Chapter 12

A Natural History Account of the Tricarinate Hill-Turtle

Melanochelys tricarinata in the Doon Valley, Northern India

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Introduction

The Tricarinate Hill-turtle *Melanochelys tricarinata* belonging to the family Geoemydidae that includes the semi aquatic pond turtles is a small terrestrial turtle, attaining 174 mm in length and restricted to the northern parts of the Indian subcontinent (Das, 2009). The name of the turtle is derived from the presence of three prominent yellow lines/keels on its brownish-black carapace (Plate 12-A and B). This along with the yellow plastron distinguishes it easily from its only congener, the Indian Black turtle *Melanochelys trijuga*, and all other semi-aquatic pond turtles. *M. tricarinata* is more generally reported from the Himalayan foothills and riverine grasslands along the river Ganga and Bramhaputra (Boulenger, 1890; Smith, 1931; Pritchard, 1979; Ernst and Barbour, 1989; Choudhury and Bhupathy, 1993a; Busack, 1994; Das, 1991, 2009; Mitchell and Rhodin, 1996; Schleich and Kastle, 2002). However, the records by Khan (1987) from the Whykong reserve forest, Cox's Bazar district of Bangladesh suggest the occurrence of the species at a considerable distance from the Himalayan ranges. In addition, the species is also known to occur in the Sal (*Shorea robusta*) dominated forests of Chaibassa district, Jharkhand (Das, 1991), from where it was originally described (Blyth, 1856), and recently recorded in the Simlipal Tiger Reserve in northern Orissa (Dutta *et al.* 2009).

The *M. tricarinata* is included in the Schedule I of the Indian Wildlife (Protection) Act of 1972, and listed in the Appendix 1 of CITES and classified as Vulnerable on the IUCN Red List (Asian Turtle Trade Working Group, 2000), however still, it is a poorly known species with virtually no information on its population status, habitat requirements, habit, diet or breeding biology from the wild. Knowledge of the life history of the species is almost entirely a result of observations from few captive individuals (Tikader and Sharma, 1985; Das, 1988; Mitchell and Rhodin, 1996; Valentin and Gemel, 1999). Destruction of primary forests (Das, 2009), and exploitation of the species for food and commercial trade are concerns for the survival of the species (Tikader and Sharma, 1985; Choudhury and Bhupathy, 1993a,b; Das, 1995; Javed and Hanfee, 1995; Mitchell and Rhodin, 1996; Shrestha, 1997; Zhou *et al.*, 2008; Gong *et al.*, 2009). Here, we present natural history accounts of *M. tricarinata* based on observations of the turtles recorded (capture/recapture), over a period of 10 years from 1998 to 2008 from within the Wildlife Institute of India (WII) campus located in the Doon Valley, northern India.

***M. tricarinata* in the WII campus.** – The tricarinate hill-turtle is the most commonly recorded species within the WII campus. Three other testudines were also recorded though only occasionally within the campus; three Indian flapshell turtle *Lissemys punctata*, two *M. trijuga* and one Yellow-headed Tortoise *Indotestudo elongata*. The WII campus with an area of 32 hectares is located near to the Shivalik hills along the southern end of the Dehradun city in the Doon Valley in the Uttarakhand state (Plate 12-C), and the natural vegetation consists of Sal forest with a dense understory dominated by bushes of *Lantana camara*, *Carrisa opaca*, *Maclura cochinchinensis* and *Jasminum multiflorum*. Also, the area is interspersed with few perennial water sources and a man-made lake. The adjoining part of the campus is contiguous with the Rajaji National Park in the Siwalik landscape.

A total of 110 *M. tricarinata* were captured and marked in the campus during the study period; 38 of these were males, 36 were females, 15 were juveniles and 21 were hatchlings. Apart from this ten other turtles (9 males and 1 female) were also captured from the adjoining areas of the campus. These turtles were further recaptured on 154 occasions during the study. The capture-recapture data on the campus of WII suggests that the turtle population is within the range of 30-40 individuals per year (*Unpublished data*).

Marking turtles

In order to identify each turtle captured in the area, permanent markings were made by filing notches into the marginal scutes of the carapace following Cagle (1939). In the genus *Melanochelys* a total of 12 marginal scutes are present on either side of the carapace, and of these only three in the anterior and five in the posterior can be

used for marking as the four other scutes are connected to the plastron. For this study, only the posterior marginal scutes, five on either side of the carapace were used for marking. The marginal scutes on the right side were given single digit ID's as 1, 2, 4, 7, and 9 while those on the left were given ID's 10, 20, 40, 70 and 90 starting from the posterior most scutes (Plate 12-D). Only a single notch was made in each of the five marginal scutes and a combination of these scutes was marked depending on the individual ID. Hatchlings and yearlings captured in the area were not marked, as their carapace was very soft and not ossified.

Morphometrics

Body size distribution of the captured turtles was found to be biased towards larger turtles (Plate 12-E). Maximum turtle captures (66.7%) were in the size class of 130 to 170 mm, predominated by males in the size classes between 150-170 mm (74.5%), and predominated by females in the size classes between 130-150 mm (91.9%). The average SCL recorded for adult male and female turtles were 154 mm (range 127-175 mm, n = 47), and 138 mm (range 117-151 mm, n = 37) respectively. Likewise, average weight of the male and female turtles were 461.5 g (range 280.0-621.4 g, n = 46), and 384.4 g (range 240.0-511.1 g, n = 35) respectively. The smallest hatchling caught had an SCL of 33 mm and weighed around 8.0 g, while most other hatchlings were between 40 and 60 mm in length. Male turtles showed a plastron concavity measuring 7.7 mm on average (range 2.4-12.0 mm, n=47). From the morphometric data obtained adult males of the species were found to be significantly larger than females in the population, which is observed among mostly terrestrial members of the family Testudinidae (true tortoises).

Age of the turtles

Turtles of all age classes based on the count of annuli rings were caught during the study, with a maximum in the seven to nine year age category (32%). Approximate age of each turtle was determined by counting the annuli rings on the pleural scutes (technique reviewed in Wilson *et al.* 2003). A comparison of the number of annuli rings from year of first capture and year of last capture in few turtles suggested the fact that over the age of 12 yrs the annuli rings appear less distinct. All unsexed juvenile turtles had five or less number of annuli rings, and hatchlings had a single ring. Four unsexed juveniles having five annuli rings at first capture were found to be males, showing a partial plastron concavity when recaptured the following year. Also, in these young male turtles, the superciliary stripe was less prominent and beginning to pale. Adult male turtles lacked the pink supercilium, while adult female turtles retained the stripe.

Habitat and Ecology

The species was found to be terrestrial as has been previously reported (Das, 2009). Turtle capture/recapture locations were mainly in the well wooded parts of the campus, with 60% of these recorded within an area of around one hectare at the northern end of the campus adjoining the man-made lake. This area is relatively less disturbed and is characterized by dense stands of young Sal (GBH = 36 mm, n = 50), with an understory of *L. camara*, *Carrisa opaca* and *J. multiflorum*.

Most turtle capture/recaptures (94.4%) occurred during the monsoon months (June to August), while no individuals were observed from November to February (winter months) in the area during the survey years. In general, capture frequency was significantly correlated with periods of high rainfall; 54% of the captures were made during July alone when the monsoon rains are at its peak in the area. Further, turtles were invariably observed on the trails at the time of heavy downpour. Based on the time of capture of individuals, the species appears to be crepuscular in activity as most captures (73.8%) were during the morning (0700 to 1100) and evening (1500 to 1800) hours and none were encountered at night. The periodicity in captures suggests that turtles are most active with the onset of the pre-monsoon showers in the area and then remain active until the onset of winter, following which they probably go through a long period of inactivity, possibly hibernating for six to seven months (October to April). On two occasions (17 October 2002 and 3 January 2009), turtles were found in burrows in the ground when they were accidentally dug up.

Five observations of mating were recorded in the area, and each lasted for more than 30 minutes. The longest duration a mating pair was observed mounted was 37 minutes, though the mating duration is likely to be longer as the turtles when first sighted were already mounted. Except for a single mating observation in August all others were observed in the month of July. Based on the annuli rings the males in the mating pairs were between 8 to 10 years, while female turtles were between 7 to 13 years. Also, the average SCL of the male turtles was 161.0 ± 6.0 mm, and was 140.0 ± 2.0 mm in the females. No nests of the species could be located during the study, while hatchlings were located either single or in two or three from the middle of July through August.

Interestingly, hatchling emergence overlapped with the mating activity of the turtles in the area. On one occasion a hatchling was located about 20 m away from a pair of mating turtles on the same day. A single observation of fighting between two large males was observed on 17 July 2005 at 1610 hr, and the turtles were observed trying to bite at each other. There were no female turtles in the vicinity. Both these male turtles had SCL of 167.1 and 161.3 mm, and weighed 566.4 and 538.4 g respectively.

Observations of diet suggested *M. tricarinata* to be omnivorous, feeding on both fruits and animal matter. A total of 53 records for diet of the turtles were collected, of which 34 records were direct feeding observations and most of these were on earthworms. During rains, earthworms were observed brought along by runoff water and collected in natural depressions in certain parts of the trails and paths. And, there turtles were observed to move in and feed on the earthworms. Analysis of turtle droppings showed a high representation of fruits of J. multiflorum. Other species of fruits recorded in the droppings, in the decreasing order of their occurrence are: *Ficus* sp., *Cordia myxa*, *Ampelocissus latifolia*, *Broussonetia papyrifera*, *Lantana camara* and *Sapium sebiferum*. Further, unidentified seeds, roots, tubers, vegetable waste in the form of tomato peel, and few animal remains in the form of feathers of a small bird, shell fragments of crab, millipede, beetle elytra, and termite wings were also observed in the turtle droppings. On three occasions turtles were observed in a garbage dump, and another was observed feeding on human faeces outside the campus.

Gaps in information

The Tricarinate hill-turtle has remained poorly studied, and even though the present study has provided valuable information, there is still paucity of information on crucial aspects like breeding biology, activity pattern and habitat requirements. Also, observations from the present study suggest the species to likely hibernate during winter months and this requires further investigation. The present population status and threats to the species across its distribution range is not known. Thus, for a better understanding of the species and for its conservation, studies focusing on the above are suggested to be taken up.

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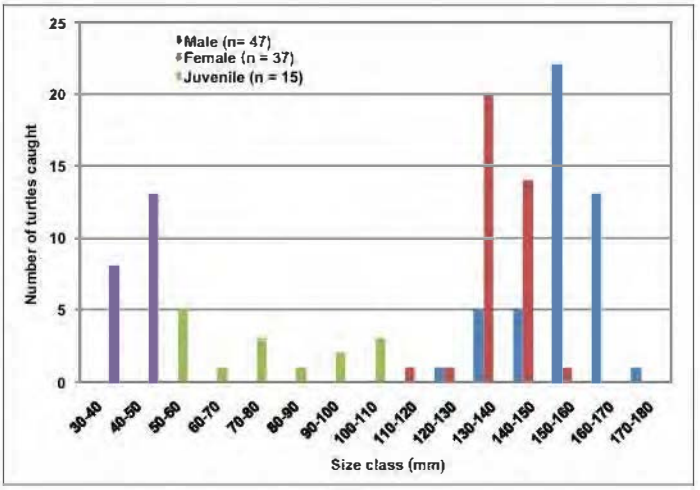
Plate 12

(A)

(B)

(C)

(D)



(E)

(A): An adult male *M. tricarinata* in its natural habitat showing the distinct yellow keels on the carapace; (B): Carapace of *M. tricarinata* showing the three prominent yellow lines/keels; (C): Map showing the distribution range of *M.tricarinata* (based on Das, 2009) and location of the study site in the Doon Valley, Northern India. The location marked with a star is the type locality of the species in the Chaibasa District of Jharkhand State in eastern India; (D): Marginal scute marking pattern employed in this study and (E): Carapace length frequency of *M. tricarinata* between sexes and the unsexed juveniles and hatchlings. Photos A, B and D by: Bivash Pandav