

**SHORT COMMUNICATION**

**Recent findings of rare sharks, *Squatina oculata* Bonaparte, 1840 and *Squatina squatina* (Linnaeus, 1758) from Gökçeada Island, Northern Aegean Sea, Turkey**

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**Abstract**

Two species of cartilaginous fish, *Squatina oculata* Cuvier, 1829 and *Squatina squatina* (Linnaeus, 1758) were captured by a commercial bottom trawler at a depth of 110 m off Gökçeada Island, Northern Aegean Sea on 22 March 2018. *S. oculata* was a female specimen with a total length of 875 mm and a weight of 5.536 g. It contained a total of 6 symmetrically distributed developing oocytes ranging from 52.22 to 59.55 mm in diameter. *S. squatina* was a male specimen with a total length 915 mm and a weight of 6.294 g.

**Keywords:** Squatinidae, smoothback angelshark, angelshark, Aegean Sea

**Received:** 12.06.2019, **Accepted:** 27.11.2019

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Angel sharks, *Squatina oculata* Cuvier, 1829 and *Squatina squatina* (Linnaeus, 1758) are benthic species that found in coastal and outer continental shelf habitats and may also found in estuaries (Compagno 1984; 2005). They are found mainly on sandy or muddy bottoms, between 5 and 500 m of depth; sluggish by day, lying buried with eyes protruding. Their habitats also include rocky substrata covered with macroalgae or kelp (Morey *et al.* 2006). They were formerly common throughout the coastal zones and continental shelf in the Northeast Atlantic and Eastern Atlantic; waters off Morocco, Senegal, Guinea to Nigeria, Gabon to Angola, Mediterranean and Black Sea (Compagno 1984).

Overfishing currently threatens a majority of elasmobranch species and Squatinidae are known to be the second most threatened family of elasmobranchs (Dulvy *et al.* 2014; Holcer and Lazar 2017). *S. oculata* and *S. squatina* are considered “Critically Endangered” for the European seas and also

for the Mediterranean (IUCN 2019; Nieto *et al.* 2015; Zava *et al.* 2016). Earlier records of angel sharks were reported by Devedjian (1915), Ninni (1923), Gruvel (1931) and Geldiay (1969). There are a few records from the Mediterranean Sea and the Aegean Sea off the Turkish coasts. Angel sharks are reported from Mersin-Iskenderun Bay, North-eastern Mediterranean (Gücü and Bingel 1994), Iskenderun Bay (Başusta 2002), Gökova Bay (Filiz *et al.* 2005), southern Aegean Sea (Öğretmen *et al.* 2005), northern Aegean Sea (Karakulak *et al.* 2006; Ismen *et al.* 2009), Antalya Bay, North-eastern Mediterranean (Bulguroğlu *et al.* 2014; Başusta 2016), the Sea of Marmara (Kabasakal 2002, 2003; Kabasakal and Kabasakal 2014), Mersin Bay (Ergüden and Bayhan 2015), Gökova Bay-Eastern Mediterranean (Akyol *et al.* 2015) and Mersin Bay-North-eastern Mediterranean Sea (Ergüden *et al.* 2019). Due to the rare occurrence of *S. oculata* and *S. squatina* in the Mediterranean basin, our study on the morphological characteristics of the specimens caught in the northern Aegean Sea can contribute to update the conservation status of these species.

*S. oculata* and *S. squatina* were caught by a commercial trawl on 22 March 2018, at a depth of 110 m, off Gökçeada Island in the northern Aegean Sea. The specimens were photographed (Figures 1 and 2) and identified according to Whitehead *et al.* (1984). Morphometric measurements were carried out by following Compagno (1984) and Serena (2005) to the nearest 0.01 mm and the weight of each specimen was measured with a digital scale to the nearest 0.01 g.



**Figure 1.** Dorsal view of the angelshark, *Squatina squatina* from Gökçeada Island, NE Aegean Sea (Photo: Koray Cabbar)



**Figure 2.** Dorsal view of the smoothback angelshark, *Squatina oculata* from Gökçeada Island, NE Aegean Sea (Photo: Koray Cabbar)

Morphometric measurements of the angelshark specimens are shown in Table 1.

**Table 1.** Morphometric measurements of *S. oculata* and *S. squatina* specimens

	<i>S. oculata</i>	%TL	<i>S. squatina</i>	%TL
Sex	Female		Male	
Total weight (g)	5536		6294	
<b>Measurement (mm)</b>				
Total length	875		915	
Fork length	820	93.7	868	94.9
Trunk length	270	30.9	270	29.5
Precaudal length	742	84.8	790	86.3
Head length	145	16.6	175	19.1
Preoral length	100	11.4	120	13.1
Mouth width	115	13.1	110	12.0
Internasal distance	800	91.4	850	92.9
Preorbital length	400	45.7	450	49.2
Eye diameter	120	13.7	110	12.0
Snout-vent length	800	91.4	750	82.0
Suborbital width	260	29.7	250	27.3
Interorbital length	560	64.0	610	66.7
Preanal length	400	45.7	423	46.2
Pre-first dorsal length	565	64.6	570	62.3
Pre-second dorsal length	664	75.9	685	74.9
Prepectoral length	152	17.4	165	18.0
Prepelvic length	355	40.6	350	38.3
Dorsal- caudal length	650	74.3	700	76.5
Ventral caudal length	780	89.1	800	87.4
Pectoral anterior margin	255	29.1	255	27.9
Pectoral base	285	32.6	110	12.0
Pectoral inner margin	155	17.7	100	10.9

**Table 1.** Continued

Pectoral posterior margin	146	16.7	157	17.2
Pectoral height	190	21.7	102	11.1
Dorsal caudal margin	100	11.4	110	12.0
Ventral caudal margin	115	13.1	133	14.5
First dorsal length	300	34.3	430	47.0
First dorsal anterior margin	700	80.0	910	99.5
First dorsal base	550	62.9	600	65.6
First dorsal height	650	74.3	800	87.4
First dorsal inner margin	240	27.4	230	25.1
First dorsal posterior margin	550	62.9	700	76.5
Second dorsal length	300	34.3	380	41.5
Second dorsal anterior margin	650	74.3	880	96.2
Second dorsal base	400	45.7	350	38.3
Second dorsal height	590	67.4	740	80.9
Second dorsal inner margin	250	28.6	200	21.9
Second dorsal posterior margin	450	51.4	670	73.2
Pelvic length	214	24.5	197	21.5
Pelvic anterior margin	110	12.6	110	12.0
Pelvic base	135	15.4	145	15.8
Pelvic height	120	13.7	860	94.0
Pelvic inner margin length	110	12.6	650	71.0
Pelvic posterior margin length	173	19.8	135	14.8
Caudal fork width	128	14.6	135	14.8
Caudal fork length	700	80.0	850	92.9

The female specimen of *S. oculata* contained a total of six developing eggs (Figure 3). The developing eggs were symmetrically distributed in the ovaries; three in the right ovary and three in the left ovary. This was found in agreement with Capapé *et al.* (1990, 2002). However, in contrast to these findings, Cavallaro *et al.* (2015) reported asymmetrically distributed oocytes in *S. squatina* with 17 yellow yolk oocytes in the right ovary and five oocytes in the left ovary. Even higher oocytes numbers for *S. oculata* have been reported; for example, Capapé *et al.* (2002) reported a total of 29 ripe oocytes in *S. oculata* caught off the coast of Senegal (eastern tropical Atlantic). Variations in the number of oocytes reported from different localities may be due to feed abundance, prey type, and habitat quality. The diameters of the oocytes of the present specimen ranged between 52.22-59.55 mm (mean 55.21± SD 0.96 mm) and weights of the oocytes from 82.91 g to 88.52 g (mean 85.43± SD 1.51 mm).

Different gestation periods have been reported for different angel shark species: 6-12 months for *S. tergocellata* (Bridge *et al.* 1998); 10 months for *S. californica*, and at least one year for *S. oculata* (Capapé *et al.* 2002), *S. aculeata* (Capapé *et al.* 2005) and *S. guggenheim* (Colonello *et al.* 2007; Awruch *et al.* 2008). However, the reproduction biology and longevity of the members of Squatinidae are still not well known (Ergüden *et al.* 2019). *S. oculata* females are reported to mature at 100 cm in total length in Tunisian waters, 89 cm in

Senegal coastal waters, and males are reported to be mature at 71 cm from Tunisia and 82 cm from Senegal (Capapé *et al.* 1990; 2002).



**Figure 3.** Oocytes developing in the smoothback angelshark, *Squatina oculata*  
(Photo: Koray Cabbar)

*S. squatina* and *S. oculata* are considered rare as indicated by their absence or very low abundance in scientific trawling surveys and commercial trawling operations (Ragonese 2013; Miller 2015). Their low abundance in commercial operations may also be due to unreported occurrences as these fishes are critically endangered and protected under current legislations. In order to better understand and obtain data for many species of sharks, scientific studies on population structure are required.

Our findings confirmed low fecundity of *S. oculata*. *Squatina* species are also characterized by a long reproductive cycle (about two years) and long gestation period (about one year) (Hamlett 2005; Miller 2015). In addition, slow growth rates and late maturation of many shark species have been well established (Frisk *et al.* 2001; Dulvy and Forrest 2009; Holcer and Lazar 2017). All these factors contribute to their vulnerability to commercial fishing activities. Although there are no directed fisheries for *Squatina* species, it is taken as bycatch in the national and international demersal trawl fisheries and artisanal fisheries (Miller 2015). In terms of commercial fishing, a major threat identified for angelsharks in Turkish waters was the bycatch of the species by commercial fishermen using gill nets, bottom-set long lines, handlines and fixed bottom nets (Yığın *et al.* 2016). Therefore, sporadic reports on the occurrences of these species are important for these species as they provide critical information on

their distribution, habitat and reproductive biology to help increase monitoring and conservation efforts.

### **Acknowledgement**

The authors would like to thank the crew of the trawl vessel “Yalçinoğlu 1”.

## **Türkiye, Kuzey Ege Denizi, Gökçeada’da nadir görülen köpek balıkları *Squatina oculata* Bonaparte, 1840 ve *Squatina squatina* (Linnaeus, 1758)’ya ait son bulgular**

### **Öz**

Bu çalışmada, Türkiye sularında nadir olduğu bilinen ve Kuzey Ege Denizi, Gökçeada açıklarından 110 m derinlikten ticari trol teknesi ile elde edilen iki adet kıkırdaklı balık türü *Squatina oculata* Cuvier, 1829 ve *Squatina squatina* (Linnaeus, 1758) rapor edilmiştir. *Squatina oculata*, 875 mm toplam boyda ve 5536 g. ağırlıkta bir dişi ve *Squatina squatina*, 915 mm toplam boy ve 6294 g. ağırlığa sahip bir erkektir. *S. oculata*’nın ovaryumlarında 52.22-59.55 mm çap aralığında simetrik olarak dağılmış 6 adet oosit tespit edilmiştir.

**Anahtar kelimeler:** Squatinidae, keler, Ege Denizi

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