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3 **Occurrence of Bluntnose Sixgill Shark**
4 ***Hexanchus griseus* (Bonnaterre,**
5 **1788) in Yeşilovacık Bay,**
6 **Northeastern Mediterranean**

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10 **ABSTRACT**
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Aims: In this study, an individual of *H. griseus* was caught from the Mersin Bay and this ichthyologic note presents a new female record of *H. griseus* for Mersin Bay, Mediterranean coast of Turkey. This study aims to contribute to the chronological records of the species in the Mediterranean Sea.

Place and Duration of Study: Yeşilovacık bay is a small bay in the west of Mersin Bay. Yeşilovacık bay which lies at approximately 36°07'n latitude, 33°37'e, longitude and about 143 km western of in Mersin province, Turkey. Sample: On 19 March 2018 blunthose sixgill shark specimen was measured and then deposited in the Museum of the Systematic, Faculty of Fisheries, University of Mersin.

Methodology: A female specimen of *H. griseus* with a total length (TL) of 350 cm (400 kg) was captured by a commercial trawl at a depth around of 280 m off the Yeşilovacık Bay (Northeastern Mediterranean Sea), Turkey. Total length was measured to the nearest 1 mm and the weight of specimen was determined to the nearest kilogram.

Results: Measurements of the specimen are presented and compared with the previous records of *H. griseus* in the Eastern Mediterranean coast of Turkey (Iskenderun Bay), which are given in Table. The identification was carried out according to previous report.

Conclusion: To date specific conservation measures are not known for this species for the Northeastern Mediterranean coast of Turkey. Thus, the effect of coastal fishery on sharks should be regularly monitored and protection measures should be taken for this region in order for this shark species to continue their conservation for the next generation.

12
13 *Keywords: Hexanchidae; Shark; Mersin Coast; Mediterranean Sea; Turkey*

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16 **1. INTRODUCTION**
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18 The bluntnose sixgill shark, *Hexanchus griseus* (Bonnaterre, 1788), an apex predator of the
19 deep waters, located at the upper trophic level of the food chain, belongs to the family
20 Hexanchidae [1]. It is known that the species inhabits depths of 2500 m in the subtropical
21 regions of the oceans and seas. *H. griseus* usually lives at depths between 180-1100 m
22 [2,3]. It is a deep-water species, which lives in the outer continental and insular shelves and
23 upper slopes. They are found in pelagic areas and upper slopes [4]. Adult specimens are
24 usually below 91 m, while juveniles can be found near the coast [3]. They are found on the
25 bottom during the day. However, they are close to the surface at night to feed. They usually
26 feed on sharks, rays, chimaeras, bony fish, squids, crabs, shrimps, carrion, and even seals
27 [5]. *H. griseus* is an oceanodrom fish species [6]. This circumglobal species is distributed in
28 tropical and temperate waters, including Eastern Atlantic, Western Atlantic, Western Pacific

29 and Eastern Pacific [7]. The maximum weight reported in the literature is 590 kg [8].
30 Although maximum total length (TL) reported in the literature is 482 cm according to
31 Compagno [9] and Cervigón et al. [10]. However, the maximum total length of the species
32 reported in the records is 650 cm in the Turkish coast by Kabasakal [11]. Compagno [9]
33 reported individuals of this species reach reproduction maturity in the range of 300-482 cm
34 in TL. Although studies on the biological properties of the species are limited, it has been
35 reported that they are ovoviviparous and their fecundity vary between 22 to 108 [1].

36 The bluntnose sixgill shark, *H. griseus* has been reported from France [12,13], from Italy
37 [14,15], from Israel [16], from Tunisia [17], from Greece [18] in the Mediterranean Sea.
38 There are reports of *H. griseus* from the Pacific [1,19], from the Indian and Atlantic Oceans
39 [20]. It has been also reported from Turkey waters of the Mediterranean, the Aegean Sea,
40 the Sea of Marmara and Black Sea [21]. According to Kabasakal [11]; first record of this
41 species in the waters of Turkey was reported in 1923 by [22], and the following studies:
42 Devedjian [23]; Konsuloff and Drensky [24]; Ben-Tuvia [16]; Akşiray [25]; Meriç [26]; Goren
43 and Galil [27]; Jones et al. [28]; Kabasakal [21]; Sion et al. [29]; Golani et al. [30]; Kabasakal
44 [31]; Kabasakal [11]; Basusta and Basusta [32].

45 In this study, an individual of *H. griseus* was caught from the Mersin Bay and this
46 ichthyologic note presents a new female record of *H. griseus* for Mersin Bay, Mediterranean
47 coast of Turkey. This study aims to contribute to the chronological records of the species in
48 the Mediterranean Sea.

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51 **2. MATERIAL AND METHODS**

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53 **2.1 Study Area**

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55 Yeşilovacık Bay is a small bay in the west of Mersin Bay. (Fig. 1). Yeşilovacık Bay which lies
56 at approximately 36°07'N latitude, 33°37'E, longitude and about 143 km western of in Mersin
57 Province, Turkey. The bay is the spawning and breeding area for many bony fish species
58 due to the wide continental shelf. The biodiversity of the Yeşilovacık Bay is affected by the
59 migration of the alien species. Both sides of the bay are surrounded by littoral shores, while
60 sandy beach is located inside. It is covered with sandy muddy sediment on the sea floor of
61 the bay. The bay has an anticyclonic gyre opposite to the cyclonic gyre, which the main gyre
62 of the Mediterranean Sea. The maximum depth of the bay is 180 m. The physical and
63 chemical parameters of the Bay are similar to those of the Mediterranean Sea. Tourism,
64 agriculture, fishing and ship transportation are the main activities in the bay.

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66 **2.2. Fish Sampled**

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68 On 19 March 2018, a female specimen of *H. griseus* with a total length (TL) of 350 cm (400
69 kg) was captured by a commercial trawl at a depth around of 280 m off the Yeşilovacık Bay
70 (Northeastern Mediterranean Sea), Turkey (Fig. 1).

71 Total length was measured to the nearest 1 mm and the weight of specimen was determined
72 to the nearest kilogram. The head and fins of the specimen were deposited in the Museum
73 of the Systematic, Faculty of Fisheries, Mersin University, (MEUFC-18-11-058), (Fig. 2).

74 **3. RESULTS**

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76 In this study, a female individual was captured from the Mediterranean waters off Turkish
77 coast (Mersin Bay). The identification was carried out according to Compagno [9]. Some
78 measurements of the specimen are presented and compared with the previous records of *H.*
79 *griseus* in the Eastern Mediterranean coast of Turkey (Iskenderun Bay), which are given in
80 Table 1.

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82 The species possesses six pairs of gill slits, a subterminal mouth and a short, broadly
83 rounded blunt snout. It is grey with or without irregular brown spots. Also, the distance from
84 the dorsal fin to the caudal fin is equal to the length of the dorsal fin base [9].

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86 The color of fresh specimen was dark grey without spots on the back and white on the belly,
87 with no clear boundary between the two colors.

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90 **4. DISCUSSION**

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92 The bluntnose sixgill shark, *H. griseus* is not a commercial species due to the fact that it is a
93 deep-water species and it is difficult to capture. However, it can also be sold for commercial
94 purposes when caught by commercial fishermen [1]. Although *H. griseus* is found in deep
95 waters (1-2500 m), it can come up to shallow waters (50-100 m) [11]. Individuals of this
96 species are usually caught during the fishing activities in coastal waters. In this study, the
97 reported individual was caught at a depth of 280 m.

98 The size at birth is 56 to 70 cm and the total length of the species is usually 300 cm [10].
99 Females mature at about 300 to 482 cm and males at about 300 to 350 cm [9,33,34].
100 Kabasakal [11] reported 6 female individuals of *H. griseus* with a total length of 350 cm were
101 caught between in October-April from Taşucu and Kaş. In the same period, the presence of
102 a large number of mature female individuals in the same region may indicate that they came
103 for breeding purposes. The total length of the individual caught in this study was 350 cm and
104 it was a mature individual. It was evaluated that this individual may have reached shallow
105 waters in the same period with the purpose of reproduction.

106 The bluntnose sixgill shark commonly feeds on *Squalus* spp., sharks, rays, bony fish, crabs,
107 shrimps, carrion, and seals [9,20,35]. In this study, a large number of bony fish species were
108 found in the stomach contents. In addition, shark (*Squalus* spp.), *Galeus melastomus* and
109 some species of rays (*Dipturus oxyrinchus*), as well as cans and plastic remains were found.
110 Similar Barrull and Mate [36] reported that *Scyliorhinus canicula*, *G. melastomus*, *Merluccius*
111 *merluccius* and *Phycis blennoides* were found in the stomach contents of six shark samples
112 caught in the Catalan Sea. Celona et al. [37] reported the stomach contents of 23 specimens
113 captured in Eastern Sicilian waters mainly consist of bony fish (60.87%), cephalopods
114 (13.04%), decapod crustaceans (8.7%), cartilaginous (4.35%) and echinoderms (4.35%).
115 According to Ebert [20] the main prey of individuals over 200 cm of *H. griseus* in the coasts
116 of South Africa is composed of bony fish. Consumption of sharks and sea mammals has
117 been reported to be associated with their lengths. In this study, the main prey of the
118 captured individual (350 cm, TL) formed bony fish. This finding is consistent with the
119 literature.

120 The bluntnose sixgill shark has several records in the Mediterranean Sea, Turkey [11]. 150
121 individuals of *H. griseus* were caught from the Turkish coastal waters between 1963-2013
122 years by commercial fishermen. 90 specimens from the Marmara Sea, 41 specimens from
123 the Turkish coastal waters of Aegean Sea, 15 specimens from the Turkish coastal waters of

124 Mediterranean Sea and 3 specimens from the Turkish coastal waters of Black Sea and 1
125 specimen from the Dardanelles were reported [11]. After 2013, 2 individuals have been
126 reported from Mediterranean coasts of Turkey [32,38].

127 To date there is little information available about habitat, ecology, and population of *H.*
128 *griseus*. This species is listed as Near Threatened (NT) in the Global Red List by the
129 International Union for Conservation of Nature, IUCN [39,40] and also by CITES [41].
130 Therefore, this record is significant and the species could be considered as exceptionally
131 rare in the Mediterranean, Turkey.

132 The bluntnose sixgill shark is a species that has not been economically important because it
133 is not a species offered for human consumption but marketed for human consumption when
134 it is caught to the nets by fishermen in some regions. The fishermen do not like this shark
135 species because they can damage the economically important seafood. The pressure of the
136 species on the economic species is neglected in the scientific researches. However,
137 fishermen should be encouraged to release the sharks caught by mistake. This is an
138 important move in terms of conservation of species and improvement of fisheries
139 management.

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141 **5. CONCLUSION**

142 This predator species in the upper trophic levels of the food chain are found to be few in
143 number, their distribution in deep waters and the difficulties in catching them therefore limit
144 the biological studies related to the species. These individuals, which are accidentally caught
145 by the fishermen and come to the shallow waters for breeding purposes, enable the study of
146 the species for scientific purposes. This situation is not preferred for commercial fishermen
147 because they cannot market this species economically to the people of our country.
148 Therefore, fishermen can be more easily encouraged to release the captured *H. griseus* into
149 the water.

150 To date specific conservation measures are not known for this species for the Northeastern
151 Mediterranean coast of Turkey. Thus, the effect of coastal fishery on sharks should be
152 regularly monitored and protection measures should be taken for this region in order for this
153 shark species to continue their conservation for the next generation.

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155 **COMPETING INTERESTS**

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157 The authors declare no competing of interests.

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160 **ETHICAL APPROVAL**

161

162 As per international standard or university standard written ethical approval has been
163 collected and preserved by the authors.

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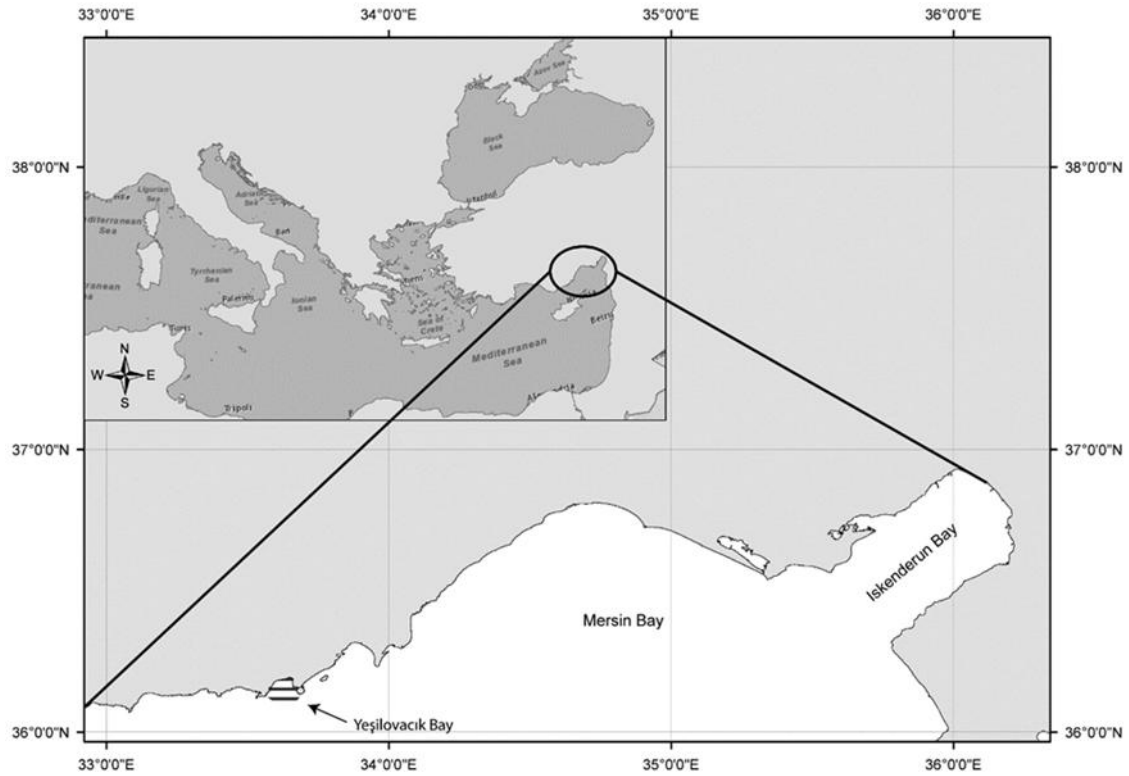
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274 **Table 1. Comparison of measurements of the bluntnose sixgill shark specimen (*H.***
 275 ***griseus*) from Mersin Bay (Northeastern Mediterranean, Turkey) with previous record**
 276 **in the Iskenderun Bay (Eastern Mediterranean, Turkey)**
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	This study		Başusta and Başusta (2015)	
Specimen	n=1		n=1	
Sex	Female		Male	
Measurements	Length (cm)	Ratio (TL%)	Length (cm)	Ratio (TL%)
TL-Total Length)	350.0	100.00	213.0	100.00
FL-Fork Length	271.8	77.66	165.4	77.65
PCL-Precaudal Length	245.1	70.04	149.2	70.05
HDL-Head Length)	53.2	15.20	32.4	15.21
PNL-Prenarial Length	18.5	5.30	11.3	5.31
EYL -Eye Length	12.0	3.41	7.3	3.43
CDM-Dorsal Caudal Margin	101.8	29.09	62.0	29.11
DL-Dorsal Length	22.1	6.32	13.5	6.34
DH-Dorsal Height	23.0	6.55	14.0	6.57
CLI-Clasper Inner Length	-	-	7.3	3.43
BH-Body Height	37.7	10.68	23.0	10.80
Weight (kg)	400	-	480	-

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Fig. 1. The shaded area indicates the location where the specimen of *H. griseus* was caught from Mersin Bay

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Fig. 2. Female specimen of *H. griseus* caught from Mersin Bay

UNDER PEER REVIEW