

New records of neonate and juvenile sharks (*Heptranchias perlo*, *Squatina aculeata*, *Etmopterus spinax*) from the North-eastern Mediterranean Sea

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Abstract Three species of neonate and juvenile sharks (*Heptranchias perlo*, *Squatina aculeata*, *Etmopterus spinax*) were captured as by-catch from a commercial trawl fishing from depths between 360 and 430 m in the North-eastern Mediterranean Sea. Two neonates of *H. perlo*, five neonates of *E. spinax* and one juvenile of *S. aculeata* were for the first time identified in the above region.

Keywords *Heptranchias perlo* · *Squatina aculeata* · *Etmopterus spinax* · Sharpnose sevengill shark · Sawback angelshark · Velvet belly · North-eastern Mediterranean

Introduction

The sharpnose sevengill shark, *Heptranchias perlo* (Bonnaterre, 1788), is found near the bottom usually in deep-water and cosmopolitan tropical and subtropical seas. It is characterized by seven gill slits and a single dorsal fin on the posterior part of the body. It has small pointed teeth in the upper jaw and saw-like teeth with a large anterior cusp in the lower jaw. This benthic shark inhabits depths of 30–700 m and reaches maturity at 80 cm. *H. perlo* is ovoviparous and each litter consists of 10–20 young, which are 25 cm in length at birth (Golani et al. 2006). The sharpnose sevengill shark is considered as “vulnerable” in the Mediterranean Sea and as “near threatened” globally by the International Union

for Conservation of Nature (IUCN; Abdul Malak et al. 2011). The occurrence of *H. perlo* is extremely rare (Bilecenoglu et al. 2014) and its reproduction biology is not known in the eastern Mediterranean waters.

The velvet belly, *Etmopterus spinax*, is a small benthic shark, inhabiting depths of 500–2000 m in the Mediterranean Sea (Golani et al. 2006). This species is assessed as a “least concerned” (LC) species in the Mediterranean Sea by the IUCN (Abdulmalak et al. 2011).

The sawback angelshark, *Squatina aculeata* belongs to family Squatinidae and is one of the rarest sharks inhabiting demersal sandy or muddy substrates at depths of 30–500 m in the Mediterranean Sea. The family consists of 13 species worldwide, with 3 in the Mediterranean Sea (Golani et al. 2006). There are only a few records from the North-eastern Mediterranean Sea and Aegean Sea. This species is reported from Iskenderun Bay by Başusta (2002), from Gokova Bay by Filiz et al. (2005) and from Mersin Bay by Ergüden and Bayhan (2015). There is no information on the reproductive age, gestation period, reproductive periodicity as well as fecundity of this species. In addition, the sawback angelshark is considered a critically endangered (CR) species in the Mediterranean Sea by the IUCN (Abdul Malak et al. 2011). This paper presents the existence of the neonate and juvenile sharks in the North-eastern Mediterranean sea.

Materials and methods

During commercial trawl fishing in the international waters of the North-eastern Mediterranean (between 36° 06'004 N - 35°23'821E and 36° 06'152 N -35° 36'966E) at 360–400 m depths, two neonates of *Heptranchias perlo* and five neonates of *Etmopterus spinax* specimens were caught as by-catch on the 4th of May 2015. A juvenile sawback angelshark

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Table 1 Morphometric measurements of species

Measurements (mm)	<i>H. perlo</i> (min – max)	<i>E. spinax</i> (min – max)	<i>S. aculeata</i>
Total length	323–325	103–191	374
Fork length	253–255	88–163	–
Precaudal length	210–220	79–140	308
Predorsal length	153–154	31–51	223
Head length	67–68	22–39	75
Prebranchial length	55–56	16–32	57
Preorbital length	16–17	5–8	13
Preanal length	130–133	45–96	154
Eye length	15–15	4–7	11
Eye height	7–7	3–5	7

(*Squatina aculeata*) specimen was also captured as by-catch from another commercial trawl fishing operation at 415–430 m depths in the North-eastern Mediterranean (between 36° 07'308 N -35°05'364E and 36° 03'909 N -35° 29'066E) on the 6th of June 2015.

The samples were transferred to an eco-physiology laboratory where they were identified, sexed and photographed. Morphometric measurements of the specimens were taken to the nearest 1 mm and the weight of each specimen was measured with a digital scale to the nearest 0.01 g. *H. perlo*, *E. spinax* and *S. aculeata* specimens were preserved at the Museum of Fisheries Faculty, Firat University with codes FFM-FISH/2015-6a-b, FFM-FISH/2015-8a, b, c, d, e and FFM-FISH/2015-12, respectively.

Results and discussion

All morphometric measurements of the species are given in Table 1. Total lengths and weights of females and males of *H. perlo* were 32.3 and 32.5 cm, 106.90 and 101.77 g, respectively (Fig. 1). Total lengths of the sharpnose sevengill shark for male and female were similar. Considering total lengths of *H. perlo*, it is thought that this area of North-eastern Mediterranean Sea might be one of the breeding and nursery grounds for this species.

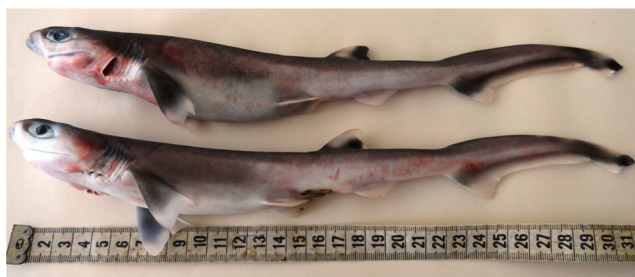


Fig. 1 Female and male sharpnose sevengill shark, *Heptranchias perlo* from North-eastern Mediterranean, total length=32.3 cm and 32.5 cm



Fig. 2 Neonate angular rough sharks, *Etmopterus spinax* from North-eastern Mediterranean

Total lengths of *E. spinax* individuals were measured as 10.3, 17.9, 15.6, 16.4 and 19.1 cm, while their weights were 4.05, 25.81, 16.70, 23.52, 35.51 g, respectively (Fig. 2). The size at birth was previously reported as 12 to 14 cm for *E. spinax* by Compagno (2001). However, the smallest length for this species was recorded as 10.3 cm in our study for the same species. Thus, the occurrence of the newborn individuals of *E. spinax* in the North-eastern Mediterranean Sea strongly declares that this species breeds and nurtures in this region.

Total length and weight of the only juvenile *S. aculeata* specimen were measured as 37.4 cm and 352.26 g (Figs. 3 and 4). Thus, this study provides the first record of juvenile *S. aculeata* from the North-eastern Mediterranean Sea. The presence of juvenil size of sawback angelshark also indicates that *S. aculeata* might be using the North-eastern Mediterranean Sea as breeding and nursery area.

Generally, Turkish vessels in the North-eastern Mediterranean Sea are fishing in international waters during



Fig. 3 Sawback angelshark, *Squatina aculeata* from North-eastern Mediterranean, total length=37.4 cm



Fig. 4 Frontal view of head and prominent fringes of *Squatina aculeata*

the season between 15 April and 15 July, when fishing is entirely prohibited in the continental shelf. According to Castro (1993), the decision about an area to be considered as breeding and nursery ground by a given species can be made by the presence of neonates, small juveniles and gravid females caught in that respective area. As a matter of fact, in the following years, some eggs and mature individuals belonging to the same species were also observed in the same region during fishing operations (personal observation).

As a result, we may conclude that some shark species are using the North-eastern Mediterranean region as mating, breeding and nursery grounds. Since cartilaginous fishes produce limited number of eggs or fry, heavy fishing activities exerted by Turkish, Syrian and Egyptian fishing vessels might pose threats for the existence of these species in the above

area. Therefore, necessary precautions should be taken to protect and ensure sustainability of these endangered species in the North-eastern Mediterranean region.

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