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CONSERVATION PLAN FOR INDIAN FLAPSHELL TURTLE, *Lissemys punctata* (FAMILY TRIONYCHIDAE)

Ashok K Rathoure

Eco Chem Sales & Services, Gujarat, India

*Corresponding author's E-mail: asokumr@gmail.com

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Abstract: The Indian Flapshell Turtle, *Lissemys punctata* belongs to family Trionychidae. It is a small softshell fresh water turtle found in rivers and streams to reservoirs, marshes, ponds, lakes, and even salt marshes, rice fields, gutters, and canals, etc. Rapid development and urbanization has lost many water bodies and hence this species has threat to vanished. There is a vital requirement to conserve the species in captive as well as wild.

Keywords: Conservation; Flapshell Turtle; Industrial Development; Urbanization; Threat.

Postal Address: Mayashivraj Sadan, Gupta Colony, Hardoi (UP) India

INTRODUCTION

Freshwater turtles are reptiles, like snakes, crocodilians and lizards. They are ectothermic, or cold-blooded, meaning that their internal temperature matches that of their surroundings. They also have a scaly skin, enabling them, as opposed to most amphibians, to live outside of water. Also like many reptile species, turtles lay eggs (they are oviparous). But what makes them different to other reptiles is that turtles have a shell. This shell, composed of a carapace in the back and a plastron on the belly, is made of bony plates. These bones are covered by horny scutes made of keratin (like human fingernails) or leathery skin, depending on the species. The shell is considered perhaps the most efficient form of armour in the animal kingdom, as adult turtles are very likely to survive from one year to the next. Indeed, turtles have an impressively long life for such small animals. Our freshwater turtles come in a variety of shapes, colours and sizes. In some species, adult males are smaller than adult females, or the reverse, but most species show very little sexual dimorphism, so males and females are almost identical. Typically, freshwater turtles are smaller than their marine counterparts and their looks are more varied. The Indian Flapshell Turtle, *Lissemys*

punctata (Family Trionychidae), is a relatively small softshell turtle with a carapace length of up to 350 mm. Three intergrading subspecies are confined to the Indian subregion. Individuals are adaptable and durable, occurring in a variety of aquatic habitats, ranging from rivers and streams to reservoirs, marshes, ponds, lakes, and even salt marshes, rice fields, gutters, and canals in metropolitan areas. It is common in brackish water lagoons on the east coast of India and is often abundant in irrigation canals and tanks and paddy fields with stagnant water. The species is not plentiful in the main channels of rivers or in large canals, but seems to prefer relatively shallow waters. *Lissemys punctata* is omnivorous and can survive periods of drought by estivating for a long time on land. Nesting generally occurs in late summer and extends into the monsoon season, July through November. Clutch size varies from 4–15 eggs, which generally have a prolonged incubation period of >300 days. Despite extensive exploitation by man as a food source for many years, these turtles are still fairly common and seem to be holding their own, with populations relatively stable.

The specific status of *L. punctata* has not been questioned since the original description, but the species has been recognized by several

different name combinations. Several authors assigned the species to the genus *Trionyx*. Gray (1831) proposed *Emyda* for this species and Duméril and Bibron (1835) changed the generic and specific names, using *Cryptopus granosus*, the specific name stemming from Schoepff's (1801) name *Testudo granosa*. The name *Emyda granosa* became entrenched as the name for the Indian Flapshell Turtle in the literature for a while through its use by Boulenger (1889), Siebenrock (1902, 1909) and Annandale (1912).

Distribution: Bangladesh, India, Myanmar, Nepal, Pakistan distributed in the Indian subregion from the Indus basin of Pakistan through India, Nepal and Bangladesh to northeast India and extreme western Myanmar. Populations on Sri Lanka formerly considered to belong to this species have recently been recognized as the distinct species *L. ceylonensis*. Turtles having morphologically intermediate patterns on the head and carapace generally occur across northern India, mostly south of the Ganges River drainage. Reported intergrades between *L. p. andersoni* and *L. p. vittata* are known from the states of Bihar, West Bengal, Orissa, and Rajasthan, Madhya Pradesh and the Kathiwar peninsula, Gujarat. Rashid and Khan (2000) reported the unspotted subspecies as uncommon in southern Bangladesh. *Lissemys p. vittata* occurs naturally in the south and southwest of Bangladesh, but their numbers are very low (<1%) and *L. p. andersoni* is quite common there. In analyzing mitochondrial DNA sequences, a spotted *L. p. andersoni* specimen from the Subanarekha River, Orissa, India, showed the same haplotype as an unspotted *L. p. vittata* and five specimens of unspotted specimens from Chilka Lake, Orissa, conflicting with the observed morphology. There is no information available about intergradation between *L. p. punctata* and *L. p. vittata*.

Synonymy: *Testudo punctata* Lacépède 1788 (nomen rejectum), *Testudo punctata* Bonnaterre 1789, *Trionyx (Emyda) punctatus*, *Trionyx punctatus*, *Emyda punctata*, *Trionyx punctata*, *Lissemys punctata*, *Lissemys punctata punctata*, *Trionyx punctatus punctatus*, *Testudo sonnerati* Meyer 1790, *Testudo granulosa* Suckow 1798, *Testudo scabra* Latreille in Sonnini and Latreille 1801, *Testudo granosa* Schoepff 1801, *Trionyx*

granosus, *Cryptopus granosus*, *Emyda granosa*, *Emyda granosa granosa*, *Lissemys punctata granosa*, *Trionyx punctatus granosus*, *Testudo granulata* Daudin 1801, *Trionyx coromandelicus* Geoffroy Saint-Hilaire 1809, *Emyda dura* Anderson 1876.

Sub species: Currently three subspecies are recognized:

i) *Lissemys punctata punctata* (Southern Indian Flapshell Turtle) (distribution: southern peninsular India [Kerala, Tamil Nadu]);

ii) *Lissemys punctata andersoni* (Spotted Northern Indian Flapshell Turtle) (synonymy: *Lissemys punctata andersoni* Webb 1980, *Lissemys andersoni*) (distribution: Bangladesh, northern India [Assam, Bihar, Haryana, Jammu, Madhya Pradesh, Meghalaya, Rajasthan, Sikkim, Uttar Pradesh, West Bengal], Myanmar, Nepal, Pakistan);

iii) *Lissemys punctata vittata* (Central Indian Flapshell Turtle) (synonymy: *Emyda vittata* Peters 1854, *Emyda granosa vittata*, *Lissemys punctata vittata*, *Emyda granosa intermedia* Annandale 1912) (distribution: central India [Andhra Pradesh, Chhattisgarh, Goa, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Rajasthan]).

Appearance: While most freshwater turtles have hard boney shells, three species known as softshell turtles have fleshy shells adapted for swimming. Turtle shells provide protection from predators. Femoral flaps and nasal septal ridges are present. Shell closure (femoral flaps and moveable anterior plastral lobe) allows for complete concealment of head, neck, and limbs and thus protection from predators and desiccation.

Habitat and Ecology: *Lissemys punctata* occurs in a variety of aquatic habitats, ranging from rivers and streams to reservoirs, marshes, ponds, lakes, and even salt marshes, rice fields, gutters, and canals in metropolitan areas. This species appears to tolerate salt water conditions well, as it is common in brackish water lagoons in the Sunderbans (West Bengal), Bhitarkanika (Orissa), and Coringa (Andhra Pradesh) of the east coast of India. It is often abundant in irrigation canals and tanks, and paddy fields with stagnant water. Turtles seem to prefer relatively shallow waters, which may be devoid of aquatic

vegetation, and they may spend long periods shallowly buried in the mud bottoms. Turtles bask on banks of rivers and ponds and on floating vegetation. Activities are geared to the winter (generally November into February), summer (March into July), and monsoon (July into November) seasons that vary somewhat with latitude.

Behavior. Although all turtles are air-breathing reptiles, aquatic turtles can hold their breath for long periods of time. All freshwater turtles lay eggs on land in holes they have dug. When the eggs hatch, the baby turtles (hatchlings) return to water. The bony carapace has a distinctive, sandpapery or sharkskin texture, contrasting with the relatively coarsely pitted texture in most trionychid species. The carapace has a prenuchal bone (initially isolated but sutured to the nuchal in large adults), two neurals between the first pair of pleurals, and a diagonally oriented suture between the nuchal and the first pleural. The nuchal (ventral view) is bifid or notched on either side. There are six to nine (usually eight) neurals with one or two pairs of the posteriormost pleurals sutured medially; the last (eighth) pair of pleurals is subtriangular in shape. The rear half of the bony carapace has posteriorly tapered and somewhat concave lateral margins. There is a series of juxtaposed but unsutured peripheral elements, the anteriormost being the largest, that is not connected to the ribs or to the rest of the carapace, and that may or may not be homologous with the peripherals of hardshelled turtle species. The number of peripherals seems to vary ontogenetically, with the smallest number in the largest turtles, the reduction presumably occurring by fusion between adjacent elements. The plastron has well developed callosities on all bones, except that the isolated entoplastral callosity varies greatly in size, and may be absent. The hyo- and hypoplastra are fused on each side, without visible suture, and share a very large callosity that, in large adults, is enlarged anteriorly and almost contacts the posterolateral enlargement of the epiplastral callosity to form the lateral margin of the carapace; thus, replacing the peripheral bones in this area of the shell. The epiplastra are straight (not angular) and sutured to the entoplastron. A single prong projects medially from the

hypoplastron, and the middle prong of the posteriomedial process of the hypoplastron interdigitates with the xiphoplastron.

Movements and Estivation: Overland movements occur in response to either drought conditions, or increased water depth during the rainy season. In the latter instance, turtles move overland into shallow pools; when these dry up they move back into the larger, permanent sites. Turtles move overland, burrow, and estivate when shallow ponds and lakes dry up in the summer months (peak in May); larger sites may go dry in later months if drought conditions persist into the monsoon seasons. Bhupathy and Vijayan (1994) reported a mean depth (surface to top of carapace) of 5.02 (2–10) cm (n = 304), higher density of estivation sites under bushes closer to dried marshes, and a density of 950 estivating turtles/ha. The maximal duration of estivation recorded for turtles in wild populations is 160 days. The estivation-site temperature in open dried marshes during midday hours may be as high as 48°C exceeding the ambient air temperature and is higher than the critical thermal maximum of at least some other trionychid turtles (*Apalone spinifera aspera*, 41.05°C, 39.9–42.3°C, n = 10, indicating a high temperature tolerance in *L. punctata*. Annandale (1912) reported hibernating turtles (buried in mud substrate) in ponds in winter months in the northern part of the range. Das (1991) noted hibernation from November to February in northern India, with males becoming inactive prior to females and emerging later than females.

Diet: The species is an opportunistic omnivore. Food items include adult frogs, tadpoles, fish, crustaceans, molluscs, earthworms, insects, carrion, and water plants (Das, 1991). Bhupathy and Vijayan (1993) quantified the diet analyzing scats (n = 71) and found plants (34%), insects (20%), molluscs (26%), and fish (20%). The molluscs include both snails (*Lymnaea*, *Gyrulus*, *Palidomus*) and bivalves. Aside from aquatic insects and larvae, the species eats terrestrial insects that may fall into the water (Orthoptera, Coleoptera, Hemiptera, Hymenoptera). Aquatic plants consumed include grass, water lilies (*Nymphoides*, *Nymphaea*), bladderwort (*Utricularia*), and some seeds and fruits.

Sexual Maturity: Specific data on size and/or age at attainment of sexual maturity in this species are few. Yadava and Prasad (1982) reported turtles with CL < 160 mm as immature, and males are smaller in size at maturity compared to females.

Reproduction: The reproductive cycle of *L. punctata* differs according to geographic region and it seems that it is closely correlated with monsoon seasons and heavy rains. Aquatic mating occurs in April involving the male with head extended circling the female, head-bobbing of both sexes that face each other with necks extended, and copulation on the bottom with subsequent rotation of the male to face the opposite direction. However, Bhupathy has observed the male biting the anterior edge of the female's carapace, and turtles in copula floating at the surface.

Nesting: Nesting generally occurs in late summer, extending into the monsoon season, July through November. Turtles inhabiting perennial rivers may move through canals to find suitable nesting sites in loamy soil. Minton (1966) reported nest excavation (slow movement of hind limbs) about seven feet from the pond edge. Das (1985, 1991) reported nests 8–10 cm deep, close to water, either under cover of thorny bushes or fully exposed. Sandy areas are not preferred for nesting. Rashid and Swingland (1997) noted bowl-shaped nests (15–18 cm deep), 10–30 m from water, in backyard gardens, bamboo groves, pond banks, and even in fallow land separating paddy fields. Mishra (1986) reported a nest depth of 23 cm (egg depth, 19 cm) in muddy soil and 220 cm from the edge of the Chambal River. Clutch size varies from 2–15 eggs. Larger females tend to deposit more eggs than smaller females, with egg size decreasing with increasing clutch size. The eggs are white, nearly spherical, and brittle-shelled. Minton (1966) reported egg diameters of 24–30 mm, Rashid and Swingland (1997) 24–33 mm [mean 26 mm, mass 14.75 g, n = 105], Mishra (1986) 27.3 mm (n = 7, mass 11 g) and Yadav (1989) an average of 23.9 mm (n = 14, 8.75 g). Rashid and Swingland (1997) recorded three nests, on 26 August (28 eggs, probably two clutches), 26 December (14 eggs), and 11 March (12 eggs).

Predation: Aside from human exploitation for food, mortality is caused by a variety of predators. Antipredator adaptations include the ability to completely close the shell (concealing soft body parts), and to secrete from the two pairs of Rathke's glands an egg-yolk like fluid that has an objectionable odor and presumably bad taste.

Population Status: General surveys in many parts of the range of the species, including several sites in India and Bangladesh have revealed *L. punctata* as common and/or the most frequently observed of any turtle species and Das (1991) reported that it may be the most common species in the Indian sub-region. No data are available to document historic changes in abundance. A literature compilation indicates that this species is recorded from at least 150 localities within India, and is common at 88, uncommon at two, with status unknown at the remaining localities. Choudhury et al. (2000) considered the species common and stable in India. As approximately one third of the locality records are from protected areas, such as wildlife sanctuaries and national parks where hunting is prohibited, the population status of this species within India may be considered stable.

Threats to Survival: *Lissemys punctata* and its eggs are rather heavily exploited for food and it is one of the most frequently observed species in markets. Some 50–70 thousand are sold each year (early 1980s) in the Howrah Market near Kolkata. Choudhury et al. (2000) noted that *L. punctata* was the most common Indian softshell in the meat trade, and that habitat loss was not a major concern. In 1995 in the south Indian city of Coimbatore, turtles weighing 2–4 kg were sold at Indian Rupees 100–150. Turtles are caught by nets, hooks, or by hand, with burrowed turtles located by probing with an iron-tipped bamboo stick. Rashid and Swingland (1997) noted turtles were easily collected at night, when they approach the shore in response (and seeming attraction) to the search lights. Recognizing that the trade in this species, despite its wide occurrence, is technically illegal, Choudhury and Bhupathy (1993) reported that wildlife authorities had confiscated 4053 individuals in Kolkata in 1991, 2735 in 1992 and 1134 in the first three months of 1993. One kg of turtle meat in the

Kolkata market was sold at Rs. 50. Choudhury *et al.* (2000) noted that some illegal exports occur.

Conservation Status

IUCN 2013 Red List: Least Concern (LC, assessed 2000)

TFTSG Draft Red List: Least Concern (LC, assessed 2011)

CITES: Appendix II

Indian Wildlife (Protection) Act: Schedule I



Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Reptilia	Testudines	Trionychidae

Scientific Name:	<i>Lissemys punctata</i> (Lacépède, 1788)
Common Name(s):	English – Indian Flapshell Turtle, Indian Flap-shelled Turtle
Synonym(s):	<i>Emyda granosa</i> Schoepff, 1801 <i>Testudo granulosa</i> Suckow, 1801 <i>Testudo punctata</i> Lacépède, 1788

Figure 1. Status on IUCN (Source: IUCN)



Figure 2. Freshwater Flapshell Turtle

Many freshwater turtle species have complex habitat requirements, requiring large and diverse mosaics of upland, wetland, and aquatic habitats with high ecological integrity. As a consequence of this as well as their individual longevity and marked fidelity to certain landscape features, turtles often fall through the cracks when standard coarse filter metrics are applied to land conservation prioritization. It is necessary that some turtle species continue to be protected using a fine-filter approach, specifically tailored to their unique life history characteristics and habitat needs. Because of their habitat requirements and localized distributions, their conservation requires coordination among many partners and an on-the-ground sampling effort.

Conservation Action Plan

To truly protect turtles around the world, many different countries and cultures must cooperate and share responsibility. International laws and agreements, research, and the work of dedicated organizations and individuals each must play a part. Long-term protection of turtles also means

developing solutions that reduce reliance on management methods requiring direct human involvement such as moving nests or raising hatchlings in captivity. Feeding and nesting grounds must be protected, and a public wildlife conservation ethic must be fostered that can withstand gaps in government regulations, pressure from private interests, and changes in the political climate.

Recommendations

- a) Crack down on illegal trade in freshwater turtles and their products by enforcing laws and agreements.
- b) Decrease the turtle deaths caused by commercial fishing through enforcement of Turtle Excluder Device (TED) and gill net regulations.
- c) Protect nesting by establishing parks and refuges or through regulations combined with public education initiatives.
- d) Eliminate disturbances at nesting by decreasing artificial lighting, halting beach armoring, regulating beach

nourishment and limiting the impacts of people on the nest ground.

Education programs should be implemented to inform local populations and fishermen of the usefulness of these turtles in consuming carrion and their negligible effect as predators on active healthy fish (most fish-eating seems to involve dead or dying fish and carrion); although such observations need to be more thoroughly documented. Some conservation effort is required to restrict wholesale commercial exploitation, and especially the collecting of eggs and gravid females during the nesting season. As the species thrives in captivity, a captive breeding program for limited commercial exploitation might be feasible to relieve the stress on wild populations. Currently, several infrastructure development projects such as highway construction are being executed in India. It is suggested that appropriate plans should be made to avoid or reduce mortality of herpetofauna, including turtles.

Captive Husbandry: *Lissemys punctata* thrives in captivity; thus, the species is amenable to successful captive breeding programs. Artificial incubation of eggs and hatching has been accomplished at the Madras Crocodile Bank Trust (MCBT), with the last author noting the feasibility of rearing turtles in village ponds because of their scavenging tendencies and subsistence on household garbage such as vegetable wastes. During the mid-1980s, as part of the Turtle Rehabilitation Project, eggs of *Lissemys* (and other softshell turtles) were maintained and hatched in artificial hatcheries in Uttar Pradesh, such as the Saranath Turtle Breeding Centre, Varanasi, and at a captive rearing center at Kukrail near Lucknow with ultimate release in the Ganges River. *Lissemys punctata* is one of the most common turtles found in Indian zoological gardens. Of the 140 Indian zoos, many of them possess this species.

CONCLUSION

The softshell turtle *L. punctata* is found in various types of habitats. Due to industrialization, the habitat fragmentation is major threat to the turtles. Hence there is an urgent need of conservation of this species along with awareness program for local people.

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