SHORT COMMUNICATION

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

Cahide Çiğdem Yığın*, Ali İşmen, Burak Daban, Koray Cabbar, Umur Önal

Faculty of Marine Science and Technology Çanakkale Onsekiz Mart University, 17100, Çanakkale, TURKEY

*Corresponding author: cyigin@hotmail.com

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

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 0.01g.

Figure 1. Dorsal view of the angelshark, Squatina squatina from Gökçeada Island, NE Aegean Sea (Photo: Koray Cabbar)
Morphometric measurements of the angelshark specimens are shown in Table 1.

<table>
<thead>
<tr>
<th></th>
<th>S. oculata</th>
<th>%TL</th>
<th>S. squatina</th>
<th>%TL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>Female</td>
<td></td>
<td>Male</td>
<td></td>
</tr>
<tr>
<td>Total weight (g)</td>
<td>5536</td>
<td></td>
<td>6294</td>
<td></td>
</tr>
<tr>
<td><strong>Measurement (mm)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total length</td>
<td>875</td>
<td></td>
<td>915</td>
<td></td>
</tr>
<tr>
<td>Fork length</td>
<td>820</td>
<td>93.7</td>
<td>868</td>
<td>94.9</td>
</tr>
<tr>
<td>Trunk length</td>
<td>270</td>
<td>30.9</td>
<td>270</td>
<td>29.5</td>
</tr>
<tr>
<td>Precaudal length</td>
<td>742</td>
<td>84.8</td>
<td>790</td>
<td>86.3</td>
</tr>
<tr>
<td>Head length</td>
<td>145</td>
<td>16.6</td>
<td>175</td>
<td>19.1</td>
</tr>
<tr>
<td>Preoral length</td>
<td>100</td>
<td>11.4</td>
<td>120</td>
<td>13.1</td>
</tr>
<tr>
<td>Mouth width</td>
<td>115</td>
<td>13.1</td>
<td>110</td>
<td>12.0</td>
</tr>
<tr>
<td>Internasal distance</td>
<td>800</td>
<td>91.4</td>
<td>850</td>
<td>92.9</td>
</tr>
<tr>
<td>Preorbital length</td>
<td>400</td>
<td>45.7</td>
<td>450</td>
<td>49.2</td>
</tr>
<tr>
<td>Eye diameter</td>
<td>120</td>
<td>13.7</td>
<td>110</td>
<td>12.0</td>
</tr>
<tr>
<td>Snout-vent length</td>
<td>800</td>
<td>91.4</td>
<td>750</td>
<td>82.0</td>
</tr>
<tr>
<td>Suborbital width</td>
<td>260</td>
<td>29.7</td>
<td>250</td>
<td>27.3</td>
</tr>
<tr>
<td>Interorbital length</td>
<td>560</td>
<td>64.0</td>
<td>610</td>
<td>66.7</td>
</tr>
<tr>
<td>Preanal length</td>
<td>400</td>
<td>45.7</td>
<td>423</td>
<td>46.2</td>
</tr>
<tr>
<td>Pre-first dorsal length</td>
<td>565</td>
<td>64.6</td>
<td>570</td>
<td>62.3</td>
</tr>
<tr>
<td>Pre-second dorsal length</td>
<td>664</td>
<td>75.9</td>
<td>685</td>
<td>74.9</td>
</tr>
<tr>
<td>Prepectoral length</td>
<td>152</td>
<td>17.4</td>
<td>165</td>
<td>18.0</td>
</tr>
<tr>
<td>Prepelvic length</td>
<td>355</td>
<td>40.6</td>
<td>350</td>
<td>38.3</td>
</tr>
<tr>
<td>Dorsal- caudal length</td>
<td>650</td>
<td>74.3</td>
<td>700</td>
<td>76.5</td>
</tr>
<tr>
<td>Ventral caudal length</td>
<td>780</td>
<td>89.1</td>
<td>800</td>
<td>87.4</td>
</tr>
<tr>
<td>Pectoral anterior margin</td>
<td>255</td>
<td>29.1</td>
<td>255</td>
<td>27.9</td>
</tr>
<tr>
<td>Pectoral base</td>
<td>285</td>
<td>32.6</td>
<td>110</td>
<td>12.0</td>
</tr>
<tr>
<td>Pectoral inner margin</td>
<td>155</td>
<td>17.7</td>
<td>100</td>
<td>10.9</td>
</tr>
</tbody>
</table>
Table 1. Continued

<table>
<thead>
<tr>
<th>Body part</th>
<th>Unit</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pectoral posterior margin</td>
<td></td>
<td>146</td>
<td>157</td>
</tr>
<tr>
<td>Pectoral height</td>
<td></td>
<td>190</td>
<td>102</td>
</tr>
<tr>
<td>Dorsal caudal margin</td>
<td></td>
<td>100</td>
<td>110</td>
</tr>
<tr>
<td>Ventral caudal margin</td>
<td></td>
<td>115</td>
<td>133</td>
</tr>
<tr>
<td>First dorsal length</td>
<td></td>
<td>300</td>
<td>430</td>
</tr>
<tr>
<td>First dorsal anterior margin</td>
<td></td>
<td>700</td>
<td>910</td>
</tr>
<tr>
<td>First dorsal base</td>
<td></td>
<td>550</td>
<td>600</td>
</tr>
<tr>
<td>First dorsal height</td>
<td></td>
<td>650</td>
<td>800</td>
</tr>
<tr>
<td>First dorsal inner margin</td>
<td></td>
<td>240</td>
<td>230</td>
</tr>
<tr>
<td>First dorsal posterior margin</td>
<td></td>
<td>550</td>
<td>700</td>
</tr>
<tr>
<td>Second dorsal length</td>
<td></td>
<td>300</td>
<td>380</td>
</tr>
<tr>
<td>Second dorsal anterior margin</td>
<td></td>
<td>650</td>
<td>880</td>
</tr>
<tr>
<td>Second dorsal base</td>
<td></td>
<td>400</td>
<td>350</td>
</tr>
<tr>
<td>Second dorsal height</td>
<td></td>
<td>590</td>
<td>740</td>
</tr>
<tr>
<td>Second dorsal inner margin</td>
<td></td>
<td>250</td>
<td>200</td>
</tr>
<tr>
<td>Second dorsal posterior margin</td>
<td></td>
<td>450</td>
<td>670</td>
</tr>
<tr>
<td>Pelvic length</td>
<td></td>
<td>214</td>
<td>197</td>
</tr>
<tr>
<td>Pelvic anterior margin</td>
<td></td>
<td>110</td>
<td>110</td>
</tr>
<tr>
<td>Pelvic base</td>
<td></td>
<td>135</td>
<td>145</td>
</tr>
<tr>
<td>Pelvic height</td>
<td></td>
<td>120</td>
<td>860</td>
</tr>
<tr>
<td>Pelvic inner margin length</td>
<td></td>
<td>110</td>
<td>650</td>
</tr>
<tr>
<td>Pelvic posterior margin length</td>
<td></td>
<td>173</td>
<td>135</td>
</tr>
<tr>
<td>Caudal fork width</td>
<td></td>
<td>128</td>
<td>135</td>
</tr>
<tr>
<td>Caudal fork length</td>
<td></td>
<td>700</td>
<td>850</td>
</tr>
</tbody>
</table>

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 (Yışım *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 “Yalçınoğlu 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 kıkrıdkılı balık türü Squatina oculata Cuvier, 1829 ve Squatina squatina (Linnaeus, 1758) rapor edilmiştir. Squatina oculata, 875 mm toplam boyda ve 5536 g. ağrılıktta bir dişi ve Squatina squatina, 915 mm toplam boy ve 6294 g. ağrığa 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

References


Devedjian, K. (1915) Fish and Fishery. İstanbul: Düyun-u Umumiye-i Osmaniye Varidat-ı Mahsusa İdare-i Merkeziyesi Matbaası (in Ottoman).


