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***Research Paper***

# DIVERSITY OF CHELONIAN SPECIES IN ORANG NATIONAL PARK, ASSAM, INDIA

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**Abstract**

Northeast India has been recognised as the hotspot of Chelonian diversity within Indian subcontinent. The region harboars above 22 species and subspecies of Chelonian fauna belongs to three families viz., Bataguridae (Emydidae), Trionychidae and Testudinidae. Several workers have studied Chelonian species in Assam and as well as in Northeast India since last two decades. However, the detailed investigation and reporting of Chelonian diversity in Orang National Park has not been done by any workers since the present works. The present study has been carried out from 2009 through 2012 to investigate the total diversity of Chelonian species and its distribution patterns in various seasons of the year and as well as its threat factors. Study revealed the existence of 12 Chelonian species under Bataguridae, Testudinidae and Trionychidae families. The presence of Brahmaputra River and Panchnoi Sand-bars has created suitable habitats for chelonian breeding. However, the local people have regularly been using small mesh sized fishing nets during winter and pre-monsoon season that catches and drown aquatic chelonians. Further, annual grass burning practices of the park authority likely to have major impact on the population declines of chelonian species in the study area. The present study highlighted the diversity and abundance of Chelonian species and its conservation threats in Orang National Park.

Key words: Chelonian species, diversity, distribution, Orang National Park, conservation threats, sand bars.

## INTRODUCTION

Chelonians are by far the most ancient quadruped vertebrates on earth and the group is very widely distributed in India (Das, 1985, 1995, 2002; Das and Andrews, 1997). In India, altogether 28 species of tortoises and fresh water turtle occurs and unfortunately nearly 40% (11 species out of 28 of total) taxa are listed as either endangered or critically endangered as per IUCN Red list category (CFH/MCBT 2006; Conservation Action Plan for Endangered

Freshwater Turtles and Tortoises of India, Madras Crocodile Bank Trust). Northeast India is regarded as one of the major centre of turtle diversity (Das, 1990). The studies on the diversity of turtle fauna in North eastern region have been done bye Talukdar (1979), Vijaya (1983). In Assam, number of studies has been done by several authors in view of species richness and diversity of turtle fauna and its conservation issues. The occurrences of turtle fauna in Orang National Park, Kaziranga National Park and Mupa-Lanteng Reserve forests have been reported by Bhupathy *et al*. (1992), in Manas National Park, Sonapur and Biswanath Plains by Das (1990,1995). Sengupta *et al.* (1998a, b) have been worked out on the turtle fauna in Kamrup district and Pabitara Wildlife Sanctuary. In Dibru-Saikhowa National Park, the turtle survey has been done by Choudhury (1995). A Technical Report on Inventory and Natural History of the Herpetofauna of the Orang National Park of Assam was prepared by Ahmed (2002).

In view of the existing chelonian studies in Assam, the present study has been emphasized to find out the diversity and distribution of turtle fauna in Orang National Park to initiate the conservation measures. The main objectives of the present studies were as follows-

1. To investigate the diversity and distribution of Chelonian species in Orang National Park and its adjoining areas,
2. To study the habitat types of Chelonian species in Orang National Park and to investigate the habitat used types,
3. To investigate the conservation threats of Chelonian species and to evaluate the conservation strategies in Orang National Park.

## MATERIALS AND METHODS

### Study area

### Physiography and location

The Orang National Park (Co-ordinates: 92$^0$15′-92$^0$27′E and 26$^0$29′-26$^0$40′N) is situated in the north bank of river Brahmaputra within the administrative districts of Udalguri and Sonitpur district of Assam, India (Figure 1). It is located about 130 km apart from the state capital city of Guwahati and included under the jurisdiction of Mangaldoi Wildlife Division, Assam. The study area comprises alluvial floodplains of the river Brahmaputra as well as alluvial terrace. Again, the entire study area could be divided into two halves i.e. lower Orang and upper Orang part. The lower Orang part is more recent origin, whereas, the upper portion of the north side is separated by high bank, traversing the park from east to west. The terrain is gently sloping from North to South. The altitude of the study area ranges between of 45- 75m msl.

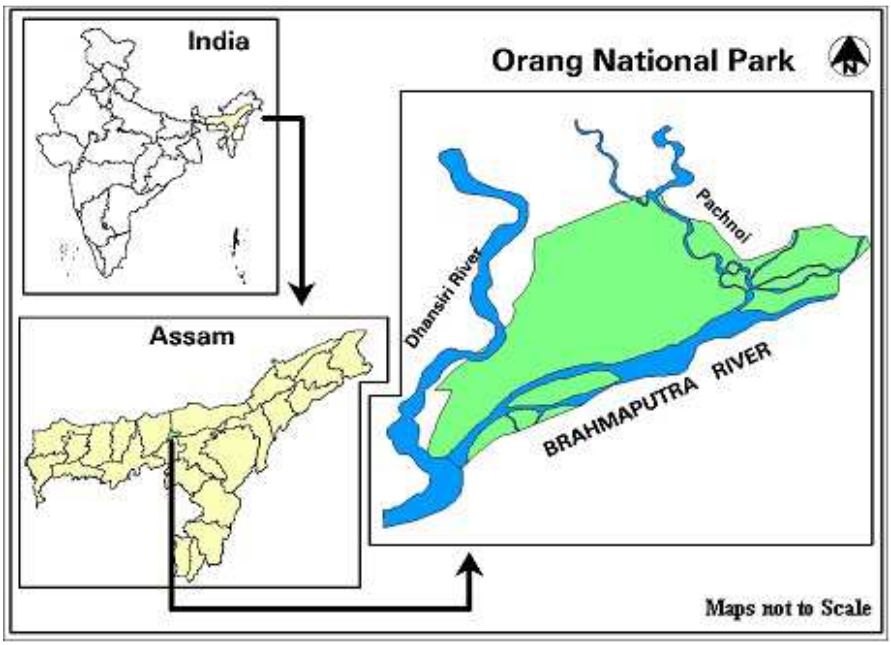



**Fig 1** Map of Orang National Park (not in scale) (Source: Hazarika & Saikia, 2012).

**Vegetation types**

The study area composed of mainly four different types of vegetation (Champion & Seth, 1968) Viz., (i) Eastern Himalaya's Moist-deciduous forests, (ii) Eastern seasonal swamp-forest, (iii) Khair-Sisso forests and (iv) Eastern Wet-Alluvial grasslands. Again, the vegetation composition of the study area is unique within North Bank, that comprises short and tall grasslands dotted with natural and cultural woodland habitat and water bodies. Based on grass height and characters, the grasslands could be divided into (i) Tall grassland (ii) Short grassland and (iii) Marshy grassland. The tall grassland consists of *Saccharum ravanae, Arundo donax, Phargmytis karka, Themda arundinaceum, Saccharum spontaneum, Saccharum elephantinum, Andropogon squarrosus, Pollinia ciliata, Cenchurus ciliaris.* Whereas, the short grasslands consists of the grass species of *Imperata cylindrica, Cynodon dactylon, Hemerthria compressa, Chrysopogon aciculatus, Vetivaria ziganoides, Leersia hexandra, Brachiarea ramosa, Hymenachne pseudoimperata etc.* The marshy lands habitat of the study area is mostly composed of *Enhydra fluctuans, Ipomoea raptans, Ipomoea aquatica, Vallisnaria sp, Hydrilla verticillata, Eichornia crassipes, Trapa bispinosa, Trapa natans, Lemna perpusilla, Nymphea species, Nelumbu nucifera, Tinospora cordifolia, Brachiaria pseudoimperata, Alpinia alohas, Pistoia steatites and Lemma pancicostata* etc. The grass species like *Leersia hexandra, Hymenachne pseudointerrupta, Hygroryza aristata* are dominate the marshy land habitat. The woodlands could be divided into (i) Natural and (ii) Plantation forests. The trees of the natural forest has been represented by *Bombax ceiba, Acacia catechu, Albizzia procera, Sterculia villosa, Ziziphus mauriciana, Trewia nudiflora, Syzygium fruticosum, S. cumini, Bauhinia purpurea, Tamarix dioca, Lagerstroemia speciosa, Ficus bengamina, Ficus religiosa, Biscofia javanica and Alstonia scholaris* etc. The plantation forests of Orang national park consists of *Anthocephalus cadamba, Dalbergia sisoo, Acacia catechu, Albizzia procera, A. lebek, Samania saman, Tectona grandis, Tona ciliata, Trewia nudiflora, Michaelia champaka, Bombax ceiba, Alstonia scholaris, Biscofia javanica, and Lagerstroemia speciosa* etc (Hazarika, 2008, Hazarika and Saikia, 2012).

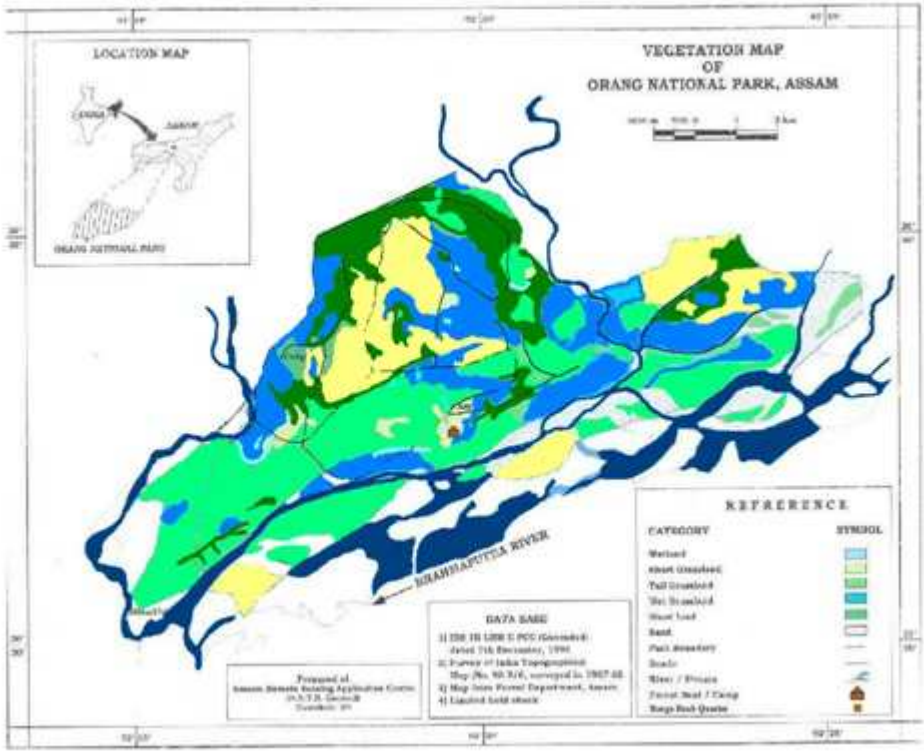



**Fig. 2 Vegetation Map of Orang National Park (Sources: Hazarika & Saikia 2012)**

**Important wildlife species**

The study area Orange National Park harboars Great Indian One horned Rhinoceros (Rhinoceros unicornis), Royal Bengal Tiger (*Panthera tigris tigris*), Asiatic Elephant (*Elephas maximus*), Hog Deer (*Axis porcinus*), Wild Boar (*Sus scrofa*), different species of Civet cats,

Leopard (*Panther pardus*), Porcupine (*Erethizon dorsatum*), Chinese Pangolin (*Manis pentadactyla*), Common Otter (*Lutra lutra*), various other snakes, lizards and amphibians etc., It is also an important habitat for endangered Bengal Florican (*Houbaropsis bengalensis*) and endemic Swamp Francolin (*Francolinus gularis*) species.

**Climate**

The climatic condition of the study area is meso-thermal humid climate of Brahmaputra valley type. Based on seasonal variation of temperature, rainfall and humidity, the climate could be divided into four distinct seasons - Pre-monsoon (March- May), Monsoon (June-September), Re-treating Monsoon (October-November) and winter (December-February) (Borthakur, 1986). Pre-monsoon is the transitional period between relatively dry winter and hot summer and characterized by rapid rise and fall of temperature. The minimum and maximum temperatures ranged between 20° and 32°C. The average relative humidity ranges between 67-85% and the average annual rainfall is 390 mm. Monsoon season gets an average rainfall of 1160mm. The average relative humidity during monsoon was recorded as 81%. In Retreating monsoon season, the temperature gradually falls and moving mist and fog appears. The minimum and maximum temperature ranged between 20° and 30°C during retreating monsoon. Rainfall slightly lowered in this season and attained up to 106.4 mm and average relative humidity reported was 80%. The winter season is characterized by cool weather and fogs and average minimum and maximum temperature dropped down to 12° and 25°C respectively. The average relative humidity during winter season ranged between 77% and 65%.

**Methods of Survey**

Extensive survey of Chelonian species has been carried out in Orang National Park from March 2009 to February 2012 to determine the diversity, distribution and habitat use types. The survey was conducted thrice in a month for twelve month period in each year to determine the species availability in various months. But due to heavy rain in some days, we had to stop the work. Especially in rainy season from June to August it was very difficult to enter into the core region of the forest. All the roads were under the annual flood water. Both line and point transact and quadrate methods were used for data collection. All surveys were made on foot as well as using motor boats. The techniques of direct sighting, visual encounter survey (VES), active searching were used as per the methods used by Jaeger (1978), Pough *et al*. (1987), Crumps and Pounds (1989).

**Transect design**

Altogether 10 randomly selected systematic line transects were established (with a fixed lengths of 10 m) using colour flags (Bibby *et al*. 1992). Quadrate (size 5×5 $m^2$) sampling method was used mainly in grassland habitat of the study area (Heatwole and Sextog, 1966; Barbault, 1967; Loyed *et al.* 1968a; Toft, 1980; Schott, 1987; Lieberman, 1986; Fauth *et al.* 1989). The area covered during line transacts were Nislamari Camp, Gorbhanga, Ramkong, Bantapoo, Barkhai and Gaspara, Rahman Par Camp (Bhellajar), Hati Camp (Via Naorasisa Charali), Kasomari, Katahali and Hajarbigha Camp etc.. 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).

**Data collection**

The Surveys were done from 04:00 hrs to 16:00 hrs of the day and the collected specimens were measured using digital slide callipers and the species were released after identification, photographs and also recording all the morphological measurements> The numbers of individual sighted and the data were noted down in field note book for further analysis. The turtle specimens were collected using fishing nets and traditional traps called Langi Jal (Local name) measuring 40-50 feet in length. Land turtles were collected by direct hand picking method from the habitat. The habitat parameters such as, date and time of collection, water temperature and temperature of the vegetations were also recorded during survey period but these environmental data were not incorporated in present analysis.

**Data analysis**

All the body measurements of the collected specimens were analyzed using standard statistical methods. The mean body parts viz., Carapace length and breadth, Plastron length, weight of the specimen etc. were done and standard deviation were calculated using MS excel. Data were represented in tabular form in all parameters.

**RESULTS**

**Diversity of Turtle fauna**

Study recorded altogether 12 chelonian species in grassland and wetland habitat of Orang National Park. Of the total 12 species, 8 belong to Bataguridae family and 4 species belongs to Trionychidae family (Table 1-2).

**Species accounts**

**A. Family: Bataguridae**

**1. The Malayan Box Turtle - *Cuora amboinensis*** (Daudin, 1802)

During present survey, study sighted altogether six live specimens at the bank of Khairatuli Pukhuri under Sat Simolu forest block and Lalpani area. A carapace was also collected from Hajarbigha camp of the study area. The analysis of morphological measurements of the collected specimens in the study area shows that, the mean carapace length(CL) was 14.5±7.69cm (n=3, range =10-25cm) followed by Carapace width(CW), 15.5 ± 6.55cm (n = 3, range=9.5-22.5cm), Plastron length(PL), 13.16±5.83cm (n=3, range=8-19.5cm), Plastron width(PW), 7.8 ±2.92cm (n=3, range=4.5-9cm) and body weight(BW)was 500±435.88g (n=3, range = 200-1000g) (Table 2; Plate 1a &b).

**2. Spotted Pond Turtle – *Geoclemys hamiltonii*** (Gray, 1831)

Altogether three live specimens, one dead specimen and three carapaces were observed in Hajarbigha area during 2010 survey. The measurements of morphological parameters of the collected specimens shows that, the mean carapace length(CL) was 28±9.5cm (n=3, range=17.5-36.0 cm) and followed by Carapace width (CW), 26.16±9.75cm(n=3,range=16.5-36cm), Plastron length(PL), 21.33±1.023cm (n=3, range=14-28cm), Plastron width (PW), 16.16±5.00cm (n=3,range=11-21cm) and body weight (BW) was 1800 ±1212.43g (n=3, range=400-2500g) (see Table 2,Plate 1c&d).

**3. Tricarinate Turtle - *Melonochelys tricarinata*** (Blyth, 1856).

During investigation, altogether 45 individuals of Tricarinate turtles were observed including 27 males and 18 females in various locations of the study area such as Nislamari, Hajarbigha, Ramkong, Gorbhanga, Katahali, Kherani, Singveti and Goldoba area from 2009 to 2011. A total of 16 individuals were caught and measured and were released in to their habitat after photographs, The morphological measurements of the collected specimens shows that, the mean carapace length (CL) was 20.51±2.33cm (n=16, range = 15-25.5 cm) followed by carapace width (CW), 17.06 ± 2.10cm (n = 16, range = 13-20.2 cm), plastron length (PL), 15.05±2.10cm (n = 16, range = 9-20cm), plastron width (PW), 11.51 ± 3.04 cm (n=16, range = 7.5-19 cm) and bodyweight (BW) was 670 ± 219.68g (n=16, range = 400-1100 g) (see Table 2). In March 2010 and December 2010, two female tricarinates were seen to lay numbers of eggs in the grassland habitat of Garbhanga and Kherani area.

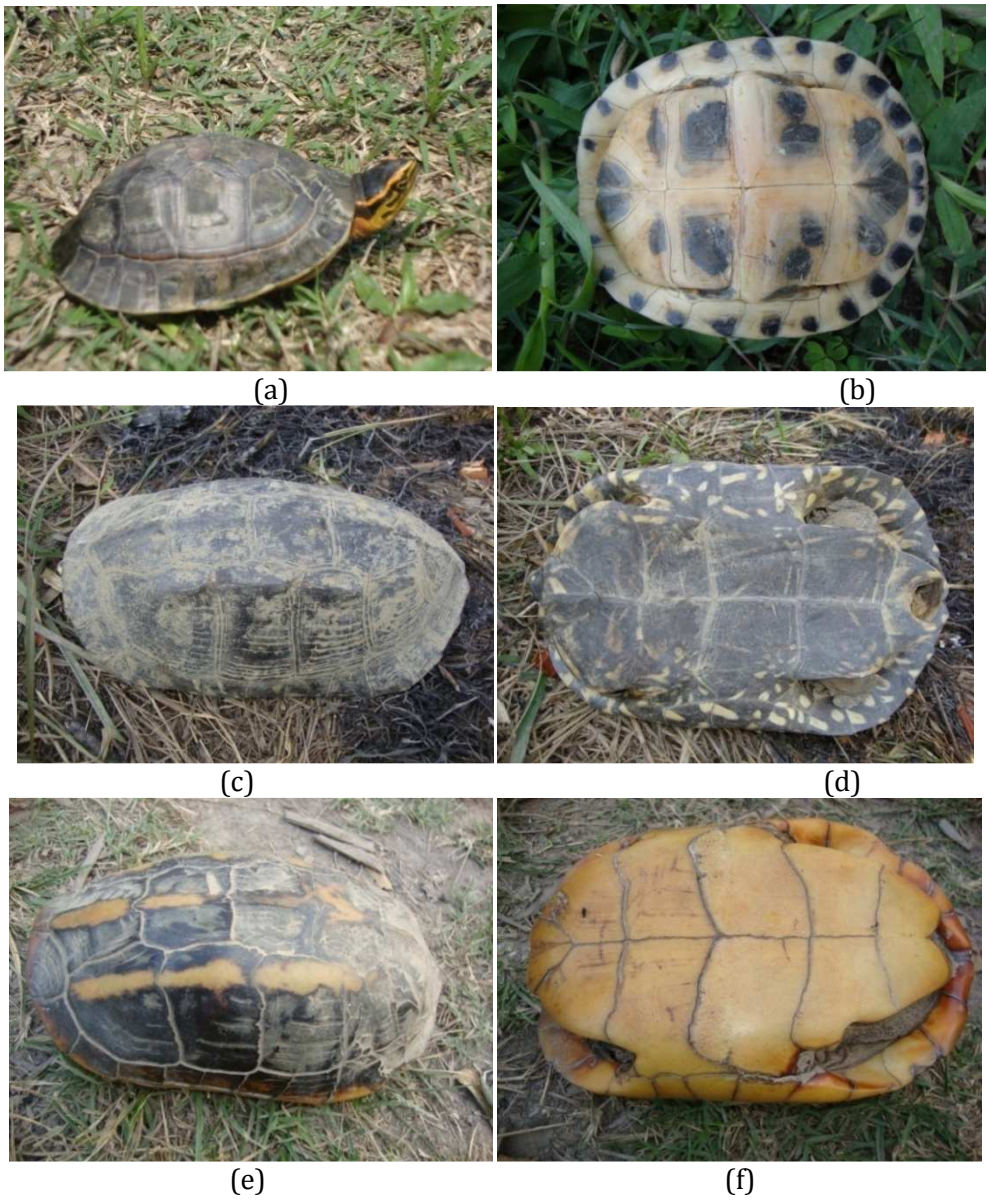


**Plate 1:** Photographs of Bataguridae family in Orang National Park [a = *Cuora amboinensis (carapace);* b = *Cuora amboinensis (plastron);* c = *Geoclemys hemiltonii (carapace);* d = *Geoclemis hemiltonii (plastron);* e = *Melanochelys tricarinata (carapace);* f = *Melanochelys tricarinata (plastron)].*

**4. Indian Eyed Turtle - *Morenia petersi*** (Anderson, 1879)

There were only two live specimens were observed in Orang National Park on 17th December, 2011 throughout survey period. The morphological measurements of the collected specimens shows that, the mean carapace length(CL) was 5±2.82cm (n=2, range=13-17cm) followed by carapace width (CW), 13±1.41cm (n=2, range =12-14cm), plastron length (PL), 11.5±2.12cm (n =2, range= 10-13cm), plastron width (PW),11.75±1.76cm (n=2, range=10.5-13cm) and body weight (BW) was 300±70.71g (n=2, range = 250-350g) (see Table 2).

**5. Assam Roofed Turtle - *Pangshura sylhetensis*** (Jordon, 1870)

During 2010-2011 survey, altogether eight individuals of Assam Roof Turtle- ***Pangshura*** *sylhetensis* were observed in Brahmaputra suti, Pachnoimukh and Marisali area of the study area. However, one dead specimen was also reported near Balisapori area of Brahmaputra river adjacent to Orang National Park. The analysis of morphological measurements of the collected specimens shows that, the mean carapace length (CL) was 12.12±4.07cm ( n =8, range = 10-22cm) followed by carapace width (CW), 10.4±0.54cm (n =

8,range=10-22cm), plastron length(PL),10.37±2.44cm (n=8, range = 8-16cm), plastron width (PW), 9.43±3.63cm (n=8, range =7-18cm) and body weight (BW) was 300±48.98g (n=8, range =220-400g) (see Table 2).

**6. Brown Roofed Turtle - *Pangshura smithii* (Gray, 1863)**

During 2009-2011 survey altogether two live specimens of **Brown Roofed Turtle - *Pangshura smithii*** were observed in Ramkong and Digholi beels of study area. However, a dead carapace was also found in Gorbhanga area of Nislamari block. The analysis of morphological measurements of the collected specimens shows that, the mean carapace length (CL) was 19.65±1.62cm(n=2, range = 18.5-20.8cm) followed by carapace width (CW),17.7±1.69cm (n=2, range =16.5-18.9cm), plastron length(PL),17.35±2.19cm (n=2, range=15-18.9cm), plastron width(PW),11±34.24cm (n=2, range = 8-14cm) and bodyweight (BW) was 733.33±251.66g (n=2,range=500-1000g) (see Table 2).

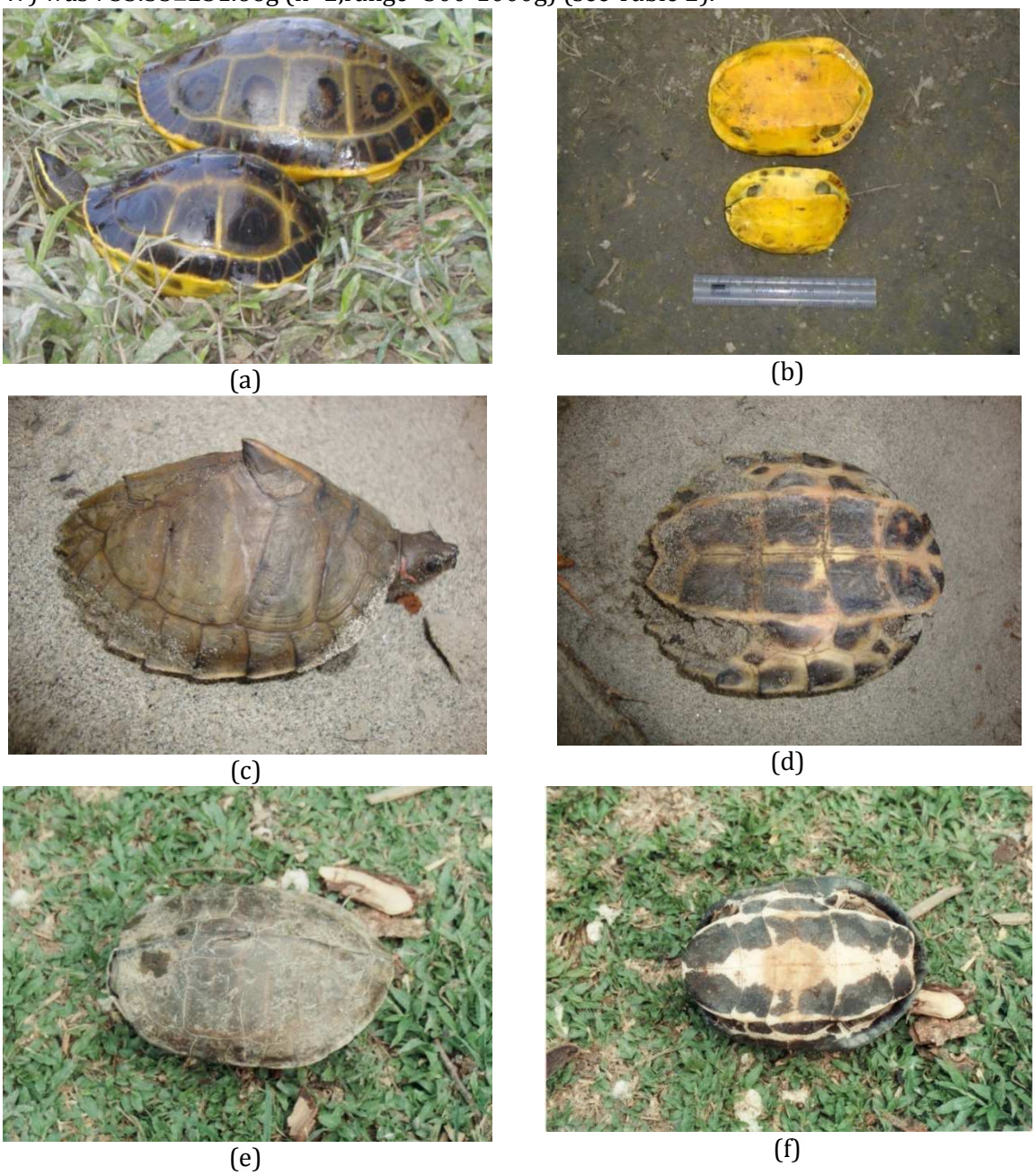



Plate 2: Photographs of Bataguridae family in Orang National Park [a = *Morenia petersi* (Carapace); b = *Morenia petersi* (Plastron); c = *Pangshura sylhetensis* (Carapace); d = *Pangshura sylhetensis* (Plastron); e = *Pangshura smithii* (Carapace); f = *Pangshura smithii* (Plastron)].

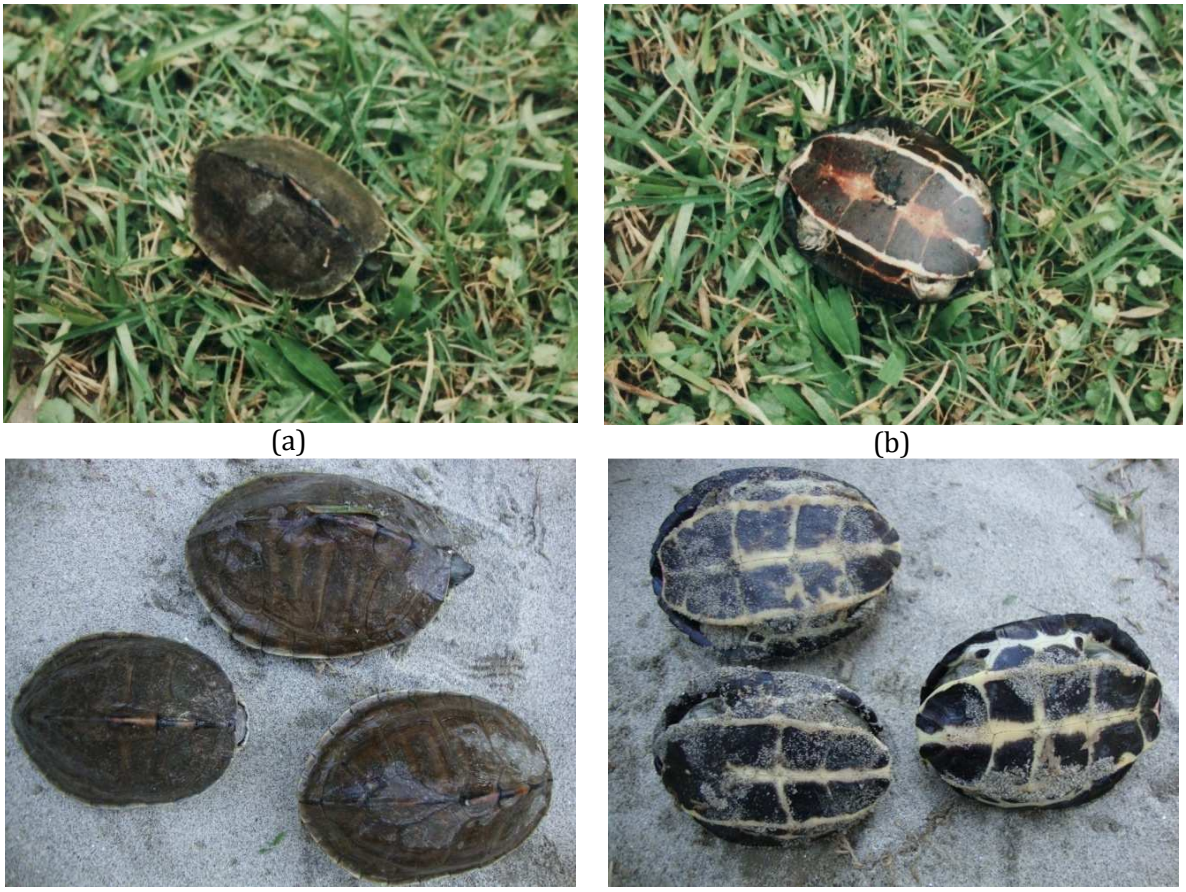
**7. Indian Roofed Turtle - *Pangshura tecta* (Gray, 1831).**

There were altogether seven live specimens of **Indian Roofed Turtle - *Pangshura tecta*** observed in Nislamari beel and Jaroni Goldobi area of Orang National park during 2009. Of which, five were caught and measured all captured specimens were released into the habitat after photographs. The analysis of morphological measurements of the collected specimens shows that, the mean carapace length(CL) was 13.98±1.62cm(n=5, range= 9-23.9cm) followed by carapace width (CW),10.62±4.87cm (n =5,range=6-18.9), plastron length (PL),11.12±4.27cm (n=5,range=8-15.6cm), plastron width (PW),5.56±1.86cm (n=5,range=4-8cm) and body weight (BWwas405±278.61g (n=5, range=200-800g) (see Table 2). On 29th May, 2009, altogether four juvenile species were observed in Pachnoimukh and four numbers of eggs were observed in Balisapori area of Brahmaputra river. During survey it was also observed that, one egg was hatched and newly hatched baby turtle of *Pungshura tecta* was ran fast towards riverside of Brahmaputra suti. On 15 March, 2010, 10 numbers of long spindle-shaped eggs of *Pungshura tecta* were found in the Balichapori area of Pachnai river. All the eggs were laid from September to October and hatched during March–April. Eggs were found between 4 -5 metres distance and the footprints of female individuals were also prominent from riverside to the nests. Unfortunately few eggs were eaten either by Wild Boar or *Varanus* species afterwards. The fringe villagers were frequently sold turtle eggs in the local market and the people were purchased for using medicinal purposes as informed us during survey.

**8. Indian Tent Turtle - *Pangshura tentoria* (Gray, 1834).**

Altogether 52 live specimens of **Indian Tent Turtle - *Pangshura tentoria*** were observed in the channels of Brahmaputra river of which, 11 were caught, measured, and photographs during observation period and released afterward. The analysis of morphological measurements shows that, the mean carapace length (CL) was 9.48±6.40cm (n=11,range=7-12.8cm) followed by carapace width (CW), 8.89±142cm (n=11, range=7-11.5cm), plastron length (PL), 8.07±1.62cm (n = 11, range = 6-10.8cm), plastron width (PW), 6.3±1.55cm (n=11, range = 3-8cm) and body weight (BW) was 194.18±46.17g (n =11,range=120-286g) (see Table 2).

On 2 April 2009 (at 0900 hours-1200 hours), we have observed 20 individuals of ***Pangshura tentoria*** busking at wooden logs along the stretches of 2km in the bank of Brahmaputra suti under Bantapoo Barkhai area. On 11May, 2009, 70 individuals of *Pungshura tecta* and *Pungshura tentoria* were observed to busk at Jarani area. The temperature ranged during survey period was $30^0$ to $36^0$ C (from 09.30 hours - 12.30 hours). Again, the water turbidity measured was 30 cm and humidity was 21.27%. However, it was also observed that, the busking of *sylhetensis*, *tecta* and *tentoria* at wooden log substratum was very common scenario from Barkhai, to Jarani area through Gaspara and in Marisali area. Inter specific interactions was also observed between individuals during busking activities.



(a) (b)

(c) (d)

Plate 3: Photographs of Bataguridae family in Orang National Park [a = *Pangshura tecta* (Carapace); b = *Pangshura tecta* (Plastron); c = *Pangshura tentoria* (Carapace); d = *Pangshura tentoria* (Plastron)].

**B. Family Trionychidae**

**9. Indian Soft-shell Turtle - *Nilssonia gangeticus* (Cuvier, 1825)**

Only two live specimens (one juvenile and one adult) were observed during survey period of 2009 in the channel of Brahmaputra river. The analysis of morphological measurements of the collected specimens shows that, the mean carapace length (CL) was 21.8±12.30cm (n=2, range=13.1-30.5cm) followed by carapace width(CW),18.8±8.06cm (n = 2,range =13.1-24.5cm), plastron length (PL) = 21.5±13.43cm (n = 2, range = 12-31cm), plastron width(PW),27.05±5.72cm (n=2, range =13.1-23cm) and body weight (BW) was 2700±3252.69g (n= 2, range = 400-5000g) (see Table 2).

**10. Peacock soft shell - *Nilssonia hurum* (Gray, 1931)**

Altogether eight (both juveniles and adults) individual were observed in different locations of Brahmaputra suti area of Orang National Park. The analysis of morphological measurements of the collected specimens shows that, the mean carapace length (CL)was 14.81±5.39cm (n=8,range=11.5-28cm) followed by carapace width (CW),13±4.09cm (n =8, range=11-23cm), plastron length (PL), 14.81±5.90cm (n = 8, range = 9.5-29cm), plastron width (PW)=12.12±4.58cm (n=8, range=8-23cm) and body weight (BW) was 775±714.64g (n = 8, range = 200-2500g) (see Table 2).

(a) (b)

(c) (d)

Plate 4: Photographs of Bataguridae family in Orang National Park [a = *Nilssonia gangeticus* (Juvenile), b = *Nilssonia gangeticus* (Adult), c = *Nilssonia hurum* (Juvenile), d = *Nilssonia hurum* (Adult)].

**11. Narrow Headed Soft-shell Turtle - *Chitra indica* (Gray, 1831)**

There were only two specimens of **Narrow Headed Soft-shell Turtle - *Chitra indica*** were collected from local fisherman adjacent to Orang national Park. According to Fisherman they have caught it from the river Brahmaputra. The analysis of morphological measurements of the collected specimens in the study area shows that, the mean carapace length (CL) was 37±4.24cm (n = 2,range = 34-40cm) followed by carapace width (CW), 30.5±3.53cm (n = 2, range = 28-33cm), plastron length(PL), 38.5±3.53cm (n=2, range = 36-41cm), plastron width (PW),19.5±10.60cm (n=2, rang = 27-32cm) and body weight (BW) was 3250±353.55g (n=2, range = 3000-3500g). (see Table 2)

**12. Indian Flapshell Turtle - *Lissemys punctata* (Lacepede, 1788)**

There were altogether three adult and one juvenile specimens of **Indian Flapshell Turtle - *Lissemys punctata*** were observed in Gorbhanga and Pachnoimukh area of Orang National Park during survey. However, one dead specimen was also found in Singveti area of Orang National Park during 2011. The analysis of morphological measurements of the collected specimens in the study area shows that, the mean carapace length(CL) was 18.37±7.49cm (n=4, range=10.5-27cm) followed by carapace width (CW),16.37±6.65cm (n = 4, range = 8.5-24cm), plastron length (PL), 16.75±6.98cm (n = 4, range = 9.5-26cm), plastron width (PW), 16±7.03cm (n=4, range = 8.5-24cm) and Body weight (BW) was 625±607.79g (n=4, range=1000-1500g) (see Table 2). Again, a female turtle of *L. punctata has* seen to laid 5 numbers of eggs on 2 November 2010 that were rounded in shape.

(a)

(b)

(c)

(d)

(e)

**Plate 4:** Photographs of Trionychidae family in Orang National Park [a = *Chitra indica* (carapace); b = *Chitra indica* (plastron); c = *Lissemys punctata* **(**carapace); d = *Lissemys punctata* **(**plastron); e = *Lissemys punctata* (front view)].

**Conservation Threats**

The fresh water turtle species population has been found to declining in Orang national park due to habitat loss egg collection, egg depredation and destruction of eggs. Most of the turtles were exploited for meat and medicinal purpose. However, some individuals were frequently trapped by local fisherman unintentionally in the fringe village area. They were also sold in the local market especially the species of *N. gangeticus, N. hurum, L. punctata and C. indica*. The other major threats to declination of land turtle was the regular burning practices of grassland area in Orang national park during February and April. The species *M. tricarinata, Cuora amboinensis, G. hamiltonii* were commonly burnt species during fire management in Orang National Park. Certain evidence of natural death viz., extreme cold, during flood and

under the footsteps of Elephant and Rhino were also observed. The animal depredation of eggs by wild Pig and Varanus species was also observed during survey period.

**New records in Orang National Park**

**Altogether three species of Chelonian species have been newly recorded in Orang National Park. Those were such as-**

**1. Indian Eyed Turtle - *Morenia petersi*** (Anderson, 1879)

The Indian eyed turtle has been recorded for the first time in Orang National Park. There was no such report of this species from Orang National Park. During present study, the species was recorded during December, 2011 and two live specimens were sighted in Meteka beel of Garbhanga site of study area. The status of the species was very rare in Orang. In Assam, first authentic record of this species has been made by Sengupta *et al*. (1998) in Pabitora Wildlife Sanctuary.

**2. Assam Roofed Turtle - *Pangshura sylhetensis*** (Jordon, 1870)

The *P. sylhetensis* has been recorded for the first time in Orang National Park. There was no such earlier report of this species from the study area. The species was found to be common in the river Brahmaputra along the periphery of Orang National Park.

**3. Narrow Headed Soft-shell Turtle - *Chitra indica*** (Gray, 1831)

*Chitra indica* has been recorded for the first time in Orang National Park. It was reported from various channels of the river Brahmaputra in different locations. There was no such earlier report of the existence of ***Chitra indica*** in Orang National Park.

**Table 1(a):** Morphological Measurements of *Melanochelys tricarinata* and *Melanochelys Petersi* in Orang National Park 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; HJ: Hajarbigha; GB: Gorabhaga; **IK**: Ikarani; **GB**: Gorabhaga; **KH**: Kherani; **MB**: Meteka beel; **AM**: Adult male; **AF**: Adult female; **JM**: Juvenile male; **JF**: Juvenile Female

| Sl. No. | Species | Study Locations | CL (in cm) | CB (cm) | PL (cm) | PB (cm) | Wt. (in kg) | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1 | *M. tricarinata* | HJ | 21 | 16.8 | 15 | 9 | 0.8 | AM |
| 2 | *M. tricarinata* | HJ | 19 | 17 | 14.5 | 8 | 0.6 | AF |
| 3 | *M. tricarinata* | HJ | 22 | 18 | 14.5 | 7.5 | 1.0 | AM |
| 4 | *M. tricarinata* | HJ | 18.5 | 15 | 14 | 11.5 | 0.4 | JM |
| 5 | *M. tricarinata* | HJ | 17.5 | 15.5 | 13.5 | 11.5 | 0.4 | JM |
| 6 | *M. tricarinata* | HJ | 22 | 18 | 15 | 13 | 0.9 | AM |
| 7 | *M. tricarinata* | HJ | 23 | 19 | 15 | 12.5 | 1.1 | AM |
| 8 | *M. tricarinata* | GB | 20 | 17 | 14.5 | 11.5 | 1.0 | AM |
| 9 | *M. tricarinata* | IK | 22 | 19 | 15 | 8 | 0.45 | JF |
| 10 | *M. tricarinata* | IK | 19 | 16 | 14.5 | 10.5 | 0.5 | AM |
| 11 | *M. tricarinata* | IK | 20.5 | 18 | 16 | 11 | 0.5 | AM |
| 12 | *M. tricarinata* | KH | 15 | 13 | 9 | 10 | 0.5 | AF |
| 13 | *M. tricarinata* | KH | 21.5 | 20 | 20 | 19 | 0.8 | AF |
| 14 | *M. tricarinata* | KH | 20 | 19 | 19 | 18 | 0.65 | AF |
| 15 | *M. tricarinata* | KH | 20 | 15 | 15 | 8 | 0.5 | AM |
| 16 | *M. tricarinata* | KH | 23 | 19 | 15 | 13 | 0.7 | AM |
| 17 | *M. tricarinata* | GB, MB | 17 | 14 | 13 | 13 | 0.35 | JF |
| 18 | *M. petersi* | GB, MB | 13 | 12 | 10 | 10.5 | 0.25 | JF |

**Table 1(B):** Morphological Measurements of *P. sylhetensis, P. smithii, P. tecta and P. tentoria* (all measured Specimens were live and in natural condition; **CL**=Carapace length, **CB**=Carapace breadth, **PL**=Plastron length and **PB**=Plastron breadth; **PACM**: Pachnoimukh; **CNB**: Channel of Brahmaputra Nislamari; **GB**: Gorabhaga;IK: Ikarani; **GB**: Gorabhaga;KH: Kherani; **MB**: Meteka beel; **DB**: Dighali beel; **BT**: Bantapu; **RKB**: Ramkong river side of Brahmaputra; **GAK**: Goldubi area of Kherani;**N**: Nislamari;**T**: Tincona; **P**: Pachnoimukh;**BC**: Brahmaputra Channel).

| Sample No. | Species involved | Locality | CL (in cm) | CB (in cm) | PL (in cm) | PB (in cm) | Wt. (in kg) |
|---|---|---|---|---|---|---|---|
| 1 | P. sylhetensis | BC | 12.5 | 12 | 11 | 9.5 | 0.3 |
| 2 | P. sylhetensis | PACM | 10.5 | 10.5 | 9 | 8 | 0.22 |
| 3 | P. sylhetensis | PACM | 22 | 20 | 16 | 18 | 0.4 |
| 4 | P. sylhetensis | PACM | 10 | 10 | 10 | 8 | 0.28 |
| 5 | P. sylhetensis | PACM | 11 | 11 | 10 | 8 | 0.3 |
| 6 | P. sylhetensis | PACM | 10 | 10 | 10 | 8 | 0.3 |
| 7 | P. sylhetensis | PACM | 10 | 10 | 9 | 7 | 0.3 |
| 8 | P. sylhetensis | PACM | 11 | 11 | 8 | 9 | 0.3 |
| 9 | P. smithii | CNB | 20.8 | 18.9 | 18.9 | 8 | 1.0 |
| 10 | P. smithii | DB | 18.5 | 16.5 | 15.8 | 14 | 0.5 |
| 11 | P. smithii | DB, BT | 19.5 | 18 | 17 | 14.6 | 0.7 |
| 12 | P. tecta | N | 10 | 9.2 | 8 | 5 | 0.2 |
| 13 | P. tecta | N | 10 | 10 | 8 | 3.8 | 0.2 |
| 14 | P. tecta | RKB | 17 | 6 | 16 | 7 | 0.6 |
| 15 | P. tecta | RKB | 9 | 9 | 8 | 4 | 0.225 |
| 16 | P. tecta | GAK | 23.9 | 18.9 | 15.6 | 8 | 0.8 |
| 17 | P. tentoria | CNB | 12.8 | 11.5 | 10.8 | 4.8 | 0.2 |
| 18 | P. tentoria | CNB | 11 | 10 | 10 | 4.5 | 0.12 |
| 19 | P. tentoria | T | 7 | 7.8 | 6 | 3 | 0.286 |
| 20 | P. tentoria | P | 10 | 9 | 9 | 7 | 0.2 |
| 21 | P. tentoria | T | 9.5 | 8.5 | 8 | 7 | 0.2 |
| 22 | P. tentoria | T | 8.5 | 7 | 7 | 6.5 | 0.15 |
| 23 | P. tentoria | T | 8 | 7.5 | 6.5 | 6.5 | 0.15 |
| 24 | P. tentoria | P | 9.5 | 8 | 7.5 | 7 | 0.2 |
| 25 | P. tentoria | P | 8 | 8.5 | 7 | 7 | 0.18 |
| 26 | P. tentoria | P | 11 | 11 | 10 | 8 | 0.25 |
| 27 | P. tentoria | P | 9 | 9 | 7 | 8 | 0.2 |

**Table 1(C):** Morphological Measurements of various age groups specimens of *N. gangeticus, N. hurum, C. indica* and *L. Punctata* in different study locations at Orang National Park. (all were live specimens and measured in natural condition; **CL**=Carapace length, **CB**=Carapace breadth, **PL**=Plastron length and **PB**=Plastron breadth; PACM: Pachnoimukh; CNB: Channel of Brahmaputra Nislamari; GB:Gorabhaga;IK: Ikarani; GB: Gorabhaga;KH: Kherani;MB: Meteka beel; DB: Dighali beel; BT: Bantapu; RKB: Ramkong river side of Brahmaputra; GAK: Goldubi area of Kherani;N: Nislamari;T: Tincona;P: Pachnoimukh; BC:Brhmaputra channel, BR: Brahmaputra River; MSA;SBA: Singbheti area;GB:Garbhanga.

| Sl. No. | Species involved | Study Locality | CL (in cm) | CB (in cm) | PL (in cm) | PB (in cm) | Wt. (in Kg) | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1 | *N. gangeticus* | CNB | 13.1 | 13.1 | 12 | 13.1 | 0.04 | Juvenile |
| 2 | *N. gangeticus* | GB | 30.5 | 24.5 | 31 | 23 | 5.0 | Adult |
| 3 | *N. hurum* | CNB | 28 | 23 | 29 | 23 | 2.50 | Adult |
| 4 | *N. hurum* | RKB | 14 | 12.5 | 14 | 12 | 0.5 | Adult |
| 5 | *N. hurum* | BC | 12 | 11 | 13 | 10 | 0.7 | Adult |
| 6 | *N. hurum* | RKB | 13 | 12 | 13 | 11 | 0.7 | Adult |
| 7 | *N. hurum* | T | 11.5 | 11 | 9.5 | 8 | 0.6 | Juvenile |
| 8 | *N. hurum* | P | 13 | 11 | 13 | 11 | 0.5 | Juvenile |
| 9 | *N. hurum* | BC | 14 | 12.5 | 14 | 12 | 0.5 | Juvenile |
| 10 | *N. hurum* | BC | 13 | 11 | 13 | 10 | 0.2 | Juvenile |
| 11 | *C. indica* | BC | 40 | 33 | 41 | 32 | 0.3 | Adult |
| 12 | *C. indica* | BR | 34 | 28 | 36 | 27 | 3.5 | Adult |
| 13 | *L. punctata* | MA | 14 | 14 | 14 | 12 | 0.4 | Juvenile |
| 14 | *L. punctata* | SBA | 22 | 19 | 17.5 | 19.5 | 0.5 | Juvenile |
| 15 | *L. punctata* | RKB | 27 | 24 | 26 | 24 | 1.5 | Adult |
| 16 | *L. punctata* | GB | 10.5 | 8.5 | 9.5 | 8.5 | 0.1 | Juvenile |

Table 1(D): Morphological Measurements of various age groups specimens of *C. amboinensis* and *G. hamiltoni* (all were live specimens and measured in natural condition; (KP*:* Kahiratoli pukhuri; LP: Lalpani; **GB**: Gorbhanga; **HB**: Hazarbigha; **CL**=Carapace length, **CB** = Carapace breadth, **PL** = Plastron length and **PB** = Plastron breadth).

| Sl. No. | Species involved | Study Locality | CL (in cm) | CB (in cm) | PL (in cm) | PB (in cm) | Wt. (in gm) | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1 | *C. amboinensis* | KP | 25 | 22.5 | 19.5 | 9 | 1000 | Adult |
| 2 | *C. amboinensis* | LP | 10 | 9.5 | 8 | 4.5 | 200 | Juvenile |
| 3 | *C. amboinensis* | GB | 14.5 | 14.5 | 12 | 10 | 300 | Juvenile |
| 4 | *G. hamiltoni* | HB | 30.5 | 26 | 22 | 16.5 | 2500 | Adult |
| 5 | *G. hamiltoni* | HB | 17.5 | 16.5 | 14 | 11 | 400 | Juvenile |
| 6 | *G. hamiltoni* | GB | 36 | 36 | 28 | 21 | 2500 | Adult |

**Table 2:** Mean measurements of various morphological characters of Chelonian species observed in Orang National Park during study period (**CL**= Carapace length, **CW**= Carapace width, **PL**= Plastron length, **PW**= Plastron width, **BW**= Body weight, **N**= Number of observation; R: Range).

| Species involved | CL<br>Mean ± SD (in cm) | CW<br>Mean ± SD (in cm) | PL<br>Mean ± SD (in cm) | PW<br>Mean ± SD (in cm) | BW<br>Mean ± SD (weight in g) | N |
|---|---|---|---|---|---|---|
| *Melanochelys tricarinata* | 20.51 ± 2.33 ( R:15 - 25.5) | 17.06 ± 2.10 (R:13 - 20.2) | 15.05 ± 2.10 (R:9 – 20) | 11.51 ± 3.04 (R:7.5 – 19) | 670.0 ± 219.68 ( R:400 - 1100 ) | 1<br>6 |
| *Geoclemys hamiltonii* | 28.0 ± 9.5 ( R:17.5 – 36) | 26.16 ± 9.75 ( R:16.5 – 36) | 21.33 ± 1.02 ( R:14 – 28) | 16.16 ± 5.00 ( R:11 – 21) | 1800.0 ± 212.43 ( R:400 - 2500) | 3 |
| *Cuora amboinensis* | 14.5 ± 7.69 ( R:10 – 25) | 15.5 ± 6.55 ( R:9.5 -22.5) | 13.16 ± 5.83 ( R:8 - 19.5) | 7.8 ± 2.92 ( R:4.5 – 9) | 500.0 ± 435.88 ( R:200 - 1000 ) | 3 |
| *Morenia petersi* | 15.0 ± 2.82 (R:13 – 17) | 13.0 ± 1.41 (R:12 – 14) | 11.5 ± 2.12 (R:10 – 13) | 11.75 ±1.76 ( R:10.5 – 13) | 300.0 ± 70.71 ( R:250 - 350 ) | 2 |
| *Pungshura sylhetensis* | 12.12 ± 4.07 ( R:10 – 22) | 10.4 ± 0.54 (R:10 – 20) | 10.37 ± 2.44 (R:8 – 16) | 9.43 ± 3.53 ( R:7 – 18) | 300 ± 48.98 (R: 220 – 400 ) | 8 |
| *Pungshura smithi* | 19.65 ± 1.62 (R:18.5 - 20.8) | 17.7 ± 1.69 (R:5 - 18.9) | 17.35 ± 2.19 ( 15.8 - 18.9) | 11.0 ± 4.24 ( R:8 – 14) | 733.33 ± 251. 7 (R:500–1000 ) | 2 |
| *Pungshura tecta* | 13.98 ± 1.62 ( R:9 - 23.9) | 10.62 ± 4.87 (R:6 - 18.9) | 11.12 ± 4.27 ( R:8 - 15.6) | 5.56 ± 1.86 ( R:4 – 8) | 405.0 ± 278.61 ( R:200 – 800 ) | 5 |
| *Pungshura tentoria* | 9.48 ± 6.40 ( R:7 - 12.8) | 8.89 ± 1.42 ( R:7 - 11.5) | 8.07 ± 1.62 (R:6 - 10.8) | 6.3 ± 1.55 ( R:3 – 8) | 194.18 ± 46.17 (R:120 – 286 ) | 1<br>1 |
| *Nilssonia gangeticus* | 21.8 ± 12.30 (R:13.1 - 30.5) | 18.8 ± 8.06 ( R:13.1 - 24.5) | 21.5 ± 13.43 ( R:12 – 31) | 27.05 ± 5.72 ( R:13.1 – 23) | 2700 ± 52.69 (R: 400 - 5000 ) | 2 |
| *Nilssonia hurum* | 14.81 ± 5.39 (R:11.5 – 28) | 13.0 ± 4.09 (R:11 – 23) | 14.81 ± 5.90 (R:9.5 -29) | 12.12 ± 4.58 (R: 8–23) | 775.0 ± 714.64 (R:200–2500) | 8 |
| *Chitra indica* | 37.0 ± 4.24 (R:34-40) | 30.5 ± 3.53 (R:28-33) | 38.5 ± 3.53 (R:36-41) | 19.5 ± 10.60 (R:27-32) | 3250.0 ± 353.55 (R:3000-3500) | 2 |
| *Lissemys punctata* | 18.37 ± 7.49 (R:10.5-27) | 16.37 ± 6.65 (R:8.5-24) | 16.75 ± 6.98 (R:9.5-26) | 16.0 ± 7.03 (R:8.5-24) | 625.0 ± 607.79 (R:100-1500) | 4 |

**DISCUSSION**

The species *Cuora amboinensis* is active only during early morning and sighted only in stagnant water body and never been sighted in running water. Bhupathy *et al* (1992) also have been recorded this species in stagnant water in Orang national park. Moll & Vijaya, (1986) have reported about the abundance of this species in Mangaldoi district. In Assam, most of the earlier workers have reported the species in various locations viz., Kaziranga and Manas National Park (Sharma, 1988), Dibru-Saikhowa Biosphere Reserve (Choudhury, 1995) and Kamrup district (Sengupta *et al,* 1995, 1997). Das (1991) and Choudhury (1995) have mentioned about the long and straight carapace of the species and measured about 21.6 -23.3cm long. However, the present study measured 25 cm long carapace of *Cuora amboinensis* in Orang National Park. The species *Geoclemys hemiltonii* is inhabitant in the muddy and swampy habitat and grassland habitat and indicating the use of diverse habitat types. As per Smith (1931), the species has distributed from Sind to Bengal. However, Vijaya (1983) suggested that, the species range has been extended up to Kaziranga National Park. Bhupathy (1992) has reported the species from Orang National Park in his report. Again, the species is also reported from Sonapur area of Kamrup district (Das, 1995; Sengupta et al, 1995, 1997) and Jamjing Reserve Forest of Dhemaji district (Choudhury, 1995).*Similarly the Melanochelys tricarinata* is most abundant species in Orang National Park. During study, the species has sighted in different habitat types in Kherani, Ikarani, Kathani but hardly seen to move in water in the rainy season. However, Das (1995) has described that, *M. tricarinata* is a terrestrial grassland species of Ganga and Brahmaputra valleys at the foot of Himalayas and in the nearest hilly areas. Smith (1931) has regarded the species as hilly species. In Assam, most of the earlier workers have reported this species in various locations such as from Kaziranga National Park, Orang National Park (Bhupathy *et al*, 1992), Sonapur area of Kamrup district (Das, 1995; Sengupta *et al*, 1995, 1997) and Jamjing Reserve Forest of Dhemaji (Choudhury, 1995).

Domed-shaped carapace of *Morelia peters* is a greyish black in colour and Plastron is yellow and recorded in the Meteka beel of Garbhanga region. The finding of the species in Orang National Park indicating the range extension. Although, it was initially thought to be the endemic to Bangladesh (Khan, 1982), but later it was reported from India by Das (1985). Later, it was reported from Udaipur (Bihar) and neighbourhood of Calcutta (Das, 1995). In Assam, the first record was established by Sengupta *et al* (1998) in Pabitora Wildlife Sanctuary.

The present investigation of chelonian species indicating the range extension of *P. sylhetensis* to Orang National Park. The *P. sylhetensis* is mostly found in the Brahmaputra suti area and in the sandy bottom of Pachnoi river of Orang National Park. Earlier, Sharma (1988) has described the habitat of this species in both bank of river Brahmaputra and shallow water of Rupahi river at Manas National Park. However, Choudhury (1993) has reported the distribution of this species at Ghilamara and Bonkobeel area of Dibru-Saikhowa Biosphere Reserve and also established that, the species occur in the flood plains as well as in fast flowing stream with sandy bottom.

Only a few individuals of *Pungshura smithii* has been reported during present study at Orang National Park. According to Rashid and Khan (2000), *Pungshura smithii* is also relatively common in the tributaries of the river Brahmaputra. Previously, other workers also have reported the species from various localities such as, Sengupta *et al* (1998) reported from Kamrup district and Choudhury has collected the species from Lohit river near Saikhowaghat (March, 1994). Again, the *Pungshura tecta* is a common species in Orang National Park. The present study reveals that, the species is abundant in Orang National Park. In past, Smith (1931) has reported the range extension of the species up to Northern India including Ganga and Brahmaputra River.

*Pungshura tentoria* is the most abundant species in Orang National Park. Maximum numbers of the individuals of the species has been collected by local fisherman through fishing net in the channel of Brahmaputra river. However, Choudhury (1993) has reported the range extension up to the river Brahmaputra at Sibsagar district and later in Guijan and Saikhowa (1993, 1994). Choudhury (1993) has reported the average carapace length of this species as 16.37 cm and the length ranging between 13-17cm, but the present study indicated some

variation in measurements viz., average carapace length is 9.48cm and range between 7-12.8 cm.

Very few individuals of *Nilssonia gangeticus* (one juvenile and one adult) are recorded dring present study that have been collected from the channel of river Brahmaputra through local fisherman's fishing net. The adult species was weighted as 5 Kg in weight. Past study have reported the species from various locations at Assam such as Bhupathy *et al* (1992) have reported from Kaziranga National Park, Orang National Park and Nameri National Park. Choudhury (1995) has mentioned the species as fairly common species in the river Brahmaputra and Lohit near Dibru-Saikhowa Biosphere Reserve. Sengupta *et al* (1997) reported the species for the first time in the river Brahmaputra river at Kamrup district.

In present survey, maximum numbers of *Nilssonia hurum* is reported from Brahmaputra suti and in other swampy and marshy area of Orang National Park. Most of them are juvenile. present study found only one adult specimen which is 2.5 kg in weight. But, it was a history that, about four to five Borkaso (local name) was exists in Old Orang Pukhuri that have been seen always when anybody feed them to gram seeds at Pond during morning and also seen to basking at the periphery of the pond (from personal communication). But, during present study no such evidence was found. The species is also widely distributed in Assam and most of the earlier workers have also reported in various localities such as from North Cachar Hills and Kaziranga National Park by Bhupathy *et al* (1992), Dilkush, Sibsagar, Sonapur, Guijanghat, Nazira and Bokakhat by Das (1995). The occurrence of this species also has been confirmed at different habitats and locations of Kamrup district by Sengupta *et al* (1998) in both north and south bank of the river Brahmaputra.

During present survey period from 2009-2011, three numbers of live specimens of *Chitra indica* are recorded in Brahmaputra river suti (only two are measured). Although it is a very rare species in Orang national park, the species has usually seen during rainy season (June to August) in the river Brahmaputra as per the forest guard. The present study has collected the specimens from Orang national park and is the first record from the study area. Earlier, Choudhury (1992) has reported only one specimen from Guijan of Dibru-Saikhowa Biosphere Reserve. No other information was available about the existence of this species in Assam.

During present study, *Lissemys punctata* is recorded from both the water bodies (Ramkong beel) and in the grassland (Singveti, Garbhanga and Marisali) habitat area of Orang National Park. However, Das (1990) has reported *Lissemys punctata* only from Brahmaputra drainage system.

**Recommendations**

**To conserve the Chelonians in Orang National Park, the following recommendation has been forwarded**

(i) To reduce the death of slow moving chelonian species during the annual forest burning, the stripe burning process with flushing system should be applied, otherwise, most of the turtles would be die due to burning. During present survey, nearly 70 to 80 dead specimens of chelonians are observed that have been died due to forest burning.

(ii) Nesting sites of turtles should be protected by park authority so that, predators/enemy could be avoided.

(iii) Large scale awareness programme could be initiated along the periphery of the park to protect the endangered Chelonian species, because, the village people have frequently been used to kill the turtle for consumption and as well as sale in the remote markets.

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