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Distribution, Morphology and Genetic Validation of *Saurida pseudotumbil* Dutt & Sagar, 1981 (Teleostei: Synodontidae) from Indian Waters

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Abstract

The Lizardfish, *Saurida pseudotumbil* was caught along the eastern and western coasts of India. The record of 20 specimens extends the knowledge of its occurrence and morphology and provides genetic confirmation of species in Indian waters after more than three decades of its discovery.

Keywords: Lizardfishes, Synodontidae, Saurida, Distribution, COI, Parangipettai, Kochi, India

1. Introduction

The fish family Synodontidae comprises 74 species belong to 4 genus (Eschmeyer, 2018). This family is distributed in tropical, subtropical and continental shelves (Golani, 1993). They are associated with soft muddy or sandy bottoms in depths usually of about 200 m and some of the species are known to be associated with shallow reefs (Russell, 2011). Lizardfishes are monophyletic group within the order Aulopiformes and include species from various regions and different bathymetric distributions (Davis, 2010). The bathymetric range of some species extends from the shallow waters to about 800 m deep (Golani, 1993). *Saurida pseudotumbil* is a lesser known species in the Synodontidae family often misidentified and considered as *S. tumbil*. The name *pseudotumbil* was given to this species because of its close resemblance to its congener sibling *S. tumbil*. Both *S. pseudotumbil* and *S. tumbil* looks identical and share the morphology to greater extent and often landed together in the commercial trawl catches along with the other species. Due to its high similarity with *S. tumbil*, the former will be misidentified and considered as *S. tumbil*. The reason might be attributed to the popularity, similarity and dominance of *S. tumbil* in the pool and the taxonomic impediment prevailing in the country often add to the problem (Dutt & Sagar, 1981; James, 2010; Najmudeen *et al.*, 2015). Apart from *S. tumbil*, *S. pseudotumbil* have also been synonymized with *S. gracilis* and *S. longimanus*. Therefore the range and distribution of *S. pseudotumbil* in Indian waters at present is unknown since Dutt and Sagar (1981) re-examined the museum specimens of lizard fishes from Zoological Survey of India (ZSI), Kolkata and found that *S. pseudotumbil* was mislabeled with other species recorded from six localities in east coast (Vishakapatnam, Puri, Kakinada, Machilipatnam, Madras and Rameswaram) and two localities (Calangute and Karwar) along the west coast of India. Hence the present study was undertaken to extend the knowledge of its taxonomy and distribution in Indian waters.

2. Materials and Methods

Ten specimens each of *Saurida pseudotumbil* collected from the Mudasalodai landing centre on 15/08/2013 (latitude 11°29'25.55"N; longitude 79°45'38.62"E), Tamil Nadu, Southeast Coast of India and from Cochin backwaters (latitude 9°58'08.41"N, longitude 76°14'40.78"E), Kochi, Kerala, Southwest Coast of India on 12/10/2013. In both of the locations, specimens were collected from the trawl catch. A total of three complete specimens were deposited at the Marine Reference Museum at the Centre of Advanced Study in Marine Biology, Annamalai University under the voucher numbers CASMB1289-CASMB1291 (Fig. 1) for future reference. Morphometric and meristic characters of the voucher specimens along with other specimens were registered following the procedure described by Shindo and Yamada (1972) and Inoue and Nakabo (2006). A small piece of muscle tissues for two individual specimens were preserved in 95% ethanol for molecular identification.

Total DNA was extracted from the specimens of muscle tissues using standard ethanol-chloroform protocols (Sambrook *et al.*, 1989). The mitochondrial gene, cytochrome oxidase I (COI) was amplified using universal primers: FishF1+FishF2 and FishR1 (Ward *et al.*, 2005). Polymerase Chain Reaction (PCR) was carried out in 25 µl reaction volume containing 12.5 µl FastStart PCR MasterMix (Roche), 0.375 µl each primer (10 µM) and 1 µl of template DNA. The PCR conditions were followed by the initial preliminary denaturation at 92°C for 5 minutes followed by 35 cycles of strand denaturation at 92°C for 1 minute, 52°C for 45 seconds and primer extension at 72°C for 1.5 minutes, followed by final extension at 72°C for 5 minutes. Sequencing was done in the BIONTEQ sequencing platform in Chennai, India. All nucleotide sequences obtained in the present study were deposited in GenBank under the accession numbers KF876337, KM459005 and KM459006. Intra-specific distance and nucleotidic divergence between species of the *Saurida* genus were estimated using the Kimura 2-

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Fig. 1. *Saurida pseudot-umbil* Dutt and Sagar, 1981 (SL: 23.47 cm; Museum voucher number: CASMB1291)

parameter distance model of MEGA (Version 5.0) package (Tamura *et al.*, 2011).

3. Results

Saurida pseudotumbil is a small to large species having one dorsal fin in the middle of body, a small adipose fin at the back, large ventral fin consisting of 8 or 9 rays and a forked caudal fin. Their fins are not spiny. Body elongate, subcylindrical, deepest at origin of first dorsal fin. Body depth in terms of percentage of standard length 7.0 (5.9-8.5) and head length 4.5 (3.9-4.5). Snout rounded, its length slightly more than eye diameter. Eye diameter 5.25 (4.5-6.3) in head length. Adipose eyelids relatively less developed than in *S. tumbil*. Nostrils midway between snout tip and eye.

Both jaws with numerous caniniform teeth in three or four rows with a tendency for increase in size of teeth in inner rows. Palatine teeth in two bands, with a narrow gap between them; the outer band consists of 3-4 rows of teeth anteriorly and 2 rows posteriorly; the inner band is spindle-shaped. There is a small patch of vomerine teeth between the anterior ends of the two outer palatine bands. Branchiostegal membrane extends a little beyond the edge of the posteroventral edge of operculum, as in the other recorded species of *Saurida*. Dorsal fin origin about midway between snout tip and origin of adipose dorsal; longest (second) dorsal ray 1.16 (1.11-1.28) in head length, becoming relatively longer with growth. Pectoral fins short, not reaching pelvic origin; axillary scale pointed, a little more than half of fin length. Pelvics longer than pectorals, extending to below last dorsal ray, their origin anterior to vertical from origin of first dorsal fin, inner rays longer than the outer, eighth ray the longest, axillary scale about half the fin length. Anal fin origin anterior to vertical from origin of adipose dorsal, its base shorter than that of first dorsal. Dorsal fin rays 12 (10-12); pectoral fin 15 (14-15); ventral fin 9 (9); anal fin rays 10 (10-11); lateral line 56 (55-58); predorsal scales 20 (19-21). Coloration of the upper flanks brown; lower flanks paler brown, becoming increasingly silvery white towards ventral side. Body without blotches. The adipose dorsal shows grey pigmentation in anterior half, posterior half being hyaline, as also its upper edge. Base of pectorals hyaline to pale grey, rest of fin grey, becoming darker posteriorly; the ventral most rays are hyaline or only barely pigmented. In the ventral fins, the lower half is hyaline; in the distal half, the middle of the fin has a grey blotch, the edges being hyaline. The anal is hyaline. Upper caudal lobe grey, lower dusky, both lobes being darker towards posterior edges. The upper caudal edge is not barred. The morphometric and meristic measurements obtained for the specimens are given in Tables 1 & 2.

COI sequence analysis showed a net mean divergence level of 0.1% within the same species from the Indian waters (Cochin- KF876337; Parangipettai - KM459005), 1.8 – 1.9% with *S. tumbil* (Parangipettai - KM459006; Maharashtra- KJ713184and Iran- HQ149924) and 2.9% between *Synodus synodus* (USA - JX519408) confirming the identity of the specimens.

4. Discussion

The data on *Saurida pseudotumbil* from the present study is in accordance with the range of size, body proportions and meristic characteristics previously reported for this species (Dutt and Sagar, 1981). *S. pseudotumbil* and *S. tumbil* highly share the morphology and in no way it can be separated by morphometric and meristic characters except the length of the pectoral fin.

S. pseudotumbil can be differentiated from *S. tumbil* only by shorter pectoral fin which does not reach the pelvic origin besides the color of stomach and pyloric caecae which is greyish and striped black and white respectively. Whereas, the colour of stomach and pyloric caecae is white in *S. tumbil*. *S. pseudotumbil* can be distinguished from the other species of *Saurida* of the Indo-West Pacific, *S. wanieso*, *S. isarankurai*, *S. undosquamis* and *S. longimanus* by its shorter pectorals (not reaching pelvic origin) and absence of blotches on flanks. Though *S. pseudotumbil* resembles *S. micropectoralis* in having short pectorals (not reaching pelvic origin), it differs from *S. micropectoralis* in not having blotches on flanks and bars on the upper edge of caudal, palatine dentition and anterior 2/3 to 3/4 of stomach being dark grey (white in *S. micropectoralis*) and pyloric caecae being striped black and white (white in *S. micropectoralis*) (Dutt and Sagar, 1981). Unavailability of scientific reports on *S. pseudotumbil* in Indian waters is due to limitations in monitoring of fishery resources at species level due to lesser number of fish taxonomists. On the other hand, considering the importance and efficacy of DNA based

Table 1. Morphometric characters of *Saurida pseudotumbil*: mean ± standard deviation and range.

Morphometric characters	Present study		Range (From Dutt and Sagar, 1981)
	Mean ± SD	Range	
Fork length	24.91 ± 5.20	20.1-33.9	-
Total length	27.28 ± 5.40	22.2-35.7	16.5-19.0
Standard length	23.47 ± 4.80	19.5-30.8	-
Head length	5.26 ± 1.16	4.1-7.2	2.2-2.5
Snout length	1.38 ± 0.36	1.0-2.1	-
Upper jaw length	3.79 ± 0.86	3.1-5.3	-
Lower jaw length	3.72 ± 0.83	3.0-5.2	-
Eye diameter	1.07 ± 0.29	0.8-1.6	0.3 - 0.5
Post orbital length	3.32 ± 0.77	2.7-4.7	-
Head depth	2.35 ± 0.57	1.7-3.4	-
Snout to preopercle	3.92 ± 0.95	3.1-5.5	-
Body depth	3.3 ± 0.59	2.6-4.3	1.1-1.7
Dorsal fin base length	3.01 ± 0.62	2.3-4.1	-
Anal fin base length	2.39 ± 0.56	1.7-3.3	-
Snout to dorsal fin	9.96 ± 2.23	8.3-13.5	4.0-4.3
Snout to adipose fin	18.72 ± 4.18	15.0-25.1	-
Snout to pectoral fin	5.48 ± 1.23	4.2-7.5	2.2-2.6
Snout to pelvic fin	8.55 ± 1.69	7.1-11.6	3.5-4.0
Snout to anal fin	17.52 ± 4.09	14.2-23.9	7.1-7.5
Dorsal to adipose fin	6.5 ± 1.63	5.0-9.4	-
Pectoral length	2.87 ± 0.51	2.4-3.9	1.6-1.9

SD, Standard Deviation

Table 2. Meristic characters of *Saurida pseudotumbil*: mean ± standard deviation and range.

Meristic characters	Present study		Range (Dutt and Sagar, 1981)
	Mean ± SD	Range	
Dorsal fin rays	12.1 ± 0.73	11.0-13.0	10-12
Procurrent caudal fin rays	23 ± 1.05	22.0-24.0	-
Pectoral fin rays	14.6 ± 0.51	14.0-15.0	14-15
Pelvic fin rays	8.7 ± 0.48	8.0-9.0	-
Anal fin rays	10.6 ± 0.51	10.0-11.0	10-11
Lateral line	54.7 ± 1.49	52.0-57.0	55-58
Transverse scale above lateral line	5.3 ± 0.48	5.0-6.0	-
Transverse scale below lateral line	5.7 ± 0.48	5.0-6.0	-
Branchiostegal rays	15 ± 0.94	14.0-16.0	-

SD, Standard Deviation

approaches for the precise identification, the COI sequences of *S. pseudotumbil* (KF876337; KM459005) was made in the present study and deposited in GenBank database for the first time since the species has been described by Dutt and Sagar (1981). The pairwise distance analysis between the COI regions of *S. tumbil* and *S. pseudotumbil* clearly demarcated both the species with the range of 1.8 – 1.9% level of divergence whereas 0.0 – 0.1% of divergence was noticed within the same species of *S. pseudotumbil* as well as *S. tumbil*. Given the background, the FishBol DNA barcoding is an effective and pertinent approach to increase our knowledge about species abundance and distribution range of lizardfish in Indian waters. However, COI barcode data alone is not sufficient to unravel the evolutionary hitches existing in this economic and ecologically important demersal fish group. The present report extends the current knowledge about the occurrence of *S. pseudotumbil* in Indian waters and further investigations on its occurrence in the Indian subcontinent and biology of the species are required to find out the exact range of its distribution along the Indian coast. It also helps to clearly understand the wellbeing, feeding and breeding grounds, longevity and stock of *S. pseudotumbil* for deriving fishery strategies which will be helpful for judicial management of fishery resources.

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