



Rapid Communication

First record of *Abudefduf cfr saxatilis* Linnaeus, 1758 (Perciformes: Pomacentridae) from the Maltese Islands (Central Mediterranean)

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Abstract

The first sighting of *Abudefduf* individuals from Maltese (Central Mediterranean) coastal waters is reported. The individuals (6-7) were photographed in the field but were not collected. The pattern of body colouration of these individuals is consistent with that reported by most previous authors for *A. saxatilis*, marking the first record of this Atlantic species from Maltese waters.

Key words: Maltese Islands, Central Mediterranean, *Abudefduf*, non-indigenous species

Introduction

The Mediterranean Sea is currently besieged by an unprecedented influx of non-native marine species moving in, mainly through the Suez Canal (the so-called Lessepsian phenomenon) and, to a lesser extent, through the Gibraltar Straits. The total number of confirmed non-indigenous marine species in the Basin is approaching the 1000 mark (Zenetos et al. 2012). Fish rank fifth as the marine taxon with the highest number of non-indigenous species (NIS) recorded within the Mediterranean, with a total of 126 species (Zenetos et al. 2012), but excluding several Atlantic species considered vagrant or expanding their natural range in the Mediterranean. In recent years, an increasingly number of exotic species has been recorded in Malta, just east of the Sicily Strait, which demarcates the boundary between the Western and the Eastern Mediterranean. Sciberras and Schembri (2007) list almost 50 non-indigenous marine species from Maltese waters; however, many numerous additional species have been recorded since then.

Abudefduf Forskål, 1775 is a relatively large (20 valid species) genus of damselfish species

that are mainly associated with shallow coral reefs in tropical and sub-tropical seas. Jointly, the distribution of the twenty *Abudefduf* species girdles the globe. To date, two *Abudefduf* species have been recorded from the Mediterranean – the Atlantic *A. saxatilis* (Linnaeus, 1758) (Sergeant major), recorded from just one locality in the western half of the Mediterranean Basin (Tarragona, Spain – Azzurro et al. 2013), and the Indo-Pacific *A. vaigiensis* (Quoy & Gaimard, 1825) (Indo-Pacific sergeant), recorded from three localities in the Mediterranean: the Gulf of Naples in the lower Tyrrhenian Sea (Tardent 1959); the north coast of Israel (Goren and Galil 1998); and the Gulf of Genoa in the Ligurian Sea (Vacchi and Chiantore 2000). According to CIESM (2012), the latter species is establishing itself with increasing numbers in the Levantine Basin.

Methods and materials

During a SCUBA dive in October 2013, close to the cruise-ship passenger terminal within the Grand Harbour of Valletta, Malta (35°53.37'N, 14°30.52'E), one of the authors (A.D.) observed

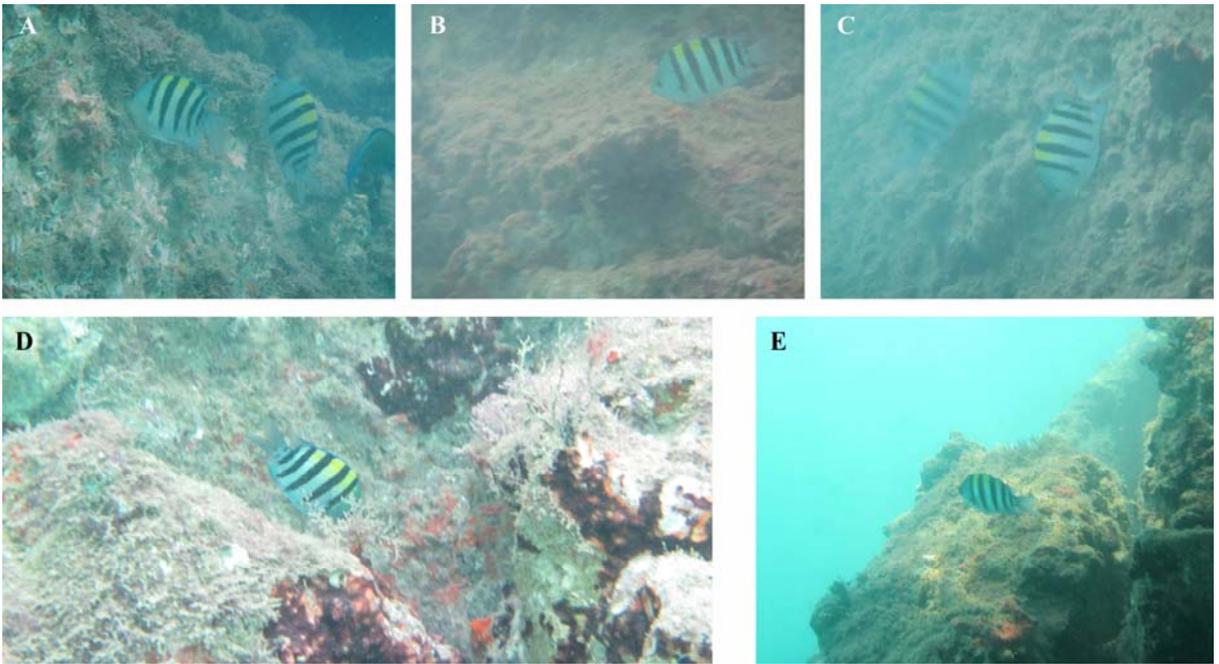


Figure 1 (A-E). Different aspects of the *Abudefduf* sp. individuals spotted within the Grand Harbour, Valletta, Malta.

a small school (6–7 individuals) of *Abudefduf* individuals, in association with a group of damselfish *Chromis chromis* (Linnaeus, 1758) at in shallow (1–2 m) waters and encircling coastal pylons making up the cruise liner berthing facilities. Photos of these same individuals were taken and are reported as Figure 1(A-E).

Results and conclusion

The description of the *Abudefduf* individuals sighted within the Grand Harbour in Valletta is consistent with that given by a number of authors for *A. saxatilis*, namely de Beaufort (1940), who states that the extension of the fifth vertical bar, from the posterior margin of dorsal and anal fin (visible in the photos included in this study), is an unambiguous character to identify this species. Another distinctive feature of *A. saxatilis*, which is again visible in the photos included in this study, is the presence of two black spots on the caudal peduncle (Philip C. Heemstra, Gerald R. Allen, pers. comm.) although these are considered by some (e.g. Randall 1996) to constitute an incomplete sixth bar. Yet another valuable distinguishing character, which typically requires specimen

collection, is the origin of the fourth dark bar, which, in *A. saxatilis*, is located directly behind the last dorsal spine and usually just makes contact with it. In *A. vaigiensis*, the fourth bar arises well behind the last spine, more towards the centre of the soft portion of the dorsal fin (Allen 1991). Azzurro et al (2013) also list yet another distinctive feature for *A. saxatilis* – the presence of a black spot at the upper base of the pectoral fins. Such a feature is also evident in some of the photographs taken in the field (Figures 1B and 1E).

However, according to Gerald R. Allen (Western Australian Museum, Perth, Australia; pers. comm.), there are no consistent meristic or morphometric differences between the two congeners, as emerging from the examination of different specimens of both species, from the Atlantic and the Pacific Oceans. Despite the consistency of our individuals with the features of *A. saxatilis*, we retrieved a number of photos of *Abudefduf* individuals from the internet, which have been ascribed to *A. vaigiensis* (probably on the sole basis of the geographical location of the sighting) but which actually exhibit the same characteristics described above for *A. saxatilis*. Similarly, there has been confusion in the past in classifying different

Abudefduf species, in particular in distinguishing between *A. saxatilis* and *A. vaigiensis*. Several authors (Herre 1936; Meek and Hildebrand 1925; Hildebrand 1946) assigned to *A. saxatilis* specimens they examined in the Pacific, which probably belonged to *A. vaigiensis* in view of the known biogeographical range for the two species. The large degree of overlap in the livery and morphology of *A. saxatilis* and *A. vaigiensis* is confirmed by Quenoille et al. (2011), who re-constructed the phylogenies of four tropical genera of fish, amongst which were *Abudefduf*. The results of this study indicate that these two *Abudefduf* species, along with *A. troschellii* (Gill, 1862) and *A. abdominalis* (Quoy & Gaimard, 1825), are very closely-related because they are separated by a short genetic distance. Hence, this molecular study was unable to conclusively elucidate the systematic validity of and phylogenetic relationship between the two *Abudefduf* species under study.

Although the authors of the current study are confident in assigning the *Abudefduf* individuals reported in Maltese waters to *A. saxatilis*, the (co-) occurrence of *A. vaigiensis* in Maltese waters is feasible from a biogeographical perspective because Maltese waters are geographically located close to the point of overlap between the known ranges of the two congeners, within the Sicily Channel, although the two species have never been recorded in sympatry. The fact that the *Abudefduf* individuals were spotted for the first time in Maltese waters in the Grand Harbour of Valletta is hardly surprising, considering that a number of other allochthonous marine species have been recorded in recent years from the same Harbour, including the Malabar grouper *Epinephelus malabaricus* (Bloch & Schneider, 1801) (Schembri and Tonna 2011) and the barred knifejaw *Oplegnathus fasciatus* (Temminck & Schlegel, 1844) (Schembri et al. 2010). In addition, the exact location within the Harbour where the *Abudefduf* individuals were located corresponds to the cruise liner terminal, which, in 2012 alone, witnessed calls by 322 cruise liners (MTA 2013).

Previous studies have invoked accidental or wilful release into the wild through the aquarium trade, passive dispersal through shipping (fouling or via ballast water), or even in association with floating debris (van der Elst 1988) as possible avenues for dispersal of *Abudefduf* species. The fact that the sighting within the Grand Harbour consisted of a number of individuals, rather than a single individual, might lead one to infer that release into the wild of aquarium individuals is the most probably avenue, although the importance

of the location in question for cruise liners might point towards shipping as a possible avenue.

Azzurro et al. (2013) highlight the importance of citizen science networks as a first alert of the arrival of new NIS. However, cryptic species offer a challenge to such networks, which can be only overcome through the collection of the specimens themselves (this was not possible in the current study), with subsequent closer morphological study, coupled possibly with molecular analyses.

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References

- Allen GR (1991) Damsel-fishes of the World. Mergus Publishers, Germany, 271 pp
- Azzurro E, Broglio E, Maynou F, Bariche M (2013) Citizen science detects the undetected: the case of *Abudefduf saxatilis* from the Mediterranean Sea. *Management of Biological Invasions* 4: 167–170, <http://dx.doi.org/10.3391/mbi.2013.4.2.10>
- CIESM (2012) Atlas of Exotic Species in the Mediterranean, <http://www.ciesm.org/atlas/> (Accessed 2nd December 2013)
- De Beaufort LF (1940) The fishes of the Indo-Australian Archipelago. Brill EJ (ed). Leiden, 508 pp
- Goren M, Galil BS (1998) First record of the Indo-Pacific coral reef fish *Abudefduf vaigiensis* (Quoy and Gaimard, 1825) in the Levant. *Israel Journal of Zoology* 44: 57–59
- Herre AW (1936) Fishes of the Crane Pacific Expedition. *Zoological Series – Field Museum of Natural History* XXI: 291–292
- Hildebrand SF (1946) A descriptive catalogue of the shore fishes of Peru. Smithsonian Institution United States National Museum, Bulletin 189, Washington
- Meek SE, Hildebrand SF (1925) The marine fishes of Panama. Publication n. 226. *Zoological Series Vol XV*, Field Museum of Natural History Chicago
- MTA (2013) Tourism in Malta, Valletta, Malta, 16 pp
- Quenoille B, Hubert N, Bermingham E, Planes S (2011) Speciation in tropical seas: allopatry followed by range change. *Molecular Phylogenetics and Evolution* 58: 546–552, <http://dx.doi.org/10.1016/j.ympev.2010.12.009>
- Randall JE (1996) Caribbean Reef Fishes, Third Edition, TFH Publications, Neptune City, NJ, 512 pp
- Schembri PJ, Bodilis P, Evans J, Francour P (2010) Occurrence of *Oplegnathus fasciatus* (Temminck et Schlegel, 1844) (Actinopterygii: Perciformes: Oplegnathidae) in Malta (Central Mediterranean) with a discussion on possible modes of entry. *Acta Ichthyologica et Piscatoria* 40(2): 101–104, <http://dx.doi.org/10.3750/AIP2010.40.2.01>
- Schembri PJ, Tonna R (2011) Occurrence of the Malabar grouper *Epinephelus malabaricus* (Bloch and Schneider, 1801) (Actinopterygii, Perciformes, Serranidae), in the Maltese Islands. *Aquatic Invasions* 6, Supplement 1: S129–S132, <http://dx.doi.org/10.3391/ai.2011.6.S1.029>

- Sciberras M, Schembri PJ (2007) A critical review of records of alien marine species from the Maltese Islands and surrounding waters (Central Mediterranean). *Mediterranean Marine Science* 8: 41–66
- Tardent P (1959) Capture d'un *Abudefduf saxatilis vaigiensis* Q. und G. (Pisces, Pomacentridae) dans le Golfe de Naples. *Revue Suisse de Zoologie* 66: 347–351
- Vacchi M, Chiantore M (2000) *Abudefduf vaigiensis* (Quoy & Guinnard, 1825) a tropical damselfish in the Mediterranean Sea. *Biologia Marina Mediterranea* 7(1): 841–843
- Van der Elst R (1988) A guide to the common seafishes of South Africa. P Borchert Editor, Cape Town, South Africa, 398 pp
- Zenetos A, Gofas S, Morri C, Rosso A, Violanti D, García Raso JE, Çinar ME, Almogi-Labin A, Ates AS, Azzurro E, Ballesteros E, Bianchi CN, Bilecenoglu M, Gambi MC, Giangrande A, Gravili C, Hyams-Kaphzan O, Karachle PK, Katsanevakis S, Lipej L, Mastrotoaro F, Mineur F, Pancucci-Papadopoulou M.A, Ramos Esplá A, Salas C, San Martín G, Sfriso A, Streftaris N, Verlaque M (2012) Alien species in the Mediterranean Sea by 2012. A contribution to the application of European Union's Marine Strategy Framework Directive (MSFD). Part 2. Introduction trends and pathways. *Mediterranean Marine Science* 13/2: 328–352