

ANNALES

*Analì za istrske in mediteranske študije
Annali di Studi istriani e mediterranei
Annals for Istrian and Mediterranean Studies
Series Historia Naturalis, 32, 2022, 2*



UDK 5

ISSN 1408-533X
e-ISSN 2591-1783



ANNALES

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

Series Historia Naturalis, 32, 2022, 2

KOPER 2022

**UREDNIŠKI ODBOR/
COMITATO DI REDAZIONE/
BOARD OF EDITORS:**

Alessandro Acquavita (IT), Nicola Bettoso (IT), Christian Capapé (FR), Darko Darovec, Dušan Devetak, Jakov Dulčić (HR), Serena Fonda Umani (IT), Andrej Gogala, Daniel Golani (IL), Danijel Ivajnšič, Mitja Kaligarič, Marcelo Kovačič (HR), Andrej Kranjc, Lovrenc Lipej, Vesna Mačić (ME), Alenka Malej, Patricija Mozetič, Martina Orlando-Bonaca, Michael Stachowitzsch (AT), Tom Turk, Al Vrezec

**Glavni urednik/Redattore capo/
Editor in chief:**

Darko Darovec

**Odgovorni urednik naravoslovja/
Redattore responsabile per le scienze
naturali/Natural Science Editor:**

Lovrenc Lipej

Urednica/Redattrice/Editor:

Martina Orlando-Bonaca

Prevajalci/Traduttori/Translators:

Martina Orlando-Bonaca (sl./it.)

**Oblikovalec/Progetto grafico/
Graphic design:**

Dušan Podgornik, Lovrenc Lipej

Tisk/Stampa/Print:

Založništvo PADRE d.o.o.

Izdajatelja/Editori/Published by:

Zgodovinsko društvo za južno Primorsko - Koper / Società storica del Litorale - Capodistria[®]

Inštitut IRRIS za raziskave, razvoj in strategije družbe, kulture in okolja / Institute IRRIS for Research, Development and Strategies of Society, Culture and Environment / Istituto IRRIS di ricerca, sviluppo e strategie della società, cultura e ambiente[®]

**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 +386 5 671 2901;

e-mail: annales@mbss.org, **internet:** www.zdjp.si

Redakcija te številke je bila zaključena 23. 12. 2022.

**Sofinancirajo/Supporto finanziario/
Financially supported by:**

Javna agencija za raziskovalno dejavnost Republike Slovenije (ARRS) in Mestna občina Koper

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 / La rivista Annales, series Historia Naturalis è inserita nei seguenti data base / Articles appearing in this journal are abstracted and indexed in: BIOSIS-Zoological Record (UK); Aquatic Sciences and Fisheries Abstracts (ASFA); Elsevier B.V.: SCOPUS (NL); Directory of Open Access Journals (DOAJ).

To delo je objavljeno pod licenco / Quest'opera è distribuita con Licenza / This work is licensed under a Creative Commons BY-NC 4.0.



Navodila avtorjem in vse znanstvene revije in članki so brezplačno dostopni na spletni strani <https://zdjp.si/en/p/annalesshn/> / The submission guidelines and all scientific journals and articles are available free of charge on the website <https://zdjp.si/en/p/annalesshn/> / Le norme redazionali e tutti le riviste scientifiche e gli articoli sono disponibili gratuitamente sul sito <https://zdjp.si/en/p/annalesshn/>



VSEBINA / INDICE GENERALE / CONTENTS

BIOTSKA GLOBALIZACIJA
GLOBALIZZAZIONE BIOTICA
BIOTIC GLOBALIZATION**Murat BILECENOĞLU & M. Baki YOKES**

- New Data on the Occurrence of Two Lessepsian Marine Heterobranchs, *Plocamopherus ocellatus* (Nudibranchia: Polyceridae) and *Lamprohaminoea ovalis* (Cephalaspidea: Haminoeidae), from the Aegean Sea 267
Novi podatki o pojavljanju dveh lesepskih morskih polžev zaškrgarjev, Plocamopherus ocellatus (Nudibranchia: Polyceridae) in Lamprohaminoea ovalis (Cephalaspidea: Haminoeidae), iz Egejskega morja

- Gianni INSACCO, Aniello AMATO, Bruno ZAVA & Maria CORSINI-FOKA** Additional Capture of *Halosaurus oovenii* (Actinopterygii: Notacanthiformes: Halosauridae) in Italian Waters 273
Novi ulov vrste Halosaurus oovenii (Actinopterygii: Notacanthiformes: Halosauridae) v italijanskih vodah

- Christian CAPAPÉ, Christian REYNAUD & Farid HEMIDA** First Record of Marbled Stingray, *Dasyatis marmorata* (Chondrichthyes: Dasyatidae) from the Algerian Coast (Southwestern Mediterranean Sea) 281
Prvi zapis o pojavljanju marmoriranega morskega biča, Dasyatis marmorata (Chondrichthyes: Dasyatidae) iz alžirske obale (jugozahodno Sredozemsko morje)

- Maria CORSINI-FOKA & Bruno ZAVA** Second Occurrence of *Siganus javus* (Siganidae) in the Mediterranean Waters 287
Drugi zapis o pojavljanju progastega morskega kunca, Siganus javus (Siganidae), v sredozemskih vodah

- Daniel GOLANI, Haim SHOHAT & Brenda APPELBAUM-GOLANI** Colonisation of Exotic Fish Species of the Genera *Pseudotropheus* and *Aulonocara* (Perciformes: Cichlidae) and the Decline of Native Ichthyofauna in Nahal Amal, Israel 293
Naseljevanje eksotičnih vrst rib iz rodov Pseudotropheus in Aulonocara (Perciformes: Cichlidae) in upad domorodne ribje favne v reki Nahal Amal, Izrael

Panayotis OVALIS & Maria CORSINI-FOKA

- On the Occurrence of *Velolambrus expansus* (Brachyura, Parthenopidae) in Hellenic Waters 301
O pojavljanju rakovice vrste Velolambrus expansus (Brachyura, Parthenopidae) v grških vodah

Saul CIRIACO, Marco SEGARICH, Vera CIRINÀ & Lovrenc LIPEJ

- First Record of the Long-Jawed Squirrelfish *Holocentrus adscensionis* (Osbeck, 1765) in the Adriatic Sea 309
Prvi zapis o pojavljanju vrste veveričjaka Holocentrus adscensionis (Osbeck, 1765) v Jadranskem morju

Christian CAPAPÉ, Vienna HAMMOUD, Aola FANDI & Malek ALI

- First Record of Moontail Bullseye *Priacanthus hamrur* (Osteichthyes, Priacanthidae) from the Syrian Coast (Eastern Mediterranean Sea) 317
Prvi zapis o pojavljanju lunastorepega velikookega ostriza Priacanthus hamrur (Osteichthyes, Priacanthidae) s sirske obale (vzhodno Sredozemsko morje)

SREDOZEMSKI MORSKI PSI
SQUALI MEDITERRANEI
MEDITERRANEAN SHARKS**Hakan KABASAKAL, Erdi BAYRI & Görkem ALKAN**

- Distribution and Status of the Great White Shark, *Carcharodon carcharias*, in Turkish Waters: a Review and New Records 325
Status in razširjenost belega morskega volka (Carcharodon carcharias) v turških vodah: pregled in novi zapisi o pojavljanju

Alen SOLDO 200 Years of Records of the Basking

- Shark, *Cetorhinus maximus*, in the Eastern Adriatic 343
Dvesto let opazovanj morskega psa orjaka, Cetorhinus maximus, v vzhodnem Jadranskem morju

Hakan KABASAKAL, Ayşe ORUÇ, Cansu LKILINÇ, Efe SEVİM, Ebrucan KALECİK & Nilüfer ARAÇ

- Morphometrics of an Incidentally Captured Little Gulper Shark, *Centrophorus uyato* (Squaliformes: Centrophoridae), from the Gulf of Antalya, with Notes on Its Biology 351
Morfometrija naključno ujetega globinskega trneža, Centrophorus uyato (Squaliformes: Centrophoridae), iz Antalijskega zaliva z zapiski o njegovi biologiji

Christian CAPAPÉ, Almamy DIABY, Youssouph DIATTA, Sihem RAFRAFI-NOUIRA & Christian REYNAUD Atypical Claspers in Smoothhound, <i>Mustelus mustelus</i> (Chondrichthyes: Triakidae) from the Coast of Senegal (Eastern Tropical Atlantic) 359 <i>Netipična klasperja navadnega morskega psa, Mustelus mustelus (Chondrichthyes: Triakidae) iz senegalske obale (vzhodni tropski Atlantik)</i>	Marijana HURE, Davor LUČIĆ, Barbara GANGAI ZOVKO & Ivona ONOFRI Dynamics of Mesozooplankton Along the Eastern Coast of the South Adriatic Sea 411 <i>Dinamika mezozooplanktona vzdolž vzhodne obale južnega Jadran</i>
Hakan KABASAKAL, Ayşe ORUÇ, Ebrucan KALECIK, Efe SEVİM, Nilüfer ARAÇ & Cansu ILKILINÇ Notes on a Newborn Kitefin Shark, <i>Dalatias licha</i> : New Evidence on the Nursery of a Rare Deep-Sea Shark in Northeastern Levant (Turkey) 367 <i>Zapis o najdbi skotenega klinoplavutega morskega psa, Dalatias licha: novi dokaz o jaslicah redkega globokomorskega morskega psa v severovzhodnem levantu (Turčija)</i>	Abdelkarim DERBALI, Kandeel E. KANDEEL, Aymen HADJ TAIEB & Othman JARBOUI Population Dynamics of the Cockle <i>Cerastoderma glaucum</i> (Mollusca: Bivalvia) in the Gulf of Gabes (Tunisia) 431 <i>Populacijska dinamika navadne srčanke Cerastoderma glaucum (Mollusca: Bivalvia) v Gabeškem zalivu (Tunizija)</i>
IHTIOLOGIJA ITTILOGIA ICHTHYOLOGY	Vasiliki K. SOKOU, Joan GONZALVO, Ioannis GIOVOS, Cristina BRITO & Dimitrios K. MOUTOPOULOS Tracing Dolphin-Fishery Interaction in Early Greek Fisheries 443 <i>Sledenje interakcij med delfini in ribiči v zgodnjih grških ribiških dejavnostih</i>
Nadia BOUZZAMMIT, Hammou EL HABOUZ, El hassan AIT-TALBORJT, Zahra OKBA & Hassan EL OUIZGANI Diet Composition and Feeding Strategy of Atlantic Chub Mackerel <i>Scomber colias</i> in the Atlantic Coast of Morocco 377 <i>Prehrana in prehranjevalna strategija lokarde (Scomber colias) ob atlantski obali Maroka</i>	Pavel JAMNIK, Matija KRIŽNAR & Bruno BLAŽINA Novi najdišči pleistocenske favne pod Kraškim robom. Smo končno našli tudi jamo <i>Grotta dell'Orso?</i> 451 <i>Two New Sites of Pleistocene Fauna under Karst Edge. Has a Grotta dell'Orso Cave Been Finally Found?</i>
FLORA FLORA FLORA	OCENE IN POROČILA RECENSIONI E RELAZIONI REVIEWS AND REPORTS
Amelio PEZZETTA Le Orchidaceae di Albona (Labin, Croazia) 393 <i>Kukavičevke Labina (Hrvaška)</i>	Andreja PALATINUS Book Review: Plastic Pollution and Marine Conservation. Approaches to Protect Biodiversity and Marine Life 471 <i>Kazalo k slikam na ovitku 473 Index to images on the cover 473</i>
FAVNA FAVNA FAVNA	
Murat BILECENOĞLU & Melih Ertan ÇINAR The Mauve Stinger, <i>Pelagia noctiluca</i> , Has Expanded Its Range to the Sea of Marmara 405 <i>Mesečinka (Pelagia noctiluca) je razširila svoj areal do Marmarskega morja</i>	

received: 2022-06-09

DOI 10.19233/ASHN.2022.35

200 YEARS OF RECORDS OF THE BASKING SHARK, *CETORHINUS MAXIMUS*, IN THE EASTERN ADRIATIC

Alen SOLDO

University of Split, Department of Marine Studies, Ulica Rudera Boškovića 31, 21000 Split, Croatia
e-mail: soldo@unist.hr

ABSTRACT

The basking shark was relatively rare in the Adriatic, but since the beginning of the 21st century, its occurrence was substantially increased. It was suggested that basking sharks migrate from the Mediterranean toward the northern Adriatic, following water masses carrying specific copepod species that are sufficiently abundant for their feeding. In this paper, recent and historical data are compiled to re-examine spatial and temporal trends of the basking shark occurrence in the Adriatic. During the last 200 years, a total of 75 records were reported since the first one in 1822. The majority is reported during the spring season when the copepod abundance is the highest. After spring, the winter, especially the second half, is the time of the year when most of the basking sharks are reported, while during autumn and summer only a low number of records exist, 7 and 6 respectively.

Key words: basking shark, *Cetorhinus maximus*, Adriatic, occurrence, public perception

200 ANNI DI SEGNALAZIONI DELLO SQUALO ELEFANTE, *CETORHINUS MAXIMUS*, NELL'ADRIATICO ORIENTALE

SINTESI

Lo squalo elefante era relativamente raro nell'Adriatico, ma dall'inizio del XXI secolo la sua presenza è aumentata in modo sostanziale. È stato ipotizzato che gli squali elefante migrino dal Mediterraneo verso l'Adriatico settentrionale, seguendo masse d'acqua che trasportano specifiche specie di copepodi sufficientemente abbondanti per la loro alimentazione. In questo lavoro vengono raccolti dati recenti e storici per riesaminare le tendenze spaziali e temporali della presenza dello squalo elefante nell'Adriatico. Nel corso degli ultimi 200 anni sono state raccolte in totale 75 segnalazioni, a partire dalla prima del 1822. La maggior parte degli avvistamenti risale alla stagione primaverile, quando l'abbondanza dei copepodi è più elevata. Dopo la primavera, l'inverno, soprattutto la seconda metà, è il periodo dell'anno in cui è stata avvistata la maggior parte degli squali elefante, mentre durante l'autunno e l'estate sono stati registrati solo, rispettivamente, 7 e 6 esemplari di squalo elefante.

Parole chiave: squalo elefante, *Cetorhinus maximus*, Adriatico, presenza, percezione pubblica

INTRODUCTION

The basking shark, *Cetorhinus maximus* (Gunnerus, 1765), is a coastal-pelagic and semioceanic or oceanic shark species found in boreal to warm-temperate waters of the continental and insular shelves, occurring well offshore and often very close to land, just off the surf zone, and entering enclosed bays (Compagno, 2002; Ebert et al., 2021). It is a highly seasonal species, noteworthy for its seasonal appearance in given localities and subsequent disappearance (Ebert et al., 2021). The numbers of basking sharks sighted may fluctuate greatly in given areas each year, with irregular increases ('invasions') and decreases that are of uncertain cause. In Eastern Atlantic it occurs from Iceland and Norway to North Africa and the Mediterranean (Compagno, 2002; Ebert et al., 2021). Although the basking shark records are widespread in the Mediterranean most of the records are reported in the Tyrrhenian, Balearic and Adriatic regions (Mancusi et al., 2005, 2020).

Soldo & Jardas (2002a, 2002b) reported 27 records of the basking shark in the Eastern Adriatic from 1822 until mid of 2001. The records were widespread all over the coastal area of the Eastern Adriatic, although most were reported in the area of Kvarner Bay in northern Adriatic. The majority of the records were related to the accidentally caught specimens, either in the gillnet or trawl. Hence, not many records were recorded during the 19th century as most of them were from the 20th century, thus the basking shark was considered rare species in the Adriatic (Soldo et al., 1999). However, during 2000 and the first half of 2001, a lot of new records were reported along the eastern and western coasts of Central and Northern Adriatic (Zuffa et al., 2001). Some records were related to the individual specimens but some were sightings of relatively large schools of adult sharks. What Zuffa et al. (2001) also noted was the absence of the basking shark along the Tuscany coast, which was frequently visited by *C. maximus*, at the same time when an increasing number of records were reported from the Adriatic coast. At that time, due to the lack of data, Zuffa et al. (2001) could not give an accurate reason for such a phenomenon but further research provided a reliable explanation. Soldo et al. (2008) compared the records of the basking shark in the Northern Adriatic during the period from January 2000 to October 2002 with various seawater characteristics. Comparing the occurrence of basking sharks and fluctuations in temperature and salinity showed no evident pattern. However, when the occurrence of the basking sharks was compared to fluctuations in zooplankton structure and abundance it was evident that

the basking sharks were found exactly in the time of high density of large copepods, particularly *Calanus helgolandicus*, which is their major prey. Thus, it was suggested that basking sharks migrate from the Mediterranean toward the Northern Adriatic, following water masses carrying specific copepod species that are sufficiently abundant for their feeding (Soldo et al., 2008). Hence, segregation of adults and young-of-the-year was also observed as adults were arriving during the second half of winter and then in the following months seen near the surface usually feeding on patches of plankton. From mid of spring until its end, with the decline of zooplankton abundance, adults were leaving the Adriatic along the eastern coast but in deeper waters, and later, with the start of the summer season, the arrival of newborn sharks from deep water to coastal feeding grounds was observed (Soldo et al., 2008). Furthermore, what has to be noted is that this kind of behavior observed in the Adriatic was very similar to the behavior of the basking sharks described from southwest England (Sims & Merrett, 1997; Sims et al., 1997, 2003).

In the Mediterranean, thus even in the Adriatic, the basking shark is protected under recommendation GFCM/36/2012/3 (later amended to GFCM/42/2018/2) of the General Fisheries Commission of the Mediterranean (GFCM). This recommendation is aimed at protecting those species of sharks and rays that are listed in Annex II of the Protocol of the Barcelona Convention on specially protected areas and biological diversity in the Mediterranean. Furthermore, *C. maximus* is listed in Annex I of Regulation (EU) 2019/1241 that prohibits for EU vessels to fish for, retain on board, tranship, land, store, sell, display or offer for sale this shark for all EU waters. In Croatian waters, which encompass most of the Eastern Adriatic, the highest level of protection is given to the basking shark as it is declared as a Strictly protected species (Soldo & Lipej, 2022).

The aim of this study is to compile recent and historical data to re-examine spatial and temporal trends in basking shark occurrence in the Adriatic. Such information is essential to differentiate whether changes in the occurrence of the Mediterranean basking shark population happen due to changes in population size or due to the movement patterns and distribution because of environmental change.

MATERIAL AND METHODS

The study area presented in this paper relates to the Eastern Adriatic which in the north is separated from the Western Adriatic at the point of Lido di

Jesolo. The timespan covered by this study started in 1822, when the first record was reported and ends by March 2022, thus resulting in 200 years period.

Data presented in this paper were retrieved from studies focusing on the basking shark in the Adriatic (Lipej *et al.*, 2000; Zuffa *et al.*, 2001; Soldo & Jardas, 2002a, 2002b; Soldo *et al.*, 2008; Lipej & Mavrić, 2015) and from records published

in different media. However, only published records that were accompanied by photo and/or video evidence that could be verified were used. Luckily, being the world's second largest fish and one of three filter-feeding shark species, the basking shark is put at the center of public interest, thus most of the new records were published by several media sources with additional data which simplified the confirmation of the record.

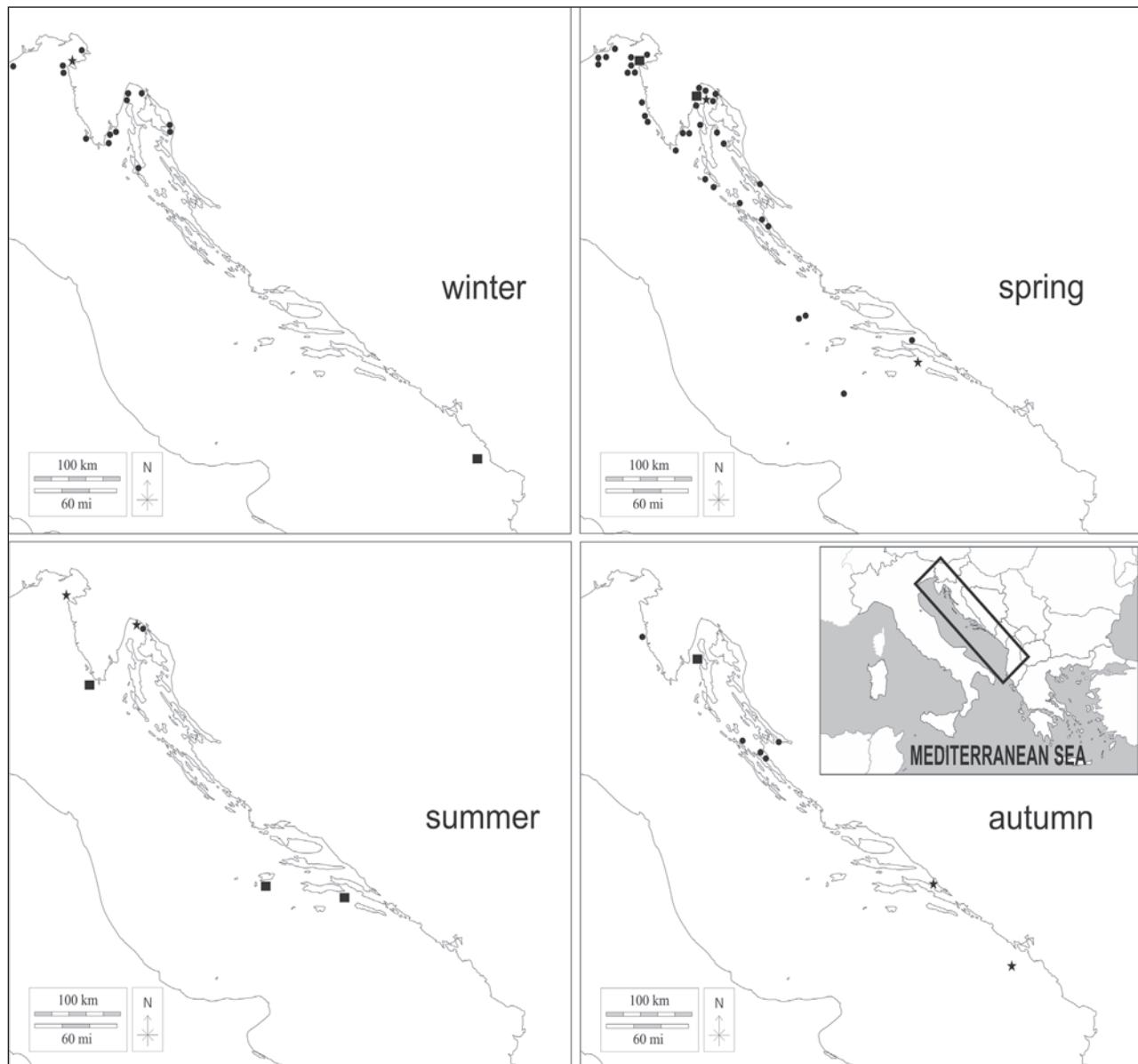


Fig. 1: Geographical locations of records of *C. maximus* per season in the Eastern Adriatic Sea; * - juveniles (<299 cm TL), ■ - subadults (300–499 cm TL), ● - adults (>500 cm TL).

Sl. 1: Geografske lokacije primerov pojavljanja vrste *C. maximus* v vzhodnem Jadranskem morju glede na sezono; * - mladostni primerki (<299 cm telesne dolžine), ■ - subadulti (300–499 cm), ● - odrasli primerki (>500 cm).

To investigate the segregation of adults and young basking sharks three size classes were compared, specifically <299 cm (juveniles), 300–499 cm (subadults), and adults >500 cm in total length.

RESULTS AND DISCUSSION

During the last 200 years, a total of 75 records were reported since the first one in 1822 (Appendix 1). Appendix 1 contains even an additional record, which is not numbered, from 12th February 2008 when public media reported about the catch of the basking shark 9 NM from Rogoznica in the Central Adriatic. However, later examination of the available photos revealed that the shark in the case is not a basking shark but the bluntnose sixgill shark, *Hexanchus griseus* (Bonnaterre, 1788). This record also proves that although citizen science and social media are useful for gathering additional information, careful investigation of the available data is needed as reporting and successive publishing of incorrect data can result in misleading conclusions.

Although records that contain an exact location are widespread along the Eastern Adriatic coast, most are reported from the Northern Adriatic, including Kvarner Bay, which is well known as the area of Adriatic with the highest zooplankton biomass. Soldo *et al.* (2008) reported that during the investigation carried out in the Northern Adriatic many basking sharks were observed feeding on patches of plankton which coincides with the available information from new records as only for the basking sharks from that area similar feeding behavior is reported. When the records are divided by the season (Fig. 1), it is clear that the majority is reported during the spring season when the copepod abundance is the highest, which corresponds with the findings of Soldo *et al.* (2008). After spring, the winter, especially the second half, is the time of the year when most of the basking sharks are reported, while during autumn and summer only a low number of records exist, 7 and 6 respectively. The increasing numbers of records of *C. maximus* in spring and winter months due to the increasing abundance of larger copepods is later also reported from northern Aegean waters (Kabasakal, 2013). A similar phenomenon was also observed in the northeastern Mediterranean, where records of *C. maximus* in the Bay of Mersin (Turkey) were associated with annual average zooplankton biomass in coastal waters that was about nine times higher than in open waters (Zenginer & Beşiktepe, 2007; Kabasakal, 2013). Hence, during the summer, out of 6 records, 2 are juveniles and 3 subadults which also coincides with the temporal segregation of juvenile and adult age classes observed by Soldo

et al. (2008) who suggested that younger sharks are arriving in summer after adults leave the Adriatic. Two juveniles were reported during the autumn but only in southern Adriatic which can be explained by a late exit from the Adriatic of juveniles that were inhabiting more northern areas during the summer. The only exception from the observed pattern is the case of a male juvenile basking shark of 217 cm in total length and 40 kg of weight caught on 25th December 2014 (Lipej & Mavrič, 2015). Soldo *et al.* (2008) already proved that the migration of the basking sharks in the Adriatic is not related to changes in temperature and/or salinity, which was recently also confirmed by studies performed in other world regions (Finnuci *et al.*, 2021; Johnston *et al.*, 2022). Thus, such surprising early winter arrival of the juvenile basking shark in very shallow waters of the Northern Adriatic (20 m depth) can not be precisely explained as the reasons can be various. Basking sharks are known to exhibit high interannual variability in occurrence, but the forcing mechanisms behind this are not known, especially for the juveniles for which the data is even more scarce than for the adults. The reason can be attributed to the feeding behavior, but on the other hand, it is unclear if basking sharks continue to actively feed during the winter (Doherty *et al.*, 2019). It is also possible that such behavior is related to thermoregulation or aid energy conservation (Thums *et al.*, 2013) but again all the possible explanations are difficult to confirm due to the limited amount of biological data available. Hence, what also has to be noted is that this case is not a unique one as a female juvenile basking shark at the transition stage with S-shaped snout and a total length of 3.02 m, was captured in Sagami Bay, Japan, on December 26, 2020, however, again without meaningful explanation (Katooka *et al.*, 2020).

During the last few decades records that are reported mainly come from sightings while incidental catches are decreased. Even more, when basking sharks are accidentally caught, if still alive, they are usually released by the fishermen (e.g. the record from Savudrija in March 2019), which shows that the basking shark today are perceived by the general public as harmless and gentle marine giants in comparison to late 20th century period when any large shark was portrayed negatively (Soldo & Jardas, 2002b). Although the increased occurrence of the basking shark is linked to environmental factors, it can be also presumed that basking sharks appear to be responding well to protective measures that are existing in the eastern Adriatic, especially as they are combined with positive media and public perception that enhance conservation efforts. That is particularly important

Appendix 1: Records of the basking shark, *Cetorhinus maximus*, in the Eastern Adriatic from 1822 until April 2022.
Priloga 1: Zapisi o pojavljanju morskega psa orjaka, *Cetorhinus maximus*, v vzhodnem Jadranu od leta 1822 do aprila 2022.

No	Date	Location	TL (cm)	Weight (kg)	Sex	Remarks
1	1822	Kvarner Bay	-	-	-	-
2	15.03.1825	Trieste Bay	-	-	-	-
3	1846	Dalmatia	-	-	-	-
4	1866	Kvarner Bay	800	-	-	-
5	1903	Hvar	-	-	-	-
6	23.07.1908	Vîs	310	289	female	-
7	07.10.1921	Cres	320	-	male	-
8	15.03.1925	-	-	-	-	-
9	09.09.1926	-	600-700	800-1000	-	-
10	1931	Bakarac	-	-	-	caught in tuna gillnet
11	02.06.1933	Bakar	500	1000	-	caught in tuna gillnet
12	01.09.1934	Kraljevica	762	2400	-	-
13	10.07.1937	Lumbarda	350	250	-	caught in gillnet
14	07.11.1952	Poreč	-	-	-	caught in gillnet
15	August 1954	Peškera	470	-	-	-
16	07.12.1968	Ston	250	80	-	-
17	1974	Trieste	392	386	male	caught in gillnet
18	25.11.1980	Molat	550	-	-	-
19	14.02.1981	Bar	400	-	-	caught in gillnet
20	18.06.1981	Ičići	265	120	-	-
21	20.05.1985	Volosko	647	2000	-	caught in tuna gillnet
22	11.01.1991	Ičići	600	-	-	photographed in the sea
23	05.04.1995	Palagruža	650	1500	female	caught by trawl
24	08.10.1995	Ugljan	700	2000	-	caught in gillnet
25	23.03.1999	Pelješac	722	2500	female	caught in gillnet
26	March and April 2000	Rovinj	700	2000	-	several sightings and encounters with boats, finally caught in gillnet and released
27	22.05.2000	Piran	299	120	male	caught in gillnet
28	23.05.2000	Blitvenica area	700	2000	-	caught by trawl
29	05.06.2000	Blitvenica area	850	2500	-	caught by trawl
30	19.07.2000	Piran	249	70	male	caught in gillnet
31	22.03.2001	Umag	800	-	-	several sightings in following days
32	28.03.2001	Caorle	500	-	-	sighted several times and photographed
33	29.03.2001	Caorle	<500	-	-	according to photo, different specimen
34	April 2001	Slovenian waters	-	-	-	school of 9 sharks
35	09.05.2001	Trieste	600	-	-	sighting
36	20.05.2001	Kali	800	-	-	several sightings (specimen with wounded head)
37	25.09.2001	Pašman channel	700	-	-	sighting
38	16.03.2002	Sv.Juraj	740	-	female	accidentally caught in lobster pot mainline
39	16.03.2002	Jesolo	600	-	-	sighting
40	8.04.2002	Lignano	600	-	-	caught 23 miles in front of Tagliamento estuary
41	01.05.2002	Karin sea	700	-	-	caught in gillnet, released, found dead after month, probably the same specimen
42	May 2002	Jesolo	600	-	-	sighted and photographed
43	03.03.2003	Osov	600	-	-	caught in gillnet
44	24.03.2003	Paška vrata	650	-	-	caught in lobster pot line
45	01.04.2003	Supetarska Draga-Rab	710	-	-	caught in gillnet and released
46	07.04.2003	in front of Ugljan	500-600	-	-	sighting
47	12.05.2003	Savudrija	>700	-	female	caught in gillnet, towed into Savudrija and released
48	October 2004	Herceg Novi	420	300	-	caught on longline
49	20.02.2007	Umag	600	-	-	sighting
50	29.04.2007	Lumbarda	270	-	-	juvenile caught in gillnet and released
	12.02.2008	9 NM from Rogoznica	350	350	female	caught and reported as the basking shark but probably misidentified as sixgill shark <i>Hexanchus griseus</i>
51	11.07.2008	Rijeka port	250	-	-	juvenile
52	17.01.2009	Pula port	6 m	-	-	sighting
53	31.03.2009	Plavnik	7 m	-	-	caught in lobster pot line
54	26. 04.2010	Koromačno	6 m	-	-	sighting
55	01.05.2010	Premantura	6 m	-	-	seen with mouth wide open during feeding
56	30.05.2010	Ičići	5 m	-	-	sighting
57	03.06.2010	Omišalj	8 m	-	female	caught in lobster pot line
58	09.06.2010	Umag	7 m	-	-	sighting
59	16.6.2010	Koromačno	6 m	-	-	sighting
60	22.04.2011	Molat	10 m	-	-	caught in gillnet
61	29.04.2011	Illovik	7 m	-	-	seen with mouth wide open during feeding
62	29.04.2011	Moščenička draga	3,7 m	-	-	sighting
63	12.05.2011	Rovinj	7 m	-	-	carcass found
64	26.04.2012	Poreč	8 m	-	female	caught in gillnet
65	31.01.2013	Senj	8 m	-	-	caught in gillnet and reportedly released
66	14.01.2014	Ičići, Ika	6-7 m	-	-	sighting
67	08.06.2014	Between Mali Lošinj and Susak	5.5 m	-	-	sighting
68	25.12.2014	Piran	217 cm	40	male	juvenile
69	22.02.2015	Ližnjan	8 m	-	-	sighting
70	29.04.2015	Cres	7 m	-	-	sighting
71	02.02.2016	Rijeka	6 m	-	female	carcass with the rope around the body
72	10.05.2017	Porozina-Brestova	5 m	-	-	sighting
73	02.03.2019	Savudrija	8 m	-	-	caught in gillnet and released
74	05.03.2021	Koromačno	8 M	-	-	sighting
75	12.03.2022	Cape Ubaš	8 m	-	-	sighting, missing of the dorsal fin part reported

for this species as the basking shark in the Adriatic is assessed as Critically Endangered by the latest study (Soldo & Lipej, 2022). A huge amount of media articles presenting scientific facts and conservation issues were published in the media each time after basking shark sightings or accidental cat-

ches occurred, thus, changing the public attitude toward this large shark. Therefore, the case of the basking sharks in the Adriatic can be an example for other shark species' conservation as, obviously, the combination of science, proper management and positive public perception is giving results.

DVESTO LET OPAZOVANJ MORSKEGA PSA ORJAKA, *CETORHINUS MAXIMUS*, V VZHODNEM JADRANSKEM MORJU

Alen SOLDO

University of Split, Department of Marine Studies, Ulica Rudera Boškovića 31, 21000 Split, Croatia
e-mail: soldo@unist.hr

POVZETEK

Morski pes orjak je relativno redka vrsta v Jadranu, toda od začetka 21. stoletja se je število opazovanj te vrste znatno povečalo. Domnevali so, da se morski psi orjaki selijo iz Sredozemskega morja proti severnemu Jadranu zasledujoč vodne mase z določenimi vrstami rakov ceponožcev, ki so dovolj številčni za njihovo prehrano. V pričujočem prispevku je avtor zbral in analiziral podatke o prostorskem in časovnem trendu pojavljanja morskih psov orjakov v Jadranskem morju. V zadnjih dvestih letih je bilo objavljenih skupaj 75 zapisov o pojavljanju te vrste po prvemu zapisu iz leta 1822. Večina podatkov se nanaša na spomladansko sezono, v kateri so največje gostote rakov ceponožcev. Poleg pomladi je največ zapisov o pojavljanju znanih pozimi, še posebej v drugi polovici, medtem ko je iz jesenskega in poletnega obdobja znanih le 7 oziroma 6 zapisov.

Ključne besede: morski pes orjak, *Cetorhinus maximus*, Jadran, pojavljanje, dojemanje javnosti

REFERENCES

- Compagno, L.J.V. (2002):** Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Volume 2. Bullhead, mackerel and carpet sharks (Heterodontiformes, Lamniformes and Orectolobiformes). No. 1, Vol. 2. FAO, Rome.
- Doherty, P.D., J.M. Baxter, B.J. Godley, R.T. Graham, G. Hall, J. Hall, L.A. Hawkes, S.M. Henderson, L. Johnson, C. Speedie & M.J. Witt (2019):** Seasonal changes in basking shark vertical space use in the north-east Atlantic. Mar. Biol., 166, 129.
- Ebert, D.A., M. Dando & S. Fowler (2021):** Sharks of the World: A complete guide. Princeton 112 University Press, Wild Nature Press Series, UK: 608 pp.
- Finucci, B., C.A.J. Duffy, T. Brough, M.P. Francis, M. Milardi, M.H. Pinkerton, G. Petersen & F. Stephenson (2021):** Drivers of Spatial Distributions of Basking Shark (*Cetorhinus maximus*) in the Southwest Pacific. Front. Mar. Sci., 8, 665337.
- Johnston, E.M., J.D.R. Houghton, P.A. Mayo, G.K.F. Hatten, A.P. Klimley & P.J. Mensink (2022):** Cool runnings: behavioural plasticity and the realised thermal niche of basking sharks. Environ. Biol. Fish., <https://doi.org/10.1007/s10641-021-01202-8>.
- Kabasakal, H. (2013):** Rare but present: Status of basking shark, *Cetorhinus maximus* (Gunnerus, 1765) in eastern Mediterranean. Annales, Ser. Hist. Nat., 23, 127-132.
- Katooka, D., T. Sakiyama & H. Senou (2020):** Record of a juvenile basking shark, *Cetorhinus maximus* (Lamniformes: Cetorhinidae), from Sagami Bay, central Japan, with a review of worldwide records of juveniles of the species. Kanagawa Nature Magazine Material, 43, 53-60.
- Lipej, L., A. De Maddalena & A. Soldo (2004):** Sharks of the Adriatic Sea. Knjižnica Annales Majora, Koper, 254 pp.
- Lipej, L., T. Makovec, A. Soldo & V. Žiža (2000):** Occurrence of the Basking Shark, *Cetorhinus maximus* (Gunnerus, 1765), in the waters off Piran (Gulf of Trieste, Northern Adriatic). Annales, Ser. Hist. Nat., 10(2), 205-206.
- Lipej, L. & B. Mavrič (2015):** Juvenile basking shark *Cetorhinus maximus* caught in the waters off Piran (northern Adriatic). In: Tsiamis et al. New Mediterranean Biodiversity Records (July 2015). Mediterranean Marine Science, 16(2), 472-488.
- Mancusi, C., Clò, S., Affronte, M., Bradaï, M.N., Hemida, F., Serena, F., Soldo, A. & M. Vacchi (2005):** On the presence of basking shark (*Cetorhinus maximus*) in the Mediterranean Sea, Cybium 29 (4): 399- 405.
- Mancusi, C., R. Baino, C. Fortuna, L. De Sola, G. Morey, M. Bradai, A. Kallianotis, A. Soldo, F. Hemida, A. Saad, M. Dimech, P. Peristeraki, M. Bariche, S. Clò, E. De Sabata, L. Castellano, F. Garibaldi, L. Lanteri, F. Tinti, A. Pais, E. Sperone, P. Micarelli, F. Poisson, L. Sion, R. Carlucci, D. Cebrian-Menchero, B. Séret, F. Ferretti, A. El-Far, I. Saygu, E. Shakman, A. Bartoli, J. Guallart, D. Damalas, P. Megalofonou, M. Vacchi, M. Bottaro, G. Notarbartolo Di Sciara, M. Follesa, R. Cannas, H. Kabasakal, B. Zava, G. Cavlan, A. Jung, M. Abudaya, J. Kolitari, A. Barash, A. Joksimović, B. Marčeta, L. Gonzalez Vilas, F. Tirialongo, I. Giovos, F. Bargnesi, S. Lelli, M. Barone, S. Moro, C. Mazzoldi, C. Charis, A. Abella & F. Serena (2020): MEDLEM database, a data collection on large Elasmobranchs in the Mediterranean and Black seas. Mediterranean Marine Science, 21(2), 276-288.**
- Sims, D.W. & D.A. Merrett (1997):** Determination of zooplankton characteristics in the presence of surface feeding basking sharks *Cetorhinus maximus*. Mar. Ecol. Prog. Ser., 158, 297-302.
- Sims, D.W., A.M. Fox & D.A. Merrett (1997):** Basking shark occurrence off south-west England in relation to zooplankton abundance. J. Fish Biol., 51, 436-440.
- Sims, D.W., E.J. Southall, D.A. Merrett & J. Sanders (2003):** Effects of zooplankton density and diel period on the surface-swimming duration of basking sharks. J. Mar. Biol. Ass. U.K., 83, 643-646.
- Soldo A. & I. Jardas (2002a):** Large sharks in the Eastern Adriatic. In: Vacchi M., La Mesa G., Serena F. & B. Séret (eds), Proc. 4th Elasmobranch Ass. Meet., Livorno (Italy) 2000, pp. 141-155.
- Soldo A. & I. Jardas (2002b):** Occurrence of great white shark, *Carcharodon carcharias* (Linnaeus, 1758) and basking shark, *Cetorhinus maximus* (Gunnerus, 1765) in the Eastern Adriatic and their protection. Period. Biol., 104(2), 195-201.
- Soldo, A. & L. Lipej (2022):** An Annotated Checklist and the Conservation Status of Chondrichthyans in the Adriatic. Fishes, 7, 245.
- Soldo, A., M. Peharda, V. Onofri, N. Glavić & P. Tutman (1999):** New record and some morphological data of the basking shark *Cetorhinus maximus* (Gunnerus, 1765) in the Eastern Adriatic. Annales, Ser. Hist. Nat., 17, 229-232.
- Thums, M., M. Meekan, J. Stevens, S. Wilson & J. Polovina (2013):** Evidence for behavioural thermoregulation by the world's largest fish. J. R. Soc. Interface, 10, 2-6.
- Zenginer, A. & Ş. Beşiktepe (2007):** Annual variations of zooplankton biomass and abundance in Mersin bay (NE Mediterranean Sea). Rapp. Comm. int Mer Médit., 38, 643.
- Zufa, M., A. Soldo & T. Storai (2001):** Preliminary observations on abnormal abundance of *Cetorhinus maximus* (Gunnerus, 1765) in the Central and Northern Adriatic Sea. Ann. Ser. Hist. Nat., 11(2), 185-192.