Tortoises and Turtles of Northeast India: Saving them from Extinction!

Survey, Assessment of Present Status and Conservation of Tortoises and Freshwater Turtles in Northeast India

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Contents

Acknowledgements	1
Executive summary	2
Introduction	3
Methodology	5
Map of NE India	6
Study Sites	7
Results	14
Other activities	58
Discussion	62
Recommendations	67
References	68
Case study	74
Annexure	77

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Executive Summary

This report provides an Assessment of Present Status and Conservation of Tortoises and Freshwater Turtles in Northeast India. The survey was under the project "Turtles and Tortoises of Northeast India, Saving them from Extinction" of the division of herpetology, Aaranyak.
The study was initiated in the year 2007 with the following objectives:-

1. Survey wild tortoises and turtles in protected, non-protected, community owned areas and major turtle markets in the region and evaluate their present status.
2. Identify viable turtle population, prepare distribution maps using GIS techniques and assess threats to their existence.
3. Evaluate present conservation measures and wherever necessary propose new strategies based on new findings.
4. Aware local people especially youth and publish education materials. Capacity building for local biologists in field research and turtle husbandry.

The investigation was carried out in the six northeastern states (Excluding Tripura) involving protected areas, freshwater habitats (river, beels, marshes), ex-situ conservation areas, and temple ponds of the region.
We used opportunistic search, active search, river transects to document the diversity. Out of 21 species so far reported from the region we document 19 species. Each species encountered in the field were described with detail notes on distributional localities, natural history notes and distributional map. Each species is backed up with colour pictures.
Habitat loss due to illegal felling, Jhum cultivation, over- fishing, and hunting are considered as looming threats to the turtle population in Northeast India. The situation is so that out of 21 species of chelonians found in the region 15 species are now considered as globally threatened by extinction (IUCN, 2007). These include, one critically endangered species, six species Endangered (EN) and seven species are Vulnerable (VU).
However, it is realized that based on fresh field information it is important to to evaluate the present conservation status of northeastern turtle species. Thus we propose a national workshop involving various stakeholders. This will enable to evaluate Current Status, Conservation Prioritization and prepare Strategic Action Planning for Tortoises and Freshwater Turtles of the region. We plan to arrange this workshop by September this year and results of the workshop will be presented in a separate report immediately after the workshop is over.

Introduction

North-East India (NE India) extends from 88° E–97° E and 22° N–29° 30′ N with a geographical area of about 255,083 square km (Figure I). The altitude in the region varies from 15 m at low-lying plains of Barak Valley (15 m) to around 6,000 m in parts of Arunachal Pradesh. The climate of the region varies from tropical to sub-alpine.

NE India along with Himalayan region is a unique transitional zone amongst the Indian, the Indo-Malayan and the Indo-Chinese biogeographical zones as well as being the meeting point of the Himalayan region with the Peninsular India. This region is constituted by seven north-eastern states and is popularly known as 'seven sisters.' The total forest cover of this region is 164,043 sq km, which is 25% of the total forest cover of India (FSI, 1997 any new reference).

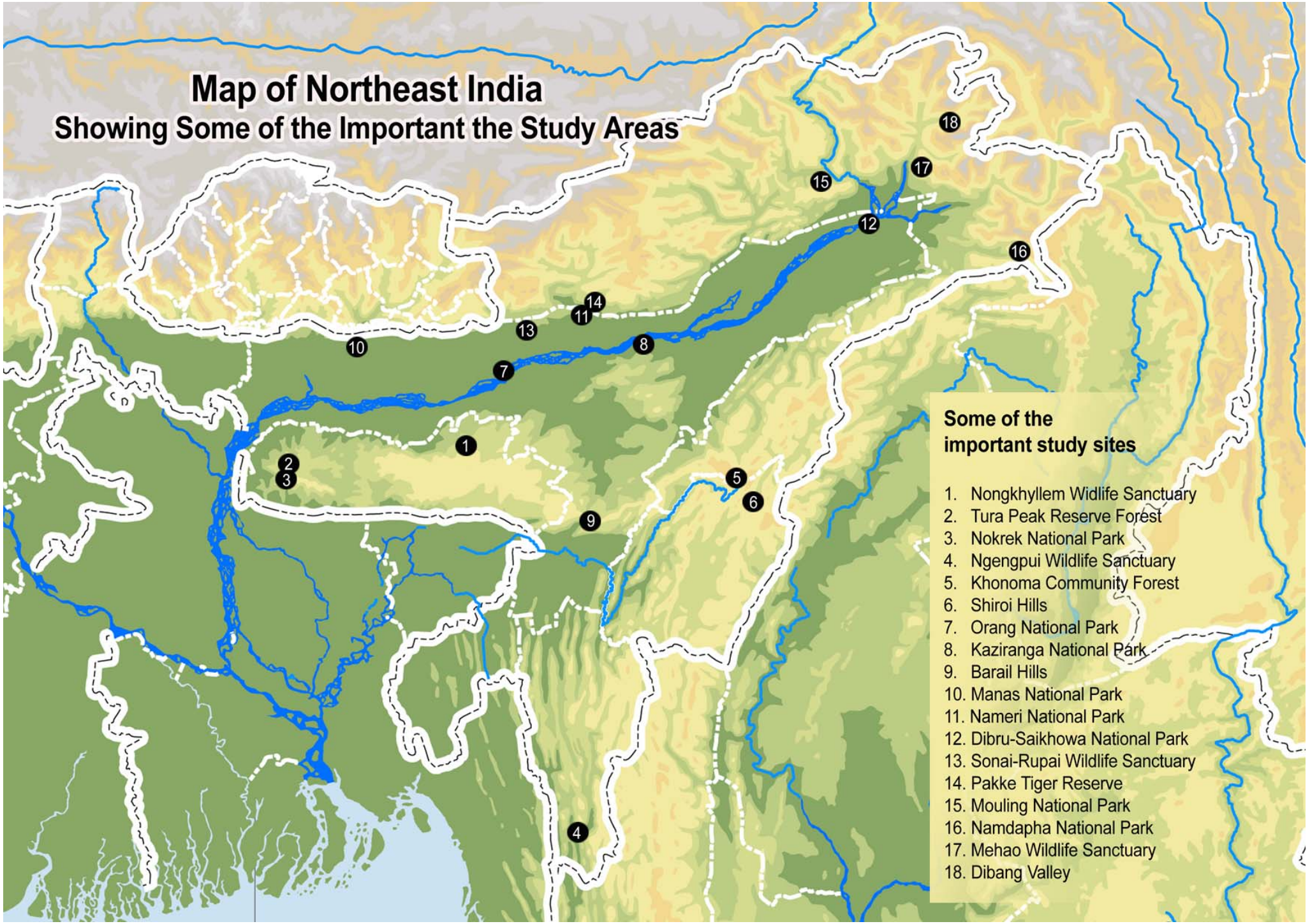
NE India is spanning across the Eastern Himalayas and Indo-Burma global biodiversity hotspots and forms a significant portion of both these biodiversity hotspots (Mittermeier *et al*., 2004). The region can be broadly differentiated into the Eastern Himalaya (Olson and Dinerstein, 2002) to the north, the North-east Hills (Meghalaya and Mizoram-Manipur-Kachin Forest Zones of Olson & Dinerstein, 2002) to the south, and the Brahmaputra plain (the Brahmaputra valley forest zone of Olson and Dinerstein, 2002) in between (also see Mani, 1974). Of these, Eastern Himalaya and North-east Hills are primarily montane zones with contrasting geological origin and morphology, while the Assam plains (Brahmaputra and Barak plain) is mainly alluvial deposit of Brahmaputra and Barak river (Mani, 1974). North-east India has a relatively complex biogeography due to a combination of factors, including its age, unique plate tectonic and palaeoclimatic history, location at the confluence of distinct realms (Afrotropic, Palearctic, and Indo-Malay; cf. Olson and Dinerstein, 2002), wide physiognomic range (e.g. altitude ranging from *c*. 100 to > 7000 m above sea level) and habitat diversity (from tropical to alpine; Champion and Seth, 1968; Puri *et al*., 1989). Distribution data across multiple plant and animal groups indicate that the region's biological affinities are closest to South-East Asia (Mani, 1974).

The northeastern region is a 'Hotspot' of tortoises and freshwater turtles within India. Out of 29 species known from India, 21 species are so far recorded from this region (Ahmed *et al*., 2009). Few efforts related to the turtles of the region are Fritz *et al*. (2008), Pawar and Choudhury (2000), Das (1990), Prachag and Gemel (2002), Sengupta *et al*. (2000), and Choudhury (1995). Still, the rich diversity of turtle resource is still poorly known. Especially the information from the field is scanty. This is evident that even new species (Fritz *et al*., 2008) and new country records (Pawar and Choudhury, 2000; Paschag and Gemel, 2002) are recently been reported from the region. Sadly, the tortoises and freshwater turtles of the region are facing extinction due to excessive hunting for meat and rapid loss of habitat. They are being extirpated very fast in most part of the region from outside well protected conservation areas.

This study carried out over last three years and spreading over six states of the region (excluding Tripura) has attempted to evaluate the current status of tortoises

and freshwater turtles of the region. It has been found that the chelonians are increasingly pushed towards extinction due to over-exploitation and habitat loss. Most of the species populations are now restricted to the protected areas. Turtles were extensively collected for meat, particularly the Softshell turtles and large sized hardshell turtles as well. Catch per effort has gone down drastically as reported by the fisherman. Further, markets that used to sell turtles regularly now hardly gets those to sell and even when that get is it is sold without notice of the police and forest department making it increasingly difficult to monitor if the turtles are still sold in large numbers.

As part of this study, we plan to hold a workshop to evaluate Current Status, Conservation Prioritization and prepare Strategic Action Planning for Tortoises and Freshwater Turtles of Northeast India within this year and results of the workshop will be presented in a separate report in due course.


Map of Northeast India
Showing Some of the Important the Study Areas
Some of the important study sites
1. Nongkhyllem Widlife Sanctuary
2. Tura Peak Reserve Forest
3. Nokrek National Park
4. Ngengpui Wildlife Sanctuary
5. Khonoma Community Forest
6. Shiroi Hills
7. Orang National Park
8. Kaziranga National Park
9. Barail Hills
10. Manas National Park
11. Nameri National Park
12. Dibru-Saikhowa National Park
13. Sonai-Rupai Wildlife Sanctuary
14. Pakke Tiger Reserve
15. Mouling National Park
16. Namdapha National Park
17. Mehao Wildlife Sanctuary
18. Dibang Valley

Methodology

The study was carried out during October 2006 through May 2010, with an aim to determine the diversity, distribution and natural history information of turtles and tortoises in Northeast India. The study area included protected areas, non protected areas, rivers, lakes, forest streams, temple ponds and the fringe areas including tea gardens, paddy and human habitations.

Field surveys were carried out during day time. During the extensive survey, we carried out visual inspection of forest floor, shrubberies, grasses and wetlands. All possible ecotones were searched thoroughly including such microhabitat as puddles and springs and along the streambeds, wetlands, aquatic vegetations, basking areas, under loose barks and logs, bases of buttressed trees, under rocks, accumulated debris and such areas which often attract turtles and tortoises for food, shelter or breeding.

We looked for turtles and tortoise during 0800 hr to 1200 hr and in the afternoon 1400 hr till dusk. While looking for basking or active reptiles we visually mapped the habitat to be surveyed in the afternoon.

Occasionally turtles at distant were observed through binoculars (20x50) and spotting scope (40X). Whenever possible individuals were caught, photographed and measured for future reference and released back. Turtle shells were observed at different localities- protection camps inside the park and also from the villages.

Data sheet (Annexure 01) was filled in to record- date, time, specific locality, latitude, longitude and altitude (recorded using a Garmin 12 channel GPS), habitat type, habitat description, morphological measurements, weather such as temperature and humidity, detailed live coloration and natural history as well as other important field notes were taken for most of the animals we observed. Photographs were taken in natural condition for additional information. Forest staffs based in the camps inside the park and communities living on the fringe villages were interviewed to get more information about turtles.

Taxonomy and nomenclature in this report follows Das (2002, 1995), Prachag and Gemel (2000), Praschag *et al.* (2007a), Praschag *et al*. (2007b), Fritz *et al.* (2008), Praschag *et al*. (2009), Fritz and Havas (2007).

Study Sites

The following representative sites were extensively surveyed to evaluate the turtle diversity and distribution -

Nongkhyllem Widlife Sanctuary, Meghalaya: The Nongkhyllem Reserve Forest is located in Ri-Bhoi District of Meghalaya (25° 50′ to 25° 58′ N and 91° 45′ to 91° 50′ E) covering an area of 96.91 sq. km excluding the Nonkhyllem Wildlife Sanctuary, which is 29 sq. km. The climatic condition of the area is tropical monsoon type and experiences an annual average rainfall of 2500mm. Temperature varies from minimum of 6° C in winter to maximum of 32° C in summer. Altitude ranges from 240 m to 800 m. Bulk of the habitat is tropical moist deciduous with patches of tropical semi-evergreen forests. The Wildlife Sanctuary is under the administration of Khasi Hills Wildlife Division, Shillong. The Range Office is located at Nongpoh and has four beat offices located at Lailad, Umtasor, Audit Point and Bench Point. Except the Reserve Forest the adjacent forests are either mostly degraded or privately/community owned.

Tura Peak Reserve Forest, Meghalaya: Tura is the district Head Quarter of West Garo Hills. A high hill range stands on its eastern border, known as Tura-Nokrek Hill range with maximum altitude of 1431 m above msl (Nokrek Peak). The Tura Peak Reserve Forest (25° 8′ to 26° 1′ N and 89° 49′ to 91° 21′ E, Alt. 500-1045 m) or Tura Catchment area is an important amphibian habitat for herps indicated by description of four endemic species (Annandale, 1912 and 1919).

The hill range is very rich in biodiversity because of its topography, climate and soil. Average annual rainfall varies from 1500–3500 mm. Forest of the area is tropical evergreen, sub tropical broadleaf and secondary bamboo forests. The Tura Catchment Area or Tura Peak, overlooking the Tura town, is a reserve forest and is under the administration Divisional Forest Officer (Territorial), Tura.

Nokrek National Park, Meghalaya: Nokrek National Park (25° 30′ N and 90° 15′ E, alt 1430m) is located in the West Garo Hills district of Meghalaya. Garo Hills, one of the very biodiversity rich areas of the northeast India. This park was established in 1986 with an area 47.48 km^2 to preserve the rich flora and fauna of the state. The park includes the Nokrek Peak (alt. 1430m), the highest peak in the western Meghalaya, formerly Garo Hills. The park is also a Biosphere Reserve.

The vegetation of the area is mainly tropical evergreen and semievergreen especially the south facing hills and also moist deciduous forest. Some broadleaf forest patches are also found in parts of the park. Temperate cloud forest is prominent on the peak area. The area experiances heavy rainfall (app. 2500 mm) during the monsoon.

Ngengpui Wildlife Sanctuary, Mizoram: The Ngengpui Wildlife Sanctuary (22^o 21′ 24″ - 22^o 30′ 06″ N to 92^o 45′ 12″ - 92^o 50′ 20″ E, alt. 180-540 m) is located in southern part of Mizoram and covers an area of 110 km^2 that encloses the valley of Ngengpui River and adjoining hills. The Ngengpui River flows through the heart of the sanctuary from north to south, and joins the Kolodyne River in the south. The rainfall is very high in the sanctuary with average annual precipitation 2752

mm and conditions are humid even during the drier seasons. Vegetation is tropical moist evergreen and most of the areas within the sanctuary are primary depterocarp dominated patches, while the surrounding areas are mosaic of bamboo-dominated patches, remnant mature forest, teak plantation and shifting cultivation or fallow of varying ages (Pawar and Choudhury, 2000).

Khonoma Community Forest, Nagaland: Khonoma Nature Conservation and Tragopan Sanctuary (25° 38.927 N - 94° 01.617' E, alt. 1900-2750 m) is situated near Kohima in southern Nagaland. The forest is owned by village community and managed by an independent trust approved by the village council. Vegetation of the sanctuary is Tropical Evergreen, semi evergreen, broadleaf temperate, short bamboo. Surrounding areas are covered with terrace cultivation and alder forest. Annual average rainfall in the area is above 2000 mm. Temperature varies from sub zero— 30° C.

Shiroi Hills, Manipur: Shiroi Hills is located in the Ukhrul district of Manipur state about 100 km northeast of Imphal. Though most of the hills in this hill district are razed due to traditional agriculture practices, however, the slopes of Shiroi hills are still having subtropical and tropical broadleaved evergreen forest and grasses and scrubs on the hilltop. The Shiroi hill is famous for the Shiroi Lily (*Lilium macklineae*), which is endemic to the Shiroi Hills peak (2755 m msl) only. Total area of the study site is approximately 50 km² (25° 06.362' N - 94 ° 27.613' E, alt. 1500-2570 m) experiencing more than 2000 mm of rainfall annually. Temperature varies from 5°—30° C.

Orang National Park, Assam: The Orang National Park (26° 30′ to 26° 40′ N and 92° 15′ to 92° 30′ E, elevation 40-60 m) is located on the floodplains of the River Brahmaputra on the southern part of the Darrang and the Sonitpur districts of Assam. The park covers an area of 78.81 km² and receives above 3000 mm annual average rainfalls (Talukdar and Sarma, 1995). The annual monsoon flood repeatedly inundates a large part of the park.

The general vegetation type of the park comprises an admixture of dry and wet grassland and the forest type is dry-deciduous The forest (5-10% of total area) is dominated by *Dalbargia sisso, Bombax ceiba, Lannea grandis, Terminalia myriocarpa, Gmalina arborea, Albizzia procera, Dillenia indica* and *Oroxylon indica*. About 45% of the total park area is covered by tall alluvial grassland dominated by *Phragmytes kakra, Saccharum* spp. and *Erianthus ravannae* while wetlands and swamps covers the rest (Management Plan, 2003; Talukdar and Sharma, 1995). Extensive ecotones are created by all these habitats and ecosystem mosaic.

Human habitation and agriculture surround the park all around, even on the large river islands to the south. The area has been under some kind of protection since early twentieth century and was declared as Game Reserve as early as in 1915 and as Wildlife Sanctuary in 1985 (Talukdar and Sarma, 1995).

Kaziranga National Park, Assam: The Kaziranga National Park (26° 34′ N to 26°46′ N and 93° 08′ E to 93° 36′ E) covers civil jurisdictions of Nagaon and Golaghat districts in Assam. The Brahmaputra River flows by the northern boundary and Karbi Anglong hills stands to the south. Thickly populated villages bound the east and west as well as south boundaries of the park leaving only three small forested corridors to the Karb Anglong Hills on south. The total area of the park at present is 430 km^2 and with new and proposed additions the total area spreads over 860 km^2.

The alluvial deposits of the Brahmaputra River and its tributaries, which carry a great amount of silt during the rainy season every year, formed most of the Park area (Vasu, 2003). The Brahmaputra River forms and removes alluvial land bars (river islands) every year and islands thus formed is initially colonized by *Saccharum* sp. and other grass species as soon as the land bars are stabilized. Numerous channels of the Brahmaputra River once flowed crisscrossing the entire park area and in course of time the deep water wetlands of various sizes and depth were formed. Some of the large beels are Borbeel, Dafflong, Dunga, Boisamari, Goroimari, Jhalki, Kilakili, Mihi, Roumari, Sohola, Sapekati and so on. All together there are 191 small and large wetlands or beels in the park.

Diffolu River originating from Karbi Anglong Hills to the south flows east to west and divides the park in two sections before merging to the Brahmaputra. Deopani and Mora-Diffolu are the other two rivers that drain through the park. Numerous small streams from the Karbi Anglong flows north into the park including drainage from the tea gardens. All together there are 58 rivers, rivulets and streams in the drainage systems of the park

Kaziranga NP has the largest population of Indian one-horned rhinoceros (*Rhinoceros unicornis*) with 70% of the global population (Sawarkar, 1995). The park also has population of Asian elephant (*Elephas maximus*), swamp deer (*Cervus duvaucelli ranjitsinghi*), Asiatic water buffalo (*Bubalus arnee*), and tiger (*Panthera tigris*) significant from conservation point of view. This park is also home to some 490 species of birds (Barua and Sharma, 1999; Choudhury, 2004). However, prior to this work no thorough study was carried out to evaluate the herpetofaunal species richness of the Kaziranga NP.

Barail Hills, Assam and Nagaland: Barail hill range (24^o 58´- 25° 50' N and 92° 50' - 92° 52' N) is a southwestern extension of Patkai range and runs south-westerly from southern Nagaland and parts of Northern Manipur up to Jaintia Hill in Meghalaya. The range also forms watershed between two largest river systems of Northeast- the Brahmaputra and the Barak and form well known valley of Jatinga. The range forms important catchments of the Barak River, which is the second largest river of Northeast India. Barail range also forms catchments of Jatinga River, Doloo River and the Harang River. The vegetations of the hill range vary from subtropical broadleaved hill forest at higher reaches (Dzaphü peak in Southern Nagaland) to semi evergreen and evergreen elements at lower reaches (Assam). Thus the site covers two Biomes: Biome 8 (Sino-Himalayan subtropical forests) at 1000-2000 m and Biome 9 (Indo-Chinese Tropical Moist evergreen Forest) mainly below 1000 m.

Manas National Park, Assam: Manas National Park (26°35'-26°50'N, 90°45'-91°15'E) is the core area of Manas Biosphere Reserve with an area of 500 sq. km., located in Baksa and Chirang districts of the BTC, Assam. The National Park is surrounded by Reserve Forests to its east and west. To the north of Manas National Park is the Royal Manas National Park (1023 km^2.) of Bhutan which is a contiguous forest. On the other hand, the southern side is bounded by thickly populated villages. It is also recognized as an Important Bird Area for its outstanding avifaunal diversity and significant population of some globally threatened species (Birdlife International, 2003). Manas National Park is divided into three ranges viz. Bansbari, which is the central range, Bhuyanpara , the eastern range and Panbari, the western range for smooth management of the Park.

The vegetation types recorded in the Park consist of evergreen forest, semi evergreen forest, mixed moist deciduous forest, grassland, wetlands and riparian forest (Rabha, 2001). The grassland of Manas National Park are the second largest in the entire North-East India (Choudhury, 2003).

Nameri National Park, Assam: The Nameri National Park is situated in the foothills of the Arunachal Himalayas on the northern part of Sonitpur district of Assam (92° 38′ 57″ and 93° 05′ 00″E and 26° 48′ 23″ and 27° 03′ 43″ N). It is contiguous to the Pakke Wildlife Sanctuary in Arunachal Pradesh and makes a socio-ecologically important conservation area in the eastern Himalayan eco-region on the north bank of the Brahmaputra River. It also represents the core of an extensive wildlife habitat that is home to important migratory wildlife along the trans-border tract of Bhutan and Arunachal Pradesh of India in the Eastern Himalayas (Rodgers and Panwar, 1988).

The River Jiabhoreli flowing along the western border of the park is breeding sites of endangered fish species like the Golden Mahsheer (*Labeo pangusia*). It also acts as an important barrier for human.

The vegetation pattern of the park ranges from grasslands in riverine successional stage to high forests of various species in the climax stage. The park has grasslands (sustained by floods and fire) and semi-evergreen forests. The principal forest types of the NTR include Upper Assam Valley Tropical Evergreen Forest- Mesua forest, Sub-Himalayan Light Alluvial Semi Evergreen Forest, Pioneer Euphorbiaceous Scrub, Eastern Alluvial Secondary Semi Evergreen Forest, Cane Brakes, Eastern Heavy Alluvial Plains Sal, East Himalayan Moist Deciduous Forests, Low Alluvial Savannah Woodland (*Salmalia Albizzia*), Eastern Dillenia Swamp Forests (*Dillenia - Biscofia* composition and *Dillenia - Mesua* Composition) (Champion and Seth, 1968). The park experiences more than 3000 mm of annual average rainfall and temperature varies from 7° C - 35° C.

Dibru-Saikhowa National Park, Assam: Dibru-Saikhowa National Park is situated in the floodplain of the upper reaches of the Brahmaputra River in eastern Assam. Covers an area of 340 km^2 in the Dibrugarh and Tibsukia district. Altitude varies from 110-126 m asl. The place enjoys tropical climate with a long rainy season from April to September. Annual rainfall varies from 230-3800 mm and temperature varies from 7-34 °C. The vegetation of the park comprises of semi-evergreen and evergreen forest, moist deciduous forest, alluvial grassland, littoral and swamp forests. The park is inhabited by 36 species of mammals that include, tiger, elephant, wild buffalo, Leopard, sambar, hog deer, Gangetic dolphin, etc. As many as 350 species of birds are recorded from the park including white winged wood duck, vultures and black breasted parrotbill. The park is also a Biosphere Reserve and is the second in the state of Assam.

Sonai-Rupai Wildlife Sanctuary, Assam: Sonai-Rupai Wildlife Sanctuary is situated in the Sonitpur district of Assam (26^o 55' 11'' N; 92^o 34' 24'' E). The Sanctuary has an area of 220 km2 which was initially declared as a Game Reserve in 1934 because of its rich biodiversity that included Indian One-horned Rhinoceros and reported populations of Wild Buffalo. Both of these species are however, now locally extinct from this Sanctuary. The Sanctuary is on the interstate border with Arunachal Pradesh. It was earlier part of the Charduar Reserve Forest. The rivers *Gabharu. Gelgeli, Sonai and Rupai* flow through the Sanctuary. The habitat is basically comprised with Tropical Wet Evergreen, Tropical Semi-evergreen, Tropical Moist Deciduous Forests and Tropical Grasslands. Rainfall ranges between 2000-2800 mm. The terrain in Sonai_rupai is flat and gently sloping towards the south, typical of Bhabar and terrain areas. Most of Sonai-Rupai is tree forest, but there are large patches of grassland also (Islam and Rahmani, 2004). The grasslands are represented by *Cymbopogon citrates, Imperata cylindrical, Saccharum narenga, Erianthus longisetosus, Typha elephantina, Sclerostachya fusca, Digitaria longiflora, Panicum humidorum, Alpinia allughas, Eupatorium odoratum, Themeda arundinacea*, *Saccharum procerum, Apluda aristita* and *Phragmites karka*.

In Sonai-Rupai Wildlife Sanctuary five different types of land use/ land cover classes have been identified. These include- dense forest which is covered by 31% of the total area, open forest by 10%, grassland by 20%, degraded forest by 31% and river & sandy area by 8%. (Red dots indicate the location of transect survey).

Pakke Tiger Reserve, Arunachal Pradesh: Pakke Tiger Reserve (TR, 862 km^2, 26^o 53' 07"- 27^o 16' 02" N and 92^o 07' 05"- 92^o 22' 00"E) in East Kameng district of western AP. The park is surrounded by contiguous forests on most sides and bounded by rivers in the east, west, and north. Numerous small rivers and perennial streams drain the area. The terrain is undulating and hilly, with elevation ranging from 60 to over 1700 m. The central and northern part of the sanctuary is relatively inaccessible due to dense vegetation and hilly terrain, whereas hunting, fishing, and collection of cane and other minor forest products occur along the southern boundary. The study area has a tropical climate, with cooler weather from November to February. It receives rainfall from the southwest monsoon (May– September) and the northeast monsoon (December– April). The

vegetation of the reserve is classified as Assam Valley tropical semi evergreen forest 2B/C1 (Champion and Seth, 1968).

Mouling National Park, Arunachal Pradesh: Mouling NP (28° 28′ - 28° 42′ N and 94° 42′ - 95° 10′ E, alt. 400-3064 m) is located in the upper Siang district of Arunachal Pradesh, adjoining the Siang Valley. The Siang River curves through the rugged mountains with highest peak 4593 m msl). The area is extremely humid, with high rainfall and apparently no well defined rainless seasons. As the valley cut deeply into the mountains and hills raises very high, it contains tropical, subtropical and alpine elements in vegetation at different elevations. With large number of drainages the area provide optimum habitat for amphibians along with many other species of animals. The area of the park is about 483 sq km with an annual average rainfall of 2343 mm).

Namdapha National Park, Arunachal Pradesh: The Namdapha National Park (27° 23′ to 27° 39′ N and 96° 15′ to 96° 58′ E) is located in the Changlang district of Arunachal Pradesh. The habitat is contiguous with Myanmar on east and south and spread over an area of 1985 sq. km. The park, situated at the transition zone of the Indian and Indo-Chinese biogeographic region has tremendous importance from the biogeographic point of view. The richness of biodiversity in this region it quite high due to occurrence of five distinct biomes in the belt, viz. evergreen forests, moist deciduous forest, sub-tropical forests, temperate forests and alpine forest that is probably not found in any protected areas in the continent. The area also offers a wide variety of altitudinal gradient that varies from 150 m at Miao to 4621 m at Daphabum (Singh *et al.,* 2000).

The reserve has three distinct climatic season viz. winter (December to February), Premonsoon (March to May), Monsoon (June to September) and post monsoon (October to November). Annual average annual rainfall is 3000 mm and temperature varies from 5°—37° C.

Mehao Wildlife Sanctuary, Arunachal Pradesh: Located on the southern facing slopes of Mishmi Hill Range, Mehao wildlife Sanctuary (28^0 5′ and 28^0 15′ N and 930 30′- 95^0 45″ E) is one of the most diverse protected area of the state of Arunachal Pradesh. The Sanctuary was declared in the year 1980 with an area of 281.5 sq. km. These south facing slopes of Mishmi Hills receive very heavy rainfall (Choudhury, 2003). The Dibang River with its wide network of Small mountain streams and rapid waterfalls is the major drainage system of the sanctuary. However the best feature of the sanctuary is its tremendous altitudinal variation from 400m a.s.l to 3568m a.s.l which presumably indicates its diverse biota particularly of Herpetofaunal taxa where species replacement occurs according to altitudinal gradients. Also due to this remarkable altitudinal variation, this site represent three Biomes: Biome 7 (Sino-Himalayan Temperate Forest), Biome 8 (Sino-Himalayan subtropical Forest), Biome 9 (Indo-Chinese Tropical Moist Forest).

Dibang Valley (Dihang-Dibang Biosphere Reserve and Dibang Wildlife Sanctuary): The Biosphere Reserve constitutes an area of 5112 km^2 in the district of West Siang, Upper Siang and Dibang valley of Arunachal Pradesh. An area of 4095 km^2 constitutes the core zone of the Reserve. Due to the steep terrain the area has a very sparse human population.

The vegetation varies as the BR has an altitudinal range from 500-6000 m. The type of vegetation seen are 1. Sub-tropical broad leafed forests, 2. Sub-tropical pine forest, 3. Temperate broad leafed forests, 4. Temperate conifer, 5. Sub-alpine woody shrub, 6. Alpine meadow (Mountain tundra) and 7. Bamboo brakes.

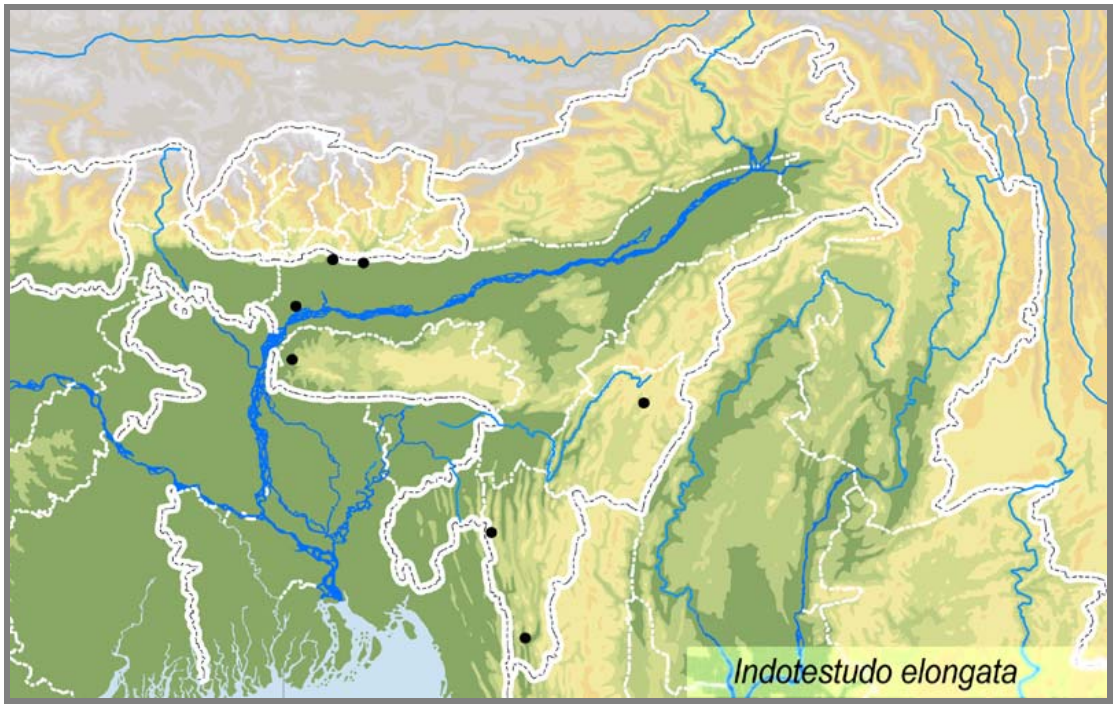
The BR is very rich in fauna. Some of the species here are endemic to the eastern Himalayas, many of these as well as others are listed at endangered. Herpetofauna of the BR is poorly known. The BR also rich in threatened species like tiger, leopard, clouded leopard, snow leopard, lesser cats, takin, goral and serow, as well as red panda. Other animals include Bison, Himalayan Black Bear, Sloth bear, Indian Wild dog, Red fox, Assamese Macaque, Squirrel, Civet and Wild Boar.

Results

Species Account

Indotestudo elongata, Yellow Tortoise

a. *Indotestudo elongata*, adult, b. Juvenile, c. plastron of *I. elongata*



Distribution map of *Manouria emys*, see text for more.

Indotestudo elongata (Blyth, 1853)

Yellow Tortoise

Diagnostic Characters: Shell elongated, elevated carapace flat above. Shell rounded in young. Nuchal long and narrow, vertebral I as long as broad, II, III and IV broader than long. Dorsum yellow with black blotches of variable sizes; occasionally yellow or mostly dark. Plastron yellow, usually with black blotch. Tail tip bears a claw like spur. Male with concave plastron.

Distribution: India, Nepal, Bangladesh, SE Asia and Peninsular Malaysia.

This Study: Kalamati, Manas National Park, Aizwal, Manipur. This species is expected on the foothills of the region along Assam-Bhutan-Arunachal Pradesh border areas and similarly, Assam-Manipur-Nagaland-Mizoram bordering areas.

Literature and Museum Record: Dampa Tiger Reserve, Rhiang hamlet near Nengpui Wildlife Sanctuary (Pawar and Choudhury, 2000), Tura (Das, 1995), Dhubri (Dutta, .

Notes: In Kalamati male individual (SCL 27.5 cm, PL: 23.5 cm, PW, 15.7 cm) was collected from a Sal forest. The juvenile (SCL 9 cm, PL: 7.6 cm) was found under a rock and uncovered while constructing a forest road.

Primarily land dwelling. Inhabit moist deciduous and evergreen forests at foothills (usually below 500 m). The species is widely distributed in the Sal (*Shorea robusta*) and Teak (*Tectona grandis*) forests of south and southeast Asia (Das, 1995). Most active during breeding season (monsoon). Lay 2-9 eggs per clutch. Feeds on shoots, buds, fruits, flowers, mushroom and occasionally slugs, worms and insects.

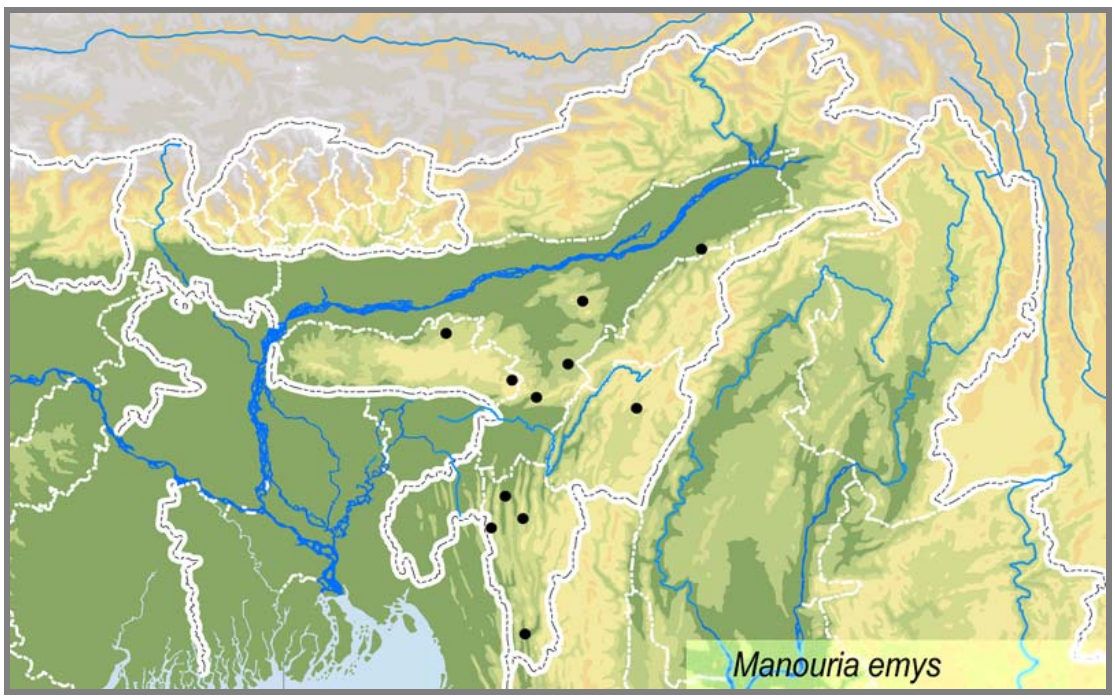
Conservation Status: Endangered (IUCN), Appendix II (CITES) and Schedule IV of the Wildlife (Protection) Act, 1972. Rare and exploited for meat and pet trade.

Population Status: Not known. Declining due to loss of habitat and exploitation for turtle meat. Forest areas of Manas Tiger Reserve bordering Bhutan holds promise for survival of this species.

Recommendation: Population and ecological study. Upgrade to a higher Schedule of the Wildlife (Protection) Act, 1972.

Manouria emys, Asian Brown Tortoise

a. *Manouria emys*, adult, b. close up of head, and c. plastron of *M. e emys* (left) and *M. emys phayrei* (right)



Distribution map of *Manouria emys*, see text for more.

Manouria emys (Schlegel and Müller, 1840)

Asian Brown Tortoise

Diagnostic Characters: Carapace convex, rounded (in young) or elongated (in adult). Colour dark brown or black blotches on carapace. Several spines on upper thigh. Tail ending into a horny scale. Two subspecies known; in subspecies *phayrei* pectoral scutes on plastron touches each other and they are separated in subspecies *emys*.

Distribution: India (Northeast India south of river Brahmaputra), Bangladesh, Myanmar, Thailand, Malaysia, Sumatra and Borneo.

This Study: Barail Wildlife Sanctuary; Aizwal and Mamit district, Mizoram, unspecified location in Manipur (observed in Manipur zoo).

Literature and Museum Record: Umling and Lailad Village, Nongkhellym Wildlife Sanctuary, Nongpoh village, east Khasi Hills (Das, 1990), Cachar Hills (Anderson, 1871), Lumajooting near Naga Hills (Anderson, 1872).

Jerdon (1870) wrote that the species is not uncommon in the hills of North Cachar, from where Godwin-Austin's specimens were obtained. The same authority stated, on information received, the tortoise extends westwards to the Jaintia hills (eastern Meghalaya. Probably in Manipur (Das, 1995). Tarapung area, Kalyani reserved forest of Karbi Anglong (Choudhury, 1996).

Lengteng (2000 m) near Lamzawl village (Choudhury, 2002), Phura and Sangau in Saiha district (Choudhury, 2001), Dampa and Nengpui Wildlife Sanctuaries (Pawar and Choudhury, 2000).

Notes: Primarily terrestrial. Inhabit evergreen forests in the Hills close to water. Remain inactive for long period, partially buried in damp soil or water. Lay 23-51 eggs in each clutch that hatch in 60-75 days. Feeds on plants- shoots, tubers, bamboo shoots, and probably wild fruits.

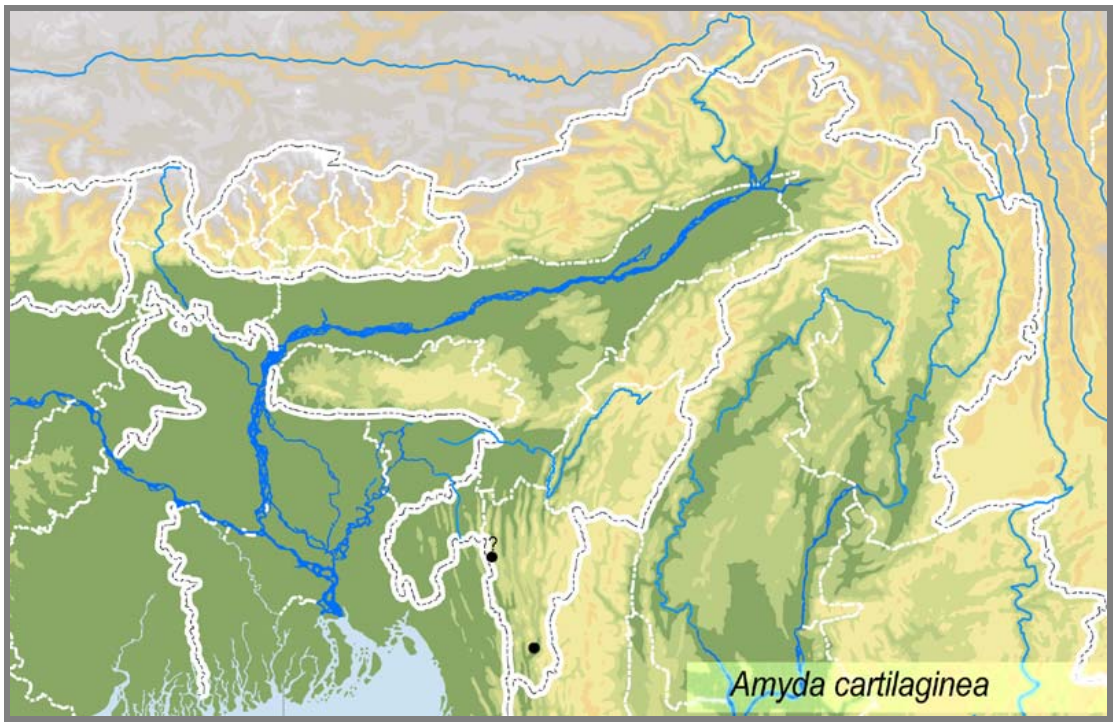
Conservation Status: Endangered (IUCN), Appendix II (CITES), and Schedule IV of Wildlife (Protection) Act, 1972. Rare. Exploited in the hill areas of the region where they are found.

Population Status: Not known but believed to be declining fast due to habitat loss and exploitation. Nengpui Wildlife Sanctuary, North Cachar Hills and Nongkhyllem Wildlife Sanctuary are known to support wild population and undisturbed habitats.

Recommendation: Study on exploitation trend, ecology and population. Initiation of Captive breeding programme. Upgrade to a higher Schedule of the Wildlife (Protection) Act, 1972.

Amyda cartilaginea, Malayan *Softshell* Turtle

a. and b. *Amyda cartilaginea*, adult, c. head of *A. cartilaginea*



Distribution map of *Amyda cartilaginea*, see text for more.

Amyda cartilaginea (Boddaert, 1770)

Malayan Softshell Turtle

Diagnostic Characters: Carapace low; greenish or olive with yellow and black speckling. Head with numerous indistinct yellow spots on olive. A distinct row of tubercles along anterior edge of the carapace. Plastron white or grey with 5 callosities.

Distribution: India (Mizoram), Southeast Asia, Sumatra, Java and Borneo.

This Study: Dampa Tiger Reserve, Mizoram. This record is based on photographs of a turtle collected by hunters from a river inside the reserve.

Literature and Museum Record: Nengpui Wildlife Sanctuary, Mizoram (Pawar and Choudhury, 2000).

Notes: The individuals from Mizoram were reported to be caught by fisherman from rocky bottomed hill streams. The turtles were mainly hunted during dry season when water recedes and the turtles take refuge under silt/sand. Female collected in late February contained 18 small oviductal eggs. Dominant food material is found to be plant material although the species is omnivore feeding on fishes, insects and even birds and regarded as an opportunistic omnivore (Jensen and Das, 2008). Known to nest along the river bank where 4-8 rounded eggs are deposited that hatch in 130-140 days.

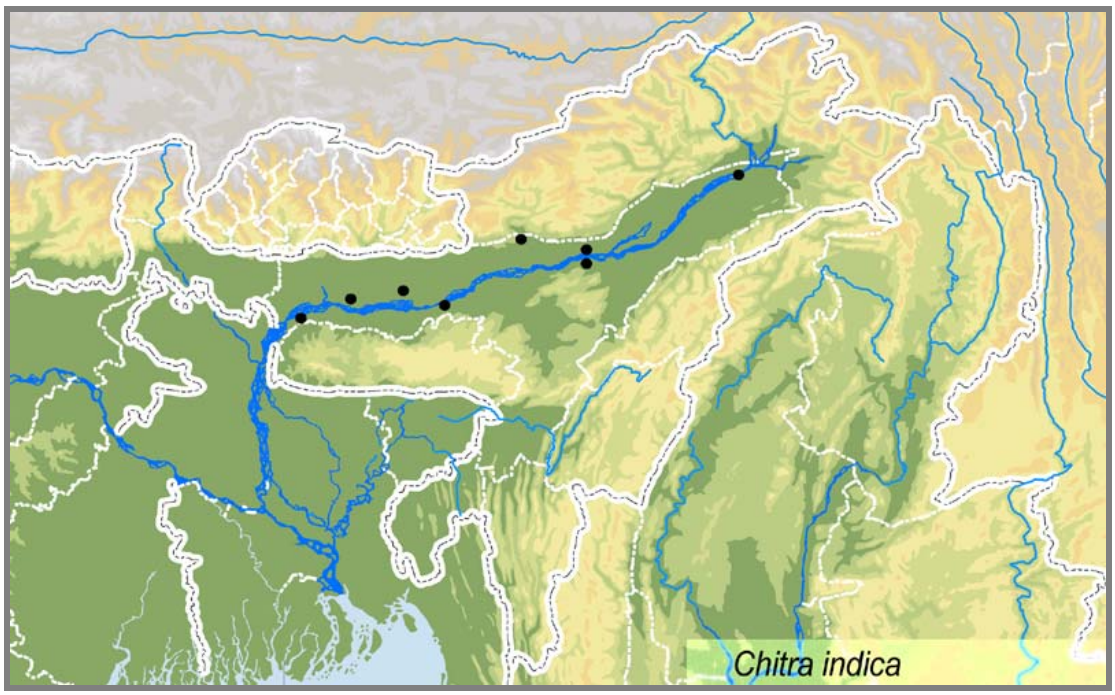
Conservation Status: Vulnerable (IUCN), Appendix II (CITES), no legal protection in India yet. Not recorded yet from any protected area in the region except the report from Dampa Tiger Reserve (this study). Perhaps population is mostly found outside protected areas and hence exploited extensively .

Population Status: Nothing known about its population. However, drainage in parts of southern Mizoram and Dampa Tiger Reserve holds undetermined populations that are also exploited often.

Recommendation: Systematic survey of important drainages like Chimtuipui and its tributaries of southern Mizoram and drainages in Dampa TR to assess abundance of the species. Ecological and molecular phylogenetic study is recommended. List in the Schedule of the Wildlife (Protection) Act, 1972.

Chitra indica, Narrow-headed Softshell Turtle

a. *Chitra indica*, adult, b. close up of head, and c. plastron of *C. indica*



Distribution map of *C. indica*, see text for more.

Chitra indica (Gray, 1831)

Narrow-headed Softshell Turtle

Diagnostic Characters: Flat and oval carapace. Gray to dull olive covered with wavy and complex dark brown pattern that forms stripes on neck. Patterns fade with age. Head narrow, long and flat. Stripes on neck continue to head. Eyes positioned dorsally. Snout short and small. Plastron white with four callosities.

Distribution: India, Bangladesh, Nepal and Pakistan.

This Study: Puthimari Village (Kamrup), Bishwanath Ghat, Kaziranga National Park, Nagshankar and Sarupeta temple pond.

Literature and Museum Record: Fakirganj ferry ghat, Dhubri (Datta, 1997). Dibru-Saikhowa NP (Choudhury, 1995), Kaziranga NP (Choudhury, 2004). Two basking individuals spotted on the sandy Brahmaputra river bank of Debeshwari and Arimora during our survey. Reported from Kazirranga National Park and Nameri National Park of Assam (Bhupathy *et al*., 1999). Choudhury (1995) reported it from Dibru-Saikhowa National Park. Often seen in the temple tanks of Assam. Two individuals in the possession of Assam State Zoo are reported to be from Brahmapyutra River. These indicate that the species has a wider distribution in the Brahmaputra river system.

Being exclusively aquatic this species is rarely seen. Information on population is lacking. Also used to be seen commonly in local markets. Require in-depth research on population and ecology of this species. Sharma and Nakhasi (1981) studied the chromosomes of the species supposedly from the specimen derived from Shillong, Meghalaya. However, it is unlikely that C. indica will occur in Shillong.

Notes: Diurnal. Inhabit least turbid water with sandy bottom. Remain buried at bottom under sand, keeping only the eyes and snout out to catch prey at lightening speed. Rarely seen on land or basking. Lay 65-187 round eggs that hatch in 40-70 days. Fish and mollusk are main diet.

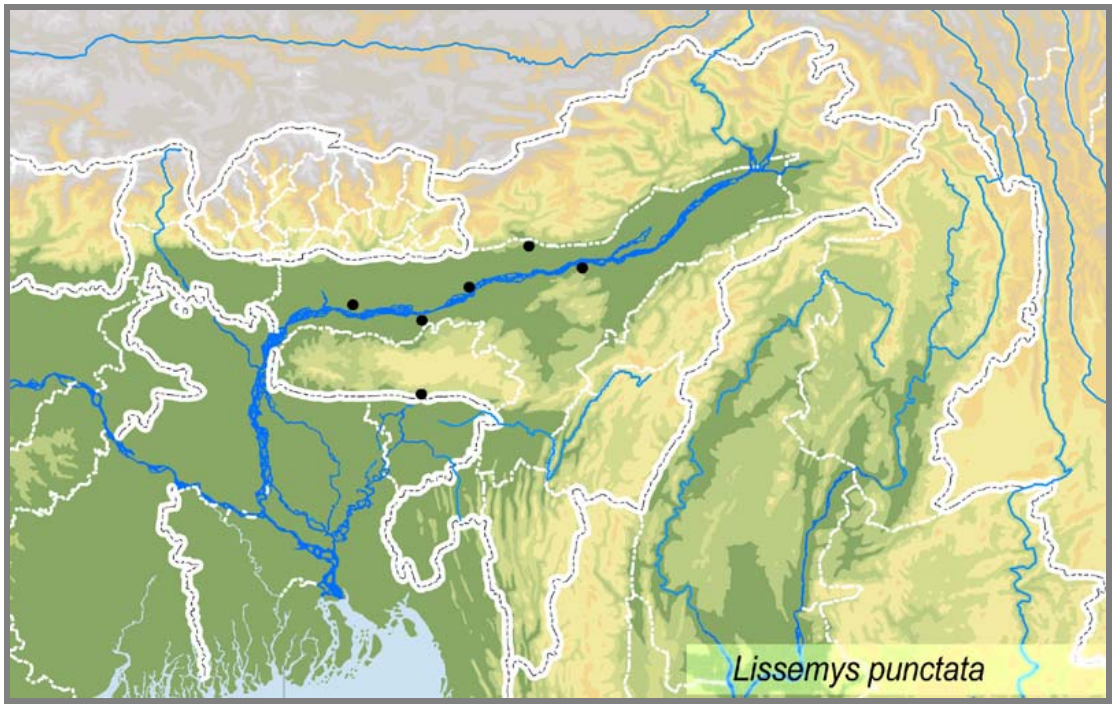
Conservation Status: Endangered (IUCN), Appendix II (CITES) and Schedule IV of Wildlife (Protection) Act, 1972. Very rare. Extensively exploited for local turtle meat trade.

Population Status: Not known. Declining along with other softshell turtles. Brahmaputra and its tributaries (around Kaziranga and Orang NP) hold potential for survival of this species.

Recommendation: Study on population and ecology. Upgrade to a higher Schedule of the Wildlife (Protection) Act, 1972.

Lissemys punctata, Indian Flapshell Turtle

a. *Lissemys punctata*, adult, b. close up of head, and c. plastron with flaps



Distribution map of *L. punctata*, see text for more.

Lissemys punctata (Lacepede, 1788)

Indian Flapshell Turtle

Diagnostic Characters: Shell oval, dome shaped. Eight pairs of pleurals, carapace and head olive green with scattered dark yellow blotches (sub-species *andersoni*). Two characteristic flaps on posterior part of the plastron. Plastron white with seven callosities.case of females.

Tail in males extend slightly beyond carapace rim and is not in case of females.

Distribution: India, South Asia and Northern Myanmar.

This Study: Guwahati, Barpeta, Sarupeta (temple pond), Kaziranga NP, Nameri NP, Orang NP.

Literature and Museum Record: Borbeel, Kaziranga National Park (Das, 1990), Ranikor, West Khasi Hills (ZSI/ERS VI/8390), Mona beel, Kaziranga National Park (Talukdar, 1979).

Notes: Inhabit a wide range of habitat- rivers, ponds, lakes, streams, waterlogged paddy field, canals and even drains. Lay 2-15 eggs per clutch. Incubation period is very long (9 months). Aestivate during winter and dry summer. Feeds on frogs, tadpoles, fishes, prawns, mollusks and aquatic plants. Also scavenges on dead animals.

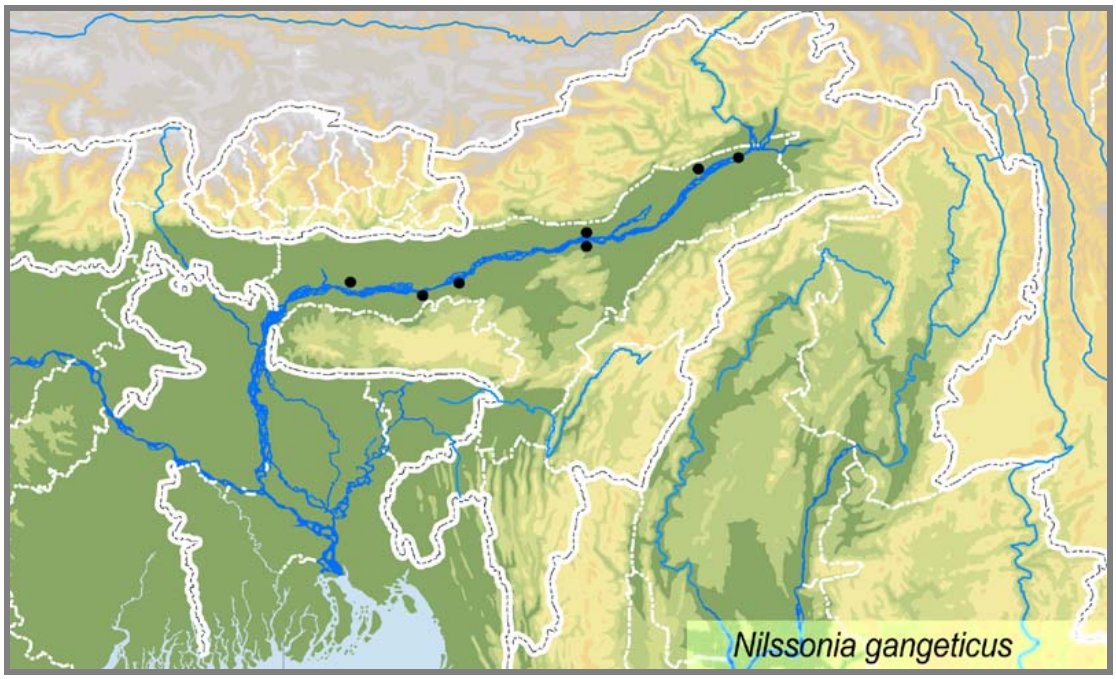
Conservation Status: Status not assessed. Appendix II (CITES). Schedule I of Wildlife (Protection) Act, 1972. Rare. Heavily exploited for meat in Assam.

Population Status: Not know but declined over last couple of decades. This species was common on the western part of Assam and traditionally exploited for meat. However, unsustainable harvest has led to population crash and now only rarely encountered. Viable population in the region could not be determined during this study.

Recommendation: Population study. Community conservation in wetlands of Assam.

Nilssonia gangeticus, Indian Softshell Turtle

a. *Nilssonia gangeticus*, adult, b. close up of head (old individual), c. Juvenile, and d. plastron.



Distribution map of *Nilssonia gangeticus*, see text for more.

Nilssonia gangeticus (Cuvier, 1825)
Indian Softshell Turtle

Diagnostic Characters: Carapace flat, oval and covered with a thin layer of skin. Head greenish with several oblique black stripes on the side and above. Plastron cream or pink in colour. Five callosities present.

Distribution: India, Bangladesh and Nepal.

This Study: Kaziranga National Park, Biswanath Ghat, Brahmaputra near Guwahati, Temple pond at Biswanath and Sarupeta.

Literature and Museum Record: Laika in Dibru-Saikhowa NP (Choudhury, 1995), Dhakuakhana, Lakhimpur district (Choudhury, 1995), Pabitora Wildlife Sanctuary (Sengupta *et al*., 1998).

Notes: Strictly aquatic. Inhabit rivers and wetlands. Remain buried at bottom under mud or sand keeping only eyes and snout out. Wait for prey to pass by to grab at lightening speed. Occasionally, foray on land near water to eat fruits (*Ficus* sp.). Lay 8-47 spherical eggs in each clutch. Feed on fishes, frogs, birds, mollusk and insects as well as aquatic plants, fruits and carrion.

Cannibalism in *N. gangeticus* is reported by Rao (1986) and Choudhury (1995).

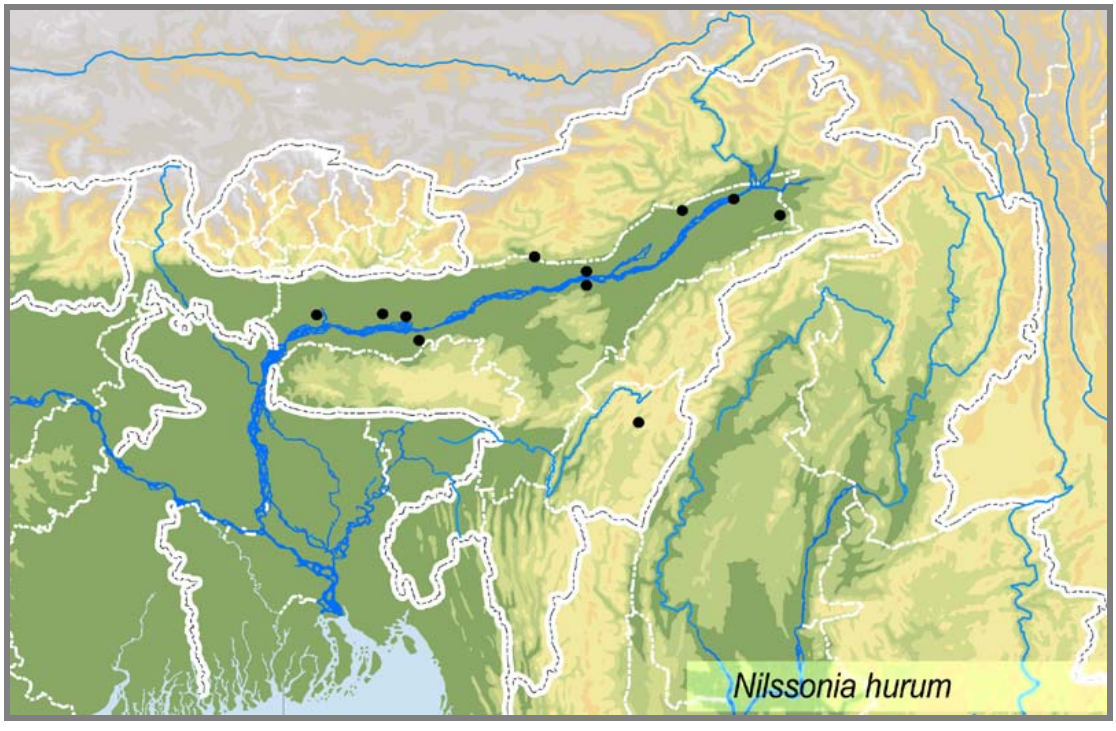
Conservation Status: Vulnerable IUCN), Appendix I (CITES) and Schedule I of Wildlife (Protection) Act, 1972. Rare. It is restricted to only few localities in the region. Very high demand for turtle meat and persistent local trade is the major threat.

Population Status: Not know but presumably declined due to overexploitation. The species is reported as the most common turtle species in the markets of Silchar, Assam (Das and Gupta, 2004). Brahmaputra River and tributaries and areas particularly Orang and Kaziranga NP hold future population of this species.

Recommendation: Population and ecological study. Involve communities in conservation.

Nilssonia hurum, Peacock Softshell Turtle

a. *Nilssonia hurum*, adult, close up of head (inset), b. young individual, c. plastron.



Distribution map of *Nilssonia hurum*, see text for more.

Nilssonia hurum (Gray, 1831)

Peacock Softshell Turtle

Diagnostic Characters: Low and oval carapace, olive in colour with a yellow rim. Head large with black reticulation; large yellow or orange patch behind eye and across snout. Juvenile with four-six dark eye marks on dorsum. Plastron white or light gray with five large callosities.

Distribution: India, Bangladesh and Nepal.

This Study: Gauhati Univerty campus, Deepor Beel, Kaziranga National Park, Manas NP, Chakrashila Wildlife Sanctuary, Dulung RF (N. Lakhimpur). Tihu (Nalbari), Biswanath Ghat. Temple pond at Biswanath and Sarupeta in Assam.

Literature and Museum Record: Panigaon area, Lakhimpur district (Choudhury, 1995), Brahmaputra Basin, North Cachar (Barman, 1996, Datta, 1997), Kaziranga NP (Choudhury, 2004). Pakke Wildlife Sanctuary (Datta, 1998), Jiribam (Singh 1995).

Notes: Nocturnal. Strictly aquatic. Inhabit in river channels, marshes and wetlands. It buries itself in mud or sand at the bottom keeping just eyes and nostrils out, wait for preys to pass by to grab at an amazing speed. Lay 20-38 eggs per clutch. Feed on nails and fishes. However, animals in temple ponds eat rice, cake, sweets and animal viscera.

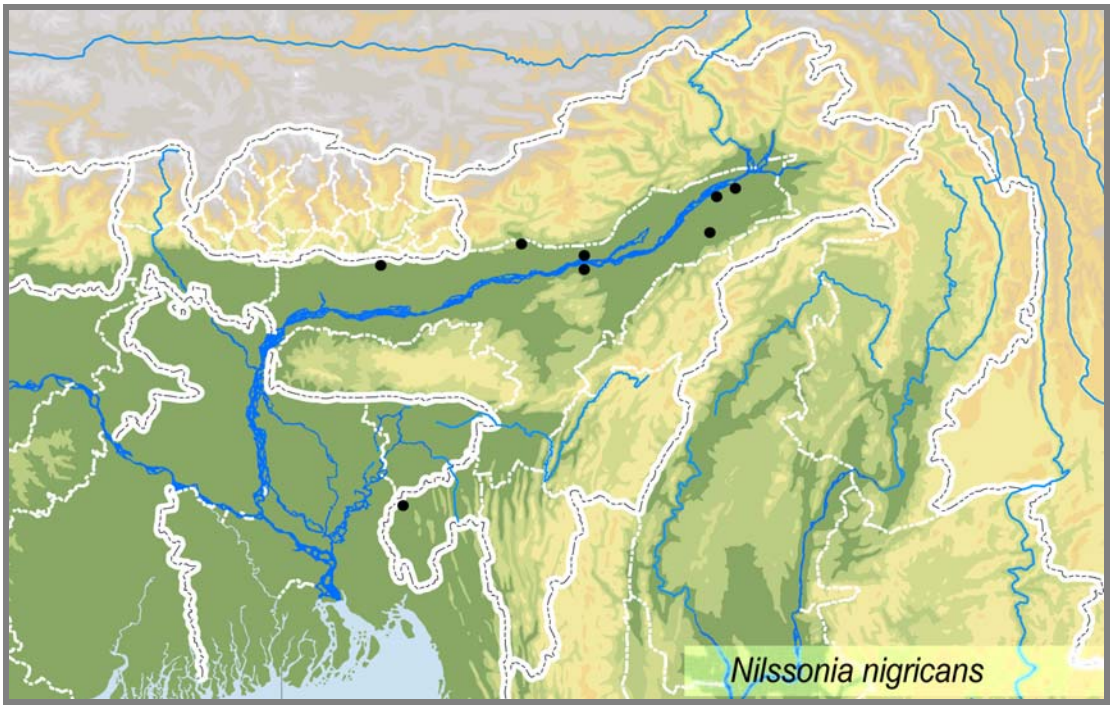
Conservation Status: Vulnerable IUCN), Appendix I (CITES) and Schedule I of Wildlife (Protection) Act, 1972. Rare. Very high demand for meat and persistent local trade is the major threat.

Population Status: Not know but declined due to overexploitation. Kaziranga and Orang NP hold populations for future conservations.

Recommendation: Population and ecological study. Involve communities in conservation as the species is found in wetlands around human settlements too.

Nilssonia nigricans, Black Softshell Turtle

a. *Nilssonia nigricans*, adult and close up of head (inset), b. Juvenile, c. plastron.



Distribution map of *Nilssonia nigricans*, see text for more.

Nilssonia nigricans (Anderson, 1875)

Black Softshell Turtle

Diagnostic Characters: Similar to *N. hurum.* But, head is larger and black reticulation on head less distinct. Yellow/orange patches behind eye and across snout are lacking. Carapace olive or dark gray, slightly rough in appearance (somewhat smooth in *N. hurum*). Juveniles with four-six dark yellow-bordered eye marks. Plastron white or light gray with four large callosities.

Distribution: India (Assam), Bangladesh.

This Study: Kaziranga NP, Biswanath Ghat, Manas NP. Temple pond at Biswanath and Sarupeta.

In the Kaziranga NP, first individual was found on April 14, 2004, at 1400 h. observed on the forest trail beside Rangamatia Beel of Agoratoli Range. On 03 December 20, 2009, One female individual (CL 45 cm, CW 47 cm, PL 43 cm) was found dead in Diffolu river. Another live individual (CL 43 cm, CW 42 cm, PL 60 cm) was found on the bank of Sapekhati beel (covered with water hyacinth) near Gandermari camp on 06 December 2009. A recent visit (March, 2010, Bhengrai Nala) of the Kaziranga NP recorded five individuals in three days duration.

Literature and Museum Record: Kamakhya Temple Pond, Nagshankar Pond, Dibrugarh, Tinsukia, Biswanath Ghat, Nameri NP, Nazira (Prachag and Gemel, 2002). Also known from royal lake in Tripura. Nazira, Assam (ref. BMNH 1994.449).

Notes: Diurnal. Inhabit large river. Not yet recorded from lake and other stagnant water body except 'temple ponds'. Occasionally bask in winter on undisturbed sand bars. Lay 6-38 spherical eggs per clutch. Diet not known in the wild. Presumably same as other soft-shell turtles. Individuals at temple ponds feed on fruits, cake, animal viscera, puffed rice and banana.

Thought to be restricted to the Bostami tank of Bangladesh until Praschag and Gemel (2000) reported the wild population from Bishwanath Ghat, Dibrugarh, Tinsukia and Nameri National park and also found that *N. nigricans* were the most common temple turtle species of Assam which were previously misidentified as *N. hurum*. This study recorded this species for the first time from inside the park. Inhabit the Brahmaputra River (probably also the tributaries), wetlands and some temple ponds in Assam plains. This Critically Endangered species deserve scientific research and conservation attention immediately.

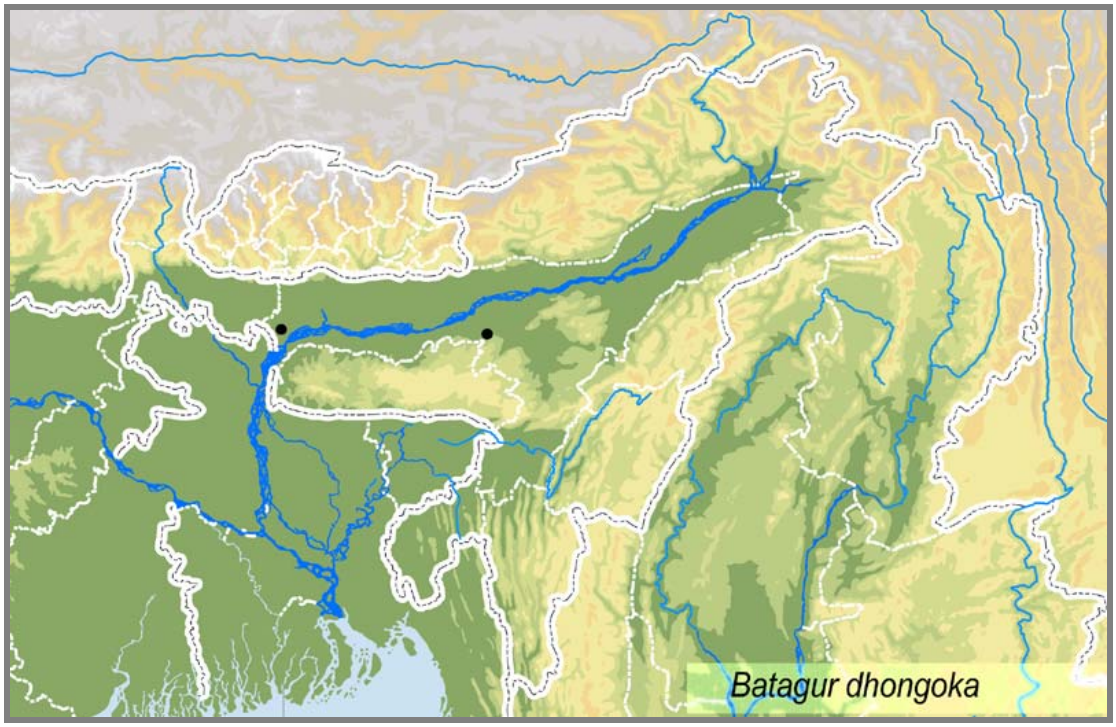
Conservation Status: Critically Endangered (IUCN), Appendix I (CITES) and not listed in Wildlife (Protection) Act, 1972. Rare. Extensively exploited for local turtle meat trade. Local fishermen report decline (catch per effort) in population.

Population Status: Not known, but on decline. Kaziranga NP seems to have a fair population of this species in wild and holds future for future conservation.

Recommendation: Survey, biology, population estimation and ecological study. Involve communities in conservation of this species in community ponds. List in the Schedule of the Wildlife (Protection) Act, 1972.

Batagur dhongoka, Three-striped Roofed Turtle

a. *Batagur dhongoka*, adult, b. close up of head, c. plastron.



Distribution map of *Batagur dhongoka*, see text for more.

Batagur dhongoka (Gray, 1831)
Three-striped Roofed Turtle

Diagnostic Characters: Carapace oval and elevated. Vertebral keel terminates into a knob on third vertebra. Dorsally brownish-grey with three dark brown stripes. A yellow stripe on head and neck from tip of snout, over eyes. Plastron yellow.

Distribution: India**,** Bangladesh and Nepal.

This Study: Not recorded in any of the study sites.

Literature and Museum Record: Sonapur, Kamrup Assam (Moll, 1987). Golakganj, Dhubri (Datta, 1997).

Notes: This species since reported by Moll (1987) has not been encountered except by Datta (1997). This indicates the patchy availability of the species in the region or not at all found in the Brahmaputra valley. This region is also the westernmost distribution range of the species. Our effort to find this species in the wild, temple ponds and markets were unsuccessful.

Grows up to 48 cm. Inhibit medium to large rivers. A non aggressive species. Females are hervivorous and males are omnivorous (Das, 2002). Nesting season in National Chambal Sanctuary is recorded as March and April. Lay 21-35 eggs that hatch in 56-89 days.

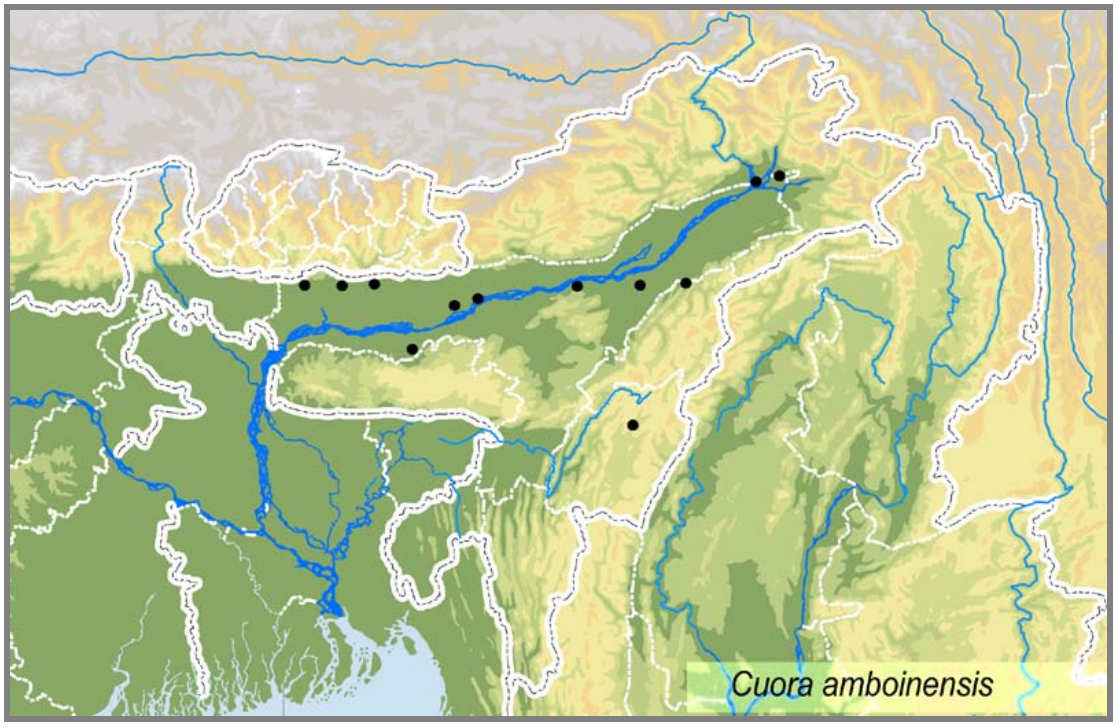
Conservation Status: Endangered (IUCN), Appendix II (CITES), no legal protection in India yet. Not recorded yet from any protected area in the region. Very rare in the region and perhaps extirpated before its distribution is known properly.

Population Status: Not known. Declining in the rest of the country. Viable population in the region could not be identified during this study. Perhaps a very rare species or even may not occur in the region.

Recommendation: Continue effort to find the species in the wilderness in the region, particularly in the localities form where it has been reported.

Cuora amboinensis, Malayan Box Turtle

a. *Cuora amboinensis*, adult, b. close up of head, c. plastron.



Distribution map of *Cuora amboinensis*, see text for more.

Cuora amboinensis (Daudin, 1802)

Malayan Box Turtle

Diagnostic Characters: Shell high domed, smooth and slightly elongated. Olive or blackish above. Head and face with yellow stripes. Neck yellow ventrally. Plastron yellow with single black blotch on each scute as well as marginal. A transverse hinge on the plastron enables it to close the shell very tightly.

Distribution: Northeast India**,** throughout Southeast Asia and the Philippines.

This Study: Kaziranga National Park (three shells and one live), Chandubi *Beel*, Orang National Park [One shell preserved at Range Office], Manas National Park, Mehao Wildlife Sanctuary (SCL 171mm; CW 117mm), Dibru-Saikhowa National Park (one shell). We also observed 4 live individuals in the Manipur Zoological Garden that were reported to be sourced locally. However, this needs to be authenticated though occurrence of C. amboinensis in Manipur is most likely.

Literature and Museum Record: Mangaldai (Moll and Vijaya, 1986), Kaziranga National Park, Manas Tiger Reserve, (Das, 1990), Gela Beel River, Jorhat (MHNG 1557.15), Samagooting (Anderson, 1872). Baluchar, Amarpur, Guijan, Santipur, Sadiya all near Dibru-Saikhowa National Park (Choudhury, 1995). D'Ering Wildlife Sanctuary (Bhupathy *et al.*, 1992).

Notes: Population in India is the westernmost population in the range of this species. Inhabit in rivers, lakes, marshes, ponds, channels, creeks, swamps and paddy fields in and around lowland forests. When disturbed or threatened it closes its shells tightly. Bask on banks or on logs. Breed during early monsoon and lay 1-6 eggs. Not much known about this species and its biology in the region. Observed with traditional healer in couple of occasions.

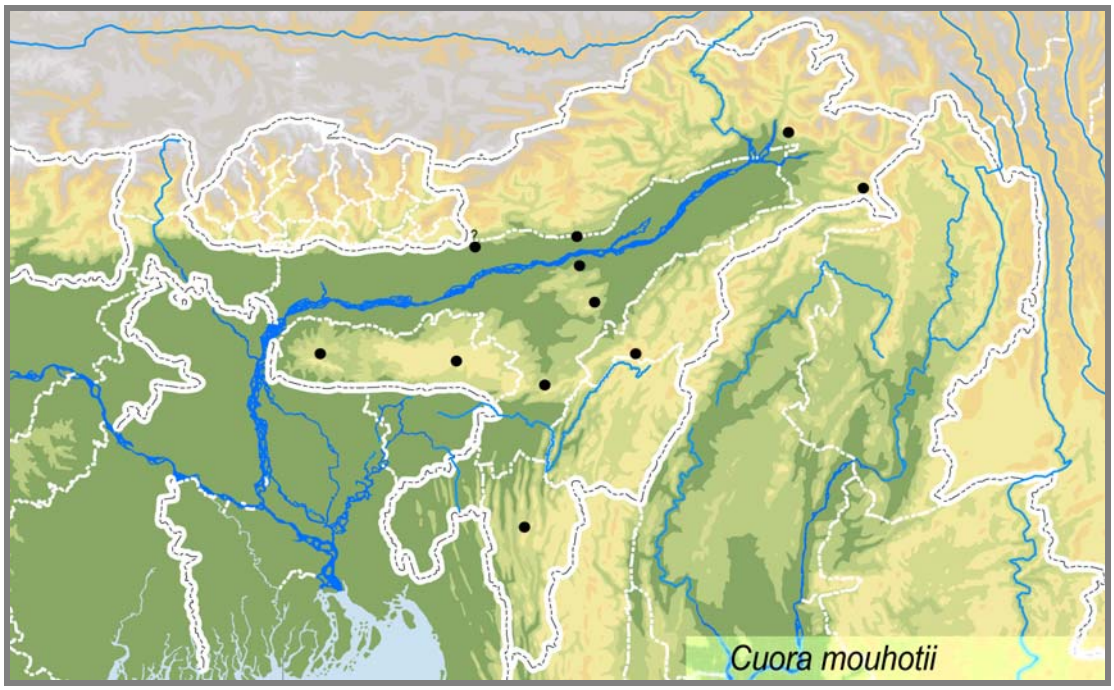
Conservation Status: Vulnerable (IUCN), Appendix II (CITES), no legal protection in India yet. Recorded from few protected area in the region. Rare in the region and severely declined outside the protected areas.

Population Status: Not known. Declining throughout its rage. Kaziranga, Manas, Nameri, Dibru-Saikhowa NP holds wild populations of this species.

Recommendation: Systematic research on Biology, population and ecology is suggested as information on this species within India is scanty. List in the Schedule of the Wildlife (Protection) Act, 1972.

Cuora mouhotii, Keeled Box Turtle

a. & b. *Cuora mouhotii*, adults, c. plastron.



Distribution map of *Cuora mouhotii*, see text for more.

Cuora mouhotii (Gray, 1831)

Keeled Box Turtle

Diagnostic Characters: Shell flat and elongated with three distinct keels. Posterior marginals serrated. Plastron weakly hinged. Carapace light to dark brown, plastron yellow or light brown with dark brown blotches on each scute. Males with concave plastron and thicker and longer tail.

Distribution: India (Northeast India), Myanmar, Laos, Cambodia, Thailand and China.

This Study: One live female from Namdapha National Park, Arunachal Pradesh; two shells from Borjuri (Panbari RF), Kaziranga NP; Barail Wildlife Sanctuary, Aizawl of Mizoram. Another individual was rescued from Odulguri market (origin unknown). Also, Dzuku Valley in Nagaland and Manipur.

Literature and Museum Record: The species is recorded from Dhansiri reserved forest of Karbi-Anglong district (Choudhury, 1993) and Madhupur Village of Lakhimpur district (Choudhury, 1996). Also Cachar Hills (Anderson, 1871), Mupa-Langteng Reserved forest, near Maibong and Kapali reservoir of North Cachar Hills (Das, 1995), Barail Wildlife Sanctuary (Das *et al*., 2009), Garo and Khasi Hills of Meghalaya (Das, 1995), Namdhapa National Park [Deban], (Das, 1990), Mehao Wildlife Sanctuary (Bhupathy *et al*., 1992). Garo Hills (ZSI 14, 708, 1016), Deban of Namdapha (ZSI 23923) were observed in the museum.

Notes: Inhabit forest floor of the evergreen, semi evergreen and subtropical broadleaf forests of the region from 100-2500 m altitude. Panbari individual was reported to be collected from thick leaf litter of forest floor while the Barail animal was found under rocks near evergreen forest stream. The lone live individual encountered in the Namdhapha National Park was found on thick leaf litter of on a hill slope of evergreen forest. Das (1995) also mentioned that the species presumably live among the leaf litter on the forest floor. Exploitation is uncommon as the species itself is very rare. Trend of collection by local communities is not known. Omnivorous. Clutch comprise of 1-5 eggs. Rare.

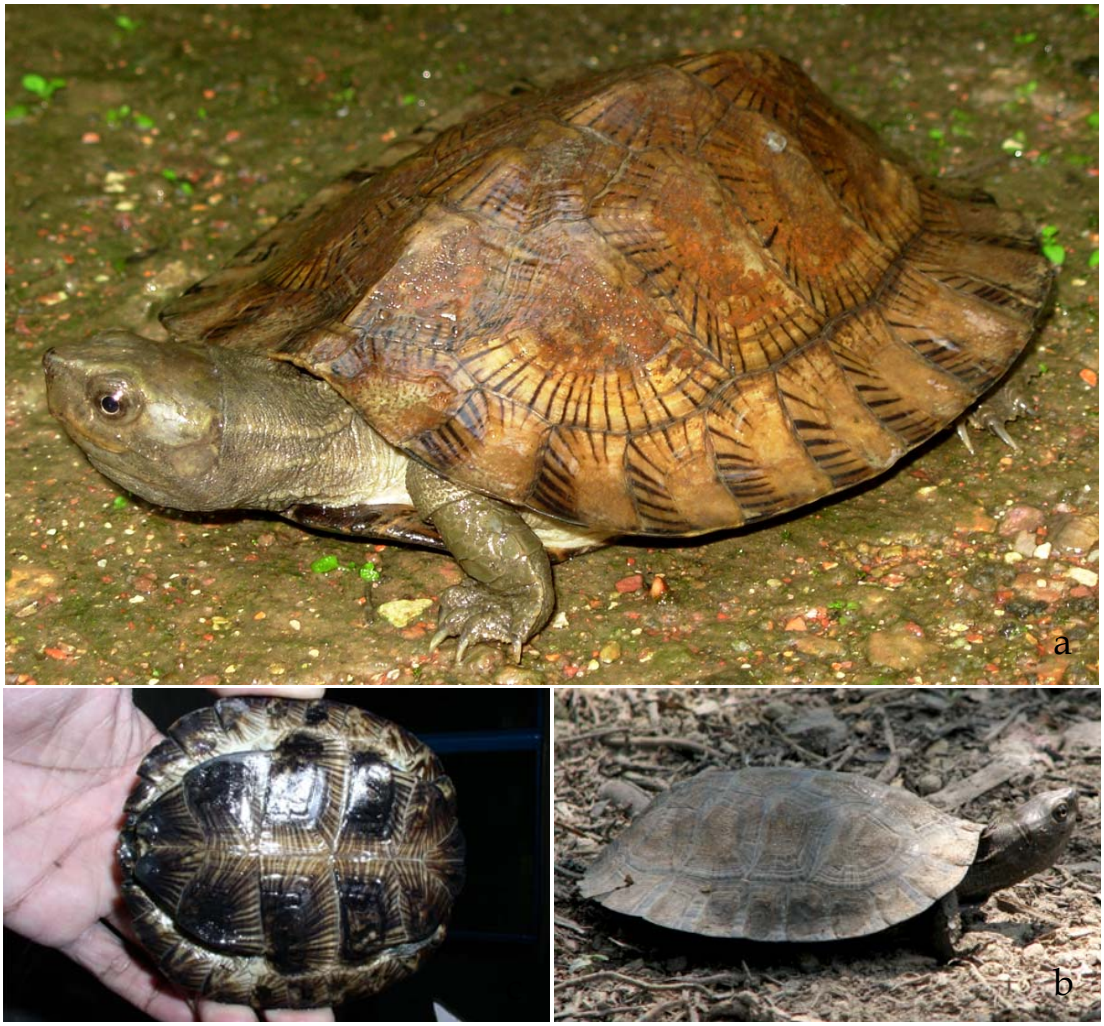
Taxonomic Note: This species was referred under the monotypic genus *Pyxidea* Gray, 1863. However, we follow Honda *et al.* (2002), Stuart and Parham (2004), Stuart and Platt (2004) in allocating this species under the genus *Cuora*.

Conservation Status: Endangered (IUCN), Appendix II (CITES), no legal protection in India yet. Recorded from few protected area in the region. Very rare in the region and perhaps severely declined outside the protected areas.

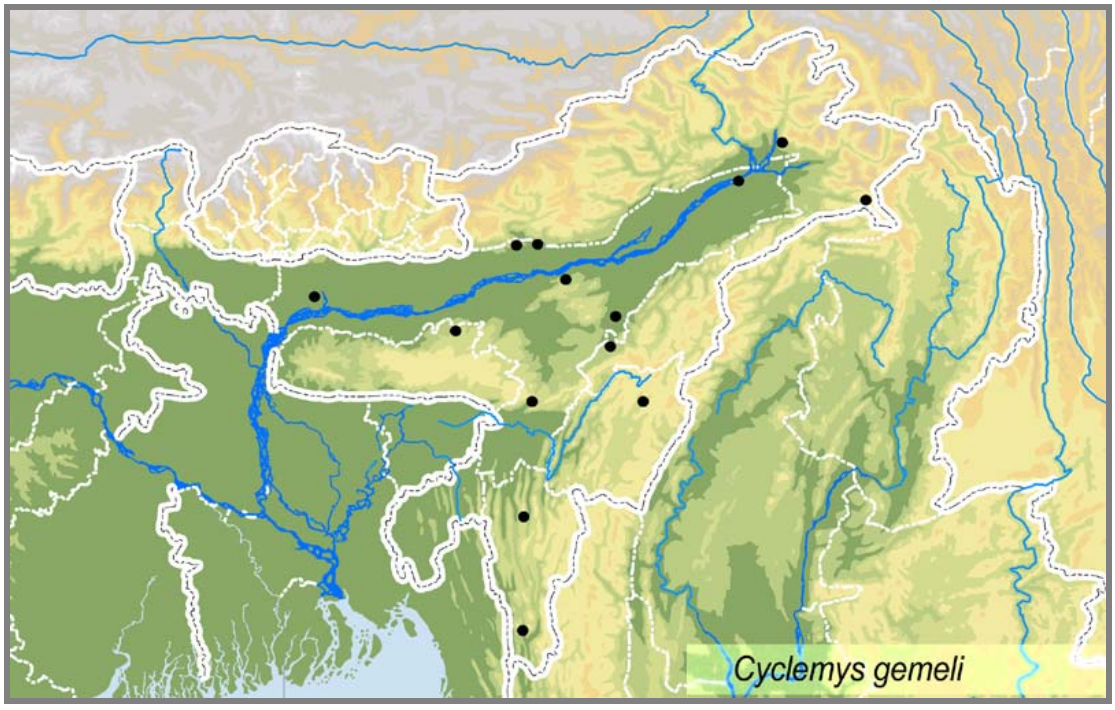
Population Status: Not known. Declining throughout its rage. Namdapha National Park holds promises for this species in the region. Forests in Karbi Anglong Hills may hold another viable population.

Recommendation: Systematic research on population and ecology is suggested as information on this species within India is scanty. List in the Schedule of the Wildlife (Protection) Act, 1972.

Cyclemys gemeli, Indian Leaf Turtle



a & b. *Cyclemys gemeli*, adults, c. plastron.



Distribution map of *Cyclemys gemeli*, see text for more.

Cyclemys gemeli Fritz, Guicking, Auer, Sommer, Wink and Hundsdorfer, 2008

Indian Leaf Turtle

Diagnostic Characters: Carapace flat; rounded and posterior marginals serrated in juveniles. Shell elevated, smooth and elongated in adults. Shell brown with dark radiation on each scute that fades out with age. Juveniles with unusually long tail, shorter in adults.

Distribution: India (Eastern Himalaya and Northeast India) and most likely Bangladesh bordering Meghalaya state.

This Study: Tezpur, Nameri National Park,Barail Wildlife Sanctuary, Seijusa, Pakke Tiger Reserve, Mehao Wildlife Sanctuary, Aizawl, Imphal.

Literature and Museum Record: Guijan village, Rohmoria village near Dibru-Saikhowa NP (Choudhury, 1995). Chakrashila Wildlife Sanctuary (Datta, 1997), Golaghat (Rajeev Basumatary, *pers. Comm.*). Bungtlang, Pawizawh lui (Pawar and Choudhury, 2000).

Notes: Choudhury (2004) reported this species from Baghser Reserve Forest close to the park as *C. oldhami*. In a recent revision of the genus *Cyclemys*, Fritz *et al*. (2008) described *C. gemeli* based on a collection from Tezpur and Jia Bhoroli River of Assam. They revealed that, *Cyclemys* in north-east India, northern West Bengal, Uttar Pradesh (Nepal Border) are *C. gemeli* and not *C. oldhami* as it was previously believed (see Fritz *et al.,* 1997). Subsequently, *Cyclemys gemeli* was recorded from and from Barail wildlife sanctuary, Nameri NP, Damra village close Assam; Byrnihat, Meghalaya; Dimapur, and Tuli village, Nagaland (Praschag *et al*., 2009).

Habitat of the species is reported as large rivers as Jia Bhoroli River and its oxbows, fast flowing creeks, and also leaf litter of evergreen forest (see, Praschag *et al*., 2009, Das *et al*., 2009).

Observation of specimens in Manipur and Mizoram leads to believe that there is more Cyclemys sp. in the region and molecular phylogenetics of populations in eastern part of the region, bordering Myanmar will throw more light on such taxonomic questions.

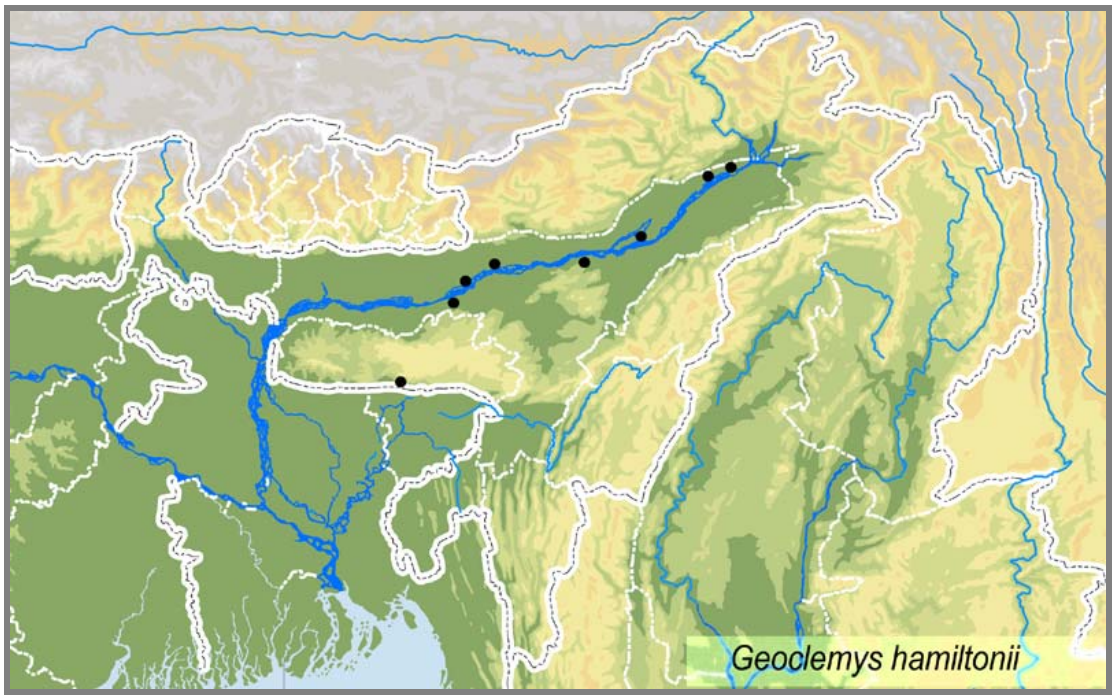
Conservation Status: Not assessed. Not listed in CITES or in Wildlife (Protection) Act, 1972. Its look alike (*C. oldhami*) is often in trade in SE Asia.

Population Status: Not known. Widespread in the region. Manas, Nameri, Namdapha NP, Pakke and Barail WLS, Karbi Anglong Hills holds promise for survival of this species.

Recommendation: Distribution surveys. Population and ecological study to generate baseline data. Phylogenetics of populations found in Manipur and Nagaland to know if the populations are different, which is most likely. List in the Schedule of the Wildlife (Protection) Act, 1972.

Geoclemys hamiltonii, Spotted Pond Turtle

a. *Geoclemys hamiltonii*, adult, b. close up of head, c. plastron.



Distribution map of *Geoclemys hamiltonii*, see text for more.

Geoclemys hamiltonii (Gray, 1831)

Spotted Pond Turtle

Diagnostic Characters: Carapace convex and elongated with three interrupted keels. Yellow spots on black shell. Spots on head and neck more prominent. Plastron black with yellowish elongated marks on each scute. Anal scute deeply forked.

Distribution: Nepal, Bangladesh and Pakistan.

This Study: Kaziranga National Park (Aahotguri Camp, Borbeel Nullah), Orang National Park (Raumari beel, Near range office), Majuli (Raunapukhuri), Tezpur (Deurigaon).

Literature and Museum Record: Kaziranga National Park (Vijaya, 1983; Das, 1990), Sonapur (ZSI 18339), West Khasi Hills (Ranikhor) (ZSI/ERS record cited in Das, 1990). Jamjing Reserved Forest in Dhemaji district (Choudhury, 1995a), Dhakuakhana (Choudhury, 1995b).

Notes: Crepuscular. Inhabit shallow *beel* in tall grasslands, marsh, lake, pond, reservoir and slow flowing river. Bask on water edge. Large head is adapted to crush and feed on mollusks. Lay up to 24 eggs that hatch within 76 days. Feeds on Mollusks, grasses and fruits.

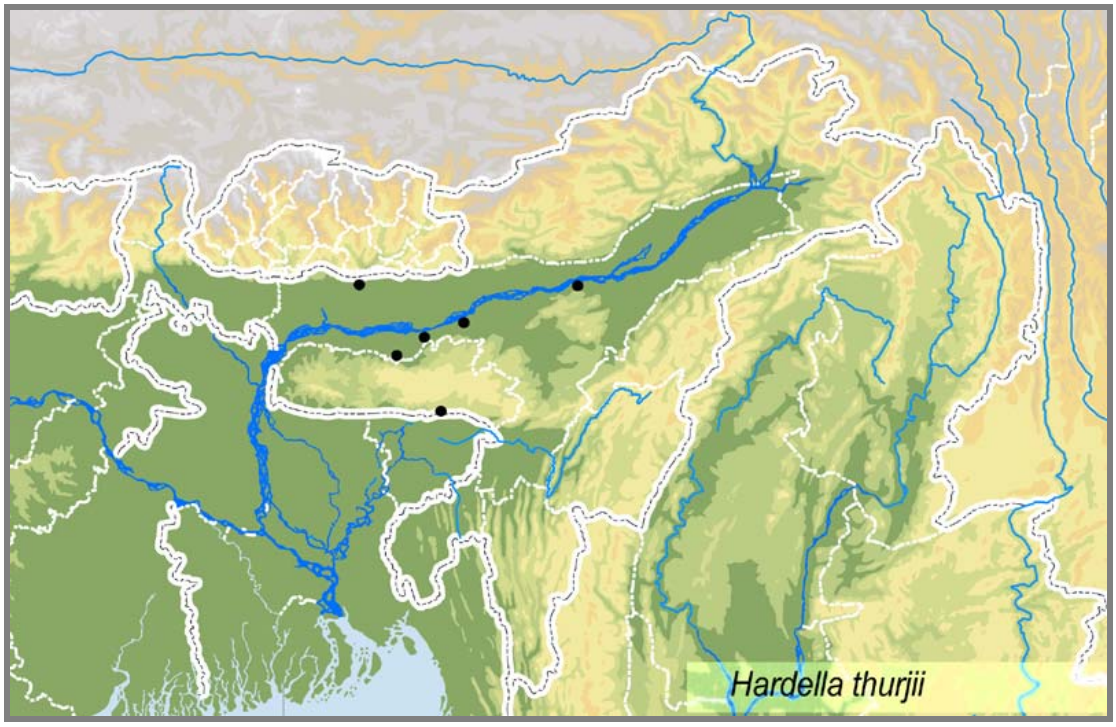
Conservation Status: Vulnerable (IUCN), Appendix I (CITES), Schedule I of Wildlife (Protection) Act, 1972. Perhaps only viable population in the region is restricted to Kaziranga NP and Orang NP. Heavily exploited outside PAs and almost extirpated.

Population Status: Not much know about population. Das (1995) mentioned as the most common species in Kaziranga NP and is perhaps still most common one in the park as we have observed. Kaziranga and Orang NP hold survival promise for this species in the wild.

Recommendation: Ecological study and population estimation using scientific methods.

Hardella thurjii, Crowned River Turtle

a. *Hardella thurjii*, adult, b & c. plastron of two patterns.



Distribution map of *Hardella thurjii*, see text for more.

Hardella thurjii (Gray, 1831)
Crowned River Turtle

Diagnostic Characters: Carapace dome-shaped, elongated. Dark brown above with a greyblack vertebral keel. Plastron yellow with large black blotch on each scute or completely black. Head large, four yellowish-orange stripes on either side. Occasionally a similar stripe on top of the head.

Two subspecies are so far recognized- the *Hardella thurjii thurjii* inhibiting the Brahmaputra and the Ganga river systems and *Hardella thurjii indi* inhibiting Indus river system. The nominate subspecies has a week vertebral keel and no lateral keel, on the other hand *indi* subspecies with a weak, discontinuous lateral pleural keel. However, Praschag *et al*. (2007) synonimized *H. t. indi* with *H. t. thurjii*.

Distribution: India, Bangladesh and Pakistan.

This Study: (Donga, Borbeel Nulla and Mihi beel, Mer beel,) Kaziranga National Park; Amlaitenga in Manas National Park.

Literature and Museum Record: Shella (Bangladesh border near Cherrapunjee) (Frazier and Das, 1994); Deepar Beel Wildlife Sanctuary; Mayeng Hill reserved Forest (Chandubi), Pabitora Wildlife Sanctuary by Sengupta *et al* (1998, 2001); Kaziranga (Das, 1995).

Notes: The individuals were sighted while basking along aquatic edges of stagnant water bodies surrounded by thick vegetation mainly of Cane and semievergreen patches. Shrestha (1997) remarked that the species is more or less restricted to the still or slow moving water bodies including pools, ponds, canals, ox-bow lakes. This observation is consistent with field records from ox-bow lakes with standing water. Although subject to field verification, some forest staffs narrated about its occurrence in the Brahmaputra River. Minton and Anderson (1962) reported an individual from estuarine environment. Sarkar and Hossain (1997) reported *Hardella* from riverine habitat where they use banks and emerged sand bar for basking and nesting.

Vegetable matters, frog, prawn are included in the diet (Minton, 1966, Rashid and Swingland, 1997). Nesting occurs in November –January, 12-16 eggs are laid per clutch (Rashid and Swingland, 1997). Information on breeding biology from this region is lacking.

Large shells were observed in Arimora camp. One shell at the Kohora Range Office labeled as *Kachuga kachuga* was correctly identified as *Hardella thrurjii*.

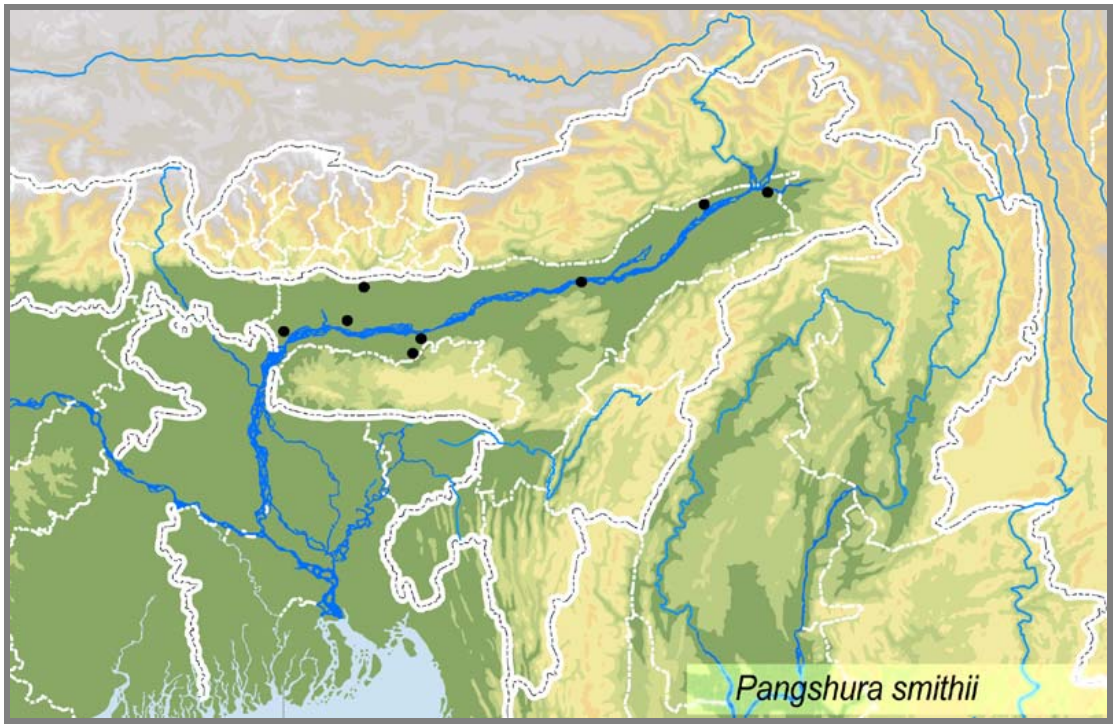
Conservation Status: Vulnerable (IUCN), not listed by CITES and no legal protection in India yet. It appears that the population is low in number as the individuals are removed from outside the protected areas. Not much recorded from outside the protected areas.

Population Status: Information on population in the region is not available. However, Kaziranga NP seems to hold largest population of this species in the region.

Recommendation: Population and ecological study. Assisted breeding and restocking. List in a higher Schedule of the Wildlife (Protection) Act, 1972.

***Pangshura smithii*, Brown Roofed Turtle**

a & b. *Pangshura smithii*, adult, c. plastron.



Distribution map of *Pangshura smithii*, see text for more.

Pangshura smithii (Gray, 1831)

Brown Roofed Turtle

Diagnostic Characters: Carapace elongated and depressed. Plastron projecting anteriorly and truncated. Dorsally brown or light green in colour, edge of shell yellow.

Plastron yellowish; large black blotch present in on each scute in subspecies *smithii* and absent in subspecies *pallidipes*.

Distribution: India, Bangladesh, Nepal and Pakistan.

This Study: Chandubi, Bishwanath Ghat, Temple pond at Sarupeta (Barpeta district).

Literature and Museum Record: Manas National Park (Das, 1990), Kaziranga National Park (MHNG 1185.27), North Bank of river Brahmaputra in the Jorhat area (MHNG 1240.55). Saikhowaghat (Choudhury, 1995), Matmora of Dhakuakhana (Choudhury, 1995b), Dharapur and Palasbari, Kukurmara, Karipar and Kulsi of Kamrup District (Choudhury, 1999), Dhubri (Datta, 1997).

Notes: Two Individuals (SCL 11.5 and 12.8 cm) were observed from the possession of fisherman's of Bishwanath Ghat. All the individuals were reported to be caught from Brahmaputra river on the western part of KNP. Das (1995) reported it from the KNP. Choudhury *et al.,* (1999) reported its occurrence in both lentic and lotic environments of Kamrup district of Assam. Inhabit small and large rivers preferably in areas with abundant macrophytic growth (Frazier, 1992, Das, 1995).

However, tradition to release in temple pond is recorded in Assam though not very common. Research on detailed distribution and extent of habitat is suggested.

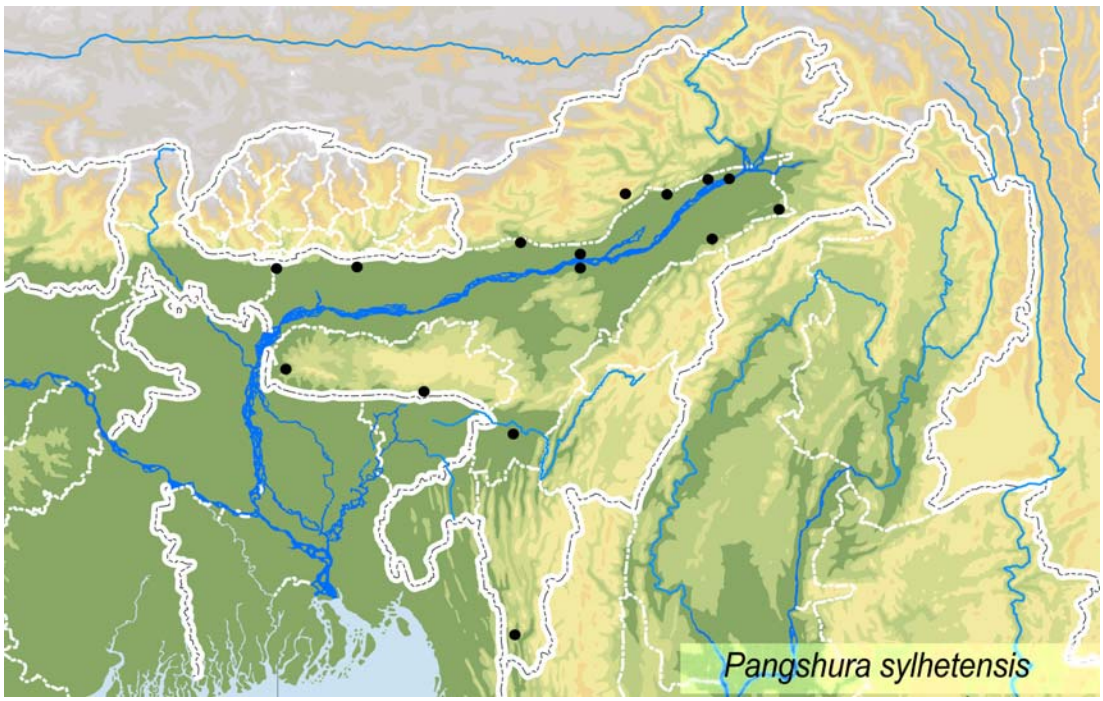
Conservation Status: Near Threatened (IUCN). Appendix II (CITES). No legal protection in India yet. Almost extirpated from outside PAs in Assam or population is too thin to be observed.

Population Status: Not known. Declined throughout the region as the case with most other species. Viable population cold not be identified during this survey as encounter of this rare species is very few. However, Brahmaputra River and wetlands in Kazirnaga and Orang NP seems future conservation area for this turtle species.

Recommendation: Population and ecological study. List in the Schedule of the Wildlife (Protection) Act, 1972.

Pangshura sylhetensis, Assam Roofed Turtle

a. *Pangshura sylhetensis*, adult, b. close up of head, c. plastron.



Distribution map of *Pangshura sylhetensis*, see text for more.

Pangshura sylhetensis (Jerdon, 1870)
Assam Roofed Turtle

Diagnostic Characters: Unique species with 13 pairs of marginal. Carapace smoothly domed in females; highly elevated in males and juveniles, third vertebra spiked. Male smaller than female. Olive brown above and an 'S-shaped' red stripe behind eye. Plastron yellow with large black blotches on each scute.

Distribution: India (North Bengal, Northeast India), Bhutan and Bangladesh.

This Study: Bishwanath Ghat, Joypore reserved forest, Chandanpur (Arunachal Pradesh), Jia Bhoreli River (Nameri National Park), Buhri Dihing River (Dihing-Patkai Wildlife Sanctuary).

Literature and Museum Record: Kolathua village, Sibsagar District (ZSI/ERS VI/8139), Cherrapunjee (Likely from Shella), Garo Hills, Cachar (Moll, 1987), Manas National Park (Sharma, 1988). Banko Beel of Dibru Saikhowa National Park (Choudhury, 1995), Saikhowaghat (Choudhury, 1995). Ghilamara in Dhakuakhana (Choudhury, 1993); Roha beel, Ranganadi, Lakhimpur district (Choudhury, 1995b); Kukurmara and Chandubi (Choudhury *et al.*, 1999); Cachar district (ZSI 110); Southwestern part of Nengpui Wildlife Sanctuary (Pawar and Choudhury, 2000).

Notes: Grow upto 20 cm. Males are much smaller than females. Inhibit both large and Small River as well as hill streams. Large aggregation of the species is encountered in the stagnant water of Diffolu River in Kaziranga NP. Frequently seen basking on the logs and occationally on sand bars and along aquatic edge. Jump into water with slightest disturbance. Individual obtained from shallow water (25 cm depth) with extensive plant debris. Basking areas shared with P. tentoria, Lissemys punctata and Geoclemys hamiltonii in KNP. Known to lay 5 eggs per cluch during March.

The Cherrapunjee record (Moll, 1987) is most likely to be from areas bordering Bangladesh as it is unlikely to be found there.

Bishwanath Ghat animals were (CL 6.3-8.5 cm; PL 5.3-7.5 cm) caught in the fishing net

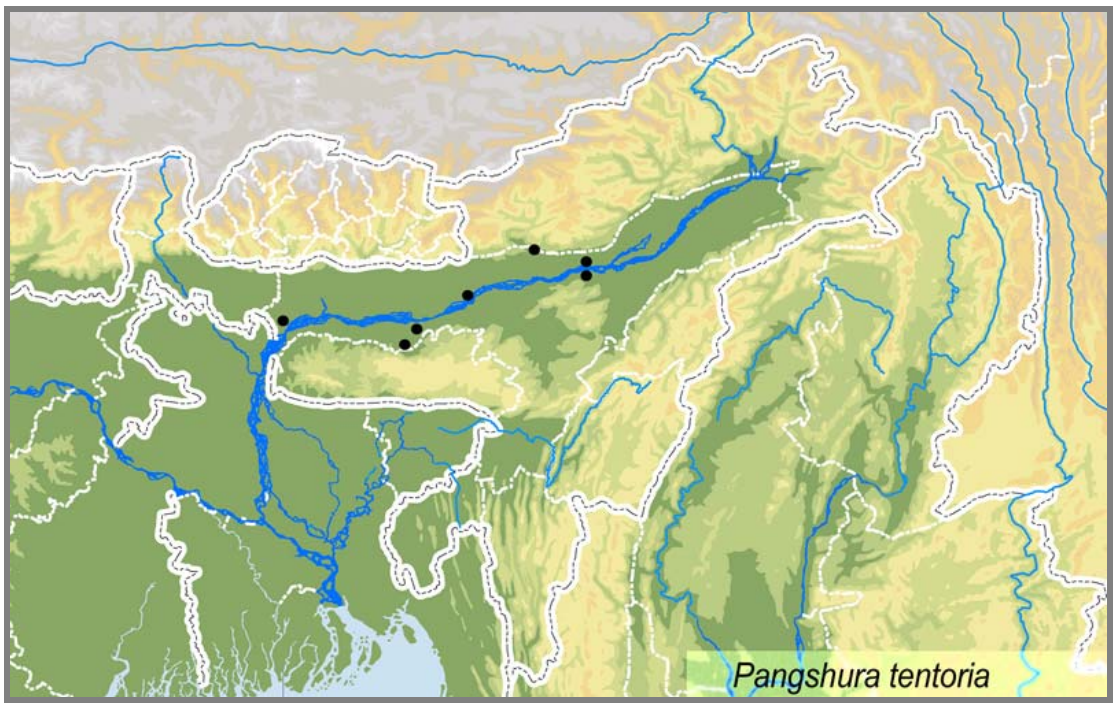
Conservation Status: Endangered (IUCN), not listed by CITES, Schedule I of Wildlife (Protection) Act, 1972. Species with restricted distribution and seems uncommon.

Population Status: Not known, but locally common in Diffolu river in Kaziranga NP, Biswanath Ghat. Restricted to habitat in forested river with boulders and logs on water. Kaziranga NP, Brahmaputra River near Kaziranga, Nameri National Park, Chandubi Beel, Nengpui Wildlife Sanctuary holds future conservation of this species.

Recommendation: Population and ecological study.

Pangshura tecta, Indian Roofed Turtle

a & b. *Pangshura tecta*, adult, c. plastron.



Distribution map of *Pangshura tecta*, see text for more.

Pangshura tecta (Gray, 1831)
Indian Roofed Turtle

Diagnostic Characters: Carapace elevated slightly elongated; vertebral keel spiked on 3rd vertebra. Brownish dorsally, a yellow border along marginals. Plastron yellow with 2-4 black markings. Characteristic crescent shaped orange or pink mark from behind eye to over head. Neck brightly striped.

Distribution: India, Bangladesh, Nepal and Pakistan.

This Study: Diffolu river, River side of Brahmaputra river, Bishwanath Ghat and Borbeel nullah (in Kaziranga NP), Kolomi Nala, Dibru Nala (in Dibru-Saikhowa NP), Khari (Pakke Tiger Reserve), Brahmaputra River near Orang National Park.

Literature and Museum Record: Chandubi, Kukurmara, Kulsi and Numolijola of Kamrup district (Choudhury *et al.*, 1999), Dhubri (Datta, 1997).

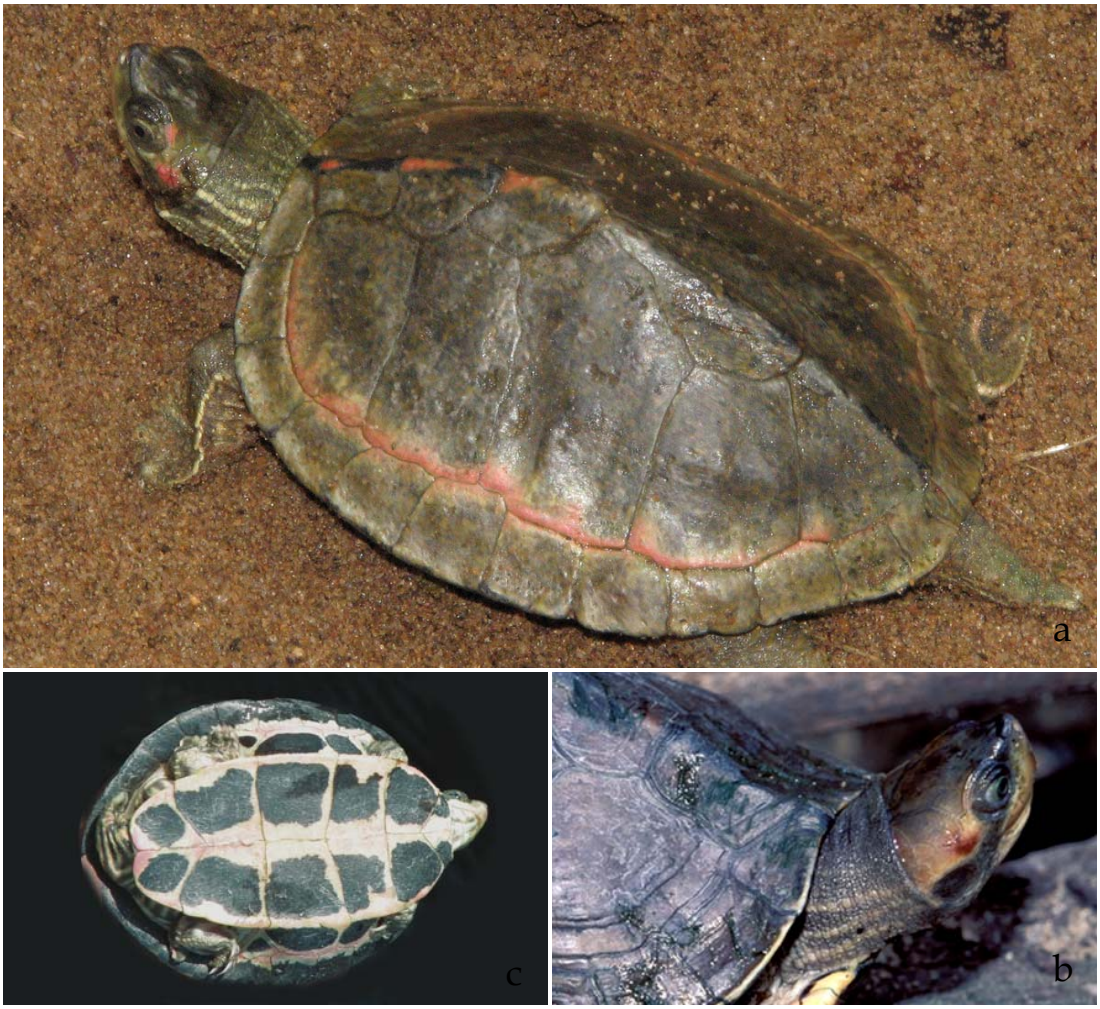
Notes: Inhabit in river and standing water bodies. Usually seen basking on banks, logs or aquatic vegetation. Avoid areas disturbed by human. Lay 4-10 eggs per clutch on sandy banks during winter. Feeds on Aquatic plants.

Conservation Status: Status not assessed. Appendix I (CITES). Schedule I of Wildlife (Protection) Act, 1972. Common in places but rarely found in human dominated rivers or wetlands. Exploitation for meat is no known but not uncommon in pet trade.

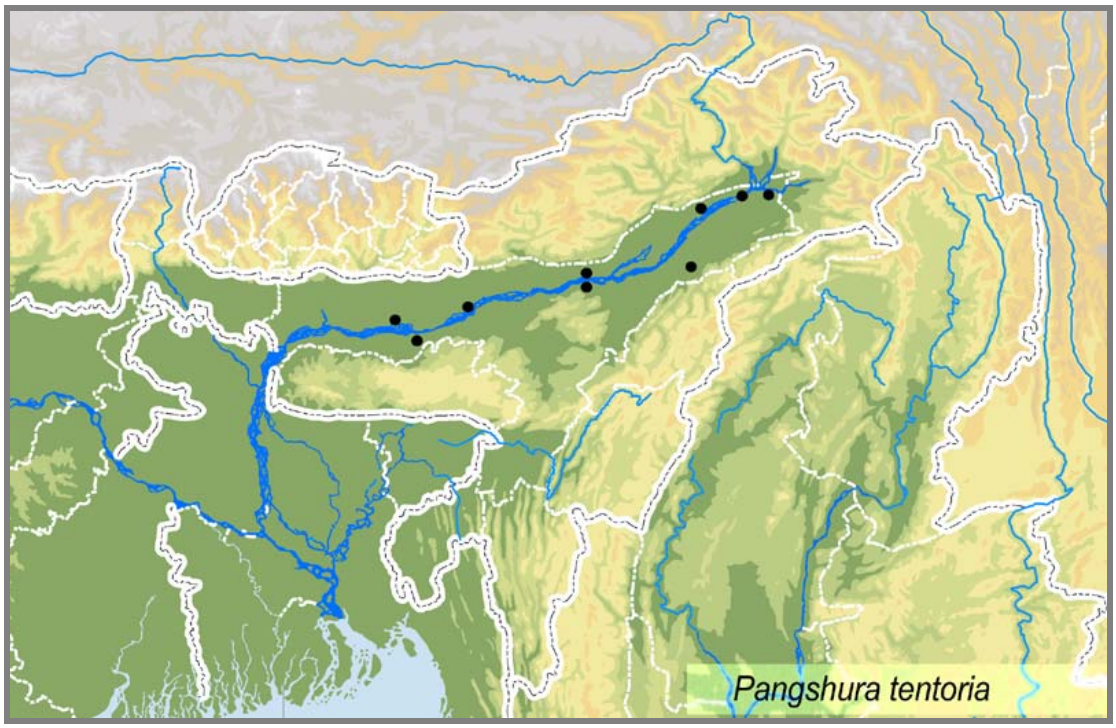
Population Status: Not known and perhaps declined throughout due to anthropogenic invasion in most areas. This common species, though declining could survive in the Brahmaputra and Barak River Systems provided sanctity and tranquility is prevailed in some stretch of the river. Anthropogenic activity seems the major cause of this species disappearing in the river stretches. Still commonly seen in Kaziranga NP and the nearby Brahmaputra River.

Recommendation: Population and ecological study. Study on habitat suitability.

Pangshura tentoria, Indian Tent Turtle



a & b. *Pangshura tentoria*, adult, c. plastron.



Distribution map of *Pangshura tentoria*, see text for more.

Pangshura tentoria (Gray, 1834)

Indian Tent Turtle

Diagnostic Characters: Similar to Indian roofed turtle, but differs in absence of pink mark behind eye and less distinct neck stripe. Brownish olive dorsally with a pink or lighter pleuro-marginal ring. Reddish post ocular spot between eye and tympanum usually present.

Distribution: India**,** Bangladesh, Nepal and Pakistan.

This Study: Bishwanath Ghat; Gobrai, Dhansiri, Arimora, Borbeel, Mer beel of Kaziranga National Park, Orang National Park, (Baluchar of Dibru Saikhowa NP.

Literature and Museum Record: Manas National Park (Das, 1990), Sibasagar (Das 1990 *in litt*.). Guijan, Baluchar, Saikhowaghat, Rohmonia all near Dibru Saikhowa National Park (Choudhury, 1995), Pani-Dihing, Sibsagar district (Choudhury, 1990). He also mentioned the species as most abundant Bataguridae in the region. Matmora, Mornoi Bebejia, Kadam RF in Dhakuakhana (Choudhury, 1995b), Kukurmara, Dharapur, Palashbari, Hajo and North Guwahati of Kamrup district (Choudhury *et al.*, 1999).

Notes: Inhabit both large and small rivers. Communally bask on logs or rocks and undisturbed sand bars. Avoid areas disturbed by human. Non-aggressive. Lay 3-6 eggs during winter. Both plants and animals. Females are vegetarian while males and juveniles are carnivorous. Bishwanath Ghat animals (CL 12.5 cm, PL 12.1 cm) were caught in the fishing net.

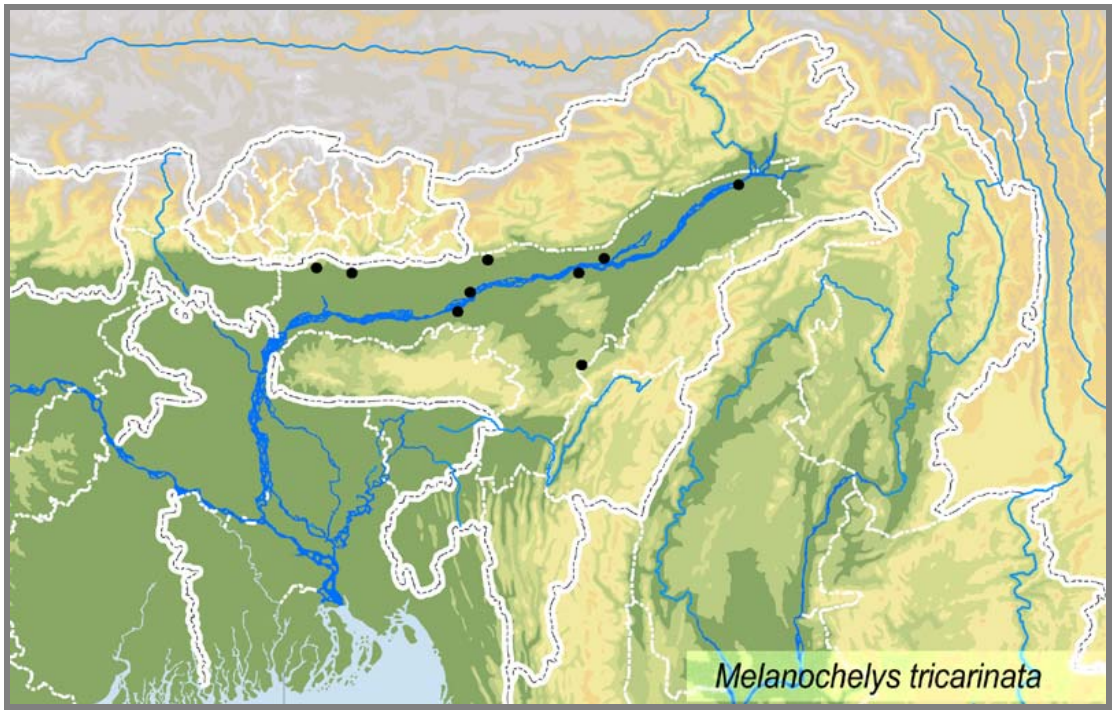
Conservation Status: Status not assessed. Appendix II (CITES). No legal protection in India yet. Occasionally seen in pet trade.

Population Status: Not known. Uncommon in the region. Kaziranga and Orang NP, and the nearby Brahmaputra River hold future.

Recommendation: Population and ecological study. List in the Schedule of the Wildlife (Protection) Act, 1972.

Melanochelys tricarinata, Tricarinate Turtle

a & b. *Melanochelys tricarinata*, adult, c. plastron.



Distribution map of *Melanochelys tricarinata*, see text for more.

Melanochelys tricarinata (Blyth, 1856)
Tricarinate Turtle

Diagnostic Characters: Carapace elevated and elongated with three smooth keels. Dorsally dark brown, keels pale yellow. Plastron light yellow or orange. Head, neck and limbs black. Males much bigger than females, with a concave plastron.

Distribution: India, Bangladesh, Bhutan and Nepal.

This Study: Kaziranga National Park (Mihimukh), Lahoroni Chapori in Buhrapahar Range; Orang National Park (Nislamari, Satsimolu, Raumari, Old Orang Camp), Kalamati near Indo-Bhuan Border in Chirang District, Dibru-Saikhowa NP, Sonai Rupai WLS.

Literature and Museum Record: Bansbari Grassland of Manas NP (Das, 1990), Bishwanath Plain and Dafla Hills (Smith, 1931), Sonapur (ZSI 18391). Dhakuakhana (Choudhury, 1995b); The species is also reported from Pabitora Wildlife Sanctuary (Sengupta *et al*., 1998), Orang National Park, Kaziranga National Park, Mupa-Lanteng Reserved Forest (Bhupathy *et al*., 1992).

Notes: Individual recorded during this study (at Kalamati) was found under a rock in riverine grassland. Four individuals (SCL 16-19.2 cm, CW 9.8-11.7 cm, PL 14-15.8 cm, PW 7.8-9.7cm) encountered in Orang NP (during May) were found on forest patch near fruiting trees and fecal matter contained seeds of small fruits available there. A pair was observed in Orang NP mating in a small pool of water during June. The mating pair was surfacing at regular interval for breathing.

Live male individual (SCL 18.2 cm, CW 12 cm, PL: 15.6 cm) of the species was found near Mihimukh grassland (Kaziranga) at around 1600 hr. Burnt shells were obtained from different grassland areas suggesting its vulnerability to burning. Four live individuals with burnt sign were observed. Inhabit tall grassland and forest areas in terai as well as alluvial floodplains (areas not regularly flooded). Local people collect for consumption but not seen in local trade.

Little is known about biology of this species. Das (1988) reported that the individual from Manas NP laid single large egg in the month of December. Theobald (1876) reported a clutch of 3 eggs.

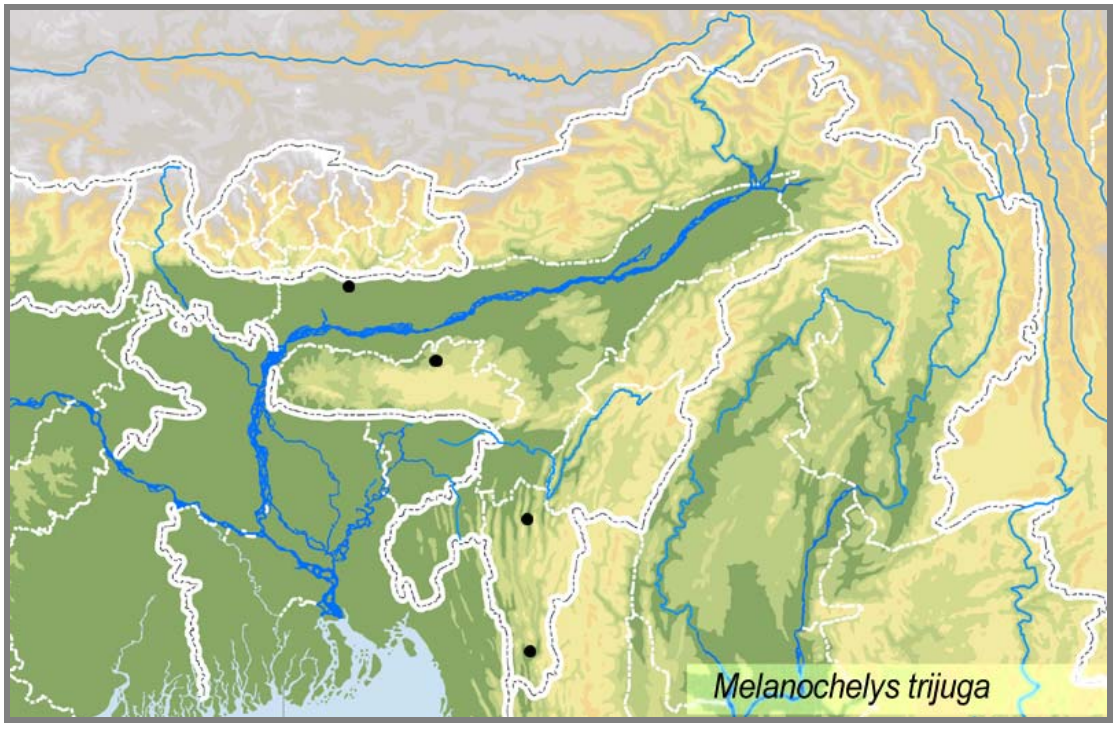
Conservation Status: Vulnerable (IUCN), Appendix I (CITES) and Schedule I of the Wildlife (Protection) Act, 1972. Population is restricted to protected areas only, viz. Manas, Orang, Kaziranga NP.

Population Status: Encountered frequently in Orang NP and Manas NP. Information on population is lacking. Facing extirpation due to shrinkage of habitats including grasslands in the terai and local collection. It lives in floodplain grassland (e.g. Kaziranga, Orang NP) but uncommon there. Hence, forest areas in the terai are important for long term survival of this species.

Recommendation: Population and ecological study.

Melanochelys trijuga, Indian Black Turtle

a & b. *Melanochelys trijuga*, adult, c. plastron.



Distribution map of *Melanochelys trijuga*, see text for more.

Melanochelys trijuga (Schweigger, 1841)
Indian Black Turtle

Diagnostic Characters: Carapace elongated, with three keels; elevated in adult and low in juvenile. Carapace brown and plastron blackish in colour. Dark yellow border on plastron may disappear with age. Males are larger than females and plastron concave. Spear shaped mark on the forehead (*M. t. indopeninsularis*).

Distribution: India, Bangladesh, Nepal, Myanmar, Thailand, Sri Lanka and Maldives

This Study: Not recorded.

Literature and Museum Record: Lailad Village, Nongkhyllm Wildlife Sanctuary (Das, 1990). The individuals collected from Manas National Park were assigned to *M. t. indopenninsularis* by Das (1990). Mizoram: Ngopa town (1100 m asl) obtained from Tuivai river (450 m) (Choudhury, 2002); Pawizawh lui, Zawhlet lui, Khuangpui lui of Northern part of Nengpui Wildlife Sanctuary (Pawar and Choudhury, 2000). Das and Bhupathy (2009) projected its distribution in Nagaland and not verified with observation.

Notes: Grow up to 38.3 cm. Mizoram individuals referable to *M. t. indopeninsularis* were observed from hill streams with rocky side (Pawar and Choudhury, 2000). The Turtles reported to retreat inside the riverside rocky crevices. Streamside basking activity was recorded during January. Omnivore and feed on aquatic vegetation and vertebrates, also a scavenger.

Clutch of *M. t. indopeninsularis* comprises of 3-6 eggs and are found to be laid under Rhino dung heap or under clump of grass (*Saccharum* sp.). MacCann (1934) reported nesting of the species during the third week of October. Six subspecies are currently recognized (Das and Bhupathy, 2009).

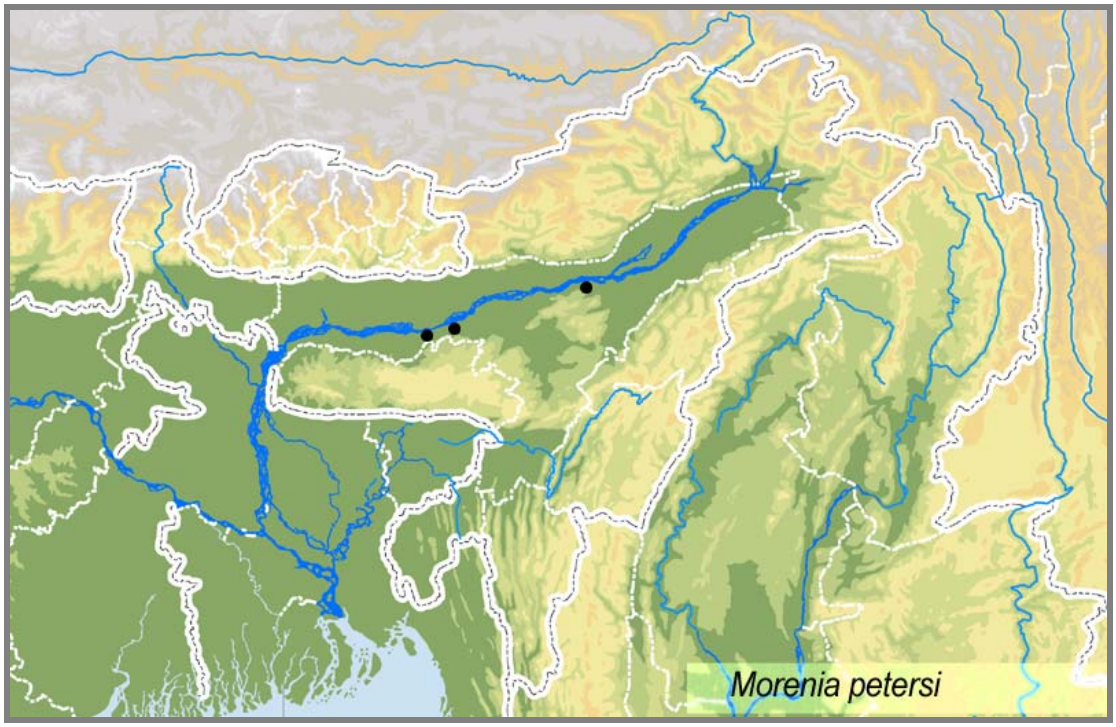
Conservation Status: Near Threatened (IUCN). Not listed by CITES and no legal protection in India yet. Distribution record is poor in the region.

Population Status: Information on population is lacking. It is also restricted to the protected areas only in the region and perhaps rarely seen outside Mizoram and Meghalaya.

Recommendation: Population and natural history study. List in the Schedule of the Wildlife (Protection) Act, 1972.

Morenia petersi, Indian Eyed Turtle

a. *Morenia petersi*, adult, b, close up of head, c. plastron.



Distribution map of *Morenia petersi*, see text for more.

Morenia petersi (Anderson, 1879)
Indian Eyed Turtle

Diagnostic characters: Carapace domed, juveniles with a low vertebral keel. Plastron narrow. Dorsally grey-black or olive green. Vertebral and costal with yellow or green border. Plastron yellow or orange. Head olive. Three yellow stripes on face.

Distribution: India**,** Bangladesh and Nepal.

This Study: Deepor Beel Wildlife Sanctuary.

Literature and Museum record: One individual (ZSI 18335) is from north of Brahmaputra River without any specific record. Choudhury (2004) reported this species from the Kaziranga NP without any specific locality. We did not encounter live animal or shell in and around Kaziranga but most likely to be found in the wetlands in the park. We one observed live and one shell at Deepor Beel of Kamrup district of Assam and Sengupta *et al.* (1998) reported it from Pabitora wildlife Sanctuary. Das (1995) reported it from North Brahmaputra (Assam) without any locality record (which is probably the ZSI 18335 specimen).

Notes: Inhibit both standing and slow moving water bodies. Das (1995) remarked that the species prefer stagnant vegetation choked wetlands and they bask in rows on the newly created sandbars or on sand slabs along eroded river bank. Breed during winter months but its biology is poorly known. Feed on Both plants and animals.

Conservation Status: VU (IUCN). Not listed by CITES, nor protected under law in India.

Population Status: A poorly known species and nothing is known about population status in this region. Population in Deepor Beel is threatened as the wetland is being polluted by solid waste dumping and city sewerage. Kaziranga hold promise for future conservation of this species.

Recommendation: Research on ecology and distribution suggested. Detail survey in Kaziranga NP. List in the Schedule of the Wildlife (Protection) Act, 1972.

Other Activities

Awareness and Capacity Building

Publication of Field Guide

As an outcome of this study, we prepared and published two Field Guides entitled '***Amphibians and Reptiles of Northeast India- A Photographic Guide***' both in English and Assamese. The publications were supported by Conservation Leadership Programme, Rufford Small Grants Foundation and World Bank. Both the volumes are extremely useful for interested individuals in identifying turtles and tortoise along with other species of herpetofauna and readers have welcomed the efforts.

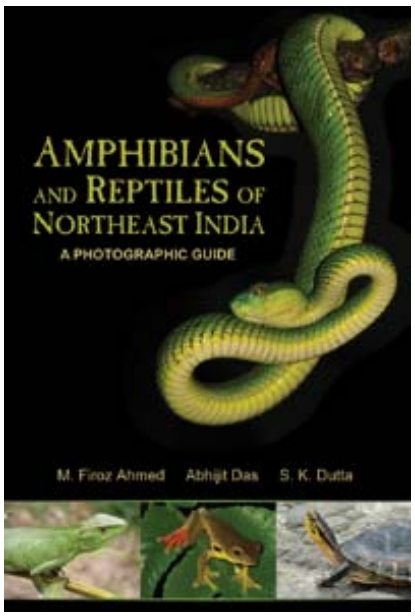
Amphibians and Reptiles of Northeast India- A Photographic Guide

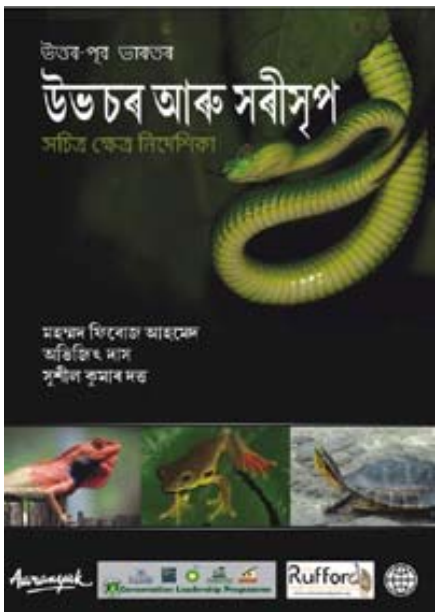
(English and Assamese Volumes)

M Firoz Ahmed, Abhijit Das and S. K. Dutta

About the Book:

- This is the first ever regional colour guide on the amphibians and reptiles of Northeast India and covers all the known turtle species of the region.
- Detailed illustration of 102 species (92 in Assamese) that include 29 species of amphibians, 23 species of lizards, 29 species of snakes, 21 species (all found in Northeast India) of freshwater turtles and tortoises and the single crocodile species- Gharial.
- A photo gallery (in English volume only) of other species (not described in details) of herpetofauna of the region is also included. This section covers 40 species of amphibians and 48 species of reptiles along with their scientific names.
- A checklist of the Herpetofauna so far known from Northeast India is also incorporated.
- Useful section of Snakebite and its Management with first aid tips.





Awareness activities

A series of awareness and capacity building activities were carried out during the period of this study. As many as 20 awareness programmes were conducted in different parts of the region targeting school children, youth, community leaders and elders, forest staff, fishermen, NGO workers and Govt. Officials. Awareness activities ranged from meetings, group discussions and one to one discussions. The Book Amphibians and Reptiles of Northeast India- A Photographic Guide (both in English and Assamese), produced by Aaranyak was used as tool for the awareness programme and occasionally other audiovisual tools. The book was given as complimentary to selected participants and as many as 200 copies of the books were distributed amongst the target group.

Capacity Building

Effort to build capacity of local biologists is very important as the region lacks researchers though it has tremendous potential in research and conservation. During this period, Abhijit Das (Biologist of Aaranyak) got advanced training in turtle husbandry and taxonomy in the Madras Crocodile Bank in Chennai along with Biswajit Barua a BSc Student of Guwahati College. During survey trips we used to take members of local NGOs and Forest Staff and all were given hands on training on turtle survey, identification and conservation whenever possible and available.

Sharing in Conferences and meetings

1. The finding of the study was presented at the Society for Conservation Biologist Conference held at Port Elizabeth, South Africa. Abhijit Das attended the conference and gave an oral presentation.
2. M Firoz Ahmed presented preliminary findings of the study in the first SERC School in Herpetology held at North Orissa University, India in December 2007.

Discussion

Diversity and Distribution: The freshwater turtle and tortoise diversity of Northeast India comprises of 21 species that include 14 genera and 3 families. This is the richest known assemblage compared to any other regional assemblage in India. Present study confirms the presence of 19 species from different parts of the study area. The species *Batagur dhongoka* and *Melanochelys trijuga* were not recorded during this study and presence of these species reported here is based on previous literature records.

The genus *Pangshura* shows the highest diversity in the region with four species followed by *Nilssonia*, *Cuora* and *Melanochelys*. The genus *Manouria, Indotestudo, Morenia, Amyda, Chitra, Batagur, Cyclemys, Geoclemys* and *Hardella* are represented by single species each. *Melanochelys tricarinata*, *Pangshura sylhetensis* appear to be the relatively abundant species during this study period with population seems to be restricted to the protected areas of the Assam plain.

However, this staggering diversity is still poorly known. This is evident from the fact that new range records and even new species are being reported in the recent past. Pawar and Choudhury (2000) included the *Amyda cartiledgenea* in the chelonian list of India from Mizoram state. Paschag and Gemel (2002) reported Nilssonia nigricans from Assam state and remarked as "widely distributed" in the Brahmaputra river system of Assam which was earlier considered as "Extinct in Wild" and species is restricted to Bangladesh. Paschag and Gemel (2002) also indicated that the animals earlier identified as *Nilssonia hurum* by Das (1991, 1995) from Kamakhya temple pond, Datta (1998) from Pakke tiger reserve this are actually specimens of *Nilssonia nigricans*.

During this study, we recorded this Critically Endangered species in wild in the Kaziranga National Park is the only known population inside a protected area throughout its range (India and Bangladesh). This study observed that population this species outside PAs is very thin or non existent as habitat is altered or disturbed and often individuals are killed for turtle meat.

In a recent revision of the *Cyclemys*, Fritz *et al*. (2008) described *C. gemeli* based on a collection from Tezpur to Arunachal Pradesh, 5 km to border of Arunachal Pradesh, Jia Bhoroli River Region, Assam, India. They revealed that, *Cyclemys* in the northeast India, northern West Bengal, Uttar Pradesh (bordering Nepal) are *C. gemeli* and not *C. oldhami* as was previously believed (see Fritz *et al*., 1997). We assigned our recently procured specimens from Assam and Arunachal Pradesh to *C. gameli* based on extended morphological description of *Cyclemys gameli* by Praschag *et al.* (2009). However, our observation in few specimens from Manipur indicated that another there might be a second *Cyclemys* sp. occurring in the Myanmar bordering areas in the region.

The distributional information of the turtles of the region is also scanty. Except few protected areas in Assam, information on Chelonians are lacking from other region. Present study provide new locality information for *Indotestudo elongata,*

Manouria emys, Chitra indica, Pangshura sylhetensis, Cuora mouhotii, Cyclemys gemeli, Geoclemys hamiltonii, Hardella thurjii, Melanochelys tricarinata and *Morenia petersi.*

The low to mid elevation hill ranges of the north and south of Brahmaputra remain comparatively unexplored. The two endangered species called *Manouria emys phayrei* and *Cuora mouhotii* are found in these hills. *Manouria emys phayrei* which is restricted to south of the Brahmaputra River is often been recorded from Lushai Hills and Barail Hills. A total of 13 are reported to be collected from in and around Aizwal town. This large growing species is particularly threatened from Jhum cultivation and hunting. Thus it seems justified to initiate a captive breeding programme involving the wild caught individuals in the zoos of the region.

Threats: The threats to turtle identified during this study were no different to any other animals facing in this region. However, these can be prioritized as follows-

1. Collection of turtles for meat or any other purposes: Many communities in the region are fond of turtle meat. Usually the large bodied turtles, the Softshell turtles are the first choice. Softshell turtles are the most frequently exploited one. Das and Gupta (2004) reported that *Nilssonia gangeticus*, *N. hurum, C. indica, L. punctata* are the most common turtles sold in southern Assam. The Turtle trade of the region is intricately associated with the adjoining Bangladesh and nearby states. Rasid *et al*. (2000) also reported trade between Bangladesh and southern Assam. Bhupathy *et al.* (1992) noted about species suffering from non sustainable exploitation in the region. They recognize the *Manouria emys* being the worst sufferer in the hills.
2. Habitat Loss is significant in the entire region. In the Brahmaputra and Barak Valley it is demand for agriculture land as population has increased and wetlands and low lying forest are converted into agriculture. Illegal tree felling for timber is common through out the region and turtle habitats are disappearing fast. Slash and burn cultivation practiced in the hills of the region has razed the tropical and subtropical forests in the region causing shrinkage of habitats for tortoises and turtles.
3. Loss of habitat connectivity within the populations that are bound within the protected areas of the region is a major concern for turtle conservation in future. As many important protected areas are islands within human settlement hence opportunity for turtles exchanging genes within populations is non-existent. Except the riverine species most other species are increasingly isolated due to agriculture and developmental activities.
4. Over fishing in the freshwater habitats including rivers, lakes and marshes are posing serious threat to the Turtle population of the region. We observed such large incidental turtle capture in the fishing zones near Kaziranga National Park (Bishwanath Ghat). This kind of subsistence loss of wild population is a serious cause of concern.

Prescribed Burning for management and its affect on chelonians: In Kaziranga NP, we recorded dead *Pangshura tentoria* (n=2) and *Geochlemys hamiltonii* (n=3) due to direct affect of burning. No information on affect of burning on herpetofauna is available from the Brahmaputra Valley. There were evidences of high mortality of turtles during burning in alluvial grasslands in Assam (Lahkar, 2000; Firoz Ahmed, *pers. obs.* and *this study*). For a relative assessment on impact of burning on herpetofauna we compared our data on affect of burning available from observations in Orang NP and Manas NP, three sites ecologically similar. Three species of turtles viz. *Pangshura tentoria* (n=2), *Melanochelys tricarinata* (n=6), *Coura amboinensis* (n=3). *Geoclemys hamiltonii* was rescued from burnt grassland and later released. Interestingly, one female of *M. tricarinata* that survived burning was observed breeding in Orang NP.

Observations and data from Manas NP indicated that *Melanochelys tricarinata* (n=7), *Coura amboinensis* (n=3), which are active in grassland are affected during burning. We presume that typical grassland dwelling species like Melanochelys tricarinata are particularly vulnerable to grassland burning.

A detailed and long-term study on the effect of burning is suggested to minimize the affect of burning on turtles and tortoises.

Conservation Status: Out of 21 species of chelonians found in the region 15 species are globally threatened by extinction (IUCN, 2007). These include, one species (*Nilssonia nigricans*) Critically Endangered (CR), six species (*Indotestudo elongata, Manouria emys, Chitra indica, Batagur dhongoka, Pangshura sylhetensis, Cuora mouhotii*) Endangered (EN) and seven species (*Amyda cartilaginea, Nilssonia gangeticus, Nilssonia hurum, Cuora amboinensis, Geoclemys hamiltonii, Hardella thurjii, Melanochelys tricarinata, Morenia petersi*) Vulnerable (VU).

Most of the species (e.g. *Melanochelys tricarinata, Lissemys punctata*) were widely distributed in the foothills and in the wetlands respectively, few decades back are now restricted only to protected forests and habitats in the region. This is principally because of exploitation outside protected forests and loss of habitat mostly due to conversion for agriculture purposes. At present distribution of most species (e.g. *Hardella thurjii, Indotestudo elongata, Geoclemys hamiltonii*) are restricted to protected areas only or their occurrence outside is too negligible.

However, few species are still occurring in human dominated areas, e.g. *Nilssonia hurum, Pangshura tentoria, Pangshura tecta* and their future conservation seems community dependant.

Research, Management needs and Conservation: There is no information on community ecology of the tortoises and freshwater turtles found in the region. Information on ecological requirements of these species is also lacking that limits management options for freshwater turtles for the managers and policy makers. Further, preliminary observation suggested that grassland burning for habitat management has some amount of affect on turtle species, particularly species that remain out of water during winter. We observed that *Pangshura tecta* (n=2), *Melanochelys tricarinata* (n=6), *Cuora amboinensis* (n=3) and *Geoclemys hamiltonii*

(n=1) were killed or burnt by fire in the Kaziranga National Park or in similar grassland habitats in the region. A detailed study on effect of burning on grassland and its biodiversity is of utmost need.

The turtles inside the most of the PAs are protected, however, because of fishing activity on the boundary of the park particularly in the rivers and wetlands, turtles were often get entangled in the fishing nets or intentionally killed. Turtle meat is still in good demand in various markets in the region.

Role of Protected Areas: The protected areas in the region offer tremendous conservation opportunity for the chelonian community which is not to be found in any other similar habitat in the region. However, the chelonians populations of the region are increasingly isolated from each other due to loss of habitat connectivity within the region. However, strictly aquatic species like *Nilssonia* spp. are perhaps still connected through the river networks in the region. For long term conservation of chelonians in the region, they must be protected from excessive hunting for turtle meat and more areas should be brought under protected area network through proper planning, so that connectivity within population can also be established or maintained. Also being a home to a remarkable chelonian diversity (17 out of 21 species), the Kaziranga National Park represents as one of the best sites for future chelonian community ecology study and wild gene pool conservation of chelonians in the region.

Awareness and Community Involvement: The level of awareness about the need of conservation of chelonians is extremely low in the region. Turtles are traditionally eaten in the region and hence the turtle populations outside protected area are mostly extirpated. Most of the species are traditionally used in the hill states of the region. We attempted to create awareness among common people and fishermen during the study including the forest staff through personal meeting and consultation. Large scale and well designed awareness activities is the need of the hour to enhance protection and conservation of chelonians in the region.

We also studied some of the community ponds in Assam (known to have turtles) and their role in turtle conservation. At least five temple ponds are holding turtles in the state, viz. Hoigrib-Madhab Temple Pond at Hajo (near Guwahati), Nagshankar Temple Pond (near Biswanath Chariali), Kamakhya Temple Pond (in Guwahati), Aatkheliya Namghar (near Golaghat) and another Gorokhia Atar Than pond at Sarupeta (near Barpeta Road). These temple ponds are populated with mostly all the three species of *Nilssonia* spp., along with *C. indica* and other commonly available *P. tecta*. Other species seen in these temples are *L. punctata, H. thurjii* and *I. elongata*.

It has been observed that though these temples are supporting threatened turtle population in Assam and able to convey message (unknowingly) about turtle conservation in Assam, however, most of the temple ponds are now overpopulated and there is severe constrain with food and space. Even inbreeding may not be ruled out as these populations are not connected to wild populations. In one occasion (Temple pond at Hajo), several turtles were found dead during 2008 for unknown reason. A case study is attached in this report.

If properly planned and managed, the temple ponds and other community ponds in Assam along with innumerable wetlands spread throughout the state can play a major role in future conservation and management of wild turtles in Assam and in the region as a whole. This should start with a well planned conservation education programme followed by dialogue and involvement of the communities in turtle conservation initiatives.

Viable Populations: It is difficult to discuss and comment on 'viable population' of turtle in the region as information on population of the chelonians of the region is not available at all. It is utmost need that studies in future concentrate in population ecology and biology of the species as a priority.

With 17 species so far recorded from in and around Kaziranga National Park (Ahmed and Das, *in press*), this PA represents the best remaining habitat for the turtles in the region. Among the most frequently encountered species *P. sylhetensis, C. amboinensis, M. tricarinata* are noteworthy.

However, looking at the available information on population trend in the region, based on perception of common people and fisherman, population of all the known species are declining throughout. The fishermen are good evaluator of population trend of the exploited species. Many fishermen reported sharp decline in catch per effort in the area where they have been fishing for generations. This was obvious that during the last two decades or so, as they reported. Such decline can be attributed to several reasons described above.

This study has identified future conservation centers of turtles in the region mostly in the protected. Amongst these Kaziranga National Park in Assam offers the maximum hope for turtles of the region with highest diversity in a single protected area. Further, protection to the species is also highest in the park compared to any PAs in the region.

In addition, Namdapha NP, Manas NP, Orang NP, Nameri NP, Pakke WLS, Barail Wildlife sanctuary, Mupa- Langteng reserved forest, Nongkhyllem WLS, Nengpui WLS, the Riverine areas between Orang and Kaziranga NP (Kazirang-Orang Riverine Landscape) hold future potential for turtle gene pool conservation in the region as identified till now. There might be some other suitable areas in the region that was not spotted or evaluated during this study.

Conservation Planning Workshop: A participatory workshop for Conservation Planning and Strategic Action Planning for Tortoises and Freshwater Turtles of Northeast India has been planned in September 2010. This workshop has been delayed due to lack of suitable timing for several experts on chelonians in the country. However, a number of organizations and institutions have shown interest in the workshop and we expect to hold this in September 2010. A separate report will be submitted on this workshop that would include conservation planning and strategic action plans for Tortoises and Freshwater Turtles of Northeast India. An Action plan will be published as the end product of the workshop.

A detailed account on the planned workshop is presented in Annexure 05.

Recommendations

1. The NE Indian region should be recognized as 'tortoise and freshwater turtle Hot Spot' within India to attract more attention of the government, national and international agencies. This will also help in creating awareness amongst the stakeholders.
2. This rapid survey was repeated after a period of 17 years. Still a large tract of habitats left out due to vastness and remoteness of the region. We recommend further short term and in depth surveys in other important turtle habitats that were not or least covered during this study.
3. As chelonians of the region are fast disappearing, we recommend that a center for tortoises and freshwater turtle conservation be established in the region with facility for research for breeding, education and community involvement in restocking.
4. The Kaziranga National Park in Assam is the only protected area that is known to house highest diversity of chelonian fauna in the northeast India. We recommend that the Kaziranga NP be used as a conservation model for many other PAs in the region to further strengthen chelonian conservation in the region.
5. We would like to recommend initiation of fresh biological and ecological research to identify the remaining 'Turtle Hotspot' of the region and prioritize those areas for turtle conservation.
6. Killing of turtles and tortoises are still going on in different places in the region. Enforcement by forest departments and other law enforcement agencies has made turtle meat trade underground and effort should be made to identify such networks and dismantle them sincerely.
7. We would like to recommend inclusion of more strategic areas under the protected areas network in the region as habitat and populations of turtles are disappearing fast.
8. Temple ponds could be used as a good model for community turtle conservation in Assam. We recommend that selected wetlands (Beels) be recognized and involve communities in long term turtle conservation.
9. Conservation awareness holds another key to future turtle conservation in the region. We recommend that suitable education programmes are designed to address awareness needs of different group of target audiences.
10. A network needs to be established to share information about chelonians and strengthen their conservation in the region in near future.

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Case study: A rapid Assessment of Turtle Mortality at Haigrib-Madhab Temple Pond, Hajo, Assam.

The Haigrib Madhab Mandir Temple pond is famous for its Huge Turtle stock. In this era of Turtle crisis throughout the world, this temple pond population however represents important genetic stock which is getting protection under traditional culture. The Pond is located at 26° 14.604′ and 91° 31.763′; altitude, 49 m above sea level. On receiving information of reported Turtle mortality, we reached the temple pond at 1500hrs on 8th July 2008.

This large temple pond is 468 ft in Length and 252 ft in width, approx. 40 ft deep (Maximum depth) with concrete sides. Concrete bank was constructed during October 2007 from soil edges after removing the coconut plantation on pond surroundings.

Turtle Species Observed and their Importance:

During our visit, we could observe five species of Turtles in the Pond-

Black Softshell Turtle	*Nilssonia nigricans* (Endangered)
Peacock Softshell Turtle	*Nilssonia hurum* (Vulnerable)
Spotted Pond Turtle	*Geoclemys hamiltonii* (Vulnerable)
Assam Roofed Turtle	*Pangshura sylhetensis* (Endangered)
Indian Tent Turtle	*Pangshura tecta* (Lower risk)

1. Black Softshell Turtle, *Nilssonia nigricans*: This species is listed as Critically Endangered in IUCN Redlist. Interestingly first wild population of this species is recently reported from Assam (Kaziranga, Nameri and Bishwanath Ghat of Brahmaputra). Initially it was thought that the global population of this species is restricted to a single Temple pond of Bangladesh. However, a study on the temple turtles (Hajo and Kamakhya) of Assam revealed that Black Softshell turtles also present in Assam's temple ponds and subsequently wild population of Black softshell is discovered from many places of Assam.

2. Peacock Softshell Turtle, *Nilssonia hurum*: Listed as Vulnerable species in red list. This schedule I species of Wildlife Protection Act 1972. Like all the large softshell species (*Bor Kasso*) this species is also under severe threat. Habitat loss, overfishing coupled local consumption has greatly reduced all the Softshell turtle population in Assam.

3. Spotted Pond Turtle, *Geoclemys hamiltonii*: this is also a Schedule I species and is Listed as Vulnerable in IUCN Redlist. Large scale local consumption has virtually wiped out the population outside protected area. Kaziranga and Orang National park is having good population of this species.

4. Assam Roofed Turtle, *Pangshura sylhetensis*: Listed as Endangered in IUCN red list. And a schedule I species of Wildlife Protection act. This is a rare species of hardshell turtle. Kaziranga National Park is holding the best known population of this species. Habitat loss seems to be the key threat for this ecologically sensitive species rather than local consumption.

5. Indian Tent Turtle, *Pangshura tecta*: Listed as Lower risk in IUCN however is a schedule I species in wildlife protection act. This is a relatively widespread species but local consumption reported. Population is also regarded as in a declining trend.

The above mentioned species were observed near the visitors point and often been fed by Biscuits. According to local peoples there are few more turtle species. One species they reported is *Baghia Kasso* (*Chitra indica*) which is a large growing softshell turtle and is an endangered species.

Observations:

Although no information exists on the Turtle population, but according to locals the number is above one thousand (!). According to Temple pond authority, 7-8 turtles died in the 2007 and this year the toll rises up to around 7 so far. The shells of those six dead turtles could only be obtained as the soft body parts were being consumed by other turtles. On 8th July 2008 again one turtle died and that was recovered with all body part before being consumed by other and was send to Veterinary College for post mortem. There is also information about fish mortality and we observed one dead fish (*C. mrigala*) floating near bank with few injury marks that presumably reflects the turtle bites. Other fish's observed including *Labeo rohita*, *L. kalbasu* which are seen while feeding on the same food offered by visitors. According to locals' no smaller fishes are available in the pond which could be the food of the Turtles.

It has been observed that the visitors often throw the plastic packets in which the Biscuits for Turtles were sold. Although Temple authorities put a restriction in throwing the plastic packets but that is rarely followed.

There is no sighting evidence of macrophytic aquatic vegetation available in the pond which some species use as food. Neither any natural turtle food is supplied from outside. The pond water found to be as highly turbid and with huge planktonic (Blue green algae) load. The water colour is greenish. The three turtles were caught and examined. All the individuals were found to have severe ecto- parasitic load (Turtle leech).

Temple authority also narrated that few years back they used to find many turtle eggs along pond banks but after the pond bank development the egg lying was decreased.

Reasoning of Death:

Villagers View:

According to local peoples and Temple authority from last 2-3 years turtle death became a regular phenomenon. This year death of & turtles is a cause of concern for them. They recognize that there is a food shortage for the turtles and also lack of breeding sites. As they mentioned before the concrete bank was constructed they often encountered turtle eggs and turtles frequently used the pond bank. Few local residents mentioned that there is a need to change the pond water and sun dry the pond.

Our View:

All the Reptiles need sunlight to raise their body temperature since they are ectothermic. In Wild, Turtles spend a significant time basking along river shoreline and climb fallen branches for Basking. However, there is little or no basking place available in Hajo pond.

So we feel there is an urgent need to develop adequate sandy aquatic edges so that large soft shell turtles can bask and Tree branches for smaller hard-shell species (*Dura*) so that they can climb on those tree branches and regulate their body temperature.

We have seen that Turtles are using base of water pump attached to pond as basking place. This probably reflects the need for this critical resource (Basking sites). Overcrowding is a factor for recent Turtle death. If the turtle population is around 1000(?) then this monotypic habitat then it is surely overcrowded. As it is known that overcrowding is a cause related to mortality and is a important factor for population

dynamics. Overcrowding May leads to food scarcity especially for the smaller individuals that cannot compete with larger individuals for food or for the shy species (e.g. *Pangshura sylhetensis*) that avoid food that are being offered by visitors. Furthermore, this may contribute to increase in parasitic load which is observed in these Turtles.

There is an urgent need to check the polythene menace in the Hajo pond. Some visitors also through the polythene packets with food within it that the turtles attempt to take out the food items from inside the packets. In such circumstances it is possible that polythene packets can be consumed by turtles.

Although temple authority tried to provide with nesting sites- soil in pond corners but that seems not adequate for the population. Most of the soils are already washed out. So there is need of development of a sandy and sloppy pond bank so that turtles can climb. Turtles need riverine sands on which they lay eggs. So, for long time sustenance of turtle population of Hajo tank, modification of the pond according to the biological need of "turtles" seems paramount importance.

Recommendation:

Short-term:

- Provide half submerged Tree branches for Turtle Basking.
- Ban use of Polythene packets and introduce Paper Packets.
- In case of further case of mortality, collect the Carcass immediately and send for veterinary examination.
- Analysis of water quality (pH, Dissolve Oxygen, etc.)

Long Term:

- Develop an aquatic edge suitable for Turtle Basking and Nesting.
- Introduction of Natural Food (Small Fish, Macrophytic Vegetation etc)
- Determine the population, if it is beyond the bearing capacity, capture and introduce in other suitable place(s)
- Conduct scientific investigations like serology, bacteriology, virology and parasitology work to evaluate the causes of incidence.

Veterinarian Dr. Bidyut Jyoti Das, Pigmy Hog Conservation Programme, Guwahati was part of this investigation and participated in preparation of this short report.

Annexure 01

Turtle Survey Data Sheet

Date: start end

Locality:

Starting GPS point: End GPS point: km. covered:

Habitat/Vegetation: river/lake/pond/forest _____

Type: Seasonal/perennial

Ownership type:

Distance from human habitation: Length of Shoreline Searched:

Temperature: Air °C Water °C;

Weather: sunny/cloud/foggy/rainy Water Color: clear/stained/turbidity_____

Max Depth of water body (in meters):

Shoreline Characteristics (Tick): shallows, no shallows, emergent veg, no emergent veg

Emergent Vegetation Species (in order of abundance):

Distance to forest edge _____m Forest Type_____

Species Information

Species (Scientific and local name)	Sex	#	Stage E/H/J /A/D	Time	Activity/ Substratum	Trade / consume Rating	Habitat Ranking*

*Habitat Ranking: 01 (best): 02 (Good): 03 (under pressure.): 04 (degraded/polluted), 05 (manmade)

Nest and eggs: Number of eggs_____predation pressure_____

Microhabitat Description**:**

Identification Method**:** visual in hand/visual not in hand/Photographic/Shell/plastron/others_____

Identification Confidence: certain_____ uncertain_____

Local Contact _____

Other animal seen during survey:
Natural History:

Annexure 02

Table 1. Conservation status (IUCN) and legal protection (in India) of the tortoise and freshwater turtles of Northeast India.

species	WPA	IUCN	CITES
Indotestudo elongata	IV	EN	II
Manouria emys	IV	EN	II
Amyda cartilaginea	X	VU	II
Chitra Indica	IV	EN	II
Lissemys punctata	I	-	II
Nilssonia gangeticus	I	VU	I
Nilssonia hurum	I	VU	I
Nilssonia nigricans	-	CR	I
Cuora amboinensis	-	VU	II
Cuora mouhotii	-	EN	II
Cyclemys gemeli	-	-	-
Geoclemys hamiltonii	I	VU	-
Hardella thurjii	-	VU	-
Batagur dhongoka	-	EN	II
Pangshura smithii	-	NT	II
Pangshura sylhetensis	I	EN	-
Pangshura tecta	I	-	I
Pangshura tentoria	-	-	II
Melanochelys tricarinata	I	VU	I
Melanochelys trijuga	-	NT	-
Morenia petersi	-	VU	-

Annexure 03

Table 2. List of places where from turtles occurrence is recorded along with geographical coordinates and altitude.

Locality name	Current name or equivalent	District or Division / State	Country	Coordinates	Elevation a.s.l. in m
Amguri	-	Golaghat Dist. / Assam	India	26°35´N, 93°21´E	~90
Balphakram NP	-	South Garo Hills Dist. / Meghalaya	India	25°14´N, 90°49´E	~ 500
Borjuri village	-	Golaghat Dist. / Assam	India	26°37´N, 93°32´E	65
Bishwanath ghat				26 39.420 93 10.536	58
Chessa	-	Papum Pare Dist. / Arunachal Pradesh	India	27°04.082´N, 93°35.641´E	266
Chabua	-	Dibrugarh Dist. / Assam MVZ 43786	India	27° 48´ N, 95° 18´ E	106
Chandanpur		Papum pare		27 04.082 93 35.641	266
Dejoo	Diju	Lakhimpur Dist. / Assam	India	27° 17' N, 94° 03' E	~ 100
Dibrugarh	-	Dibrugarh Dist. / Assam	India	27° 48´ N, 94° 09´E	94
Dulung				27 26 657 94 13.000	95
Garbhanga Reserved Forest	-	Kamrup Dist. / Assam	India	26°04´N 91°43´E	~120
Goalpara	-	Goalpara Dist. / Assam	India	26°10´N, 90°37E	~ 35
Haldibari	-	Golaghat Dist. / Assam	India	26°35´N, 93°28´E	86
Harmoti	-	Golaghat Dist. / Assam	India	26°34´N, 93°16´E	55
Hengrabari Reserved Forest	-	Kamrup Dist. / Assam	India	26°09´N, 91°47´E	150
Itanagar	-	Papum Pare Dist. / Arunachal Pradesh	India	27°01´N, 93°62´E	440
Jalukbari	-	Kamrup Distr. / Assam	India	26°09´N, 91°40´E	90
Jorhat	-	Jorhat Dist. / Assam	India	26°75´N, 94°22´E	116

Kamakhya Temple Hills	-	Kamrup Dist. / Assam	India	26°10´N, 91°42´E	120
Kathpora Tower grassland	-	Golaghat Dist. / Assam	India	26°36´N, 93°23´E	50
Gibbon WLS	-	Jorhat Distr. / Assam	India	26°44´N, 94°24´E	~ 90 m
Mihimukh road	-	Golaghat Dist. / Assam	India	26°37′ N, 93°23′ E	55
Majuli				26 56.994 94 15.676	68
North Guwahati	-	Kamrup Dist. /Assam	India	26°11'N, 91° 44'E	55
Panbari Reserved Forest	-	Golaghat Dist. / Assam	India	26°36´N, 93°30´E	78
Potasali	-	Sonitpur Dist. / Assam	India	26°56´N, 92°50´E	88
Rampore Tea Estate	-	North Cachar Hills Distr. / Assam	India	24°56´N, 92°46´E	90
Sadiya	-	Tinsukia Dist. / Assam	India	27°50´N, 95°40´E	125
Sibsagar	-	Sibsagar Dist. / Assam	India	26°98´N 94°63´E	95
Singhbeti camp	-	Darang Dist. / Assam	India	26°30´N 92°16´E	53
Seijusa	-	East Kameng Dist. / Arunachal Pradesh	India	26°56.035´N 92°59.063´E	126
Shillong	-	East Khasi Hills Dist. / Meghalaya	India	25°57´N, 91°88´E	1525
Sonapur	-	Kamrup Dist. / Assam	India	26°07´N, 91°59´E	55
Sonai Rupai				26 53.369 92 33.616	115 m
Samagooting	Chumukedima, Samaguting	Dimapur Dist. / Nagaland	India	25°48´N, 93°48´E	~ 200
Tezpore	Tezpur	Sonitpur	India	26 37.595 N, 92 46.751 E	46 m
Tura	-	West Garo Hills Dist. / Meghalaya	India	25°31´N, 90°13´E	~ 540

Annexure 04

Networking

The following institutions were contacted, consulted, and involved during the study and a number of these institutions participated in different form of awareness activities conducted throughout the study period.

Cachar College, Silchar

Department of Environment and Ecology, Assam University

Department of Zoology, Gohpur College

Department of Zoology, N. Lakhimpur College

Department of Zoology, Arunachal University

Department of Zoology, Golaghat College

Department of Zoology, Kokrajhar College

Department of Zoology, Pandu College

Department of Zoology, Mizoram University

Forest Range Office, Majbat

Forest Range Office, N. Lakhimpur

Forest Range Office, Orang NP

Forest Range Office, Pakke TR

Dampa Tiger Reserve Authority, Mizoram

G. C. College, Silchar

Green Guard

Green Heritage

Khonoma Village Council, Nagaland

Kokrajhar Government College, Kokrajhar

Madras Crocodile Bank Trust, Chennai

Majuli Science Society

Nameri National Park Authority

Nature's Banyapran

Nature's Foster

NERIST, Arunachal Pradesh

New Horizons

Pavoi Youth Club

Pigmy Hog Conservation Programme

Sasastra Seema Bal (Defence)

Science College, Majuli

Sonai Rupai Forest Range Office

State Forest Research Institute, Itanagar

Traditional Satras, Majuli

WWF- North Bank Landscape Programme

Annexure 05

Turtles and Tortoises of North East India: Saving them from Extinction!

A Workshop on Current Status, Conservation Prioritization and Strategic Action Planning for Tortoises and Freshwater Turtles of Northeast India

Background

Northeast India (NE India) is an important part of the Eastern Himalayas as well as Indo-Myanmar Biodiversity Hotspots and supports some of the very unique and rich biota on earth. Being located at the confluence of the Indo-Chinese, Indo-Malayan and Indian biogeographic regions, this region attracts special attention due to its faunal and floral composition with derivatives from all the three bioregions. As many as 274 species of herpetofauna are known to occur in the region. The region can also be termed as a 'Turtle Hotspot' within India and home to 21 out of 29 species of freshwater turtles and tortoises are found in the region.

However, the Tortoises and Freshwater Turtles are the most exploited reptiles for food in the region. It is evident that turtle populations have crashed all over the region to untraceable number except in few protected areas; or even extirpated only because of greed for turtle meat. Habitat destruction and conversion of turtle habitats for human and agriculture has added to the decline and loss of loss of turtle population in the region.

The Division of Herpetology, Aaranyak, with support from the Conservation Leadership Programme and the CEPF Small Grants Programme has carried out an extensive survey of Tortoises and Freshwater Turtles in the region since 2007. During the Phase I (2007-09) the following activities were carried out_

- Extensively surveyed tortoises and freshwater turtles in the NE India and gathered valuable information on distribution, threats and status of each species in the range.
- Published a field guide on amphibians and reptiles of the NE India that include al known species of tortoises and freshwater turtles of the region.
- Currently preparing status report and distribution map of the species found in the region and planning to prepare a conservation action plan for the tortoises and freshwater turtles of the region.

A detailed account on the project background and activities are available online http://www.aaranyak.org/Projects/turtles_northeast.htm

Based on the information gathered during recent field surveys and also distribution and status data available with other workers within and outside the region we propose to hold a workshop with experts, conservationists and managers having field knowledge on chelonians of the region to evaluate current status, conservation prioritization and strategic action planning of the Tortoises and Freshwater Turtles of the region.

Objectives of the Workshop

Evaluation of current status of the chelonians of NE India and preparation of Conservation Action Plan.

Expected Outcome

1. Revised status of the chelonians of NE India.
2. A Strategic Conservation Action Plan for long term conservation of the prioritized threatened species of the region.
3. Stakeholder herpetologists establish a broad-based TFT working group for NE India to share information and address conservation gaps and minimize overlapping to achieve conservation goals.

Stakeholders

The workshop will bring in different stakeholders from the region and outside having knowledge and experiences on chelonians and their conservation and management. Some of the stakeholders are:

1. Biologists working on chelonians.
2. Institutions and organizations involved with Chelonian conservation and research.
3. State Forest Departments of the region and selective PA Managers.
4. State Fishery Department of the region.
5. Power (Dams) and Irrigation Departments
6. Law Enforcement agencies (other than forest)

Date

Tentatively September 2010

Duration: Three days maximum

(A detailed session wise schedule is being prepared)

Venue

Kaziranga NP, Assam, India

Organizer/Host

Aaranyak (Division of Herpetology) and Assam Forest Department

Expected Collaborating Organizations and Institutions

(Collective list without any official communications)

Name of Organization/Institutions (arranged alphabetically)	Workshop Responsibilities (P=probable, C= Confirmed)
Aaranyak	**Organizing and Financial (C)**
Assam State Zoo	Workshop Venue (P)
ATREE	Participation (P)
CEE-Northeast	Participation (P)
Conservation International	Financial and Technical Support (P)
Department of Sc. and Tech., GoI	Financial Support (P)
Dept of Zoology, Gauhati University	Participation (P)
Dept. of Env. Science, Assam University	Participation (P)
Dept. of Zoology, Arya Vidyapeeth College	Participation (C)
Ministry of Env. and Forest, GoI	Financial Support (P)
Pigmy Hog Conservation Programme	Participation (P)
SACON	Participation and technical support (C)
State Forest Departments	Participation (P)
Turtle Survival Alliance/ Madras Crocodile Bank's Indian Turtle Conservation Program	Financial and Technical Support (P)
Wildlife Institute of India	Technical Support (C)
Wildlife Trust of India	Participation (P)
WPSI	Participation (P)
WWF-India	Participation (P)
Zoo Outreach Organization	Participation & Technical Support (C)
Individuals	
Bryan Horne	USA (C)
Indraneil Das	Malaysia (C)
Peter Prachag	Austria (C)

Table: List of Tortoises and Freshwater Turtles of NE India with IUCN and CITES categories.

	Scientific Name	Status
Family: Testudinidae		
1	*Indotestudo elongata* (Blyth, 1853)	EN, CITES Appendix II
2	*Manouria emys* (Schelegel & Muller, 1844)	EN, CITES Appendix II
Family: Trionychidae		
3	*Nilssonia gangeticus* (Cuvier, 1825)	VU, CITES Appendix I
4	*Nilssonia hurum* (Gray, 1831)	VU, CITES Appendix I
5	*Nilssonia nigricans* (Anderson, 1875)	CR, CITES Appendix I
6	*Chitra indica* (Gray, 1831)	EN, CITES Appendix II
7	*Lissemys punctata* (Lacepede, 1788)	NA*
8	*Amyda cartilaginea* (Boddaert, 1770)	VU, CITES Appendix II
Family: Geoemydidae		
9	*Cuora amboinensis* (Daudin, 1802)	VU, CITES Appendix II
10	*Cuora mouhotii* (Gray, 1831)	EN, CITES Appendix II
11	*Cyclemys gemeli* Fritz, Guicking, Auer, Sommer, Wink and Hundsdorfer, 2008	NA*
12	*Geoclemys hamiltonii* (Gray, 1831)	VU, CITES Appendix I
13	*Hardella thurjii* (Gray, 1831)	VU
14	*Batagur dhongoka* (Gray, 1831)	EN, CITES Appendix II
15	*Pangshura smithii* (Gray, 1831)	NT, CITES Appendix II
16	*Pangshura sylhetensis* (Jerdon, 1870)	EN
17	*Pangshura tecta* (Gray, 1831)	NA*, CITES Appendix II
18	*Pangshura tentoria* (Gray, 1834)	NA*, CITES Appendix II
19	*Melanochelys tricarinata* (Blyth, 1856)	VU, CITES Appendix I
20	*Melanochelys trijuga* (Scheweigger, 1841)	NT
21	*Morenia petersi* (Anderson, 1879)	VU

*NA= NOT ASSESSED

Preliminary Workshop Agenda

Day 1 (Sept. DD):
Current Research and Conservation Efforts

- Introductions and formal presentations on tortoise and freshwater turtle of India (with special reference to NE India).
- Short presentation on research and conservation activities carried out by participating individuals and organizations.
- This should include conservation biology research, community programs, captive breeding programs, and trade data analysis.
- Review of previous CAMP/RedList assessment and progress.

Day 2 (Sept. DD)
Red List Status Updating
IUCN RedList status assessments and updated threat categorizations of tortoise and freshwater turtle species of the region.

Development of Conservation Strategies
Identify and develop focused conservation actions needed for tortoise and freshwater turtle species of NE India.

Day 3 (Sept. DD)
Prioritizarion and Strategic Action Planning
Synthesize and prioritize conservation needs into a strategic vision and focused Conservation Action Plan. Identify key partners and conservation opportunities for collaborative and focused approaches as well as capacity-building for long term successful conservation of tortoises and freshwater turtles of NE India.

Post-Workshop Deliverables
Publication of Action Plan.

- Production and publication of a formal Workshop Proceedings and Conservation Action Plan (in professional hardcopy and digital pdf formats).
- To include documentation of research and conservation efforts, IUCN RedList status assessments, conservation prioritizations, and the strategic Conservation Action Plan.

IUCN Red List Assessments
Recommendation for review of the IUCN RedList status to the RedList Authority (IUCN/SSC Tortoise and Freshwater Turtle Specialist Group Steering Committee).