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A range extension of *Diretmoides veriginae* Kotlyar, 1987 (Beryciformes: Diretmidae) from the Nicobar Island, India

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Abstract

The occurrence of *Diretmoides veriginae* in the Indian water is reported for the first time. This fish has been reported earlier only from Northeastern Indian Ocean, Southern Taiwan, and South China Sea. Two specimens measuring 175 and 161 mm TL were collected onboard Fishery Oceanographic Research Vessel (FORV) Sagar Sampada using demersal trawl from two locations, Great Nicobar Waters (576 m depth) and Nicobar East Katchall Island (591 m depth). The meristic counts, body measurements and descriptions are presented and the specimens have been compared with the earlier reports and found out that the fish has a new distributional record for Indian waters.

Keywords: Diretmidae, Spinyfin, Great Nicobar Waters, Nicobar East Katchall Island.
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Introduction

The members of the family Diretmidae, commonly known as 'Spinyfin' or 'Discfishes' are round to oval shaped body, strongly laterally compressed and moderate-sized fishes. The family is relatively very small species consisting 3 genera with 4 species. The members of this family consists of *Diretmichthys parini* Post and Quéro, 1981, *Diretmus argenteus* Johnson, 1864*, Diretmoides pauciradiatus* Woods, 1973 and *D. veriginae* Kotlyar, 1987, and distributed throughout the world ocean in tropical and temperate latitudes, except eastern North Pacific and Mediterranean Sea (Post and Quero 1981; Kotlyar 1988, 1996). *Diretmichthys parini* is found in Tropical, subtropical and moderate latitudes of the Atlantic, Pacific and Indian Oceans (Post and Quéro 1981; Kotlyar 1996; Post 1986a; López-Abellán et al. 1994; Sanches and Pinto 1991; Quéro 1994; Quéro et al. 1997; Jónsson and Pálsson 2003), at a depth range of 270 to 2000 m. The juveniles are epipelagic to mesopelagic and adults are collected close to the bottom (Post 1986b; Kotlyar 1988). This species was not reported from latitudes higher than 59° and in the North Sea (GBIF 2016) indicating their affinity for warm waters (Quero et al. 1998). *Diretmus argenteus* is distributed in tropical to temperate waters mainly Eastern Atlantic, Iceland and British Isles to South Africa including Canary Islands and Ascension Island (Post 1986a). *Diretmoides pauciradiatus* distributed in Eastern Atlantic, Guinea Bissau to Angola (Post 1990), Western Atlantic, Indian Ocean and Pacific Ocean. *Diretmoides veriginae* recorded in Eastern Indian Ocean: Mentawai range of the Andaman, Timor and South China Sea in Western Pacific (Kotlyar 1987). All the four species are reported to feed on small planktonic crustaceans (Kotlyar 1996, 1988). In the present paper, we describe two specimens of *D. veriginae* collected from Great Nicobar Island and Katchall Island area.

Material and Methods

The specimens of *D. veriginae* were collected during the exploratory deep-sea fishery surveys in the continental margins (8˚24'261"N, 93˚20'482"E, and 11˚09'903"N, 92˚19'061"E, 576 m depth) of the Indian Exclusive Economic Zone (EEZ) by onboard FORV Sagar Sampada (Cruise No 349) of the Centre for Marine Living Resources and Ecology (CMLRE), Ministry of Earth Sciences (MoES), Govt. of India (Fig. 1). A High-speed Demersal Trawl (Crustacean Version) was used for bottom trawling. Samples were preserved in 10%

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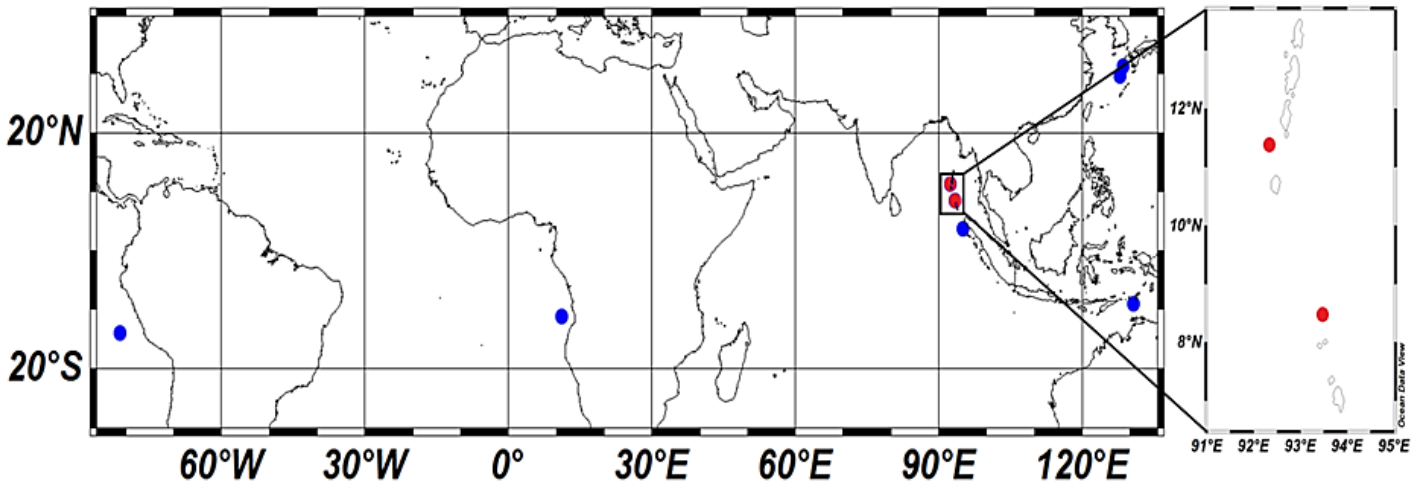

Figure 1. The map showing the collection locations of *Diretmoides veriginae* (red bullets indicate the location of present study and blue bullets: previous reports).

formaldehyde and taken to the shore laboratory for the further studies. The identification of the species was based on Kotlyar (1986). Measurements were taken to the nearest 0.1 mm using digital Vernier caliper. The specimens were deposited in the Centre for Marine Living Resources and Ecology referral Centre (Ref no: IO/SS/FIS/00517). Proportions of measurements are expressed as percentage of the standard length (SL). Morphometric and meristic measurements for the species identification were taken from the preserved specimens and compared with type materials following Moore and Dodd (2010), Nomenclature follows Eschmeyer et al. (2017), references and journals follows Fricke (2017) and Fricke and Eschmeyer (2017), respectively. Sagittal otoliths were removed by making an incision in the head and the collected otoliths were cleaned, dried and stored in plastic vials for further analysis. The otoliths were photographed in stereo zoom trinocular microscope (Leica model No. S8APO: Camera, Leica DFP-425) with the sulcus acusticus oriented towards the observer. Environmental parameters were measured using Sea-Bird SBE 9, Software Version Seasave V 7.22.

Results

Systematic:

Class Actinopterygii
Order Beryciformes
Family Diretmidae Gill, 1893
Genus *Diretmoides* Post & Quero, 1981
Species *Diretmoides veriginae* Kotlyar, 1987

Materials Examined: Specimen 1: 175 mm SL; Cruise 349, station 3 Nicobar East Katchall Island, 8˚24'261"N, 93˚20'482"E, 591 m depth, 5 April 2016 (Fig. 2). — Specimen 2: 161 mm SL; Cruise 349, station 1 Great Nicobar Waters, 11˚09'903"N, 92˚19'061"E576 m depth, 4 April 2016.

Diagnosis: Dorsal fin II+25; anal fin I+21; pelvic fin 16-18; caudal fin 32; Gill rakers 22(8+14); Lateral line scales 57; Pre-dorsal scales rows (Pdr) 29.

Description: The Morphometric and meristic measurements is shown in the Table1. Body moderately high and flattened laterally; large round eyes. Head about one third of body length; small spines gather densely in the back of head forming a diamond shaped structure; deep and oblique mouth, presence of 2-7 rows of villiform

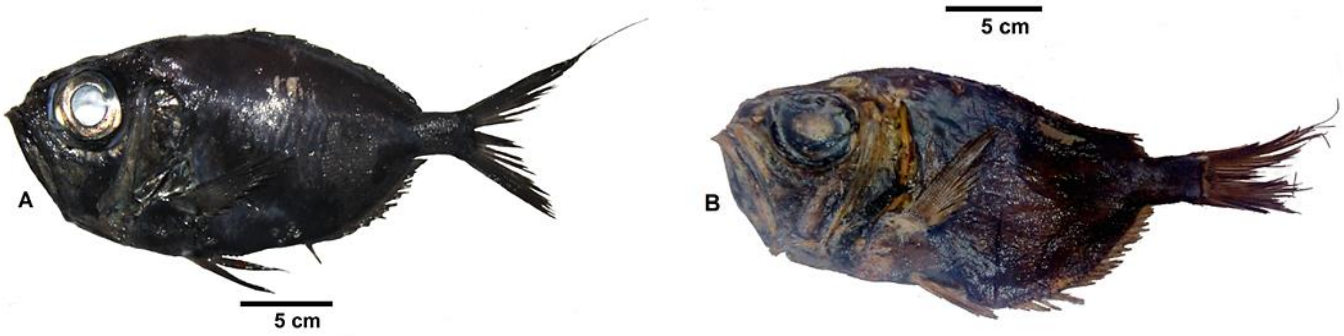

Figure 2. Lateral view of *Diretmoides veriginae* from Nicobar east Katchall Island, 591 m. (A) fresh specimen and (B) formalin preserved specimen) (Ref no: IO/SS/FIS/00517).

Table 1. Morphometric and meristic measurements of *Diretmoides veriginae*.

Morphometric and meristic measurements	Specimen 1	Specimen 2	From Kotlyar, 1988, 33 specimens	From Okamoto, 2010, 2 specimens
Morphometric counts				
Total length (mm)	230	225		
Standard length (mm)	175	161	86-233	138-175
% of SL				
Head length	40.51	38.71	34.5-40.5	34.6-35.5
Body depth	45.10	47.35	47.6-57.2	49.6-52.9
Head depth	44.90	48.00	40.0-50.0	43.7-44.6
Eye diameter	17.74	18.93	15.2-18.5	16.4-17.6
Post orbital length	12.11	13.65	9.8-14.3	10.2-10.9
Inter orbital space	5.74	5.86	4.8-8.3	5.3-6.0
Upper jaw length	23.94	26.04	23.1-28.7	23.7-24.6
Lower jaw length	25.26	27.98	25.5-32.3	27.7-27.8
Snout length	7.61	6.67	6.8-9.8	7.7-7.8
Caudal peduncle depth	9.86	9.52	8.9-10.4	9.4-10.3
Caudal peduncle length	13.03	14.16	11.4-17.7	13.1-13.3
Pre dorsal length	47.83	46.29	45.3-54.0	46.1-46.2
Pre anal length	55.25	54.11	60.0-72.1	68.2-70.2
Pre pectoral length	38.40	38.57	36.1-40.2	35.0-36.7
Pre pelvic length	44.62	39.21	46.7-52.4	47.8-49.5
Dorsal base length	43.86	40.11	36.6-47.8	44.4-46.1
Anal base length	27.69	32.78	27.0-34.7	33.9-34.4
Pectoral fin length	27.78	32.11	25.3-35.3	29.8-30.0
Meristic counts				
Dorsal fin rays	27	27	24-26	26
Anal fin	22	22	19-22	20 - 21
Pelvic fin	I+6	I+6	I+6	I+6
Caudal fin	IV+3+7+4+7+ 3+IV	IV+3+7+4+7+ 3+IV	-	-
Pectoral fin	17±1	18	17-20	17-18
Pre-anal scutes	10	10	8-13	9-10
Post-anal scutes	8	10	7-11	9-10
Gill rakers	8+14	8+13	6-8+14-16=21-24	7+15=22
Scutes on isthmus	5	5	-	3-4
Pseudo-branch	25	21	-	-
Vertebrae		-	13+15-16=28-29	13-14+15-16=29

teeth forms a tooth belt side by side, lower jaw tooth are larger than the upper jaw with 1-3 rows of conical teeth, densely gathered tooth band are seen along the tip of lower jaw. Lower jaw tip protrudes beyond upper jaw tip, sharp symphyseal on lower jaw, scutes on isthmus 5; gill number 21-24; pseudo-gill large. Tip of pelvic-fin

Table 2. Distribution details of *Diretmoides veriginae*.

	Location	Author
Diretmoides veriginae	**1.** Northeastern Indian Ocean, 3°46'N, 95°00'E, 800-875 meters.	Kotlyar (1987)
	2. South China Sea	Kotlyar (2002)
	South China Sea	Randall and Lim (2000)
	Northern South China Sea	Shao et al. (2008)
	East China Sea, 31°16'N, 128°25'E, 428 m and 29°41'N, 127°42'E, 558 m	Okamoto and Hoshino (2010)
	Nicobar east Katchall Island, 8.24.261N, 93.20.482E, 591 m and Great Nicobar Waters, 11˚09'903N, 92˚19'061E, 576 m depth	Present study (Nikki et al. 2017)

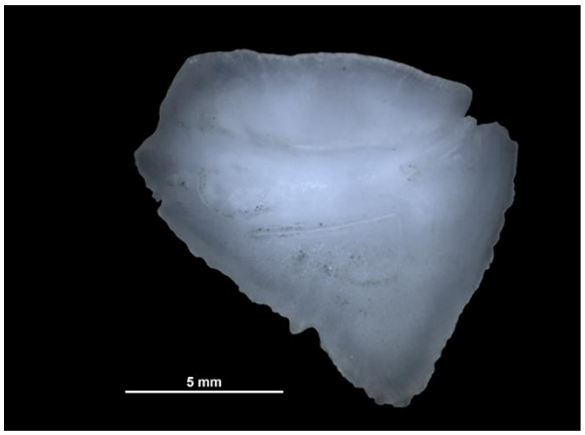

Figure 3. Otolith of *Diretmoides veriginae*.

reaching origin of anal fin; rear end of pectoral fin reaching just above the anal fin. Abdominal scutes present; scales ctenoid covering body and head. Soft rays with rows of very small spinules. Caudal fin forked; upper lobe slightly extended.

Colour of fresh specimen (Fig. 2): Fresh fish black, bluish black where scales missing, branchio-oral cavity and abdomen black.

Colour in preservative (Fig. 2): On preservation, body color is almost blackish brown with light brown fins; main gill cover, oral cavity and gill cavity black and the ridge of the abdomen brownish.

Otolith morphology: The otolith is shown in the Figure 3. The morphological description and nomenclature used in this paper are derived from Smale et al. (1995) and Tuset et al. (2008). The otolith of *D. veriginae* is rhomboidal in shape, anterior region is peaked and posterior region round. Dorsal and ventral edge is entire to irregular. Rostrum and antirostrum are non-developed. Rostrum is blunt. Excisura is narrow; notch shallow; angle acute. Sulcus acusticus is ostial, sulcus opens on to the anterior margin. The cauda is closed and slightly cured ventrally at posterior end. Sulcus type is homosulcoid. Colliculum is homomorph. Collum is absent.

Distribution: *Diretmoides veriginae* is distributed in Eastern Indian Ocean: Mentawai range of the Andaman Islands has only been previously recorded two times: off coast of Northeastern Indian Ocean, 3°46'N, 95°00'E, 800-875 m (Kotlyar 1987) and off coast of East China Sea, 31°16'N, 128°25'E, 428 m and 29°41'N, 127°42'E, 558 m by Okamoto and Hoshino (2010). In the present work, *D. veriginae* from Nicobar east Katchall Island, 8˚24'261"N, 93˚20'482"E, 591 m depth and Great Nicobar Waters, 11°09 '903" N, 92°19'061"E, 576 m depth is described. Distribution details of *D. veriginae* is shown in Table 2.

Discussion

The deep-sea fish *D. veriginae* described herein are in agreement with the size, body proportions and radial formulae reported by previous authors (Kotlyar 1987, 1990, 1996, 2002; Paxton 1999; Paxton et al. 2000; Shao

et al. 2008; Okamoto and Hoshino 2010). This is the first record in the Nicobar east Katchall Island and the Great Nicobar Waters. Kotlyar (1987) reported occurrence of this species off Northeastern Indian Ocean (3°gradient). In the present study, this species was caught off the Nicobar east Katchall Island (9°gradient) and Great Nicobar Waters (10°gradient), suggesting a northward extension. This hypothesis suggests the distribution of *D. veriginae* might expand following a northward extension. The biology of this species is poorly known due to rare nature during the fishing operations. There is not much published information is available about this species as targeted catch or bycatch from any of the fisheries existed worldwide. Present study gives insight towards the distribution of *D. veriginae* from the Indian waters, which are quite renowned for their rich deep-sea fishery resource.

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