



# International Journal of Fisheries and Aquatic Studies

E-ISSN: 2347-5129

P-ISSN: 2394-0506

(ICV-Poland) Impact Value: 5.62

(GIF) Impact Factor: 0.549

IJFAS 2018; 6(3): 93-95

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www.fisheriesjournal.com

Received: 12-03-2018

Accepted: 13-04-2018

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## *Coryphaena hippurus*: A potential predator of *Lagocephalus sceleratus* in the Mediterranean Sea

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### Abstract

*Lagocephalus sceleratus* is considered as one of the most invasive Lessepsian immigrants introduced in the Mediterranean Sea. It is a highly toxic fish, considered as a pest for fisheries, the environment and the economy. Hitherto, its invasion has been favoured by the lack of natural predators and its non-commercial value. The present study reports the first published incidence of a juvenile *L. sceleratus* predation in the Mediterranean by an adult *Coryphaena hippurus*. This constitute a significant finding which can potentially guide future management efforts of *L. sceleratus* control in the basin; however, further research should be conducted to elucidate whether the catch was accidental or if the sustainable management of *C. hippurus* populations can potentially affect the early life stages of *L. sceleratus*.

**Keywords:** Mediterranean, lagocephalus, predation, mahi mahi, invasive, management

### 1. Introduction

*Lagocephalus sceleratus* (Gmelin, 1789), known as the silver-cheeked toadfish, is widely distributed widely in the tropical and subtropical waters of the Indian and Pacific Ocean, including the southern African shores and the Red Sea, recently entered in the Mediterranean Sea. Since its first record in the basin in 2003<sup>[1]</sup>, this Lessepsian immigrant has established populations along the coasts of the eastern Mediterranean basin, and expanded towards the western Basin; being recorded from Spain in 2014<sup>[2, 3]</sup>.

The species has received considerable attention from the public and the scientific community as it contains high concentrations of tetrodotoxin (TTX) in its tissues, which can be fatal when consumed<sup>[4, 5]</sup>. Although regulations have been imposed to prohibit sale and consumption of *Tetraodontidae*, such as *L. sceleratus* (e.g. EC 854/2004), more than 15 incidences of human intoxication have been reported from the eastern Mediterranean countries so far, most recently from Cyprus and Greece<sup>[6, 7]</sup>. *L. sceleratus* is also considered to cause ecological and economic damages and viewed as a pest by fishermen; capable of reducing the local stocks of important commercial cephalopod species, damaging fishing gears, deterring customers from buying fish and introducing additional effort to discard the fish<sup>[8-10]</sup>. These impacts have led scientists to classify *L. sceleratus* invasion among the 100 worst marine invasions in the Mediterranean basin<sup>[11]</sup>.

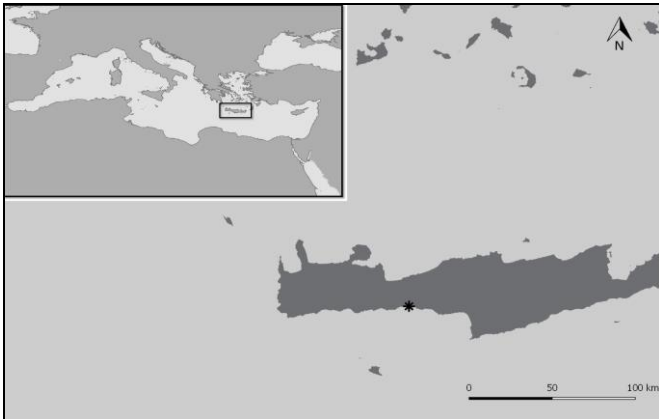
The non-commercial value of *L. sceleratus* and possible lack of natural predators<sup>[12]</sup> may have contributed to its rapid expansion in the Mediterranean Sea. To this end, some countries, such as Cyprus, have even provided financial compensation (i.e. €1-3 per kg) to encourage fishermen to target the fish in an effort to control its population<sup>[13]</sup>. To our knowledge, there is no previous documented information on natural predators for the species in the Mediterranean basin. Here, the first published incidence of *L. sceleratus* predation in the Mediterranean Sea is reported.

### 2. Materials and methods

In 2016, an online data repository was established by iSea (i.e. "Is it Alien to you.... Share it!!!"), in which citizen scientists could easily upload photographic material along with information on specimen size (length and/or weight), depth, number of specimens, exact location, date and type of observation (freediving, underwater photography, shore-base fishing, boat-based fishing, spearfishing). A Google Form and a Group on Facebook were established to facilitate these reports.

### 3. Results and Discussions

On 29 August 2017, a fisherman reported an incidence of potential predation of *L. sceleratus* through the citizen-science programme. Specifically, one individual of *Coryphaena hippurus* Linnaeus, 1758 was captured at 09:50 a.m. using shore angling, at Plakias harbour, South Rethymno (Crete, Greece) (35°11'34.4"N; 24°22'51.7"E) (Figure 1). The fish was found swimming in a school and caught over a sandy substrate at 4 m depth. The specimen weighted around 2-3 kg and was approximately 70 cm (fork) length (Figure 2A; B). A juvenile *L. sceleratus* of approximately 3 cm was found in the oesophagus. The prey appeared freshly consumed with no signs of degradation or digestion (Figure 2C; D). All the information and evidences were submitted to the programme.



**Fig 1:** The catch location of the *C. hippurus* that consumed a juvenile *L. Sceleratus* in South Crete, Greece.



**Fig 2:** The specimen of *C. hippurus* caught (A, B) and the juvenile *L. sceleratus* (C, D) found in the oesophagus.

It has been demonstrated that non-toxic species show low resistance to TTX and TTX-bearing organisms use it effectively as a defensive or offensive substance [14]. According to the results of Katikou *et al.* (2009) [15], toxicity was not detected in any of the tested tissues of two *L. sceleratus* specimens smaller than 16 cm. However, the effect of *L. sceleratus* consumption on other species acting as predators has not been extensively studied and therefore, any assumption would be ambiguous.

Studies in the Pacific and Atlantic Oceans and the Arabian Sea have found that *C. hippurus* may consume a variety of Tetraodontidae species, including the congeneric toxic species *L. lagocephalus* (Linnaeus, 1758) [16-20]. An earlier study on the diet of *C. hippurus* in the western Mediterranean Sea found a large proportion of epipelagic prey and indicated that

*C. hippurus* is a top predator, but no species of Tetraodontidae were reported [21]. However, many Tetraodontidae species such as *L. sceleratus* have been expanded into the Mediterranean after the study of [21] and it is therefore imperative that updated studies on the diet of *C. hippurus* are being conducted.

### 4. Conclusions

Studies on the diet of *C. hippurus* could usefully be undertaken to determine whether the species is a potential natural predator of juvenile *L. sceleratus* in the Mediterranean. Such information can be vital for managers as it can guide future strategies towards the control and management of the invasive *L. sceleratus* in the basin.

### 5. Acknowledgments

The authors are grateful to the fisherman Mr Konstantinos Tsagkarakis (Greece), for sharing his information and pictures to the citizen-science programme "Is it Alien to you.... Share it."

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