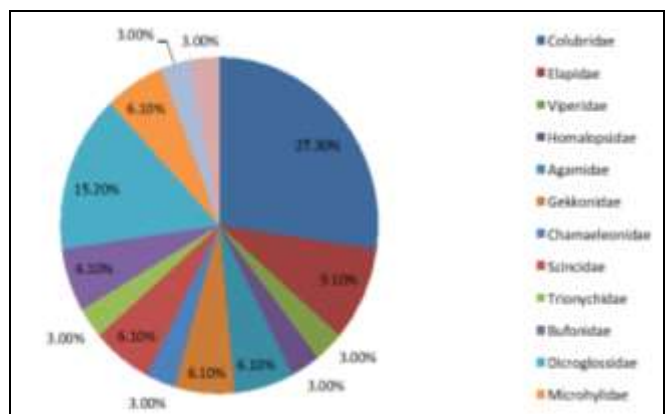
Rhacophoridae were represented by only one species of each, among the Gekkonidae, Scincidae and Agamidae have only three species. Recorded Serpents belong to 5 families among them Colubridae is richest family with 9 species. 4 species of venomous snakes belonged from family: Viperidae (1) and Elapidae (3) species. We recorded some major threats which may lead to a decline of the herpetofauna especially reptiles. 20 species were recorded as killed by anthropogenic activities (Table 2) and vehicle movement on the roads in this area, local people used nets for fishing, which is a great threat to the snakes like *Fowlea piscator*.



**Fig 2:** Overview of Herpetofauna in Dantan I

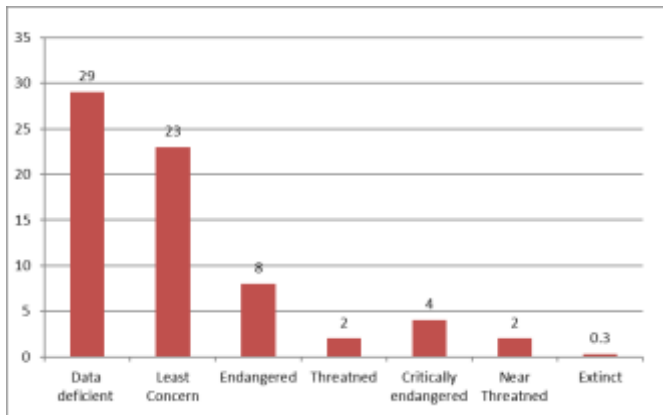


**Fig 3:** Group-wise percentage composition of Herpetofauna of Dantan I

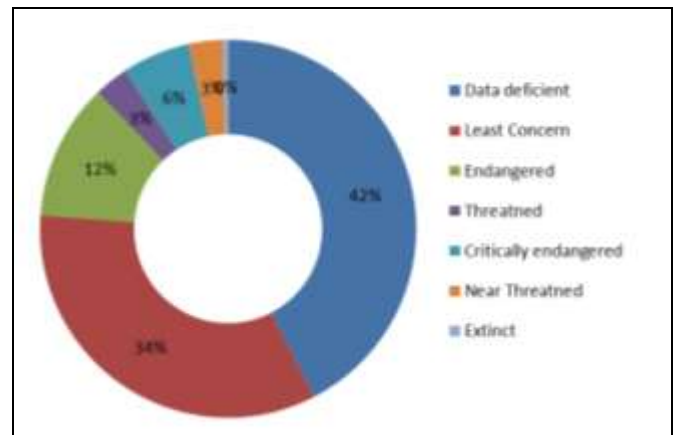


**Fig 4:** Family wise percentage composition of Herpetofauna in Dantan I

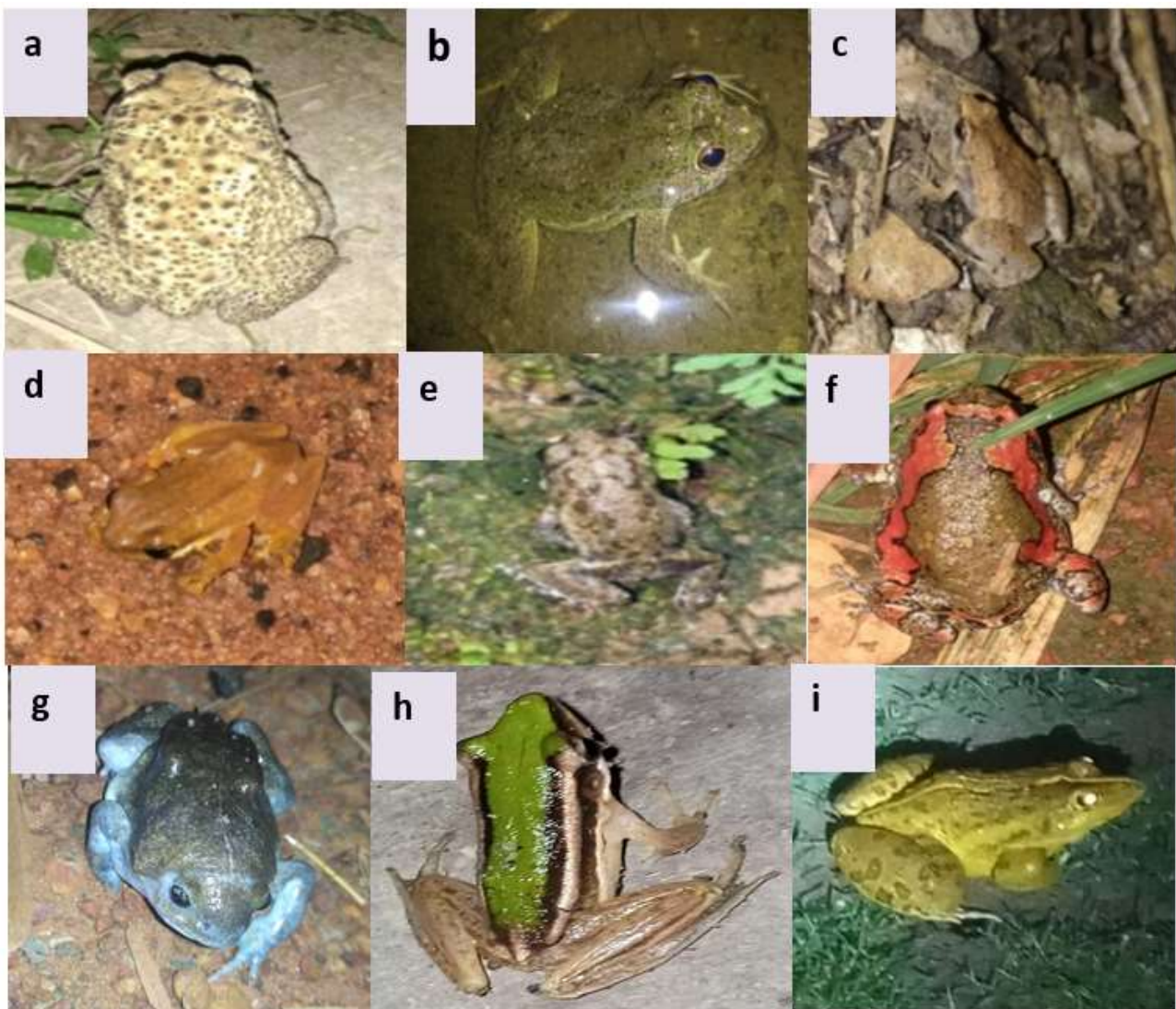




**Fig 5:** Herpetofauna composition in Dantan I according to ICUN status



**Fig 6:** Percentage composition of Herpetofauna in Dantan I according to ICUN status



**Fig 7:** Some representative amphibian fauna from the study area (a) *Duttaphrynus melanostictus*, (b) *Euphlyctis cyanophlyctis*, (c) *Microhyla* cf. *Ornate*, (d) *Polypedates* sp. (e) *Sphearotheca* sp. (f) *Uperodon taprobanicus*, (g) *Uperodon globulosos*, (h) *Hylarana tyleri*, (i) *Hoplobatrachus crassus*





**Fig 8:** Some representative reptelian fauna from the study area (a) *Bungarus caeruleus*, (b) *Naja kaouthia*, (c) *Daboia russelii*, (d) *Lycodon striatus*, (e) *Lycodon aulicus*, (f) *Lycodon jara*, (g) *Enhydris enhydris*, (h) *Oligodon arnensis*, (i) *Fowlea pisacator*, (j) *Enhydris enhydris*, (k) *Hemidacuyllus parvimaculatus*, (l) *Lissemys punctata*, (m) *Psammophilus blanfordanus*, (n) *Ophisops jerdonii*

**Table 1:** List of Herpetofauna in Dantan I

S. No	Common name	Scientific name	IWPA status	IUCN Status*
<b>Class : Reptilia</b>				
<b>Order : Squamata</b>				
<b>Family : Colubridae</b>				
1	Stripped keelback	<i>Amphiesma stolatum</i> (Linnaeus, 1758)	Sch IV	NE
2	Common vine snake	<i>Ahaetulla nasuta</i> (Lacepede, 1789)	Sch IV	NE
3	Common wolf snake	<i>Lycodon aulicus</i> (Linnaeus, 1754)	Sch IV	NE
4	Yellow Speckled wolf snake	<i>Lycodon jara</i> (Shaw, 1802)	Sch IV	NE
5	Barred wolf snake	<i>Lycodon striatus</i> (Shaw, 1802)	Sch IV	NE
6	Common Kukri	<i>Oligodon arnensis</i> (Shaw, 1802)	Sch IV	NE
7	Indian Rat snake	<i>Ptyas mucosa</i> (Linnaeus, 1758)	Sch IV	NE
8	Fowler	<i>Fowlea piscator</i> (Schneider, 1799)	Sch IV	NE
9	Common Bronze Back Tree snake	<i>Dendrelaphis tristis</i> (Daudin, 1803)	Sch IV	NE
<b>Family : Elapidae</b>				
10	Monocled cobra	<i>Naja kaouthia</i> (Lesson, 1831)	Sch II	LC
11	Spectacled cobra	<i>Naja naja</i> (Linnaeus, 1758)	Sch II	LC
12	Common krait	<i>Bungarus caeruleus</i> (Schneider, 1801)	Sch IV	NE
<b>Family: Viperidae</b>				
13	Russell's viper	<i>Daboia russelii</i> (Shaw & Nodder, 1797)	Sch II	NE
<b>Family : Homalopsidae</b>				
14	Smooth scaled water snake	<i>Enhydryis enhydryis</i> (Schneider, 1799)	-	LC
<b>Family: Agamidae</b>				
15	Indian Garden lizard	<i>Calotes versicolor</i> (Daudin, 1802)	-	NE
16	Indian Rock lizard	<i>Psammophilus blanfordanus</i> (Stoliczka, 1870)	-	LC
<b>Family: Gekkonidae</b>				
17	Indian house gecko	<i>Hemidactylus flaviviridis</i> (Ruppel, 1840)	-	NA
18	Spotted house gecko	<i>Hemidactylus parvimaculatus</i> (Deraniyagala, 1951)	-	NA
<b>Family : Chamaeleonidae</b>				
19	Indian Chamaeleon	<i>Chamaeleon zeylanicus</i> (Laurenti, 1718)	Sch II	LC
<b>Family : Lacertidae</b>				
20	Jerdon Snake eye	<i>Ophisops jerdonii</i> (Blyth, 1853)	-	LC
<b>Family : Scincidae</b>				
21	Common keeled skink	<i>Eutropis carinata</i> (Schneider, 1801)	-	LC
22	Bronze grass skink	<i>Eutropis macularia</i> (Blyth, 1853)	-	NA
<b>Order : Testudines</b>				
<b>Family : Trionychidae</b>				
23	Indian flapshell turtle	<i>Lissemys punctate</i> (Peter's, 1854)	Sch I	LC
<b>Class: Amphibia</b>				
<b>Order: Anura</b>				
<b>Family: Bufonidae</b>				
24	Common Asian toad	<i>Duttaphrynus melanostictus</i> (Schneider, 1799)	-	LC
25	Marbled toad	<i>Duttaphrynus stomaticus</i> (Lutken, 1864)	-	LC
<b>Family : Dicroglossidae</b>				
26	Indian skipping frog	<i>Euphlyctis cyanophlyctis</i> (Schneider, 1799)	-	LC
27	Jerdon Bullfrog	<i>Hoplobatrachus crassus</i> (Jerdon, 1853)	Sch IV	LC
28	Indian bullfrog	<i>Hoplobatrachus tigerinus</i> (Daudin, 1803)	Sch IV	LC
29	Indian Burrowing frog	<i>Sphearotheca sp.</i>	-	LC
30	Dutta's cricket frog	<i>Fejervarya sp.</i>	-	LC
<b>Family: Microhylidae</b>				
31	Painted balloon frog	<i>Uperodon taprobanicus</i> (Parker, 1934)	-	LC
32	Ornate Narrow Mouth Frog	<i>Microhyla cf. Ornata</i> (Dumeril & Bibron, 1841)	-	LC
33	Yellow stripped frog	<i>Hylarana tyleri</i> (Theobald, 1868)	-	LC
<b>Family: Rhacophoridae</b>				
34	Common Indian Tree Frog	<i>Polypedates sp.</i> (Gray, 1838)	-	LC

\*NE: Not evaluated; LC: Least concerned; NA: Not accessed

**Discussion**

The study area, Dantan I, has a pretty good herpetofaunal diversity throughout the range. Among 34-recorded species, the checkered keelback snake *Fowlea piscator* was recorded from the paddy field. The snake species *Amphiesma solatum* and *Ptyas mucosus* abundant throughout this area were recorded from roadsides. *Lycodon striatus* and *Lycodon jara* were recorded from water pools. *Daboia russelii* was very

rare in this area. *Naja naja* and *Naja kouthia* were found to be in and around human habitation and largely responsible for snakebite cases in this area. *Enhydryis enhydryis* were encountered from pond. *Hemidactylus flaviviridis* and *Hemidactylus parvimaculatus* were encountered in old buildings. *Ophisops sp.* was recorded from leaf litters in dry areas. *Chamaeleo zeylanicus* was very rare in this locality. Among the recorded amphibians, *Duttaphrynus melanostictus*



and *Euphlyctis cyanophlyctis* are abundant in this area. *Uperodon taprobanicus* was found in the holes and crevices of large tree trunks. *Microhyla ornate* and *Sphaerotheca* sp. were very observed explicitly during the rainy season. Among lizards *Psammophilus blandfordanus* were found in building walls. *Eutropis carinata* and *Eutropis macularia* were also found in grassland.

During the study period we observed that snakes both venomous and non-venomous, were killed by the people mostly due to stigma, fear and superstition. Such human behaviour has been observed in different parts of the world (Pandey *et al.* 2016) [6]. In this area, snakes often enter in the houses for foraging, largely due to habitat disturbance. The study also emphasizes the role of sustainability of herpetofauna in local and urban areas through proper awareness, such work should make special efforts to identify distinctive and representing herpetofauna taxa of unique habitats to enhance and highlight their conservation value; such very taxa can serve as 'Indicator species' for assessing the future conservation priorities and requirements of this area.

### Threats and Conservation

The present study was conducted at Dantan I, with an aim to determine the diversity of herpetofauna and also to prepare a checklist of herpetofauna in this area. The present study brought into light the fact that herpetofauna diversity of species may be under threat leading to their population decline in the near future. Such observations have been reported by Ashaharraza and Kaur (2018) [2] as well. Loss of habitat due to industrial and agriculture intensification and sometimes postures poses a major threat to the herpetofauna species in this area.

Anthropogenic activities have the maximum impact on the population of herpetofauna species. Therefore immediate action is required to protect the herpetofauna species in this area. It will be possible through a poster presentation, awareness programme, etc., among the local people. So conservation plans with proper scientific ways are warranted, to save these dwindling species of herpetofauna under changing environmental conditions.

**Table 2:** Number of species and individuals killed by different anthropogenic activities

Sl. No.	Species Name	No. of Individuals Killed by		
		Human	Nets	Vehicle on Roads
1.	<i>Fowlea piscator</i>	2	5	3
2.	<i>Amphiesma stolatum</i>	6	2	5
3.	<i>Ahaetulla nasuta</i>	5	-	3
4.	<i>Lycodon jara</i>	6	-	2
5.	<i>Lycodon aulicus</i>	-	-	2
6.	<i>Ptyas mucosa</i>	-	3	2
7.	<i>Naja naja</i>	7	6	-
8.	<i>Oligodon arnensis</i>	2	-	3
9.	<i>Bungarus caeruleus</i>	10	-	4
10.	<i>Daboia russelii</i>	7	6	4

**Table 3:** Some species collected during data collection from Dantan I

Sl. No	Species Name	Locality	GPS
1	<i>Amphiesma stolatum</i>	Anikola	21.8560°N 87.3190°E
2	<i>Fowlea piscator</i>	Anikola	21.8560°N 87.3190°E
3	<i>Lycodon aulicus</i>	Arjuni	21.8360°N 87.2989°E
4	<i>Bungarus caeruleus</i>	Kushmi	21.8360°N 87.2989°E
5	<i>Dabioa Russelii</i>	Nimpur	21.7818°N 87.2407°E
6	<i>Ptyas mucosa</i>	Nimpur	21.7818°N 87.2407°E
7	<i>Calotes versicolor</i>	Matiberua	21.8142°N 87.3091°E
8	<i>Uperodon taprobanicus</i>	Jatibar	21.8277°N 87.3153°E
9	<i>Polypedates sp.</i>	Jatibar	21.8277°N 87.3153°E

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