

## Species

### To Cite:

Beura S, Bineesh KK. Report of the Titan Cardinal fish *Holapogon maximus* (Boulenger, 1888) from Chennai coast of India, Bay of Bengal. *Species* 2025; 26: e9s1777  
doi: <https://doi.org/10.54905/disssi.v26i77.e9s1777>

### Author Affiliation:

Marine Biology Regional Centre, Zoological Survey of India, Chennai-28, India

### \*Corresponding Author

Marine Biology Regional Centre, Zoological Survey of India, Chennai-28, India  
Email: [bsweta492@gmail.com](mailto:bsweta492@gmail.com)

### ORCID List

Sweta Beura 0009-0005-2721-3860  
Bineesh KK 0000-0002-4061-1020

### Peer-Review History

Received: 14 September 2024  
Reviewed & Revised: 18/September/2024 to 20/January/2025  
Accepted: 24 January 2025  
Published: 29 January 2025

### Peer-Review Model

External peer-review was done through double-blind method.

### Species

pISSN 2319-5746; eISSN 2319-5754



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# Report of the Titan Cardinal fish *Holapogon maximus* (Boulenger, 1888) from Chennai coast of India, Bay of Bengal

Sweta Beura\*, Bineesh KK

## ABSTRACT

This article deals with the report of the Titan cardinal fish (*Holapogon maximus*) from a new locality (Chennai, South-East coast of India, Bay of Bengal). A total of four specimens were collected from the Kasimedu fish landing centre, located on the northern southeastern coast of India from the trawl bycatch in September 2023. The morphometric and meristic characteristics of the specimens are described and discussed, along with the otolith shape and structure. This finding represents the third record of this species from the east coast of India and the fourth record from Indian waters.

**Keywords:** Cardinalfish, bycatch, new report, distribution, Chennai

## 1. INTRODUCTION

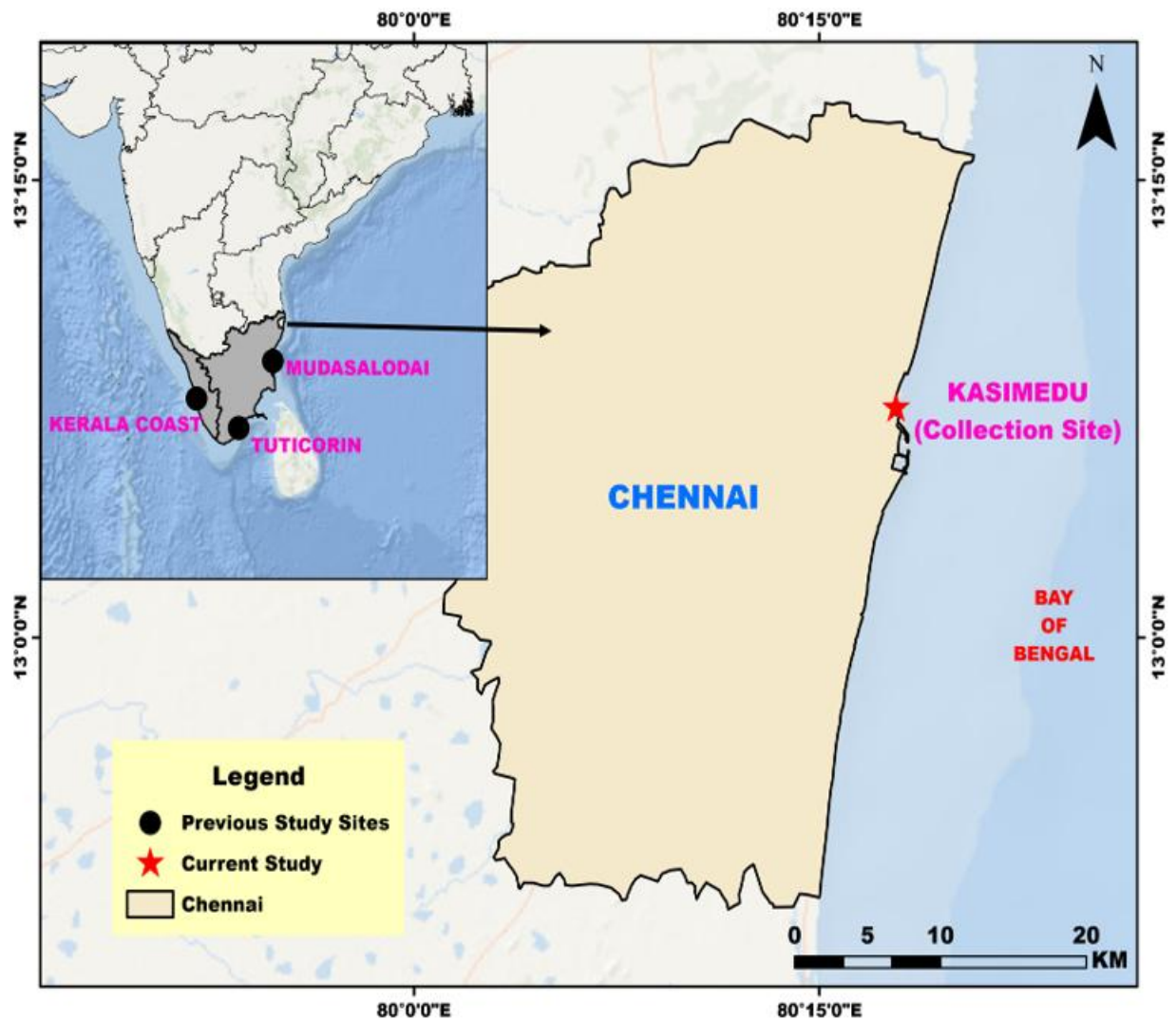
Cardinal fishes belonging to the family Apogonidae, are the seventh most common groups of fish species found in tropical and subtropical regions around the world. They are usually small in size (less than 20 cm) except *Holapogon maximus* (maximum size recorded 30 cm) (Fraser and Allen, 2010). They are primarily nocturnal feeders, often seen in schools seeking refuge in coral reefs, seagrass beds, and other sheltered habitats during the day and venturing out to feed at night. They represent a fascinating group of marine fish with diverse adaptations, distinctive color patterns, ecological roles in coral reefs and coastal ecosystems. They are incidentally caught as bycatch in various types of fisheries such as gillnetting, trawling and seine netting, which primarily target commercially valuable species. *H. maximus* is a tropical inhabited species that is the only single species within the genus *Holapogon*.

It is known for its relatively large size compared to other cardinalfish species. They exhibit schooling behaviour by forming aggregations, especially during reproductive periods or while hunting. The species is easily recognizable by the presence of a small 8th spine at the end of 1st dorsal ray and the vertical pattern of black spots running over the body. In the present study, the specimens were collected from Kasimedu fish landing centre situated in Chennai district during a regular fishery monitoring visit to collect fish samples. It was caught as bycatch in bottom

trawl fisheries operating at a depth range of 10–60 m and was sold fresh in the market. *H. maximus* was first recorded from the west coast of India and then from the southeast coast of India (Koya et al., 2011; Saravanan et al., 2014; Ranjith et al., 2016). We report here the range extension of *H. maximus* to the northern coast of Tamil Nadu, a new locality- Chennai, east coast of India, Bay of Bengal (Figure 1).

## 2. MATERIAL & METHODS

The samples of *H. maximus* was collected from Kasimedu fishing harbour (13°07'24.49" N; 80°17'52.20" E) from trashes, landed by trawlers operating near Chennai coast, Tamil Nadu, India (Figure 1). A total of four specimens were collected, one specimen on 16.09.2023 and other three on 23.09.2023. The fresh specimens were brought to the laboratory, photographed, and the morphometric measurements were recorded using a Mitutoyo CD-6" ASX digital caliper to the nearest millimeter. The specimens were identified, registered and are deposited in the National collections at museum of Marine Biology Regional Centre, Zoological Survey of India, Chennai (Regd. No. ZSI/MBRC/F2997 & ZSI/MBRC/F3113).



**Figure 1** Map showing the collection site and previous collected sites.

Morphometric measurements were expressed in percentage of Standard Length (SL), except the total length (TL) & SL in mm. The head of one specimen was dissected to extract the otolith, which was preserved in 2 ml storage vial filled with water. Tissue samples were preserved in 90% alcohol for subsequent COI barcode analysis. The specimens were fixed in 10%

formaldehyde solution. Images of the otolith structure were captured using a stereo-microscope (Axiocam 305 color), and its length and width were measured to the nearest 0.01  $\mu\text{m}$  using imaging software.

### 3. RESULTS

#### Systematics

Class: Actinopterygii

Order: Kurtiformes

Family: Apogonidae

*Holapogon maximus* (Boulenger, 1888)

English common name: Titan cardinal fish

Figure 2 (a & b), Table 1



(a)



(b)

Figure 2 (a) & (b) Lateral left side view of the specimens of *Holapogon maximus* caught off Chennai, South-east coast of India

### Material examined

MBRCF2997, one ex., 177.83 mm SL, 16.09.2023 & MBRCF3113, three ex., 163.6 mm SL, 129.17 mm SL & 124.62 mm SL, 23.09.2023, Kasimedu fishing harbor, Chennai, Tamil Nadu coast, India (13°07'24.49" N; 80°17'52.20" E). Description: D1 VIII, D2 I+9, P I+5, A II+7, P 13, LL 25, branchiostegal rays 7; Body slender, elongated and laterally compressed; two separate dorsal fins; third dorsal fin spine larger or of almost equal length than of fourth dorsal fin spine; large eyes; eye diameter 33.2-39.9% of head length; mouth large with elongated cardiform teeth; eighth dorsal spine smallest of all spines located at the end of first dorsal fin; origin of anal fin at mid-base of second dorsal fin; lateral line running at uppermost half of body; pectoral and pelvic fin origins are parallel to each other; pectoral fin ends at second (for big specimens) and at third anal ray (for smaller specimens) respectively of anal fin; caudal fin emarginate with rounded lobes; caudal fin each ray lined with black markings. The detailed morphometric measurements are given in (Table 1).

### Color

When fresh, fins yellowish with edges irregular black lined blotches; body pale silvery with numerous tiny black lined dots running over; eyes are bluish with a visible eyelid.

After preservation- An orange-lined spot extends from the eye to the start of the caudal fin along the lateral line; body color turned into reddish orange; fins with black margin posteriorly; tips of pelvic and anal fins dusky black.

### Otolith shape

The otolith, also known as an ear stone, is a calcium carbonate structure located in the inner ear of fish. These structures vary in size and are widely used in fisheries research for species identification, age determination, and studying environmental histories. The otolith (sagitta) of this *Apogon* species was extracted from the otic capsule using fine forceps and examined under a stereo microscope. The structure of sagitta was found to have a significant structure, being elongated or pear shaped, with one end pointed and other slightly rounded. The surface was rough, featuring fine ridges or grooves. The otolith length (OL) and width (OW) were measured with the help of an imaging software (Figure 3).



**Figure 3** Dorsal view of the otolith of *H. maximus*

**Table 1** Morphometric measurements of *Holapogon maximus*, expressed in % of Standard length (SL) except the total length (TL) & SL

Morphometric characters	Specimen 1 % of SL	Specimen 2 % of SL	Specimen 3 % of SL	Specimen 4 % of SL
Total length (in mm)	223.96	197.68	172.5	157.53
Standard length (in mm)	177.83	163.6	129.17	124.62
Body depth	34.5	33.4	35.7	31.8
Inter-dorsal space	4.0	3.7	3.1	3.0
Head length	33.5	30.5	31.8	32.0
Orbit diameter	11.2	11.3	12.7	11.6
Interorbital length	9.4	10.2	9.6	9.0
Upper jaw length	17.3	12.4	13.5	11.5
Pre-orbital length	8.7	8.5	8.6	8.0
Post-orbital length	10.1	10.2	12.0	11.4
Pectoral length	26.7	26.4	27.4	26.0
Pre-dorsal length	39.4	37.3	39.0	38.3
Pre-pelvic length	36.3	33.1	35.4	34.5
Pre-anal length	59.8	66.5	63.1	63.5
Both Dorsal fin base lengths	35.1	37.3	38.8	37.5
Pelvic fin base length	4.7	4.3	4.7	4.5
Anal fin base length	15.6	15.6	15.2	14.1
Caudal peduncle length	20.4	20.0	19.9	19.0
Caudal peduncle depth	16.1	16.2	16.3	15.5
1st dorsal spine length	3.7	3.9	4.3	4.4
3rd dorsal spine length	14.6	15.9	18.8	17.8
9th dorsal spine length	13.5	13.4	16.7	15.6
1st dorsal ray length	21.7	21.3	23.8	21.6
last dorsal ray length	8.5	10.5	12.2	9.4
1st anal fin length	3.0	2.7	3.4	3.1
2nd anal fin length	12.0	12.8	14.2	13.3
1st anal ray length	18.8	19.4	21.8	20.8
last anal ray length	11.0	10.4	10.8	9.7
Pelvic spine length	12.9	13.2	15.7	13.8
1st pelvic ray length	20.7	20.6	21.3	20.4
5th pelvic ray length	17.9	17.4	19.2	16.5

#### 4. DISCUSSION

Apogonids are the seventh most common family in terms of new marine fish descriptions, and worldwide recorded about 32 new descriptions of apogonids over the past decade (Thacker and Roje, 2009; Eschmeyer and Fong, 2013). The present record adds to the species diversity of Apogonids from the Chennai region, that will provide a strong base for ichthyological studies in India. The present species was caught as a bycatch by trawlers operating along the Visakhapatnam area, in the northern part of the southeast coast of India. Previously it has been reported from the lower southern coast of Kochi to Tuticorin.

We propose that this species may have migrated to the northern coast of Tamil Nadu for feeding or spawning, or alternatively, it could be moving towards higher latitudes in response to environmental and climatic changes, including shifts in sea temperatures. In recent years, many apogonid species have been reported from Indian waters which attributes that fishing is taking place in deeper

waters which therefore bringing a high number of species as bycatch. The present study shows that bycatch monitoring is crucial for documenting fish diversity along the Indian coast.

### Acknowledgements

We express our sincere thanks to the Director, Zoological Survey of India for the support and facilities provided during the study. We are also thankful to the Officer-In-Charge, Marine Biology Regional Centre, Zoological Survey of India, Chennai for providing the necessary facilities for the research work.

### Author Contributions

SB and BKK collected the samples.

SB prepared the manuscript, the figures and the map.

BKK supervised and helped with manuscript correction.

### Ethical approval & declaration

In this article, as per the animal regulations followed in Marine Biology Regional Centre, Zoological Survey of India, Chennai-28, India, the authors observed & reported the Titan cardinal fish (*Holapogon maximus*) from a new locality (Chennai, South-East coast of India, Bay of Bengal). A total of four specimens were collected from the Kasimedu fish landing centre, located on the northern southeastern coast of India from the trawl bycatch in September 2023. The Animal ethical guidelines are followed in the study for species observation, identification & experimentation.

### Informed consent

Not applicable.

### Conflicts of interests:

The authors declare that there are no conflicts of interests.

### Funding:

The study has not received any external funding.

### Data and materials availability

All data associated with this study are present in the paper.

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