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Confirmed occurrence of Indian Ocean twospot Cardinalfish *Cheilodipterus novemstriatus* (Osteichthyes: Apogonidae) in the Levantine Sea: first record from the Syrian coast

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The authors present the first record of Indian Ocean twospot Cardinalfish Cheilodipterus novemstriatus *from the Syrian coast (eastern Mediterranean).The species is described including morphometric measurements and meristic counts. This new finding confirms the establishment of a viable population of* C. novemstriatus *occurs at present in the Levant Basin.*

Key words: Osteichthyes, Apogonidae, *Cheilodipterus novemstriatus*, Lessepsian migration, population

INTRODUCTION

Of the six species belonging to the family Apogonidae, which inhabit the Levantine Sea, in the Eastern Mediterranean, five are Lessepsian migrants (*sensu* POR, 1978), and among them, Indian Ocean twospot *Cheilodipterus novemstriatus* (RÜPPELL, 1838). It is considered as one of the most recent records of non-indigenous species known to date in the Mediterranean Sea (BARICHE & AZZURRO, 2012). *C. novemstriatus* was first recorded from Tel Aviv's coastal waters, where two specimens were collected by SCUBA divers from a shipwreck situated at 30 m depth (GOREN *et al.* 2010). BARICHE & AZZURRO (2012) photographed several specimens while SCUBA diving in the coastal waters of Lebanon, where it was also furtherly reported by ZENETOS *et al.* (2015). Additionally, CROCETTA *et al.* (2015) found the species in waters surrounding Cyprus Island, and IRMAK & ENGIN (2015) and TURAN *et al.* (2015) from the coast of Turkey, In Iskenderun Bay and off Mersin Province, respectively.

All observations concerning collected and/or underwater photographed specimens suggest that *C. novemstriatus* could be, at present, substantially established in the Eastern Mediterranean. Is native range includes the Red Sea, Gulf of Oman and the Persian Gulf (GON & RANDALL, 2003; FROESE & PAULY, 2017), and from these areas *C. novemstriatus* entered into the Mediterranean Sea, through Suez Canal.

Surveys regularly conducted in the Syrian marine waters since several decades (see SAAD, 2005) offered us the opportunity to collect a specimen of *Cheilodipterus novemstriatus* and

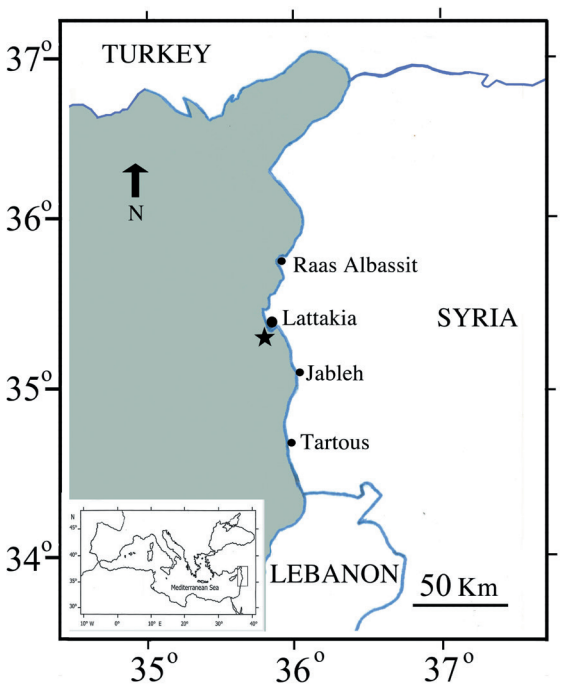

Fig. 1. Map of the Mediterranean Sea showing the coast of Syria and indicating the capture site of Cheilodipterus novemstriatus *(black star)*

comment and discuss on the species occurrence in the area and the Mediterranean Sea.

MATERIAL AND METHODS

The source of information about captures of species unknown or rare off the Syrian coast is the result of a collaboration with experienced fishermen aware of fishing grounds. The help of local communities was considered by researchers to enlarge and improve attention in fisheries research, it was referred as local ecological research following ANADÓN *et al.* (2009), used to track geographical distribution of alien species in their new living area (AZZURRO *et al*., 2011; AZZURRO & BARICHE, 2017).

On 02 October 2016, one specimen of *Cheilodipterus novemstriatus* (RÜPPELL, 1838), was captured from 25m off Lattakia Beach, located on the Syrian coast, by 35º 46´ E and 35º 29´ N (Fig. 1), using trammel net, on sandy bottom, at 6m depth., and described in the present paper, following BELLO *et al*. (2014). The specimen was

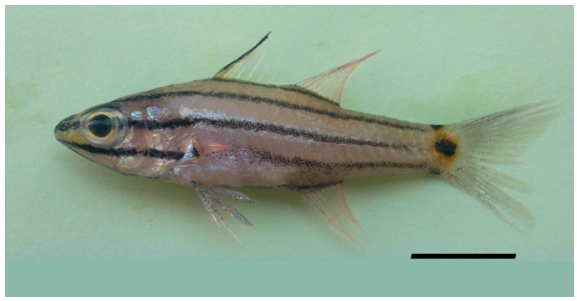

Fig. 2. Cheilodipterus novemstriatus *captured off the Syrian coast: (2279 MSL), scale bar = 10 mm*

delivered to the laboratory for examination, and all measurements were recorded to the nearest millimeter with digital caliper and the weight to the nearest milligram. Morphometric measurement with percentages of total length (%TL) are given in Table 1.

The specimen was preserved in 10% buffered formalin and deposited in the Ichthyologi-

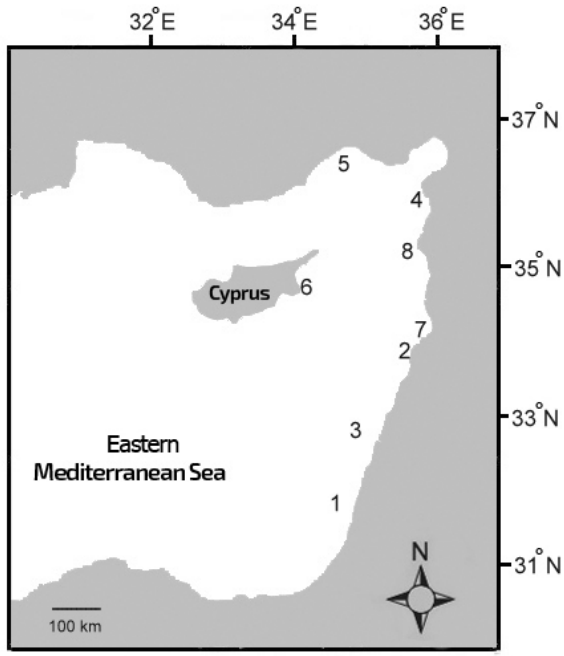

Fig. 3. Map of the Eastern Mediterranean indicating the capture sites of Cheilodipterus novemstriatus, *by chronological order. 1: Off Tel-Aviv (GOREN et al. (2010). 2: Northern Lebanon (BARICHE & AZZURRO, 2012). 3: Eastern Levantine Sea (ROTHMAN et al., 2013). 4: Iskenderun Bay, Turkish waters (TUREN et al., 2013). 5: Off Mersin, Turkish waters (IRMAK & ENGIN, 2015). 6: Cyprus waters (CROCETTA et al., 2015). 7: Northern Lebanon (ZENETOS et al., 2015). 8: Coast of Syria, this study.*

Table 1. Morphometric measurements in mm and meristic counts recorded from the specimen of *Cheilodipterus novemstriatus* (2279 MSL), captured off Syrian coast

Morphometric measurements	mm	%TL
Total length	48.7	100.0
Standard length	39.5	81.1
Fork length	44.9	92.2
Head length	14.2	29.2
Interorbital space	2.5	5.1
Eye diameter	4.9	10.1
Pectoral fin length	7.8	16.0
Pectoral fin base	1.4	2.9
First dorsal fin length	5.9	12.1
First dorsal fin height	6.3	12.9
Second dorsal fin length	7.7	15.8
Second dorsal fin height	9.2	18.9
Pelvic fin length	7.1	14.6
Anal fin length	8.3	17.0
Anal fin height	8.6	17.7
Body depth	10.2	20.9
Pre-pectoral length	14.1	29.0
Pre-first dorsal length	14.9	30.6
Pre-second dorsal length	21.8	44.8
Caudal peduncle length	11.2	23.0
First dorsal spine length of 1th dorsal fin	7.3	15.0
First dorsal spine length of 2th dorsal fin	8.8	18.1
Meristic counts		
First dorsal rays	VI	
Second dorsal rays	I + 9	
Pectoral fin rays	12	
Pelvic rays	I + 5	
Anal rays	II + 8	
Lateral line scales	23	

cal Collection of the Marine Sciences Laboratory, Agriculture Faculty at Tishreen University, Syria, under the catalogue number: 2279 M.S.L. (Fig. 2).

RESULTS AND DISCUSSION

The Syrian *Cheilodipterus novemstriatus* was a small specimen measuring 48.7mm TL and weighing 1.56g; it was identified by the following combination of characters: body oval, tapering backward, head large with large and rounded eyes, snout short and rounded, preopercle ridge smooth, the edge serrate on vertical part and around angle, but smooth on ventral part; small canine teeth in both jaws; no canines at lower jaw symphysis; two dorsal fins well separated, the origin of the first slightly beyond pelvic fin origin, anal fin opposite to second dorsal fin. caudal fin forked. Color of body pale brown, with 4 dark brown stripes; black caudal spot; front of first dorsal fin dark; other fins pale or slightly dark-pigmented, belly silvery with scattered dark spots on ventral and dorsal parts, but not on sides.

Morphology, colour, morphometric measurements and meristic counts observed in the Syrian specimen of *Cheilodipterus novemstriatus* are in total agreement with GON & RANDALL (2003), GOREN *et al.* (2010), BARICHE & AZZURRO (2012) and GOLANI *et al.* (2017). This finding increases the number of fish species previously reported in the same area (ALI *et al*., 2017), *C. novemstriatus* should be included among the number of Lessepsian fish species (*sensu* POR, 1978) found in the Syrian marine waters. The right number of Lessespian bony fish species recorded to date off the Syrian water is 45 species; 37 species were recorded by SAAD (2005), a species by SABOUR *et al.* (2014), and we recorded to date 7 species including *C. novemstriatus*. Additionally, a single elasmobranch species, honeycomb stingray *Himantura uarnak* (FORSSKÅL, 1775) was recorded (ALI *et al*., 2010). Present and previous records of *C. novemstriatus* are plotted in Figure 3, indicating that the species is at present substantially established in the Eastern Mediterranean.

Following GOREN *et al.* (2010) and BARICHE & AZZURRO (2012), such phenomenon is the result of the global warming of the Mediterranean waters since two decades at least (see FRANCOUR *et al*.,1994) and also due to the ability of these species to penetrate into the Mediterranean Sea through Suez Canal (QUIGNARD & TOMASINI, 2000), enhancing the introduction of exotic species in this sea. BARICHE & AZZURRO (2012) noted that most of records of *Cheilodipterus novemstriatus* were made by SCUBA divers, and following AZZURRO *et al.* (2011) noted that

information provided by fishermen and sea lovers cannot be totally ruled out, reflecting the role of local ecological knowledge in such investigations. Syrian fishermen reported they had seen more than once specimens of *Cheilodipterus novemstriatus,*, first time was in 2015, but they could not catch any specimen before 2016.

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Potvrđeni nalaz *Cheilodipterus novemstriatus* (Osteichthyes: Apogonidae) u Levantinskom moru: prvi nalaz na Sirijskoj obali

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SAŽETAK

U ovom radu autori potvrđuje se nalaz *Cheilodipterus novemstriatus* na sirijskoj obali (istočni Mediteran). Opisana je jedinka vrste, uključujući morfometrijska obilježja i merističke vrijednosti. Ovaj nalaz potvrđuje uspostavu populacije ove vrste u istočnom Sredozemlju.

Key words: Osteichthyes, Apogonidae, *Cheilodipterus novemstriatus*, lesepsijske migracije, populacija