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Priyankar Chakraborty

Bharati Vidyapeeth Institute of
Environment Education and
Research (BVIEER), Bharati
Vidyapeeth (Deemed to be)
University, Pune, Maharashtra,
India

Yardi Kranti

Bharati Vidyapeeth Institute of
Environment Education and
Research (BVIEER), Bharati
Vidyapeeth (Deemed to be)
University, Pune, Maharashtra,
India

Prasun Mukherjee

School of Water Resources
Engineering, Jadavpur
University, Kolkata, West
Bengal, India

Subhankar Das

Department of Zoology,
Vidyasagar College, Kolkata,
West Bengal, India

First record of two species of fishes from West Bengal, India and additional new ichthyofaunal records for the Indian Sundarbans

**Priyankar Chakraborty, Kranti Yardi, Prasun Mukherjee and
Subhankar Das**

Abstract

Five species of fishes viz., *Ichthyoscopus lebeck*, *Lagocephalus spadiceus*, *Platax teira*, *Caesio caerulea* and *Thysanophrys celebica* are recorded from the Indian Sundarbans, the deltaic bulge of the Ganges River in the State of West Bengal, India. *Thysanophrys celebica* and *Lagocephalus spadiceus* forms the first record for the state of West Bengal, India. Diagnostic characteristics and notes on distribution are provided in this paper. The present paper subsidises the already existing list of ichthyofaunal resources from the Indian Sundarbans region to provide a better understanding of the role of different species in the functioning of the ecosystem.

Keywords: Taxonomy, biodiversity, distribution, ichthyology, mangroves, first record

1. Introduction

The Sundarban mangrove forests comprise about 2114 sq.km of forest cover in the state of West Bengal, India which is about half the total estimate for mangroves of coastal India ^[1]. Mangrove ecosystem includes the forest of mangroves and associate plants with its surrounding habitats consisting of creeks, shallow channels and vast mudflats. All these habitats provide a foothold for a variety of food chains and functions as a breeding nursery and foraging ground for many finfish and shellfish species. The Sundarban mangroves are located in an estuarine zone and atypical to that of any estuarine zone in the world, is subjected to hefty variations in environmental conditions ^[2]. One of the world's most productive ecosystems is the Sundarbans and a large proportion of the region's human population depends on it for subsistence. Extensive focus has been given to the region's ichthyofaunal resources since fishes contribute significantly as a resource. The well-being of the region's fishes plays an essential role in the economy of the region. Interest in the region's fishes dates back to early 1800s when British Surgeon-Naturalist Francis Hamilton ^[3] worked upon the fishes of these brackish water zones. More recently, a new genus of goby was described from the Sundarbans; *Awaouichthys menoni* and is considered to be endemic to the region ^[4]. Very recently, a list of 350 species of fishes contained in 225 genera, belonging to 86 families distributed in 25 orders was prepared for this region ^[5]. This study is aimed at updating the inventory of fishes of the region and trying to ascertain the reason behind their occurrence.

2. Materials and Methods

2.1 Study area

The first author collected the specimens opportunistically from a landing site at Bally-I on the opposite of the buffer zone of Sundarbans Tiger Reserve (STR), West Bengal, India (22°04.957' N / 088°45.473' E) while surveying sawfishes (Pristidae) in the region. The fish were caught in a 'Benthi' net, a type of bag net that was being operated by local fishers within the permissible area (Fig.1).

2.2 Treatment of specimens

The specimens were fixed in 10% formaldehyde and shifted to 70% ethanol. Measurements were recorded to the nearest millimetre using a digital calliper and bilateral counts were done

Corresponding Author:

Subhankar Das

Department of Zoology,
Vidyasagar College, Kolkata,
West Bengal, India

on the left side. The specimens were deposited at Bombay Natural History Society (BNHS), Mumbai. Identification was following standard pieces of literature [6-10]. Questions

regarding the fish's ecology and distribution were asked by the first author to the fishers.

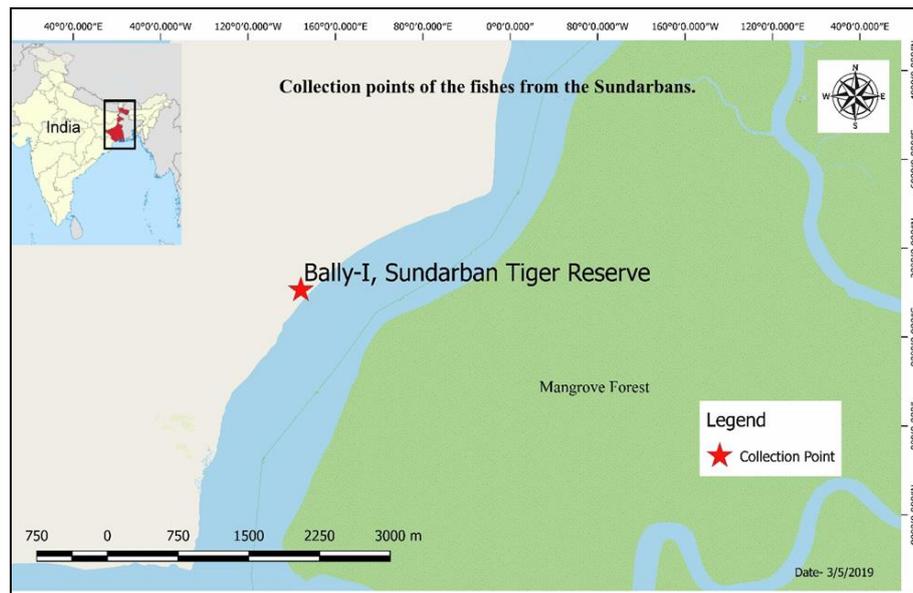


Fig 1: Map showing the collection point of the five species of fishes from the Sundarbans, West Bengal (Inset- West Bengal, India).

3. Result

The study reveals the new record of five species of fishes; *Caesio caeruleaurea* Lacepède, 1801 *Platax teira* (Forsskål, 1775), *Ichthyoscopus lebeck* (Bloch and Schneider, 1801), *Thysanophrys celebica* (Bleeker, 1855) and *Lagocephalus spadiceus* (Richardson, 1845). The occurrence of *Thysanophrys celebica* and *Lagocephalus spadiceus* forms the first records of the species for the state of West Bengal, India and perhaps even extending to the Northeastern part of Bay of Bengal. This study also records three families; Uranoscopidae, Caesionidae and Ephippidae from the Sundarbans, West Bengal, a UNESCO Heritage site for the first time.

3.1 Taxonomic Accounts:

3.1.1 *Thysanophrys celebica* (Bleeker, 1855), Celebes Flathead

(Fig. 1 [Plate 1], Table 1)

1855. *Platycephalus celebica* Bleeker, P., *Natuurkundig Tijdschrift voor Nederlandsch Indië* v. 7 (no. 3): 449-452. (Type Locality: Manado, Sulawesi, Indonesia)

2019. *Thysanophrys celebica* Imamura *et al.*, *Species Diversity* v. 24: 21.

Material examined: BNHS 973, 2 ex, 128.69-133.43 mm SL, Near Bally-1 Island, Sundarbans Tiger Reserve, 22 December 2018, Priyankar Chakraborty.

Diagnostic characters: Body elongate, head strongly depressed; bony ridges on the head containing spines and serrations; upper preopercular spine distinctly longer than the succeeding spine, lower jaw longer than upper jaw; vomerine teeth in two separate patches, iris lappet with finger like lobes, dorsal spines IX; dorsal fin rays 12, anal fin rays 13, a single small dermal papillae present on the upper surface of the eye, body brownish in color with 3-4 dark bands crossing the back. Difference between similar occurring species in the area- No other species belonging to the genus *Thysanophrys* has been recorded from the Indian Sundarbans or coastal West Bengal. But other species viz., *Platycephalus indicus* (Linnaeus,

1758), *Grammoplites scaber* (Linnaeus, 1758) and *Sorsogona tuberculata* (Cuvier, 1829) belonging to Platycephalidae has been reported. *Thysanophrys celebica* differs from them in having single papillae on the surface of the eye, absence of a yellow blotch in the middle of the caudal and lacking stout spines on lateral line scales

Local name- 'Chata Bele', Bengali for goby and goby like fishes (Bele) with a flattened head (Chata). This name is also used for other members of Platycephalidae in the region.

3.1.2 *Caesio caeruleaurea* Lacepède, 1801, Blue and Gold Fusilier

(Fig. 2 [Plate 1], Table 1)

1801. *Caesio caeruleaurea* Lacepède, B. G. E., *Histoire naturelle des poissons*. v. 3: i-lxvi + 1-558, Pls. 1-34. (Type Locality: Molucca Islands, Indonesia).

2019. *Caesio caeruleaurea* Zajnoz *et al.*, *Zootaxa* 4636 (no. 1): 77.

Material examined: BNHS 974, 1 ex, 121.06 mm SL, Near Bally-1 Island, Sundarbans Tiger Reserve, 22 December 2018, Priyankar Chakraborty.

Diagnostic characters: Fusiform body, moderately compressed, mouth small and distinctly protractible; single post maxillary process; posterior end of maxilla blunt, lateral line scale 59, a scaleless v-shaped zone anteriorly to the midline, scale rows above the lateral line is nine and below lateral line is 15, dorsal fin spines X; dorsal fin soft rays 14; scale rows are horizontal on the spinous part of the dorsal fin, anal fin spines III with 12 soft rays; caudal fin forked with pointed lobes, a single yellow stripe above the lateral line but above the caudal peduncle it is one scale above the lateral line, caudal fin lobes with black median streaks.

Difference between similar occurring species in the area- This study observes the first representation of the family Caesionidae and the genus *Caesio* from the Sundarbans hence no comparisons could be made. The family Caesionidae was only recently represented in West Bengal coast [11].

Local name- No local name is available for this fish.

3.1.3 *Ichthyoscopus lebeck* (Bloch & Schneider, 1801), Longnosed Stargazer (Fig. 3 [Plate 1], Table 1)

1801. *Ichthyoscopus lebeck* Bloch, M. E. and Schneider J. G., Sumtibus Auctoris Impressum et Bibliopolio Sanderiano Commissum. i-lx + 1-584, Pls. 1-110. (Type Locality: Tranquebar [Tharangambadi], India).

2019 *Ichthyoscopus lebeck* Vilasri *et al.*, Zootaxa 4702 (no.1): 55.

Material examined: BNHS 975, 1 ex, 126.25 mm SL, Near Bally-1 Island, Sundarbans Tiger Reserve, 22 December 2018, Priyankar Chakraborty.

Diagnostic characters: Head and body compressed, lateral line runs close to the soft dorsal fin base, eyes are small and telescopic, single dorsal fin with II spines and 17 soft rays, anal fin with 16 soft rays, pectoral fins knife-shaped with the upper ray being the longest, upper margin of nasal valves fringed, no mental barbel on chin, ventral portion of the body with dermal folds originating from the base of the anal fin rays, gill flap dermally fringed, upper part of cleithrum concealed in fleshy appendage, nape between lateral lines with few scales, posterior nostril diagonally or longitudinally elongated and is twice the size of the anterior one, total vertebrae 26, yellow colour with brown markings, several pale white oval spots some on pectoral and dorsal fins, dark bar across caudal and pectoral fins.

Difference between similar occurring species in the area- This study observes the first representation of the family Uranoscopidae and the genus *Ichthyoscopus* from the Sundarbans hence no comparisons could be made. Records of *I.lebeck* and *Uranoscopus cognatus* exists for coastal West Bengal [12].

Local name- During the time of this survey, the fishers were unable to comment on a local name for it was the first time they had seen the fish.

3.1.4 *Platax teira* (Forsskål, 1775), Longfin Batfish (Fig. 4 [Plate 1], Table 1)

1775. *Chaetodon teira* Forsskål P.S., Hauniae., pp. x-xix and 22-76. (Type Locality: Al-Luhayya, Yemen, Red Sea).

2019. *Platax teira* Zajnoz *et al.*, Zootaxa 4636 (no. 1): 98.

Material examined: BNHS, 976, 1 ex, 48.03 mm SL, Near Bally-1 Island, Sundarbans Tiger Reserve, 22/12/2018, Priyankar Chakraborty.

Diagnostic characters: Deep bodied, orbicular and strongly compressed, body depth is 1.25 times in standard length, head is short and less than half the body depth; head length about 2.81 times in standard length; head profile convex, the snout not produced, posteriormost dorsal fin spine longest; dorsal fin with spines V; the anterior spines are concealed in the front portion of the fin; the fifth spine is the longest; 32 dorsal

fin rays, anal fin with III spines and 27 soft rays, lateral cusps of outer teeth visible, dusky with a black bar through eye, another through the dorsal fin origin and rear edge of operculum through pectoral fin base up to belly, a third black bar present at the origin of anal fin, median fins dusky with black margins posteriorly.

Difference between similar occurring species in the area- This study observes the first representation of the family Ehippidae and genus *Platax* from the Sundarbans. The family Ehippidae prior to this record was from coastal West Bengal and represented by *Ehippus orbis* (Bloch, 1787), *Platax pinnatus* (Linnaeus, 1758) and *Platax teira* (Forsskål, 1775) [12].

Local name- 'Payera Chanda' which is originally the local name for *Scatophagus argus* (Linnaeus, 1766).

3.1.5 *Lagocephalus spadiceus* (Richardson, 1845), Half-smooth Golden Pufferfish.

(Fig. 4 [Plate 1], Table 1)

1845. *Tetrodon spadiceus* Richardson J., No. 10. London: Smith, Elder & Co. 99-150, Pls. 55-64. (Type locality: China Seas)

2019. *Lagocephalus spadiceus* Eagderi *et al.*, Iranian Journal of Ichthyology v. 6 (supplement 1): 138.

Material examined: BNHS 977, 2 ex, 81.23-142.79 mm SL, Near Bally-1 Island, Sundarbans Tiger Reserve, 09/12/2018, Priyankar Chakraborty.

Diagnostic characters: Body elongate and inflatable, mouth small and terminal; two large teeth in each jaws, two lateral lines, curving around eyes, no scales on the body, but small spinules on nape, interorbital (not extending beyond pectoral fin) and on belly, dorsal fin rays 12, anal fin rays 12, pectoral fin rays 17, dorsal and anal fins are short based, both located posteriorly, caudal fin lunate with medial posterior extension; upper rays of caudal fin relatively projected than lower rays; dorsal two third dark yellow and ventral one third white without white tips on lobes, no pelvic fins, body dark green on the dorsum, silvery yellow on the sides and whitish below.

Difference between similar occurring species in the area- Other species of the genus *Lagocephalus* has been recorded from the Indian Sundarbans and coastal West Bengal; *Lagocephalus lunaris* (Bloch and Schneider, 1801), *Lagocephalus inermis* (Temminck and Schlegel, 1847) and *Lagocephalus sceleratus* (Gmelin, 1789). *L. spadiceus* differs from the others in possessing spinules on its back that doesn't extend up to its dorsal fin origin and absence of regular black spots on the body.

Local name- 'Sonali Tyapa', Bengali for puffer fishes (Tyapa) and the iridescent silvery yellow color (Sonali).

Table 1: Morphometric measurements of the five newly recorded species of fishes.

Measurements	<i>Thysanophrys celebica</i> (n=2)	<i>Caesio caerulea</i> (n=1)	<i>Ichthyoscopus lebeck</i> (n=1)	<i>Platax teira</i> (n=1)	<i>Lagocephalus spadiceus</i> (n=2)
Total length	150.28-157.48	156.55	154.94	63.82	99.72-175.82
Standard length	128.69-133.43	121.06	126.25	48.03	81.23-142.79
Body depth	19.04-20.10	31.02	40.88	41.12	22.10-41.43
Head length	43.27-45.46	35.30	52.77	16.38	29.89-51.35
Eye diameter	10.48-11.29	13.82	6.14	6.69	9.42-14.97
Snout length	11.19-12.02	6.06	4.23	5.78	11.94-22.63
Post-orbital length	131.46-132.48	131.98	140.20	55.73	34.34-66.98
Caudal peduncle depth	5.05-5.58	9.29	11.36	8.26	4.10-7.92
Dorsal fin length	37.32-38.57	64.25	55.97	35.42	9.33-13.29
Anal fin length	42.56-45.25	29.97	59.71	36.07	6.93-14.58
Pelvic fin length	30.55-31.54	13.02	26.36	49.15	n/a

Pectoral fin length	22.08-25.68	30.72	50.38	13.16	16.91-25.38
Caudal fin length	21.59-24.05	35.49	28.69	15.79	17.24-34.96



Fig 1: *Thysanophrys celebica* (Bleeker, 1855)



Fig 2: *Caesio caerulaurea* Lacepède, 1801



Fig 3: *Ichthyoscopus lebeck* (Bloch & Schneider, 1801)



Fig 4: *Platax teira* (Forsskal, 1775)



Fig 5: *Lagocephalus spadiceus* (Richardson, 1845)

Plate 1: New records of fishes from the Sundarbans

4. Discussion

The Indo-Pacific and Central Pacific region has the highest diversity of fishes in the world with over 600 species found in mangrove systems [13]. From India itself, 86 endemic marine and estuarine fishes have been documented [14]. The mangroves with their prop roots and pneumatophores along with fallen branches and leaves make a complex habitat for a host of prey organisms that are an important food source for the fishes [15], making mangroves one of the core fish habitats [16].

This study recorded five species of fishes (Table 1) for the first time from the Indian Sundarbans effectively bringing the total number of fish species recorded from the Sundarbans to 355 that belong to 229 genera occurring amongst 89 families and 25 orders. The reason for the occurrence of these fishes can be manifold. Salinity is an important factor in the distribution of both marine and euryhaline fish and long term variation in salinity can affect the distribution of fish species even in estuaries [17]. Many studies from other parts of the world have shown a strong correlation between the catch rates of abundant species and salinity patterns [18]. Other abiotic factors can also play a role in the presence of fish species not recorded earlier, for example, turbidity. Cyrus and Blaber [19] said that the high rate of turbidity of the mangrove regions reduces the visual effectiveness of large predators and the shallow waters of the estuaries exclude large fishes entering them which allow small fishes to take shelter and thrive among the mangroves. Foraging could be another reason for the occurrence of species that were previously not found in the area. Both the quantity and type of food found in the mangroves are different from the adjacent offshore waters increasing in the diversity of fishes [20]. There is a possibility that some of the newly recorded species are found in the mangroves seasonally and also the possibility that these fishes may have simply escaped scientists' attention due to insufficient sampling, cryptic nature of the fishes or incorrect taxonomy. A combination of the aforementioned factors played a role in the distribution of the five species that were previously unknown from the Indian Sundarban mangroves. The species reported in this study were all caught along with other species of fishes primarily of the families; Engraulidae (Anchovies), Ariidae (Sea Catfishes) Bregmacerotidae (Codlets) and Carangidae (Jacks and Pompanos) that are known from the area. All the species found in this study are economically important and even consumed locally including the pufferfish which the locals have a unique way to prepare, removing the toxic parts. But, consuming fishes of the family Tetraodontiformes has resulted in occasional deaths, though unreported [8].

5. Conclusion

The diversity of the estuarine fishes of the Sundarbans including marine species has been studied and inventoried quite fairly in the last few decades [21] but, there needs to be more thorough investigations supplemented with taxonomic and molecular work [5]. Our study reports five species of fishes; *Thysanophrys celebica*, *Caesio caerulaurea*, *Ichthyoscopus lebeck*, *Platax teira* and *Lagocephalus spadiceus* from the Indian Sundarbans that were not reported from the area previously. Furthermore, *T. celebica*, and *L. spadiceus* forms the first record of the two species for the

state of West Bengal, effectively increasing the number of *Lagocephalus* spp. found and Platycephalidae in the state to four.

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