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Rapid Communication

Far from home....the first documented capture of the genus *Elops* (Actinopterygii, Elopidae) from the Mediterranean

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Abstract

The tenpounder fish genus *Elops* Linnaeus, 1766 was recorded for the first time from the Mediterranean in October 2019, as a single individual was caught in Maltese waters. The genus has a disparate global distribution consisting of west Atlantic and west Pacific tropical and sub-tropical areas. A single individual was caught, but not retained, during artificial lighting-assisted purse seining, and the identification of the genus was determined based upon photographs submitted by the fisherman. The mechanisms of range expansion of the genus from the Atlantic into the Mediterranean are discussed.

Key words: range-expansion, first record, western Ionian Sea, Maltese Archipelago, *Elops* Linnaeus, 1766

Introduction

The seven known tenpounder/ladyfish (Genus *Elops* Linnaeus, 1766) species have a wide tropical-subtropical distribution and occur in most marine, coastal and estuarine waters at these latitudes of the Pacific, Indian and Atlantic Oceans (McBride et al. 2010). These species disperse as larvae or, rarely, as vagrant adults into temperate latitudes of the Atlantic and Pacific Oceans (Adams et al. 2014). Larval ladyfish develop into an elongate, flat, nearly transparent larval type known as a leptocephalus, which is considered an ancestral larval form present in a number of living teleost bony fish groups (Masterson 2008). Until 2010, when a seventh *Elops* species (*E. smithi* McBride, Rocha, Ruiz-Carus & Bowen, 2010) was proposed on the results of molecular analyses (McBride et al. 2010), six *Elops* species were known globally. These, now, seven *Elops* species have largely allopatric distributions, although sympatry is recorded for a number of species. For instance, according to Adams et al. (2014), two sympatric species, *Elops senegalensis* Regan, 1909 and *Elops lacerta* Valenciennes, 1847, occur in the Eastern Atlantic, whilst two largely allopatric species are recognized in the western Atlantic (*Elops saurus* Linnaeus,

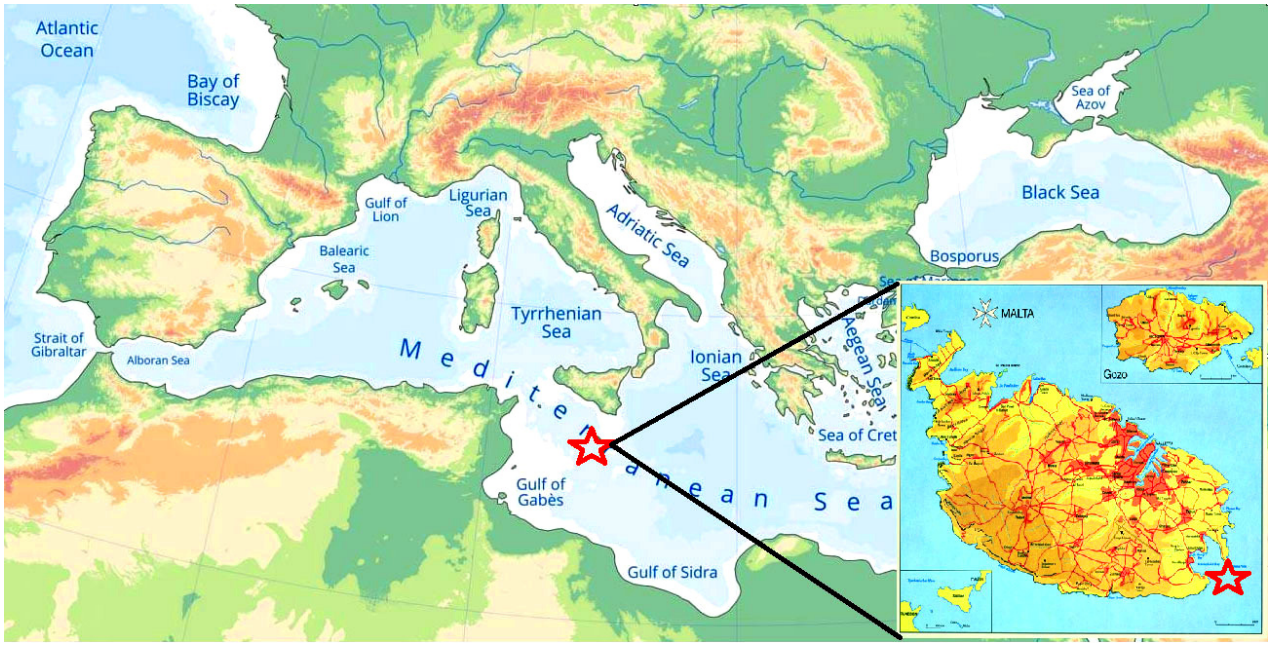

Figure 1. Location of capture (denoted by a red star) within Maltese waters of the *Elops* sp. individual reported here on October 10, 2019 via artificial lighting-assisted purse seining.

1766 and the recently described *Elops smithi*). The distributions of the latter two species overlap in the Gulf of Mexico and southeastern USA. Two Indo-Pacific species, *Elops hawaiensis* Regan, 1909 and *Elops machnata* (Forsskål, 1775), may also occur sympatrically, whilst the Eastern Pacific has a single species, *Elops affinis* Regan, 1909. This study represents the first record of an *Elops* species found within the Mediterranean; we discuss possible modes of introduction and impacts.

Materials and methods

On the 10th October 2019, a single *Elops* individual was caught off the south-eastern coast of the island of Malta (35.818340°N; 14.559242°E), in the central Mediterranean (western Ionian Sea), through artificial lighting-assisted purse seining (Figure 1). The specimen was photographed by the fisherman but was not retained, such that no morphometric and only limited meristic measurements could be collected. A number of photographs of the same specimen were submitted to the authors through the social media page of the "Spot the Alien Fish" citizen science campaign (www.aliensmalta.eu).

Results

The long, slender, silvery specimen was estimated to have a total length of 55–60 cm and elongated and pointed fins, including a deeply-forked caudal fin (Figure 2).

The fish was assigned tentatively to the *Elops* genus solely on the basis of the visual investigation of the submitted photos. The main diagnostic features that distinguish the seven *Elops* species from one another are the

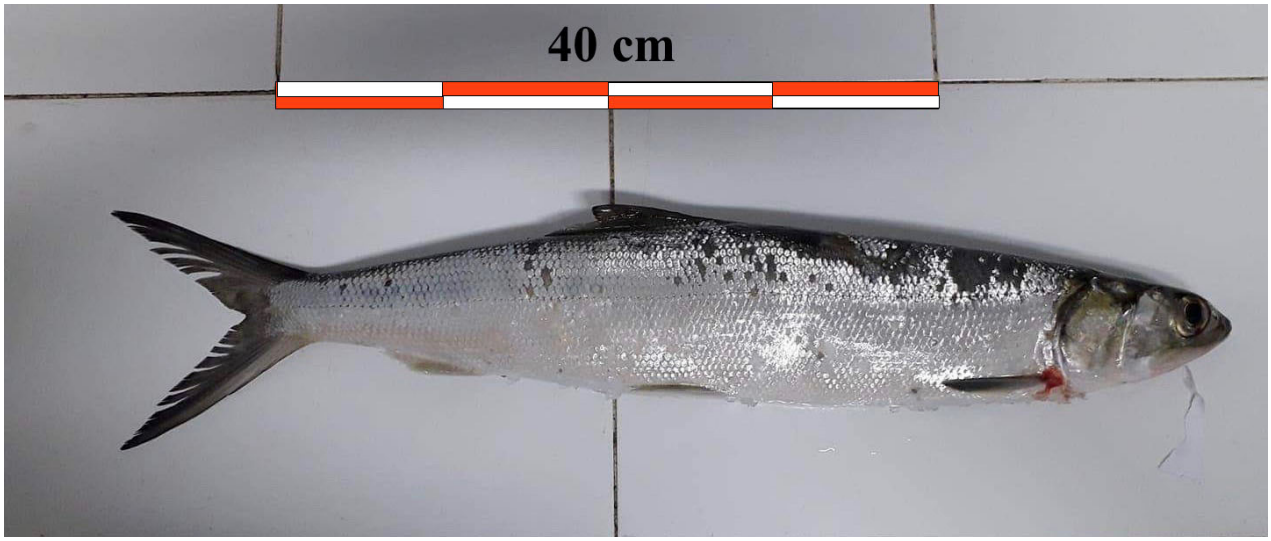

Figure 2. One of the original photographs of the *Elops* sp. individual submitted to the authors by the fisherman responsible for the catch.

vertebrae and gillraker counts for adults and myomere counts in larvae (McBride et al. 2010). Because both of these counts require the actual specimen in hand, we were not able to definitively assign the individual to a particular *Elops* species.

Additional distinguishing features of the different *Elops* species (besides the vertebrae and gill raker counts) include the number of lateral line scales. Whilst *E. saurus* is characterised by 119–128 lateral line scales (Hoese and Moore 1977; Jones et al. 1978), the lateral line scale number is less than 118 in all other *Elops* species. Our specimen had 120 lateral line scales, and we speculate that the individual caught in Malta could be *E. saurus*. However, since the Mediterranean is not in an area of sympatry, the lateral line scales cannot be used as a diagnostic feature between species (McBride et al. 2010). Given that we were not able to examine the individual ourselves for additional diagnostic features and the fact that scales in *Elops* species are small and easily displaced, our identification of the individual as *E. saurus* is highly tentative and speculative. Additional specimens are needed to confirm species identification via morphological features and molecular methods.

Discussion

Globally, no reports of introduced *Elops* species exist, such that the genus can be considered as having a very low invasive potential. However, most *Elops* species have a piscivorous diet (Sekavec 1974) and, thus, in large numbers, these species could exert considerable predatory pressure on indigenous species. In fact, one of the few studies on the diet of an *Elops* species (*E. saurus*) revealed that over 90% of the stomach contents of sampled *E. saurus* individuals consisted of fish (Sekavec 1974).

We tentatively assigned the species caught in Maltese waters as *E. saurus* Linnaeus, 1766, although we note that actual specimens are needed to

confirm this identification via molecular methods. *Elops saurus* is reported to have a disjunct global distribution from the western Atlantic along the eastern coast of North America as well as from a number of western Pacific Ocean locations (e.g. China, Vietnam, Taiwan). However, this distribution is questioned by some (e.g. Adams et al. 2014) due to the possibility of misidentification.

The larvae and juveniles of a number of *Elops* species are associated with estuaries and other low-salinity coastal areas in their native ranges (Govoni and Merriner 1978). However, the area of Maltese coast where this *Elops* sp. individual was caught has relatively high salinity waters and does not receive riverine/estuarine discharge. This is consistent with the fact that adults of this genus are regularly encountered throughout the year in polyhaline and marine waters (McBride et al. 2001).

Elops species are known for their schooling behaviour (Rieucau et al. 2015). However, only one *Elops* sp. individual was caught within Maltese waters. This might suggest that the caught individual was actually a vagrant one. The "vagrant adult" hypothesis is substantiated by the known dispersal of vagrant *Elops* sp. adults to more temperate latitudes of the Pacific and Atlantic Oceans (Adams et al. 2014). The capture of the specimen from Maltese waters in autumn is also consistent with the fact that sexually-mature ladyfish individuals are known to be offshore spawners, with such spawning normally taking place in autumn (McBride et al. 2010).

The first capture of an individual of the *Elops* genus from the Mediterranean Sea is consistent with its thermophilous nature (Zale and Merrifield 1989) and the progressive warming trend observed for the Basin in recent years (Lejeusne et al. 2010). The fact that the first Mediterranean record of the genus is from Maltese waters, and not from a peripheral region within the same Basin, is anomalous, especially since the genus is not used in the aquarium or pet industry, thus ruling out any deliberate release of the species within Maltese waters.

The genus' spread into the Mediterranean Basin could also have been promoted through ballast water-mediated transport via the larval or sub-adult form. However, given the relatively large dimensions of the specimen, a passive range-expansion mode of introduction is more likely. However, ballast-mediated, long-distance transport cannot be ruled out completely, especially if this species is actually an Indo-Pacific *Elops* species as this species would have to be introduced via the Suez Canal.

While the capture of a single *Elops* sp. individual in the Mediterranean Sea might represent a vagrant adult, its occurrence suggests that the genus could potentially survive in the Basin. Further surveys and liaison with fishermen are necessary to monitor for the potential further introduction of the genus within the region.

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