

SHARKS CAPTURED BY COMMERCIAL FISHING VESSELS
OFF THE COAST OF TURKEY IN THE NORTHERN AEGEAN SEA*Hakan KABASAKAL & Elif KABASAKAL*Ichthyological Research Society, Atatürk Mahallesi, Menteşo ğlu Caddesi, İdil Apt., No: 30, D: 4, Ümraniye TR-34764 İstanbul, Turkey
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ABSTRACT

Between 1995 and 2004, 1068 sharks – representing 20 species, 11 families and 5 orders – were recorded off the coast of NE Aegean Sea. 1003 (93.8%) of them were captured by means of bottom trawling, followed by long-lining ($n = 30$, 2.8%), gill-netting ($n = 25$, 2.34%), purse-seining ($n = 5$, 0.46%) and hand-lining ($n = 1$, 0.09%), while the remaining 4 sharks (0.37%) were sighted by a diver (*Carcharodon carcharias*, TOT ca. 500 cm) or by fishermen. Juveniles of *Galeus melastomus*, *Scyliorhinus canicula*, *Etmopterus spinax*, *Squalus acanthias* and *S. blainvillei* dominated the by-catch of bottom trawlers operating in the investigated area.

Key words: sharks, fishery, Turkey, NE Aegean Sea, by-catch

SQUALI CATTURATI NELLE ACQUE TURCHE DEL MAR EGEO SETTENTRIONALE

SINTESI

Tra il 1995 ed il 2004, nelle acque turche del Mar Egeo settentrionale sono stati registrati 1068 squali, appartenenti a 20 specie, 11 famiglie e 5 ordini. Ben 1003 esemplari (93,8%) sono stati catturati con la cocchia (rete a strascico), 30 (2,8%) con il parangale (lenza armata con numerosi ami), 25 (2,34%) con il tramaglio (rete da posta), 5 squali (0,46%) con la saccaleva (rete da circuizione), un esemplare (0,09%) con la classica lenza a mano, mentre i restanti 4 (0,37%) sono stati segnalati da un subacqueo (*Carcharodon carcharias*, TOT ca. 500 cm) e da pescatori. Tra le catture casuali con le cocchie nell'area in questione c'era una prevalenza di giovani esemplari delle specie *Galeus melastomus*, *Scyliorhinus canicula*, *Etmopterus spinax*, *Squalus acanthias* and *S. blainvillei*.

Parole chiave: squali, pesca, Turchia, Mar Egeo settentrionale, pesca casuale

INTRODUCTION

According to the more recent list of elasmobranch species from the seas of Turkey (Kabasakal, 2002a), a total of 28 confirmed species of sharks have been recorded from the Turkish coast of Aegean Sea to date. However, our knowledge about the distribution, bio-ecological features and population structures of nearly all of these 28 species, even of the commercially exploited ones, still include significant gaps, and this circumstance causes remarkable difficulties in terms to regulate their fisheries or conservation. As previously reported, the amount of by-caught sharks, especially by the Turkish trawling fleet operating in the northern Aegean Sea, is quite high (Kabasakal, 1998). On the other hand, littoral and bathyal grounds of the northern Aegean Sea, mainly along the eastern side, are important nurseries and breeding areas for many shark species (D'Onghia *et al.*, 1995; Kabasakal, 2002a). Investigations of the interactions between sharks and fishing operations in the northern Aegean Sea are therefore of vital importance.

There are very few recent reports on sharks known to have occurred along the coast of Turkey in the northern Aegean Sea, and the knowledge of sharks from the mentioned area is mainly limited either to the general ichthyological works, which have been carried out by Turkish or foreign researchers (see for example, Whitehead *et al.* 1984; Akşiray, 1987; Ulutürk, 1987; Keskin & Ünsal, 1998), or works on the systematics or biology of a few species of sharks captured in this area (D'Onghia *et al.*, 1995; Cihangir *et al.*, 1997; Kabasakal & Ünsal, 1999; Kabasakal, 2002a, b, c; Kabasakal & Kabasakal, 2002).

The aim of the present study is to provide information on the presence and bio-ecological features of shark species captured by commercial fishing vessels along the Turkish coast in the northern Aegean Sea between 1995 and 2004.

MATERIAL AND METHODS

The study area is the northeastern part of the Aegean Sea (Fig. 1), characterized by an extended continental shelf, lower salinities due to the Pontic fresh water going through the Dardanelles, absence of thermophile fauna, and practically unchanged water temperature throughout the year below 250 m (13.5 ° to 14.0 °C) (Kocataş & Bilecik, 1992; Papaconstantinou, 1992).

Samplings of sharks were carried out mainly on board of commercial fishing trawlers by means of a bottom trawl with a cod-end mesh opening of 22 mm from knot to knot. Furthermore, shark by-catches with the aid of purse-seines, gill-netters, bottom long-liners and swordfish harpooners were also analysed. Whenever possible, the following data were recorded: total

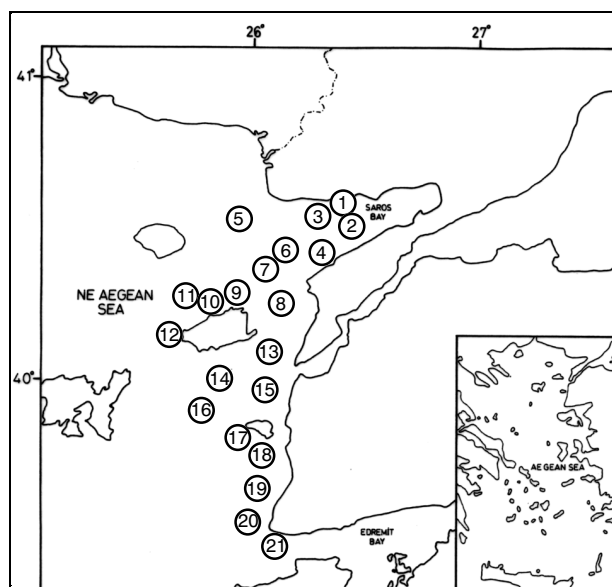


Fig. 1: Map showing the investigated area in NE Aegean Sea. Circled numbers indicate approximate locality of the stations.

Sl. 1: Zemljevid raziskovalnega območja v severovzhodnem Egejskem morju. Obkrožene številke ponazarjajo približne lokalitete postaj.

length (TOT) of shark to the nearest cm, sex and sampling locality. Total length (TOT) of the shark is the distance between the tip of the nose and the tip of the upper lobe of the caudal fin, lay in natural position (Compagno, 1984a). One to three specimens of the following species were fixed and preserved in 5% formaline solution in sea water (now kept at the Faculty of Fisheries, University of Istanbul): *Hexanchus griseus* (Bonnaterre, 1788), bluntnose sixgill shark; *Galeus melastomus* Rafinesque, 1810, blackmouth catshark; *Scyliorhinus canicula* (Linnaeus, 1758), small-spotted catshark; *Scyliorhinus stellaris* (Linnaeus, 1758), nursehound; *Galeorhinus galeus* (Linnaeus, 1758), tope shark; *Mustelus asterias* Cloquet, 1821, starry smoothhound; *Mustelus mustelus* (Linnaeus, 1758), smoothhound; *Oxynotus centrina* (Linnaeus, 1758), angular roughshark; *Etmopterus spinax* (Linnaeus, 1758), velvet belly; *Dalatias licha* (Bonnaterre, 1788), kitefin shark; *Squalus acanthias* Linnaeus, 1758, spiny dogfish; *Squalus blainvillei* (Risso, 1827), longnose spurdog; *Squatina oculata* Bonaparte, 1840, smoothback angelshark; and *Squatina squatina* (Linnaeus, 1758), angelshark. Our study also included the taxidermied specimens of blue shark, *Prionace glauca* (Linnaeus, 1758), and smooth hammerhead, *Sphyrna zygaena* (Linnaeus, 1758), preserved in the collection of Gökçeada Marine Station (GMS), Çanakkale, Turkey. No specimens of the great white shark, *Carcharodon carcharias* (Linnaeus, 1758), porbeagle, *Lamna nasus* (Bonnaterre, 1788), basking shark, *Cetorhinus maximus*



Fig. 2: Lateral view of the head of female *A. vulpinus* (400 cm TOT). (Photo: H. Kabasakal)

Sl. 2: Pogled od strani na glavo samice *A. vulpinus* (400 cm TOT). (Foto: H. Kabasakal)

(Gunnerus, 1765) or thresher shark, *Alopias vulpinus* (Bonnaterre, 1788), are available in the collections of Gökçeada Marine Station or Faculty of Fisheries, University of Istanbul, as large sharks are generally sold at fish markets (only teeth samples are available for a female specimen of *A. vulpinus*, TOT 400 cm; see Table 1). Identification follows Compagno (1984a, b). Taxonomic nomenclature follows the check-list proposed by the European Register of Marine Species (<http://erms.biol.soton.ac.uk./lists/brief/Chondrichthyes.shtml>).

RESULTS

Between 1995 and 2004, we recorded 1068 sharks, representing 20 species, 11 families, and 5 orders. These were: order Hexanchiformes: *H. griseus* (Bonnaterre, 1788) (n = 7) (family Hexanchidae); order Lamniformes: *C. carcharias* (Linnaeus, 1758) (n = 3), *L. nasus* (Bonnaterre, 1788) (n = 1) (family Lamnidae); *C. maximus* (Gunnerus, 1765) (n = 1) (family Cetorhinidae); *A. vulpinus* (Bonnaterre, 1788) (n = 3) (family Alopiidae); order Carcharhiniformes: *G. melastomus* Rafinesque, 1810 (n = 183), *S. canicula* (Linnaeus, 1758) (n = 119), *S. stellaris* (Linnaeus, 1758) (n = 3) (family Scyliorhinidae); *G. galeus* (Linnaeus, 1758) (n = 2), *M. asterias* Cloquet, 1821 (n = 14), *M. mustelus* (Linnaeus, 1758) (n = 30) (family Triakidae); *P. glauca* (Linnaeus, 1758) (n = 3) (family Carcharhinidae); *S. zygaena* (Linnaeus, 1758) (n = 1) (family Sphyrnidae); order Squaliformes: *E. spinax* (Linnaeus, 1758) (n = 220), *O. centrina* (Linnaeus, 1758) (n = 1), *D. licha* (Bonnaterre, 1788) (n = 5) (family Dalatiidae); *S. acanthias* Linnaeus, 1758 (n = 447), *S. blainvillei* (Risso, 1827) (n = 18) (family Squalidae); and order Squatiniformes: *S. oculata* Bonaparte, 1840 (n = 2), *S. squatina* (Linnaeus, 1758) (n = 5) (family Squatinidae).



Fig. 3: A pregnant female of *M. asterias* (153 cm TOT) had 21 embryos in its uterus. (Photo: H. Kabasakal)

Sl. 3: V maternici breje samice vrste *M. asterias* (153 cm TOT) je bilo odkritih 21 zarodkov. (Foto: H. Kabasakal)



Fig. 4: A pregnant female of *S. blainvillei* (84 cm TOT) had 7 embryos in its uterus. (Photo: H. Kabasakal)

Sl. 4: V maternici breje samice vrste *S. blainvillei* (84 cm TOT) je bilo odkritih 7 zarodkov. (Foto: H. Kabasakal)

Of the 1068 sharks recorded, 1003 (93.8%) had been captured by means of bottom trawling, followed by long-lining (n = 30, 2.8%), gill-netting (n = 25, 2.34%), purse-seining (n = 5, 0.46%) and hand-lining (n = 1, 0.09%), while the remaining 4 sharks (0.37%) were sighted by a diver (*C. carcharias*, TOT ca. 500 cm, Tab. 1) or by fishermen.

The data collected are presented in Table 1. The number of sharks captured off the Turkish coast in the northern Aegean Sea between 1995 and 2004 and the percentage of each species of the total shark captures are presented in Table 2.

Tab. 1: Sharks captured or sighted by commercial fishing vessels off the Turkish coast of NE Aegean Sea. Station numbers in the table are the same as circled numbers in figure 1.

Tab. 1: Morski psi, ki so jih v turških vodah severovzhodnega Egejskega morja ujele ali opazile posadke ribiških bark. Oštevilčene postaje v tabeli so enake obkroženim številkam na sliki 1.

SPECIES	No.	DATE	STATIONS	SEX	TOTAL LENGTH (cm)	NOTES
<i>Hexanchus griseus</i>	1	1997	10	?	350	Captured at a depth of 400 m by means of bottom trawling.
	1	1998	13	M	360	Captured by bottom trawl.
	1	20 Jul 1998	11	M	400	Captured by bottom trawl. Claspers were fully calcified.
	1	Oct 1999	3	F	66	Captured by bottom trawl. An unhealed umbilical scar was noticed on its ventral surface.
	1	6 Jul 2000	11	?	400	Captured by purse-seining.
	1	24 Aug 2002	3	F	400	-
	1	25 Dec 2002	21	?	?	A very large specimen weighing nearly 565 kg (R. Çavuş, pers. comm.).
<i>Carcharodon carcharias</i>	1	Mar 1996	17	F	550	Captured by purse-seining.
	1	Apr 1998	16	?	ca. 450	Sighted by a gill-netter.
	1	May 1999	4	?	ca 500	Sighted by a diver.
<i>Lamna nasus</i>	1	11 Apr 2004	18	M	250	Captured by fishermen A. Gürtay (pers. comm.) by means of gill-netting.
<i>Cetorhinus maximus</i>	1	16 May 1997	14	?	ca. 800	Sighted by a swordfish harpooner.
<i>Alopias vulpinus</i>	1	Jun 1996	14	F	400	Captured by a tuna hand-liner (Fig. 2).
	1	Jul 1996	20	F	600	Captured by purse-seining.
	1	3 Apr 2004	19	M	250	Captured by gill-netting in coastal waters.
<i>Galeus melastomus</i>	20	Jul 1997	9	M	16-25	Captured by bottom trawling.
	17	Jul 1997	9	F	15.2-27	Captured by bottom trawling.
	63	Oct 1999	10	M	18.22	Captured by bottom trawling.
	83	Oct 1999	10	F	14-29.3	Captured by bottom trawling.
<i>Scyliorhinus canicula</i>	8	Jul 1997	12	M	32-45	Captured by long-lining.
	6	Jul 1997	12	F	26-50.2	Captured by long-lining. Specimens \geq 40 cm TOT contained egg cases.
	65	Mar 1998	5	M	15-45.2	Captured by bottom trawling.
	40	Mar 1998	5	F	17-50	Captured by bottom trawling. Specimens \geq 40 cm TOT contained egg cases.
<i>Scyliorhinus stellaris</i>	3	Mar 1997	18	F	40-165	Captured by bottom trawling. Two females, 155 and 165 cm TOT, contained egg cases (one in each uterus).
<i>Galeorhinus galeus</i>	1	Sep 1997	8	M	165	Captured by bottom trawling. Claspers were fully calcified.
	1	Oct 1997	15	M	175	Captured by bottom trawling. Claspers were fully calcified.
<i>Mustelus asterias</i>	5	Mar 1997	3	F	45-95	Captured by gill-netting. Specimen, 95 cm TOT, contained matured eggs.
	2	Sep 1997	2	F	75-104	Captured by bottom trawling.
	6	Sep 1997	2	M	45-112	Captured by bottom trawling.
	1	Nov 1997	2	F	153	Captured by bottom trawling. A total of 21 embryos were found in the uterus (Fig. 3).
<i>Mustelus mustelus</i>	10	Oct 1997	6	M	40-109	Captured by otter trawling. Claspers of the specimens \geq 70 cm TOT were fully calcified.
	6	Oct 1997	6	F	53-130	Captured by bottom trawling. Specimens \geq ca. 75 cm TOT contained matured eggs.
	5	Sep 1998	7	M	90-122	Captured by long-lining.
	7	Sep 1998	7	F	83-132	Captured by long-lining.
	2	Mar 1999	20	M	43-52	Captured by bottom trawling.
<i>Prionace glauca</i>	1	May 1997	9	M	220	Captured by purse-seining. Head and caudal fin are preserved in the field museum of GMS.
	1	Jun 1997	10	F	51	Captured by seining. Specimen is preserved in the museum of GMS.
	1	Oct 1999	9	?	ca. 250	Sighted on board of fishing trawler Şekerbaba 2, while attacking the cod-end.

<i>Sphyrna zygaena</i>	1	Jun 1998	12	F	221	Captured by gill-netting. Head and caudal fin are preserved in the field museum of GMS.
<i>Etmopterus spinax</i>	5	16 Oct 1996	2	3 F, 2 M	15.3-20.4	Captured by bottom trawling at a depth of 280 m. Males were 186 and 204 mm TOT, females 153 to 197 mm TOT. Morphometric and biological data on the examined specimens are given by Kabasakal & Ünsal (1999).
	122	Oct 1999	9,10,11	M	12-21	Captured by bottom trawling.
	93	Oct 1999	9,10,11	F	14-22.7	Captured by bottom trawling.
<i>Oxynotus centrina</i>	1	Nov 1998	16	F	65	Captured by bottom trawling.
<i>Dalatias licha</i>	5	Oct 1999	9	M	33.8-41.9	Captured by bottom trawling at a depth of 380 m. Three specimens were found to bear healing umbilical scar. Morphometric and biological data on the examined specimens are given by Kabasakal & Kabasakal (2002).
<i>Squalus acanthias</i>	65	1-3 Mar 1997	13, 14, 15, 16, 18, 20	M	35-87	Captured by bottom trawling.
	47	1-3 Mar 1997	13, 14, 15, 16, 18, 20	F	37-103	Captured by bottom trawling.
	9	Jul 1997	8	M	40-75	Captured by gill-netting.
	6	Jul 1997	8	F	50-65	Captured by gill-netting.
	128	Sep - Nov 1997	4, 7, 9, 14, 16, 19, 21	M	47-98	Captured by bottom trawling.
	137	Sep - Nov 1997	4, 7, 9, 14, 16, 19, 21	F	37-103	Captured by bottom trawling.
	35	Oct 1999	7, 9, 10	M	30-37	Captured by bottom trawling.
	20	Oct 1999	7, 9, 10	F	28-32	Captured by bottom trawling.
<i>Squalus blainvillei</i>	10	Oct 1996	3	M	30-51	Captured by bottom trawling.
	8	Oct 1996	3	F	35-87	Captured by bottom trawling. One of the specimens, 87 cm TOT, was found to contain 7 embryos in the uterus (Fig. 4).
<i>Squatina oculata</i>	1	Jul 1997	8	M	30	Captured by bottom trawling.
	1	Sep 1999	13	F	95	Captured by bottom trawling.
<i>Squatina squatina</i>	3	Oct 1996	13	M	120-152	Captured by long-lining.
	2	Jul 1997	12	M	75-83	Captured by gill-netting.

DISCUSSION AND CONCLUSIONS

Twenty shark species captured during the study constitute 71.42% of the total shark fauna, recorded from the Turkish Aegean Sea to date (Kabasakal, 2002a). In terms of the number of captured individuals, *S. acanthias* (n = 447, 41.85%) was the most abundant species, followed by *E. spinax* (n = 220, 20.59%), *G. melastomus* (n = 183, 17.13%) and *S. canicula* (n = 119, 11.14%). The number of the captured individuals of the remaining species was less than 30, and only individual each of *L. nasus*, *C. maximus*, *S. zygaena* and *O. centrina* were captured over the 9-year investigation period.

Before the present study, *H. griseus*, a new-born female of 66 cm TOT was recorded from the bathyal grounds off the northern coast of Gökçeada by Kabasakal (2002a). Mature individuals of the bluntnose six-gill shark were recorded for the first time off the coast of Turkey in the northern Aegean Sea during the present study. The scarcity of capture records of the great white shark and porbeagle in Turkish waters is obvious, and only one report dealing with the occurrence of *C. carcharias* in the Sea of Marmara is available (Kabasakal, 2003). During the present study, we recorded 3 great

white sharks in the investigated area between 1996 and 1999. *C. carcharias* was recorded for the first time in the investigated area. Only one *L. nasus* was recorded in 2004, and this is the second porbeagle record off the Turkish coast of the Aegean Sea (Kabasakal, 2002a). The presence of the basking shark in Turkish waters has always been a point of discussion. According to Kıdeyş (1997) and Kabasakal (2002d), the basking shark encounters in Turkish waters are concentrated off the southern coast of Anatolian peninsula, and it has been therefore for long time assumed that the distribution range of *C. maximus* does not extend to the northern Aegean Sea. The sighting of a basking shark of ca. 8 m TOT suggests, however, that this filter-feeding shark may penetrate the mentioned area. But based on a single sighting, it is not possible to say whether the basking shark occurrence in the northern Aegean Sea shows seasonal regularity. The occurrence of *H. griseus*, *C. carcharias*, *L. nasus* and *C. maximus* in northern Aegean Sea has been reported by Papaconstantinou (1988), but the fact is that his results are based on the old work of Konsuloff & Drenski (1943; cited in Papaconstantinou & Tsimenidis, 1979). In the recent study carried out by Fergusson (1996), its author reports on the occurrence of

Tab. 2: Number of recorded specimens of each shark species.
Tab. 2: Število zabeleženih primerkov posameznih vrst morskih psov.

SPECIES	No.	%
<i>Hexanchus griseus</i> (Bonnaterre, 1788)	7	0.65
<i>Carcharodon carcharias</i> (Linnaeus, 1758)	3	0.28
<i>Lamna nasus</i> (Bonnaterre, 1788)	1	0.09
<i>Cetorhinus maximus</i> (Gunnerus 1765)	1	0.09
<i>Alopias vulpinus</i> (Bonnaterre, 1788)	3	0.28
<i>Galeus melastomus</i> Rafinesque, 1810	183	17.13
<i>Scyliorhinus canicula</i> (Linnaeus, 1758)	119	11.14
<i>S. stellaris</i> (Linnaeus, 1758)	3	0.28
<i>Galeorhinus galeus</i> (Linnaeus, 1758)	2	0.18
<i>Mustelus asterias</i> Cloquet, 1821	14	1.31
<i>M. mustelus</i> (Linnaeus, 1758)	30	2.8
<i>Prionace glauca</i> (Linnaeus, 1758)	3	0.28
<i>Sphyrna zygaena</i> (Linnaeus, 1758)	1	0.09
<i>Etmopterus spinax</i> (Linnaeus, 1758)	220	20.59
<i>Oxynotus centrina</i> (Linnaeus, 1758)	1	0.09
<i>Dalatias licha</i> (Bonnaterre, 1788)	5	0.46
<i>Squalus acanthias</i> Linnaeus, 1758	447	41.85
<i>S. blainvillei</i> (Risso, 1827)	18	1.68
<i>Squatina oculata</i> Bonaparte, 1840	2	0.18
<i>S. squatina</i> (Linnaeus, 1758)	5	0.46

4 great white sharks in northern Aegean waters. Before the present study, Ulutürk (1987) reported on single captures of *P. glauca* and *S. zygaena* off the coast of Gökçeada (NE Aegean Sea). The common thresher shark, *A. vulpinus*, has been recorded for the first time in the investigated area. Therefore, our study provides updated information on the occurrence of these large sharks from the investigated area.

G. melastomus, *S. canicula*, *S. stellaris*, *M. asterias*, *M. mustelus*, *E. spinax*, *S. acanthias*, *S. blainvillei* and *S. squatina* are considered as quite to very common species in the northern Aegean Sea by some researchers (Papaconstantinou & Tsimenidis, 1979; Papaconstantinou & Tortonese, 1980; Ulutürk, 1987; Keskin & Ünsal, 1998; Kabasakal, 2002a). On the other hand, *G. galeus*, *O. centrina*, *D. licha* and *S. oculata* are considered as rare in the same area (Papaconstantinou & Tortonese, 1980; Whitehead *et al.*, 1984; Kabasakal, 2002a; Kabasakal & Kabasakal, 2002). The number of the captured specimens of these 4 sharks over the 9 year research period confirms their rarity in the investigated area (Tab. 1).

The total lengths of nearly all sharks fell within the ranges previously described for these species by Compagno (1984a, b). However, in two cases total lengths of the specimens exceeded the reported maximum values (Tab. 3). One of the pregnant female *S. stellaris* captured in March 1997 and measured as 165 cm TOT by one of the authors (H. Kabasakal), exceeds the reported maximum TOT for this species (162 cm in Compagno,

1984b). In the second case, a pregnant female *M. asterias* captured in November 1997 and measured by H. Kabasakal as 153 cm TOT, also exceeds the reported maximum TOT for this species (140 cm in Compagno, 1984b).

During the present study, significant numbers of new-born and juvenile sharks as well as pregnant females were captured at most of the stations. The new-born *H. griseus* of 66 cm TOT, captured in October 1999, bore an umbilical scar. According to Capapé *et al.* (2004), size at birth of *H. griseus* from the Mediterranean Sea ranged between 55.6 and 68 cm TOT. Significant numbers of *G. melastomus* new-hatchlings and juveniles were captured. According to Compagno (1984b), the minimum TOT of mature male and female blackmouth catsharks is 34 cm and 39 cm, respectively. *S. canicula* is another catshark, whose new-hatchlings and juveniles were captured in significant numbers, and according to Compagno (1984b) the size at hatching of this species is 9 to 10 cm. Barrull & Mate (2002) reported the size at hatching of *S. canicula* as 7 cm. The smallest individual of *S. canicula* during the present research is 15 cm TOT. Size at birth of *M. asterias* is 28.5 to 30 cm (Quignard & Capapé, 1972) and of *M. mustelus* is 39 cm (Capapé, 1974). The smallest individual of the former triakid shark is 45 cm TOT and 40 cm for the latter. Although we did not observe any umbilical scar on these juveniles, their total lengths are very close to size at birth. In June 1997, a female blue shark, *P. glauca*, of 51 cm TOT was captured by seining and is now preserved in the GMS as a

Tab. 3: Recorded and maximum TOT range of each shark species.

Tab. 3: Razpon izmerjenih in maksimalnih celotnih iztegnjenih dolžin (TOT) posameznih vrst morskih psov.

SPECIES	Recorded TOT range (cm)	Max. TOT (cm) (Compagno 1984a, b)
<i>Hexanchus griseus</i> (Bonnaterre, 1788)	66-400	482
<i>Carcharodon carcharias</i> (Linnaeus, 1758)	ca. 450-550	640
<i>Lamna nasus</i> (Bonnaterre, 1788)	250	300
<i>Cetorhinus maximus</i> (Gunnerus 1765)	ca. 800	1520
<i>Alopias vulpinus</i> (Bonnaterre, 1788)	250-600	610
<i>Galeus melastomus</i> Rafinesque, 1810	15.2-29.3	90
<i>Scyliorhinus canicula</i> (Linnaeus, 1758)	15-50.2	60
<i>S. stellaris</i> (Linnaeus, 1758)	40-165	162
<i>Galeorhinus galeus</i> (Linnaeus, 1758)	165-175	195
<i>Mustelus asterias</i> Cloquet, 1821	45-153	140
<i>M. mustelus</i> (Linnaeus, 1758)	40-132	164
<i>Prionace glauca</i> (Linnaeus, 1758)	97-ca. 250	383
<i>Sphyrna zygaena</i> (Linnaeus, 1758)	221	400
<i>Etmopterus spinax</i> (Linnaeus, 1758)	11-22.7	60
<i>Oxynotus centrina</i> (Linnaeus, 1758)	65	150
<i>Dalatias licha</i> (Bonnaterre, 1788)	33.8-41.9	182
<i>Squalus acanthias</i> Linnaeus, 1758	28-103	160
<i>S. blainvillei</i> (Risso, 1827)	30-87	95
<i>Squatina oculata</i> Bonaparte, 1840	30-95	160
<i>S. squatina</i> (Linnaeus, 1758)	75-152	244

taxidermied specimen. Regarding the size at birth of the blue shark, 35 to 44 cm TOT (Compagno, 1984b), it is possible to classify this specimen as a neonate, and this is the first neonate blue shark reported off the Turkish coast of the northern Aegean Sea. The smallest individual of *E. spinax* captured during the present study is 12 cm TOT, while the largest is 22.7 cm TOT. Specimens between 12 to 15 cm TOT bore healing umbilical scar; Vacchi & Relini Orsi (1979), Bauchot (1987), Barrull *et al.* (1999) and De Maddalena & Piscitelli (2001) reported that size at birth of the velvet belly is 10 to 11 cm TOT. Three specimens of *D. licha*, 33.8 to 37.2 cm TOT, bore healing umbilical scars (Kabasakal & Kabasakal, 2002). According to Compagno (1984a), the size of the kitefin shark at birth is about 30 cm. Total lengths of the captured specimens of *S. acanthias* and *S. blainvillei* ranged between 28 to 103 cm TOT, and 30 to 87 cm TOT, respectively. Individuals of *S. acanthias* between 28 to 35 cm TOT bore umbilical scars, and the size at birth of the piked dogfish is 22 to 33 cm (Compagno, 1984a). Although we did not observe any birth mark on the smallest individual (30 cm TOT) of *S. blainvillei*, its size is very close to the size at birth (about 23 cm TOT) of the species (Compagno, 1984a). With the exception of male *S. oculata* of 30 cm TOT, captured in July 1997, total length of the remaining individuals of both squatinid sharks were well above the size at birth described for two species (24 to 27 cm TOT for *S. oculata*, and 24 to 30 cm TOT for *S. squatina*; Compagno, 1984a).

Some pregnant sharks were also captured during the present study. Females of *S. canicula*, ≥ 40 cm TOT, contained egg cases in uteri; these specimens were captured in both littoral and bathyal haulings. Two female *S. stellaris*, 155 and 165 cm TOT, captured at a depth of 70 m, contained egg cases in uteri. Female *M. asterias* of 153 cm TOT, captured in November 1997 at a depth of nearly 150 m, had 21 embryos in its uterus. Females of *M. asterias*, ≥ 95 cm TOT, and *M. mustelus*, \geq ca. 75 cm TOT, contained matured ova. Seven embryos were found in the uterus of a female *S. blainvillei* of 87 cm TOT, captured in October 1996 at a depth of 170 m.

The recorded data is not sufficient to make clear judgements on the reproductive biology and breeding seasons of sharks in the northern Aegean Sea; however, they provide us with some useful information, indicating the presence of breeding and nursery grounds of sharks in littoral and bathyal zones. Based on research, concerning the depth distribution of *S. canicula* in the northern Aegean Sea, D'Onghia *et al.* (1995) concluded that spawning and birth of the new generation of the lesser-spotted catshark might occur in the bathyal grounds of the mentioned area. In a previous study, Kabasakal (2002a) reported on the presence of suitable breeding and nursery grounds of bathyal sharks, rays and the holocephalan, *Chimaera monstrosa* along the Turkish coast of NE Aegean Sea. Needless to say, extensive investigations are required for mapping such

breeding and nursery grounds, and estimating the impacts of bottom trawling on these habitats.

Of 1068 sharks recorded, 1003 specimens (93.91%) were captured by bottom trawling. In the NE Aegean Sea, bottom trawling on the continental shelf and slope from about 200 m to 600 m depth targeting decapod crustaceans with high economic value, such as *Parapenaeus longirostris*, *Nephrops norvegicus*, and the European hake, *Merluccius merluccius*, is important fishery. However, besides the targeted species, sharks and other elasmobranchs are the main by-catch of bottom trawlers operating in the investigated area. With the exception of large specimens of carcharhiniforms, squaliforms and squatinids, sharks are generally discarded. In the present study, juveniles of *G. melastomus*, *S. canicula*, *E. spinax*, *S. acanthias* and *S. blainvillei* dominated the by-catch. Sartor *et al.* (2003) reported that in bottom trawling discard was particularly frequent in cases of low commercial value species, such as blackmouth catshark, *G. melastomus*, which is one of the main by-catches recorded during the present study. According to Sartor *et al.* (2003), this kind of fishery produces a significant amount of discard, reaching about 20% of the total catch on different fishing grounds.

The study of sharks from commercial fisheries allows us to monitor the state of local shark populations. Furthermore, a continuous long-term analysis of commer-

cial fisheries may provide information on the occurrence and fisheries status of sharks present in the investigated area. The present study has been performed without any support from public institutions, and for this very reason the results show some incompleteness and approximations. However, it may be considered as a pioneering attempt to provide a data base for future researches on shark populations to be conducted in the investigated area. Ecologically, sharks are 'k-selected' species having long sexual maturation times, low fecundity, long gestation periods and relatively small litter size, which makes them extremely vulnerable to fishing pressures. There is a critical need for biological information on the life history of many shark species in order to better assess the stock status and the impact of fisheries. Lack of research and conservation of sharks in many countries, such as is sadly the case in Turkey, may lead to the extinction of many shark species in the future.

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MORSKI PSI, UJETI V TURŠKIH VODAH SEVERNEGA EGEJSKEGA MORJA

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POVZETEK

Med letoma 1995 in 2004 je bilo v turških vodah severovzhodnega Egejskega morja zabeleženih 1068 morskih psov, pripadajočih 20 vrstam, 11 družinam in 5 redom. Kar 1003 (93,8%) od teh psov je bilo ujetih s kočami, 30 (2,8%) s parangali, 25 (2,34%) s stoječimi mrežami, 5 (0,46%) s povlečnimi mrežami in 1 (0,09%) ročno na trnek, medtem ko so preostale 4 (0,37%) opazili potapljači (*Carcharodon carcharias*, TOT cca. 500 cm) ali ribiči. V naključnih ulovih s kočami bark, ki so lovile v raziskovalnem območju, so prevladovali mladostni osebkovi vrst *Galeus melastomus*, *Scyliorhinus canicula*, *Etmopterus spinax*, *Squalus acanthias* in *S. blainvillei*.

Ključne besede: morski psi, ribolov, Turčija, severovzhodno Egejsko morje, naključni ulov

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