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43/2 Varadarajulu Nagar, 5th Street West, Ganapathy, Coimbatore, Tamil Nadu 641006, India
Registered Office: 3A2 Varadarajulu Nagar, FCI Road, Ganapathy, Coimbatore, Tamil Nadu 641006, India
Ph: +91 9385339863 | www.threatenedtaxa.org
Email: sanjay@threatenedtaxa.org

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Cover: Rose-breasted Grosbeak *Pheucticus ludovicianus*, pen & ink with colour pencil. © Lucille Betti-Nash.



Traditional harvesting practices employed for freshwater turtles by the indigenous communities along Shilabati River, West Bengal, India

Prasun Mandal¹ , Pathik Kumar Jana² , Priyanka Halder Mallick³ , Shailendra Singh⁴
& Tanmay Bhattacharya⁵

¹Department of Zoology, Vidyasagar University, Midnapore, West Bengal, 721102, India.

²Centre for Life Sciences, Vidyasagar University, Midnapore, West Bengal, 721102, India.

³Department of Zoology, Vidyasagar University, Midnapore, West Bengal, 721102, India.

⁴TSA Foundation India, D 1/ 317 Sector F, Jankipuram, Lucknow, Uttar Pradesh, 226021, India.

⁵Formerly of Department of Zoology, Vidyasagar University, Midnapore, West Bengal, 721102, India.

¹prasunmandalzoo7@gmail.com (corresponding author), ²pathikjana@gmail.com, ³priyanka@mail.vidyasagar.ac.in, ⁴shailendrasingh.phd@gmail.com, ⁵prof.t.bhattacharya@gmail.com

Abstract: A survey was conducted through semi-structured interviews, involving 38 local fishermen of three villages in the Gangani region along Shilabati River in West Bengal, India. The survey revealed that three threatened species of turtles—*Nilssonina gangetica*, *Nilssonina hurum*, and *Lissemys punctata*—were clandestinely harvested by the riverine communities. These species are also being documented for the first time from this area, popularly called Jangal Mahal. *N. gangetica* was the most commonly harvested species, followed by *L. punctata* and *N. hurum*, mostly for consumption, local sale, and as traditional medicine. The most frequently used method for capturing turtles was the ‘multiple hook bait’; exclusively practiced by adult males of the fisher community, usually belonging to the age group 21–40 years, between February and June. The study indicated that the respondents knew that harvesting of turtles was clandestine, yet they continued to do so as their traditional right, as they believed minor catches will not harm local turtle populations. It is assumed that *N. hurum*, which is an endangered species, is already rare and on the brink of local extinction, whereas other two species are coping with the harvest in the specialized riparian habitat and adjacent ponds. In this study the harvesting of threatened turtle species was ardently associated with the socio-cultural customs rather than an economic compulsion but to check rising threat to these species, the uncontrolled harvest needs to be addressed urgently as a high priority conservation issue. This requires further explorations on the ecology of turtles, initiatives by enforcement agencies, and utilizing the inherent knowledge of indigenous people.

Keywords: Clandestine harvesting, conservation, riparian habitat, Soft-shell Turtle, Trionychidae, wildlife utilisation.

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Author details: PRASUN MANDAL is a research scholar, Department of Zoology, Vidyasagar University. PATHIK KUMAR JANA is an active researcher at Centre for Life Sciences, Vidyasagar University, after completing his M.Phil. from this University. DR. PRIYANKA HALDER MALLICK, presently associate professor and head of the department, Zoology at Vidyasagar University, is an environmentalist with research specializations in freshwater and forest ecology, environment, biodiversity conservation, etc. She is also the state coordinator of TSA Foundation India. DR. SHAILENDRA SINGH has two decades of experience with Indian freshwater turtle and tortoise research and management. He received the Behler Turtle Conservation Award for 2021 and Disney Conservation Award 2008. Currently Dr. Singh spearheaded TSA Foundation India as its director. DR. TANMAY BHATTACHARYA, former professor of Zoology, Vidyasagar University, Midnapore was a member, Wildlife Advisory Board of Tripura and Pollution Control Board of Tripura.

Author contribution: All enlisted authors have collaborated in developing and designing the paper. Supervision and administration for the research activity was offered by PHM. Drafting of initial manuscript, field data collection, visualization and analyses were done by PM with the assistance of PKJ. Final shape to the manuscript along with technical guidance was given by SS, PHM and TB. All authors have carefully gone through the final manuscript and approved it.

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INTRODUCTION

Local and indigenous people have been dependent on wildlife for their livelihood and subsistence in every corner of the globe from ancient times. Throughout the world, hunting and trafficking of animals or their parts pose serious threats to wildlife (Milner-Gulland & Bennett 2003). Hunting by indigenous people is prevalent in India and many wild regions of the world, as it is closely connected to local culture and rituals. Though hunting can provide a significant source of income for local communities, and particularly indigenous groups, it is generally considered a conservation issue (Nasi et al. 2008). Wild meat is an important source of nutrition and earnings for millions of people in developing countries (Brashares et al. 2011). In Asia, hunting practices are not well understood and research is mainly focused on trade (Banks et al. 2006). The local community around a river may rely on native bio-resources, including turtles, for food, economic support and cultural expression. However, the adoption of uncontrolled hunting practices has become more severe due to population growth, resulting in the over-exploitation of many species beyond sustainable levels (Apaza et al. 2002).

Various tools and techniques have been used for catching freshwater turtles in different regions of the world. In Mahanadi basin of India, floating hooks, harpoons and baits are used (Krishnakumar et al. 2009). In northwestern Ecuador and Chittagong Hill Tracts in Bangladesh, pitfall traps are employed (Carr et al. 2014; Rahman et al. 2015). Harpoons are used in Bangladesh (Rashid & Khan 2000) and Brazil (Fachín-Terán et al. 2004), while spear rods are utilized in Pakistan (Noureen et al. 2012). In addition to these methods, different types of nets such as gill nets and drag nets in Brazil (Fachín-Terán et al. 2004), fishing nets and hook lines are used in Pakistan and Bangladesh (Rashid & Khan 2000; Noureen et al. 2012). Baited fishing lines are employed in Indonesia (Shepherd 2000) and physical diving is a common practice in Bangladesh (Rashid & Khan 2000) and the Amazon basin (Fachín-Terán et al. 2004). Direct Hand Capture (DHC) is also a popular method used during rainy and winter seasons (Fachín-Terán et al. 2004; Carr et al. 2014). Other methods used in various parts of the world include hunting dogs (Rahman et al. 2015), wooden pole & jatica (Fachín-Terán et al. 2004), muddling (Rashid & Khan 2000), pool cleaning, turtle basket, probing (Carr et al. 2014), and electric current (Shepherd 2000). The biomass of wildlife populations has significantly decreased in areas where hunting is prevalent, leading to changes in the age distribution

of species (Peres 2000). River turtles play a vital role in the local economy and ecology by dispersing seeds, controlling prey, and scavenging in aquatic ecosystems. Protecting vulnerable nesting areas and eggs is crucial for turtle conservation (Fachín-Terán et al. 2004).

Globally, chelonians are the second most endangered vertebrate group after primates in terms of their rate of extinction (Rhodin et al. 2018). Turtle populations are steadily declining due to a variety of factors, including over-exploitation of turtles and their eggs for food, traditional medicines and the global pet trade, as well as habitat degradation (Stanford et al. 2020). Hunting of threatened animals is strictly prohibited in India and carries legal consequences under the Wildlife (Protection) Act, 1972. Several turtle species are protected under this Act (Yadav et al. 2021). However, turtle hunting continues to be widespread in several regions of India even though it is refuted (Krishnakumar et al. 2009; Kanagavela & Raghavana 2013; Behera et al. 2019). Turtle harvesting is also prevalent in the Shilabati River of the Paschim Medinipur district of West Bengal, where meat consumption has led to a significant conservation issue. Three species that are being harvested in this area are *N. gangetica* (Cuvier, 1825), *N. hurum* (Gray, 1831), and *L. punctata* (Bonnaterre, 1789). According to the IUCN Red List, *N. gangetica* and *N. hurum* are 'Endangered' and *L. punctata* is 'Vulnerable' (IUCN 2024). All three species are listed in Schedule-I of the Wildlife (Protection) Act, 1972 of India and are protected live or dead and parts thereof (Yadav et al. 2021). Each of the three species mentioned belong to the Trionychidae family and are known as softshell turtles. These turtles are mostly found in the Indian subcontinent, particularly in countries such as India, Pakistan, Bangladesh, and Nepal but *L. punctata* has a wider distribution range that extends to Myanmar (Hmar et al. 2020; Yadav et al. 2021). Understanding the harvesting practices and factors that influence local harvesting is crucial for conservation of these species.

This study was designed to gather information on the techniques used to capture river turtles in the Shilabati River, and investigate the effects of turtle harvesting in the region vis-a-vis the socioeconomic and cultural backdrops of the local inhabitants for delving deeper into the conservation issue of threatened turtle species. A better understanding of harvesting practices is necessary to comprehend the socioeconomic features leading to these activities and their ecological consequences.

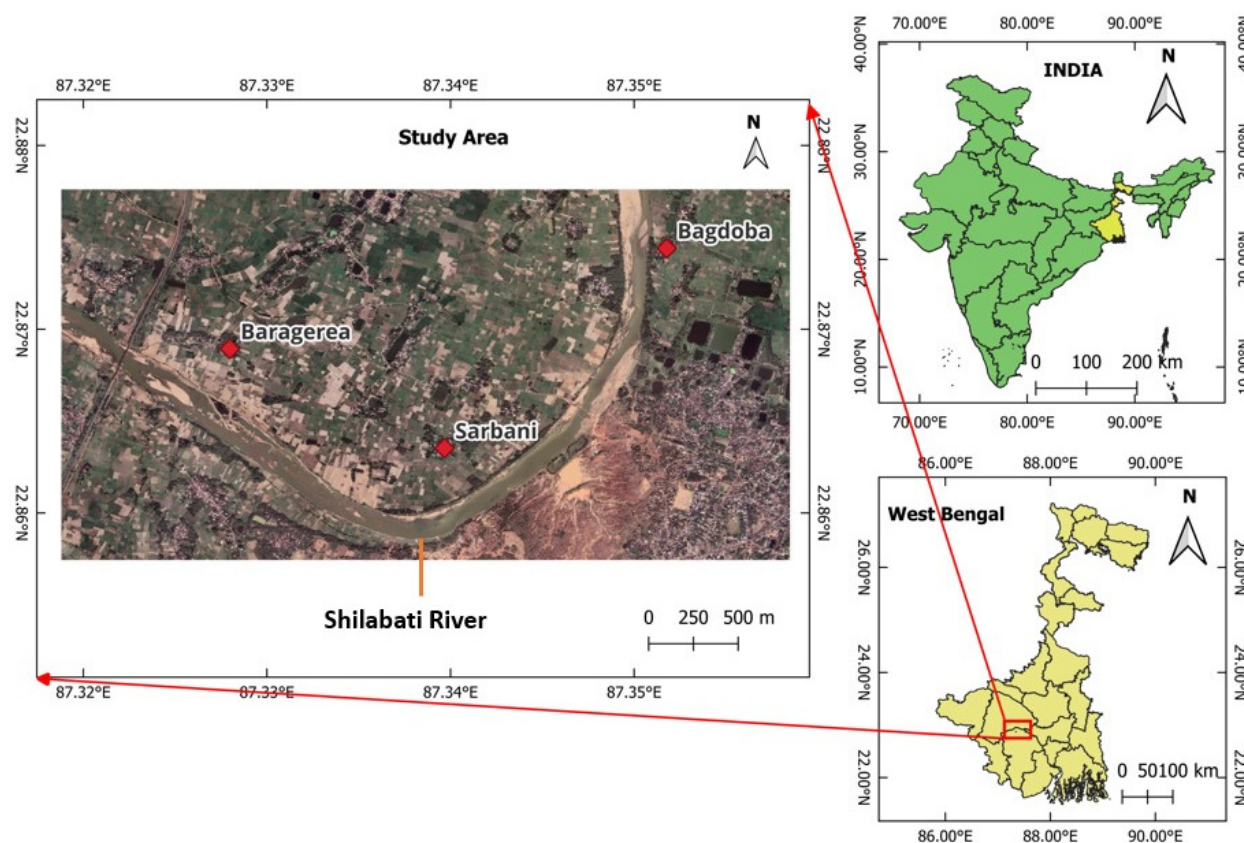


Image 1. Study area with three villages along Shilabati River.

MATERIALS AND METHODS

The study was conducted over an area spanning a 5-km stretch along Shilabati River in Paschim Medinipur District of West Bengal including three villages Baragerea, Sarbani, and Bagdoba (22.866°N, 87.323°E to 22.883°N, 87.350°E) in the Gangani area of Jangal Mahal (Image 1) inhabited by local people who mostly depend on the nearby natural resources. This area of the Shilabati River has been found to be an ideal habitat for turtles, with large submerged rocks suitable for hiding. To ensure high accuracy, the coordinates were recorded using a GPS device (Garmin Etrex- 30).

The data presented here are from 12-month surveys in 2021, and partly from an ongoing study. Weekly visits were made to gather a combination of qualitative and quantitative data through surveys and conducting semi-structured interviews, incorporating both open ended and close ended questions following Mueller & Segal (2014). Thirty-eight fishermen who came to the river on a regular basis from three different villages primarily for fishing were interviewed. All respondents agreed to be interviewed with the assurance that their identities would remain confidential and each interview was performed

individually. Consent of the interviewees were obtained prior, as a part of human ethics for research. Indigenous community members involved in turtle harvesting parallel to fishing were divided into four age groups: A (11–20 years), B (21–30 years), C (31–40 years), and D (41–50 years). Our objective was to prepare a database about the harvesting practices adopted in the area including tools and techniques, targeted species, frequency, number of turtles captured, preferred season and time of harvesting, purpose of harvesting, clandestine trade, cultural practices and age-structure of fishermen.

Photographs of various Indian freshwater turtle species were presented during the survey, validating the identification of the species. Statistical analyses of data were done by SPSS-26 and illustration of results were done using MS Excel 2019. Map of the study area was designed using QGIS 3.28.2 software.

RESULTS

Our routine survey revealed occurrence of three species of turtles from Shilabati River (Image 2) and



Image 2. Photographs of the three species of turtles encountered during survey from Shilabati River: A—*Lissemys punctata* | B—*Nilsonia gangetica* | C—*Nilsonia hurum*. © Prasun Mandal.

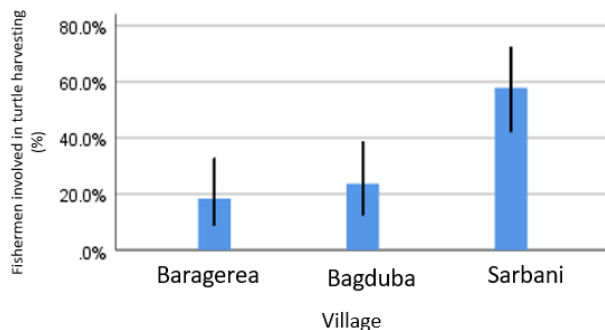


Figure 1. Number of fishermen involved in turtle harvesting (%) across three villages.

adjoining ponds, viz., *L. punctata*, the most common aquatic turtle in India, *N. gangetica* and *N. hurum*. The local inhabitants confessed to harvesting all three turtle species, although they knew that turtle harvesting was clandestine in general (Table 1). Kruskal Wallis test was used as an alternative to ANOVA as normality assumption was not met as far as difference in the number of individuals involved in harvesting of turtles from the three villages were concerned. Findings suggested that the number of harvesters were significantly different ($H = 53.386$, $p < 0.001$) among villages. Pairwise comparison revealed that significantly higher number of harvesters were from Sarbani village as compared to Bagduba ($H = 55.308$, $p < 0.001$) and Baragerea ($H = 54.163$, $p < 0.001$) villages (Figure 1). No significant difference, however, could be observed between the number of harvesters from Bagduba and Baragerea village ($H = -1.144$, $p = 0.895$).

During the study period of about a year, fishermen reported to encounter an average of 43 turtles per month. In total 518 turtles were reported to be harvested during those 12 months (Table 2), of which maximum number

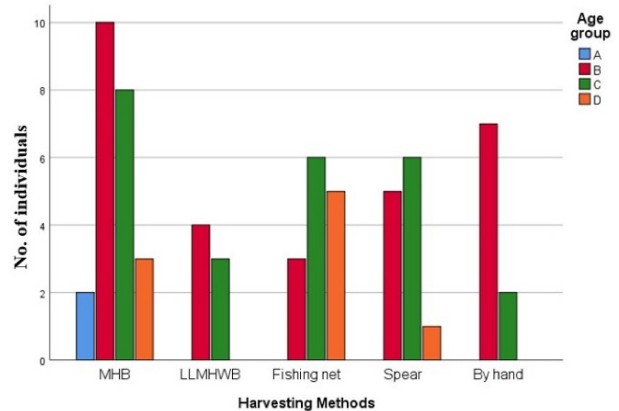


Figure 2. Age group-wise distribution A (11–20 years), B (21–30 years), C (31–40 years), and D (41–50 years), individuals adopting different harvesting techniques to catch turtles.

($N = 299$) were captured by the residents of Sarbani village. The most common species in the study area was *N. gangetica* ($N = 334$) followed by *L. punctata* ($N = 182$). Only two *N. hurum* were reported to be captured during this period. However, there is no evidence to prove these figures beyond doubt. Of the five harvesting practices used, viz., multiple hook bait (MHB), fishing net, spears, long line multiple hook without bait (LLMHWP) and manual capture, MHB was the most preferred method ($N = 225$) followed by fishing net ($N = 120$) in that order (Figure 2). Though all age groups preferred MHB method, it was exclusively used by age group A. Most of the harvesting was done by people belonging to age groups B and C (Figure 2); 31.5% of respondents were illiterate while 60.5% had only basic schooling (Table 1). In MHB, the hooks were left with attached baits dangling in water. Baits used in MHB included snails, shrimp, small fish, crabs, earthworms and pieces of chicken

Table 1. Summary of the responses by respondents N (%).

Questions	Answer	Number (%)
Gender	Male	38 (100 %)
	Female	0 (0 %)
Age group	A (11–20)	2 (5 %)
	B (21–30)	18 (48 %)
	C (31–40)	13 (34 %)
	D (41–50)	5 (13 %)
Education	Graduation	3 (8 %)
	School	23 (60.5 %)
	Illiterate	12 (31.5 %)
Annual income	< 30000 INR	0 (0 %)
	30000–60000 INR	2 (5 %)
	60000–90000 INR	16 (42 %)
	90000–120000 INR	12 (32 %)
	>120000 INR	3 (8 %)
	No response	5 (13 %)
From which village do you belong?	Sarbani	22 (58 %)
	Bagduba	9 (24 %)
	Baragerea	7 (18 %)
Do you catch turtles in addition to fishes?	Yes	38 (100 %)
	No	0 (0 %)
Which method do you prefer most?	MHB	18 (47 %)
	Fishing net	8 (21 %)
	Spear	4 (11 %)
	LLMHWB	3 (8 %)
	No preference	5 (13 %)
Which season do you mostly catch a turtle?	Summer	26 (69 %)
	Winter	10 (26 %)
	Monsoon	2 (5 %)
Which time of the day do you prefer to catch turtles?	1000–1400 h	8 (21 %)
	1400–1800 h	21 (55 %)
	1800–2200 h	6 (16 %)
	No Preference	3 (8 %)
What for do you catch turtles?	Eating	3 (8 %)
	Selling	8 (21 %)
	Both eating & selling	24 (63 %)
	Other	3 (8 %)
What do you do if a juvenile is caught?	Release	32 (84 %)
	Keep as pet	6 (16 %)
Is turtle population increasing or decreasing?	Increasing	25 (66 %)
	Same	7 (18 %)
	Don't know	6 (16 %)
Do you know turtle harvesting is an offence?	Yes	38 (100 %)
	No	0 (0 %)
Would you continue turtle harvesting in future?	Yes	35 (92%)
	No	3 (8%)

Table 2. Turtle hunting by various methods N (%).

Method	<i>Lissemys punctata</i> (local name: 'Kachim')	<i>Nilssonina gangetica</i> (local name: 'Boro Bargol')	<i>Nilssonina hurum</i> (local name: 'Bargol')	Total
MHB	60 (26.66 %)	164 (72.88 %)	1 (0.45 %)	225 (43.44%)
LLMHWB	0 (0 %)	67 (100 %)	0 (0 %)	67 (12.93%)
Fishing net	53 (44.16 %)	67 (55.83 %)	0 (0 %)	120 (23.17%)
Spear	43 (62.31 %)	26 (37.68 %)	0 (0 %)	69 (13.32%)
By hand	26 (70.27 %)	10 (27.02 %)	1 (2.7 %)	37 (7.14%)
Total	182 (35.13%)	334 (64.48%)	2 (0.39%)	518 (100%)

intestine. One end of the rope contained five to ten baited hooks, whereas remaining hooks were left bait-free with a weight attached at the end before throwing it into the river (Image 3) and leaving it for at least two hours. Usually, hooks were baited around 1500 h and sometimes left overnight. This was the most suitable method for catching turtles particularly *N. gangetica* but not practiced during rainy season when water level was higher, animals disperse rather than congregating due to high tide conditions. LLMHB was generally used during pre-monsoon period when water level was low but never in rainy season (July–September). This method was only effective for *N. gangetica*. A total of 67 individuals were harvested by this method (Table 2). In summer, fishing nets were commonly used between 1000 h to 1430 h to avoid the afternoon. This method was stated as very effective for small-sized turtles, which was, however, not used during monsoon. A total of 53 *L. punctata* and 67 *N. gangetica* were harvested by this method. During winter and harvesting festival (locally known as 'Bartch'), spears were used to locate and capture buried turtles by the sound produced as a result of the impact of the iron tip of the spear on the carapace and captured by hand. Spears were also used to capture turtles from crevices in rocks. This method was generally not used from July to September. During bartch, a group of 10–15 people go out for harvesting in river, spend 7–8 hours or even more and harvest the riverine fauna including turtles. Harvesters mostly used turtles in addition to fishes for domestic consumption. Gravid females migrating to the breeding sites were sometimes picked up by hand following their trails.

Juveniles were never caught for consumption, and rarely kept as pets. One juvenile *N. hurum* was captured from the river bank during sand dredging but was later released back into the river. Anonymous information collected stated that sometimes large-sized softshell turtles caught from the river and were kept in small cemented tanks by tying rope on to their legs for

consumption during forthcoming festivals.

Turtle harvesting was done by adult male community members, majority of which (48%) belonged to age group B followed by (34%) age group C; 69% of respondents preferred to catch turtles during pre-monsoon or summer (February–June) and the most preferred time was between 1400 h to 1800 h (55%) (Table 1). A substantial proportion of respondents (92%) wanted to continue clandestine turtle hunting; 89% of respondents used carapace as traditional medicine and hung that on the wall of cowsheds (Image 4a), around the neck of livestock as amulet (Image 4b) for their protection. Moreover, children also used them as playing tools (Image 4c). Of the interviewed, 66% respondents believed that turtle population was not declining rather increasing. Despite the fact that every family had access to other proteinaceous food sources (goat, pig, duck, and chicken), turtle meat was always esteemed over others. One-way ANOVA revealed that number of *N. gangetica* and *L. punctata* caught were significantly more ($p < 0.001$) with F value being 20.75 and 9.13, respectively, as compared to *N. hurum* ($F = 0.75$; $p = 0.599$).

DISCUSSION

Softshell turtles (Family Trionychidae) are considered to be the finest of all freshwater turtles consumed because of their low bone-to-body ratio, along with extra cartilage and gelatinous skin (Krishnakumar et al. 2009). Due to the substantial demand, these turtles are being regularly harvested and traded in Asian countries including India. Over 58,000 individuals of turtles, belonging to at least 15 different species, including 10 identified as threatened by the IUCN have been illegally harvested in India between 2011 and 2015 (Mendiratta et al. 2017). Rana & Kumar (2023) highlighted that a total of 37,267 turtles were confiscated between 2015



Image 3. Indigenous harvesting gears used for turtles: A—MHB | B—Spear | C—LLMHWP | D—Fishing net. © Prasun Mandal.



Image 4. Use of turtle carapace by local residents of the study area: A—as a good omen, hung on the wall of cow-shed | B—a piece around neck of buffalo as amulet | C—kid using carapace shaft as a toy. © Prasun Mandal.

and 2016, indicating that the government officials seized 100 individuals on an average every day. This shows that turtle harvesting is quite rampant in India. Present study also revealed that harvesting of threatened turtle species in the region under study is in vogue and needs to be checked with proper vigilance of the local authorities and stringent enforcement of the Wildlife (Protection) Act, 1972. It is hinted that clandestine harvesting might have followed secret sale by personal or online channels instead of open market, and demand

for turtles from urban people for consumption, or high prices offered by smugglers, might have lured some of the poor people to take the risk of turtle harvesting and trading. These three species, although widely distributed in India (Singh et al. 2021), have been documented for the first time from Shilabati River. As such harvesting and trading of these live, dead or parts thereof is a punishable act which the local people are ignoring. Number of such fishermen were significantly more from Sarbani village as compared to remaining two villages.

The total number of individuals harvested in one year in the present study was lower than that in Punnamada in Kerala (Krishnakumar et al. 2009) but higher than that in the Western Ghats (Kanagavel & Raghavana 2013).

L. punctata is heavily exploited and trafficked at both national and international markets for its meat and supposedly medicinal value across its distributional range (Bhupathy et al. 2014; Mendiratta et al. 2017). Illegal sale of *L. punctata* in West Bengal has been previously reported by Choudhury et al. (2000) and Mendiratta et al. (2017). Sale of turtle in the markets of Midnapore Town and Purba Medinipur District have also been reported by Pratihari et al. (2014) and Mahapatra et al. (2022) respectively but they did not mention anything about source and ways of harvesting. As in the present study, use of hooks, harpoons and baits has also been previously reported from India (Krishnakumar et al. 2009; Peng & Nobayashi 2021).

The connection between indigenous festivals and turtle harvesting is common around the world. Lovich et al. (2014) highlighted that turtle harvesting is scheduled before the 'Niam' festival in July at Arizona, USA when men go for turtle harvesting that lasts for 6–7 days. Likewise, in the present study it was seen that turtle harvesting precedes Bartch festival from April to June. In Jangal Mahal area another festival, 'Bandh Bibaha' is held in which turtles, tortoise and frogs are released in ponds and dams (Sarkar & Modak 2022) for mating, which is also a positive intention of villagers towards animal conservation. Kanagavel & Raghavan (2013) in Western Ghats, India reported that larger chelonian species were consumed immediately after harvesting and smaller ones were reared until those reached the desirable size for consumption. In contrast, in the present study it was seen that large sized turtles were kept in small water-filled cemented tanks with their legs tied for consumption during the forthcoming festivals. Indigenous communities generally prefer wild meat over domesticated meat (Aiyadurai et al. 2010; Brittain et al. 2022) for the sake of taste or religious reasons. The same was found to be true in case of the Gangani region as well.

Commonly, indigenous people use turtle shells for various traditional, cultural and religious customs (Das et al. 2012; Kanagavel et al. 2016). Mahawar & Jaroli (2007) stated that carapace ash was used as traditional medicine for cure of asthma, skin burn and tuberculosis in Rajasthan. In Western Ghats, shell and fatty tissue of turtles are used for their supposedly therapeutic value for curing piles, fissure, asthma, respiratory and gastric problem as well as in boosting strength (Kanagavel et

al. 2016). In Assam and Bangladesh carapace is used for livestock treatment (Khatun et al. 2013). In Assam, shells are also hung in cowsheds and sometimes inside homes. They believe that this would keep livestock healthy and bring prosperity to the household (Barhadiya & Singh 2020). In the present study also, it was observed that carapace was hung on the wall of cowshed and as amulet hung round the neck of the cattle to protect against evil eyes. Moreover, children were also seen to play with those as toy. Earlier, a similar case was observed in the Dangi tribes, Dangs, Gujarat (Vyas 2006).

The most likely cause of clandestine harvesting seems to be traditional culture. They were also not aware of the adverse legal consequences of turtle harvesting. Tosakana et al. (2010) opined that a low level of education in the community might be associated with turtle harvesting, since they found that 62% of the surveyed people had not completed their primary education. Our findings also confirmed this contention as 92% of the respondents were either illiterate or had undergone only school education. Education is widely recognized as one of the foremost factors for knowledge acquisition and learning, exerting a profound impact on individual's perspectives towards environmental conservation and the responsible use of resources (Medeiros et al. 2023). It plays a pivotal role in enhancing employment prospects and alternative livelihood strategies, ultimately reducing the direct reliance on natural resources (Kideghesho et al. 2007). Due to lack of proper education 84% people of the area believed that turtle harvesting has no adverse effect on the turtle population.

CONCLUSION

Clandestine harvesting is prevalent in the forest-dominated Jangal Mahal area of West Bengal, and in most wild regions of the world as a traditional practice. Present study was an attempt to portray the socio-ecological set-up of the Gangani region focusing on the dynamic interaction of indigenous communities with these freshwater chelonians from socio-cultural point of view which clearly revealed that the hunting of threatened turtle species in the study area was emphatically associated with the traditional customs rather than the economic compulsion, as most of the respondents were not that poor economically. Absence of awareness regarding the present situation of aquatic wildlife seems to play an important role in persisting harmful activities as indigenous communities believed that turtle populations were not declining due to their

harvesting activities. Lack of knowledge regarding wildlife laws among fishermen, particularly ignorance of the distinction between unthreatened and threatened species, might be another reason for such ignorant activities. In this view, chelonian surveys become even more vital to fill the lacunae of scientific information in the region and subsequently promote conservation. Since only two individuals of *N. hurum* were captured during the study period it may be assumed that this species is in the brink of local extirpation. The remaining two species may be regarded as rare as those are still existing in small numbers. Forest authorities kept a watchful eye and released turtles to their natural habitat whenever found by their staff. Needless to mention, ethnic people are the ones deeply connected with nature so their knowledge may be constructively used to conserve the threatened species through concerted efforts. To frame a workable management strategy, not only further exploratory study is required on the status of turtle population; but also appropriate programs to create awareness among indigenous people regarding ecological importance of turtles, needs for its conservation and environmental sustainability for their own well-being in long term by government agencies, stakeholders as well as NGOs.

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Mr. Jatishwor Singh Irungbam, Biology Centre CAS, Branišovská, Czech Republic.
Dr. Ian J. Kitching, Natural History Museum, Cromwell Road, UK
Dr. George Mathew, Kerala Forest Research Institute, Peechi, India
Dr. John Noyes, Natural History Museum, London, UK
Dr. Albert G. Orr, Griffith University, Nathan, Australia
Dr. Sameer Padhye, Katholieke Universiteit Leuven, Belgium
Dr. Nancy van der Poorten, Toronto, Canada
Dr. Kareen Schnabel, NIWA, Wellington, New Zealand
Dr. R.M. Sharma, (Retd.) Scientist, Zoological Survey of India, Pune, India
Dr. Manju Siliwal, WILD, Coimbatore, Tamil Nadu, India
Dr. G.P. Sinha, Botanical Survey of India, Allahabad, India
Dr. K.A. Subramanian, Zoological Survey of India, New Alipore, Kolkata, India
Dr. P.M. Sureshan, Zoological Survey of India, Kozhikode, Kerala, India
Dr. R. Varatharajan, Manipur University, Imphal, Manipur, India
Dr. Eduard Vives, Museu de Ciències Naturals de Barcelona, Terrassa, Spain
Dr. James Young, Hong Kong Lepidopterists' Society, Hong Kong
Dr. R. Sundararaj, Institute of Wood Science & Technology, Bengaluru, India
Dr. M. Nithyanandan, Environmental Department, La Ala Al Kuwait Real Estate. Co. K.S.C., Kuwait
Dr. Himender Bharti, Punjabi University, Punjab, India
Mr. Purnendu Roy, London, UK
Dr. Saito Motoki, The Butterfly Society of Japan, Tokyo, Japan
Dr. Sanjay Sondhi, TITLI TRUST, Kalpavriksh, Dehradun, India
Dr. Nguyen Thi Phuong Lien, Vietnam Academy of Science and Technology, Hanoi, Vietnam
Dr. Nitin Kulkarni, Tropical Research Institute, Jabalpur, India
Dr. Robin Wen Jiang Ngiam, National Parks Board, Singapore
Dr. Lionel Monod, Natural History Museum of Geneva, Genève, Switzerland.
Dr. Asheesh Shivam, Nehru Gram Bharti University, Allahabad, India
Dr. Rosana Moreira da Rocha, Universidade Federal do Paraná, Curitiba, Brasil
Dr. Kurt R. Arnold, North Dakota State University, Saxony, Germany
Dr. James M. Carpenter, American Museum of Natural History, New York, USA
Dr. David M. Claborn, Missouri State University, Springfield, USA
Dr. Kareen Schnabel, Marine Biologist, Wellington, New Zealand
Dr. Amazonas Chagas Júnior, Universidade Federal de Mato Grosso, Cuiabá, Brasil
Mr. Monsoon Jyoti Gogoi, Assam University, Silchar, Assam, India
Dr. Heo Chong Chin, Universiti Teknologi MARA (UiTM), Selangor, Malaysia
Dr. R.J. Shiel, University of Adelaide, SA 5005, Australia
Dr. Siddharth Kulkarni, The George Washington University, Washington, USA
Dr. Priyadarsanan Dharma Rajan, ATREE, Bengaluru, India
Dr. Phil Alderslade, CSIRO Marine And Atmospheric Research, Hobart, Australia
Dr. John E.N. Veron, Coral Reef Research, Townsville, Australia
Dr. Daniel Whitmore, State Museum of Natural History Stuttgart, Rosenstein, Germany.
Dr. Yu-Feng Hsu, National Taiwan Normal University, Taipei City, Taiwan
Dr. Keith V. Wolfe, Antioch, California, USA
Dr. Siddharth Kulkarni, The Hormiga Lab, The George Washington University, Washington, D.C., USA
Dr. Tomas Ditrich, Faculty of Education, University of South Bohemia in Ceske Budejovice, Czech Republic
Dr. Mihaly Foldvari, Natural History Museum, University of Oslo, Norway
Dr. V.P. Uniyal, Wildlife Institute of India, Dehradun, Uttarakhand 248001, India
Dr. John T.D. Caleb, Zoological Survey of India, Kolkata, West Bengal, India
Dr. Priyadarsanan Dharma Rajan, Ashoka Trust for Research in Ecology and the Environment (ATREE), Royal Enclave, Bangalore, Karnataka, India

Fishes

Dr. Neelesh Dahanukar, IISER, Pune, Maharashtra, India
Dr. Topiltzin Contreras MacBeath, Universidad Autónoma del estado de Morelos, México
Dr. Heok Hee Ng, National University of Singapore, Science Drive, Singapore
Dr. Rajeev Raghavan, St. Albert's College, Kochi, Kerala, India
Dr. Robert D. Sluka, Chiltern Gateway Project, A Rocha UK, Southall, Middlesex, UK
Dr. E. Vivekanandan, Central Marine Fisheries Research Institute, Chennai, India
Dr. Davor Zanella, University of Zagreb, Zagreb, Croatia
Dr. A. Biju Kumar, University of Kerala, Thiruvananthapuram, Kerala, India
Dr. Akhilesh K.V., ICAR-Central Marine Fisheries Research Institute, Mumbai Research Centre, Mumbai, Maharashtra, India
Dr. J.A. Johnson, Wildlife Institute of India, Dehradun, Uttarakhand, India
Dr. R. Ravinesh, Gujarat Institute of Desert Ecology, Gujarat, India

Amphibians

Dr. Sushil K. Dutta, Indian Institute of Science, Bengaluru, Karnataka, India
Dr. Annemarie Ohler, Muséum national d'Histoire naturelle, Paris, France

Reptiles

Dr. Gernot Vogel, Heidelberg, Germany
Dr. Raju Vyas, Vadodara, Gujarat, India
Dr. Pritpal S. Soorae, Environment Agency, Abu Dubai, UAE.
Prof. Dr. Wayne J. Fuller, Near East University, Mersin, Turkey
Prof. Chandrashekhar U. Rivonker, Goa University, Taleigao Plateau, Goa. India
Dr. S.R. Ganesh, Chennai Snake Park, Chennai, Tamil Nadu, India
Dr. Himansu Sekhar Das, Terrestrial & Marine Biodiversity, Abu Dhabi, UAE

Birds

Dr. Hem Sagar Baral, Charles Sturt University, NSW Australia
Mr. H. Byju, Coimbatore, Tamil Nadu, India
Dr. Chris Bowden, Royal Society for the Protection of Birds, Sandy, UK
Dr. Priya Davidar, Pondicherry University, Kalapet, Puducherry, India
Dr. J.W. Duckworth, IUCN SSC, Bath, UK
Dr. Rajah Jayapal, SACON, Coimbatore, Tamil Nadu, India
Dr. Rajiv S. Kalsi, M.L.N. College, Yamuna Nagar, Haryana, India
Dr. V. Santharam, Rishi Valley Education Centre, Chittoor Dt., Andhra Pradesh, India
Dr. S. Balachandran, Bombay Natural History Society, Mumbai, India
Mr. J. Praveen, Bengaluru, India
Dr. C. Srinivasulu, Osmania University, Hyderabad, India
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ravi@threatenedtaxa.org

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