

***Nilssonina leithii* (Gray 1872) –
Leith’s Softshell Turtle**

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SUMMARY. – Leith’s Softshell Turtle, *Nilssonina leithii* (Family Trionychidae), is a large turtle, known to attain at least 720 mm in carapace length (bony disk plus fibrocartilage flap), and possibly as much as 1000 mm. The species inhabits the rivers and reservoirs of southern peninsular India, replacing the more familiar Indian Softshell Turtle, *N. gangetica*, of northern India. The turtle is apparently rare within its range, even within protected areas, which is suspected to be due to a past history of exploitation. Fish, crabs, freshwater molluscs, and mosquito larvae are taken as food, and some numbers are kept in temple tanks, where they are often fed on *Hibiscus* flowers. At least two clutches of eggs, which are spherical, are suspected to be produced per year.

DISTRIBUTION. – India. Restricted to southern peninsular India (Andhra Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, and Tamil Nadu) in the Cauvery, Thungabhadra, Ghataprabha, Bhavani, Godavari, and Moyar drainages.

SYNONYMY. – *Testudo gotaghol* Buchanan-Hamilton in Gray 1831 (*nomen nudum*), *Trionyx leithii* Gray 1872, *Isola leithii*, *Aspideretes leithii*, *Amyda leithii*, *Nilssonina leithii*, *Aspilus gataghol* Gray 1872; *Trionyx sulcifrons* Annandale 1915.

SUBSPECIES. – None described.

STATUS. – IUCN 2013 Red List: Vulnerable (VU, A1c) (assessed 2000); TFTSG Draft: Critically Endangered (CR, assessed 2011); CITES: Appendix II; Indian Wildlife (Protection) Act: Schedule IV.

Taxonomy. – Originally described as *Trionyx leithii* by Gray (1872), based on two syntypes from “Poonah” (= Pune, Maharashtra State, west-central India), the species was transferred to the genus *Aspideretes* by Meylan (1987),

based on morphology, along with three other species of large trionychids that were formerly in the catchall trionychid genus *Trionyx*. Praschag et al. (2007), based on genetic analysis, included this species in the genus *Nilssonina*. Liebing et al.



Figure 1. Adult female *Nilssonina leithii* from Godavari River near Nashik, Maharashtra, India. Photo by Rahul Naik.



Figure 2. Two adult female *Nilssonia leithii* from Kali River, Karnataka, India. Photo by Shashwat Sirsi.

(2012) showed that *N. leithii* shares a sister relationship with *Nilssonia gangetica*.

No subspecies have been described and geographic variation, if any, has at present not been reported. Valid synonyms include *Trionyx sulcifrons* Annandale 1915, from Nagpur, west-central India. Gemel and Praschag (2003) listed synonymies as relevant to this taxon. Nonetheless, at least two distinct morphotypes from peninsular India are currently allocated to this species (see Description).

Description. — The carapace is low and oval; a pre-neural with one or two neurals separates the first pair of pleural bones; the eighth pair of pleurals meet each other at the carapace midline; there are eight or nine neurals; the triturating surfaces of the maxilla are flat with a prominent median groove. A patch of flat, wart-like tubercles is often present on the anterior median edge of the carapace and along the midline posterior to the bony portion of the shell in some populations, while absent from others. Whether this has any taxonomic significance is not known.

The carapace is gray or grayish-olive with yellow vermiculations, most prominent in the young, which possess

4–6 dark-centered, light bordered eye-like spots. The plastron is cream-colored. The head is greenish, sometimes with a black streak (especially in juveniles) that extends from the eye to the neck; two or three pairs of dark lines extend toward the side of the head and another extends backwards from the eye. The corner of the mouth has a yellow or reddish-orange spot and patches of the same color are present on the forehead of juveniles. The outer surface of the limbs is olive, the inner surface cream-colored.

Secondary sexual dimorphism is known, with males showing comparatively longer and thicker tails than females. The mean (curved) carapace length (bony disk plus fibrocartilage flap) of five individuals from the Kali River, Karnataka, was 633 mm; additionally, an adult male from the same area had a (curved) carapace length of 720 mm. However, our small sample size does not permit conclusions on size dimorphism. Local fishermen in the area report the occurrence of individuals exceeding 1000 mm in length. An adult female captured in the Cauvery Wildlife Sanctuary had a carapace length of 500 mm.

The karyotype is $2n = 52-54$ (Gorman 1973).



Figure 3. Adult female *Nilssonia leithii* from Cauvery River, Karnataka, India. Photo by Shashwat Sirsi.



Figure 4. Adult male *Nilssonia leithii* from Moyar River near Theni, Tamil Nadu, India. Photo by V. Deepak.

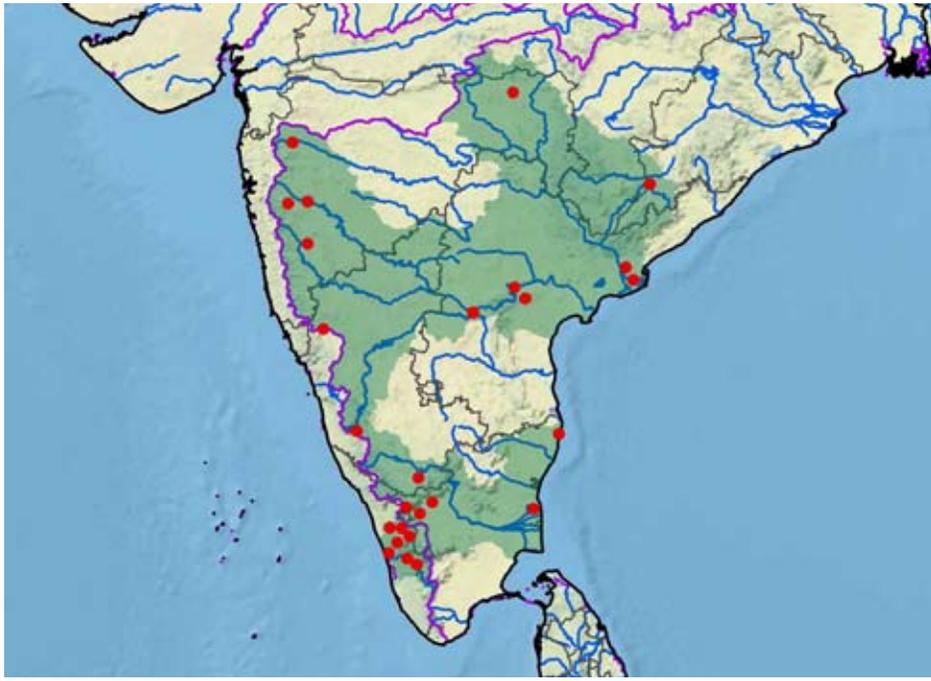


Figure 5. Distribution of *Nilssonina leithii* in India, south Asia. Purple lines = boundaries delimiting major watersheds (level 3 hydrologic unit compartments – HUCs); red dots = museum and literature occurrence records of native populations based on Iverson (1992), plus more recent and authors' data; green shading = projected native distribution based on GIS-defined HUCs constructed around verified localities and then adding HUCs that connect known point localities in the same watershed or physiographic region, and similar habitats and elevations as verified HUCs (Buhlmann et al. 2009), and adjusted based on authors' subsequent data.

Distribution. — Leith's Softshell Turtle is endemic to peninsular India, and occurs in rivers and reservoirs. The early records of this species from a few northern Indian drainages (e.g., Annandale 1912; Hora 1948) are considered erroneous. The source of some of these misidentifications appears to stem from Smith's (1931) erroneous diagnosis of the lack of ocelli on the hatchling carapace of the congeneric *N. gangetica*, leading to the extralimital records of the current species from northern drainages of India, where *N. leithii* is replaced by *N. gangetica*. However, other large softshell turtles, such as *Chitra indica*, have occasionally been misidentified as *N. leithii* in the literature (see, for instance, Webb 1981; Murthy 2011); both species have been found at the Thungabhadra Dam in Hospet, Karnataka, and may be sympatric (Murthy, pers. obs.).



Figure 6. Juvenile *Nilssonina leithii* from Tengumarada, Moyar River, Tamil Nadu, India. Photo by Karthik Vasudevan.

Population Status. — Few data are available of the population status of this species, the turtle not being common anywhere, even within protected areas, such as the Mudumalai Wildlife Sanctuary, Tamil Nadu, southwestern India, presumably because of hunting for the trade in calipee and habitat destruction. Nonetheless, viable populations appear to remain in the Thungabhadra River, Kali River, Bheema River (around the Krishna River tributaries, except the Malaprabha River). A month-long sampling effort on two separate occasions in 2012 and 2013 in the Kali River yielded 4 (sex ratio: 2.2) and 2 (sex ratio: 1.1) individuals, respectively.

Habitat and Ecology. — The species appears to replace *N. gangetica* in peninsular India, although there are unsubstantiated reports of the species from the north, including the state of Gujarat, where both species reportedly occur sympatrically. Generally, records of the species are from large, east- and west-flowing rivers that arise from the low hills of Peninsular India, with isolated records from large reservoirs. An individual was recently recorded from Perinjalam, Thrissur District, Kerala, at the mouth of the Chalakudy River, suggestive of its occasional usage of estuarine habitats.

Nilssonina leithii is known to consume fish, crabs, freshwater molluscs, and mosquito larvae (Das 2001). Fishermen along the Kali River report that the species often retrieves fish trapped in monofilament gill nets. Two specimens were dug up from mud in the bed of a pool just after the winter months (dry part of the year) in the Nallamalai



Figure 7. Habitat of *Nilssonia leithii* in Cauvery River, Karnataka, India. Photo by Shashwat Sirsi.

hills of the Eastern Ghats (Annandale 1915), suggesting that the species may estivate during the summers.

Some specimens of *N. leithii* are kept in a temple tank at Kotapalli village, Andhra Pradesh, southeastern India, where they are fed on flowers of the red china rose (*Hibiscus rosa-sinensis*) and banana (*Musa domestica*).

Little is known of the reproductive behavior of the species. In mid-June, a female was found to carry fully developed, shelled eggs with a diameter of 31 mm (Sirsi, unpubl. data). Oviductal eggs, ready for oviposition, were also found in the month of January, suggesting that at least two clutches may be laid in a year, and fishermen along the Kali River reported that nesting occurs in the months of December and January (Sirsi, unpubl. data). Two hatchlings were observed in the Moyar River, near Tengumaragada village on 15 July 1994, and eggs found in Pune, Maharashtra, west-central India, were spherical and 29.8–31.1 mm in diameter (Sirsi, unpubl. data). Nesting in the Sharavathi Valley Wildlife Sanctuary reportedly occurs between the months of April and May (Sirsi, unpubl. data).

The intestinal parasite, *Astiotrema cirricurvatus*, has been recorded from this species (Simha and Chattopadhyaya 1970).

Threats to Survival. — Despite being widespread in peninsular India, few data are available on the status, distribution, and biology of this species. It is locally exploited throughout peninsular India (e.g., see Biju Kumar 2004). Questionnaire surveys of Bengali settlers were conducted in 2011 in Sindanoor town in north-eastern Karnataka (Sirsi 2011). Survey respondents indicated that the species is exploited for its fibro-cartilaginous rim or calipee. Local populations in the Tungabhadra, Krishna, and Bhima drainages were apparently being exploited for this purpose. Threats to the species include riverine development projects, aquatic pollution, sand mining, construction of hydroelectric projects, and exploitation of adults and eggs. Two poached adult specimens were confiscated in Amaravathi, within the Annamalai Tiger Reserve, Tamil Nadu, in January 2009 (V. Deepak, pers. obs.).

Conservation Measures Taken. — Leith's Softshell Turtle is protected under Schedule IV of the Indian Wildlife



Figure 8. Habitat of *Nilssonia leithii* in Kali River, Karnataka, India. Photo by Shashwat Sirsi.

(Protection) Act of 1972; any offense is punishable by imprisonment and fine. It has been recorded from several protected areas such as Mudumalai Wildlife Sanctuary, Sathymangalam Tiger Reserve (Tamil Nadu), Kudremukh National Park, Bheemeshwari Wildlife Reserve/Cauvery Wildlife Sanctuary, Tungabhadra River Sanctuary, Dandeli Anshi Tiger Reserve, and in Sharavathi River Valley Wildlife Sanctuary, Karnataka (Sirsi, unpubl. data).

The species is currently listed on the IUCN Red List as Vulnerable, having been assessed in 2000, but in 2011 the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group provisionally assessed it as Critically Endangered. The species has also recently been listed on Appendix II of CITES in order to monitor and regulate its international trade.

Conservation Measures Proposed. — Surveys of the species, to determine distribution and status, and studies on its autecology will help understand the conservation requirements of this large turtle, which can be a renewable source of proteinaceous food for the local people. Madras Crocodile Bank Trust (MCBT) and the Turtle Survival Alliance (TSA) are engaged in conducting species surveys and developing captive assurance colonies at regional zoos within the species' range with partial support from the Mohamed bin Zayed Species Conservation Fund and the Turtle Conservation Fund at Conservation International. MCBT and TSA have proposed a species conservation plan workshop as recommended in 2010 during the *Freshwater Turtle and Tortoise Priority Areas and Initiatives* workshop at Lucknow. A review of the listing of this species in the Indian Wildlife (Protection) Act of 1972 is also required in concurrence with its present conservation status.

Captive Husbandry. — An adult female of this species was maintained for over 10 years at the Madras Crocodile Bank. It was housed in a large (> 10 x 10 m) cemented tank, along with a variety of other freshwater turtles, including *N. gangetica*. It accepted fish and vegetables, including cabbage and tomatoes, and was rarely seen basking at the surface of water, and never approached the land. It was thought that this individual was less aggressive than *N. gangetica*. A solitary adult female is presently housed in Nehru Zoological Park, Hyderabad.

Additional data on husbandry are given by Vardia and Tonapi (1992) and Varghese and Tonapi (1986). In captivity, the species was found to prefer oligochaete worms, prawns, molluscs, and fish fingerlings and tadpoles to plants, nibbling the tender root-tips of floating aquatic macrophytes only when starved for 1–2 weeks. The young accepted mosquito larvae.

Current Research. — B.H.C.K. Murthy of the Zoological Survey of India, in collaboration with the Turtle Survival Alliance, is currently working on the ecology and exploitation of this species in southwestern India, and Shaswat Sirsi, with support from Turtle Survival Alliance and the Turtle Conservation Fund at Conservation International, is conducting a survey of the distribution and conservation status of this species.

Acknowledgments. — This work was supported by the Centre for Herpetology, Madras Crocodile Bank Trust, Universiti Malaysia Sarawak, Wildlife Institute of India, and Turtle Survival Alliance. We thank K.G. Baby, Technical Staff of Central Marine Fisheries Research Institute, Kochin, Kerala, who provided data on sighting and images from near Perinjalam. We thank V. Deepak and Peter C.H. Pritchard for unpublished information, V. Deepak, Rahul Naik, and Gowri Mallapur for images, and Genevieve V.A. Gee and John B. Iverson for reading a draft manuscript.

LITERATURE CITED

- ANNANDALE, N. 1912. The Indian mud-turtles (Trionychidae). Records of the Indian Museum 7:151–179.
- ANNANDALE, N. 1915. Notes on some Indian Chelonia. Records of the Indian Museum 11:189–195.
- BIJU KUMAR, A. 2004. Records of Leith's softshell turtle, *Aspideretes leithii* (Gray, 1872) and Asian giant soft shell turtle, *Pelochelys cantorii* (Gray, 1864) in Bharathapuzha River, Kerala. Zoos' Print Journal 19(4):1445.
- BUHLMANN, K.A., AKRE, T.S.B., IVERSON, J.B., KARAPATAKIS, D., MITTERMEIER, R.A., GEORGES, A., RHODIN, A.G.J., VAN DIJK, P.P., AND GIBBONS, J.W. 2009. A global analysis of tortoise and freshwater turtle distributions with identification of priority conservation areas. *Chelonian Conservation and Biology* 8(2):116–149.
- DAS, I. 1991. Colour Guide to the Turtles and Tortoises of the Indian Subcontinent. Portishead: R & A Publishing, 133 pp.
- DAS, I. 2001. Die Schildkröten des Indischen Subkontinents. Frankfurt am Main: Edition Chimaira, 160 pp.
- DAS, I. 2002. A Photographic Guide to the Snakes and Other Reptiles of India. London: New Holland Publishers (U.K.) Ltd., 144 pp.
- DEEPAK, V. AND VASUDEVAN, K. 2010. Endemic turtles of India. In: Vasudevan, K. (Ed.). *Freshwater Turtles and Tortoises of India*. Dehradun: Wildlife Institute of India. ENVIS Bulletin: Wildlife and Protected Areas 12(1):25–42.
- GEMEL, R. AND PRASCHAG, P. 2003. On the nomenclature and vernacular names of recent *Aspideretes* species (Reptilia, Testudines, Trionychidae). *Zoologische Abhandlungen, Dresden* 53:93–105.
- GORMAN, G.C. 1973. The chromosomes of the Reptilia, a cytotoxic interpretation. In: Chiarella, A.B. and Capanna, E. (Eds.). *Cytotaxonomy and Vertebrate Evolution*. London and New York: Academic Press, pp. 349–424.
- GRAY, J.E. 1831. Synopsis Reptilium; or Short Descriptions of the Species of Reptiles. Part I.—Cataphracta. Tortoises, Crocodiles, and Enaliosaurians. London: Treuttel, Wurz, and Co., 85 pp.
- GRAY, J.E. 1872. Notes on the mud-turtles of India (*Trionyx*, Geoffroy). *Annals and Magazines of Natural History* (4)10:326–340.
- HORA, S.L. 1948. The distribution of crocodiles and chelonians in Ceylon, India, Burma and farther east. *Proceedings of the National Institute of Science, India* 14(6):285–310.
- IVERSON, J.B. 1992. A Revised Checklist with Distribution Maps of the Turtles of the World. Richmond, IN: Privately printed, 363 pp.
- LIEBING, N., PRASCHAG, P., GOSH, R., VASUDEVAN, K., RASHID, S.M.A., RAO, D.-Q., STUCKAS, H., AND FRITZ, U. 2012. Molecular phylogeny of the softshell turtle genus *Nilssonina* revisited, with first records of *N. formosa* for China and wild-living *N. nigricans* for Bangladesh. *Vertebrate Zoology* 62:261–272.
- MEYLAN, P.A. 1987. The phylogenetic relationships of soft-shelled turtles (Family Trionychidae). *Bulletin of the American Museum of Natural History* 186(1):1–101.
- MOLL, E.O. AND VIJAYA, J. 1986. Distributional records for some Indian turtles. *Journal of the Bombay Natural History Society* 83(1):57–62.
- MURTHY, B.H.C.K. 2011. The largest fresh water turtle from Thungabhadra River, Hampi, Bellary District, Karnataka. *ZSI E-News* 3(8):23.
- PRASCHAG, P., HUNDSDÖRFER, A.K., REZA, A.H.M.A., AND FRITZ, U. 2007. Genetic evidence for wild-living *Aspideretes nigricans* and a molecular phylogeny of south Asian softshell turtles (Reptilia: Trionychidae: *Aspideretes*, *Nilssonina*). *Zoologica Scripta* 36:301–310.
- SIRSI, S. 2011. Preliminary observations on occurrence of softshell turtles in Karnataka, southern India. *Turtle Survival Newsletter* 2011:97–99.
- SMITH, M.A. 1931. The Fauna of British India, including Ceylon and Burma. Vol. I. Loricata, Testudines. London: Taylor and Francis, 185 pp.
- SATYAMURTI, S.T. 1962. Guide to the lizards, crocodiles, turtles and tortoises exhibited in the Reptile Gallery. Madras: Madras Government Museum, Government of Madras, 45 pp.
- SIMHA, S.S. AND CHATTOPADHYAYA, D.R. 1970. On a new species of the genus *Astiotrema* Looss, 1900 from the intestine of a fresh water turtle, *Trionyx leithii*, from Gulburga, Mysore State. *Proceedings of the Indian Science Congress Association* 57(III):457.
- VARDIA, H.K. AND TONAPI, G.T. 1992. Bioecology of some freshwater turtles of Poona. *Geobios New Reports* 11:78–80.
- VARGHESE, G. AND TONAPI, G.T. 1986. Observations on the identity of some Indian freshwater turtles and their feeding habits. *Biological Conservation* 37:87–92.
- VIJAYA, J. 1983. Freshwater turtle survey in India 1982–83. *Hamadryad* 8(1):21–22.
- WEBB, R.G. 1981. The Narrow-headed softshell turtle, *Chitra indica* (Testudines: Trionychidae), in Peninsular India. *Records of the Zoological Survey of India* 79:203–204.

Citation Format for this Account:

- DAS, I., SIRSI, S., VASUDEVAN, K., AND MURTHY, B.H.C.K. 2014. *Nilssonina leithii* (Gray 1872) – Leith's Softshell Turtle. In: Rhodin, A.G.J., Pritchard, P.C.H., van Dijk, P.P., Saumure, R.A., Buhlmann, K.A., Iverson, J.B., and Mittermeier, R.A. (Eds.). *Conservation Biology of Freshwater Turtles and Tortoises: A Compilation Project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group*. Chelonian Research Monographs No. 5, pp. 075.1–5, doi:10.3854/crm.5.075.leithii.v1.2014, <http://www.iucn-tftsg.org/cbftt/>.