

**FIRST RECORD OF THE INDIAN OCEAN TWOSPOT CARDINALFISH,
CHEILODIPTERUS NOVEMSTRIATUS (ACTINOPTERYGII: PERCIFORMES:
APOGONIDAE), FROM TURKISH MARINE WATERS**

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Abstract. Indian Ocean twospot cardinalfish, *Cheilodipterus novemstriatus* (Rüppell, 1838), is recorded for the first time from the Turkish marine waters. Two specimens of *C. novemstriatus* were sampled with a purse seiner on 1 December 2014, and also a school of *C. novemstriatus* was photographed during scuba diving at a depth of 13 m on a rocky surface on 8 December 2014 in the Cevlik coast, Iskenderun Bay, north-eastern Mediterranean of Turkey. With the present report, the number of alien cardinal fish species reported in the Turkish coasts has reached five.

Keywords: fish, first country record, Lessepsian migration, colonisation, range extension

Nowadays many alien fish species, which entered the Mediterranean via the Suez Canal, have established dense populations in the north-eastern coastal waters of Turkey (Ergüden and Turan 2013). Some species have become abundant in the eastern Mediterranean ichthyofauna and also acquired an economic importance within the regional fisheries (Bariche et al. 2004).

To date, the family Apogonidae is represented in the eastern Mediterranean Sea by four genera and six species (Golani et al. 2002, Gon and Randall 2003, Froese and Pauly 2014), namely *Apogon imberbis* (Linnaeus, 1758); *Jaydia queketti* (Gilchrist, 1903); *Jaydia smithi* Kotthaus, 1970; *Apogonichthyoides pharaonis* (Bellotti, 1874); *Cheilodipterus novemstriatus* (Rüppell, 1838); and *Ostorhinchus fasciatus* (White, 1790). These five species are of Indo-Pacific origin while only *Apogon imberbis* is of Atlantic provenance. In recent years, cardinal fish species successfully established in the north-eastern Mediterranean coast of Turkey (Eryılmaz and Dalyan 2006, Goren et al. 2009, Turan 2010) and are now components of the Turkish ichthyofauna (Ergüden et al. 2013).

The Indian Ocean twospot cardinalfish, *Cheilodipterus novemstriatus*, was first reported in the Mediterranean

off Tel Aviv in June 2010 (Goren et al. 2010). Thereafter, Bariche and Azzurro (2012) recorded two specimens off shore, north of Beirut, Lebanon in July–August 2012. Lately, *C. novemstriatus* was reported to form dense aggregations along the Israeli coasts (Rothman et al. 2013).

In the present report, two specimens of Indian Ocean twospot cardinalfish, *Cheilodipterus novemstriatus* (Fig. 1) were caught by purse seiner on sandy-muddy bottom at a depth of 15 m on 1 December 2014 from the near Cevlik harbour, Iskenderun Bay, north-eastern Mediterranean coast of Turkey (36°07'N, 35°54'E). The collected two specimens were preserved in 4% formalin and deposited at the ichthyological collection of Marine Science and Technology Faculty, Mustafa Kemal University (Catalogue numbers: MSM-PIS/2014-5 and MSM-PIS/2014-6) (Fig. 1). Moreover, a school of numerous individuals of *C. novemstriatus* were photographed from the same location during scuba diving at a depth of 13 m on a rocky surface on 7 December 2014 (Fig. 2).

The identification of the specimens collected and observed in the Cevlik province were similar with those previously reported in Israel and Lebanon (Goren et al. 2010, Bariche and Azzurro 2012). Morphometric measurements

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Fig. 1. Indian Ocean twospot cardinalfish, *Cheilodipterus novemstriatus*, from the Cevlik harbour (Iskenderun Bay)



Fig. 2. Underwater photos of Indian Ocean twospot cardinalfish, *Cheilodipterus novemstriatus*, at Cevlik coast, Iskenderun Bay

of the specimens were made to the nearest 0.01 mm using digital calliper. All measurements, counts, the morphological descriptions and colours agree with the descriptions given by Gon and Randall (2003) and Goren et al. (2010).

The presently reported finding constitutes the first record of *Cheilodipterus novemstriatus* in the Turkish marine waters, thus increasing up to five the total number of alien cardinal fish species reported from the Turkish coastal waters. The occurrence of *C. novemstriatus* in the Mediterranean Sea can be attributed to migration from the Red Sea via the Suez Canal, and the fish were apparently following the northward pathway in the eastern Mediterranean Sea judging from previously reported records (Goren et al. 2010, Bariche and Azzurro 2012, Rothman et al. 2013).

The common size of *Cheilodipterus novemstriatus* is 2 to 6 cm, however, it can reach up to 8 cm TL (Randall 1995, Gon and Randall 2003, Froese and Pauly 2014). The length of the two specimens measured in this study was respectively 29.98 and 34.33 mm (standard length) and 40.78 and 46.75 mm (total length). All measurements and counts of those specimens of *C. novemstriatus* are given in Table 1.

Cheilodipterus novemstriatus preys on zooplankton and is commonly found in shallow waters of depths ranging from 1 to 10 m, in association with holes and under ledge of corals and rocky reefs (Randall 1995). It is widely distributed throughout the western Indian Ocean, from the Red Sea, through Gulf of Oman to the Persian Gulf (Froese and Pauly 2014). Dense populations on rocky substrate at depths down to 50 m were sighted in Israel (Brokovich et al. 2008). In the presently reported study, underwater observation (Fig. 2) suggested that there is also dense population of *C. novemstriatus* in Cevlik coast, indicating rapid expansion of this species in the Turkish coasts.

In the last decade, three cardinal fish species rapidly spread and established along the Turkish coasts (Ergüden et al. 2013), and several studies reported a range expansion

to westwards, along the north-eastern Mediterranean and Aegean Sea coast of Turkey (Gökoğlu et al. 2011a, 2011b, 2012, Filiz et al. 2012). The increase in water temperature has been considered as the main reason for the increasing introductions of tropical fish in the Mediterranean Sea (Galil 2009, Ben Rais Lasram et al. 2010, Golani 2010, Turan 2010, Öztürk and Turan 2014).

The immigration of Red Sea fish species from the Suez Channel is an ongoing process and it continuously affects and changing the local fish community (Golani 1998, Turan 2010). *Cheilodipterus novemstriatus* will probably be well established like other cardinal fish species in the Iskenderun Bay and along the Mediterranean coast of Turkey in the near future. The Red Sea migrants are continuously changing the fish communities in the eastern Mediterranean Sea. Therefore, the role of this newly established species within the coastal ecosystem, and its effect on local populations should be investigated.

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Table 1
Morphometric and meristic counts for two specimens of the Indian Ocean twospot cardinalfish, *Cheilodipterus novemstriatus*, from Turkish marine waters

Character	Value [mm]	Value [% TL]	Value [% HL]	Count
Total length (TL)	46.7–40.8			
Standard length (SL)		34.3–30.0		
Body depth (BD)		21.2–19.6		
Head length (HL)		20.5–19.8		
Eye diameter (ED)			46.1–46.0	
Interorbital width (IOW)			38.2–38.1	
Length of dorsal fin basis		12.4–8.9		
Length of second dorsal fin basis		14.0–11.8		
Length of anal fin basis		17.2–9.7		
Longest pectoral fin ray		18.4–14.7		
Longest pelvic fin ray		17.9–16.2		
No. of rays in first dorsal fin (D ₁)				7–6
No. of rays in second dorsal fin (D ₂)				I 9–I 9
No. of rays in anal fin (A)				II 8–II 8
No. of rays in pectoral fin (P)				12–12

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