BioInvasions Records (2015) Volume 4, Issue 2: 139–142
doi: http://dx.doi.org/10.3391/bir.2015.4.2.11

Open Access

Rapid Communication

First record of the silver-cheeked toadfish *Lagocephalus sceleratus* (Gmelin, 1789) from Malta

Alan Deidun[1]*, Andreina Fenech-Farrugia[2], Luca Castriota[3], Manuela Falautano[3], Ernesto Azzurro[4] and Franco Andaloro[3]

[1]*Physical Oceanography Unit, University of Malta, Msida, MSD 2080 Malta*
[2]*Department of Fisheries and Aquaculture, Ministry for Sustainable Development, the Environment and Climate Change, Marsa, Malta*
[3]*Institute for Environmental Protection and Research (ISPRA), via Salvatore Puglisi 9, 90143 Palermo, Italy*
[4]*Institute for Environmental Protection and Research (ISPRA), Piazzale dei Marmi 2, 57123 Livorno, Italy*

**Corresponding author*
E-mail: alan.deidun@um.edu.mt

Received: 1 April 2015 / Accepted: 4 May 2015 / Published online: 14 May 2015

Handling editor: Vadim Panov

Abstract

The occurrence of the silver-cheeked toadfish, *Lagocephalus sceleratus*, is reported for the first time from Maltese waters. The specimen was caught at a depth of 15 m in a sparse sea grass *Posidonia oceanica* meadow. The need for a public information campaign on the danger to human health posed by the species, and to develop an early warning system of its spread, is discussed.

Key words: invasive species, fish, Mediterranean Sea, Tetraodontidae, Lessepsian

Introduction

One of the 'worst'invaders of the Mediterranean Sea (Streftaris and Zenetos 2006), the silver-cheeked toadfish *Lagocephalus sceleratus* (Gmelin, 1789) (Tetraodontidae) has exhibited a remarkable westward expansion within the Mediterranean Sea since its first record from Gökova Bay, Turkey, in 2004 (Filiz and Er 2004). Subsequently, this Lessepsian immigrant species has established large populations along the coasts of many countries of the eastern basin such as Israel, Lebanon, Turkey (Mediterranean and Aegean coasts), Cyprus, and Greece (Aegean and Ionian coasts), whilst still rapidly expanding westwards along the coasts of Egypt, Libya, and along the entire Tunisian coastline (Ben-Soussi et al. 2014). The species has been also recorded from the Strait of Sicily within the central Mediterranean, with individuals being caught off Lampedusa Island in October-November 2013 (Azzurro et al. 2014a) and off the eastern coast of Sicily in January 2014 (Tiralongo and Tibullo 2014). Šprem et al. (2014) document the northernmost record of the species from the Adriatic. *L. sceleratus* reached the coasts of Spain in July 2014 (Izquierdo-Muñoz and Izquierdo-Gomez 2014) after being recorded off the coast of Algeria over the December 2013-January 2014 period (Kara et al. 2015).

The high degree of attention to the members of the Tetraodontidae family by scientists and fishery operators is due to the tetrodotoxin contents in their tissues (mainly liver and gonads, but also skin and intestine) which, if ingested, may block vasomotor nerve function in mammals (including humans), ultimately causing death by paralysis of the respiratory muscles (Civera 2003; Katikou et al. 2009; Rodriguez et al. 2012). *L. sceleratus* is one of the most dangerous members of this family and, for this reason, its occurrence requires to be strictly monitored and promptly communicated to competent authorities in order to avoid health complications to humans (Azzurro et al. 2014a). The first record of *L. sceleratus* from Malta Island is here reported.

Figure 1. Lateral view of the *L. sceleratus* inividual (568 mm total length) caught in Maltese waters in August 2014. Photograph by Alan Deidun.

Materials and methods

The University of Malta was alerted to the potential capture of an individual of *L. sceleratus* during the first week of August 2014, by the Veterinary Affairs and Fisheries Division within the Ministry for Sustainable Development, the Environment and Climate Change. The specimen was promptly deposited at the Ministry by the fisherman making the catch. The same fisherman was interviewed to collect as many details as possible about the capture. Identification of the specimen, which was returned to the fisherman, upon his request, for taxidermic preservation, was in agreement with previous descriptions of *L. sceleratus* (Akyol et al. 2005 and literature therein). Morphometric measurements were taken to the nearest millimeter and relative length proportions were calculated.

Results and discussion

Morphometric data of the specimen of *L. sceleratus* collected in Maltese waters and relative length proportions (Table 1) generally corresponded to those reported in the literature for the specimens recorded from the Mediterranean Sea. The only exceptions were proportions involving head length (in particular preorbital length), which were higher than those reported in the relevant literature, likely because the head length of our specimen was relatively short. Its total length corresponded to that of an adult based on other *L. sceleratus* specimens collected in the Mediterranean (Kalogirou et al. 2013; Rousou et al. 2014, and literature therein).

Table 1. Morphometric characters measured for the *L. sceleratus* individual caught within Maltese waters.

Morphometric character	Dimensions in mm	Relative proportions
Total length (TL)	568	
Fork length (FL)	533	93.8%TL
Standard length (SL)	480	84.5%TL
Body depth (BD)	98	20.4%SL
Head length (HL)	100	20.8%SL
Eye diameter (ED)	33	33.0%HL
Caudal peduncle length (CpL)	111	23.1%SL
Preorbital length (PoL)	71	71.0%HL
Prepectoral length (PpL)	142	29.6%SL

The *L. sceleratus* specimen (Figure 1) was caught by means of a bottom long-line, baited with cuttlefish, from a depth of 15 m set on a seabed characterised by a sparse sea grass (*Posidonia oceanica* (Linnaeus) Delile, 1913) meadow. The location was at the mouth of Gnejna, a bay located along the north-west coast of Malta (geographical coordinates: 35°55'25.04"N, 14°20'27.83"E).

The sea surface temperature (SST) and salinity of the capture site were 28.0°C and 38, respectively.

There is a direct relationship between environmental conditions and the speed of spread and adaptation of new settlers (Mavruk and Avsar 2007). Water temperature is often considered the most important abiotic factor affecting dispersal of

Lessepsian species (Ben-Tuvia and Golani 1995), and the present warming trend of the Mediterranean waters appears to facilitate their westward spread from the already invaded eastern part of the basin (Bianchi 2007). The rapid spread and successful establishment of *L. sceleratus* in the Mediterranean Sea could be due to its somewhat broad thermal tolerance (e.g. Raitsos et al. 2010). Indeed, this tropical species has already penetrated colder Mediterranean areas, such as the north Aegean Sea.

L. sceleratus is reported to inhabit sandy or muddy substrates near shallow coral reefs at depths reaching 100 m, but it has been recorded from as deep as 250 m in the Red Sea (Kalogirou et al. 2012). According to the same authors, juveniles of the species are associated with sandy bottoms, with adults moving over to sea grass (*Posidonia oceanica*) meadows. The reported habitat preferences of the adult stage are consistent with those observed for the adult *L. sceleratus* individual from Maltese waters, which was caught over a seabed dominated by *P. oceanica* meadows.

The present record increases the number of alien species from the Maltese waters, recently reviewed by Evans et al. (2015).

The purported expansion of *L. sceleratus* within the Strait of Sicily strenghtens the case for a greater monitoring effort targeting non-indigenous marine species within the same geographical area. The setting up of a transboundary observatory within the Sicily Strait in the Central Mediterranean, as proposed by Azzurro et al. (2014b), could be one of the ways to spearhead such enhanced effort.

Acknowledgements

The authors would like to express their gratitude to the Maltese fisherman who was responsible for catching the reported individual, to Prof. Patrick J Schembri, from the Department of Biology of the University of Malta, for his technical guidance and to two unanimous reviewers for improving the manuscript through their constructive comments.

References

Akyol O, Ünal V, Ceyhan T, Bilecenoglu M (2005) First confirmed record of the silverside blaasop, *Lagocephalus sceleratus* (Gmelin, 1789), in the Mediterranean Sea. *Journal of Fish Biology* 66: 1183–1186, http://dx.doi.org/10.1111/j.0022-1112.2005.00667.x

Azzurro E, Castriota L, Falautano M, Giardina F, Andaloro F (2014a) The silver-cheeked toadfish *Lagocephalus sceleratus* (Gmelin, 1789) reaches Italian waters. *Journal of Applied Ichthyology* 30: 1050–1052, http://dx.doi.org/10.1111/jai.12471

Azzurro E, Ben Souissi J, Boughedir W, Castriota L, Deidun A, Falautano M, Ghanem R, Zammit-Mangion M, Andaloro F (2014b) The Sicily Strait: a transnational observatory for monitoring the advance of non indigenous species. *Biologia Marina Mediterranea* 21(1): 105–106

Ben Souissi J, Rifi M, Ghanem R, Ghozzi L, Boughedir W, Azzurro E (2014) *Lagocephalus sceleratus* (Gmelin, 1789) expands through the African coasts towards the Western Mediterranean Sea: A call for awareness. *Management of Biological Invasions* 5: 357–362, http://dx.doi.org/10.3391/mbi.2014.5.4.06

Ben-Tuvia A, Golani D (1995) Temperature as the main factor influencing the Lessepsian migration. In: La Méditerranée: Variabilités climatiques, environnement et biodiversité. Actes du Colloque Scientifique, Montpellier France, April 6–7, 1995, pp 159–161

Bianchi CN (2007) Biodiversity issues for the forthcoming tropical Mediterranean Sea. *Hydrobiologia* 580: 7–21, http://dx.doi.org/10.1007/s10750-006-0469-5

Civera T (2003) Species identification and safety of fish products. *Veterinary research communications* 27 (Suppl. 1): 481–489, http://dx.doi.org/10.1023/B:VERC.0000014205.87859.ab

Evans J, Barbara J, Schembri PJ (2015) Updated review of marine alien species and other 'newcomers' recorded from the Maltese Islands (Central Mediterranean). *Mediterranean Marine Science* 16(1): 225–244

Filiz H, Er M (2004) "Akdeniz'in Yeni Misafiri" (New guests in the Mediterranean Sea). *Deniz Magazin Dergisi* 3(68): 52–54

Izquierdo-Muñoz A, Izquierdo-Gomez D (2014) First record of *Lagocephalus sceleratus* (Gmelin, 1789) (Actinopterygii, Tetraodontidae) on the Mediterranean Spanish coast, pp 686-687. In: Katsanevakis S et al. (2014), New Mediterranean Biodiversity Records (October, 2014). *Mediterranean Marine Science* 15(3): 675–695

Kalogirou S, Wennhage H, Pihl L (2012) Non-indigenous species in Mediterranean fish assemblages: Contrasting feeding guilds of *Posidonia oceanica* meadows and sandy habitats. *Estuarine, Coastal and Shelf Science* 96: 209–218, http://dx.doi.org/10.1016/j.ecss.2011.11.008

Kalogirou S (2013) Ecological characteristics of the invasive pufferfish *Lagocephalus sceleratus* (Gmelin, 1789) in Rhodes, Eastern Mediterranean Sea. A case study from Rhodes. *Mediterranean Marine Science* 14: 251–260, http://dx.doi.org/10.12681/mms.364

Kara MH, Ben Lamine E, Francour P (2015) Range expansion of an invasive pufferfish, *Lagocephalus sceleratus* (Actinopterygii: Tetraodontiformes: Tetraodontidae), to the south-western Mediterranean. *Acta Ichthylogica et Piscatoria* 45(1): 103–108, http://dx.doi.org/10.3750/AIP2014.45.1.13

Katikou P, Georgantelis D, Sinouris N, Petsi A, Fotaras T (2009) First report on toxicity assessment of the Lessepsian migrant pufferfish *Lagocephalus sceleratus (*Gmelin, 1789) from European waters (Aegean Sea, Greece). *Toxicon* 54: 50–55, http://dx.doi.org/10.1016/j.toxicon.2009.03.012

Mavruk S, Avsar D (2007) Lesepsiyen Baliklarin Akdeniz Ekosistemine Etkileri [The Effects of Lessepsian Fishes on the Mediterranean Ecosystem]. Ulusal Su Gunleri 2007. Antalya, Turkey, May 16–18, 2007. *Turkish Journal of Aquatic Life* 5–8: 380–386

Raitsos DE, Beaugrand G, Georgopoulos D, Zenetos A, Pancucci-Papadopoulou AM, Theocharis A, Papathanassiou E (2010) Global climate change amplifies the entry of tropical species into the Eastern Mediterranean Sea. *Limnology and Oceanography* 55: 1478–1484, http://dx.doi.org/10.4319/lo.2010.55.4.1478

Rodriguez P, Alfonso A, Otero P, Katikou P, Georgantelis D, Botana LM (2012) Liquid chromatography-mass spectrometry method to detect tetrodotoxin and its analogues in the puffer fish *Lagocephalus sceleratus* (Gmelin, 1789) from European waters. *Food Chemistry* 132: 1103–1111, http://dx.doi.org/10.1016/j.foodchem.2011.11.081

Rousou M, Ganias K, Kletou D, Loucaides A, Tsinganis M (2014) Maturity of the pufferfish *Lagocephalus sceleratus* in the southeastern Mediterranean Sea. *Sexuality and Early*

Development in Aquatic Organisms 1: 35–44, http://dx.doi.org/10.3354/sedao00005

Šprem JD, Dobroslavić T, Kožul V, Kuzman A, Dulčić J (2014) First record of *Lagocephalus sceleratus* in the Adriatic Sea (Croatian coast), a Lessepsian migrant. *Cybium* 38(2): 147–148

Streftaris N, Zenetos A (2006) Alien Marine Species in the Mediterranean – the 100 'Worst Invasives' and their impact. *Mediterranean Marine Science* 7: 87–118, http://dx.doi.org/10.12681/mms.180

Tiralongo F, Tibullo D (2014) *Lagocephalus sceleratus* (Gmelin, 1789), (Pisces: Tetraodontidae) reaches the Italian Ionian Sea, pp 203–204. In: Kapiris et al. (2014) New Mediterranean Marine Biodiversity Records. *Mediterranean Marine Science* 15(1): 198–212