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COMMUNICATION

CONSERVATION BREEDING OF NORTHERN RIVER TERRAPIN *BATAGUR BASKA* (GRAY, 1830) IN SUNDARBAN TIGER RESERVE, INDIA

Nilanjan Mallick, Shailendra Singh, Dibyadeep Chatterjee & Souritra Sharma

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Conservation breeding of Northern River Terrapin *Batagur baska* (Gray, 1830) in Sundarban Tiger Reserve, India

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Abstract: The population of Northern River Terrapin *Batagur baska* is 'Critically Endangered' and threatened with extinction. In India, the species was once known to occur in the mangroves of West Bengal and Odisha. The sub-population in Odisha is suspected to have been wiped out. The Sundarban Tiger Reserve and the Turtle Survival Alliance launched a modest conservation breeding program in 2012 to recover the species using a small number of adults as founders. Gravid adult females are kept in a dedicated breeding enclosure with minimal disturbance, eggs are incubated outdoor on an artificial nesting beach, and hatchlings are raised to develop assurance colonies for purposes of reintroduction in future. Currently, the project holds 12 adults and over 350 juveniles of various size classes. Three additional assurance colonies were developed for 70 sub-adults from 2012–13 batches, using rain-fed ponds within STR.

Keywords: Critically Endangered, Four-toed Terrapin, Freshwater turtles, Geomydidae, river turtle, Testudines.

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INTRODUCTION

Distribution and status of *Batagur baska*

The Indian subcontinent has one of the richest assemblages of chelonians in the world, with 29 freshwater turtles (Mital et al. 2019) and tortoises, of which all the members of the genus *Batagur* are seriously threatened. *Batagur baska* (Gray, 1830), commonly known as the Northern River Terrapin or Four-toed Terrapin, is a giant river turtle belonging to the family Geoemydidae within the order Testudines. *B. baska* is listed as 'Critically Endangered' in the IUCN Red List (Praschag & Singh 2019), and is recognised as one of the top 25 endangered turtle species in world (Turtle Conservation Coalitions 2018). The species is also listed in the Appendix-I of the CITES.

Formerly believed to have been a single species ranging across the entire southeastern Asian region, *B. baska* is actually one of two genetically distinct species (Praschag et al., 2007). The populations of river terrapins of Thailand, Malaysia, and Indonesia are now listed as the Southern River Terrapin *Batagur affinis*, while the northern species from India to Myanmar has retained the name *B. baska* (Praschag et al. 2008b, 2009; Weissenbacher et al. 2015; Praschag & Singh 2019).

Historically, *B. baska* was found in Odisha and the Hooghly River mouth, West Bengal (Blyth in. Gunther, 1864) in India, through to Bangladesh and Myanmar (lower Ayayarwady, Sittanug, and Thanlwin), and possibly as far south as the Andaman Sea side of Thailand at the Kra River. *Batagur* was distributed in all the coastal districts of Odisha (Orissa), particularly the deltaic regions of Mahanadi, Brahmani, Baitarani, Dhamra and Subarnarekha, but Mishra, et al. (1996) believed it might have got extinct. During the last recorded river survey in West Bengal and Odisha, while no evidence of a single population of *B. baska* was found from well-known habitats of this species in Odisha (Praschag et al. 2008a), nesting females were confirmed to be surviving in the Indian Sundarbans of West Bengal. Furthermore, of the last 10 nesting females informed by Bhupathy (1995), Praschag's survey only reported one of these females to be nesting on the beaches of Mechhua Island (Praschag 2008a; Moll et al. 2009). *B. baska* is now primarily limited to the Sundarbans area of India and Bangladesh, with the exception of three females in two different temple ponds in Myanmar (Praschag & Singh 2019).

Though an aquatic species, it also uses sandy nesting beaches along the sea, frequenting the tidal zones of estuaries, large rivers and mangroves (Asian Turtle Trade Working Group, 2000). Nests are often subject to

predation by Water Monitor Lizards *Varanus salvator* or Rhesus Macaques *Macaca mulatta*. Singh et al. (2014) also found spoors and signs of severe digging by Wild Boar *Sus scrofa*, possibly in search of turtle nests in Mechhua and other sea facing sandy beaches in the Indian Sundarbans. Also, intense exploitation of the eggs and adults pertaining to illegal wildlife trade is considered to be the key driver of massive decline of *Batagur* population.

With an estimate of less than 40 animals in India (Praschag & Singh 2019) the only plausible solution to recover this species is conservation breeding followed by supplementation in the wild. Sundarban is the only known abode of *B. baska* in India, and some successful hatching of the species has occurred at the Madras Crocodile Bank Trust (Whitaker, in Singh 2014). West Bengal Forest Department, with the help of the Turtle Survival Alliance (TSA) has been attempting to recover *Batagur baska* species since 2008. In August of the same year, 12 adults were captured and examined by researchers with assistance from local fishermen in the Sajnekhali range of the Indian Sundarbans (Singh & Saha 2008), which led to re-instating the breeding programme in the STR after a gap of about 20 years. The objective in the present note is to put in record the information about the efforts made for conservation of *B. baska* in Sundarbans, West Bengal in India.

CONSERVATION OF *BATAGUR* IN SUNDARBANS

The *Batagur* population

The local Bengali name for *Batagur baska* is 'pore katha' for male, and 'sundi' or 'balli katha' for female (Das 1985). Since the 1980's ex situ conservation program for the Olive Ridley Turtle *Lepidochely solivacea* was operational in STR, when eggs of the species were collected from wild nests and incubated in controlled environment at Sajnekhali. Subsequently, the hatchlings were released in the sea. During the nesting season of 1983, amongst the Olive Ridley hatchlings there were nine hatchlings of some other species, which were later identified as *B. baska* (Ghosh & Mandal 1990).

In 1988, three clutches of eggs of *Batagur* were translocated from Mechhua to Parkhiralaya (Ghosh & Mandal 1990), followed by 24 more nests in 1988 to 1991 (Ghosh & Mandal 1990; Moll et al. 2009). Subsequently, the West Bengal Forest Department began captive breeding followed by hatch-and-release program for *B. baska* in the Sajnekhali Range Station within STR, where less than 50% of the eggs hatched after artificial incubation (Bhupathy et al 1995). In the late 1990s,

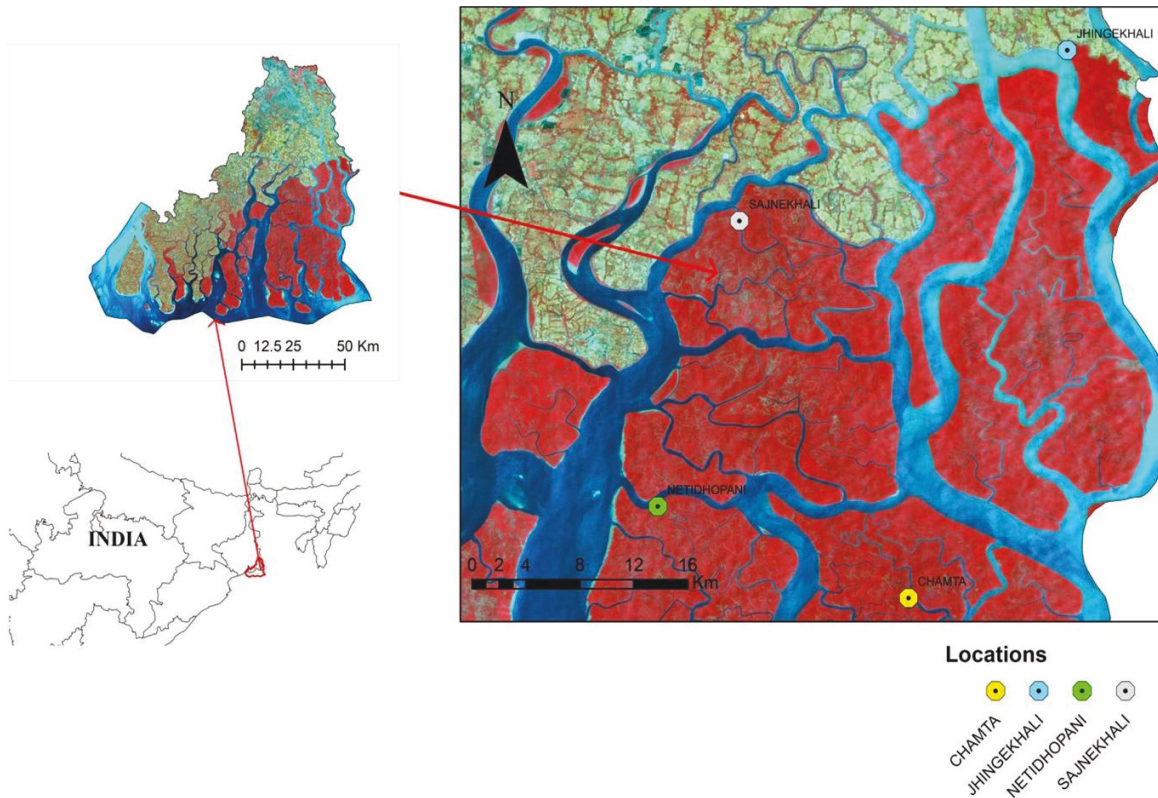


Figure 1. Map showing the colonies of *Batagur baska* in Sundarbans Tiger Reserve at Chamta, Jhingekhali, Netidhopani and Sajnekhali.

the hatch-and-release program was abandoned and the remaining captives were subsequently released in nature (Moll et al. 2009).

Observations recorded from Sajnekhali or its surroundings from 2008 onwards included detection of turtles, their relocations, occasional escapes, nesting, collection of eggs, incubation of eggs under supervision, hatching of young turtles, and housing of turtles in the available facility (Singh & Saha 2008; Pandit 2013; Singh 2013).

Housing facilities for *Batagur* in Sajnekhali, Sundarbans

1. The breeding enclosure, built in 2018 is of length (L) x width (W) x depth (D) of 16.40m x 14.50m x 9m, provided with artificial sand bank (7m x 5.8m) for nesting and two basking platform of 3m x 3m size (Figure 3 iii). The enclosure is covered with agro-net, topped with nylon net fencing to avoid predators as well as excessive sun. Females *Batagurs* of 2012 constituted the founder colony for nesting (Table 1).

2. The temporary nesting enclosure/ yearling pool is a make-shift '8'-shaped enclosure, measuring LxWxD 20.6m x 5.5-9.40m x 3.5m (Figure 3 i), with nylon net fencing on all sides. During the nesting season a few gravid females are shifted here for nesting. The turtles

of 2016 batch are also retained here.

3. The retention pond is an earthen pond of 39.70m x 35.31m size x 3.65m depth (Figure 3 ii). It is the main holding facility in Sundarbans. It holds *Batagurs* of the founder colony and turtles of batch 2013 and 2014.

4. The old nursery is 7.55m x 3.5m x 50cm (Figure 3; no. v) and the new nursery is 9m x 2.5m x 70cm (Figure 3 iv) with two hatchling ponds. This facility is enclosed from all sides for thermoregulation and to avoid predation. After the incubation period of about 60 to 66 days the hatchlings are collected and shifted to this enclosure. After the transfer, hatchlings are retained here for the next six months.

Assurance facilities at Chamta, Jhingekhali, and Netidhopani and their usage

As the Sundarbans is prone to storm, it became essential to set up assurance colonies in order to avoid total wipe-outs, as was feared in 2009, when tropical storm Aila hit the Sundarbans, when one adult male escaped due to overflow of water from the original earthen pond. Aiming for circumventing overcrowding, natural disaster and also as a precautionary measure in case of an outbreak of any contagious disease, the assurance colony ponds were set up at three islands



Table 1. Year-wise captive stock of *Batagur baska* in Sundarbans

Stock	Numbers	Source	Place of housing	Usage
2008	12 founders	Reported from Sajnekhali pond	Retention pond at Sajnekhali	Founder colony
2012	33 hatchlings	founder colony of 12 individuals	Retention pond at Sajnekhali	Development of assurance colony and wild supplementation
2013	55 hatchlings	Founder colony of 12 individuals	Retention pond at Sanjekhali	Development of assurance colony and wild supplementation
2014	57 hatchlings	Founder colony of 12 individuals	Retention pond at Sanjekhali	Development of a ssurance colony and wild supplementation
2016	96 hatchlings	Founder colony of 12 individuals	Temporary breeding cum holding facility in Sajnekhali	Development of assurance colony, survival dispersal study
2017	74 hatchlings in 2017,	Founder colony of 12 individuals	Old Nursery in Sajnekhali	Development of assurance colony and wild supplementation
2019	50 hatchlings	Founder colony of 12 individuals	New Nursery in Sajnekhali	Development of assurance colony and wild supplementation

namely Chamta, Jhingekhali, and Netidhopani, near forest department head-quarters, besides Sajnekhali, within STR.

These facilities are rain-fed earthen ponds, the embankments of which are fenced to ward off predatory animals such as *V. salvator*. These ponds measure, Netidhopani: 40m x 7m x 2m depth (Figure 4, i); Chamta: 30m x 32m x 3m depth (Figure 4, ii), and Jhingekhali: 25m x 16m x 2m (Figure 4, iii).

Turtles from the 2012–2014 batches were transferred to these ponds, and now they hold 70 individuals of *B.baska* juveniles and subadults. Other shifting were 20 individuals (13 female, 7 male) in March 2017, 34 in September 2017 to the Netidhopani sweet water pond and 16 individuals (13 female, 3 male) in November 2017 to the Jhingekhali sweet water pond.

The characteristics of water in captivity

The pH of Sajnekhali rain-fed pond is 7.68 and the salinity is 0.86 PSU, assumed to be conducive for long term retention of the species. Thus, basic physiochemical parameters of the three assurance colony ponds were tested (Table 2) to keep the level of salinity and pH adjusted in reference to the Sajnekhali; however, the result depicted a higher measure of salinity in the pond located at Jhingekhali compared to other ponds (Figure 2). Therefore, all three ponds were conditioned by adding fresh river water to keep the salinity under 10 part per thousand (ppt), and to correct the alkalinity and pH of the water matching with the specifications of the Sajnekhali Pond.

Hatching of the eggs and tending of the hatchlings and transfer to yearling pool

Gravid females after examination for calcified eggs in late February or early March are shifted to the breeding

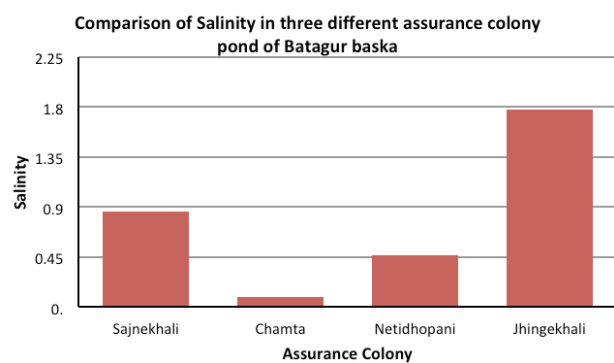


Figure 2. Salinity ranges in different sweet water ponds used for housing *Batagur baska* in Sundarban Tiger Reserve, West Bengal.

Table 2. Results of water tests done on three assurance colonies by an external laboratory recognised by the West Bengal Pollution Control Board.

Parameters	Assurance colonies		
	Chamta	Netidhopani	Jhingekhali
pH Value (at 25°C) (APHA 22ND Edition4. 500-H -B)	6.02	6.88	6.97
Total Alkalinity (as CaCO ₃), mg/ml (IS: 3025(Part-23)-1986)	<5.0	77.2	198
Nitrate (as NO ₃), mg/ml (APHA 22ND Edition,4 500N Or'E)	< 0.5	< 0.5	< 0.5
Salinity (PSU) (Electrical Conductivity Method)	0.09	< 0.5	1.78

pond for nesting. By the third week of March the females lay their eggs, which are determined with emergence, nesting tracks and camouflaging of nest cavity by the females. During 2015 and 2018, no eggs hatched, the reason for which is non-conclusive

The eggs laid by the females are kept on an artificial

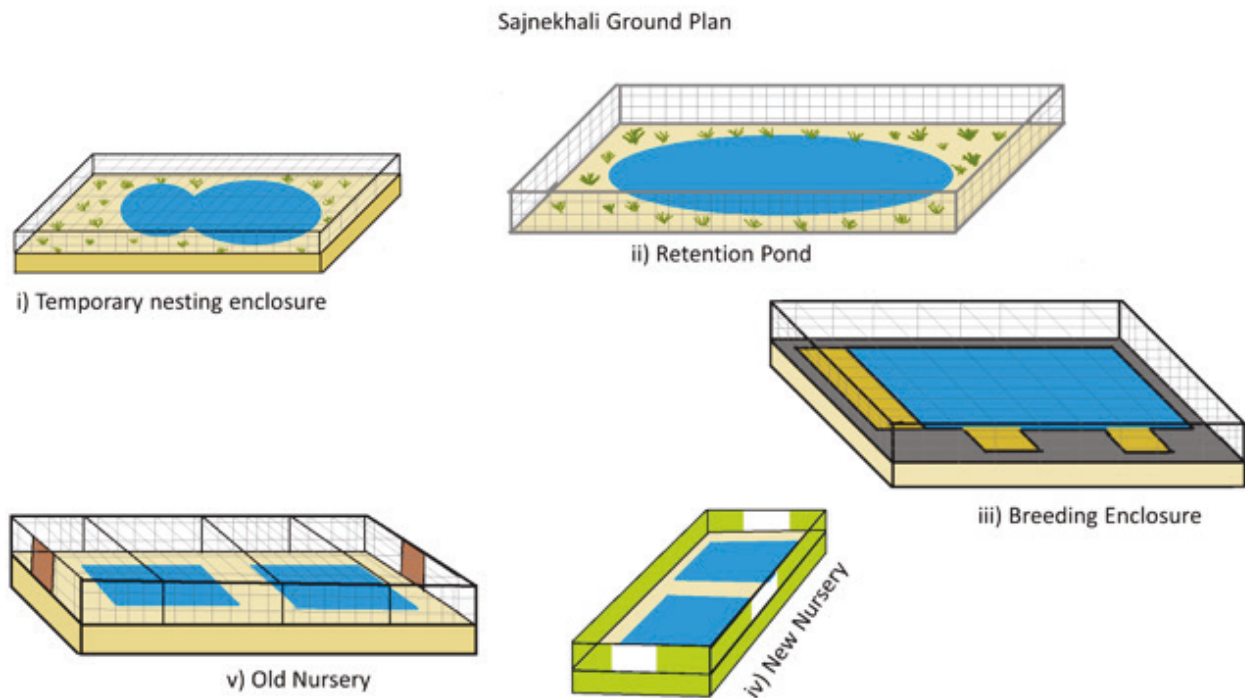


Figure 3. Ground plan of captive facilities of *Batagur baska* in Sajnekhali, Sundarbans Tiger Reserve. Design—Sreeparna Dutta.

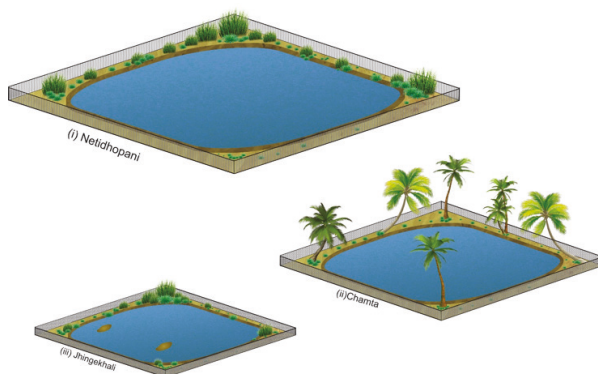


Figure 4. Ground plan of three assurance colony facilities of *Batagur baska* in Sundarban Tiger Reserve. Design—Sreeparna Dutta.

sand beach and a temperature of about 30–32 °C is maintained by mimicking the reported nest depth and providing additional shade in breeding enclosure. Temperature and humidity of the nest were continuously tracked using temperature data loggers. After an incubation period of about 60–66 days the eggs hatch during end of May. The hatchlings are then collected and shifted to the nursery (hatchling enclosure). The artificial nesting bed is monitored for about five days from the time of emergence of the first hatchling. Generally, all the eggs hatch in about two days' time. The hatchlings are transferred to the nursery pens, and are fed with aquatic plants and vegetables for the next



Image 1. Male *Batagur baska* displaying distinct and contrasting breeding colouration of black head with reddish neck.

six months. After one year, when the hatchlings weigh approximately 250g, they are transferred to the yearling ponds, which offer a larger area and deeper water.

In July 2018, five juveniles from the 2017 batch showed symptoms like sloughing off part of the face, including the mouth region, nose and eye. Two of these individuals succumbed to death during treatment. Four swab samples examined at the Institute of Animal Health and Veterinary Biologicals, Kolkata tested negative for bacteriological infections, but tested positive for the



Image 2. Assurance colony being released into the pond in Chamta.



Image 4. Release of turtles in the newly 2018-built breeding enclosure.



Image 3. Hatchlings of *Batagur baska* from captive programme in Sundarban Tiger Reserve.

Herpesvirus glycoprotein B. All the infected individuals died in a few weeks' time and carcasses were carefully disposed. The remaining non-infected individuals were taken out of the adult pool for necessary treatment and observation and later quarantined as a precaution.

Currently, there is no data on survival and dispersal of *Batagur* in Sundarban. The soft-release enclosure was blown away in a storm in February 2016 and all 10 telemetered animals escaped.

DISCUSSION

Batagur baska is not known to have any viable wild population in the last 20 years, which possibly suggest that the species has become functionally extinct from much of its range. Sundarbans Tiger Reserve has carried out assisted breeding program since 2012, and has 359

individuals in captivity today, making it the largest holding of *Batagur* anywhere. *Batagur* recovery initiative is also carried out in Bangladesh in association with Vienna Zoo and TSA. The present account shows that the entire process in Sundarbans has been a learning experience.

REFERENCES

- Asian Turtle Trade Working Group (2000). *Pangshura tecta* (Gray, 1830). The IUCN Red List of Threatened Species 2000: <https://doi.org/10.2305/IUCN.UK.2000>
- Bhupathy, S. (1995). Status and distribution of the River Terrapin *Batagur baska* in Sundarbans of India. Final Project Report, Salim Ali Centre for Ornithology and Natural History, Coimbatore, India, 37pp.
- Das, I. (1985). *Indian Turtles: A Field Guide*. World Wildlife Fund-India, Eastern Region, Calcutta, 119pp.
- Ghosh, A. & N.R. Mandal (1990). Studies on nesting and artificial hatching of the endangered river terrapin *Batagur baska* (Gray) in the Sundarbans Tiger Reserve, West Bengal. *Journal of the Bombay Natural History Society* 87: 50–52
- Gunther, A.C.L.G. (1864). *The Reptiles of British India*. Robert Hardwicke, London, 452pp.
- Mishra, Ch.G., S.K. Patnaik, S.K. Sinha, S.K. Kar. C.S. Kar & L.A.K. Singh (1996). *Wildlife Wealth of Orissa*. Govt. of Orissa, Forest Department, Wildlife Wing, 185pp.
- Mital, A., B. Tao & A. Das (2019). *Manouria impressa* (Impressed Tortoise)- Geographic distribution. *Herpetological Review* 50: 2019.
- Moll, E.O., K. Platt, S.G. Platt, P. Praschag & P.P. Van Dijk (2009). *Batagur baska* (Gray 1830)-northern river terrapin. In: Rhodin, A.G.J., P.C.H. Pritchard, P.P. van Dijk, R.A. Saumure, K.A. Buhlmann, J.B. Iverson & R.A. Mittermeier (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: 037.1–037.10. <http://doi.org/10.3854/crm.5.037.baska.v1.2009>
- Pandit, P.K. (2013). Captive Breeding of *Batagur baska* -A Critically Endangered Species In Sundarban Tiger Reserve, West Bengal, India; Vol. 40: No. 4 October-December 2013; *Tiger Paper*; Regional Quarterly Bulletin On Wildlife And National Parks Management.
- Praschag, P., Hundsdörfer, A.K. & Fritz, U. (2007) Phylogeny and taxonomy of endangered South and South-east Asian freshwater turtles elucidated by mtDNA sequence variation (Testudines:

- Geoemydidae: *Batagur*, Callagur, *Hardella*, *Kachuga*, *Pangshura*). *Zoologica Scripta* 36: 429–442.
- Praschag, P., R. Ghose & F. Willinger (2008a)**. Field survey for the river terrapin (*Batagur baska*) in East India And Bangladesh. TSA, Turtle Survival Alliance Newsletter, August, 30pp.
- Praschag, P., Sommer, R.S., McCarthy, C., Gemel, R. & Fritz, U. (2008b)** Naming one of the world's rarest chelonians, the southern *Batagur*. *Zootaxa*, 1758: 61–68: <https://doi.org/10.11646/zootaxa.1758.1.4>
- Praschag, P., R. Holloway, A. Georges, M. Päckert, A.K. Hundsdörfer & U. Fritz (2009)**: A new subspecies of *Batagur affinis* (Cantor, 1847), one of the world's most critically endangered chelonians (Testudines: Geoemydidae). *Zootaxa* 2233: 57–68. <https://doi.org/10.11646/zootaxa.2233.1.3>
- Praschag, P. & S. Singh (2019)**. *Batagur baska*. *The IUCN Red List of Threatened Species* 2019: e.T97358453A2788691: <https://doi.org/10.2305/IUCN.UK.20191.RLTS.T97358453A2788691.en>
- Singh, S. & B.K. Saha (2008)**. Impression report on a visit to assess the resources and potentials to conserve the River Terrapin; *Batagur baska* in the Sundarbans. Unpublished Report submitted to the Principal Chief Conservator of Forests (Wildlife) and the Chief Wildlife Warden, Government of West Bengal, 6pp.
- Singh, S. (2013)**. *TSA India: Committed to Securing the Future of Indian Turtles*. TSA, Turtle Survival Magazine, August, 34–38pp.
- Singh, S., S. Sirsi & L. McCaskill (2014)**. A Year of Steady Progress for Turtles and TSA India. TSA, Turtle Survival Magazine, August, 40–44pp.
- Turtle Conservation Coalition (2018)**. *Turtles in Trouble: The World's 25+ Most Endangered Tortoises and Freshwater Turtles—2018*. IUCN SSC Tortoise and Freshwater Turtle Specialist Group, Turtle Conservancy, Turtle Survival Alliance, Turtle Conservation Fund, Chelonian Research Foundation, Conservation International, Wildlife Conservation Society, and Global Wildlife Conservation, 80pp.
- Weissenbacher, A., D. Preininger, R. Ghosh, A. Morshed & P. Praschag (2015)**. Conservation breeding of the Northern river terrapin *Batagur baska* at the Vienna Zoo, Austria, and in Bangladesh: Vienna Zoo & Bangladesh: Northern River Terrapin Conservation. *International Zoo Yearbook* No: 49. <https://doi.org/10.1111/izy.12070>

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