Tracking an elusive turtle with genetic clues from nature

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- *Researchers have developed an eDNA protocol to track and monitor the critically endangered northern river terrapin in the Sundarbans.*
- *Hunting, habitat loss, and tropical cyclones that erode potential nesting sites, have contributed to the decline in this turtle's population.*

While there are in-situ conservation efforts in India, researchers call for more studies and transboundary

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Commonly called the northern river terrapin, *Batagur baska* is a terrapin uniquely adapted to mangroves. Once found in abundance in the mangrove-lined rivers and estuaries in Myanmar and in the Sundarbans across India and Bangladesh, the small turtle species is now listed as critically endangered by the International Union for Conservation of Nature (IUCN) and there are no records of adults in recent years.

As these turtles are elusive and sensitive to human activities, the typical boat-based visual survey methodologies have not been sufficient to detect the presence of these turtles in their habitat.

The Wildlife Institute of India (WII) applied an environmental DNA (eDNA) protocol, where they study genetic material in an environment sample, to detect the presence of the turtle in parts of the Indian Sundarbans. In this particular protocol, they monitored and mapped the presence of the turtle genus in its habitat by analysing water samples for traces of its DNA found in mucus secretion, faecal matter or shedded scales.

They successfully detected the DNA of the genus Batagur in the water samples, which offers hope for future conservation action for the *Batagur baska* species.

The eDNA methodology, however, is difficult to carry out for species that are extremely rare, especially in vast habitats such as the Sundarbans. Large amounts of samples need to be collected and processed immediately, before the DNA degrades. “It’s like searching for a needle in a forest,” said Abhijit Das, a WII scientist who led the study. “But it’s the only viable option.”

The team is now analysing the eDNA collected from water samples at 180 spots across 2,584 square kilometres of the Sundarbans, Amirtha Balan from WII, who is part of the research, told Mongabay India.

Batagur baska is an estuarine species which lives in rivers and chooses the sea shore only for laying eggs. Researchers are collecting and analysing water samples for traces of their DNA in the waters of Indian Sundarbans. Image by Surojit Moitra.

Hunting and habitat change

The northern river terrapin is an omnivorous turtle. It maintains the aquatic food chain by feeding on fish, invertebrates, and carrion and plant materials. It helps in seed dispersal and also plays a key role in mineral cycling. With an olive-grey carapace (hard upper shell), it can blend seamlessly with the alluvial soil base of the Sundarban Tiger Reserve (STR). According to the WII assessment, only three people of the 422 fishers and inland farmers surveyed as part of the study, sighted the species in the wild.

Harvesting turtle eggs was legal during the British era and is cited as one of the primary reasons that pushed the northern river terrapin towards extinction. Early records published by F.D. Maxwell, an administrative officer part of the British government in 1911, reveal that the local residents and fishers in Myanmar collected about 70,000 eggs of *Batagur baska* (referred to in the records as estuarine tortoises) annually.

A 2009 report on the turtle states, “The northern river terrapin has been heavily exploited for its flesh and large eggs.” The report further adds that Bangladesh fishermen used hooks baited with mangrove fruit to catch them, while those in Myanmar used traps with thamè tree leaves. A juvenile in 1997 and another in 2007 were poached by fishermen and illegally traded in the markets of Bangladesh, studies indicate.

Habitat loss is another detriment behind *Batagur baska*’s current unfortunate stature in India. “The construction of the Farakka barrage across the Ganga river has reduced the amount of freshwater flowing into the [Sundarbans] reserve. In the past ten years, the salinity of the rivers in the reserve doubled from 10 parts per thousand (ppt) to 20 ppt. This species can survive in waters with salinity up to 10 ppt,” Balan explains.

Additionally, in the past two decades, tropical cyclones in the Sundarbans region have eroded the sandy beaches, which are the potential nesting sites of *Batagur baska*.

A male (on top) and female (bottom) Batagur Baska. During the breeding season between September and November, the males develop a dull peach hue on their limbs while their head and neck darken. Image by Amirtha Balan.

An effort from India to release ten sub-adults from one of the acclimatisation colonies in STR, into the wild in 2022, resulted in the terrapins moving to Bangladesh. “According to the latest tracking data, nine of these turtles have migrated to the Sundarbans in Bangladesh. Another turtle appears to have moved toward freshwater habitats, possibly beyond India’s borders. We are confident that the species currently lacks any suitable habitat within the Indian Sundarbans,” says S. Justin Jones, deputy director of the Sundarbans Tiger Reserve, who is not associated with the study.

“The effort was not unsuccessful. The objective of the exercise was to understand the habitat ecology of terrapins and we were successful in that. We understood their preferred salinity range, habitat and other parameters which was the objective of the exercise,” he adds Jones.

When compared to the Indian Sundarbans, the Bangladesh Sundarbans are less saline with less developmental activities, making it more suitable for the species, the experts say.

The northern river terrapin maintains the aquatic food chain by feeding on fish, invertebrates, and carrion and plant materials. It also helps in seed dispersal and also plays a key role in mineral cycling. Image by Amirtha Balan.

Race against extinction

The West Bengal Forest Department initiated a captive breeding programme for the *Batagur baska* in 1988. Between 1988 and 1991, they located 21 nests and moved 645 eggs to the Sajnekhali Range Station, STR, to be artificially incubated and the hatchlings reared in captivity. Less than 50% of these eggs hatched, according to a 1997 paper written by (late) S. Bhupathy of Salim Ali Centre for Ornithology and Natural History, a pioneer in turtle ecology studies.

The forest department abandoned the programme in the late 1990s due to administrative reasons. It was then restarted in 2008 under a collaboration between Turtle Survival Alliance (TSA) India and the forest department. "It was a crucial decade. We would have progressed in many aspects if we had continued the programme," says Arunima Singh, a turtle biologist, who previously worked with TSA. "Conservation projects are time-consuming and leaving them mid-way is no solution," says Singh who is not associated with the WII study.

"The in-situ conservation program for *Batagur baska* was initiated in Sajnekhali, Sundarban Tiger Reserve (STR) in 2012 with an initial population of 12 individuals. Since the commencement of the program in 2012, the total population has increased to 397 individuals till now," states the WII report. These captive individuals are housed across seven camps in STR – Sajnekhali, Dobanki, Jhingekhali, Harikhali, Netidhopani, and Chamta. However, there is no official number for the *Batagur baska* population in the wild. "For this species we need to try out many things. The priority is to detect the species in wild and eDNA is one of the tools," Das explains.

Attempts to survey them in the wild have been met with technical challenges too. "Satellite transmitters could only track the movement of the turtle for less than two years. We couldn't go for the longer duration ones as it would also increase the weight of the equipment. Transmitters should only be one percent of the animal's body weight," explains Singh.

West Bengal forest department released 10 sub-adults in the wild in 2022. Image courtesy of the West Bengal forest department.

Government sources say that the conservation programme struggles with a funding shortage. A source who is involved with the project, shared on condition of anonymity, that although the total sanction for the programme for 2023-24 was around Rs. 2.5 crores under the Integrated Development of Wildlife Habitats (IDWH), the amount released was only Rs. 40 lakhs. "This has resulted in a fund crunch for meeting the project objectives," the source said. When asked about the payments, Deputy Director Jones said that streamlining fund dispersal is a policy decision and declined to comment further.

The need for transboundary conservation

As part of their study, the WII team also conducted a habitat suitability analysis and found the potential to reintroduce the turtle species at protected mangrove habitats of Odisha, in addition to the Sundarbans.

They call for more solid studies to be conducted on many aspects of the *Batagur baska* including its ecology, its role in the local biodiversity, long-term monitoring and a comprehensive habitat analysis.

The 2022 release by the West Bengal forest department was prominent because for the first time, satellite transmitters were used on non-marine turtles in India. Image courtesy of the West Bengal Forest Department.

Furthermore, the conservation of *Batagur baska*, a transboundary species, may be more successful if executed in collaboration with Bangladesh. “We have established a gene bank and are fine-tuning the breeding and incubation process. However, we lack control over habitat disturbances. Since the turtles thrive in the habitats of Bangladesh, concerted efforts are essential to reintroduce and repopulate them in the wild,” said Jones.

“India is working vigorously, but the need of the hour is transboundary conservation efforts, including collaboration with Bangladesh, to conserve the species,” Das added.

Banner image: A male *Batagur baska* during the breeding season. Image courtesy of the West Bengal Forest Department.

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