ANNALES

Anali za istrske in mediteranske študije
Annali di Studi istriani e mediterranei
Annals for Istrian and Mediterranean Studies
Series Historia Naturalis, 26, 2016, 1

UDK 5 Annales, Ser. hist. nat., 26, 2016, 1, pp. 1-130, Koper 2016 ISSN1408-533X

UDK 5 ISSN 1408-533X

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Series historia naturalis, 26, 2016, 1

KOPER 2016

ISSN 1408-533X UDK 5 Letnik 26, leto 2016, številka 1

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Prelom/*Composizione/Typesetting:* Grafis trade d.o.o.

Tisk/*Stampa/Print:* Grafis trade d.o.o.

Izdajatelj/*Editore/Published by:* Zgodovinsko društvo za južno Primorsko - Koper / *Società storica del Litorale - Capodistria*©

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Sedež uredništva/*Sede della redazione/ Address of Editorial Board:* Nacionalni inštitut za biologijo, Morska biološka postaja Piran / *Istituto nazionale di biologia, Stazione di biologia marina di Pirano / National Institute of Biology, Marine Biology Station Piran*
SI-6330 Piran /*Pirano*, Fornače/*Fornace* 41, tel.: +386 5 671 2900, fax 671 2901;
e-mail: annales@mbss.org, ***internet:*** www.zdjp.si

Redakcija te številke je bila zaključena 25. 6. 2016.

Sofinancirajo/*Supporto finanziario/ Financially supported by:* Javna agencija za raziskovalno dejavnost Republike Slovenije (ARRS)

Annales - series historia naturalis izhaja dvakrat letno.

Naklada/*Tiratura/Circulation:* 300 izvodov/copie/copies

Revija Annales series historia naturalis je vključena v naslednje podatkovne baze: BIOSIS-Zoological Record (UK); Aquatic Sciences and Fisheries Abstracts (ASFA); Elsevier B.V.: SCOPUS (NL).

ANNALES · Ser. hist. nat. · 26 · 2016 · 1

Anali za istrske in mediteranske študije - Annali di Studi istriani e mediterranei - Annals for Istrian and Mediterranean Studies

UDK 5 Letnik 26, Koper 2016, številka 1 ISSN 1408-533X

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Original scientific article
Received: 2016-05-05

DOI 10.19233/ASHN.2016.5

CAPTURE OF A JUVENILE SHORTFIN MAKO SHARK, *ISURUS OXYRINCHUS* RAFINESQUE, 1810 (CHONDRICHTHYES: LAMNIDAE) IN THE BAY OF EDREMIT, NORTHERN AEGEAN SEA (TURKEY)

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ABSTRACT

*A male shortfin mako shark (*Isurus oxyrinchus*) was caught on April 8, 2016, in the coastal waters of the Bay of Edremit by a commercial fisherman using nets set at the depths between 20 and 25 m. The specimen measured 74.7 cm in total length and weighed 2.75 kg. Its claspers were uncalcified, soft and shorter than the pelvic fins, revealing that it was a juvenile specimen. Upper and lower beaks of a cuttlefish (*Sepia officinalis*) were found in the stomach content. The nursery ground characteristics of* I. oxyrinchus *in relation to the feeding habit is also discussed.*

Key words: Shortfin mako, Aegean Sea, incidental catch, large elasmobranch

CATTURA DI UN GIOVANE SQUALO MAKO, *ISURUS OXYRINCHUS* RAFINESQUE, 1810 (CHONDRICHTHYES: LAMNIDAE), NELLA BAIA DI EDREMIT, EGEO SETTENTRIONALE (TURCHIA)

SINTESI

*Un maschio di squalo mako (*Isurus oxyrinchus*) è stato catturato con reti da posta l'8 aprile 2016 nelle acque costiere della baia di Edremit, ad una profondità tra i 20 e i 25 m. L'esemplare era lungo 74,7 cm e pesava 2,75 kg. I clasper (o pterigopodi) non erano calcificati, ma morbidi e più corti delle pinne pelviche, rivelando che si trattava di un esemplare giovane. Nel contenuto stomacale sono state trovate le parti superiori ed inferiori dei becchi di seppia (*Sepia officinalis*). Vengono discusse anche le caratteristiche dell'area di nursery di* I. oxyrinchus *in relazione alle abitudini di alimentazione della specie.*

Parole chiave: squalo mako, mar Egeo, catture accidentali, grandi elasmobranchi

INTRODUCTION

One of the prominent large predatory sharks, shortfin mako, *Isurus oxyrinchus* Rafinesque, 1810, is cosmopolitan in all warm-temperate and tropical waters of the world oceans (Compagno, 2001). It is a pelagic, coastal and oceanic species occurring at or near the surface or deeper down at depths of up to at least 500 m (Compagno, 2001; Serena, 2005). *I. oxyrinchus* is present in the entire Mediterranean, where it is incidentally caught by tuna longline fisheries and seldom by swordfish longliners and drift netters (Serena, 2005; Damalas & Megalofonou, 2012). The first record of *I. oxyrinchus* in Turkish waters was reported by Akşıray (1954; in Bilecenoğlu *et al*., 2002).

In the present study, we report on a recent capture of a young shortfin mako shark in the Bay of Edremit, northern Aegean Sea, off Turkish coast. Morphometric measurements and brief biological data of the present specimen are given.

MATERIAL AND METHODS

A male shortfin mako shark was caught on April 8, 2016, in the coastal waters of the Bay of Edremit (Fig. 1) by a commercial fisherman using nets set at the depths between 20 and 25 m. The specimen was transferred to the ichthyological laboratories of Çanakkale Onsekiz Mart University (ÇOMU), where morphometric measurements were recorded following Compagno (2001). The stomach and spiral valve of the specimen were removed and preserved in 70% ethanol for content analysis. Identification and measurements of cephalopod beaks found in the stomach contents were carried out following Mangold & Fioroni (1966). A binocular microscope

Fig. 1. Map showing the localities of historical and contemporary records of** I. oxyrinchus **caught in the northern Aegean Sea. Legend: (✦) Kavala specimen recorded by Konsuloff & Drensky (1943; in Papaconstantinou, 1988); (●) İzmir specimen recorded by Geldiay (1969); (▲) Bay of Saroz specimen recorded by Kabasakal & Kabasakal (2013); (■) Foça specimen recorded by Kabasakal (2015); and (★) present specimen.
Sl. 1: Zemljevid severnega dela Egejskega morja z zgodovinskimi in recentnimi zapisi o pojavljanju morskega psa maka** I. oxyrinchus**. Legenda: (✦) primerek iz Kavale, Konsuloff & Drensky (1943; v Papaconstantinou, 1988); (●) primerek iz İzmira, Geldiay (1969); (▲) primerek iz zaliva Saroz, Kabasakal & Kabasakal (2013); (■) primerek iz lokalitete Foça, Kabasakal (2015); in (★) primerek, o katerem poročata avtorja pričujočega prispevka.

Tab. 1: Morphometric measurements of the specimen of shortfin mako shark, *I. oxyrinchus.*
Tab. 1: Morfometrične meritve primerka morskega psa maka, *I. oxyrinchus.*

Measurements	Present specimen ♂	
	cm	%TOT
Total Length (TOT, cm)	74.7	100
Snout tip to		
outer nostrils	3.3	4.41
eye	6.2	8.29
mouth	5.5	7.36
1st gill opening	16.5	22.08
pectoral origin	20.2	27.04
pelvic origin	42.5	56.89
1st dorsal origin	28.0	37.48
2nd dorsal origin	55.5	74.29
dorsal caudal origin	62.0	82.99
Distance between bases		
1st and 2nd dorsal fins	17.5	23.42
2nd and caudal fins	4.5	6.02
pelvic and anal fins	15.0	20.08
anal and caudal fins	14.2	19
nostrils; between inner corners	2.8	3.74
mouth; width	5.2	6.96
mouth; length	7.2	9.63
Gill opening lengths		
1st	7.1	9.5
3rd	6.5	8.7
5th	5	6.69
Eye		
horizontal diameter	1.8	2.4
vertical diameter	1.5	2
interorbital width	1.8	2.4
1st dorsal fin		
overall length	7.5	10.04
length of base	5.5	7.36
height	6.4	8.56
2nd dorsal fin		
overall length	2.0	2.67
length of base	0.7	0.93
height	1.2	1.6
Pectoral fin		
length of base	7.2	9.63
length of anterior margin	12.0	16.06
length of distal margin	8.5	11.37
length of posterior margin	7.5	10.04
Pelvic fin		
overall length	6.0	8.03
length of base	3.2	4.28
length of anterior margin	3.3	4.41
length of clasper, outer	2.0	2.67
length of clasper, inner	4.5	6.02
Anal fin		
overall length	1.1	1.47
length of base	0.9	1.2
length of anterior margin	3.6	4.81
length of distal margin	3.5	4.68
Caudal fin		
length of dorsal lobe	16.0	21.41
length of ventral lobe	13.2	17.67
dorsal tip to notch	9.0	12.04
depth of notch	1.5	2

(magnification 16x) with an eyepiece micrometre was used to examine and measure the cephalopod beaks. Dorsal mantle length estimation of the prey is based on the ratios proposed by Mangold & Fioroni (1966). The dissected specimen is stored in the collections of the Piri Reis Museum at ÇOMU, without a catalogue number.

RESULTS AND DISCUSSION

The shortfin mako specimen (Fig. 2) measured 74.7 cm in total length and weighed 2.75 kg. Morphometric measurements are given in Table 1. The claspers of the present specimen were uncalcified, soft and shorter than the pelvic fins, revealing that it was juvenile. Second dorsal and anal fins are minute (Fig. 2); strong keels on caudal peduncle with a crescentic caudal fin (Fig. 2); no secondary keels on caudal base. Large blade-like teeth are without cusplets or serrations. Lower anterior teeth are strongly protruding and horizontal on jaws even when mouth is closed (Fig. 3). Dorsal surface of body is dark bluish, ventral surface whitish, and lighter shades of dorsal coloration extend over gill area (Fig. 2). Ventral surface of the snout is white, with a distinct black spot visible on the tip of the snout (Fig. 3). Length of the anterior margin of the pectoral fin was 16.06% of the total length and 59.4% of the head length. In *I. oxyrinchus*, the anterior margin of the pectoral fin is approximately between 16% and 22% of total length, and shorter than head length (Compagno, 2001).

Upper and lower beaks of a cuttlefish (*Sepia officinalis*) were found in the stomach contents. Based on the proportions obtained by correlating dorsal mantle length of Mediterranean cephalopods with their beak measurements (Mangold & Fioroni, 1966), the dorsal mantle

length of the specimen of *S. officinalis* was estimated to range from 106.7 mm (♂) to 113 mm (♀). In a recent study on the food habits of the shortfin mako shark caught off the southwestern coast of Portugal, Maia *et al.* (2006) found that cephalopods are relatively important in the diet of *I. oxyrinchus*, with a 40.4% occurrence in the examined stomach contents of 112 shortfin makos. According to Compagno (2001), cuttlefish (*Sepia*, Sepiidae) is one of the cephalopods preyed upon by *I. oxyrinchus*. *S. officinalis* is a neritic, demersal species, found on the continental shelf at a depth range from subtidal waters to 200 m, most abundant in the upper 100 m (Jereb & Roper, 2005). A previous study revealed that *S. officinalis* is one of the common prey items of demersal sharks occurring in northern Aegean Sea (Kabasakal, 2002). However, the results of the present study suggest that shortfin mako, a pelagic predator, can also prey on demersal species during its early life period.

The occurrence of the shortfin mako shark in the northern Aegean Sea dates back to the mid-20th century, based on a historical record of *I. oxyrinchus* recorded off Kavala, Greek coast by Konsuloff & Drensky (1943; in Papaconstantinou, 1988). Another historical record of this species was reported by Geldiay (1969) off İzmir, Turkey. Although caught in the south-eastern part of the sea, a third specimen of *I. oxyrinchus* was reported by Kabasakal & De Maddalena (2011), based on a photographic record of a huge specimen captured off Marmaris (SE Aegean Sea, Turkey) in the 1950s. Besides the historical records of *I. oxyrinchus* in the northern Aegean Sea, Kabasakal & Kabasakal (2013) recorded a young male shortfin mako in the coastal waters of the Bay of Saroz, which was caught by hook and line on March 30, 2012. Recently, a newborn female (TL 65 cm) was also caught in the coastal waters off Foça coast, Turkey, on May 19, 2015 (Kabasakal, 2015). Localities of historical and contemporary records of *I. oxyrinchus* caught in the northern Aegean Sea are shown in Fig. 1.

In recent years, several newborn and juvenile lamniform sharks, *Carcharodon carcharias* and *I. oxyrinchus*, have been incidentally caught off Turkish coast of the northern Aegean Sea, by commercial fishermen (Kabasakal, 2014, 2015; Kabasakal & Kabasakal, 2013, 2015). Occurrence of these young lamniform sharks in the mentioned area over the years since 2008 pose the question whether a breeding and nursery ground of lamniform sharks is present in the northern Aegean Sea. The diverse topography of the study area is spotted by several small and large islands just a few kilometres off the coast and farther (Fig. 1). Several authors investigating the nursey ground characteristics of *I. oxyrinchus* in several regions of the world suggested an island-oriented movement pattern for young shortfin mako sharks due to biological requirements such as feeding (Holts & Bedford, 1993; Vélez-Marin & Márquez-Farías, 2009). Secure environments of coastal shark nurseries are known to provide opportunities of open sea to the future predator for fine tuning its foraging tactics and capture before shifting to feed on more energetic prey (Clua & Reid, 2013). Unfortunately, this potential coastal breeding and nursery ground of lamniform sharks in the northern Aegean Sea off Turkish coast is also a remarkable

Fig. 2: Lateral view of present shortfin mako shark. (Photo: Sezginer Tunçer).
Sl. 2: Primerek morskega psa maka iz boka (Foto: Sezginer Tunçer).

fishing ground of artisanal fishermen, where small-scale fisheries of coastal netters and longliners are active all the year round (H. Kabasakal, *pers. obs*.) Due to the geographical overlap of this shark nursery and fishing grounds, the survival of newborn, young and adult sharks is threatened. At present, no pregnant adults of *C. carcharias* or *I. oxyrinchus* have been captured in the vicinity of this shark nursery; however, newborns, young-of-the-years or young specimens of both lamniforms are sighted or get caught in the mentioned region almost all year round. (Kabasakal, 2014, 2015). Furthermore, there is always a competition between the fishermen and the marine predators feeding on the commercially valuable species, like *S. officinalis* and other cephalopods. In most cases this competition between sharks and fishermen results in shark mortality. Since *I. oxyrinchus* is categorized as a 'critically endangered' shark in the Mediterranean Sea (Cavanagh & Gibson, 2007), targeted and non-targeted fishing pressure on young and adult shortfin mako sharks would increase the current threats to the survival of *I. oxyrinchus*. Therefore, an extensive study is needed for a better understanding of seasonal occurrence and feeding habits of lamniform sharks in the vicinity of this potential shark nursery. Implementation of regulatory measurements for the coexistence of lamniform sharks and a sustainable coastal fishery in an area, where the shark and fishermen are competing for the same resources, could only be possible after reading the conclusions of such research.

Fig. 3. Close-up view of the head of shortfin mako shark. (Photo: Sezginer Tunçer).
Sl. 3: Bližinski posnetek glave kratkoplavutega maka (Foto: Sezginer Tunçer).

ACKNOWLEDGEMENTS

Authors wish to thank to fisherman Cengiz Karagül, for donating the present specimen to examine, and two anonymous referees for their valuable comments improving the content of the article.

ZAPIS O ULOVU MLADEGA PRIMERKA MORSKEGA PSA MAKA , *ISURUS OXYRINCHUS* RAFINESQUE, 1810 (CHONDRICHTHYES: LAMNIDAE) IZ ZALIVA EDREMIT, SEVERNO EGEJSKO MORJE (TURČIJA)

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POVZETEK

*Samec morskega psa maka je 8 aprila 2016 v obrežnih vodah zaliva Edremit v ribiško mrežo ujel poklicni ribič na globini med 20 in 25 m. Primerek je meril 74.7 cm v dolžino in tehtal 2.75 kg. Klasperja sta bila mehka in nekalcificirana ter krajša od trebušnih plavuti, kar je značilno za mladiče. V želodcu so bile najdeni spodnji in zgornji deli kljunov sipe (*Sepia officinalis*).*

Ključne besede: mako, Egejsko morje, naključni ulov, velike hrustančnice

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