

Short Communication

New records and establishment of the Indian Ocean twospot cardinalfish *Cheilodipterus novemstriatus* (Rüppell, 1838) in the Mediterranean Sea

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Abstract

New Mediterranean records of the non-indigenous apogonid *Cheilodipterus novemstriatus* along the Lebanese coasts are presented. In July–August 2012, two individuals were spotted north of Beirut at 35–37 m depth on two separate occasions. A school of small-sized individuals was photographed in a nearby location a few weeks later. These findings confirm the presence and likely establishment of the species in the Mediterranean Sea.

Key words: *Cheilodipterus novemstriatus*; cardinalfish; non-indigenous species; Lessepsian migration; Lebanon; Mediterranean Sea

Introduction

The Indian Ocean twospot cardinalfish, *Cheilodipterus novemstriatus* (Rüppell, 1838) is one of the most recent records of non-indigenous species in the Mediterranean Sea. Its first record dates back to June 2010 from Tel Aviv's coastal waters, where two specimens (55 and 66 mm TL) were collected by SCUBA divers from a shipwreck situated at 30 m depth (Goren et al. 2010). No additional individuals have been reported in the literature. The native range of the species includes the Red Sea, Gulf of Oman, and the Persian Gulf, where it can reach up to 80 mm TL (Randall 1995; Gon and Randall 2003; Froese and Pauly 2012). Like many tropical apogonids, *C. novemstriatus* is reef-associated, living in the vicinity of rocky shelters and coral ledges (Gon and Randall 2003). In the Mediterranean, *C. novemstriatus* might be sharing the same habitat with its congeneric native *Apogon imberbis* (Linnaeus, 1758) (Goren et al. 2010). Four out of the five non-indigenous cardinalfishes recorded in the Mediterranean Sea were found during the last six years (Eryilmaz and Daylan 2006; Golani et al. 2008; Goren et al. 2009; 2010).

Methods

Species identification was based on high resolution photos and using the descriptions given by Gon and Randall (2003) and Goren et al. (2010). Total lengths were estimated taking into consideration the optical magnification occurring underwater.

Results and discussion

On 30 July 2012, a single individual of *C. novemstriatus* (70 mm TL) was photographed at 35 m depth while SCUBA diving in the coastal waters of Lebanon (Figure 1A). The fish was recorded off the village of Halat (34° 05'18.3"N; 35°37'06.74"E), 25 km north of Beirut. It was living on a hard bottom covered with calcareous algae (Figure 1B). On 15 August 2012, a second individual (50 mm TL) was photographed in the same location at 37 m depth (Figure 1C). It was present nearby a rocky crevice, the bottom of which was composed of a soft substrate made of sediment and broken shells (Figure 1C). No other fishes were recorded in the close vicinity of the two specimens. On 8 September 2012, a school of about 20 small-sized individuals (30 mm TL) was photographed

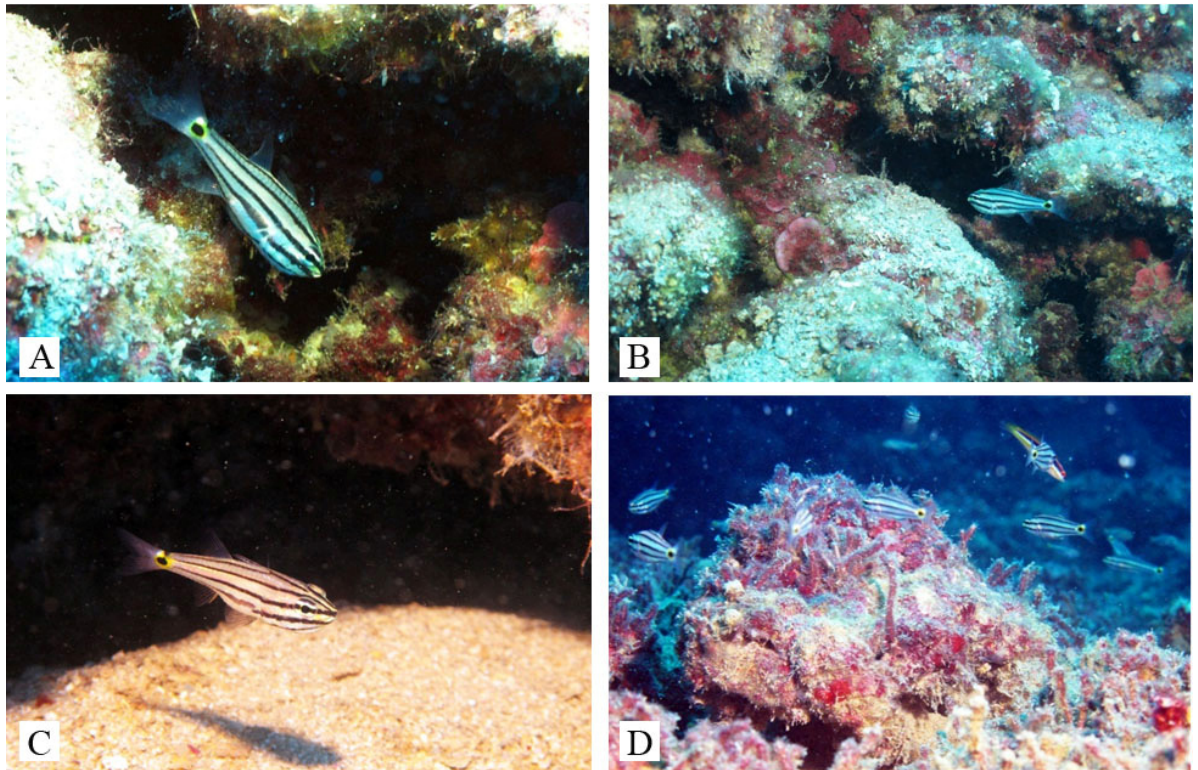


Figure 1. Underwater photos of *Cheilodipterus novemstriatus* showing characteristics used for identification and the habitat. (A, B) 30 July 2012; (C) 15 August 2012; (D) 8 September 2012. Photographs by J. Bacha.

at 33 m depth on another site, facing the village of Tabarja (34°01'52.97"N; 35°36'37.30"E). The site was constituted by several small crevices and overhangs and where two juveniles of the native wrass *Coris julis* (Linnaeus, 1758) were present nearby (Figure 1D).

Description of the specimens from Lebanon (Figures 1A,C): White body with five narrow longitudinal black stripes (Figure 1A). The upper stripe runs along the dorsal profile from upper caudal peduncle to head. The lower stripe (5th) passes along the ventral margin of the body and curves upward in front of the pelvic-fin insertion. The three remaining stripes run along the body in between, with the fourth stripe being slightly wider (Figure 1A). A black oval blotch encircled by a bright yellow circle area is present in the midlateral part of the caudal peduncle. Another smaller dark spot is visible on the upper side of the peduncle, and a small white area on its postero-dorsal section.

The peculiar colour pattern of the specimens from Lebanon matched the available descriptions for *C. novemstriatus* from the Red and the Mediterranean Seas (Gon and Randall 2003; Goren et al. 2010). However, the fish did not show a ventral dark spot on the lower side of the caudal peduncle. This might either be due to the fact that the spot is not visible on the photos or to its true absence on the individuals from Lebanon. This absence does not compromise the identification of the species as the lower spot is sometimes absent in individuals from the Red Sea (Gon and Randall 2003).

In its native geographic distribution, two other congeneric species display similar colour patterns. *Cheilodipterus quinquelineatus* Cuvier, 1828 differs mainly by the absence of dark spots on the dorsal and ventral surface of the caudal peduncle and *C. pygmaios* Gon, 1993 by the presence of a lower dark body stripe displaying a straight line between the isthmus and anal-fin

base and has a smaller number of rays on its pectoral fins (Gon and Randall 2003). While measurements of pectoral fin rays were not feasible from photos, the presence of a dark spot on the caudal peduncle and the absence of a lower dark longitudinal body stripe in a straight line (Figure 1A), allowed a clear distinction between the fish photographed in Lebanon and the two congeneric species (*C. quinquelineatus* and *C. pygmaios*). The array colours of *C. novemstriatus* are unique and suffice their distinction from all other cardinalfishes in the Mediterranean Sea (Figures 1A,C).

The sudden discovery of several individuals of *C. novemstriatus* in Lebanon constitutes an important update to its first record in the Mediterranean Sea. These observations were made about 230 km northwards of the species' first and only record from the Mediterranean Sea. The small size of the schooling individuals, probably juveniles, suggests the existence of local recruitment events (Figure 1D). This shows that the species may have established a self-sustaining population and has the potential to spread northwards in the eastern basin. Considering the sudden increase of non-indigenous cardinalfishes in the area (Eryilmaz and Dalyan 2006; Golani et al. 2008; Goren et al. 2009; 2010), these records are certainly significant.

Rise in seawater temperature has been considered the main reason for the recent increase of tropical fish introductions in the Mediterranean Sea (Galil 2009; Ben Rais Lasram et al. 2010). The sudden appearance of several non-indigenous cardinalfishes during the last six years has been mainly attributed to seawater warming (Goren et al. 2009). It has been suggested that fishes with parental care may have an advantage in the early stages of establishment (Moyle and Marchetti 2006; Moyle and García-Berthou 2011). All four recently recorded cardinalfish species belong to subfamily Apogoninae, known to be oral incubators (Nelson 2006). This behavioural characteristic might help cardinalfishes at the very early stages of establishment due to better chances of survival of their young.

Finally, we would like to highlight the importance of underwater visual records of non-indigenous species. All records of *C. novemstriatus* from the Mediterranean Sea were made by SCUBA divers (Goren et al. 2010; current paper). The information provided by divers, fishermen, and fervent sea lovers has been

shown valuable in unveiling the early presence of non-indigenous species and monitoring their spread in the rapid change of Mediterranean ecosystems (Azzurro et al. 2011). This reinforces the importance of involving non-professionals in helping scientists in the process of monitoring the changing Mediterranean biodiversity.

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