



Diversity of turtle and tortoise species and their threats: Evidence from Nagshankar temple, Assam (India).

Ranjit Kakati and Jyotikana Das Tamuly

Department of Zoology, Gauhati University, Guwahati, India

Department of Zoology, Biswanath College, Biswanath, India

Abstract

Northeast India is called ecological hub of world's most rare species which is falls under the Indo Burma Biodiversity Hotspot. Out of 356 living species of turtles and tortoises, 34 species are recorded in India. Turtles and tortoises are at a much higher risk of extinction than many other vertebrates. Temple ponds of Assam has a great role to conserve many endemic and endangered species of turtle and tortoise. Nagshankar temple is one of the famous ancient Hindu temples is located at the Biswanath district of Assam which has 9 different types of species of turtle and tortoise. Out of nine species, *Nilssonia nigricans* species were found in Nagshankar temple pond which is already extinct in wild (EW), two species were endangered viz., *Indotestudo elongate*, *Pangshura sylhetensis*, two species were vulnerable viz., *Nilssonia gangeticus* and *Nilssonia hurum*, one species of turtle Indian leaf turtle was found which is a nearly threatened species and three species *Pangshura tentoria*, *Pangshura tecta*, *Lissenys punctata* were under least concern category according to the IUCN status. The main aim of this study was to assess the turtle diversity of the Nagshankar temple pond and their threats. The Turtle temple Nagshankar has many opportunity to conserve many endemic and endangered species of turtle and tortoise but some threats were found during the study, therefore it is very essential to make strategies for their conservation.

Keywords: *Nilssonia nigricans*, critically endangered, diversity, conservation, temple ponds.

1. Introduction

Northeast India has the highest diversity of turtles and tortoises. Out of 29 species of turtles and tortoises 21 are found in the North east region (Ahmed and Das, 2009) and 18 species found in Biswanath district. However, most of these records are from Brahmaputra plain and adjoining areas in lower eastern Himalayas, and the hill states especially those south of the Brahmaputra basin is poorly surveyed (Pawar and Choudhury, 2000). Ganges and Brahmaputra drainage has been identified as world's highest priority freshwater turtle conservation area (Buhlmann et al., 2009) and the Kaziranga National Park (KNP) is the largest remaining natural habitat of Brahmaputra drainage, known to harbor 81% of Northeastern regional freshwater turtle diversity (Ahmed and Das, 2009). Temple ponds in Assam are excellent repository

for these gentle creatures and many of the temple ponds have a number of endangered turtle species which are on the verge of being wiped out in near future. The main objectives of the study is to investigate the species diversity of turtles and study their conservation threats.

2. Materials and methods

Nagshankar temple is one of the ancient Hindu temple of Assam. The exact history of the temple is not definite. It was built around 4th Century AD. According to one believe, the temple was built by a King called Nag Sankar from Lohitya dynasty in late 4th century. Nagsankar reigned eastern Kamrup (ancient name of Assam) in 378 AD. He was a great king and sent his representatives to his contemporary the Great Asoka of Maurya dynasty.

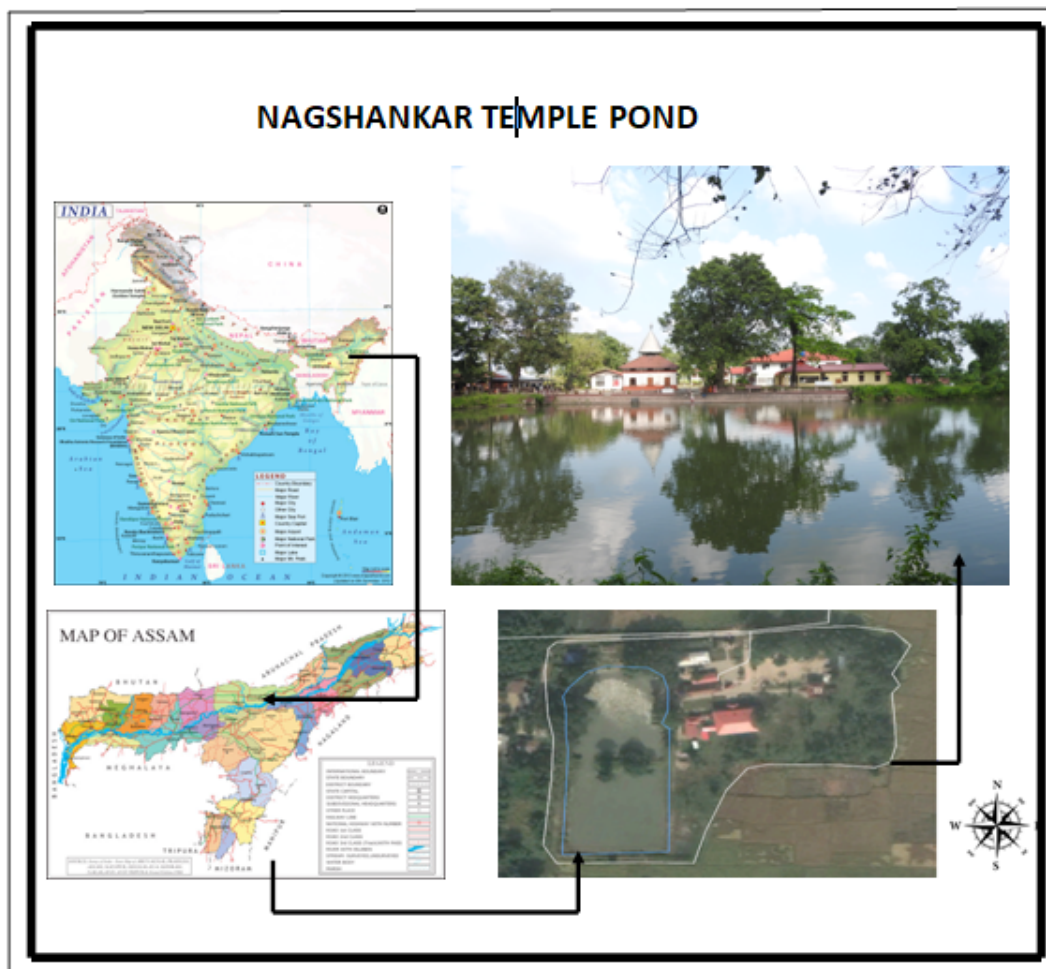


Fig. 1: Map of Nagshankar temple (not in scale).

The Nagsankar temple (Co-ordinates: 26°43' 27.63''N and 92°59'40.37''E) is situated in the north bank of river Brahmaputra within the administrative districts of Biswanath district of Assam, India (Figure 1). It is located in the west of Biswanath Chariali town. It is 17 km from biswanath town. A large pond situated adjacent to this temple. The pond is full of different species of turtles. The total area of the pond is 1,10,369 sq. feet with depth average 10 feet, elevation of the pond is 75 meters above mean sea level. Some part of the boundary of the pond is made up with concrete and most of the boundaries are made up of soil. Beside the pond paddy field is present. There are many types of grass species and tree species are nearer to the pond. The climate is humid subtropical type with three distinct seasons namely, the summer from March to May, rainy season from June to October and winter season from November to February. Temperature records a maximum of 35 degree Celsius during July-

August months and the minimum temperature falls to 5 degree Celsius in January. The area is influenced by the tropical monsoons, which cause rainfall to be seasonal and heavy with an average 3,400 mm of rain.

The study was carried out from February 2017 to January 2018. The techniques of direct sighting, visual encounter survey (VES), active searching was used as per the methods used by Jaeger (1978), Pough *et al.* (1987), Crumps and Pounds (1989).

The turtle surveys were done from 04:00 hrs to 10:00 hrs of the day. The digital slide calipers and meter tape were used to measure the collected specimens and the species were released after identification, photographs and also recording all the morphological measurements. The data were noted down in field note book for further analysis of sighted turtles individuals. The turtle specimens were collected using fishing nets and traditional traps (Langi Jal) measuring 30-45 feet in length. Turtles found in land were collected by direct

hand picking method from the habitat.

For identification of specimens, referred to descriptions and taxonomic keys of authors like Anders *et.al.*, (2017) Das (1995, 2002), Prachag and Gemel (2002), Prachag *et al.* (2009), Fritz *et al.* (2008) and guide book “Amphibians & Reptiles of Northeast India”(M. Firoj Ahmed, Abhijit Das & S.K.Das) The threatened status of the turtles and tortoises are given in the checklist is per IUCN List of Threatened Taxa.

The Parameters taken for the morphological measurements were as follows (1). Carapace length (CL), (2). Carapace breadth (CB), (3). Body weight of the specimen (W), (4) colour (C), (5). numbers of individual sighted etc. (as per Das, 1990).

3. Results

During the study a total of three families were found viz., Testudinidae, Trionychide and Geomydidae. There were nine species of turtles and tortoises were found namely *Indotestudo elongate*, *Cyclemys dentata*, *Nilssonina nigricans*, *Nilssonina hurum*, *Nilssonina gangeticus*, *Lissenys punctata*, *Pangshura sylhetensis*, *Pangshura tecta* and *Pangshura tentoria*. Out of nine species *Nilssonina nigricans* was found in Nagshankar temple pond which is already extinct in wild (EW), two species were endangered viz., *Indotestudo elongate*, *Pangshura sylhetensis*, two species were vulnerable viz., *Nilssonina gangeticus* and *Nilssonina hurum*, one species of turtle Indian leaf turtle was found which is

a nearly threatened species and three species *Pangshura tentoria*, *Pangshura tecta*, *Lissenys punctata* were under least concern category according to the IUCN status. There were a total of 90 individuals were found during the study period. Out of 90 individuals, 2 individuals were tortoises and 88 individuals of turtles were found in the Nagshankar temple pond.

Species accounts

A. Family : Testudinidae

1. Yellow tortoise - *Indotestudo elongate* (Blyth 1854)

There were two live specimens(one male and one female) were observed in Nagshankar temple on 4th October. Individuals were seen basking at in situ conservation centre in Nagshankar temple. The analysis of morphological measurements of the collected specimens in the study area shows that, the mean carapace length(CL) was 27.75 ± 0.78 cm (n= 2, range =27.20-28.30 cm) followed by Carapace width(CW), 24.75 ± 0.49 cm (n=2, range= 24.40-25.10cm), Plastron length(PL), 23.80 ± 0.98 cm (n=2, range =23.10 - 24.50 cm), Plastron width(PW), 21.80 ± 0.14 cm (n=2, Range : 21.70-21.90 cm) and body weight(BW)was 1.08 ± 0.07 kg(n=2, range :1.04-1.14 kg) (Table 2a and 3; Plate 1a). They were found at the in -situ conservation centre, Nagshankar temple, Both carapace and plastron colour was yellowish and some dark black brown colour was on their body.



(a)

Plate 1: Photographs of Testudinidae family in Nagshankar temple (a. *Indotestudo elongate*)

B. Family : Trionychidae

1. Black softshell turtle - *Nilssonina nigricans* (Anderson 1875)

Altogether 23 live specimens of Black softshell turtle- *Nilssonina nigricans* were observed in the Nagshankar temple pond and 7 individuals were

observed in the in-situ conservation centre situated in the Nagshankar temple. . Out of total 30 individuals of the nigricans species , 11 (Adult male : 3, adult female : 4, juvenile male : 1, juvenile female :3) were caught, measured, and photographs during observation period and released afterward. The analysis of morphological

measurements shows that, the mean carapace length (CL) was 45.51 ± 2.46 cm (n=11, range =: 11.40-74.00cm) followed by carapace width (CW), 40.09 ± 2.23 cm (n=11, range :10.20-66.00cm), plastron length (PL), 44.50 ± 2.44 cm(n=11, range: 11.20-73.00 cm) plastron width (PW), 38.85 ± 2.18 cm (n=11, range :10.00-64.7 cm)and body weight (BW) was 9.72 ± 7.51 kg(n=11, range.61-19.72kg) (see Table 2b and 3 ; Plate: 2a). Earlier records of the species from KNP include Praschag and Gemel (2002) from Biswanath Ghat (6th addition area), Ahmed and Das (2009) from Rangamatia beel (Agaratoli), Diffolu River at Diffolumukh camp, Sapekhati beel (near Gendarmari camp) and Bhengrai nullah (near Rongamatia camp). Morphometry of above records by Ahmed and Das (2009).

2. Indian peacock softshell turtle - *Nilssonina hurum* (Gray 1830)

During the study period there were total 25 individuals of *Nilssonina hurum* observed in the Nagshankar pond. Out of total 25 individuals of the *N. hurum* species , 10 (Adult male : 3, adult female : 4, juvenile male : 1, juvenile female :1) were caught, measured, and photographs during observation period and released afterward. The analysis of morphological measurements shows that, the mean carapace length (CL) was 46.83 ± 1.97 cm(n=10, range:13.50-70.00cm) followed by carapace width (CW), 44.41 ± 1.91 cm (n=10, range:12.10-67.00cm), plastron length (PL), 45.5 ± 1.95 cm(n=10, range:13.00-68.90cm , plastron width (PW), 43.34 ± 1.91 cm(n=10, range:11.50-66.00cm) and body weight (BW) was 7.23 ± 4.19 kg (n=10, range:.62-13.21kg) (see Table 2b and 3 ; Plate : 2b) found while moving on bank of the pond, Four eyespots on carapace distinct, plastron white in colour. 19 individuals were found bank of the temple pond.



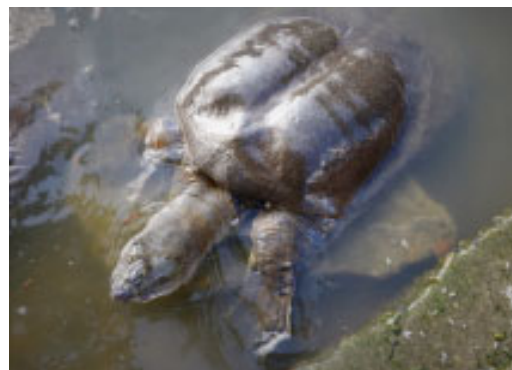
(a)

3. Indian softshell turtle - *Nilssonina gangeticus* (Cuvier 1825)

There were total 21 individuals of *Nilssonina gangeticus* observed in the Nagshankar temple pond. Out of 21 individuals of *N.gangeticus* species 7(Adult male : 3, adult female : 4, juvenile male : 0, juvenile female :0 , Unidentified : 1) were caught, measured and photographs during the study period and released afterward . The analysis of morphological measurements shows that, the mean carapace length (CL) was 49.10 ± 2.21 cm (n=8, range:17.00-75.50cm) followed by carapace width (CW), 45.88 ± 2.05 cm (n=8, range:16.20-69.00cm), plastron length (PL), 45.86 ± 2.1 cm (n=8, range:16.10-71.30cm), plastron width (PW), 44.45 ± 1.99 cm (n=8, range:16.10-67.00cm and body weight (BW) was 9.45 ± 5.96 kg(n=8, range:1.21-18.43kg) (see Table 2b and 3 ; Plate : 2c). 16 individuals were seen basking at bank of the pond .Two individuals were found when they were moved from Nagshankar temple pond to nearby pond.

4. Indian flapshell turtle - *Lissemys punctata* (Lacepede, 1788)

There were altogether three specimens of Indian Flapshell Turtle - *Lissemys punctata* were observed in Nagshankar temple pond during survey. Out of 3 individuals, there were 2 (Adult male: 1, adult female : 1) individuals *Lissemys punctata* species caught, measured and photographs during the study period and released afterward . The analysis of morphological measurements of the collected specimens in the study area shows that, the mean carapace length(CL) was 32.00 ± 8.49 cm(n=2, range 26.00-38.00cm) followed by carapace width (CW), 29.95 ± 8.56 cm(n=2, range 23.90-36.00cm), plastron length (PL), 30.60 ± 7.92 cm(n=2, range 25.00-36.20cm), plastron width (PW), 28.95 ± 8.41 cm(n=2, range 23.00-34.90cm) and Body weight (BW) was 5.27 ± 0.67 kg(n=2, range :4.80-5.75kg) (see Table 2b and 3; plate : 2d).



(b)



(a)



(b)

Plate 2: Photographs of Trionychidae family in Nagshankar temple (a. *Nilssonina nigricans* b. *Nilssonina hurum* c. *Nilssonina gangeticus* d. *Lissenys punctata*)

Family : Geomydidae

1. Assam roofed turtle - *Pangshura sylhetensis* (Jordan, 1870)

During the survey, altogether 11 individuals of Assam Roof Turtle- *Pangshura sylhetensis* were observed in Nagshankar temple. Out of 11 individuals, there were 3 (Adult male : 1, adult female : 1, juvenile male : 0, juvenile female : 0, Unidentified : 1) individuals *P. sylhetensis* species caught, measured and photographs during the study period and released afterward . The analysis of morphological measurements of the collected specimens in the study area shows that, the mean carapace length (CL) was 9.13 ± 1.85 cm (n=3, range : 7.30-11.00 cm) followed by carapace width (CW), 8.03 ± 2.00 cm (n=3, range : 6.00-10.00 cm), plastron length (PL), 7.97 ± 1.00 cm (n=3, range : 7.00-9.00 cm), plastron width (PW), 5.17 ± 1.15 cm (n=3, range : 4.50-6.50 cm) and Body weight (BW) was 0.28 ± 0.09 kg (n=3, range : 0.18-0.35 kg) (see Table 2c and 3 ; Plate : 3a). Lahkar (2000) first reported the species inside KNP . Sarma et al. (2009) observed nests of *P. sylhetensis* in Biswanath Ghat Basking individuals were observed in Nagshankar temple pond. *Pangshura sylhetensis* basically prefer half submerged logs inclined at 10-45° angle, and climb up to a height of 2-3 feet from water surface.

2. Indian roofed turtle - *Pangshura tecta* (Gray, 1831)

There were altogether 3 individuals of *Pangshura tecta* species observed in the Nagshankar temple pond . Out of 3 individuals, 2 (Adult male : 1, adult female : 1, juvenile male : 0, juvenile female : 0) individuals of

P.tecta species were caught from the basking site, measured and photographs during the study period and released afterward . The analysis of morphological measurements of the collected specimens in the study area shows that, the mean carapace length (CL) was 11.00 ± 1.41 cm (n=2, range : 10.00-12.00 cm) followed by carapace width (CW), 10.05 ± 1.06 cm (n=2, range : 9.30-10.80 cm) , plastron length (PL), 9.40 ± 0.85 cm (n=2, range : 8.80-10.00 cm), plastron width (PW), 6.00 ± 1.41 cm (n=2, range : 5.00-7.00 cm) and Body weight (BW) was 0.35 ± 0.071 kg (n=2, range : 0.30-0.40 kg) (see Table 2c and 3; Plate : 3b and). Basking behavior of *P.tecta* was almost similar with *P. sylhetensis*. Two individuals were found when they were busking and one individuals was swimming in the western bank of the Nagshankar temple pond.

3. Indian tent turtle - *Pangshura tentoria* (Gray, 1834)

During the study period there were total 3 individuals of *Pangshura tentoria* observed in the Nagshankar pond. Out of total 3 individuals of the *Pangshura tentoria* species , only two (Adult male : 0, adult female : 1, juvenile male , Unidentified : 1) individuals were caught by net, measured, and photographs during observation period and released afterward. The analysis of morphological measurements of the collected specimens in the study area shows that, the mean carapace length (CL) was 9.90 ± 0.28 cm (n=2, range : 9.70-10.10 cm) followed by carapace width (CW), 8.60 ± 0.85 cm (n=2, range : 8.00-9.20 cm), plastron length (PL), 8.60 ± 1.41 cm (n=2, range : 7.60-9.60 cm), plastron width (PW), 7.95 ± 1.34 cm (n=2,

range :7.00-8.90cm) and Body weight (BW) was $0.2250 \pm 0.03536\text{g}$ ($n=2$, range :0.20-0.25kg) (see Table 2c and 3; plate : 3c). They prefer half submerged logs inclined at 10-45° angle, and climb up to a height of 1-3 feet from water surface.

4. Indian leaf turtle - *Cyclemys dentata* (Gray, 1834)

During the study period there were total 2 individuals of Indian leaf turtle - *Cyclemys dentata* observed in the Nagshankar pond. Two (Adult male : 1, adult female : 1) individuals were caught by net, measured, and photographs during observation period

and released afterward. The analysis of morphological measurements of the collected specimens in the study area shows that, the mean carapace length (CL) was $24.15 \pm 7.99\text{cm}$ ($n=2$; range:18.50-29.80cm) followed by carapace width (CW), $19.20 \pm 4.95\text{cm}$ ($n=2$; range:15.70-22.70cm), plastron length (PL), $21.75 \pm 5.58\text{cm}$ ($n=2$; range:17.80-25.70cm), plastron width (PW), $16.50 \pm 2.26\text{cm}$ ($n=2$; range:14.90-18.10cm) and Body weight (BW) was $4.17 \pm 4.18\text{kg}$ ($n=2$; range:1.21-7.13kg) (see Table 2c and 3; plate : 3c). They prefer half submerged logs inclined at 10-45° angle, and climb up to a height of 1-3 feet from water surface.



(a)



(b)



(c)



(d)

Plate 3: Photographs of Geomydidae family in Nagshankar temple (a. *Pangshura sylhetensis*; b. *Pangshura tecta* ; c. *Pangshura tentoria* ; d. *Cyclemys dentata*).

Conservation threats

Concretizing the banks of the pond creates a problem for free basking of turtles and migrates from one pond to another pond for food or breeding. Due to the installation of tiles on the concrete, some tiles are breaking and the breaking tiles sometimes cuts the turtles body when they came to the bank of the

pond for food given by tourists. In the Nagshankar temple pond observed over population in a small pond which creates some problems like scarcity of food, space, basking space etc. Recently one pond was dugged nearer to the Nagshankar temple pond but still they have facing the problem for busking site, egg laying site and to natural food. During the

time of study one individual of *Nilssonina nigricans* species was observed in abnormal carapace shape. Middle of the carapace was downward. Plastic is a big problem for environment. Plastic is recently band

in Nagshankar temple campus but still plastic is used in the campus. Diseased affected *Nilssonina nigricans* species individuals was also found during the study.



(a)



(b)



(c)



(d)



(e)

Infection in carapace



(f)

Plate 4: Photographs of different individuals which are facing threats in Nagshankar temple. (a. Abnormal shaped *Nilssonina nigricans* ; b. Over population; c. Concrete barrier; d. plastics near the pond; e. Infected turtle; f. migration from nagshankar pond to another pond.)

Due to the destruction of natural habitat and convert it into peddy field nearer to the Nagshankar temple turtles and tortoises were facing high risk of extinction. Turtles and tortoises of Nagshankar temple laid their eggs in the peddy field. Some farmers were used tractors in the peddy fields which badly effect on

turtle and tortoise species. Many turtles and tortoise species and their eggs were killed by tractors. During flood time many of the turtles species were come out from the pond and migrates towards the different area. Some of the turtles and tortoise eggs were consume by their natural predators like snakes, varanus, dog etc.

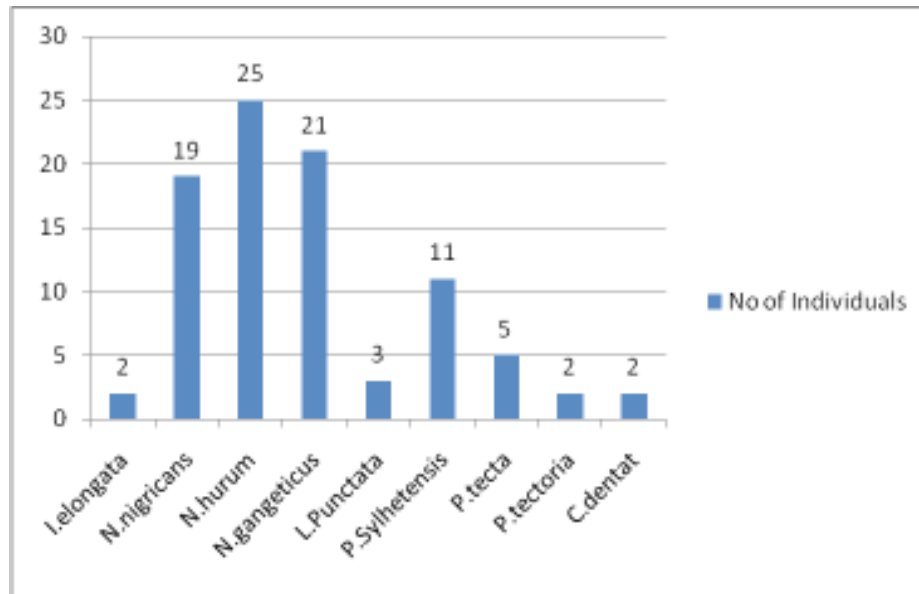


Fig. 2: No of individuals belonging to each species found in Nagshankar Temple.

Table 1: Checklist and Conservation Status of turtles and tortoises recorded in Nagshankar temple.

Si No.	Family	Common Name	Scientific Name	Local Name (in assamese)	No of individuals	Indian WLP, 1972	IUCN Status	CITES Status
1	Testudinidae	Yellow tortoise	<i>Indotestudo elongata</i>	Halodhiya kasso	02	Schedule	EN	Appendix II
2	Trionychide	Black softshell turtle	<i>Nilssonina nigricans</i>	Bormuriya kasso	19	Schedule IV	EW	Appendix I
3	Trionychide	Indian peacock softshell turtle	<i>Nilssonina hurum</i>	Bor kasso	25	Schedule I	VU	Appendix I
4	Trionychide	Indian softshell turtle	<i>Nilssonina gangeticus</i>	Lamura kasso	21	Schedule I	VU	Appendix I
5	Trionychide	Indian flapshell turtle	<i>Lissemys punctata</i>	Bagh dura	03	Schedule I	LC	Appendix II
6	Geomydidae	Assam roofed turtle	<i>Pangshura sylhetensis</i>	Asomi dura	11	Schedule I	EN	Appendix II
7	Geomydidae	Indian roofed turtle	<i>Pangshura tecta</i>	Futuki saliki dura	05	Schedule I	LC	Appendix I
8	Geomydidae	Indian tent turtle	<i>Pangshura tentoria</i>	Saliki dura	02	Not listed	LC	Appendix II
9	Geomydidae	Asian leaf turtle	<i>Cyclemys dentata</i>	Kola shil dura	02	Schedule IV	CR	Appendix II

(Abbreviations : EW – Extinct in wild, CR- Critically endangered, EN – Endangered, VU – Vulnerable, LC – Least concern.)

Table 2(a): Morphological Measurements of *Indotestudo elongate* in Nagshankar temple during study period (all measured Specimens were live and in natural condition; CL=Carapace length, CB = Carapace breadth, PL=Plastron length and PB = Plastron breadth; AM: Adult male; AF: Adult female; JM: Juvenile male; JF: Juvenile Female , UN= Unidentified)

Sl.No.	Species	Study Locations	CL (in cm)	CB (cm)	PL (cm)	PB (cm)	Wt. (in kg)	Remark
1.	<i>Indotestudo elongata</i>	ISCC, Nagshankar Temple	27.2	24.4	23.1	21.9	1.037	AM
2.	<i>Indotestudo elongata</i>	ISCC, Nagshankar Temple	28.3	25.1	24.5	21.7	1.137	AF

Table 2(b): Morphological Measurements of *Nilssonina nigricans*, *Nilssonina hurum*, *Nilssonina gangeticus*, *Lissenys punctata* in Nagshankar temple during study period (all measured Specimens were live and in natural condition; CL=Carapace length, CB = Carapace breadth, PL=Plastron length and PB = Plastron breadth; AM: Adult male; AF: Adult female; JM: Juvenile male; JF: Juvenile Female , UN= Unidentified)

Sl. No.	Species	Study Locations	CL (in cm)	CB (cm)	PL (cm)	PB (cm)	Wt. (in kg)	Remarks
1.	<i>Nilssonina nigricans</i>	Nagshankar temple pond	74	66	73	64.7	19.725	AF
2.	<i>Nilssonina nigricans</i>	Nagshankar temple pond	69	62.6	68.2	60.5	18.624	AM
3.	<i>Nilssonina nigricans</i>	Nagshankar temple pond	70	62.1	69	61	18.720	AF
4.	<i>Nilssonina nigricans</i>	Nagshankar temple pond	42.9	36	41	34	9.620	AF
5.	<i>Nilssonina nigricans</i>	Nagshankar temple pond	63	56	62.6	54	12.511	AM
6.	<i>Nilssonina nigricans</i>	Nagshankar temple pond	54	48.1	52	46.8	10.010	AM
7.	<i>Nilssonina nigricans</i>	Nagshankar temple pond	61.3	54	60.1	52.3	12.663	AF
8.	<i>Nilssonina nigricans</i>	Nagshankar temple pond	19	16	18.4	15	1.721	JF
9.	<i>Nilssonina nigricans</i>	Nagshankar temple pond	23	19	22	18	2.011	JF
10.	<i>Nilssonina nigricans</i>	Nagshankar temple pond	11.4	10.2	11.2	10	0.612	JM
11.	<i>Nilssonina nigricans</i>	Nagshankar temple pond	13	11	12	11	0.720	JF
12.	<i>Nilssonina hurum</i>	Nagshankar temple pond	61.4	58.3	58.9	57.1	10.210	AF
13.	<i>Nilssonina hurum</i>	Nagshankar temple pond	65	63	64	62.3	11.510	AM
14.	<i>Nilssonina hurum</i>	Nagshankar temple pond	70	67	68.9	66	13.210	AF
15.	<i>Nilssonina hurum</i>	Nagshankar temple pond	66.2	63.1	65	62	10.140	AF
16.	<i>Nilssonina hurum</i>	Nagshankar temple pond	54	51	53	49.1	8.214	AM
17.	<i>Nilssonina hurum</i>	Nagshankar temple pond	39	36.2	37	34.9	5.331	AM
18.	<i>Nilssonina hurum</i>	Nagshankar temple pond	21.2	19.9	20.2	19	1.703	JM
19.	<i>Nilssonina hurum</i>	Nagshankar temple pond	35	32	33.7	31.2	4.411	AF

Sl. No.	Species	Study Locations	CL (in cm)	CB (cm)	PL (cm)	PB (cm)	Wt. (in kg)	Remarks
20.	<i>Nilssonina hurum</i>	Nagshankar temple pond	43	41.5	42	40.3	6.932	AF
21.	<i>Nilssonina hurum</i>	Nagshankar temple pond	13.5	12.1	13	11.5	0.621	JF
22.	<i>Nilssonina gangeticus</i>	Nagshankar temple pond	25	23	22.4	22	3.610	AF
23.	<i>Nilssonina gangeticus</i>	Nagshankar temple pond	49.3	46.6	45.1	44.1	12.024	AM
24.	<i>Nilssonina gangeticus</i>	Nagshankar temple pond	75.5	69	71.3	67	18.428	AF
25.	<i>Nilssonina gangeticus</i>	Nagshankar temple pond	17	16.2	16.1	16.1	1.208	UN
26.	<i>Nilssonina gangeticus</i>	Nagshankar temple pond	69.9	65	66	64	15.100	AF
27.	<i>Nilssonina gangeticus</i>	Nagshankar temple pond	33.1	31	30.1	30	5.210	AM
28.	<i>Nilssonina gangeticus</i>	Nagshankar temple pond	54	50.2	50.9	48.9	7.925	AF
29.	<i>Nilssonina gangeticus</i>	Nagshankar temple pond	69	66	65	63.5	12.071	AM
30.	<i>Lissenys punctata</i>	Pond near nagshankar	26	23.9	25	23	4.800	AM
31.	<i>Lissenys punctata</i>	Nagshankar temple pond	38	36	36.2	34.9	5.750	AF

Table 2(c): Morphological Measurements of *Pangshura sylhetensis*, *Pangshura tecta*, *Pangshura tentoria* in Nagshankar temple during study period (all measured Specimens were live and in natural condition; CL=Carapace length, CB = Carapace breadth, PL=Plastron length and PB = Plastron breadth; AM: Adult male; AF: Adult female; JM: Juvenile male; JF: Juvenile Female, UN =Unidentified)

Sl. No.	Species	Study Locations	CL (in cm)	CB (cm)	PL (cm)	PB (cm)	Wt. (in kg)	Remarks
1.	<i>Pangshura sylhetensis</i>	Nagshankar Temple pond	11	10	09	4.5	0.35	AM
2.	<i>Pangshura sylhetensis</i>	Nagshankar Temple pond	9.1	8.1	7.9	6.5	0.3	UN
3.	<i>Pangshura sylhetensis</i>	Nagshankar Temple pond	7.3	6	7	4.5	0.18	AF
4.	<i>Pangshura tecta</i>	Nagshankar Temple pond	10	9.3	8.8	5	0.3	AF
5.	<i>Pangshura tecta</i>	Nagshankar Temple pond	12	10.8	10	7	0.4	AM
6.	<i>Pangshura tentoria</i>	Nagshankar Temple pond	9.7	8	7.6	7	0.2	UN
7.	<i>Pangshura tentoria</i>	Nagshankar Temple pond	10.1	9.2	9.6	8.9	0.25	AF
8.	<i>Cyclemys dentata</i>	Nagshankar temple pond	29.8	22.7	25.7	18.1	1.213	AM
9.	<i>Cyclemys dentata</i>	Peddy field, Nagshankar temple	18.5	15.7	17.8	14.9	7.13	AF

Table 3: Mean measurements of various morphological characters of turtles and tortoises observed in Nagshankar temple during study period (CL= Carapace length, CW= Carapace width, PL= Plastron length, PW= Plastron width, BW= Body weight, N= Number of observation; R: Range; AF =Adult female, AM= Adult male, JF=Juvenile female, JM= Juvenile male, UN = Unidentified).

Sl No.	Species involved	CL Mean \pm SD (in cm)	CW Mean \pm SD (in cm)	PL Mean \pm SD (in cm)	PW Mean \pm SD (in cm)	BW Mean \pm SD (weight in g)	N
1.	<i>Indotestudo elongata</i>	27.75 \pm 0.78 (R:27.20-28.30)	24.75 \pm 0.49 (R:24.40-25.10)	23.80 \pm 0.98 (R:23.10-24.50)	21.80 \pm 0.14 (R:21.70-21.90)	1.08 \pm 0.07 (R:1.04-1.14)	2
2.	<i>Nilssonia nigricans</i>	45.51 \pm 2.46 (R: 11.40- 74.00)	40.09 \pm 2.23 (R: 10.20-66.00)	44.50 \pm 2.44 (R: 11.20-73.00)	38.85 \pm 2.18 (R :10.00-64.70)	9.72 \pm 7.51 (R.61-19.72)	11
3.	<i>Nilssonia hurum</i>	46.83 \pm 1.97 (R:13.50-70.00)	44.41 \pm 1.91 (R:12.10-67.00)	45.57 \pm 1.95 (R:13.00-68.90)	43.34 \pm 1.91 (R:11.50-66.00)	7.23 \pm 4.19 (R.:62-13.21)	10
4.	<i>Nilssonia gangeticus</i>	49.10 \pm 2.21 (R:17.00-75.50)	45.88 \pm 2.05 (R:16.20-69.00)	45.86 \pm 2.11 (R:16.10-71.30)	44.45 \pm 1.99 (R:16.10-67.00)	9.45 \pm 5.96 (R:1.21-18.43)	8
5.	<i>Lissenys punctata</i>	32.00 \pm 8.49 (R:26.00-38.00)	29.95 \pm 8.56 (R:23.90-36.00)	30.60 \pm 7.92 (R:25.00-36.20)	28.95 \pm 8.41 (R:23.00-34.90)	5.27 \pm 0.67 (R:4.80-5.75)	2
6.	<i>Pangshura sylhetensis</i>	9.13 \pm 1.85 (R:7.30-11.00)	8.03 \pm 2.00 (R:6.00-10.00)	7.97 \pm 1.00 (R:7.00-9.00)	5.17 \pm 1.15 (R:4.50-6.50)	0.28 \pm 0.09 (R:0.18-0.35)	3
7.	<i>Pangshura tecta</i>	11.00 \pm 1.41 (R:10.00-12.00)	10.05 \pm 1.06 (R:9.30-10.80)	9.40 \pm 0.85 (R:8.80-10.00)	6.00 \pm 1.41 (R:5.00-7.00)	0.35 \pm 0.071 (R:0.30-0.40)	2
8.	<i>Pangshura tentoria</i>	9.90 \pm 0.28 (R:9.70-10.10)	8.60 \pm 0.85 (R:8.00-9.20)	8.60 \pm 1.41 (R:7.60-9.60)	7.95 \pm 1.34 (R:7.00-8.90)	0.2250 \pm 0.03536 (R:0.20-0.25)	2
9.	<i>Cyclemys dentata</i>	24.15 \pm 7.99 (R:18.50-29.80)	19.20 \pm 4.95 (R:15.70-22.70)	21.75 \pm 5.58 (R:17.80-25.70)	16.50 \pm 2.26 (R:14.90-18.10)	4.17 \pm 4.18 (R:1.21-7.13)	2

4. Discussion

Diversity of turtle in Nagsankar is very rich. The main reason behind it because human thought that turtle is a avatar of god so they took the turtles from different places and released them in to the Nagshankar temple pond for conservation purpose. Naturally this area is highly suitable for turtle diversity because Kaziranga National park and the Brahmaputra river is nearer to the temple. The population of fresh water turtle and tortoise species has been found to declining in Nagshankar due to habitat loss, egg depredation and destruction of eggs. During the flood time some of the turtle species were comes out from the temple, Some of the turtles were caught by villagers and

released in the Nagshankar temple pond but some of the turtles were exploited for meat and medicinal purpose. For the better environment of turtles and tortoises in the Nagshankar temple, authority must have to check their health and water condition to prevent infection. In northeast India many turtles were also sold in the local market especially the species of *N. gangeticus*, *N. hurum*, *L. punctata* and *C. indica*. Certain evidence of natural death viz., extreme cold, during flood etc. (Deka, 2015). Many species of turtles were killed by tractor used in agricultural field. There are many endangered species are still found in our state, so we need to give immediate importance on the turtles and tortoises and along with their habitats to

conserve them for our future generation.

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