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RESEARCH ARTICLE

Documenting the occurrence of the Lessepsian fish *Stephanolepis diaspros* within the Strait of Sicily, central Mediterranean

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Abstract

The increasing occurrence of the reticulated leatherjacket, *Stephanolepis diaspros* (Tetraodontiformes, Monacanthidae), a Lessepsian migrant, within the Strait of Sicily, central Mediterranean, is documented in this study. This is done through the collation of records of the species from coastal waters off the Maltese Islands, collected between August 2007 and May 2011, and through the publication of the second validated record for the same species, collected on 10 December 2013 from the island of Lampedusa (Pelagian Islands).

Keywords: Monacanthidae, *Stephanolepis diaspros*, Lessepsian, Strait of Sicily, reticulated leatherjacket, central Mediterranean

Introduction

The Mediterranean Sea has been identified as the recipient of the greatest number of exotic species in the world. Recent estimates indicate that, between 1970 and 2013, the number of recorded non-indigenous species (NIS) in the Mediterranean has grown by 204% (Galil *et al.* 2014). According to the ISPRA NIS record database (Andaloro *et al.* 2012), updated up to June 2014, Lessepsian fish species currently constitute almost half of the total of 171 exotic fish species recorded within the Mediterranean, with the remaining number constituted by Atlantic immigrants and NIS introduced by human activities.

The Strait of Sicily represents the major West-East transition zone within the Mediterranean, both from a shipping, hydrodynamic and biogeographical perspective. Despite its restricted dimensions, the Strait plays an important role in the hydrodynamic processes evolving in the entire basin and, indirectly, also in the North Atlantic (Garcia Lafuente *et al.* 2005). In view of its biogeographic importance, this area within the central Mediterranean, including the two isolated (from the mainland) archipelagos of the Maltese and the Pelagian Islands, is considered as a strategic observation outpost for the monitoring of marine non-indigenous species (Azzurro *et al.* 2014a).

Stephanolepis diaspros Fraser-Brünner, 1940, is a tropical file fish species of Indo-Pacific affinity which is also very common in the Red Sea. In fact, the species is known from the western Indian Ocean, from the Persian Gulf to the Red Sea (Hutchins 1984). *S. diaspros* is usually encountered on rocky bottoms with vegetation, but is also found on sandy and muddy bottoms as well as from seagrass meadows (Tortonese 1975; Golani *et al.* 2002). In the Mediterranean, this species was first recorded in the Levantine Basin in 1927 as *Monacanthus setifer* (Steinitz 1927); it then spread throughout the eastern basin, subsequently entering the western basin where it reached the northern Tunisian coast and the Gulf of Palermo (southern Tyrrhenian Sea) (Catalano and Zava 1993), and the Adriatic Sea as north as the Slovenian coast (Kapiris *et al.* 2014).

S. diaspros is one of two species representing the family Monacanthidae in the Mediterranean which, is considered by many authors as a species of no commercial value (e.g. Golani *et al.* 2002), although very abundant in the landings of commercial trawlers from the Suez Canal (El-Ganainy and Sabra 2008).

Despite *S. diaspros* being first reported from Maltese waters over 35 years ago, records since then of the species from the same waters have been highly infrequent. For instance, for Maltese waters, the species is listed in Lanfranco (1993), whilst the Maltese records for the species within www.fishbase.org refer to two sightings in 2001 and in March 2002 of a 4-cm juvenile at a depth of 26 m over a sandy seabed sparsely colonised by *Posidonia oceanica* (Froese and Pauly 2011). No further published records of the species from Maltese coastal waters exist.

In coastal waters off Lampedusa, a juvenile *S. diaspros* was observed underwater in 1986 (Catalano and Zava 1993), after which there was no further trace of its occurrence in this area till 2007, when this species was again reported during an awareness campaign carried out on rare and exotic species (Azzurro 2010).

Materials and Methods

In the Maltese Islands, SCUBA diving and angling clubs, as well as amateur fishermen, were interviewed in 2011 to collate a list of photographed and anecdotal records of *S. diaspros* from Maltese coastal waters over the 2007-2011 period. Similarly, in Lampedusa, within the Pelagian Islands, constant liaison with fishermen, boat owners, SCUBA divers and other sea-goers was maintained in order to tap their Local Ecological Knowledge (LEK) concerning marine alien species (Azzurro *et al.* 2011). From this area, one specimen of *S. diaspros* was caught, photographed and released alive in December 2013.

The geographical location of the study area is given in Figure 1.

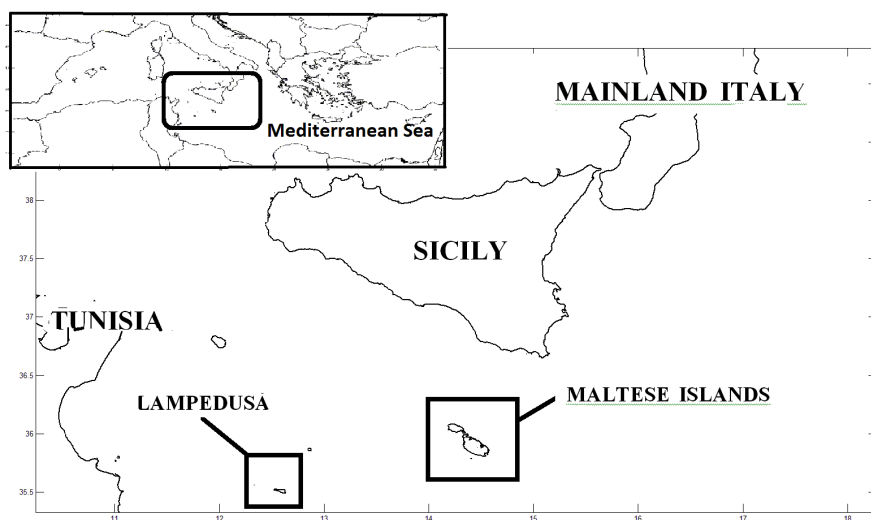


Figure 1. The study area

Results

Table 1 summarises the records of *S. diaspros* in Maltese coastal waters in recent years, whilst Figure 2 refers to one of the few authenticated report for the species in the same waters. All the *S. diaspros* individuals recorded in Maltese coastal waters occurred at depths less than 20 m, over seabeds colonised by at least a modicum of *P. oceanica*. This is consistent with the description of the habit of the species by Golani *et al.* (2006), who state that the species is to be found in inshore waters along algae-covered rocky habitats, up to a depth of 20 m, since it feeds on small-rock dwelling organisms that are plucked in sandy or muddy open flat grounds. The species was not observed to shoal within Maltese waters, with observed specimens occurring in most cases as individuals or, at most, as pairs. This might be indicative of the fact that either the observed

individuals were vagrants or that they were not juveniles, since, as reported by a number of authors (e.g. Golani *et al.* 2006), young *S. diaspros* tend to school. On 10 December 2013, one specimen of *S. diaspros* was caught in coastal waters off Lampedusa Island, near Capo Ponente (Strait of Sicily, 35°31'15"N, 12°30'57"E). Located at a distance of 113 km from the Tunisian coast and 176 km from either Sicily or the Maltese Islands, Lampedusa forms part of the Pelagian archipelago, which lies in the Strait of Sicily in the central Mediterranean. The specimen was collected in the morning (about 11:00 a.m.) by hand-line, baited with bits of squid, from a depth of about 20m, off a sandy seabed sparsely colonised by *P. oceanica* seagrass. The specimen was caught by one of the authors (G. Maraventano), photographed and released alive back into the wild. Unfortunately, morphometric and meristic features of the specimen were not recorded before the release, while the total length was only estimated. The photograph of the same species, taken by means of a mobile telephone, in spite of low quality, exhibits the distinctive characters and livery pattern of *S. diaspros*, following Fraser-Brüner (1940) and Tortonese (1975). This specimen was the first ever caught for the species from waters off the island of Lampedusa, since the single previous record of the same species from the same waters is based solely on an underwater observation.

Table 1. Details of records of *Stephanolepis diaspros* in Maltese coastal waters made over the 2007-2011 period

Date	Location*	Number of Individuals	Caught or Observed
Reports for photographed individuals			
15.05.11	Cirkewwa (Malta)	1	Photographed, in close propinquity to a diving wreck (P31 tugboat) at 14m
14.01.11	Zurrieq	1	Photographed, 15-20m depth
Anecdotal reports			
23.05.11	Paradise Bay	1	
18.08.10	Paradise Bay	1	Observed, 15-20m depth
July 2010	Comino Island	1	Observed, in close propinquity to a diving wreck (P31 tugboat)
09.10.09	Zurrieq	1	Observed, 15-20m depth
20.12.08	Zurrieq	2	Observed, 15-20m depth
22.12.08	Zurrieq	2	Observed, 15-20m depth
23.12.08	Zurrieq	2	Observed, 15-20m depth
03.12.08	Zurrieq	1	Observed, 15-20m depth
07.12.08	Zurrieq	1	Observed, 15-20m depth
31.08.07	Xatt l-Ahmar	1	Observed, 15-20m depth

*Coordinates: Cirkewwa (Malta) 35°59'11"N, 14°19'41"E; Zurrieq 35°49'17"N, 14°27'8"E

The specimen of *S. diaspros* caught in coastal waters of the island of Lampedusa and shown in Figure 3 exhibited a greyish colour laterally, with dark green striations radiating downward from the eye across the cheek, with dark green speckles on the cheek, and green-yellowish patches along body sides, the fins were pale yellow, the soft dorsal one centrally transparent with pale yellow borders and with a light brownish patch anteriorly, with the 2nd ray extended in a long filament.



Figure 2. *Stephanolepis diaspros* photographed at a depth of 34m at Cirkewwa, Malta.
Photo by Mr. Adrian Buttigieg



Figure 3. Specimen of *Stephanolepis diaspros* caught off the island of Lampedusa

It showed a deep and compressed body, straight snout with small terminal mouth, a single dorsal spine originating just above posterior margin of eye, second dorsal fin opposite to anal fin, pelvic fin absent. The specimen had a total length of about 18-20 cm.

Discussion

S. diaspros is the only definitely identified member of the genus *Stephanolepis* Gill, 1861 occurring in the Mediterranean. However, Ben Amor and Capapé (2008) recorded the capture of specimens of *Stephanolepis* sp. from northern Tunisia, whose livery resembles that of its Atlantic congener *S. hispidus*. *S. diaspros* is recognizable by the unique dorsal spine, that distinguishes it from Balistidae members (Tortonese 1975), and by its characteristic livery consisting of dark lozenge-shaped blotches, dark striations radiating from its eyes and the whitish striations on its body, which differentiates it from *S. hispidus* (Fraser-Brünner 1940). The description of our specimen is consistent with the general description of *S. diaspros*, following the most recent revision of this genus (Fraser-Brünner 1940). According to Zouari-Ktari *et al.* (2007), on the basis of the second dorsal soft ray, which is prolonged in the form of a long filament, our specimen qualifies as a male, although Fraser-Brünner (1940) reckons that “the elongation of one or more dorsal rays does not seem to have any sexual significance”. Since *S. diaspros* in the Mediterranean may first reach sexual maturity at a length of about 8 cm for females and at about 11 cm for males (Zouari-Ktari and Bradai 2011), our specimen is purportedly an adult.

S. diaspros is currently distributed in most of the eastern and central Mediterranean and is listed, along with *Fistularia commersonii*, *Siganus luridus*, *Siganus rivulatus* and *Hemiramphus far*, as one of the few Lessepsian fish species which entered the western Mediterranean Basin as well (Falautano *et al.* in press). This species established self-sustainable populations in several Mediterranean areas (Ben Amor and Capapé 2008), including the Gulf of Gabès (eastern Tunisia), where it is common at low depths over seagrass beds. Within this geographical area, *S. diaspros* exhibits a wide size range, reaching 22.4 cm in total length (Zouari-Ktari *et al.* 2007), approximating the maximum length reported in literature for this species (i.e. 26.1 cm total length in the Gulf of Suez, El-Ganainy and Sabra 2008), and shows a prolonged reproductive period, ranging between April and December (Zouari-Ktari and Bradai 2011).

The Maltese Islands and the island of Lampedusa within the Pelagian Archipelago have witnessed, in recent years, a veritable influx of allochthonous marine species as a result of their strategic central Mediterranean geographical location, which makes them ideal outposts for the documentation of both Atlantic and Lessepsian incursions. This had led some researchers, such as Azzurro *et al.* (2014a) to propose a greater degree of transboundary cooperation within the central Mediterranean in a renewed effort to promptly document the

occurrence of marine allochthonous species from the same geographical region. For instance, ever since the publication of the checklist of allochthonous marine species for Maltese coastal waters by Sciberras and Schembri (2007), a number of additional such fish species were recorded from the same waters, including *Selene dorsalis* (Vella and Deidun 2009), *Oplegnathus fasciatus* (Schembri *et al.* 2010) *Ephinephelus malabaricus* (Schembri and Tonna 2011), *Scatophagus argus* (Zammit and Schembri 2011), *Cephalolepis taeniops* (Deidun *et al.* 2011), *Pontinus kuhlii* (Castriota and Deidun 2014) and *Abudefduf cf. saxatilis* (Deidun and Castriota 2014).

As for the Pelagian Archipelago, of which Lampedusa forms part, twelve allochthonous fish species have been recorded from its waters so far, as extrapolated from the ISPRA NIS record database including *S. diaspros* and, most recently, even *Lagocephalus scleratus* (Azzurro *et al.* 2014b) although some of them have appeared only once or on rare occasions, and have not established, as yet, viable populations.

The pattern of sightings for *S. diaspros* from the area of study, consisting of isolated individual reports, most of which are not supported by photographic or video evidence or caught individuals, suggests that observed individuals of the species are most likely vagrants, with the species not being established within the same area, such that the occurrence of *S. diaspros* within the Strait of Sicily can be termed as a range expansion. The anecdotal reports cannot be relied upon with confidence since it transpired, from interviews with collaborating SCUBA divers, that a number of them confused, in the field, *S. diaspros* with *Balistes capriscus*, which is much more common within the study area. The vagrant nature of *S. diaspros* within the Strait of Sicily is also indirectly confirmed by Azzurro *et al.* (2011) who do not list the species amongst the list of 59 fish species which were considered by fishermen from the Pelagian Archipelago and from Sicily to have undergone drastic changes in abundance in recent years.

Similarly, other fish species of Lessepsian origin, most notably *S. luridus* and *S. rivulatus*, have failed to colonize extensively the Strait of Sicily, as reported by Azzurro *et al.* (2013) and Schembri *et al.* (2012). As for *F. commersonii*, Azzurro *et al.* (2013) similarly report low abundances for the same region although Deidun and Germana (2011) report the species to be on the increase within Maltese coastal waters. Reliable abundance data for marine allochthonous species, including *S. diaspros*, can only be gleaned through rigorous, regular and tailored surveys.

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