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FIRST SUBSTANTIATED RECORD OF A LESSEPSIAN MIGRANT—THE DUSKY SPINEFOOT, *SIGANUS LURIDUS* (ACTINOPTERYGII: PERCIFORMES: SIGANIDAE), IN THE ADRIATIC SEA

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Abstract. One specimen of the dusky spinefoot, *Siganus luridus* (Rüppell, 1829) (♀, total length = 17.3 cm, total weight = 87.61 g), a lessepsian migrant, was captured in the Mljet Channel (Southern Adriatic, Croatian coast) on 15 November 2010. This is the second record of this species from the Adriatic, but first well documented and based on the captured specimen. First record occurred earlier in the Northern Adriatic, but was based solely on underwater observations.

Keywords: *Siganus luridus*, Mediterranean, Lessepsian species, new record, Adriatic Sea.

Since the opening of the Suez canal in 1869, there has been an influx of Red Sea and Indo-Pacific organisms into the Mediterranean Sea, a phenomenon known as Lessepsian migration. During the past decades, 74 Lessepsian fish species have been recorded from the Mediterranean Sea (Golani 2010), while 12 from the Adriatic Sea (Lipej and Dulčić 2010).

In this paper we present a record and description of the dusky spinefoot, *Siganus luridus* (Rüppell 1829), the most recent Lessepsian migrant found in the Adriatic Sea. It is a littoral fish, living in rocky habitats with thick vegetation and is usually found in small groups of adults and large schools of juveniles (Golani et al. 2002). It originally inhabits the western Indian Ocean, from eastern Africa, Mauritius and Reunion Island to the Arabian (Persian) Gulf (Golani et al. 2002, Letourneur et al. 2004). This species migrated into the Mediterranean from the Red Sea via the Suez Canal and the first record dates back to 1956 from the coast of Israel (Ben-Tuvia 1964). Along with its congener—*Siganus rivulatus*—it became very common in most coastal areas of the eastern Mediterranean. It is speculated that the reason for the colonizing success of these two species is the occupation of unsaturated niche characterized by the scarcity of indigenous herbivorous fish, but also their greater adaptability and competitiveness over indigenous herbivorous salema, *Sarpa salpa* (L.), and partially herbivorous parrotfish, *Sparisoma cretense* (L.) (see Golani et al. 2002, Bariche et al. 2004). The westernmost *S. luridus* populations are reported in the north-east of Tunisia (Ktari-Chakroun and Bouhlal 1971), the island of Linosa in the Sicily Strait (Azzurro and Andaloro 2004), in Cape d'Orlando, northern Sicily (Castriota and Andaloro 2008), and in Sausset-les-pins, French coast (Daniel et al. 2009).

The specimen of *S. luridus* (♀, total length = 17.3 cm, total weight = 87.61 g) (Fig. 1) was caught in the Mljet Channel (southern Adriatic, Croatian coast) (lat 42º48´556´´N, long 17º30´35´´E) on 15 November 2010 with a trawl on the muddy bottom. This is the second record of this fish for the Adriatic Sea, but the first one documented on the basis of a captured specimen which allowed us to present its morphometric measurements (Table 1) and its meristic data. Meristic data are as follows: dorsal fin rays XIV+10; anal fin rays VII+9, pectoral fin rays 16; pelvic fin rays I+3+I; caudal fin rays 19. Morphometric measurements are in agreement with those presented by Castriota and Andaloro (2008).

Body deep, ellipsoid and compressed laterally. Dorsal fin origin above pectoral fin base. First dorsal spine small, directed forward and embedded in skin. Posterior margins of dorsal and anal fins rounded. Caudal fin truncated. Origin of pelvic fin behind pectoral fin base, its inner spine connecting by membrane to abdomen. Head slightly concave above eyes with blunt snout. Mouth small with thick upper lip. Body dark brown with irregular whitish blotches, more pronounced in abdominal area. Dorsal-, pectoral-, and caudal fins yellowish with yellow transverse stripes in whitish area under eyes.

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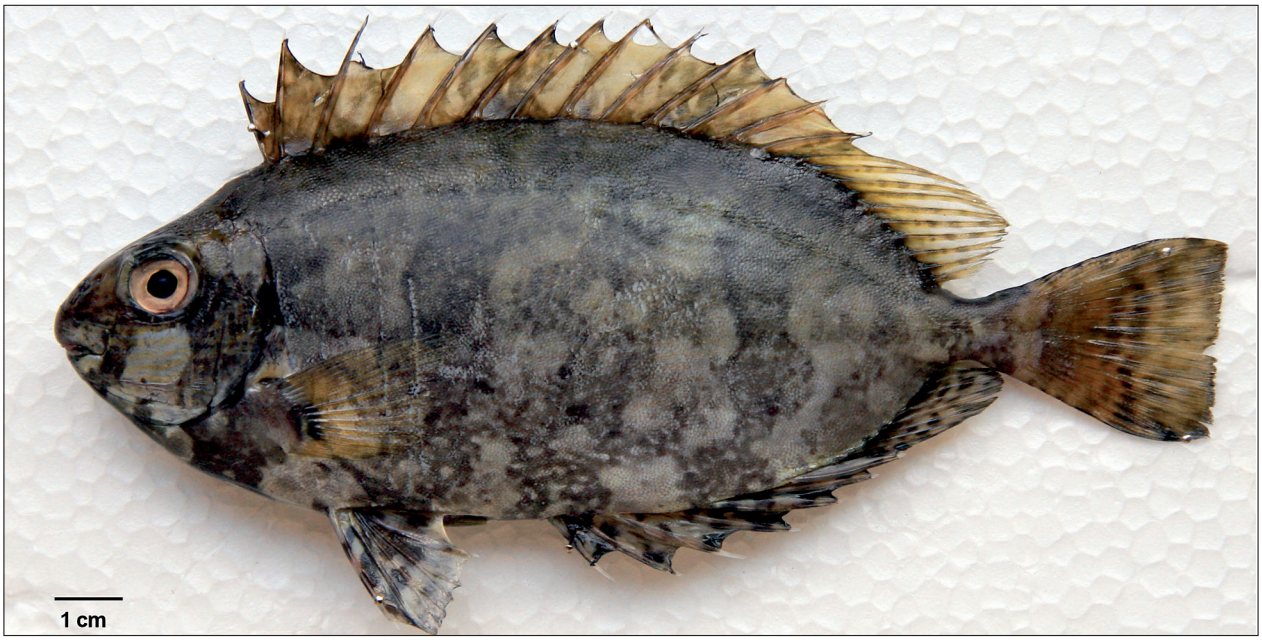

Fig. 1. *Siganus luridus* caught in the Mljet Channel (southern Adriatic, Croatian coast) (♀, total length = 17.3 cm, total weight = 87.61 g)

The specimen is deposited in the Ichthyological Collection of the Institute of Oceanography and Fisheries in Split (code IOR-Siglur 1511).

The analysis in this study was based on the captured specimen while the first record of *S. luridus* in the Adriatic Sea was based on a set of observations, photographs, and videos taken on a single specimen at the locality of Bagno Ducale in the Marine protected area of Miramare (Trieste, northern Adriatic Sea) (Poloniato et al. 2010). Records from the Adriatic and one from the French coast (Daniel et al. 2009) constitute a considerable extension of the known distribution range of this species within the Mediterranean. The presence of *S. luridus* in the Adriatic could be a consequence of the "Adriatic ingressions" (periodically intensified influx of the Ionian water into the Adriatic which influences oceanographic parameters like salinity, temperature, transparency, as well as primary production) and oceanographic changes in the Adriatic Sea (Dulčić and Grbec 2000). The entrance of new alien organisms during the period of Adriatic ingressions was already observed (see Dulčić and Grbec 2000, Civitarese et al. 2010). Individuals from the Adriatic probably originate from some relatively close southern areas like Ionian Sea (Gulf of Patras) (Kaspiris 1976), Cretan waters (Golani et al. 2004), or Strait of Sicily (Azzurro and Andaloro 2004) where established populations of these fishes exist. This could be a sound explanation considering the hypothesis of Azzurro et al. (2006) regarding dispersal dynamics of this species, where they indicated that siganid larvae could be dispersed for up to 1000 km. This could have also been facilitated by the impact of the bimodal oscillating system (BiOS) on the biogeochemistry of the Adriatic- and Ionian seas (Eastern Mediterranean) (Civitarese et al. 2010). A second hypothesis on the origin of the Adriatic specimens could be related to the anthropogenic transport of the species from some other area such as the eastern Mediterranean Sea or the Red Sea through ship-ballast waters. The area of capture is close to one of major cargo harbours in Croatian waters (Harbour Ploče) and this hypothesis remains plausible, as anthropogenic transport constitutes one of the major causes of introduction of exotic species, including teleost fish (Wonham et al. 2000). Recent report of an exotic dwarf flathead, *Elates ransonnettii* (Steindachner, 1876), from the Adriatic Sea evidenced a species introduction caused by the anthropogenic transport, probably by the ballast waters (Dulčić et al. 2010).

Table 1
Morphometric measurements of *Siganus luridus* caught in the Mljet Channel (November 2010)

Measurement	Value [cm]	Relative value [%]
Total length (TL)	17.3	—
Standard length	14.4	83.2 TL
Pre-dorsal length	3.1	17.9 TL
Pre-anal length	7.2	41.6 TL
Pre-pectoral length	3.4	19.6 TL
Pre-pelvic length	4.0	23.1 TL
Dorsal fin length	10.4	60.2 TL
Anal fin length	6.3	36.4 TL
Pectoral fin length	2.9	16.8 TL
Ventral fin length	2.3	13.3 TL
Head length (HL)	3.3	19.1 TL
Interorbital width	1.0	30.3 HL
Eye diameter	1.2	36.4 HL
Preorbital length	0.9	27.8 HL

The success of the *S. luridus* in the Mediterranean Sea has been attributed to its large eco-physiological plasticity. However, this present record still does not allow any confident comment regarding the success of this species in the Adriatic and whether an established breeding population exist in the area. In any event, the impact of possible successful colonization by this and other exotic fish species should be evaluated through future research.

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