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First report of *Chelonodontops bengalensis* (Tetraodontiformes: Tetraodontidae) from Indian coast

Anil MOHAPATRA[*1], Swarup Ranjan MOHANTY[1], Subhrendu Sekhar MISHRA[2], Prasad Chandra TUDU[3]
[1]*Estuarine Biology Regional Centre, Zoological Survey of India, Gopalpur-on-Sea, Ganjam, Odisha, India.*
[2]*Marine Fish Section, Zoological Survey of India, Kolkata, India.*
[3]*Marine Aquarium and Regional Centre, Zoological Survey of India, Digha, India.*
*Corresponding author: *E-mail: anil2k7@gmail.com*

Abstract
Chelonodontops bengalensis Habib et al., 2018 is reported for the first time from Indian waters on the basis of five specimens collected from west Bengal coast. In this paper, more details on the morphological characters have been provided and dorsal spinules are compared with all the species in the genus found in India. A revised key for the genus *Chelonodontops* is also been provided in this paper.

Keywords: Puffer, West Bengal, East coast of India, *Chelonodontops*, Revised key.
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Introduction

Chelonodontops bengalensis Habib, Neogi, Oh, Lee & Kim, 2018 was described from northern Bay of Bengal, Bangladesh waters on the basis of two specimens, majorly distinguished on account of mitochondrial COI gene and 16S rRNA. Morphological characteristics of *C. bengalensis* is having 12 dorsal fin rays, 10 anal fin rays, 19 pectoral-fin rays and dorsal half of the head and body covered with fine brown reticulations and many white spots and ventral half silvery white (Habib et al. 2018). In the original description, considering its genetic closeness, the species was compared with *C. patoca* (Hamilton, 1822) only. While preparing the manuscript, the authors were probably unaware of another species, *C. alvhiemi* Psomadakis, Matsuura & Thein, 2018, available in north-eastern Bay of Bengal and Andaman Sea (Psomadakis et al. 2018), and closely resembles *C. bengalensis*. The family Tetraodontidae comprise 192 valid species in 29 genera in the world (Fricke et al. 2020; Froece & Pauly 2019). The generic characters for the genus *Chelonodontops* Smith 1958 are well-defined in Psomadakis et al. (2018), with the description of a new species and establishing reallocation of *Tetrodon lepardus* Day 1878 under this genus, considered five species in this genus. Further, with the description of another new species by Habib et al. (2018), the genus now contains six species.

During the collections of specimens along the West Bengal coast of India we have come across five specimens of puffers which later identified as *C. bengalensis* and are reported here for the first time from Indian waters. The paper provides additional characters of the species with distinction from congeners.

Material and Methods

One specimen was collected in the year 2017 from Digha (21˚36' 51.084"N, 87˚29'39.958"E) West Bengal coast and preserved in 10% formalin for further study and later deposited in the Estuarine Biology Regional Centre of Zoological Survey of India with registration number EBRC/ZSI/F11225. Few more specimens were collected during the year 2018 from Digha by shore scene nets in live condition and released in Marine Aquarium of the Zoological Survey of India, for its beautiful colour and the live photos of those specimens were taken. From those specimens, two specimens were preserved in 10% buffer formalin for further taxonomic study and deposited in the Museum of Marine Aquarium and Regional Centre of the Zoological Survey of India with

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Table 1. Morphometric and meristic characters of *Chelonodontops bengalensis* Habib et al. 2018 collected from India and Bangladesh.

Parameters	EBRC/ZSI/F 11225 (n=1)	MARC/ZSI/ F5982 (n=1)	MARC/ZSI/ F5983 (n=1)	ZSI F 13439/2 (n= 2)	Habib et al. 2018
Total length (mm)	355	384	290	182–215	
Standard length (mm)	274	310	268	140–166	243–312
in % of SL					
Head Length	34.7	31.0	31.7	35.0–35.5	31–34
Predorsal Length	71.2	70.3	70.5	71.7–72.9	63–79
Prepectoral Length	38.0	31.6	35.1	38.3–38.5	35–38
Preanal Length	67.5	69.0	75.7	72.1–73.5	62–76
Body depth	26.5	31.9	27.98	26.4–29.2	51–52
Dorsal base	9.5	10.0	9.7	8.7–9.3	9–9
Anal base	8.0	8.7	8.6	8.6–8.8	8–8
Pectoral base	10.0	9.7	10.4	10.4–10.6	13–14
Dorsal fin length	17.5	21.0	18.7	21.0–21.9	19–19
Pectoral fin length	14.2	15.5	16.4	15.8–16.8	13–14
Anal fin Length	17.3	19.4	16.0	19.7–21.2	17–18
Caudal peduncle length	17.5	20.6	18.7	18.6–19.1	19–20
Caudal peduncle depth	12.6	15.8	16.4	13.6–15.4	13–14
in % of HL					
Head depth	80.3	77.4	77.3	78.5–80.8	75–79.3
Head width	75.9	73.9	72.6	74.9–75.2	62–66
Preorbital	48.4	50.0	52.9	45.4–45.5	45–51
Postorbital	44.2	47.9	45.9	44.3–46.4	43–44
Snout length	48.4	50.0	52.9	45.4–45.5	45–51
Nostril to snout	29.5	24.0	25.9	25.3–27.7	26–33
Eye diameter	12.6	15.6	15.3	14.0–15.3	12–13
Interorbital width	60.0	54.2	54.7	57.5–60.7	64–65
fin count					
Dorsal rays	12	12	12	12–12	12–12
Anal rays	10	10	10	10–10	10–10
Pectoral rays	18	19	19	19–19	19–19
Caudal rays	11	11	10	11–11	10–11

registration numbers MARC/ZSI/ F5958 and MARC/ZSI/ F5959 and two additional specimens collected from Digha, West Bengal, India (ZSI F 13439/2) were also deposited with Marine Fish Section, Zoological Survey of India, Kolkata. The measurements and counts were taken following Dekkers (1975), Habib et al. (2018) and Psomadakis et al. (2018) and the measurements were made up to the nearest 0.1 mm accuracy.

Results and Discussion

The species *C. bengalensis* is reported here for the first time from the Indian coast on the basis of 5 specimens collected from Digha, West Bengal coast. Also, the fresh pictures of some live specimens in the Marine Aquarium of the Zoological Survey of India are used for the exact colouration of the species.

Morphological characters: Details of proportional measurements are given in Table 1. Dorsal fin rays 12; anal fin rays 10; pectoral fin rays 18–19; caudal fin rays 10–11. Body oblong with blunt snout, pre-anal length longer than post anal. Body is moderately convex dorsally. Dorsal and ventral side of body with many two rooted spinules. Dorsal spinules originate from the level of anterior border of eye and extend up to dorsal fin base. Ventral spinules cover up from below anterior to eye to anal fin. Spinules absent from nostrils to snout tip both dorsally and ventrally as well as in caudal peduncle. Lateral sides of the body without spinules except for two

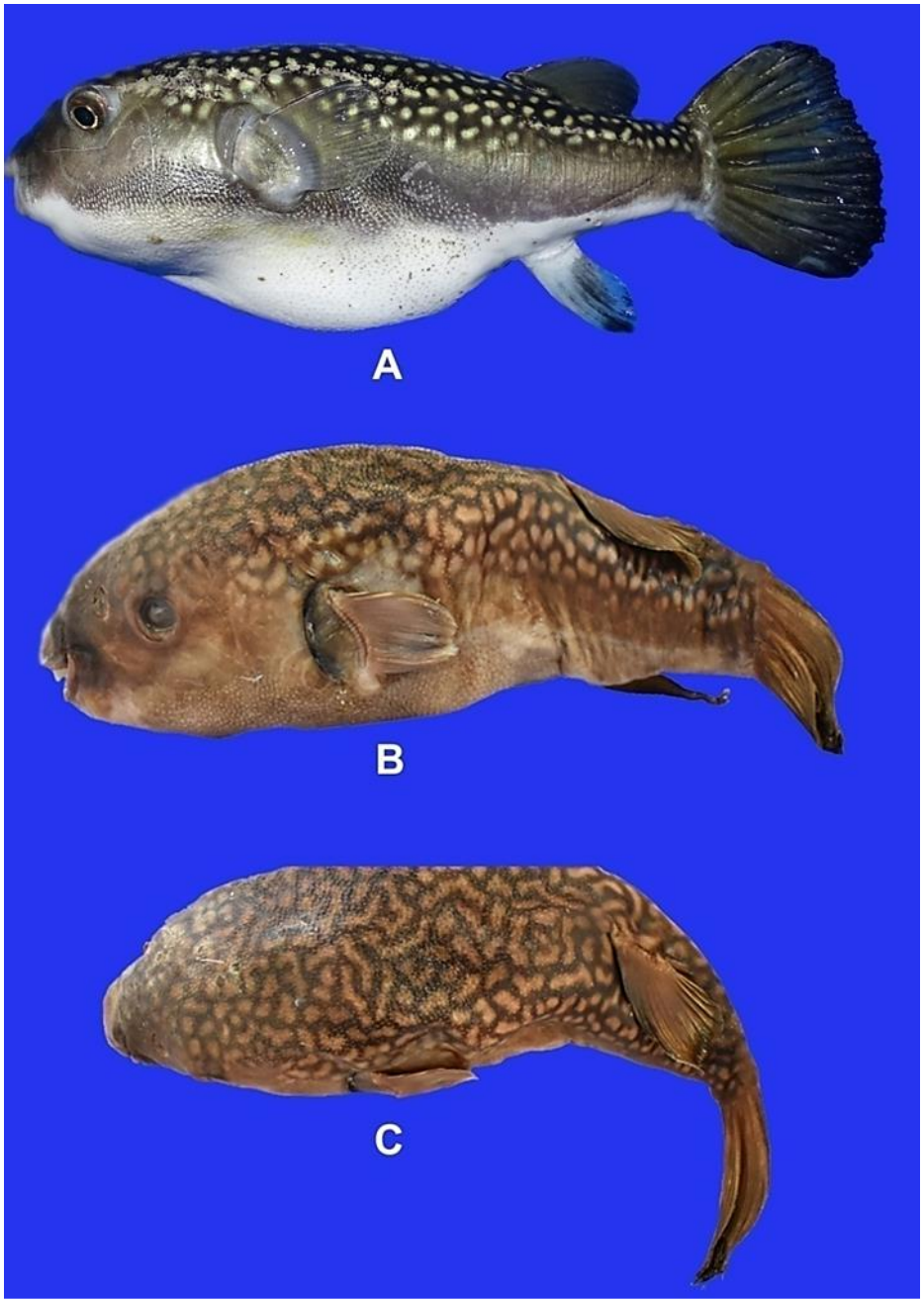

Figure 1. *Chelonodontops bengalensis*; Digha, West Bengal: A- Fresh specimen, B and C- Preserved specimen (B- Lateral view and C- Dorsal view).

narrow bands connecting dorsal and ventral patch, one midway between eye and gill opening, and second at about tip of pectoral fin. Species is having two lateral lines both joining behind anal fin in caudal peduncle. Nostrils can easily be seen by the naked eye and placed closer to eye than snout tip; nasal organ with a low basal rim produced into a wide posterior flap and narrow but triangular anterior flap. Lips are fleshy with numerous small papillae in several rows. Both the jaws having two plate like tooth which is fused together and forming beak-like structure. Pectoral fin originates slightly below upper margin of gill opening. Caudal peduncle slightly rounded. Eye rounded and located closer to snout tip than gill opening.

Colour: In fresh specimens, dorsal profile covered with dark brown reticulation along with some rod shaped, dumbbell shaped and round white spots with greenish tinge except half of head (Fig. 1). Ventral side silvery

Table 2. Comparison between *Chelonodontops* species known in the world (based on literature).

Sl.	Characters	*C. alvheimi*	*C. bengalensis*	*C. laticeps*	*C. leopardus*	*C. patoca*	*C. pleurospilus*
1	Dorsal fin rays	11	12	9-10	11-12	9-10	8-9
2	Anal fin rays	9	10	8-9	8-9	8	8
3	Pectoral fin rays	17-18	19	15-17	18-19	14-17	15-16
4	Origin of spinules on back	From anterior to nasal organ	From anterior margin of eye	Behind interorbital region	From middle of eye	From behind the nasal organ	No spinule on back
5	Nasal organ	with equal sized broadly rounded flaps	Cup shaped with unequal sized flaps	A depression with triangular flaps	with equal sized raised flaps	with equal sized raised flaps	Cup shaped with equal sized flaps

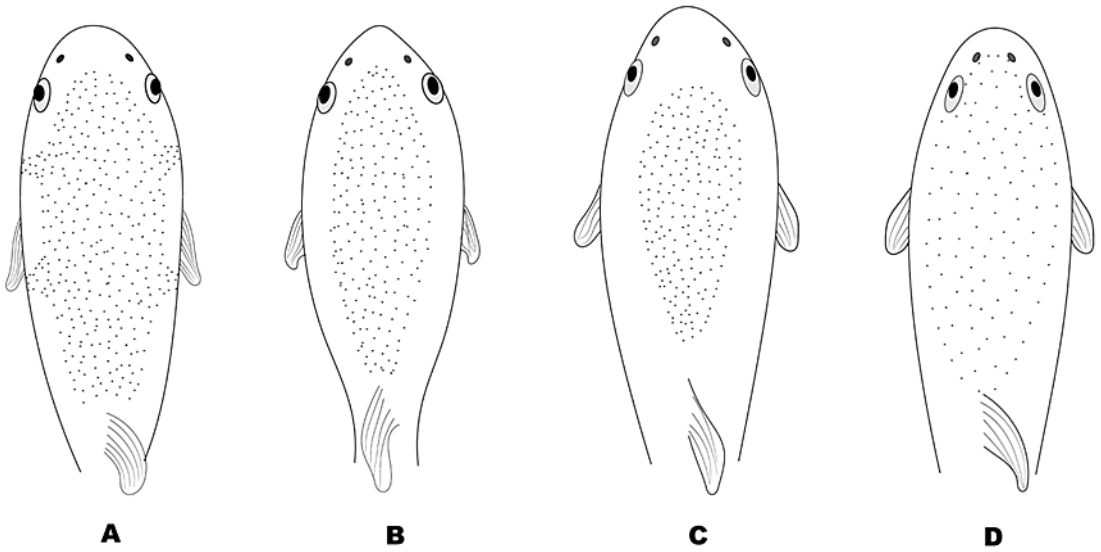

Figure 2. Distribution of spinules on back of (A) *Chelonodontops bengalensis*, (B) *C. patoca*, (C) *C. leopardus*, and (D) *C. alvheimi* (As per Psomadakis et al. 2018).

white in colour. Eye with black ball and pale-yellow dorsal rim. Pectoral fins transparent; dorsal and anal fin light brownish in colour; posteriorly caudal fin slightly dark. In preserved specimens, greenish tinge turns yellowish.

Distribution: *Chelonodontops bengalensis* is known from Sundarban region of the northern Bay of Bengal, Bangladesh (Habib et al. 2018) and the present study confirms its presence along West Bengal coast of India beyond the Sundarban areas up to Digha coast, about 200 km from its type locality and almost on same latitude.

With the discovery of *C. alvheimi* from Myanmar coast (Psomadakiset al. 2018) one can clearly observe that *C. bengalensis* closely resembles *C. alvheimi,* but not *C. patoca.* Three species, *C. laticeps* Smith, 1948, *C. patoca* (Hamilton, 1822) and *C. pleurospilos* Regan, 1919 are distinctly differing from *C. bengalensis* in having lesser number of dorsal-fin rays (8-10 vs. 12), pectoral-fin rays (14-17 vs. 18-19) and lesser extent of spinule cover on back. In both *C. alvheimi* and *C. leopardus,* the nasal organ is with two divided flat skin flaps, while in *C. bengalensis,* it is with two unequal sized raised flaps, a smaller anterior triangular flap and the posterior broad larger flap. A comparison of few characters of all *Chelonodontops* species based on published literature are given in Table 2 for clear distinction. Further, a revised key to all species is also provided.

In India there are three species, viz., *C. bengalensis, C. leopardus* and *C. patoca,* known to occur. In several cases, *C. leopards* is confused with *C. patoca.* Anterior margin of spinule cover on back (Table 2, Fig. 2) differs clearly in these three species. In *C. leopardus* and *C. patoca,* there is no connection between dorsal and ventral

spinule patch leaving the sides spinule less. But, *C. bengalensis* have two narrow bands of spinules, one on head midway between eye and gill opening and the second at about tip of pectoral fin. Day (1878) described spinules on back in *C. patoca* is "from a short distance behind the nostrils to the base of the dorsal fin" while *C. leopardus* have it spread between interorbital region and little before dorsal fin (Psomadakis et al. 2018). Arunachalam et al. (1999, 2009) probably confused in the identity of these two species in reporting *C. patoca* from Kerala.

Revised key to the species of *Chelonodontops*

1a. Dorsal fin with 8 to 10 rays; P 14-17, spinules, when present, originate from behind interorbital space…….....2
1b. Dorsal fin with 11 or 12 rays; P 17-19; spinules on back originate from interorbital region or anterior to it……..…4
2a. Dorsal surface of body smooth, without spinules ……...……...…… ***C. pleurospilus***
2b. Dorsal surface of head and body with spinules ……..…..…….. 3
3a. Spinules on back extending almost to dorsal fin origin ……..……...…….. ***C. patoca***
3b. Spinules on back extending to a level above pectoral-fin base.....***C. laticeps***
4a. Spinules on back originating from interorbital region at the level of middle of eye and extending to midpoint between pectoral and dorsal fin origin…….……...…***C. leopardus***
4b. Spinules on back originating from a level of anterior margin of eye or before and extending to almost close to dorsal fin origin……...…….....5
5a. D 12; A 10; P 19; caudal peduncle depth 12.6-16.4% SL; nasal organ cup-like with raised broad posterior flap and narrow anterior flap…….……..……***C. bengalensis***
5b. D 11; A 9; P 17-18; caudal peduncle depth 7.4-7.8% SL; nasal organ a depression with raised anterior and posterior flaps of equal size……...…….……..***C. alvheimi***

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