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A new Pomacanthidae in the Mediterranean Sea: *Pomacanthus semicirculatus* (Cuvier, 1831) from Egyptian waters

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Abstract

The first record of *Pomacanthus semicirculatus* (Cuvier, 1831) in the Mediterranean Sea is reported, based on a specimen caught off Alexandria, Egypt, in November 2024. Description of the specimen, morphometric measurements and meristic characters are given. The native range of the species is the Indo-west Pacific region and its hypothesized introduction to Mediterranean Egyptian waters as a result of Lessepsian migration is plausible, pending confirmation of its occurrence within the wider region through additional records.

Keywords: Non-indigenous species; Lessepsian migrants; Pomacanthidae; semicircle angelfish; eastern Mediterranean Sea; Egypt.

Introduction

Five species of Pomacanthidae have hitherto been reported in the Mediterranean Sea, all listed as non-indigenous species (NIS): *Holacanthus africanus* Cadenat, 1951 with an East Atlantic native range, *Holacanthus ciliaris* (Linnaeus, 1758) and *Holacanthus bermudensis* Goode, 1876, both with a natural west Atlantic origin, the Indo-Pacific *Pomacanthus imperator* (Bloch, 1795) and *Pomacanthus maculosus* (Forsskål, 1775), both naturally distributed in the west Indian Ocean (Golani *et al*., 2021; Heemstra, 2022; Galanidi *et al*. 2023; Froese & Pauly, 2024).

Among the above listed species, *P. imperator* and *P. maculosus* are Lessepsian migrants, introduced through the Suez Canal and well-established within the eastern part of the basin (Golani & Fricke, 2018), both being previously recorded from Mediterranean Egyptian waters (Al Mabruk *et al*., 2021).

The waters of Egypt along the Mediterranean Sea are part of the so-called Lessepsian Province (Por 1990; Golani, 2010) and are heavily impacted by the introduction and establishment of NIS of Indo-Pacific/Red Sea origin (Galil *et al.*, 2017). Concerning fishes, the variety of coastal habitats from marine to brackish waters along the Egyptian coasts offers suitable environmental conditions for many tropical and subtropical fish species at their arrival into the Mediterranean Sea from the Red Sea, after crossing the Suez Canal corridor. To the list of Lessepsian migrant fishes already reported in Mediterranean Egypt (Halim & Rizkalla, 2011; Rizkalla & Heneish, 2021; Galil *et al*., 2021; Golani *et al*., 2021), in the last few years various other species were added (Nour *et al*., 2021, 2022a, b; Adel *et al*., 2022; Corsini-Foka & Zava, 2022 and references inside; Mehanna & Osman, 2022; Ragheb, 2022). A large number of these new records of NIS fish are reported from the waters between Alexandria, Abu Qir and Port Said, where fishing activities are intense and where many Lessepsian migrant fish species are common and have acquired commercial value (see Farrag *et al.*, 2019; Akel, 2020; Rizkalla & Heneish, 2021; Ragheb *et al*., 2022). This is an important area of the eastern Mediterranean for the detection of new and/or already recorded Lessepsian migrant fishes, being in the proximity of or at the mouth of the Suez Canal into the basin.

In the present note, the first record of the semicircle angelfish *Pomacanthus semicirculatus* (Cuvier, 1831) in

the Mediterranean Sea is described from Egyptian waters. Monitoring the possible spreading of this new NIS in the basin is necessary, before drawing further conclusions on the most probable introduction pathway.

Materials and Methods

On 15 November 2024, a single specimen of a fish unknown to fishers was caught near Nelson's Island, Abu-Qir Bay, Alexandria, Egypt (31.47461°N, 30.10583°E) (Fig. 1). The fish was collected early in the morning using a trammel net, known as "Kanar" in Arabic, from a water depth of about 7 m, over a sandy substrate. Photos of the freshly-caught fish were promptly sent to one of the authors (OMN) for identification; subsequently the specimen was deposited in the laboratory of the Biological Museum of the Department of Biological and Geological Sciences, Faculty of Education, Alexandria University. The same catch included other fish species, mainly *Sparus aurata* Linnaeus, 1758**,** *Balistes capriscus* Gmelin, 1789, the non-indigenous *Parupeneus forsskali* (Fourmanoir & Guézé, 1976) and a few individuals of the non-indigenous crab *Portunus segnis* (Forskål, 1775).

The specimen was photographed, weighed, and meristic counts were obtained while morphometric measurements were taken at an accuracy of 0.1 cm. Taxonomic identification was carried out to a species level following Sommer *et al*. (1996), Pyle (2001) and Heemstra (2022).

Results

The specimen had 238 mm in total length and 381 g in weight, showing the following characters (Fig. 2A): body laterally compressed, ovoid; body depth more than double of head length; dorsal fin continuous; dorsal and anal fins angular; soft-rayed portion of dorsal and anal fins large, the rear end of dorsal fin elongated into filaments overcoming the outer margin of caudal fin; caudal fin rounded; preopercle serrate, with a large sharp retrorse spine at angle (Fig. 2A, B). Mouth small, with slender, brush-like teeth (Fig. 2C); no teeth on vomer and palatines; two pairs of ovoid nostrils in front of eyes, the anterior larger than the posterior (Fig. 2C). Morphometric measurements (mm), proportions and meristic characters are presented in Table 1. *Colour in defrosted specimen*: body yellow brownish with numerous dark oval spots, posterior part of the body, dorsal, anal and caudal fins dark brownish with numerous rounded spots from whitish to bluish, particularly on caudal fin. Margin of preopercle and opercle blue (the spine of preopercle was blue before handling the specimen); spine and the second ray of pelvic fins blue. Three whitish narrow vertical bands visible on head, one in front of eye, one behind the eye and one on the opercle (Fig. 2A, B); a bluish line along the profile of head (Fig. 2C); three narrow semicircular pale faint bands on body.

Discussion

The general description of the body, the morphometric measures, the meristic counts and the characteristic colour pattern allowed us to identify the fish caught from Abu Qir as an adult of *Pomacanthus semicirculatus* and to distinguish it from other Pomacanthidae species (Sommer *et al*. 1996; Pyle, 2001; Burgess, 2002; Debelius, 2011; Heemstra, 2022), including those previously recorded from the Mediterranean, namely *Holacanthus africanus*, *H. ciliaris, H. bermudensis*, *P. imperator* and *P. maculosus*.

According to Pyle *et al*. (2010), Heemstra (2022) and Froese & Pauly (2024), the natural range of the semicircular angelfish *P. semicirculatus* is the Indo-west Pacific region: Red Sea, at least its southern region, Oman to South Africa, Madagascar, Seychelles and Mascarenes; elsewhere to Indonesia, southern Japan, Australia, Sol-

Fig. 1: Location of *Pomacanthus semicirculatus* capture (red star) in the Abu-Qir Bay, Egypt, Mediterranean Sea.

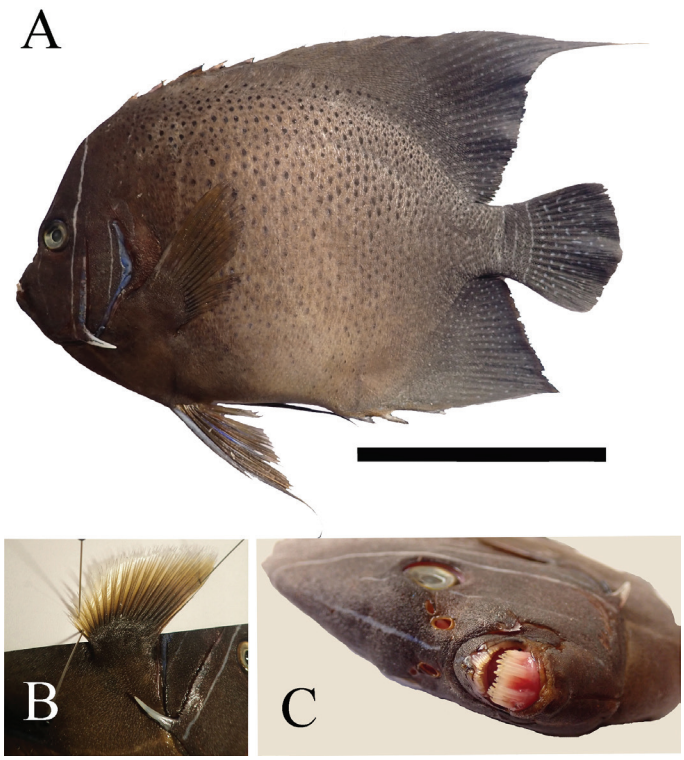

Fig. 2: The specimen of *Pomacanthus semicirculatus* (Cuvier, 1831) collected in Abu Qir, Alexandria, Egypt: A, the whole fish (black bar= 10 cm); B, the serrate preopercle and the spine (right side of the fish; a paper was placed under pectoral fin); C: frontal view of the head showing the teeth and the two pairs of nostrils.

Table 1. Morphometric measurements (mm), proportions (expressed as % of standard length and/or % of head length) and meristic characters of *Pomacanthus semicirculatus* specimen collected from off Alexandria, Egypt.

Measurements			
	mm	**% SL**	**% HL**
Total length	238.0		
Standard length (SL)	194.0		
Head length (HL)	54.0	27.8	
Body depth at 1st dorsal spine	113.0	58.2	
Maximum body depth	128.0	66.0	
Eye diameter	12.0	6.2	22.2
Snout length (from mouth to eye)	21.0	10.8	38.9
Preorbital length	12.6	6.5	23.3
Postorbital length	28.1	14.5	52.0
Length of the preopercular spine	17.0	8.8	31.5
Dorsal-fin base length	132.0	68.0	
Pectoral fin length	51.0	26.3	
Pelvic fin length	72.0	37.1	
Anal-fin base length	55.3	28.5	
Caudal fin length	43.0	22.2	
Caudal peduncle depth	27.0	13.9	
Caudal peduncle length	16.0	8.2	
Pre-dorsal distance	41.0	21.1	
Pre-pectoral distance	57.0	29.4	
Pre-pelvic distance	68.0	35.1	
Pre-anal distance	132.0	68.0	
Meristic characters			
Dorsal fin	XIII+22		
Anal fin	III+21		
Pelvic fins	I+5		
Pectoral fins	18		
Caudal fin	17		
Gill rakers of the first arch	5 in upper limb/13 in lower limb		
Lateral line scales	74		

omon Islands, New Caledonia and Fiji. It is worth noting that the occurrence of *P. semicirculatus* in the Red Sea was excluded by Golani & Bogorodsky (2010) and is consequently not reported in Golani & Fricke (2018). This species, mainly solitary, reaches a maximum total length of about 40 cm; it inhabits coral reefs at depths of 1 to 30 m and feeds on sponges, tunicates and algae; it is frequently exported through the aquarium trade (Heemstra, 2022; Froese & Pauly, 2024).

The region of Alexandria, Egypt, where *P. semicurculatus* was found, is not far from the mouth of the Suez Canal in the Mediterranean and the arrival of *P. semicirculatus* as a Lessepsian migrant appears plausible, although other records of this species in the area are required in order to confirm this hypothesized introduction pathway and the species' possible successful colonization of the new environment. The semicircle angelfish *P. semicirculatus* is a valuable ornamental marine fish (Heemstra, 2022; Froese & Pauly, 2024), but an accidental or deliberate release from the aquarium/pet industry appears less plausible as a potential introduction pathway, given that pet shops for marine ornamental fish and domestic aquaria are not common in Egypt (Nour *et al*., 2022a).

With this most recent addition of *P. semicirculatus*, the list of NIS fish of Indo-Pacific/Red Sea origin recorded from Mediterranean Egyptian waters currently surpasses the number of 70 species (see Nour *et al*., 2021, 2022b; Adel *et al*., 2022; Corsini-Foka & Zava, 2022 and references inside), most of which are Lessepsian migrants (Golani & Fricke, 2018). The abundance of new data on NIS collected in recent years is due to an increased scientific interest, supported in many cases by the contribution of citizen scientists and sensitized fishers through the use of new technologies that allow the fast acquisition of information (Corsni-Foka & Zava, 2022). Given the warming of sea water and the successive enlargements of the Suez Canal (Galil *et al.*, 2017; Galil, 2023), the Egyptian region under study could be considered as a hotspot for NIS detection, fundamental for early alerting at national and international level all people involved in NIS management.

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