

# New record of the starry flying gurnard, *Dactyloptena peterseni* (Scorpaeniformes; Dactylopteridae); from Wadge Bank, Southwest coast of India

K. Karuppasamy<sup>1</sup>  · S. Davidkingston<sup>2</sup> · P. Jawahar<sup>1</sup> · L. Ranjith<sup>3</sup> · A. Kathirvelpandian<sup>4</sup> · S. Aanand<sup>1</sup>

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**Abstract** Five specimens of dactylopterids measuring 220.5–320.0 mm standard length caught commercial trawler fishing in 80–120 m deep waters of Wadge Bank off Kanyakumari coast (8.02 N, 76.80 E) were collected from the landing centre at Jeppiaar fishing harbour, Muttom, Southwest coast of India. The specimens were identified as *Dactyloptena peterseni* (Nystrom, 1887) on the basis of morphometric measurements and the key identification character like absence of second free spine between the occipital and the first dorsal spine. The occurrence of the species suggests that the extended distribution of *D. peterseni* to Southwest coast of India. The detailed morphometric and meristic characters are described and discussed in this paper. Molecular identification was done by using partial sequence of mitochondrial cytochrome oxidase sub-unit I gene for confirmation of the species.

**Keywords** Dactylopterids · Flying/helmet gurnards · Kanyakumari coast · Distribution

## Introduction

The fishes of the family Dactylopteridae under Scorpaeniformes [1–3], are commonly called as flying gurnads or helmet gurnads as there is no actual flight and are heavy bodied and beautiful coloured demersal species [1, 4]. Dactylopterids are mostly distributed in tropical and subtropical seas [5] and are usually of little commercial importance, but they are often taken as bycatch in near-shore fisheries and few species are used in marine aquarium, such as *Dactyloptena orientalis* [6]. The Jordan and Richardson [7] erected the two genera namely *Dactyloptena* and *Dactylopterus* comprising seven valid Indo-Pacific species. The genera *Dactylopterus* possess two dorsal fin spines adjacent to each other and about equal length whereas, one or two separate free dorsal fin spines are well separated from remainder of spinous dorsal fin in case of *Dactyloptena* [8]. The genus *Dactylopterus* is represented by a single species *Dactylopterus volitans* (Linnaeus, 1758) and the genus *Dactyloptena* contain six valid species viz., *D. orientalis* (Cuvier, 1829), *D. macracantha* (Bleeker, 1855), *D. peterseni* (Nystrom, 1887), *D. tiltoni* Eschmeyer, 1997, *D. papilio* Ogilby, 1910 and *D. gilberti* Snyder, 1909 [9, 10]. *Dactyloptena peterseni* could be distinguished from the closely related species *D. orientalis* by the absence a second free spine between the occipital spine and the first dorsal fin [11].

Smith [12] has recorded *D. peterseni* in the Pacific Ocean; while Silas (1965) reported the species from west coast of India (does not specify the exact location) [11], Salvi and Deshmukh [6] reported from Mumbai, Northwest coast of India. Present finding of occurrence of *Dactyloptena* in the Wadge Bank, Southwest coast depicts the extended distribution range for the species in Indian waters.

✉ K. Karuppasamy  
karuppasamyfsc@gmail.com

<sup>1</sup> Fisheries College and Research Institute, TNFU, Thoothukudi, Tamil Nadu 628 008, India

<sup>2</sup> Fisheries Training and Research Centre, TNFU, Parakkai, Kanyakumari, Tamil Nadu 629 601, India

<sup>3</sup> Tuticorin Research Centre, CMFRI, Thoothukudi, Tamil Nadu 628 001, India

<sup>4</sup> Peninsular and Marine Fish Genetic Resources, CMFRI-Campus, NBFGR, Kochi, Kerala 682 018, India

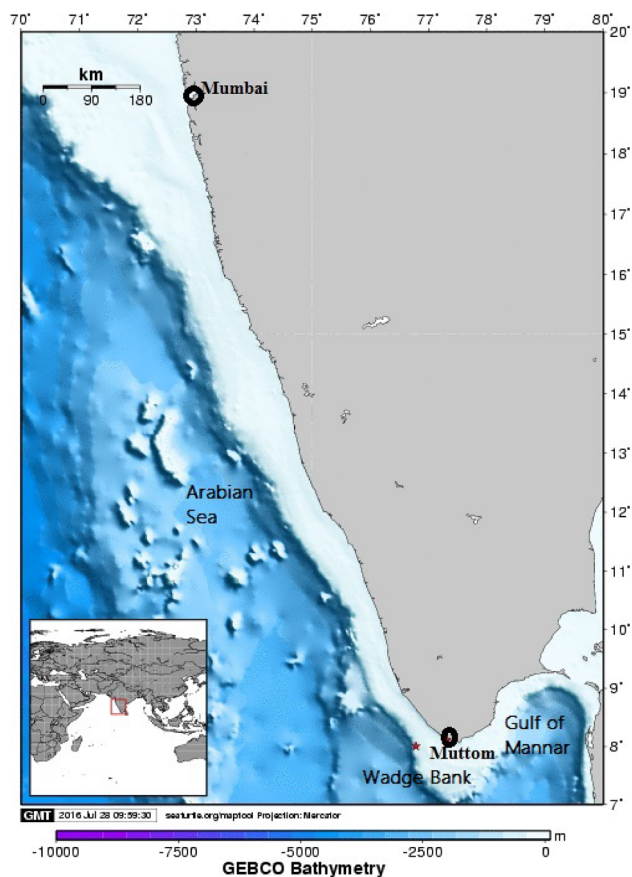
Five specimens measuring 220.5–320.0 mm standard length (SL) were collected from commercial multiday trawler operated from Jeppiaar fishing harbour, Muttom during August 2015. The specimens were caught approximately 42–60 km towards south off Muttom waters (8.02° N, 77.80° E) at the depth ranging from 80 to 120 m in the Wadge Bank (Kanyakumari–Vizhinjam) Southwest coast of the country (Fig. 1). The fresh specimens were photographed and the field diagnostic characters were noted for further identification (Fig. 2). The specimens were brought to the laboratory of Fisheries College and Research Institute, Thoothukudi for detailed taxonomic examination. The identification characters i.e. morphometric measurements and meristic counts were carried out based on the available standard taxonomic literature [2, 8, 10] was given in Table 1. Molecular confirmation of the species was carried out by analysing partial mtDNA COI gene. The genomic DNA was extracted using Qiagen Kit as per manufacturer's protocol. The partial sequence of cytochrome oxidase sub-unit I gene was amplified using primers COI F (5'-TCA ACC AAC CAC AAA GAC ATT GGC AC-3') and COI R (5'-TAG ACT TCT GGG TGG CCA AAG AAT CA-3') [13]. The amplifications were

performed in 25 µl reactions containing 10× assay buffer (100 mM Tris, 500 mM KCl, 0.1% gelatin, pH 9.0) with 25 mM MgCl<sub>2</sub>, 5 pmol of each primer, 200 µM of each dNTP, 5U *Taq* DNA polymerase and 20 ng of template DNA. The following PCR conditions were used: initial preheat at 95 °C for 5 min, denaturation 94 °C for 30 s, annealing 50.8 °C for 45 s, extension 72 °C for 1 min, repeated for 30 cycles, followed by a final extension for 10 min at 72 °C. PCR products were sequenced in Applied Biosystems AB3730 XL capillary sequencer at the sequencing facility. The DNA sequence developed in the present study for *D. peterseni* and available sequences in the NCBI database for the species (NCBI accession Nos. JQ681400.1, KP266768.1) and closely related species, *D. orientalis* (NCBI accession No. FJ583311.1) were aligned and edited using BioEdit sequence alignment editor version 7.0.5.2 (Hall, 1999). Phylogenetic and molecular evolutionary analysis using Kimura 2-parameter method [14] was conducted using MEGA version 6.0 [15]. The sequence of *Pomadasys maculatus* (NCBI accession Nos. JX042221.1) was taken as outgroup for phylogenetic analysis. The evolutionary status was inferred using the Neighbor-Joining method [16].

Based on the key diagnostic identification characters from available taxonomic literature and also from the molecular analysis, the specimens were identified as *D. peterseni* (Nystrom, 1887). The specimen accession (FF.S.D1-02) was got from Fisheries College and Research Institute, Thoothukudi, Tamil Nadu Dr. J. Jayalalithaa Fisheries University.

Kingdom: Animalia, Phylum: Chordata, Class: Actinopterygii, Order: Scorpaeniformes, Family: Dactylopteridae Rafinesque, 1810, Genus: *Dactyloptena* Jorden and Richardson, 1908, and Species: *Dactyloptena peterseni* (Nystrom, 1887).

Body description is as follows; Body, moderately elongated. Head broad and depressed; snout rounded and depressed, eyes large; scales, each with a strong median ridge, three enlarged keel like scales were present on the lower side of posterior part of trunk with the first one originating above the middle of anal fin. Single long, prominent spine was present at angle of the preopercle. Spinous and soft dorsal fins were separated by a deep notch. Single elongate filamentous spine was widely separated from remainder of spinous dorsal fin that had with VII spines. Soft dorsal fin had 8 rays and anal fin had 6 soft rays. Caudal fin was emarginated. Pectoral fins with dark ocellus about one-third out on fin; Bases of pectoral fins divided into short anterior part with 5 rays and a long posterior part with 25–27 rays. Lateral line was absent. Body of all the specimens was reddish above and pinkish with white colour below. An oblong black blotch over middle of pectoral fins was present. All the observed five



**Fig. 1** Location of *D. peterseni* caught off Wadge Bank, Southwest coast of India. Red star: caught location

**Fig. 2** *Dactyloptena peterseni* caught from Wadge Bank, Southwest coast of India



**(a)** Lateral view of *D. peterseni*



**(b)** Dorsal view of *D. peterseni* showing the absence of second dorsal filamentous spine.



**(c)** Birds eye view of *D. peterseni* showing the dark ocellus



**(d)** Ventral view of *D. peterseni*



**(e)** Lateral view of *D. peterseni* showing the laterally enlarged keel-like scales

specimens has black colour dots on the upper side of the head and body. Last dorsal fin rays also possess black dots. Mouth was moderately small mouth, sub terminal, and protractile. Upper jaw largely was obscured by bones surrounding eye. Nodular teeth was present on jaws. Small teeth on vomer and palatines was also present. Four pairs of gill arch with ten numbers of short and blunted rakers were found only in the centre of the gill arch.

This species has been reported in deeper waters ranging from 50 to 210 m distributed in the Japan, Indian Ocean to

east Africa and Western Australia [8]. *D. peterseni* is closely similar to *D. macracantha* while there is the absence of the second dorsal fin spine in *D. peterseni* whereas it is present in *D. macracantha*. Moreover, a large dark spot is present on the first third of the pectoral fin in *D. peterseni* and in *D. macracantha*, a well-marked punctuated pale spots halfway out on the pectoral fins was noticed. *Dactyloptena tiltoni* also have the similar characters with absence of second dorsal fin but no spots on upper side of the head [8].



**Table 1** Diagnostic characters of *D. peterseni* from Wadge Bank, Southwest coast of India

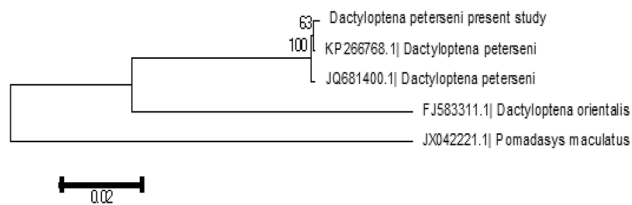
Diagnostic characters	Specimen-1/mm	Specimen-2/mm	Specimen-3/mm	Specimen-4/mm	Specimen-5/mm
Total weight(g)	540	455	613	444	360
<i>Morphometric characters</i>					
Total length (mm)	370	320.7	390	320.5	280.5
Standard length	300.5	260.5	320	290	220.5
Body depth	42.29	43.8	50.8	44.8	35.2
Body width	58.36	50.54	56.8	54.8	46.5
Pectoral length	20.21	210.5	220.5	210.5	180.5
Pelvic length	55.31	48.8	58.79	52.7	44.6
Head length	108.15	100.9	111.1	97.52	83.2
Eye diameter	6.26	5.5	6.4	6.3	6.7
Orbit diameter	3.2	3.3	3.3	3.88	2.3
Snout length	51.1	46.4	50.4	44.47	40.25
Post eye length	3.1	3.1	3.1	3.88	1.8
Predorsal length	70.5	62.8	70.65	61.15	53.9
Inter orbital width	45.78	37.7	44.9	40.6	32.7
inter orbital depth	48.32	41.1	41.8	38.6	35.6
Prepectoral length	95.46	92.5	23.1	89.8	68.2
Prepelvic length	100.5	95.2	103	90.48	81.4
Preanal length	190.5	170.5	190.5	170.5	144
Preanus length	180.1	160.2	180.5	180.5	130
Distance between pelvic to anal	87.5	79.8	90	89.1	67.11
Caudal peduncle length	17.1	15.93	17.4	13.1	11.07
Caudal peduncle width	14.5	14	14.3	13.2	11.5
Distance between anus to anal	10.4	10.3	10	10	14
<i>Meristic counts</i>					
Dorsal finrays	1 + 5 + 1 + 8	1 + 5 + 1 + 8	1 + 5 + 1 + 8	1 + 5 + 1 + 8	1 + 5 + 1 + 8
Anal finrays	6	6	6	6	6
Pelvic finrays	4	4	4	4	4
Pectoral finrays	5 + 26	5 + 27	5 + 27	5 + 25	5 + 27

*Dactyloptena peterseni* diagnostic characters were as described by Eschmeyer [8]. Moreover, the specimens were caught in deeper area of Muttom waters (80–120 m) in Wadge Bank, Southwest coast which confirms the availability of *D. peterseni* as described by Eschmeyer (1997) [8]. *Dactyloptena orientalis* were usually found in the catch from trawler operating in the same area. The present specimens were caught along with *D. orientalis* in the catch. However, Silas (1965) collected quite a large number *D. peterseni* in addition to *D. orientalis* and *D. macracantha* from the west coast of India, but no other detailed information was available on *D. peterseni* [11]. The present observation provides the exact location of collection along with that detailed diagnostic characters and other taxonomic information about the species.

In addition, molecular analysis was carried out by amplifying mtDNA COI gene which resulted in 683 bp

length sequences. After editing and aligning the generated sequences with other sequences from NCBI yielded a total length of 642 bp which was used for analysis. The gene sequence was submitted in NCBI gene bank and got the NCBI accession number (KX580026).

The pair wise genetic divergence value ranged from 0.2 to 0.3% between *D. peterseni* in the present study and other two published resources of the same species indicating that samples obtained in the present study is of *D. peterseni* only. Whereas, the value of 11.6% was obtained in comparison between *D. peterseni* and closely related species, *D. orientalis*. The Neighbour Joining tree (Fig. 3) also supported the above findings by revealing distinct clades where similar species were clustered under same nodes (sequences from the present study and other available resources for *D. peterseni*) while dissimilar species were



**Fig. 3** NJ tree depicting the phylogenetic relationship among *D. peterseni* present study with related fish species

clustered under separate nodes (between *D. peterseni* and *D. orientalis* as well as *Pomadasys maculatus*).

The Wadge Bank (area between Kanyakumari and Vizhinjam approximately 4000 sq. miles) is a fertile ground famous for commercially important percoid fishes like rock cods, snappers etc. Moreover, the continental slope is the widest along the south and south eastern edge of the Wadge Bank, whereas the slope is gentle, precipitous beyond 500 and 180–450 m depth with undulating bottom topography on the eastern side of the Wadge Bank and in the Gulf of Mannar [17]. Hence, there is a scope of diverse resources in particular deep sea fishery resources along Gulf of Mannar Southeast coast [18, 19] and the Wadge Bank, Southwest coast of India.

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