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First record of the african surgeonfish *acanthurus monroviae* (osteichthyes: acanthuridae) in the hellenic waters

Abstract

Acanthurus monroviae inhabits the African coasts from Morocco to South Africa and the Canaries. It is distributed in various tropical and subtropical seas all around the world. The species feeds mainly on benthic algae and forms large schools that overwhelm other herbivorous fish species. It has been recorded at the Brazilian coasts and at the Western Mediterranean Sea. One individual was reported at the south-eastern basin of the Mediterranean on the coasts of Israel. The present study describes the first record of the species in the Hellenic waters that was captured by spear fishing at Salamina Island by one of the authors.

Keywords: Surgeonfish, Biodiversity, Introduced species, Aegean Sea, Ballast water

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Ioannis E Batjakas,[1] Thodoros E Kampouris,[2] Alexander Papadas[3]

[1]Department of marine Sciences, School of Environment, University of The Aegean, Hellas

[2]Centre for Marine Biodiversity and Biotechnology, Heriot-Watt University, UK

[3]Env-Lab, Hellas

Correspondence: Ioannis E Batjakas, Department of marine Sciences, School of Environment, University of The Aegean, University Hill, Mytilene, Hellas, Tel +302251036828, Email jbatijakas@marine.aegean.gr

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Introduction

The African surgeonfish belongs to the Acanthuridae family which is distributed in tropical and subtropical seas around the world, absent only from the Mediterranean.[1] It is a common fish, in its native geographical range, in the tropical regions of the eastern Atlantic from the coasts of Morocco to the South Africa,[2] the Capo Verde archipelagos and the Canaries. It dwells in lagoons and inshore habitats.[3] *Acanthurus monroviae* has also been recorded off the coast of south-eastern Brazil[4] and off the Portuguese coasts.[5] In the Mediterranean basin, only scattered individuals have been reported, almost exclusively found in western Mediterranean. *A. monroviae* was first recorded[6] in the Mediterranean off Marbella (Alboran Sea, southern Spain). Two specimens were reported in 2004 on the coasts of Algeriaby Hemida et al.[7] and in the year 2011 the species was recorded once again on the Tunisian coast.[8] As it concerns the south-eastern part of the Mediterranean Sea the first and only specimen was reported on the coasts of Israel.[9] This paper reports the capture of one specimen of *A. monroviae* off the Coast of Salamina Island near the city of Piraeus, Hellas. The specific individual is the first record for the Hellenic waters and the second one for the Eastern Mediterranean. A brief description of the specimen and a discussion the species biogeography in the Mediterranean follows.

Materials and Methods

One individual of the species *A. monroviae* (Figure 1) was caught by spear fishing, off the coasts of Salamina Island, by one of the authors at a depth of 10 meters over a rocky bottom. The specimen was identified according to Desoutter[2] and Golani et al.[10] and deposited at the Biology laboratory of the Marine Science Department, School of the Environment and University of the Aegean. Meristic and morphometric data were obtained. Liver and stomach were extracted and weighed and the hepatosomatic index (HIS) was calculated. Stomach contents were observed under a dissecting microscope.

Figure 1 *Acanthurus monroviae*, Steindachner, 1876 from Salamina Island.

Results

The species of the genus *Acanthurus* have deep compressed bodies with three (03) movable anal spines and a spine that looks like a lancet at the caudal peduncle before the caudal fin. The colour of the current specimen was dark brown to black, but the caudal peduncle had a yellow-orange spot, which is a typical anatomic component of the species. Its body was deep to elongate and compressed, and its scales were small and ctenoid. *A. monroviae* has fairly large rounded eyes, a small mouth and a convex snout profile. The individual had one long and continuous dorsal fin, with a broken first spike. The caudal fin was truncate to lunate. All the morphometric and meristic measurements taken are presented in Table 1. *Acanthurus monroviae* is an herbivorous fish species that feeds mainly on benthic algae and often can form large groups that may overwhelm other herbivorous fish such as the species of the family Pomacentridae.[11] The stomach and the rest of the digestive tract as well, in the specific specimen, were full of benthic algae.

Table 1 Meristic & Morphometric data from the *Acanthurus monroviae* from Salamina Island. Also, available meristic and morphometric data from other records of the genus are presented

	Current study	Crespo et al.[6]	Hemida et al.[7]	Luiz-júnior et al.[4]	Ben souissi et al.[8]	Costa & gonçalves[5]	Langeneck et al.[16] *acanthurus coeruleus juvenile*	Langeneck et al.[17] *acanthurus chirurgus*
Total length (TL)	256 mm	310 mm	380 mm		379 mm	250-300 mm	≈ 80 mm	≈ 100 mm
Fork length (FL)	223 mm		340 mm		335 mm			
Standard length (SL)	194 mm			350-400 mm				
Head length (HL)	54 mm		75 mm		82 mm			
Maximum body height (MBH)	104 mm		138 mm		128 mm			
Minimum body height (MBH)	45 mm							
Maximum body width (MBW)	38 mm		44 mm		41 mm			
Total weight (TW)	341,56 g				730 g			
Liver weight (LW)	3.52 g							
Stomach weight (SW)	4.39 g							
Dorsal fin (D)	IX+26	IX+26	IX+25		IX+25			
Pectoral fin (P)	17							
Anal fin (A)	VI+24	III+26	III+24		III+24			
Pelvic fin (V)	I+5				I+5			
Hepatosomatic index (HIS)	1.03							

Discussion

The meristic and morphometric results are matching with the diagnostic description of Desoutter[2] and with the described specimens at the studies of Randall[1] and Golani et al.[10] It has been suggested that the African surgeonfish, *A. monroviae*, hitherto recorded off the coasts of southern Spain, Tunisia, Algeria and Israel, do not represent isolated populations but rather a continuous "patchy" population from the shores of North Africa to Israel. This record does not fit that suggestion and generates a puzzling question on how that specimen arrived off the shores of Salamina Island. The proximity of the collection site to the largest harbour in Hellas (Piraeus) makes it a very probable site for appearance of marine exotic species introduced with the ballast water of merchant ships. Moreover, the biggest Naval base of the Hellenic Navy is based at Salamina Island (Northeastern part), that increases dramatically the hypothesis of the ballast water transportation. A similar example with the finding of this study is the record of the shrimp species *Penaeus aztecus in* north Aegean Sea, Thermaikos Gulf where, according to the authors the most probable way of introduction is through ballast water.[12] Furthermore, recent studies have stress that shipping is the major vector of alien species introduction in European waters and especially in Mediterranean basin.[13-15] According to Katsanevakis et al.[14] more than half of the marine alien species in Europe were introduced by shipping (fouling and ballast water). At the decade of 2000-2010 the introduced species via ballast water were more that those which their introduction was based on hull fouling.[14] In Eastern Mediterranean Sea and therefore in Aegean Sea the main driving forces of fish species introductions are firstly the transportation through the Suez Canal (Lessepsian migrants) and secondly the transportation through shipping and ballast water.[13,15]

A release (accidental, invoke or wilful) to the wild from ornamental fishes trade or from a private aquarium it cannot be excluded as well, since the Genus is among the commonest of aquarium trade. Two records of the genus *Acanthurus*had already reported in the Mediterranean Sea. The study of Langeneck et al.[16] reports the presence of *A. coeruleus* in Cyprus and the study of Langeneck et al.[17] records the species *A. chirurgus* from Elba Island, Tyrrhenian Sea. In addition, the study of Weitzmann et al.[18] reports the presence of the species *Zebrasoma flavescens* and Balistoides conspicillum; species strongly related with aquarium trade from Spain (Costa Daurada). Moreover, it should be noted that in Vouliagmeni Lake the release from a private aquarium was the vector of introduction of *Poecilia sphenops*.[19] The specific individual at the island of Salamis may be a Herculean immigrant sprinter. Similar case is the record of the *Fistularia commersonii* from Chalkidiki Peninsula, north Aegean Sea[20] only two years after the first record of the species in south Aegean Sea in Rhodes Island.[21] Another possible transport mechanism can be the movement of drifting material (both natural and artificial) due to southern winds and the association of tropical fish to them. In the recent past there were many records of allochthonous fish species with no clear way of introduction in the Mediterranean Sea and all researchers agree that the above mentioned phenomenon cannot be excluded as a possible way of introduction.[22,23]

The authors do not think that this applies here, because if this were the case recordings of African surgeonfish on other shores of southern Hellas such as Crete and Rhodes islands, etc. would be expected. Lastly, the presence of the species in Salamina Island could be totally random and unrelated to human activities as Langeneck[16] suggests or to be a vagabond individual as Dulčić & Dragičević[24] propose to their research. The gradual warming of the Aegean Sea and the Mediterranean Sea facilitates the immigration and the survival of Atlantic exotic species. Characteristic example that confirms the above consideration is the record of the species *Paranthias furcifer*in the Adriatic Sea[24] or the report of thermophilic species from north Aegean Sea such as the species *Ruvettus pretiosus*. The fish fauna composition of north Aegean Sea is more typically temperate with cold-water species while at south Aegean Sea more thermophilic species are present, including the Lessepsian immigrants.[25] It is very difficult to estimate the reasons of the species presence in Aegean Sea and Salamina Island from a single individual. The specific individual was feeding since its stomach was full with benthic algae a strong indication that it was healthy or able to survive in Aegean Sea, at least during summer. The species prefers warmer waters from 20 to 25 °C in tropical and subtropical areas,[3] thus its establishment in Hellenic waters seems to be improbable.

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Conflicts of interest

None.

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