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Short Communication

New record of white-spotted pufferfish *Arothron hispidus* (Linnaeus, 1758) (Tetraodontiformes: Tetraodontidae) from West Bengal, India, compared with other *Arothron* species occurring in India

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Abstract
Two specimens of *Arothron hispidus* (Linnaeus, 1758) (111.7 – 112.8 mm in standard length), was collected in May 2019 from the Frasergunj fishing harbour in West Bengal, eastern India. Herein, we report this species for the first time from West Bengal. We have described the diagnostic features of the collected specimens and compared them with other *Arothron* species found in Indian waters.

Keywords: *Arothron reticularis*; Bay of Bengal; *Chelonodontops*; colouration; hybridisation; polychromatic colouration

1 | INTRODUCTION

The genus Arothron Müller, 1841, is part of the sub-family Tetraodontinae and currently consists of 14 valid fish species with a wide distribution range from the Atlantic to the Indo-Pacific Ocean (Randall *et al.* 2012; Fricke *et al.* 2021). There are eight species reported from India (Jones and Kumaran 1980; Rao *et al.* 2000; Sujatha and Padmavathi 2015). Another species, *Tetrodon leopardus* Day, 1878, earlier treated under the genus *Arothron*, is now placed under the genus *Chelonodontops* Smith, 1958 (Psomadakis *et al.* 2018). The genus *Arothron* can be easily distinguished from other genera of pufferfish by combining the following characters; 'nostrils easily visible with the naked eye and looks like an upraised cup with two fleshy flaps, a single lateral line on the side of the body' (Matsuura 2001). *Arothron hispidus* (Linnaeus, 1758), described as "habitat in India", grows to a maximum size of 50 cm in total length (Allen and Steene 1988). This species is known to inhabit mainly marine waters up to 50 m depth, commonly seen in reef areas, but enters inside the estuarine zone, particularly juveniles (Allen and Erdmann 2012). In India, this species is primarily collected for the aquarium trade and reported as bycatch. Some reports exist of *Arothron* spp. and other pufferfishes being consumed (Mishra *et al.* 2018; Joseph *et al.* 2021).

The present study reports *A. hispidus* along the West Bengal coast based on two individuals collected from Frasergunj fishing harbour, West Bengal, India. The report extends the known range of this species in India.

2 | METHODOLOGY

Two tetraodontid specimens were collected from Fra-

sergunj fishing harbour (21°34′45.7″N 88°15′04.9″E), South 24 Paraganas, West Bengal, India. They were caught in a bag net with a mesh size of 20 mm. The examined specimens were fixed with 10% formalin, stored in 70% v/v ethanol and deposited in the marine fish section of the Zoological Survey of India (ZSI), Kolkata. Identification followed Smith and Heemstra (1986), Bariche *et al.* (2018) and Froese and Pauly (2021). Measurements were taken on the left side of the specimens using digital callipers to the nearest millimetre. Colour photographs of the specimens were also taken when alive.

3 | RESULTS AND DISCUSSION

Order Tetraodontiformes Berg, 1940
Family Tetraodontidae Bonnaparte, 1831
Genus *Arothron* Müller, 1841
Arothron hispidus (Linnaeus, 1758)
Figures 1–2, Table 1
Material examined. ZSI F 13589/2, 2 ex, 111.7–112.8 mm standard length (SL), Frasergunj fishing harbour (West Bengal Coast), 16/05/2019, Priyankar Chakraborty.

FIGURE 1 Photograph of preserved *Arothron hispidus* from Frasergunj fishing harbour, West Bengal, eastern India: ZSI F 13589/2, 112.8 mm SL. Photo by P. Chakraborty.

3.1 Diagnostic characters

Counts of the present specimens are provided in Table 1. Body oval; upper and lower jaw with two large tooth plates; many small spinules on head and body except top of snout, base of fins and side of caudal peduncle; snout length 5.0 – 5.2 times in SL; nasal organs with two fleshy flaps divided from a connected base; interorbital space concave; bony ridge above eye with interorbital width 5.4 – 5.5 times in SL; restricted gill opening; anal fin origin posterior to base of dorsal fin; caudal fin rounded.

TABLE 1 Comparison of diagnostic counts of *Arothron hispidus*.

Characters	Present study (*n* = 2)	Motomura and Matsuura (2014)
Dorsal fin rays	10 – 11	10 – 11
Pectoral fin rays	18 – 19	16 – 19
Anal fin rays	8 – 9	10 – 11

Colour: Body olive-brown, abdomen white; numerous white spots on sides and back of body; three dark brown bars, running vertically on head and abdomen; base of pectoral fin within vertically oval black spot containing yellow and white lines encircling fin base; caudal fin with more concentration of white spots.

3.2. Remarks

From the waters around India, eight *Arothron* species have been recorded to date; six species, *A. firmamentum* (Temminck & Schlegel, 1850), *A. hispidus* (Linnaeus, 1758), *A. immaculatus* (Bloch & Schneider, 1801), *A. nigropunctatus* (Bloch & Schneider, 1801), *A. reticularis* (Bloch & Schneider, 1801) and *A. stellatus* (Anonymous, 1798), from peninsular India and additionally, *A. mappa* (Lesson, 1831) from *Andamans* and *A. meleagris* (Lacepède, 1798) from Lakshadweep (Jones and Kumaran 1980; Rao *et al.* 2000; Sujatha and Padmavathi 2015).

From West Bengal, located along the northern Bay of Bengal, only three species of *Arothron* are known to occur, viz., *A. immaculatus*, *A. nigropunctatus* and *A. stellatus* (Yennawar *et al.* 2017). However, *Arothron* species have not been recorded from the Sundarban region (Mishra and Gopi 2017).

Arothron hispidus is most similar to *Arothron reticularis*. However, it can be distinguished from the latter by the absence of spinules in the snout and posterior half of the caudal peduncle and a wider interorbital space (Matsuura 1999). Both the species have varying colour forms, and hence identification sometimes poses difficulty. However, *A. reticularis* can be distinguished in lacking the extensions of the dark body colour into the ventral portion of the head and body, which is always present in *A. hispidus* (Randall *et al.* 2012).

Arothron hispidus can also be easily distinguished from *A. immaculatus* by the presence of stripes or spots on the body and the absence of a yellow caudal fin with a black margin. On the other hand, *A. immaculatus* is characterised by the absence of spots on the body except for a dark blotch at the pectoral fin base and a dark-edged caudal fin.

Among the other species of the genus known from West Bengal, *A. nigropunctatus* can be distinguished from *A. hispidus* by the presence of irregular dark blotches on the body and dark colouration around the eyes and mouth; and *A. stellatus* is different from *A. hispidus* by the absence of ventrally appearing bars (in adults) and presence of black spots instead of white. Among juvenile specimens, the two can be differentiated by the presence of a yellow-coloured ventral surface with numerous black streaks turning into dark spots on the dorsal surface in *A. stellatus*.

The other three species of *Arothron* recorded from India are distinguished as follows: *Arothron meleagris*, reported from the Lakshadweep archipelago (Jones and Kumaran 1980), can be distinguished from *A. hispidus* by the presence of numerous small white spots all over the head, body and fins. *Arothron firmamentum*, known from

Vizagapatnam by a single specimen (Sujatha and Padmavathi 2015), is distinguished from *A. hispidus* by the presence of a higher number of dorsal fin rays (14 vs. 10 – 11) and anal fin rays (13 – 14 vs. 8 – 9). The overall colouration of *A. firmamentum* is also starkly different. It consists of a dark bluish base with many pale spots and dusky fins. *Arothron mappa*, recorded from the Andaman and Nicobar Islands (Rao *et al.* 2000), can be clearly distinguished from *A. hispidus* by having radiating streaks of lines from the eyes and black blotches on the gill opening and near the vent.

Arothron spp. are known for their polychromatic colouration at the intraspecies level and different life stages, making it difficult to identify them through pictures (Su and Tyler 2017; Bariche *et al.* 2018). There also exists high variability among populations from different regions. Randall *et al.* (2012) examined the variability of *A. hispidus* between the Red Sea, Indian Ocean and Pacific Ocean populations. They commented that sexual dichromatism could play a role in such variations. The individuals collected from West Bengal seems to be sub-adults, for they have fewer white spots on their body, and also, the circles around the eyes are incomplete (Figure 2).

FIGURE 2 Live photograph (ex-situ) of *Arothron hispidus* from Frasergunj fishing harbour, West Bengal, eastern India: ZSI F 13589/2. Photo by P. Chakraborty.

Sometimes, the identification of these species becomes problematic due to hybridisation. Cohabiting *Arothron* species are known to hybridise. An intermediate form of *Arothron* was recorded from Christmas and Cocos Islands (*A. nigropunctatus* × *A. mappa*) (Hobbs *et al.* 2009). Two cases of possible hybridisation of *A. meleagris* and *A. nigropunctatus* were recorded at Reunion Island (Bourjon and Chanet 2017). They considered *A. hispidus* a potential candidate to the observed hybrids other than the two species mentioned above. The presence of probable hybrids adds to the problem of the identification of an already variable species.

The present study provides the first record of *A. hispidus* (Linnaeus, 1758) from West Bengal, India. It is not recorded from the neighbouring state of Odisha (Barman *et al.* 2007) in the south and Bangladesh in the east (Rahman 2005). *Arothron hispidus* was earlier reported from Andaman Islands (Rajan *et al.* 2013), Andhra Pradesh (Sujatha and Padmavathi 2015), Tamil Nadu (Mogalekar *et al.* 2018), Kerala (Bijukumar and Raghavan 2015) and Lakshadweep (Jones and Kumaran 1980). Hence, the present report on the range extension of *A. hispidus* to the West Bengal coast holds great importance.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS' CONTRIBUTION

All authors equally participated in data analysis and preparation of the manuscript.

DATA AVAILABILITY STATEMENT

The specimens described in the manuscript have been deposited in the marine fish repository of the Zoological Survey of India, Kolkata, India (ZSI F 13589/2).

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