Short scientific article
Received: 2013-05-17

UDK 597.311.2:591.9(262.4)

FIRST RECORD OF A SHORTFIN MAKO SHARK, *ISURUS OXYRINCHUS* RAFINESQUE, 1810 (CHONDRICHTHYES: LAMNIDAE) FROM THE BAY OF SAROZ (NE AEGEAN SEA)

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ABSTRACT

A male shortfin mako, Isurus oxyrinchus *Rafinesque, 1810, was caught on March 30, 2012, in coastal waters of Bay of Saroz, by a commercial fisherman using hook and line. Total length of the shark was 123. 6 cm. This is the first confirmed record of a shortfin mako shark in the aforementioned region. Morphometrics and biological data of the present specimen are reported.*

Key words: shortfin mako, *Isurus oxyrinchus*, occurrence, Aegean Sea, Turkey

PRIMA SEGNALAZIONE DI SQUALO MAKO, *ISURUS OXYRINCHUS* RAFINESQUE, 1810 (CHONDRICHTHYES: LAMNIDAE) NELLA BAIA DI SAROZ (EGEO NORD-ORIENTALE)

SINTESI

Un esemplare maschio di squalo mako, Isurus oxyrinchus *Rafinesque, 1810, è stato catturato da un pescatore con amo e lenza, il 30 marzo 2012 nelle acque costiere della baia di Saroz. La lunghezza totale dell'animale era pari a 123,6 cm. Si tratta della prima segnalazione confermata di squalo mako in tale area. L'articolo riporta i dati morfometrici e biologici dell'esemplare in questione.*

Parole chiave: squalo mako, *Isurus oxyrinchus*, segnalazione, mare Egeo, Turchia

INTRODUCTION

Shortfin mako, *Isurus oxyrinchus* Rafinesque, 1810, is cosmopolitan in temperate and tropical waters of Atlantic, Pacific and Indian Oceans (Compagno, 1984). It is pelagic, coastal and oceanic, occurring at or near the surface or deeper, down to 400 m (Serena, 2005). The shortfin mako is present in the entire Mediterranean, where it is caught mainly in tuna longline fisheries and occasionally by the swordfish fishing industry using longlines and driftnets (Celona *et al*., 2004; Megalofonou *et al*., 2005; Serena, 2005).

I. oxyrinchus has been known from Turkish waters since the pioneering work of Akşıray (1954; in Bilecenoğlu *et al*., 2002). After the first record of the species in the seas of Turkey, a number of further records on the occurrence of the shortfin mako off the Turkish coast, including the largest individual ever recorded worldwide, have been reported by several authors (Geldiay, 1969; Mater & Meriç, 1996; Kabasakal, 2002; Fricke *et al*., 2007; Kabasakal & De Maddalena, 2011); however, there have been no specific records of *I. oxyrinchus* in the Bay of Saroz. *I. oxyrinchus* was not reported in the most extensive investigation of shark fauna of the northeastern Aegean waters off the Turkish coast (Kaba-

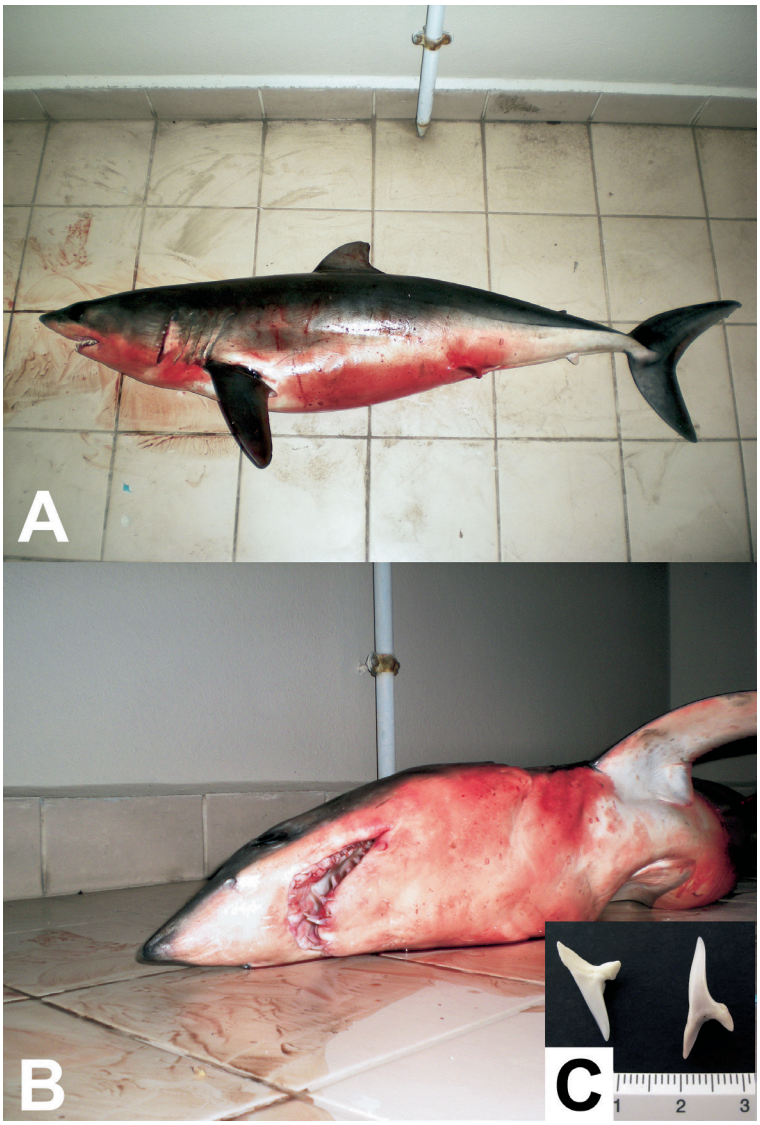

Fig. 1: Shortfin mako, *Isurus oxyrinchus* ***Rafinesque, 1810, caught in Bay of Saroz (NE Aegean Sea; 123.6 cm TOT). (a) Overall view of the present specimen, (b) close-up view of the mouth; and (c) teeth from upper and lower functional rows***

Sl. 1: Atlantski mako, *Isurus oxyrinchus* ***Rafinesque, 1810, ujet v Saroškem zalivu (SV Egejsko morje; dolžina 123,6 cm). (a) Fotografija ujetega primerka, (b) posnetek od blizu: usta primerka in (c) zoba zgornje in spodnje čeljusti***

sakal & Kabasakal, 2004), or in the more recent studies on fish fauna of Bay of Saroz (Koç *et al*., 2004; Cengiz *et al*., 2011). Based on a historical record by Konsuloff & Drensky (1943; in Papaconstantinou, 1988), shortfin mako shark was recorded off the Kavala coast (Greek coast, north Aegean Sea).

Lamniform sharks are known to occur in coastal areas of the northeastern Aegean Sea (Kabasakal, 2007, 2009; Kabasakal & Gedikoğlu, 2008; Kabasakal *et al*., 2009; Kabasakal *et al*., 2011). Recent studies have shown that some of the species, *e.g*. great white shark, *Carcharodon carcharias* may also be breeding and have a nursery ground in the northeastern Aegean Sea, off the Turkish coast (Kabasakal & Gedikoğlu, 2008). Several popular diving spots and holiday resorts are located in the region, where thousands of swimmers and divers visit the area between late spring and early autumn. Seasonal co-existence of people and the predatory sharks is a major concern. Therefore, in-depth understanding of their movements and seasonality of occurrence in the region is crucial.

In the present article, first record of *I. oxyrinchus* is reported from the Bay of Saroz, with morphometric data.

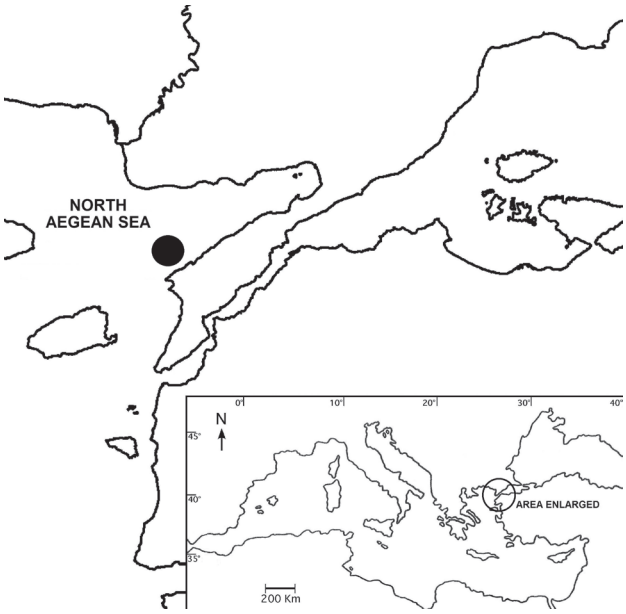

Fig. 2: Map showing the fishing locality (black circle) of the shortfin mako in Bay of Saroz (NE Aegean Sea)
Sl. 2: Zemljevid z lokaliteto ulova (črni krogec) atlatskega makoja v Saroškem zalivu (SV Egejsko morje)

MATERIAL AND METHODS

A male shortfin mako (Fig. 1), was caught on March 30, 2012, in coastal waters of the Bay of Saroz (Fig. 2) by a commercial fisherman using hook and line. The specimen was examined on site. Body measurements followed Compagno (1984). Its stomach and spiral valve were removed and preserved in 5 percent formaline solution for the contents analysis. Teeth counts of upper and lower jaws were recorded. Teeth samples from upper and lower jaws were removed. Specimen photographs and teeth samples are stored in the archives of Ichthyological Research Society (IRS).

RESULTS AND DISCUSSION

Total length of the present specimen was 123.6 cm and weight was 14 kg. Claspers of the present specimen were uncalcified, soft and shorter than the pelvic fins, revealing that it was juvenile. Faint greyish borders were visible along the posterior margins of the pectoral fins ventrally. Length of the anterior margin of the pectoral fin was 76 percent of the head length. According to Garrick (1967), in *I. oxyrinchus*, pectoral fin length usually less than 70 percent of head length but up to 84 percent in very large specimens. The proportion of pectoral fin to head length of the present specimen coincides well with the proportional range given by Garrick (1967). The dental formulae of the present specimen is 14-14 / 14-14. It is known that teeth counts of *I. oxyrinchus* show remarkable variation. In a previous study, range of counts of teeth in one-half of the lower jaw of specimens from Pacific, Atlantic-Mediterranean and Indian Oceans were reported as 11-16, 11-15 and 10-13, respectively (Garrick, 1967). Dental formulae of a large specimen (390 cm TOT) caught off Scaletta Zanclea, Italy, was 12-12 / 12-12 (Celona *et al*., 2004). Tortonese (1956) recorded 24 to 26 teeth in specimens caught off the Italian coast.

Body measurements are given in Table 1, and compared with those gathered from other literature. Most proportions are fairly consistent; the larger variations were found in the height of the first dorsal fin, and pectoral fin measurements (lengths of base and distal margin). First dorsal fin of *I. oxyrinchus* exhibits significant change in shape and proportions with growth (Garrick, 1967). The percent TOT value of height of first dorsal fin varies between 7.3 (GRK2, Japanese specimen) to 11.35 (CNA1, Sicilian specimen) (Tab. 1). In Mediterranean specimens, percent TOT value of length of base of pectoral fin varies between 3.24 (CNA1, Sicilian specimen) to 7.28 (present specimen) (Tab. 1). Since the measurements of Sicilian shortfin makos were based on frozen specimens, Celona *et al*. (2004) considered a shrinkage between 3.8 to 15% in Sicilian specimens, and corrected the measurements they recorded based on this ratio. With the exception of Brazilian specimens (Costa *et al*., 2002; CSA, Tab. 1), the similarity between the ratios of the present sample and previous specimens shown in Table 1, supports this possibility. A similar unusual difference is also present in the percent TOT value of length of distal margin of pectoral fin (Tab. 1), which varies between 3.47 (present specimen) to 14.8 (GRK 3 and 4). Henderson *et al*. (1999) also found differences in pectoral base measurements of *I. oxyrinchus* from Irish waters.

Tab. 1: Morphometrics of** Isurus oxyrinchus, **expressed as percentage of total length (TOT), in the present specimen and from the literature. HDN: Henderson** et al. **(1999); CSA: Costa** et al. **(2002); CNA: Celona** et al. **(2004); GRK: Garrick (1967); GRK1: ♂, 70.5 cm TOT, California; GRK2: ♂, 84.7 cm TOT, Japan; GRK3: ♀, 143.8 cm TOT, New Zealand; GRK4: ♀, 192.0 cm TOT, South Africa; GRK5: ♀, 200.0 cm TOT, Azores; *: average of two newborns, 66.4 and 69.3 cm TOT.

Tab. 1: Morfometrične značilnosti** Isurus oxyrinchus, **podane v odstotkih celotne dolžine. Nanašajo se na ujeti primerek in na primerke, omenjene v strokovni literaturi. HDN: Henderson** et al. **(1999); CSA: Costa** et al. **(2002); CNA: Celona** et al. **(2004); GRK: Garrick (1967); GRK1: ♂, dolžina 70,5 cm, Kalifornija; GRK2: ♂, dolžina 84,7 cm, Japonska; GRK3: ♀, dolžina 143,8 cm, Nova Zelandija; GRK4: ♀, dolžina 192,0 cm, Južna Afrika; GRK5: ♀, dolžina 200,0 cm, Azori; *: povprečna dolžina dveh mladičev, dolžina 66,4 in 69,3 cm.

Measurements	Present specimen ♂		Garrick (1967)					HDN	CSA	CNA1	CNA2
	cm	%TOT	GRK1	GRK2	GRK3	GRK4	GRK5				
Total length (TOT, cm)	123.6	100	70.5	84.7	143.8	192.0	200.0	179	*	370	390
Snout tip to											
outer nostrils	5.7	4.61	4.8	4.1	3.8	4.7	3.9	5.3	5.21	-	-
eye	9.4	7.6	7.8	6.8	6.6	6.8	6.2	7.3	7.43	-	-
mouth	8.5	6.87	6.9	5.3	5.9	6.0	5.0	-	6.83	-	-
1st gill opening	25.9	20.95	22.5	19.7	18.4	19.8	19.6	20.7	21.96	-	-
pectoral origin	33.6	27.18	28.1	26.2	25.7	25.4	25.3	25.7	27.49	-	-
pelvic origin	71.1	57.52	55.7	57.2	57.4	57.2	55.1	57.5	56.46	-	-
1st dorsal origin	47	38.02	37.4	38.0	38.7	36.7	34.7	36.3	38.91	-	-
2nd dorsal origin	87.3	70.63	70.2	71.6	72.3	71.8	69.2	71.5	71.07	-	-
dorsal caudal origin	100.5	81.31	80.1	81.8	83.2	81.6	79.2	84.4	80.43	-	-
Distance between bases											
1st and 2nd dorsal fins	30	24.27	-	-	-	-	-	25.7	-	-	-
2nd and caudal fins	11.5	9.3	-	-	-	-	-	10.6	-	-	-
pelvic and anal fins	14	11.32	-	-	-	-	-	14	-	-	-
anal and caudal fins	9	7.28	-	-	-	-	-	9.5	-	-	-
nostrils; between inner corners	4.6	3.72	4.0	3.7	3.5	3.4	3.4	3.6	4.01	-	-
mouth; width	8.3	6.71	7.1	7.0	7.7	6.5	6.5	8.9	8.22	-	-
mouth; length	7.4	5.98	7.1	6.5	6.5	6.5	5.8	5.6	6.75	-	-
Gill opening lengths											
1st	8.6	6.95	8.2	7.4	8.1	7.3	7.4	8.4	7.12	-	-
3rd	9.1	7.36	7.7	6.7	7.8	7.1	7.0	7	-	-	-
5th	10	8.09	7.9	7.1	7.5	7.3	7.5	7.8	7.37	-	-
Eye											
horizontal diameter	2.4	1.94	2.6	2.2	1.9	1.6	1.5	1.7	2.6	-	-
vertical diameter	2.3	1.86	-	-	-	-	-	1.7	2.2	-	-
interorbital width	7.3	5.9	-	-	-	-	-	6.2	-	-	-
1st dorsal fin											
overall length	12.6	10.19	-	-	-	-	-	11.2	-	9.45	-
length of base	10.6	8.57	9.2	8.9	8.5	9.9	9.1	8.9	8.54	6.75	-
height	12.6	10.19	7.9	7.3	8.1	10.2	9.9	10.6	8.04	11.35	10.54
2nd dorsal fin											
overall length	3.7	2.99	-	-	-	-	-	2.9	-	-	-
length of base	1.5	1.21	1.1	2.2	1.1	1.2	1.0	1.3	1.11	-	-
height	2.5	2.02	1.4	1.2	1.1	1.3	1.2	1.4	1.4	-	-
Pectoral fin											
length of base	9	7.28	6.9	6.7	6.7	7.2	6.9	7.3	5.46	3.24	-
length of anterior margin	19.7	15.93	18.4	17.0	16.4	17.4	17.6	18.4	17.59	19.18	17.83
length of distal margin	4.3	3.47	13.7	13.4	14.8	14.8	14.6	3.9	14.38	-	-
length of posterior margin	17.2	13.91	-	-	-	-	-	16.2	-	-	15.4
Pelvic fin											
overall length	8.8	7.11	-	-	-	-	-	7.5	7.25	-	-
length of base	6.3	5.09	5.8	4.7	5.3	5.9	5.6	3.9	4.08	-	-
length of anterior margin	4.6	3.72	5.0	4.5	3.8	4.5	4.3	4	4.41	-	-
length of clasper,outer	3.8	3.07	3.0	2.6	-	-	-	8.9	-	-	-
length clasper, inner	8.2	6.63	-	-	-	-	-	11.7	-	-	-
Anal fin											
overall length	3.8	3.07	-	-	-	-	-	3.2	-	-	-
length of base	1.4	1.13	1.3	1.2	1.2	1.3	1.2	1.5	1.18	-	-
length of anterior margin	2.7	2.18	-	-	-	-	-	2.2	2.55	-	-
length of distal margin	2.6	2.1	2.3	2.4	2.1	2.3	2.2	2.1	2.3	-	-
Caudal fin											
length of dorsal lobe	24.5	19.82	21.8	19.6	20.5	20.6	20.8	12.3	21.74	16.48	-
length of ventral lobe	18.4	14.88	15.7	14.9	16.0	16.1	17.6	14	14.28	15.27	-
dorsal tip to notch	4.2	3.99	-	-	-	-	-	8.4	-	-	-
depth of notch	0.9	0.72	-	-	-	-	-	3.9	-	-	-

One mackerel (*Scomber scombrus*; W = 124 g) was found in the stomach. Although the shortfin mako feeds mainly on bonyfish (Quéro, 1984), the mackerel found in the stomach had probably been used for baiting a hook, as commonly done by the commercial swordfish and albacora longliners in the Mediterranean (Celona *et al*., 2004; Megalofonou *et al*., 2005). Spiral valve was filled with a blackish slurry. A fishing hook, the kind used more commonly for swordfish fishing by commercial longliners in Turkey, was found in the oesophagus of the shortfin mako.

Shortfin makos have previously been reported from the Aegean Sea by several authors (see Papaconstantinou, 1988, for review of authors). Furthermore, a historical north Aegean Sea record of the species was noted by Konsuloff & Drensky (1943; in Papaconstantinou, 1988), off Kavala, Greek coast. Despite previous reports, no specimens of *I. oxyrinchus* were recorded in the Aegean Sea, during a three year survey of pelagic sharks incidentally caught by swordfish and tuna fisheries in the Mediterranean Sea (Megalofonou *et al*., 2005). According to some authors (Fricke *et al*., 2007), distributional range of *I. oxyrinchus* along Turkish coasts included the north Aegean waters; however, no specimens of *I. oxyrinchus* were recorded in the mentioned area during a recent survey of sharks caught by Turkish fishermen in the aforementioned region (Kabasakal & Kabasakal, 2004), or during the recent ichthyofaunal surveys carried out in bay waters (Koç *et al*., 2004; Cengiz *et al*., 2011). The present shortfin mako is the first record of *I. oxyrinchus* in the Bay of Saroz, which confirms the contemporary occurrence of the species in the northeastern Aegean Sea. Furthermore, occurrence of the shortfin mako in the area was also confirmed by this single individual, 80 years after being recorded by Konsuloff & Drensky (1943; in Papaconstantinou, 1988). Based on a single record, it is not possible to comprehend ecological characteristics of the species in the region, thus a clear necessity of tracking *I. oxyrinchus*, is obvious. Such a tracking survey may reveal the range and seasonality of movements of *I. oxyrinchus* along the Aegean Sea coast of Turkey.

Since the captured individual was a juvenile, an extensive survey on *I. oxyrinchus* would seem advantageous in order to clarify the question, as to whether the species has a breeding or nursery ground in the northeastern Aegean Sea, like the great white shark (Kabasakal & Gedikoğlu, 2008; Kabasakal *et al*., 2009), or not?

ACKNOWLEDGMENTS

Authors wish to thank two anonymous referees for their critical reviews, providing valuable comments to improve the manuscript. Special thank goes to Mr. Mark Taylor, an Istanbul based scuba diver and underwater photographer, for the english revision of the text.

PRVI ZAPIS O POJAVLJANJU ATLANTSKEGA MAKA, *ISURUS OXYRINCHUS*, RAFINESQUE, 1810 (CHONDRICHTHYES: LAMNIDAE), V SAROŠKEM ZALIVU (SV EGEJSKO MORJE)

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POVZETEK

V obalnih vodah Saroškega zaliva je ribič na trnk 30. marca 2012 ujel samca atlantskega makoja, Isurus oxyrinchus, *Rafinesque, 1810. V dolžino je meril 123,6 cm. Gre za prvi zapis o pojavljanju atlantskega makoja na tem območju. V članku so navedene morfometrične značilnosti in biološki podatki o ujetem primerku.*

Ključne besede: atlantski mako, *Isurus oxyrinchus*, pojavljanje, Egejsko morje, Turčija

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