MANUAL of Herpetology

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Department of Science & Technology
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Field Studies of Non-Marine Turtles

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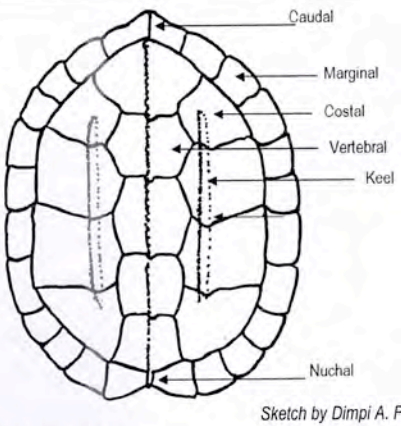
The Testudines, comprising turtles and tortoises, include some of the most ancient of the living terrestrial vertebrates, having evolved about 250 million years ago. Globally, 341 species are reported and about 45% of them are threatened, mostly due to anthropogenic reasons. India ranks 6this respect to turtle species richness, with 33 described species (four tortoises, 24 freshwater turtles and five marine turtles). This high diversity is largely due to the country's size as well as strategic location at the cross roads of Ethiopian, Palaearctic and Oriental realms and a diversity of habitats. Distribution of turtles across the country is fairly well known, thanks to the nationwide surveys conducted by Government of India-US Fish & Wildlife Service-Wildlife Institute of India project during 1991–1993. However, as of date, barring marine turtles, ecological studies on Indian turtles are scanty. This is largely due to problems associated with species identification, their largely aquatic mode of life and lack of standard sampling protocols for tropical conditions. A brief account of identification of turtles, survey, collection and marking techniques is given below.

SPECIES IDENTIFICATION

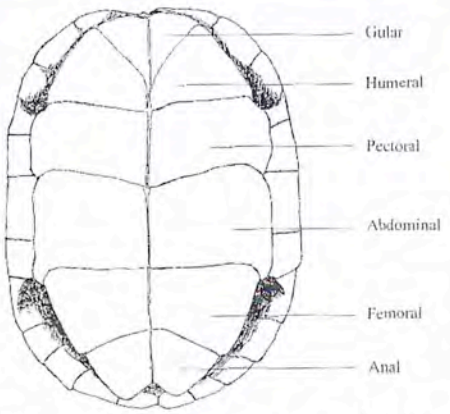
The Testudines are variously known as 'turtle', 'terrapin' and 'tortoise'; turtles- highly aquatic (such as marine turtles), terrapins- semi-aquatic (freshwater turtles) and tortoises - terrestrial (land) forms. The body of the turtle is encased in a box-like shell, the upper one is known as carapace and the lower one, plastron. Most of the freshwater turtles have webbing between digits, but in marine turtles, it is modified as a paddle. Tortoises lack digital webbing and the open body parts have tubercles and small cornified structures. The freshwater



Sketch by Dimpi A. Patel

Carapace of a hard-shelled turtle showing various scutes

turtles are categorised as soft-shelled and hard-shelled turtles. Soft-shelled turtles have relatively flat and smooth shell, which lack epidermal plates known as scutes. These species have long neck and tubular nose (proboscis), and the digits have only three claws (as opposed to four or five). On the other hand, hard-shelled turtles have relatively elevated shell, which are armoured with scutes. These species have four or five claws in each limb. Nature of the shell (relatively hard/ soft), shape and size of the shell, head and neck, position of the eyes and nostrils, number of claws, and size and shape of the vertebral scutes, presence of keels on the carapace and number of marginals (peripherals) provide important clues for species identification. Size and height of the shell, length of the tail and cephalic (head) colouration provide clues for sex identification.



Plastron of a hard-shelled turtle showing various scutes

COLLECTION OF TURTLES

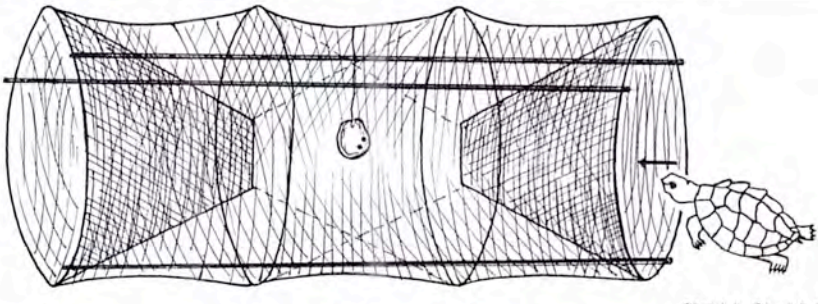
Hand collecting

Across the globe, indigenous folks have their own ways of collecting of turtles. These include, capturing turtles in water by diving, wading, harpooning and spearing, netting and trapping and using hook and line. Congregating turtles found in drying wetlands and nesting ground are often hand collected. Signs of turtles and tortoises, especially their movement (crawls) are followed and handpicked upon locating them. Indigenous people may track tortoises following (feeding) signs left. For instance, tribes in the Western Ghats collect the endemic Travancore tortoise, *Indotestudo travancorica* following seasonality of mushroom sprouts and nibbling signs. Species inhabiting monsoonal (temporary) wetlands leave drying water bodies in search of suitable habitats. The Indian flapshelled turtle, *Lissemys punctata* leave wetlands during summer for aestivation in bushes found nearby, and these turtles become easy prey to predators and poachers. Probing shallow water (edge/margin) of wetlands using a stick/ metal rod is useful for locating turtles hiding in mud. A method adopted from this practice by turtle biologists is probing with a blunt-tipped metal rod into holes underground, termed "Sounding") (see Plummer 1979; Vogt 2012).Tortoises are tracked and collected by forest-dwellers using dogs as well.

Trapping

Baited Traps

Funnel traps are useful for capturing some freshwater turtles. Collapsible funnel trap preferrable (for ease of transport and storage)and are fabricated in various size using wooder or metal frames and nylon or wire mesh. Under Indian conditions, split-bamboo of appropriat thickness and nylon threads may be useful for making traps. Size of the traps would vary depending upon the species under investigation. Selection of site for setting traps depends o the study species as well, and it is believed that traps set in shallow waters yield higher numbe of turtles. Traps set should not be completely submerged underwater, as entangled turtle would die due to drowning and suffocation. Use of baits depends on species unde investigation, and traps with baits may attract several species of turtles, especially omnivores Funnel traps baited with rotten meat may be useful for trapping soft-shelled turtles, as most o them are scavengers (such as theIndian softshell turtle, *Nilssonia gangeticus*). Researcher should examine the traps set in the field periodically for collecting trapped turtles. Larger turtle feeding on smaller turtles and cannibalism have been observed in softshelled turtles Herbivorous turtles may be attracted by baiting traps with ripened fruits.



Sketch by Dimpi A. Patel

Funnel trap: A baited hoop net

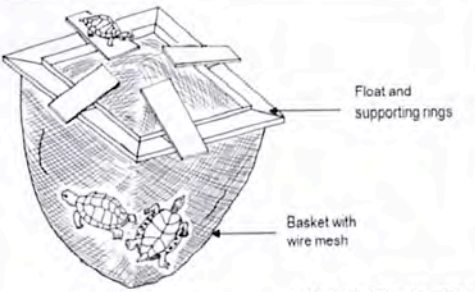
Non-baited Traps

Non-baited traps are used taking into account of the behaviour of turtles such as regular movement and basking.

Pits dug along the periphery of the water bodies may be useful for collecting nocturnally activ semi aquatic species. Drift-fences would help directing turtles towards the pits (pitfall). Specie such as Indian black turtle,*Melanochelys trijuga* are known to leave water during night fo foraging. Pitfalls with drift fences may be useful for collecting/ estimating population of this an

several other turtle species. The depth of the pit and requirement of baits, if any, should be decided based on study species and objectives of the study.

Several species of Indian turtles, especially the hard-shelled turtles are known for extensive basking. A trap designed with float and wire or nylon would be useful for studying these species. The floating basking traps should be placed in appropriate location and designed to be responsive to fluctuating water level. Turtles may fall into the wire mesh basket up on completing basking or when disturbed. Capture rate of turtles may be enhanced substantially by sudden appearance of researcher(s) from appropriate direction.



Sketch by Dimpi A. Patel

Basic design of a floating basking trap

Data on trapping of turtles using baited and non-baited traps are not available in India. Design of traps or collection methods to be adopted may be changed depending up on the species under study and objectives the research. Collection permits need to be obtained from authorities, especially from the respective State Forest Departments prior to initiating the research.

Morphometric Data

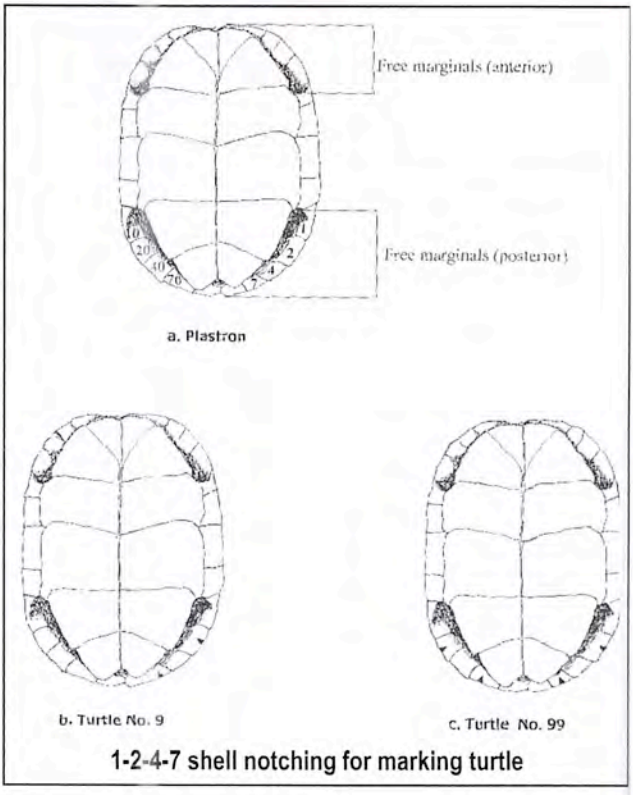
The following morphometry data are useful; straight-line carapace length (tip of the nuchal-caudal scute), and width (marginal to marginal at the meeting point of 2nd and 3rd costal scutes), and shell height (height at the most elevated part of the shell); plastron length (gular – anal scutes) and plastron width (along the abdominal scutes). Vernier callipers are used for measuring straight-line carapace length, width and shell height. Curved carapace length and width may be taken using a flexible twine and metal scale.Weight/ mass of a turtle is taken using digital/ manual spring balances.

Marking

Recognition of groups or individuals is important for estimating population, studying their movements, ontogenetic development and behaviour. The marking should be relatively permanent and prominent (visible to the observer), and it should not affect the survival of the marked individuals.

Several types of markings are available; carving number on the carapace, notching of the shell, especially the free marginals (peripherals), tattooing in soft-shelled turtles and pit tags.

Among them shell notching is popular method which is less expensive. This method was developed by F. R. Cagle, and with appropriate modification, it is being used since 1939. It is better suited for marking hard-shelled turtles, and tortoises. These species have two pairs of free marginals (peripherals), one pair each anterior and posterior. Prior to marking, numbering of free marginal; 1, 2, 4, 7; 10, 20, 40, 70; 100, 200, 400, 700 & 1000, 2000, 4000, 7000, fixing side (left/ right) and direction (top-bottom or vice-versa are essential. This type of scute notching is popularly known as 1-2-4-7 method.



1-2-4-7 shell notching for marking turtle

Marking turtle number nine and 99 is illustrated below. For marking more turtles, anterior free marginals may be numbered and notched designating 100s and 1000s.

Pit Tags

Implanting of pit tags is a simple, inexpensive method to identify turtles for mid-term (months) or long-term (years) studies (Gibbons & Andrews, 2004). Supplies include the tags themselves, an applicator, a pit tag reader, and appropriate sterile agent (such as ethanol). Pit tags are injected via the applicator, and sends a signal bearing a unique animal identification number that is picked up the pit tag reader. Possible research questions that can be answered include population estimation, age at sexual maturity, habitat and microhabitat use over time, dispersal, etc.

Radio Telemetry

A limitation of the use of pit tags is the short area (ca. inches) of detection. A relatively more complex and expensive technique is the use of radio transmitters that send signs picked up by an investigator at distances of hundreds of metres.A transmitter implanted on or within the body cavity of a free-ranging animal to a receiver. Also known as radio tagging or radio-tracking has become an important tool to increase our knowledge of life histories, frequently important for their conservation.Typically, a transmitter comprises an antenna (of the whip or loop type), a power source (either lithium and silver batteries or a solar cell) and a transmitter. Successful detection using a receiver depends on "Line of sight" range, habitat features (elevations and underwater locations reduce signal reception, as does rocky terrain, where signals may be reflected off outcrops), weather conditions (high humidity and precipitation), observer skills, and finally, brand of transmitter and receiver used.

Transmitters can be attached to the carapace, by using wire. The transmitters can have thermal sensing capacity, which allows understanding of certain activities and behaviour in relationship to temperature.

Long-term studies of non-marine turtles can be done with the use of radio-telemetry, such as size of home range, mortality and survivorship, microhabitat use and migration timing as well as routes.

FURTHER READING

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