

Short Communication

First record of the Indian Ocean anchovy *Stolephorus insularis* Hardenberg, 1933 (Clupeiformes: Engraulidae) in the Mediterranean

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Abstract

The Golden anchovy *Stolephorus insularis* was recorded for the first time in the Mediterranean near Tel-Aviv, Israel on 7 August 2009. This northern Indian Ocean species evidently reached the Mediterranean by crossing the Suez Canal from the Red Sea. Since then, several specimens were collected over a period of time which indicates that this species has established a viable population in the Levant.

Key words: *Stolephorus insularis*; Engraulidae; Indian Ocean; first record; Mediterranean; Lessepsian migration

Introduction

The opening of the Suez Canal in 1869 connected the Red Sea with the Mediterranean, resulting in an almost unidirectional migration of Red Sea organisms into the Mediterranean ("Lessepsian migration") (Golani et al. 2002; Golani 2010). Additional species were recorded by Bariche (2011: *Ostracion cubicus* (Linnaeus, 1758) (Ostraciidae), Golani et al. (2011: *Equulites elongates*, (Günther, 1874) (Leiognathidae), Goren et al. (2011: *Chaetodon austriacus* Rüppell, 1836 (Chaetodontidae), Salameh et al. (2011: *Chaetodon larvatus* Cuvier, 1831 (Chaetodontidae) and Özvarol and Gökoğlu (2012: *Chanos chanos* (Forsskål in Niebuhr, 1775) (Chanidae). Among fishes, a total of 85 Lessepsian species has been confirmed and recorded in the Mediterranean.

Material and methods

On 15 June 2012 the first two authors (RF and DG) collected 5 specimens of the Golden or Hardenberg's anchovy, *Stolephorus insularis*

Hardenberg, 1933 from a nocturnal trawl catch in the port of Jaffa; these specimens were partially damaged and were therefore used only for color description. In the Hebrew University Fish Collection (HUJ), two specimens of the *S. insularis* (63.4–65.8 mm SL) (Figure 1), were found which had been collected on 7 August 2009 from a nocturnal catch of the commercial trawler F/V Bilu, using a 44 mm mesh size cod-end net, at the depth of 23 fms (42 m) between Ga'ash (ca. 32°14'49"N, 34°49'03"E) and Jaffa (ca. 32°02'49"N, 34°44'22"E), in the vicinity of Tel-Aviv, Israel. The specimens are registered under the catalogue number HUJ 20145. Counts and measurements followed Hubbs and Lagler (1947); the classification follows Eschmeyer (2012), the references follow Fricke (2012).

Results

Description of the Mediterranean specimens (Figures 1-2)

Body slender and compressed, belly with 6–8 small needle-like pre-pelvic scutes, the first located under the first third of pectoral fin, the

Figure 1. Lateral view of *Stolephorus insularis*, HUI 20145, specimen 2 (63.4 mm SL), 7 August 2009, Tel-Aviv, Israel. Photograph by D. Darom.



Figure 2. Closeup view of needle-like prepelvic scutes, *Stolephorus insularis*, HUI 20145, specimen 2 (63.4 mm SL), 7 August 2009, Tel-Aviv, Israel. Photograph by D. Darom.



last slightly in front of pelvic fin. Maxilla tip pointed, reaching hind border of preoperculum. Preoperculum slightly concave, indented near maxilla tip. Isthmus evenly tapering anteriorly. Lower gill-rakers 24-26. Fine teeth on upper edge of hyoid bones. Dorsal finrays 15-16. Anal fin short, with iii,16 rays, its origin below the last rays of dorsal fin base. Pectoral-fin rays 15-17.

Color (based on fresh specimens): A dark grey stripe with irregular dark spots on the upper body. A dorsally silvery grey, ventrally golden line along the sides of the body. Lower part of body and belly silver-grey. Eyes silver-grey with black pupil.

Discussion

This species was first described by Hardenberg (1933a: 249; 1933b: 260-261) from near Java and from Maluku, Indonesia. In a revision by Whitehead et al. (1988: 413-414), *Stolephorus insularis* was treated as a valid species, distributed in the northern Indian Ocean and adjacent northwestern Pacific, from the Gulf of Aden east to Taiwan, south to western Indonesia. The species was subsequently reported by Lewis (1990: 15) from new Caledonia, Carpenter et al. (1997: 118) from the Persian Gulf, Wang and Tzeng (1997a, b) from the Tanshui River estuary in Taiwan, Myers (1999: 62) from the Caroline

Islands in Micronesia, Ni and Kwok (1999: 135) from Hong Kong, Wongratana et al. (1999: 1736) from the western Pacific, Mishra and Srinivasan (1999: 237) from India, Munroe and Nizinski in Randall and Lim (2000: 588) from the South China Sea, Manilo and Bogorodsky (2003: S97) from the Arabian Sea, Randall (2005: 59) from New Caledonia, Shao et al. (2008: 239) from Taiwan, Kimura in Kimura and Yoshino (2009: 26) from the Andaman sea, Fricke et al. (2011: 355) from Grande Terre, New Caledonia (depths of 0-50 m), and Satapoomin (2011: 50) from the Andaman Sea (Thailand). Though the species has not formally been recorded from the Red Sea, Whitehead et al. (1988) added a question-mark for the Red Sea in their distribution map, suspecting that the species may occur there.

The species is placed in the genus *Stolephorus* Lacepède, 1803 due to the normally shaped (not tapering or rat-tailed) body, the anal fin not joined to the caudal fin, the upper pectoral-fin rays not detached from each other, the presence of needle-like prepelvic scutes (see Figure 2), no postpelvic scutes, the isthmus evenly tapering anteriorly, and the anal fin with less than 25 fin-rays (see Whitehead et al. 1988: 309-310, 401).

S. insularis has a distribution range in the northern Indian Ocean, northwestern Pacific Ocean, and New Caledonia in the southwestern Pacific. The immigration into the southeastern Mediterranean through the Suez Canal means that the species must also be present in the Red Sea. The wanting records from those areas are either due to low collecting effort in those regions, or it was confused with the similar species *Stolephorus indicus*. This species mainly lives over soft bottoms mainly around 30-40 m depth, but young fish occur shallower, and larvae are found in estuaries. The biology of the species is poorly known (Whitehead et al. 1988: 414). However, Tzeng et al. (2002) published on the community structure and Tzeng et al. (2008) on the hatching period and the early-stage growth rate of the species in a Taiwanese estuary.

S. insularis is the first anchovy to invade the Mediterranean. It may have been included in earlier collections, but was probably missed due to its external similarities with *Engraulis encrasicolus* (Linnaeus, 1758) (Linnaeus, 1758: 358 as *Clupea encrasicolus*). *S. insularis* co-occurs with the Mediterranean indigenous species *E. encrasicolus*, which is apparently still more common than the Lessepsian invader in Israel. *E. encrasicolus* mainly differs in the

absence of needle-like prepelvic scutes, the anal fin which begins well behind the second dorsal-fin base, a higher number of lower gill-rakers (27-43 in *E. encrasicolus*, 23-27 in *S. insularis*), and a characteristic golden hue (silvery, grey or bluish in *E. encrasicolus*).

The Red Sea congener, *S. indicus* (Hasselt, 1823) (Hasselt, 1823: 329, as *Engraulis indicus*), is distinguished from *S. insularis* by its 2-6 (usually 3-5) needle-like pre-pelvic scutes [4-8 (usually 6-7) scutes in *S. insularis*], the iii,16-18 anal-fin rays (iii,14-17 in *S. insularis*), the maxilla reaching to or only just beyond the anterior border of preoperculum (reaching to or beyond posterior border of preoperculum in *S. insularis*), and silvery, grey or bluish colouration (a characteristic golden hue in *S. insularis*) (Whitehead et al. 1988: 412-414).

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