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PRESENCE OF THE GREAT WHITE SHARK, *CARCHARODON CARCHARIAS*
(LINNAEUS, 1758) IN THE CATALONIAN SEA (NW MEDITERRANEAN):
REVIEW AND DISCUSSION OF RECORDS,
AND NOTES ABOUT ITS ECOLOGY

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ABSTRACT

Occurrences of the great white shark Carcharodon carcharias in the Catalanian Sea have been poorly reported and at times poorly examined as well. Therefore, historical and contemporary records have been revised and analysed to check on their validity. Furthermore, some brief biological data are presented.

Key words: great white shark, *Carcharodon carcharias*, Catalanian Sea, records, ecology

PRESENZA DELLO SQUALO BIANCO, *CARCHARODON CARCHARIAS* (LINNAEUS,
1758) NEL MARE DELLA CATALOGNA (MEDITERRANEO NORD-OCCIDENTALE):
REVISIONE E DISCUSSIONE DELLE SEGNALAZIONI CON NOTE DI ECOLOGIA

SINTESI

La presenza dello squalo bianco Carcharodon carcharias nel Mare della Catalogna è stata scarsamente riportata e talora non esaminata in dettaglio. Pertanto le segnalazioni storiche ed attuali sono state riviste ed analizzate al fine di valutarne la validità. Vengono inoltre presentati alcuni brevi dati sulla biologia della specie.

Parole chiave: Squalo bianco, *Carcharodon carcharias*, Mare della Catalogna, segnalazioni, ecologia

INTRODUCTION

The great white shark *Carcharodon carcharias* (Linnaeus, 1758) is a cosmopolitan species inhabiting coastal and temperate waters (Compagno, 1984). In the Mediterranean, it has been mentioned in works of general ichthyology (Cadenat & Blache, 1981; Quérou, 1984; Moreno, 1995; Barrull & Mate, 1996; Notarbartolo di Sciara & Bianchi, 1998), and it also appears broadly registered in local faunistic compiled works, for instance in the waters of Greece (Papakostantinou, 1988), Italy (Tortonese, 1956), France (Moreau, 1881),

and Algeria (Duméril, 1865), and also in the Adriatic (Šoljan, 1984) and Alboran Seas (Lozano Rey, 1921). Recently, Mojetta *et al.* (1997) and De Maddalena (1999) prepared a thorough summary of records in Italian waters, and likewise De Maddalena (2000) in the waters of the Northern and Central Adriatic. Recently, Fergusson (1996) made a revision of the white shark's occurrences in the entire Mediterranean. The main objective of the present work is to get acquainted with the presence of the white shark in the Catalanian Sea, as well as to revise and discuss the records of this species.

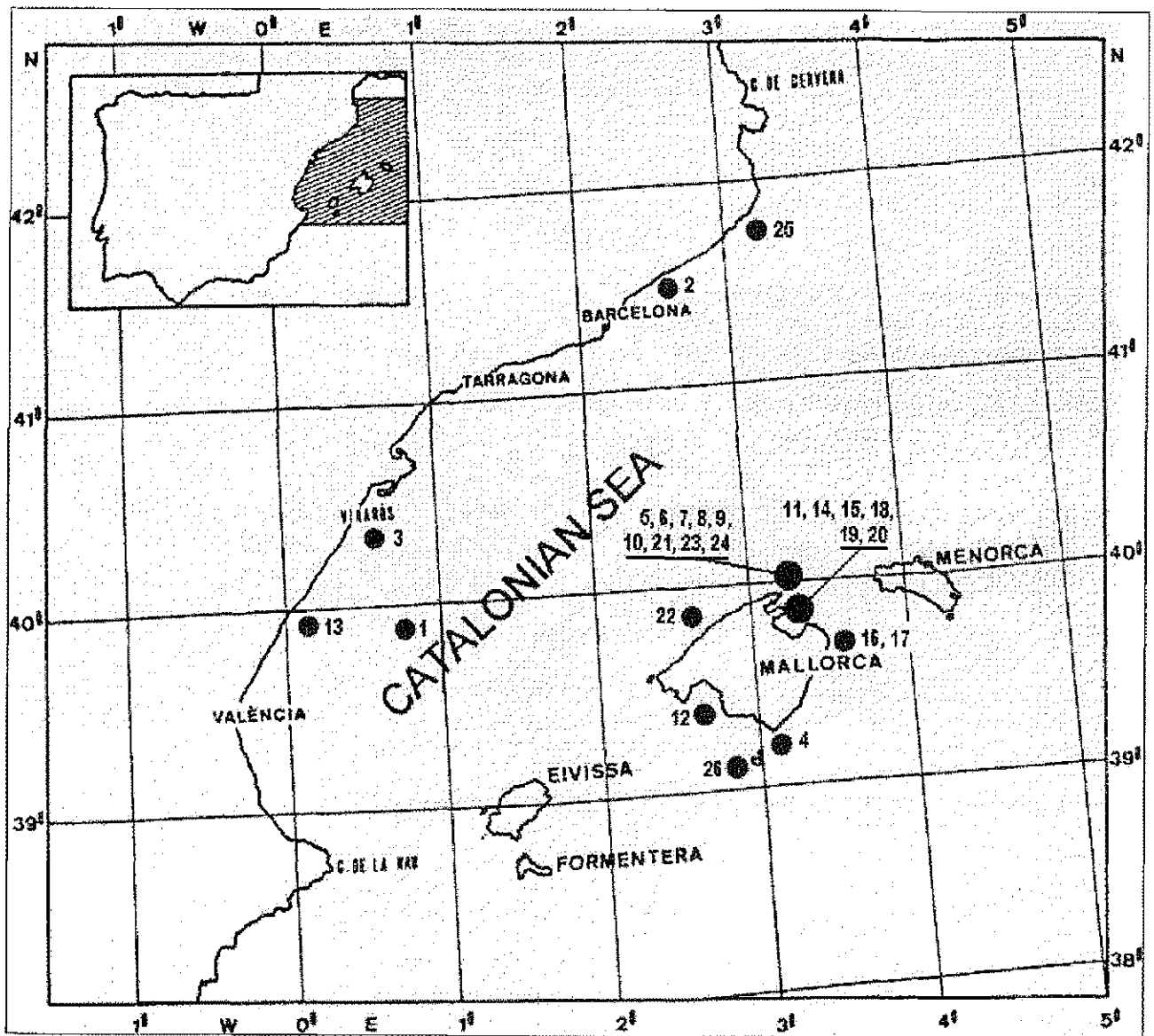


Fig. 1 : Localities of the specimens of great white shark *Carcharodon carcharias* in the Catalanian Sea (NW Mediterranean).

Sl. 1: Lokacije osebkov belega morskega volka *Carcharodon carcharias* v Katalonskem morju (SZ Sredozemlje).

MATERIALS AND METHODS

The area encompassed by the revision comprises the part of the western Mediterranean Sea known as the Catalanian Sea, whose limits were mapped by Danish Oceanographical Expeditions, 1908-1910 (Schmidt, 1912). The Catalanian Sea is a subunit of the Balearic Sea, limited by an imaginary line running from La Nau Cape (38°45'N) to Cervera Cape (42°30'N), including the Balearic Islands (Fig. 1).

This region coincides more or less with the authors' usual work area, thus enabling them to draw on a certain familiarity and background that proved invaluable in preparing the present compilation.

Data were collected from five main sources: a) books and scientific journals, b) circumstantial articles including photographs of captured specimens, c) sightings reports, d) location and study of material preserved in private collections or natural history museums, and e) collaboration with other researchers and private citizens. For the compilation of bibliographical references and scientific citations within the waters of the study area, it was sufficient to bring up to date the work of Lloris *et al.* (1984). In every case, whenever possible, the following data were collected: date and locality of the record; total length (TL) in cm, weight (W) in kg, and sex of the animal; type of record (capture, sighting or stranding). Total length and weight were estimations reported by fishermen.

RESULTS

The collected information include 26 specimens sighted or captured in the Catalanian Sea between 1878 and 2000 (Tab. 1). A total of 21 cases refer to Balearic Islands, 3 to Castelló, 1 to Girona and 1 to Barcelona.

Pérez Arcas (1878) mentions the capture of a specimen in 1878 along the coast of Valencia, between the Columbretes islands and Castelló. Surely this was the first documented record in the Catalanian Sea waters, often taken as reference in later works, such as those by Sánchez-Comendador (1904), Ferrer Aledo (1906), Fage (1907), Gibert (1911), De Buen (1935) and Lozano Cabo (1963). The contributions of these authors are not documented neither with date nor capture place, neither with sighting nor beaching of the white shark. Thus we can consider them simple general listings. Lozano Rey (1928) refers to a specimen caught in 1878 "... en las islas Columbretes no lejos de Castellón de la Plana..." ("...off the Columbretes Islands not far from Castellón de la Plana..."). The description of the capture leads us to believe that it could be the same individual as examined by Pérez Arcas due to the same date of capture, fishing place, weight of the animal, the only (small) difference being the total length, surely as a result of unreliable measure units being used. The same author further states in his work records from Mallorca (Balearic Islands), Vi-

naròs (Castelló), and "...en distintas partes de nuestro litoral mediterráneo..." ("...in different places along our Mediterranean coast..."), without any documented specification. Fergusson (1996) reported on three captures from the Columbretes Islands, Castellón and Valencia (Fergusson's cases nº 83, 84 and 85) but they are surely the same catch as reported by Pérez Arcas (1878).

Barrull & Mate (1993-1994, 1996) refer to a specimen captured in the *almadraba* (enclosed tuna net) off Vilassar de Mar (Barcelona). Two dental pieces of this individual, catalogued with the registration numbers MZB-82-5316 and MZB-82-5317, were deposited in the Museum of Zoology of Barcelona on December 16th 1912 (Fig. 2). These teeth are documental evidence of the first white shark record in Catalonia, and the second chronologically dated in the Catalanian Sea. Corbera *et al.* (1996) comment on the capture of a specimen off Premià de Mar (Barcelona), but this record is not valid due to an error (Corbera, *pers. comm.*), and it refers to the animal studied by Barrull & Mate (1993-1994).

Samper (1979) points out the capture of a 500 cm long and 1,500 kg heavy female along the coast of Castelló "...hace ya algunos años..." ("...some years ago..."). Asensi (1980) refers to an individual caught in 1962 off Castelló as well. This might be the same individual, but as Asensi has never responded to our requirement to confirm this record, we consider it doubtful.

Ramis & Terrasa (1988) comment on sighting and capture of 18 individuals with enclosed tuna nets (*almadrabas*) off Balearic Islands between 1941 and 1976. Most of these records are documented with pictures of the animals and explanations of the fishermen that made the captures (Figs. 3, 4). Further 12 individuals were said

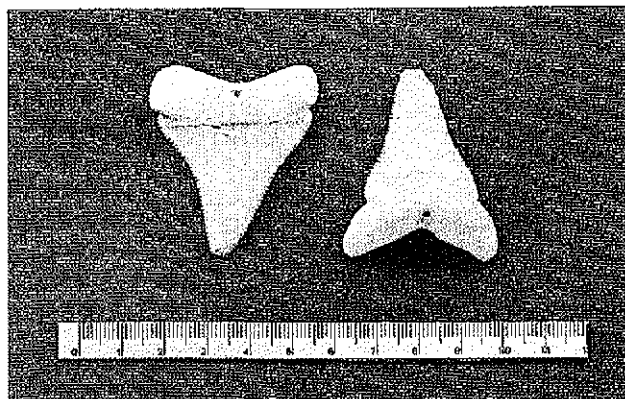


Fig. 2 : Teeth of the great white shark *Carcharodon carcharias* caught in December 1912 in the coastal waters of Vilassar de Mar (Barcelona). (Photo: J. Barrull & I. Mate).

Sl. 2: Zobovje belega morskega volka *Carcharodon carcharias*, ujetega decembra 1912 v obrežnih vodah Vilassarja de Mara (Barcelona). (Foto: J. Barrull & I. Mate).

Tab. 1: Data on great white sharks registered in the Catalanian Sea.

Tab. 1: Podatki o belih morskih volkovih, zabeleženih v Katalonskem morju.

No.	DATE	LOCATION	TL (cm)	W (kg)	SEX	REMARKS	REFERENCE
1	01/1878	Illes Columbrets (Castelló)	500 ca.	2300	?	Capture in nets. Published in "La Ilustración Española y Americana" on January 22 nd 1878	Pérez Arcas (1878), Lozano Rey (1928)
2	12/1912	Vilassar de Mar (Barcelona)	471	?	?	Capture in enclosed tuna net. Teeth donated by Dr. Joan Prim on December 16 th 1912. Reg.no.MZB-82-5316 & MZB-82-5317	Barrull & Mate (1993-94)
3	before 1928	Vinaròs (Castelló)	?	?	?	Teeth were deposited in the Museo Nacional de Ciencias Naturales de Madrid. Missing at the present time.	Lozano Rey (1928)
4	before 1928	Cap de ses Salines - Mallorca (Balears)	?	?	?	Capture in a trammel net.	Lozano Rey (1928)
5	1941	Ses Caletes des Cap Pinar-Badia de Pollença-Mallorca (Balears)	445	900	?	Capture in enclosed tuna net and harpooned. Pursued to the shore and stranding, was killed with an axe.	Ramis & Terrasa (1998), M. Martínez (<i>pers. comm.</i>)
6	08/1941	Ses Caletes des Cap Pinar-Badia de Pollença-Mallorca (Balears)	600 ca.	2000	?	Sighting. Turned round the long lines eating the captures.	M. Martínez (<i>pers. comm.</i>)
7	08/1941	Ses Caletes des Cap Pinar-Badia de Pollença-Mallorca (Balears)	600 ca.	?	?	Sighting. Came with individual no. 6.	M. Martínez (<i>pers. comm.</i>)
8	12/1941	Ses Caletes des Cap Pinar-Badia de Pollença-Mallorca (Balears)	600	1600	F	Capture in enclosed tuna nets. Stomach content: a head and two legs of goat. Sold for 16.000 pts.	M. Martínez (<i>pers. comm.</i>)
9	02-03/1943	Ses Caletes des Cap Pinar-Badia de Pollença-Mallorca (Balears)	428	800	?	Capture in enclosed tuna nets.	Ramis & Terrasa (1998), M. Martínez (<i>pers. comm.</i>)
10	02-03/1943	Ses Caletes des Cap Pinar-Badia de Pollença-Mallorca (Balears)	523	1500	?	Capture in enclosed tuna nets.	Ramis & Terrasa (1998), M. Martínez (<i>pers. comm.</i>)
11	1958	Badia d'Alcúdia - Mallorca (Balears)	?	?	?	Capture in enclosed tuna nets.	Ramis & Terrasa (1998), M. Martínez (<i>pers. comm.</i>)

12	1960-1970	Cala Blava-Badía de Palma - Mallorca (Balears)	700 ca.	2500	F	Capture in enclosed tuna nets.	Poyatos (<i>pers. comm.</i>)
13	1962?	Castelló de la Plana (Castelló)	500	1500	?		Samper (1979), Asensi (1980)
14	1963	Badia d'Alcúdia - Mallorca (Balears)	?	?	?	Capture in enclosed tuna nets. Sold for 17.000 pts.	Ramis & Terrasa (1998), M. Martínez (<i>pers. comm.</i>)
15	1967	Cap Ferrutx - Badia d'Alcúdia - Mallorca (Balears)	523	1500	?	Capture in enclosed tuna nets. Stomach content: a dolphin and 4 large tunas.	Ramis & Terrasa (1998), M. Martínez (<i>pers. comm.</i>)
16	27/01/1967	Cala Ratjada - Mallorca (Balears)	500	1300	F	Capture in enclosed tuna nets. Sold for 10.000 pts.	M. Martínez (<i>pers. comm.</i>)
17	06/1968	Cala Ratjada - Mallorca (Balears)	?	?	?	Capture in enclosed tuna nets.	M. Martínez (<i>pers. comm.</i>)
18	02/1969	Badia d'Alcúdia - Mallorca (Balears)	523	1500	?	Capture in enclosed tuna nets. Arrived alive at port.	Ramis & Terrasa (1998), M. Martínez (<i>pers. comm.</i>)
19	02/1969	Badia d'Alcúdia - Mallorca (Balears)	428	800	?	Capture in enclosed tuna nets. Jaws preserved.	Ramis & Terrasa (1998), M. Martínez (<i>pers. comm.</i>)
20	02/1969	Badia d'Alcúdia - Mallorca (Balears)	?	700e	?	Capture in enclosed tuna nets.	Ramis & Terrasa (1998), M. Martínez (<i>pers. comm.</i>)
21	01/1970	Ses Caletes des Cap Pinar-Badía de Pollença-Mallorca (Balears)	460	1000	?	Capture in enclosed tuna nets.	Ramis & Terrasa (1998), M. Martínez (<i>pers. comm.</i>)
22	1971	Sa Foradada - Mallorca (Balears)	550 ca.	1500	M	Capture in enclosed tuna nets.	Poyatos (<i>pers. comm.</i>)
23	1972	Cala Murta - Badía de Pollença-Mallorca (Balears)	574	2000	?	Capture in enclosed tuna nets.	Ramis & Terrasa (1998), M. Martínez (<i>pers. comm.</i>)
24	02/1976	Cala Murta - Badía de Pollença-Mallorca (Balears)	488	>1200	?	Capture in enclosed tuna nets. Stomach content: half digested ray.	Ramis & Terrasa (1998), M. Martínez (<i>pers. comm.</i>)
25	17/11/1992	Platja de la Mar Menuda -Tossa de Mar- (Girona)	475	?	M	Stranding. Jaws preserved at the CRAM (Premià de Mar).	Barrull (1993)
26	08/2000	Cabrera (Balears)	400 ca.	?	?	Sighting. Not absolutely confirmed.	Jiménez (2000), Poyatos (<i>pers. comm.</i>)

to be caught accidentally in the enclosed tuna nets at Cap Ferrutx, Ses Caletes des Cap Pinar, S'Illot des Porros, Sa Cova des Bous, and Cala Murta (NE Mallorca) during the same period, but most of them were not documented.

In August 1941, two great white shark were sighted off Ses Caletes des Cap Pinar (Mallorca) (Martínez, *pers. comm.*). Another individual was captured within the same area in December 1941. It was 6 m long and

weighing about 1600 kg (Martínez, *pers. comm.*).

On January 27th 1967, a 5 m long great white shark was caught near Cala Ratjada (Mallorca) (Martínez, *pers. comm.*). In early June 1968, one individual was taken at the same locality (Martínez, *pers. comm.*). Fergusson (1996) points out the capture of two individuals in Andratx (Mallorca) in July 1992, adducing a personal comment by J. Piza, veterinary from Marineland Palafofells (Girona). This record is very doubtful for it



Fig. 5: Specimen stranded on November 17th 1992 on Tossa de Mar (Girona) (Photo: J. Moré).
Sl. 5: Osebek, ki je 17. novembra 1992 nasedel na plaži Tossa de Mar (Girona) (Foto: J. Moré).

to the scarce number of records. Encounters are most common at insular sites and in association with pelagic fisheries for large teleosts such as tuna or swordfish.

After the disuse of enclosed tuna nets (at the end of the seventies), occurrences have practically disappeared. Among the studied cases, sixteen were reported with the month of capture. The seasonality of records showed an increase of captures during winter months. It is difficult to discuss the seasonal movements due to the scarcity of data. However, as the great white shark migrate seasonally, and its seasonal migration is at least partially influenced by water surface temperature (Casey & Pratt, 1985), it is possible to predict its presence in the months in which superficial waters of the Catalanian Sea are colder, occurring when the surface temperature is 13° C (Margalef, 1989). The thermal tolerance of this species is demonstrated by its latitudinal distribution (Compagno, 1984). The role played by the surface temperature in affecting this distribution might be even

more important to smaller specimens. It is possible that small white sharks have more difficulties in maintaining optimal body temperature in colder waters (Goldman *et al.*, 1996). This would explain the absence, in the study area, of small free-swimming and juvenile individuals during the colder months.

From among the twenty-two cases of white sharks captured, eighteen were caught in enclosed tuna nets (*mandragues*). Most probably they were pursuing the tunas that entered the Mediterranean Sea through the Strait of Gibraltar and went, parallel to the coast, to the laying areas. This is a clearly trophic migratory behaviour. The stomach contents of the Mediterranean white sharks denote predation on bony fish (tuna and swordfish), cartilaginous fish (mainly blue sharks and makos), dolphins and turtles (Fergusson, 1996; Mojetta *et al.*, 1997; De Maddalena, 1999). In the studied area, the number of cases in which great white shark stomach contents were reported, are few. The specimen caught off Cap Ferrutx (Mallorca) (case num. 15) had a dolphin and four large tunas in its stomach. The specimen caught off Cala Murta (Mallorca) (case num. 24) had a half digested ray, while in case No. 6 a head and two legs of a goat were reported. There are three cases (Nos. 5, 6 and 7) in which the sharks were observed during predation on grouper (*Epinephelus guaza*), amberjack (*Seriola dumerilii*), and dolphin fish (*Coryphaena hippurus*), caught in a long-line. Some old fishermen reported of a doll and a dog found in sharks' stomachs (Ramis & Terrasa, 1988). In the Catalanian Sea, the great white shark probably has the same diet as those observed in other parts of the Mediterranean, based primarily on cetaceans, large fishes, and carrion, when occasion arises. Tuna overfishing in the Mediterranean would affect seriously their population (Barrull & Mate, 2000).

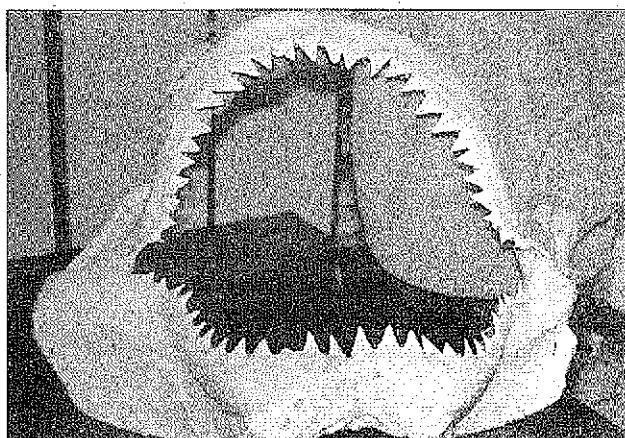


Fig. 6: The jaw of the white shark stranded in Tossa de Mar (Girona). (Photo: J. Barrull & I. Mate).
Sl. 6: Čeljust belega morskega volka, nasedlega na plaži Tossa de Mar (Girona). (Foto: J. Barrull & I. Mate).

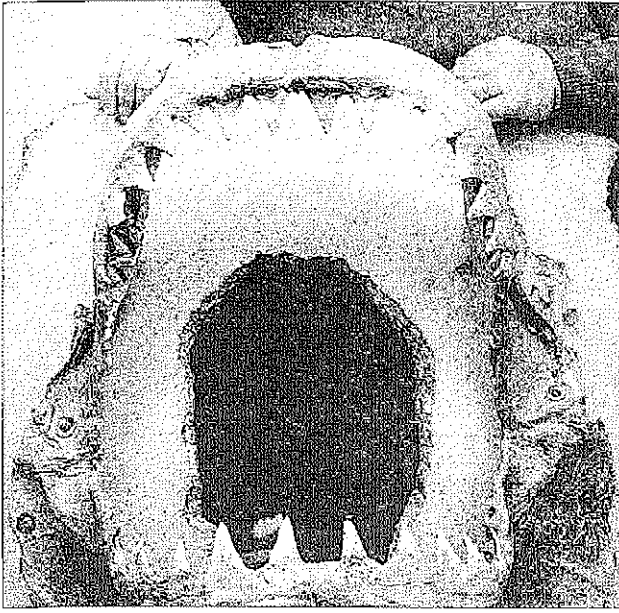


Fig. 3: The jaw of the 800 kg white shark caught in February 1969 off Badia d'Alcúdia (Mallorca). (Photo: S. Terrasa).

Sl. 3: Čeljust 800 kg težkega belega morskega volka, ujetega februarja 1969 v bližini Badije d'Alcúdie (Mallorca). (Foto: S. Terrasa).

seems that Mr. Piza has never been asked about the matter, and nobody in Port d'Andratx could confirm these catches (Martínez, *pers. comm.*).

Barrull (1993) and Barrull & Mate (1996) report on the stranding of a 475 cm long male on November 17th 1992 on the Mar Menuda beach in Tossa de Mar (Girona) (Figs. 5, 6). The individual was swimming slowly for at least six hours just below the surface of coastal shallow waters. After midnight the animal was stranded moribund on the beach, dying an hour later (Alegre, *pers. comm.*). The uncertain fact regarding this record is the total length of the animal, since the members of CRAM (Centre de Recuperació d'Animals Marins) and Marineland Palafolls (Girona) who examined the shark did not measure it with due precision, so that the total length of the specimen could be anything from 475 to 520 cm (Alegre, *pers. comm.*).

In early August 2000, a large white shark was sighted by fishermen, at nightfall, swimming near their boat. The estimated length was nearly 400 cm (Jiménez, 2000). The Guardia Civil patrol that proceeded to the place of sighting could not confirm the sighting (Poyatos, *pers. comm.*).

Fergusson (1996) points out the capture of an individual near Tarragona, without any additional data, making reference to the work by De Buen (1926). This record cannot be considered valid either, for the article by De Buen is a general listing of fishes observed off the

coast of Morocco and the Balearic Islands and, moreover, the species *C. carcharias* is not reported in it.

DISCUSSION

In the Catalanian Sea, the great white shark seems to prefer the waters of the offshore islands (a total of 21 cases are referred to Balearic Islands), just as established in other places of the Mediterranean. This species can be regarded primarily a coastal shark occurring in waters of the continental shelf, at depths ranging between 200 m and less than 20 m.

Although Quignard & Raibaut (1993) point out that the populations of this species have increased in the Gulf of Lion (near the study area) it is likely only an occasional, transient inhabitant of the Catalanian Sea, due

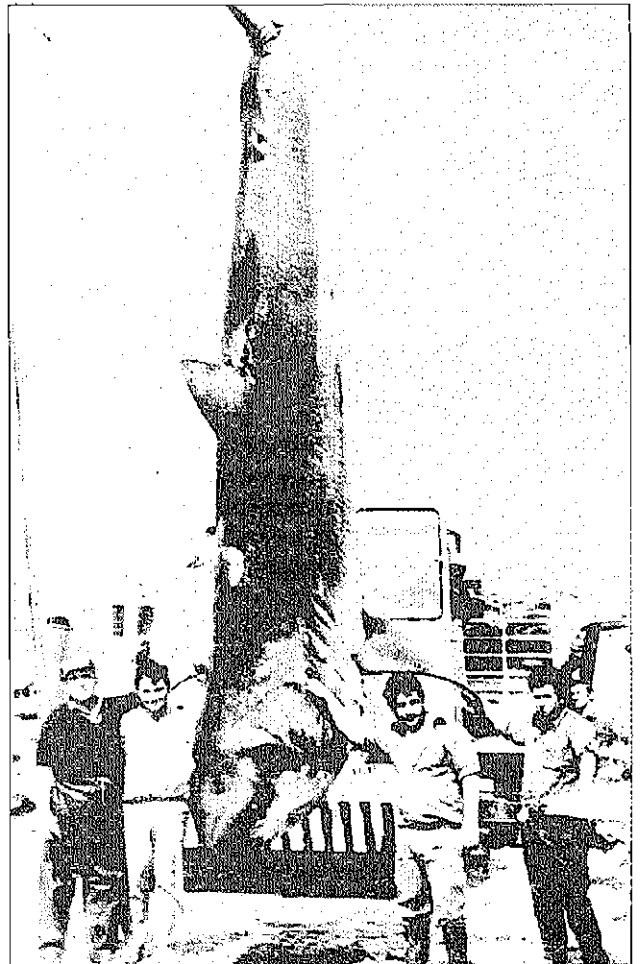


Fig. 4: One of the three individuals caught in February 1969 in the waters off Badia d'Alcúdia (Mallorca). (Photo: courtesy of "Brisas").

Sl. 4: Eden od treh osebkov, ujetih februarja 1969 v obrežnih vodah Badije d'Alcúdie (Mallorca). (Foto: z dovoljenjem revije "Brisas").

The size of sharks was reported in many cases, but the manner by which lengths were obtained is often unknown. Solely it is possible to suggest that the average of total length for the recorded specimens ranges from 426 cm to 600 cm. The dimensions of the registered sharks indicate that they were subadults and adults, since they reached the sizes given in bibliography for these development stadiums (Francis, 1996; Pratt, 1996). Only in five cases the sex of the specimens was reported: three of them were females and two were males. With so few data it is not possible to find evidence about sexual segregation in the area. There is a total absence of records of small free-swimming and juvenile individuals, although small white sharks could be confused with *Isurus* species by fishermen. Neither have there been any cases of pregnant females, and no phenomena related with reproduction. Everything seems to indicate that the Catalanian Sea is not a suitable reproductive area. Concerning this matter, Cigala-Fulgosi (1990), Fergusson (1996) and Mojetta *et al.* (1997) suggested that the Sicily Channel may be considered a nursery area for this species, but Barrull & Mate (2000) question the assertion of a Mediterranean breeding area, concluding that more research is needed in this respect.

Many of the white sharks captured were landed and sold. Regarding Nos. 4, 8 and 16, specimens were sold for 17000, 16000 and 10000 pesetas (US \$ 87.9, 82.7 and 51.7), respectively. In the studied area, the carcasses of the large sharks caught are usually dismembered and sold. This fact makes it difficult to obtain detailed information about these animals.

No injuries or fatal attacks on humans have been reported so far. Obviously, fortuitous encounters with this species in the Catalanian Sea are extremely unlikely.

CONCLUSIONS

Great white shark is very likely merely an occasional and transient inhabitant of the Catalanian Sea. It seems to prefer the waters of the offshore islands. The seasonality of records showed an increase during the months of winter, when they are in search for colder waters. Usually, their occurrence is closely associated with pelagic fisheries. In the Catalanian Sea they feed primarily on tunas, dolphins, rays and carrion. All individuals reported are large specimens, adults or subadults. No injurious or fatal attacks on humans are attributable to this species in the studied area. The authors wish to underline the importance of a continual collecting of new and historical data on the occurrence of the great white shark in the Catalanian Sea, as this may contribute towards a better understanding of this species.

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POJAVLJANJE BELEGA MORSKEGA VOLKA *CARCHARODON CARCHARIAS* LINNAEUS, 1758) V KATALONSKEM MORJU (SZ SREDOZEMLJE): PREGLED ZAPISOV IN BELEŽKE O NJEGOVI EKOLOGIJI

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POVZETEK

Beli morski volk *Carcharodon carcharias* (Linnaeus, 1758) je kozmopolitska vrsta, živeča v obrežnih zmerno toplih vodah. V Sredozemlju je omenjena v splošni ihtiološki literaturi, zabeležena pa je tudi v lokalnih favnističnih kompilacijah. Pričujoči članek obravnava pojavljanje belega morskega volka v Katalonskem morju z revizijo podatkov, zabeleženih v zvezi s to vrsto v tem območju. Zbrane informacije obsegajo 26 osebkov, opaženih ali ujetih med letoma 1878 in 2000. Pérez Arcas (1878) navaja ujetje enega osebkov leta 1878 v bližini Valencije med otoki Columbretes in Castellójem, kar je bil brez dvoma prvi dokumentirani zapis v Katalonskem morju o tej vrsti. Tudi Lozano Rey (1928) omenja belega morskega volka, ujetega leta 1878, in glede na njegov opis gre verjetno za osebek, o katerem je poročal že Arcas. Barrull & Mate (1993-1994, 1996) opisujeta osebek, ki se je decembra 1912 ujel v mrežo tunaro v bližini Vilassarja de Mara (Barcelona). Samper (1979) opozarja na ujetje samice v bližini

Castellója, najbrž v letu 1962. Ramis & Terrasa (1988) navajata 18 osebkov, ujetih s tunaro v bližini Balearskih otokov med letoma 1941 in 1976. Barrull (1993) in Barrull & Mate (1996) poročata o samcu, ki je 17. novembra 1992 nasedel na plaži Mar Menuda v Tossi de Mar (Girona). Nekateri podatki iz literature (Asensi, 1980; Corbera et al., 1996; Fergusson, 1996) so bili na novo pregledani in analizirani, ne pa tudi potrjeni.

Kar zadeva Katalonsko morje, se zdi, da se beli morski volk najraje zadržuje v otoških vodah (21 opažanj je iz območij Balearskih otokov). Sezonskost zapisov kaže na njihovo povečano pojavljanje v zimskih mesecih, ko beli morski volkovi iščejo hladnejše vode. Sicer pa je njihovo pojavljanje največkrat povezano z ribarjenjem na odprtem morju. V Katalonskem morju se prehranjujejo s tunami, delfini, ražami in, če le mogoče, z mrhovino. V vseh primerih so bili opaženi ali ujeti bolj ali manj odrasli osebki. Zabeležen ni bil niti en sam svobodno plavajoči mladostni osebek, kot tudi ne breja samica ali kar koli, kar bi lahko povezali z razmnoževanjem. Tako vse kaže, da Katalonsko morje ni primerno razmnoževalno okolje za to vrsto. Belemu morskemu volku niso bili pripisani nobeni pogubni napadi na človeka v raziskovanem območju. Avtorja opozarjata na velik pomen nadaljnjega zbiranja novih in zgodovinskih podatkov o pojavljanju belega morskega volka v Katalonskem morju, saj bi to lahko pripomoglo k veliko boljšemu poznavanju te vrste.

Ključne besede: beli morski volk, *Carcharodon carcharias*, Katalonsko morje, zapisi, ekologija

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