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### First record of the moray eel *Gymnothorax reticularis*, Bloch, 1795 in the Mediterranean Sea, with a note on its taxonomy and distribution

NIR STERN & MENACHEM GOREN

Department of Zoology, George S. Wise Faculty of Life Sciences, Tel Aviv University, Tel Aviv 69978, Israel.

E-mail: nirstern@outlook.com, gorenm@post.tau.ac.il

#### Abstract

The first Red-Sea Indo-Pacific alien moray eel in the Eastern Mediterranean is reported here. A single specimen of *Gymnothorax reticularis* was captured by a commercial bottom-trawl vessel off the northern coast of Israel. Morphological and anatomical similarities with the single known Red-Sea specimen raise an old taxonomic dilemma.

**Key words:** Mediterranean Sea, alien species, *Gymnothorax reticularis*

#### Introduction

The Levant Basin is regarded today as the world's most invaded marine ecosystem, being highly subjected to Indo-Pacific faunal invasion (Edelist *et al.* 2012). The number of reported alien Indo-Pacific species of fish is currently above 90 and rapidly approaching its hundredth record (Galil and Goren, in press).

The moray eels (family Muraenidae) are the second most diverse family in the order of true eels, Anguilliformes (Smith 2012). At present there are about 200 valid species belonging to 15 genera (Smith 2012; Froese & Pauly 2013). The genus *Gymnothorax*, Bloch 1795 represents more than half of the world's muraenids (124 species) and is regarded as a polyphyletic assemblage of ungrouped moray eels (Smith 2012). *Gymnothorax reticularis* is the type species for this genus.

Three muraenid species with an east-Atlantic origin inhabit the east Mediterranean: *Muranea helena*, L, *Gymnothorax unicolor*, (Delaroché, 1809) and *Enchelycore anatina*, (Lowe, 1838) (Froese & Pauly 2013). This is the first record of *Gymnothorax reticularis* Bloch, 1795 in the Mediterranean and the first report of an alien Pacific muraenid in the Mediterranean.

#### Material and methods

Abbreviations: TAU—Fish collection of the Zoological Museum at Tel Aviv University; HL—Head length; ED—Eye diameter; TL—Total length.

#### *Gymnothorax reticularis* Bloch, 1795

(Figure 1)

*Gymnothorax reticularis* Bloch 1795: 85, pl. 416. Type locality: Coromandel Coast, India.

**Material examined.** TAU – P.14971, one specimen, off Rosh Hanikra, Israel (33°02' N, 35°04' E), depth: 60 m, coll. Z. Haibatov (captain of the commercial bottom trawler "Or David"), 2 January 2013. TL 460 mm, Weight 113 g.

**General description.** The current *Gymnothorax* species belongs to a group of Indo-Pacific banded morays that are characterized by a color pattern of dark bars on a pale cream-colored background. In this presented *G. reticularis*, the

bars are well defined ventrally and diffused above the lateral line. Head and body above the lateral line present a dense pattern of brown spots. Jaws are not arched; hence all teeth are concealed inside mouth when closed. The anterior nostrils are tubular and the posterior are oval shaped, located behind the anterior margin of the eye. Dorsal fin origin is anterior to gill openings. *G. reticularis* is distinguished from other conspecific banded morays of this group by having pseudo-longitudinal lines on the head created by the arrangements of brown spots (Fig. 1, b). Diagnostic characters, follows Smith & Böhlke (1997).

(a)



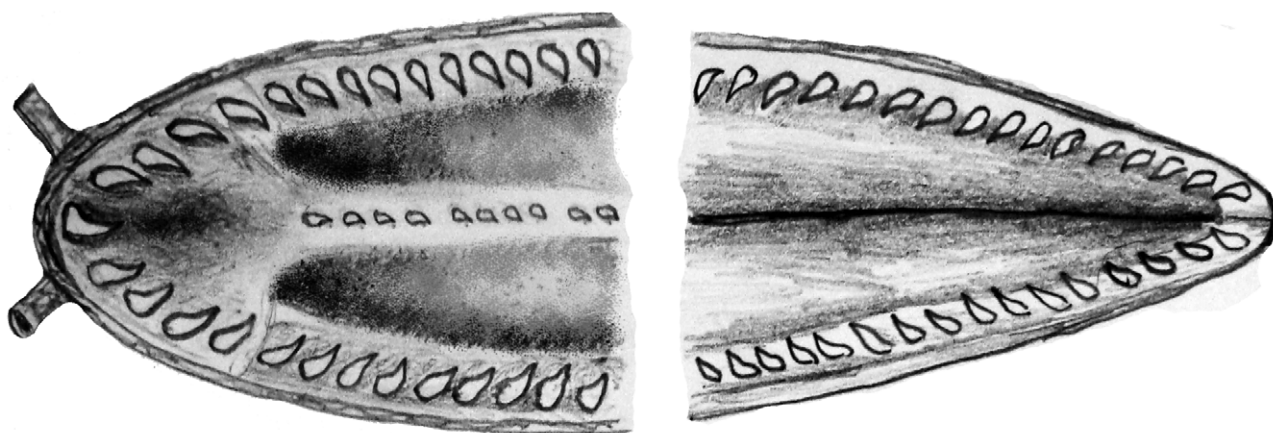
(b)



**FIGURE 1.** (a) *Gymnothorax reticularis* collected off the northern coast of Israel (TAU P. 14971); (b) Lateral view of head.

Counts and measurements: TL 460 mm, preanal 214, HL 60.4, Snout 8.7, ED 4.1, Upper jaw 20.2, Depth at gill opening 29.5. Body proportions: HL 7.6 in TL, preanal 2.15 in TL, depth at gill opening 15.6 in TL, snout 6.9 at HL, ED 14.7 in HL, upper jaw 3 in HL. HL 13.1% of TL, preanal 46.5% of TL, depth at gill opening 6.4% of TL, snout 14.4% of HL, ED 6.8% of HL, upper jaw 33.3% of HL. Vertebrae: pre-dorsal 6, pre-anal 50, total – more than 123. Since the tip of

tail is missing, we assume that 2-3 should be added to this count. Teeth: maxillary and dentary teeth are pointed canine-like with fine serration at the anterior and posterior edges. Vomerine teeth are molariform in shape and lack serration. Counting of teeth is separate for left/right side of jaw. Intermaxillary 1 + 4/4, maxillary 10/9, vomerine 10, dentary 16/16 (Fig. 2).



**FIGURE 2.** Dentition illustration of *Gymnothorax reticularis* TAU P. 14971. Left—maxilla; right—dentary.

**Color.** Body striped with 18 dark brown bars upon pale yellowish background. Head and body above lateral line speckled with dense brown spots which blur the definite borders of the vertical bars. Chin less speckled and brighter than rest of the head. Head covered with dark brown spots arranged in a longitudinal pattern. Dorsal and anal fins also feature distinct dark bars: 23 and 13, respectively.

**Remarks.** *Gymnothorax reticularis* is mainly distributed in the Indian Ocean with a single record from the Red Sea (Golani & Bogorodsky 2010; Smith 2012). Smith & Böhlke (1997) have indicated that all records of *G. reticularis* from the western Pacific Ocean are misidentifications of a highly similar species *Gymnothorax minor* (Temminck and Schlegel, 1846). In addition, the Red Sea specimen differs from the Indian Ocean specimens in color pattern and vertebrate number, 126 vs. 114-120, respectively. Based on only a single record, Smith & Böhlke (1997) refrained from describing it as a new species. Interestingly, our specimen follows the characteristics of the Red Sea specimen, i.e. coloration of the body presents a high degree of dorsal diffusion of the vertical dark bars, and vertebrae count exceeds 123. Further examination of our specimen will help determine its exact taxonomic definition.

The most reasonable introduction route of *G. reticularis* into the Mediterranean is based on the morphological similarities with the single Red Sea record. These similarities indicate that the newly reported specimen most likely originated from the Red Sea; hence it invaded the Mediterranean via the major common vector, the Suez Canal. Another possible route for introducing *G. reticularis* into the Mediterranean is based on the genus *Gymnothorax* providing many species for the world's ornamental fish trade (Monteiro-Neto *et al.* 2003; Jayalal & Ramachandran 2012). It is therefore also possible that the reported specimen of *G. reticularis* was simply released by aquarists into the Levant Basin. Further sightings of *G. reticularis* in the Mediterranean will clearly determine whether this alien species has managed to integrate within the Levantine ichthyofauna or that it will remain as a single esoteric record.

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