

**FIRST RECORD OF THE AZURE DEMOISELLE, *CHRYSIPTERA HEMICYANEA*
(ACTINOPTERYGII: PERCIFORMES: POMACENTRIDAE), IN THE MEDITERRANEAN SEA**

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Abstract. The azure demoiselle, *Chrysiptera hemicyanea* (Weber, 1913), is a marine fish native to the Indo-West Pacific and is commonly found in the aquarium industry around the world. A single individual was observed underwater at a depth of two meters in the coastal waters of Malta in June 2017. *Chrysiptera hemicyanea* is recorded from the Mediterranean Sea for the first time based on underwater photos and a video. The record suggests a very recent presence of the species in the Mediterranean, most probably a release from a tropical aquarium. The species cannot be considered yet established and monitoring of possible new individuals and awareness activities with the local community should be initiated.

Keywords: aquarium fish, alien, *Chrysiptera hemicyanea*, Malta, Mediterranean Sea

Damsel-fishes constitute a family of bony fishes found in all tropical oceans of the world, particularly the Indo-Pacific (Nelson 2006). The family is highly diverse, with about 407 species in total, of which 32 new species were described in the last 10 years (Eschmeyer et al. 2017). This is because of the presence of many species' complexes and colour patterns that vary between individuals and localities (Nelson 2006).

The azure demoiselle (or azure damselfish), *Chrysiptera hemicyanea* (Weber, 1913), is a marine fish native to the Indo-West Pacific, more specifically western and north-western Australia and Indonesia (Eschmeyer et al. 2017). It naturally lives in small groups, generally associated with *Acropora* corals (Froese and Pauly 2017). The fish is considered a desirable pet in the aquarium industry since it is hardy and beautifully coloured*.

On 26 June 2017, a single individual of azure demoiselle was spotted off Manoel Island within Marsaxmett Harbour, along the north-eastern coast of the island of Malta (35°54'4.51"N, 14°30'11.38"E). Several photos of the specimen were taken (Fig. 1) and a ten-second video of the specimen (<https://youtu.be/Or2-lAly14Y>) was shot, by one of the co-authors. The specimen was observed at a depth of 2 m over a bottom constituted by large rocks and boulders, mainly anthropogenic debris originating from construction works on land nearby. It appeared unfazed

by the human presence and was very approachable. The distinctive characters visible on the photos allowed an accurate identification of this common damselfish species, which is so popular in saltwater aquaria worldwide. In fact, the combination of a yellow, ventral livery, extending from the throat to the anterodorsal side of the caudal peduncle, including the pectoral, pelvic, and caudal fins, contrasting with the bright electric blue colouring of the remaining body parts, are characteristic features of the species. A complete description of the species is available in Allen (1991). The estimated size of the specimen inferred from the photos and video is that of approximately 4 cm in total length (Fig. 1).

The azure demoiselle is hereby reported for the first time from the Mediterranean Sea. The species is relatively easy to distinguish from the native damselfish, *Chromis chromis* (Linnaeus, 1758), as well as from the two exotic ones already reported from the Mediterranean, namely *Abudefduf vaigiensis* (Quoy et Gaimard, 1825) and *Abudefduf saxatilis* (Linnaeus, 1758) (see Goren and Galil 1998, Azzurro et al. 2013, Deidun and Castriota 2014, Vella et al. 2016a). The species can also be distinguished from other congeneric damselfishes with similar blue and yellow colour patterns. More specifically, *Chrysiptera parasema* (Fowler, 1918) is entirely blue with only the caudal fin and peduncle which are yellow. *Chrysiptera giti*

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** <http://animal-world.com>.

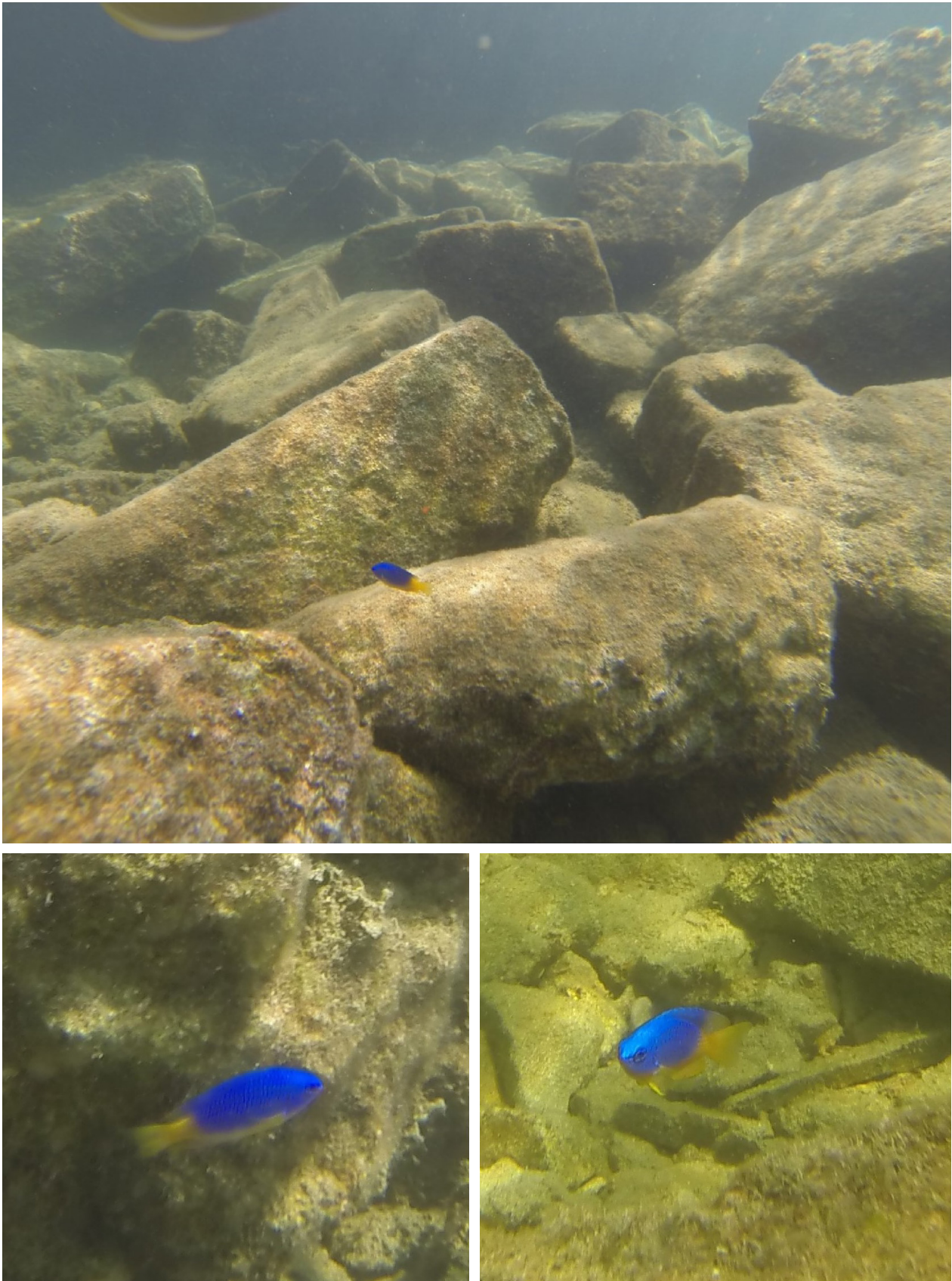


Fig. 1. Underwater photos of the azure damselfish *Chrysiptera hemicyanea* spotted at 2 m depth, off Manoel Island, Malta (35°54'4.51"N, 14°30'11.38"E)

Allen et Erdmann, 2008 is entirely blue, with the posterior portion of the body being abruptly yellow, behind the oblique line extending from the upper caudal-fin base to the anal fin origin, whilst *Chrysiptera arnazae* Allen, Erdmann et Barber, 2010 has the yellow colouration extending to the posterior side of the dorsal and anal fins, as well as to the pelvic fins (Allen et al. 2008, 2010).

Non-indigenous tropical marine fishes are currently being recorded throughout the Mediterranean Sea. They are entering from the Indo-Pacific through the Suez Canal (Lessepsian migration), from the tropical Atlantic through the Strait of Gibraltar (range-expansion), and through other vectors, such as aquaculture, aquarium releases, and ship transportation (Galil 2012, Zenetos et al. 2012, Galil et al. 2014). The geographic position of the Maltese Islands, roughly midway between the eastern and western basins, makes them an excellent location for recording and monitoring the arrival of non-native species (Sciberras and Schembri 2007). In fact, records in Maltese waters of non-native fishes from both the Indo-Pacific and Atlantic realms, but also from elsewhere are common (Sciberras and Schembri 2007, Schembri et al. 2010, Evans et al. 2015a, 2017, Vella et al. 2015, 2016a, 2016b, Deidun et al. 2016, Evans and Schembri 2017, Lipej et al. 2017). Several records for the Mediterranean have indeed first appeared in Maltese waters and this bonanza could be explained in terms of a combination of ‘real’ factors, namely the islands’ proximity to the major oil shipping traffic route in the Mediterranean (the Malta-Sicily Channel), the islands’ status as an oil rig maintenance hub (the Grand Harbour), as well as the unregulated and flourishing tropical aquarium market on the islands. This surfeit of new marine species records could also be due, however, to an artefact, namely the efficacy in recording new sightings, of citizen science campaigns conducted on the same islands in view of the relatively small extent of the Maltese coastal waters.

The most likely explanation for the presence of an individual of the azure demoiselle in the water of Malta is a release from a marine aquarium. This assumption is based on the facts that the species is popular in the tropical pet trade industry, has not, to date, been previously recorded within the Mediterranean basin, and in view of the geographic location of Malta within the central swathes of the same basin. Furthermore, the species has not been recorded from the Red Sea or the western Indian Ocean but is known exclusively from the western and north-western Australia and Indonesia (Eschmeyer et al. 2017, Froese and Pauly 2017). These facts rule out most introduction modes and long-distance dispersal methods such as through the Suez Canal. However, the hypothesis of a larval transport via ballast water through the Suez Canal cannot be completely ruled out and remain plausible, especially since the record was inside a harbour.

Several records of non-indigenous fish species from the Maltese waters, and the central Mediterranean at large, are of possible aquarium origin. These include the surgeonfish, *Acanthurus chirurgus* (Bloch, 1787); the damselfishes,

Abudefduf hoefleri (Steindachner, 1881) and *Stegastes variabilis* (Castelnau, 1855); the scat, *Scatophagus argus* (Linnaeus, 1766); and the snapper *Lutjanus fulviflamma* (Forsskål, 1775) (see Evans et al. 2015a, 2017, Vella et al. 2016c). The surgeonfish, *Acanthurus coeruleus* Bloch et Schneider, 1801, and the butterflyfish, *Heniochus intermedius* Steindachner, 1893, were first reported from the eastern Mediterranean but their presence could also be due to multiple aquarium release events, especially since no established population has ever been reported yet for these species (Evans et al. 2015b, 2017). The presence of another surgeonfish, namely *Acanthurus monroviae* Steindachner, 1876, is attributed to a range expansion from the Atlantic Ocean (Zenetos et al. 2012, Golani et al. 2015). However, subsequent records of the snapper, *Lutjanus sebae* (Cuvier, 1816) (see Gerovasileiou et al. 2017), whose first record in Greece was clearly due to an aquarium release, remain unexplained (Zenetos et al. 2016). Most fish species whose introduction is suspected to be linked with the tropical aquarium fish trade were reviewed by Zenetos et al. (2016), but the authors did not rule out entirely the possibility of them being transported to the Mediterranean via shipping, or for some, via the Suez Canal.

The absence of concrete evidence in support of an introduction from the aquarium trade for most species is probably the main reason why this introduction mechanism is not so well studied. It is safe to assume an aquarium release event when sporadically finding a highly colourful and conspicuous exotic fish, such as the *Chrysiptera hemicyanea* (Weber, 1913), that is common in the aquarium trade business and whose native range is far from the new recorded location. This is not the case for similar species, such as *Acanthurus monroviae* or *Heniochus intermedius*, whose native range encompasses neighbouring seas (eastern Atlantic or Red Sea). Finally, in view of this single record, the species could be listed in the Mediterranean as an “unestablished alien” (sensu Occhipinti-Ambrogi and Galil 2004) or “casual” (sensu Evans et al. 2015a). Since many ornamental species are intentionally released in the wild and some may potentially survive and become a nuisance, it is important to reinforce strict regulations on the aquarium trade business and to develop related education and awareness programs. To date, EU Regulation 1141/2016, which prioritises the Invasive Alien Species (IAS) destined for direct control measures within EU Member States, only lists terrestrial and freshwater species (Anonymous 2016). The lack of formal regulations concerning importation of marine exotic species indirectly translates itself in the proliferation within Maltese waters of non-indigenous marine species recorded for the first time for the Mediterranean, with most of the same species being popular in the aquarium trade. Informal public awareness campaigns about the dangers of intentionally releasing exotic species are being conducted in the Maltese Islands within the ambit of the Spot the Alien Fish citizen science initiative*, through social media and through participation in media (TV, radio) programmes.

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