

NOTES ON HISTORICAL AND CONTEMPORARY CATCHES
OF LAMNIFORM SHARKS IN TURKISH WATERS

Hakan KABASAKAL

Ichthyological Research Society, Tantavi mahallesi, Menteşoğlu caddesi, İdil apartmanı, No: 30/4, Ümraniye TR-34764, İstanbul, Turkey
kabasakal.hakan@gmail.com

ABSTRACT

On 22 December 2016, one bigeye thresher shark, *Alopias superciliosus*, a female, and two shortfin mako sharks, *Isurus oxyrinchus*, a male and a female, were incidentally captured by a commercial pelagic swordfish long-liner operating in the open waters of the Bay of Antalya (southern Turkey). A huge female of *I. oxyrinchus*, caught by a purse-seiner off the Kuşadası coast in the early 2000s, is currently displayed as a taxidermy specimen at the Kuşadası Fish Market. Available data suggest that new-born, juvenile and adult lamniform sharks are incidentally killed by commercial fisheries in the Levantine Basin, which creates a substantial threat to the survival of the lamniform and other species of large sharks in the region.

Key words: Lamniforms, large sharks, Levantine, conservation, fisheries, bycatch

NOTE SULLE CATTURE STORICHE E CONTEMPORANEE DEGLI SQUALI LAMNIFORMI
IN ACQUE TURCHE

SINTESI

Il 22 dicembre 2016, una femmina di squalo volpe occhiogrosso, *Alopias superciliosus*, e un maschio e una femmina di squalo mako, *Isurus oxyrinchus*, sono stati accidentalmente catturati con un palamito commerciale per pesce pelagico nelle acque della baia di Antalya (Turchia meridionale). Una femmina enorme di *I. oxyrinchus*, catturata con una rete da circuizione al largo della costa di Kuşadası nei primi anni 2000, è ora esposta come esemplare tassidermizzato al mercato del pesce di Kuşadası. I dati disponibili suggeriscono che individui sia giovani che adulti di squali lamniformi vengono accidentalmente uccisi nel bacino levantino dalla pesca commerciale, che crea una minaccia sostanziale per la sopravvivenza dei lamniformi e di altre specie di grossi squali nella regione.

Parole chiave: Lamniformi, grandi squali, bacino levantino, conservazione, pesca, cattura accessoria.

INTRODUCTION

The Lamniformes are a small group of sharks with 15 living species worldwide (Compagno, 2002), 9 of them occurring in the Mediterranean Sea (Serena, 2005). Except for one species, the small-sized crocodile shark, *Pseudocarcharias kamoharai* (Matsubara, 1936), all other living lamniform sharks are medium-sized to gigantic species, inhabiting varied habitats, from coastal to open oceanic waters, and ranging from bottom-dwellers to high-speed tachypelagic predators (Compagno, 2002).

Although the early reports on the occurrence of lamniform sharks in Turkish waters date back to the early 20th century (e.g. Deveciyan, 1926), the study of the biology and distribution of individual lamniform species only began in the late 1990s (e.g. Kabasakal, 1998). In the most recent checklist of marine fish in Turkey, Bilecenoğlu *et al.* (2014) reported on the occurrence of 8 species of lamniform sharks in Turkish waters: *Carcharias taurus* Rafinesque, 1810; *Odontaspis ferox* (Risso, 1810); *Carcharodon carcharias* (Linnaeus, 1758); *Isurus oxyrinchus* Rafinesque, 1810; *Lamna nasus* (Bonnaterre, 1788); *Cetorhinus maximus* (Gunnerus, 1765); *Alopias superciliosus* Lowe, 1841; and *A. vulpinus* (Bonnaterre, 1788). Before this ichthyological inventory, Kabasakal (2011) reported the occurrence of the same lamniform species in the first shark-specific inventory study of Turkish waters.

In the present article, the author reports on the historical and recent captures of several lamniform sharks landed by commercial fishermen operating in different zones of Turkish seas.

MATERIAL AND METHODS

On 22 December 2016, one bigeye thresher shark, *A. superciliosus*, a female, and two shortfin mako sharks, *I. oxyrinchus*, a male and a female, were incidentally captured by a commercial pelagic swordfish long-liner operating in the open waters of the Bay of Antalya (Fig.

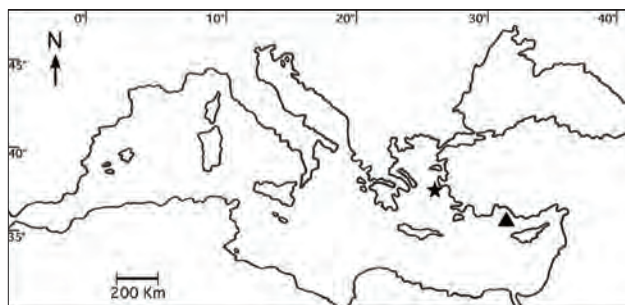


Fig. 1: Capture sites of *Alopias superciliosus* (▲) and *Isurus oxyrinchus* (▲ - fresh specimens; ★ - taxidermy specimen) in Turkish waters.

Sl. 1: Lokalizacija ulova primerkov vrst *Alopias superciliosus* (▲) in *Isurus oxyrinchus* (▲ - sveži primerki; ★ - nagačen primerek) v turških vodah.



Fig. 2: *Alopias superciliosus* and *Isurus oxyrinchus* specimens caught in the Bay of Antalya (Photo: IRS archives). Sl. 2: Primerki vrst *Alopias superciliosus* in *Isurus oxyrinchus*, ujeti v Antalijskem zalivu (Foto: arhiv IRS).

1). A huge female of *I. oxyrinchus* had been caught by a purse-seiner off the Kuşadası coast (Fig. 1) in the early 2000s, and is currently displayed as a taxidermy specimen at the Kuşadası Fish Market. Since the taxidermy shortfin mako shark was dried in a curved position without prior measurement of its body, the total length (TL) and the precaudal length (PCL) of this specimen were determined based on its photograph, by means of Klonk Image Measurement software with reference to the size of a known object located in the same plane as the taxidermy shortfin mako. The length of the bottom border of a poster frame (70 cm) seen just behind the taxidermy

Tab. 1: Selected measurements of examined specimens of *Alopias superciliosus* and *Isurus oxyrinchus* caught in Turkish waters.**Tab. 1: Izbrane meritve preiskanih primerkov vrst *Alopias superciliosus* in *Isurus oxyrinchus*, ujetih v turških vodah.**

<i>Alopias superciliosus</i> Lowe, 1841 - ♀		
Measurement	Value (cm)	% of TL
Total Length (TL)	342.4	---
Precaudal fin length	240.5	70.2
Prebranchial length	34.6	10.1
Preorbital length	14.7	4.2
Prepectoral fin length	38.6	11.2
Preoral length	15.1	4.4
Interorbital space	9.4	2.7
Eye length	6.9	2.01
Eye height	5.1	1.4
Pectoral fin anterior margin	46.4	13.5
<i>Isurus oxyrinchus</i> Rafinesque, 1810 - ♀ - fresh specimen		
Measurement	Value (cm)	% of TL
Total Length (TL)	71.2	---
Precaudal fin length	57.9	81.3
Prebranchial length	24.2	17.2
Preorbital length	8.8	6.26
Prepectoral fin length	31.5	22.4
Prenarial length	4.7	3.3
Eye length	1.8	2.5
Pectoral fin anterior margin	13	18.2

shortfin mako shark was used as a reference to estimate the animal's TL and PCL. Based on the resultant TL and PCL measures, the size of the fresh specimen was calculated, taking into account the 3.8% to 15% shrinkage parameter for frozen shortfin mako shark (Celona *et al.*, 2004). Fresh specimens of *A. superciliosus* and *I. oxyrinchus* were measured and photographed by volunteer field observers of the Ichthyological Research Society (IRS). The total length and several biometrical measurements of the examined specimens were taken on site, using a measuring tape, and recorded to the nearest 0.1 cm, following Compagno (2002). The photographs and measurements of the specimens were delivered to the IRS for further analysis and are preserved in its archives.

RESULTS AND DISCUSSION

Species identification of *A. superciliosus* and *I. oxyrinchus* were based on the following descriptive characters (Compagno, 2002):

Alopias superciliosus Lowe, 1841

Head nearly flat between the eyes, with a deep horizontal groove on either side of the nape above the gills; eyes large, reaching the dorsal surface of the head; 24 teeth on the upper and 22 on the lower jaw; first dorsal fin base closer to pelvic bases than to pectoral bases (Fig. 2).

Isurus oxyrinchus Rafinesque, 1810

A spindle-shaped, moderately slender fusiform body with an acutely pointed snout and relatively small eyes (Figs. 2 & 3); U-shaped ventral mouth with the lower anterior teeth strongly protruding and horizontal on jaw, cusps of teeth with non-serrated cutting edges and flexed tips; 25 teeth on the upper and 28 teeth on the lower jaws; anterior length of pectoral fin shorter than head length (Tab. 1); apex of the first dorsal fin somewhat rounded; brilliant to greyish-blue colouration dorsally and white ventrally, tip of snout with dark to black blotch ventrally (Figs. 2 & 3).



Fig. 3: Head view of *Isurus oxyrinchus* caught in the Bay of Antalya. (Photo: IRS archives).

Sl. 3: Glava mako *Isurus oxyrinchus*, ujetega v Antalijskem zalivu (Foto: arhiv IRS).

The descriptive characters of the examined lamniform species coincided well with those described in Compagno (2002) and Serena (2005). Moreover, the morphometric measurements of the examined species also matched the ones reported for several lamniform species previously caught in Turkish waters (Kabasakal & Karhan, 2008; Kabasakal & Kabasakal, 2013; Tunçer & Kabasakal, 2016), with negligible differences.

In two embalmed bigeye thresher sharks (TL 310 and 450 cm) caught in Dodecanese waters (southern Aegean Sea), the prepectoral length, as reported by Corsini-Foka and Sioulas (2008), was 11.1% and 14.5% of total length,

respectively, while in the present specimen it amounted to 11.2% of TL (Tab. 1). Kabasakal and Karhan (2008) examined the head of an *A. superciliosus* caught in the Sea of Marmara, and reported its interorbital space- and eye height-to-total length ratios as 25.8% and 13.04%, respectively (in the examined specimen, 27.1% and 14.7%, respectively; Tab. 1).

Previous captures of two young shortfin mako sharks (TL 74.7 and 123.6 cm) in northeastern Aegean Sea provided the opportunity to compare the biometric measurements of a young *I. oxyrinchus* caught off the Turkish coast (Kabasakal & Kabasakal, 2013; Tunçer & Kabasakal, 2016). The precaudal length-, prepectoral length- and pectoral anterior length-to-TL ratios in the examined specimens of young shortfin mako sharks stood at 81.31% to 82.99%, 27.04% to 27.1% and 15.93% to 16.06%, respectively (Kabasakal & Kabasakal, 2013; Tunçer & Kabasakal, 2016). In the latter fresh sample, the precaudal length-, prepectoral length- and pectoral anterior length-to-TL ratios were about 81.3%, 22.4% and 18.3% (Tab. 1). According to Compagno (2002), the pectoral anterior length-to-TL ratio in *I. oxyrinchus* is between 16% and 22%.

The precaudal length (PCL) and total length (TL) of the taxidermy female shortfin mako shark (Fig. 4) were estimated to be 260.41 cm and 288.07 cm, respectively. Based on the 3.8% to 15% shrinkage in frozen specimens for *I. oxyrinchus* (Celona *et al.*, 2004), the adjusted estimates of PCL and TL of the taxidermy shortfin mako shark amounted to 299.01 cm and 331.28 cm, indicating a huge specimen while it was alive. Compagno (2002) considered an estimated maximum total length of about 408 cm for *I. oxyrinchus*. Since the female *I. oxyrinchus*, according to Compagno (2002), matures at about 275 to 293 cm TL, the adjusted size estimates indicate that the taxidermy shortfin mako shark was a mature female. The occurrence of newborns and huge specimens of *I. oxyrinchus* in the Aegean Sea off the Turkish coast is well documented by historical and contemporary records of shortfin mako sharks in the mentioned region (Kabasakal & De Maddalena, 2011; Kabasakal, 2015; Tunçer & Kabasakal, 2016).

The first record of *A. superciliosus* in Turkish waters was reported by Mater (2005), based on a specimen (TL 350 cm) caught in the Gökova Bay (SE Aegean Sea) on 23 May 2005. Subsequently to the Gökova specimen, several bigeye thresher sharks were recorded in different regions of Turkish waters (Kabasakal & Karhan, 2008; Kabasakal *et al.*, 2011). On 25 February 2007, a bigeye thresher shark (TL 450 cm) was captured off the Silivri coast, which extended the Mediterranean distribution of *A. superciliosus* into Marmaric waters (Kabasakal & Karhan, 2008). Although the occurrence of *A. superciliosus* in Turkish waters is based on fairly recent records, Corsini-Foka and Sioulas (2008) pointed out that specimens of *A. superciliosus* had been captured in Dodecanese waters (SE Aegean Sea) at least since 1952. Corsini-Foka and



Fig. 4: Taxidermy specimen of *Isurus oxyrinchus* captured in the central Aegean Sea off the Turkish coast. (Photo: IRS archives).

Sl. 4: Nagačen primerek maka *Isurus oxyrinchus*, ujetega v osrednjem Egejskem morju ob turški obali (Foto: arhiv IRS).

Sioulas (2008) examined two old embalmed specimens captured in Dodecanese waters and displayed at the collection of the Hydrobiological Station of Rhodes, and concluded that they were misidentified for a long time as *A. vulpinus*, since they belong to the species *A. superciliosus*. According to Clo *et al.* (2008), a bigeye thresher shark was captured off the Marmaris coast, Turkey (SE Aegean Sea) in April 2004, and two neonates were recorded in Israeli waters (eastern Mediterranean) in 1996. Therefore, it is necessary to examine the historical records of *Alopias* specimens with precise dates of capture, preserved in scientific or fisheries collections, to clarify whether the first record of the occurrence of *A. superciliosus* in Turkish waters could be dated before 2005.

Evidence of the decline of large predatory sharks in the Mediterranean Sea has been provided by Ferretti *et al.* (2008). In a recent review of large sharks caught by commercial fishermen in Turkish waters, Kabasakal *et al.* (2017) emphasized that the low numbers of *A. superciliosus* and *I. oxyrinchus* captures were mostly related to pelagic fishing vessels. According to the authors, the *A. superciliosus* and *I. oxyrinchus* specimens represented 2.5% and 5.6% of the total large shark catch ($n=394$) in Turkish waters between 1990 and 2015.

Evidence linking commercial fisheries and lamniform shark catch both in Turkish waters and in the entire

Mediterranean Sea has been provided by several studies (e.g. Damalas & Megalofonou, 2012; De Maddalena & Heim, 2012; Kabasakal, 2007, 2015, 2016). According to Serena (2005), *A. superciliosus* and *I. oxyrinchus* are caught as bycatch in pelagic longline fisheries, mainly tuna longliners, throughout the Mediterranean Sea. Regarding the conservation status in the Mediterranean, *A. superciliosus* is an endangered (A2bd) and *I. oxyrinchus* a critically endangered (A2bd) shark species (Dulvy *et al.*, 2016). The fishery-dependent nature of the surveys (e.g. Kabasakal, 2007, 2015, 2016; Kabasakal *et al.*, 2017) did not allow for the mentioned region to be sampled homogeneously in time and space, and studies like the present one can only provide anecdotal evidence on the occurrence of large pelagic sharks. This leaves significant gaps in our understanding of the status of large pelagic sharks in Turkish waters.

The results of previous studies have demonstrated that the catches of large pelagic sharks, including the Lamniformes, in the Levantine Basin are characterized by much larger specimens than those in other areas of the Mediterranean Sea (e.g. Kabasakal, 2007, 2015, 2016; Kabasakal & De Maddalena, 2011; Megalofonou *et al.*, 2005). Recent captures of new-born and juvenile specimens of several lamniform sharks, such as *C. carcharias*, *I. oxyrinchus* and *A. vulpinus*, have also sug-

gested the possibility of breeding or nursery grounds of the mentioned species in the region (Kabasakal, 2015, 2016). For the moment, no speculation can be made on the status of breeding populations of the Lamniformes in the region. However, available data suggest that newborns, juveniles and adults of lamniform species are incidentally killed by commercial fisheries in the Levantine Basin, which creates a remarkable threat to the survival of the Lamniformes, as well as other large sharks in the region.

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ZAPISI O HISTORIČNIH IN SODOBNIH ULOVIH MORSKIH VOLKOV (LAMNIFORMES) V TURŠKIH VODAH

Hakan KABASAKAL

Ichthyological Research Society, Tantavi mahallesi, Menteşoğlu caddesi, İdil apartmanı, No: 30/4, Ümraniye TR-34764, İstanbul, Turkey
kabasakal.hakan@gmail.com

POVZETEK

Dvaindvajsetega decembra 2016 so bili v odprtih vodah zaliva Antalya (južna Turčija) naključno ujeti samica velikooke morske lisice (Alopias superciliosus) in samec ter samica atlantskega maka (Isurus oxyrinchus) v ribiške mreže za lov mečaric. Nagačen preparat izredno velike samice maka, ki so jo ujeli blizu obale Kuşadası okoli leta 2000, pa je trenutno razstavljen v ribji tržnici Kuşadası. Razpoložljivi podatki kažejo, da se skotenci, mladostni in odrasli primerki lamniformnih morskih psov naključno ujamejo v mreže komercialnih ribičev levantskega bazena, kar povzroča veliko nevarnost za preživetje te skupine morskih psov in drugih velikih vrst v regiji.

Ključne besede: morski volkovi in sorodstvo, veliki morski psi, levantski bazen, varstvo narave, ribištvo, prilov

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