

OCCURRENCE OF HAMMERHEAD SHARKS (CHONDRICHTHYES: SPHYRNIDAE) IN WATERS OFF SICILY (CENTRAL MEDITERRANEAN): HISTORICAL AND RECENT DATA

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ABSTRACT

*The authors provide a survey on the occurrence of hammerhead sharks off Sicily based on both historical and recent data. The only species identified is the smooth hammerhead *Sphyrna zygaena*. Records of pregnant females and juveniles suggest that the Sicilian Channel could be a potential reproductive area for the smooth hammerhead. Diet included bullet tuna, probably chub mackerel and squid; the first case of a hammerhead feeding on a dolphin has also been recorded. Observed smooth hammerheads often moved in schools. The fishing gears were pelagic longlines, drift nets, hook and line, harpoons and tuna-traps. Hammerheads have greatly declined in the study area in recent years: data from the Palermo area showed a decline of captures of at least 96–98% in the last 30 years.*

Key words: Chondrichthyes, Sphyrnidae, *Sphyrna zygaena*, fishery, Sicily, Italy, Mediterranean Sea

PRESENZA DEI PESCI MARTELLO (CHONDRICHTHYES: SPHYRNIDAE) NELLE ACQUE DELLA SICILIA (MEDITERRANEO CENTRALE): DATI STORICI E RECENTI

SINTESI

*Gli autori svolgono un'indagine sulla presenza dei pesci martello in acque siciliane basandosi su dati storici e recenti. L'unica specie identificata è il pesce martello comune *Sphyrna zygaena*. Le femmine gravide ed i piccoli registrati indicano che il Canale di Sicilia è una potenziale area di riproduzione per il pesce martello comune. La dieta include tombarelli, probabili sgombri e calamari; è stato inoltre registrato il primo caso di un delfino consumato da un pesce martello. I pesci martello comuni osservati nuotavano spesso in banchi. Gli attrezzi utilizzati per la pesca di questi squali sono palangari pelagici, reti derivanti, lenze a mano, arpioni e tonnare. Negli anni recenti questi squali sono drasticamente diminuiti nell'area di studio: i dati relativi alla zona di Palermo indicano una diminuzione delle catture di almeno il 96–98% negli ultimi 30 anni.*

Parole chiave: Condritti, Sphyrnidae, *Sphyrna zygaena*, pesca, Sicilia, Italia, Mare Mediterraneo

INTRODUCTION

Four species of hammerhead sharks were reported from the Mediterranean Sea (Quéro, 1984): the smooth hammerhead *Sphyrna zygaena* (Linnaeus, 1758), the great hammerhead *Sphyrna mokarran* (Rüppell, 1837), the golden hammerhead *Sphyrna tudes* (Valenciennes, 1822), and the scalloped hammerhead *Sphyrna lewini* (Griffith & Smith, 1834), the first of which is the most abundant in the area (Doderlein, 1879–1884; Tuttolomondo, 1899; Tortonese, 1956; Bini, 1967; Vanni, 1992).

The occurrence of *S. zygaena* in the Italian seas has been reported by many authors (Canestrini, 1874; Doderlein, 1879–1884; Tuttolomondo, 1899; Brian, 1906; Tortonese, 1956; Bini, 1967; Vanni, 1992; Mizzan, 1994; Soldo & Jardas, 2002); in the area, the species has been considered infrequent or rare (Canestrini, 1874; Tortonese, 1956; Bini, 1967; Capapé, 1989). Concerning *S. mokarran*, some 300 cm long specimen was caught in a tuna-trap off Camogli, Ligurian Sea, on 21 September 1969 (Boero & Carli, 1977). To date no other great hammerhead has been recorded from the entire Mediterranean area. The presence of *S. tudes* in the Adriatic Sea was described by Canestrini (1874) as very rare. Brusina (1888) reported on a specimen of the golden hammerhead that had been caught in the Kvarner region in the summer of 1888, but admitting that he was not certain about the correct species determination. Kolombatović (1894) determined and reported several young specimens of the small eye hammerhead. Tortonese (1956) examined a 55 cm male preserved in the Museum of Pisa, Italy, caught off Livorno, Italy (Tyr-

rhenian Sea). The same author reported on the presence of this species in the Adriatic Sea. Bello (1999) pointed out that the silhouette drawing and the maximum size reported by Šoljan (1975) did not correspond well to the features of this species. Soldo & Jardas (2002) suggested that the presence of *S. tudes* in the Eastern Adriatic must be considered uncertain, whereas Lipej *et al.* (2004) considered the presence of the species in the entire Adriatic Sea as doubtful. Concerning *S. lewini*, Tortonese (1956) reported on examining a specimen captured in the Mediterranean and preserved in the British Museum, London; according to Séret (1999), scalloped hammerheads are occasionally captured in tuna-traps in the Mediterranean. However, this species has never been recorded in Italian waters.

Although sphyrnids have been commonly reported from waters off Sicily, the presence of these large elasmobranchs in this area has never been previously investigated in detail. So, the purpose of this paper is to present a survey of hammerhead sharks recorded off Sicily, based on literature review and recent observations carried out in the area from 2002 to date. The occurrence of hammerhead sharks off Sicily, especially *S. zygaena*, and some aspects of their ecology and reproductive biology are commented herein.

MATERIAL AND METHODS

The study areas are Sicilian waters (Central Mediterranean Sea), Italy, including the Southern Tyrrhenian Sea, Western Ionian Sea and the Channel of Sicily (Fig. 1). This study commenced in 2002 and, although still in progress, the results presented herein are those obtained

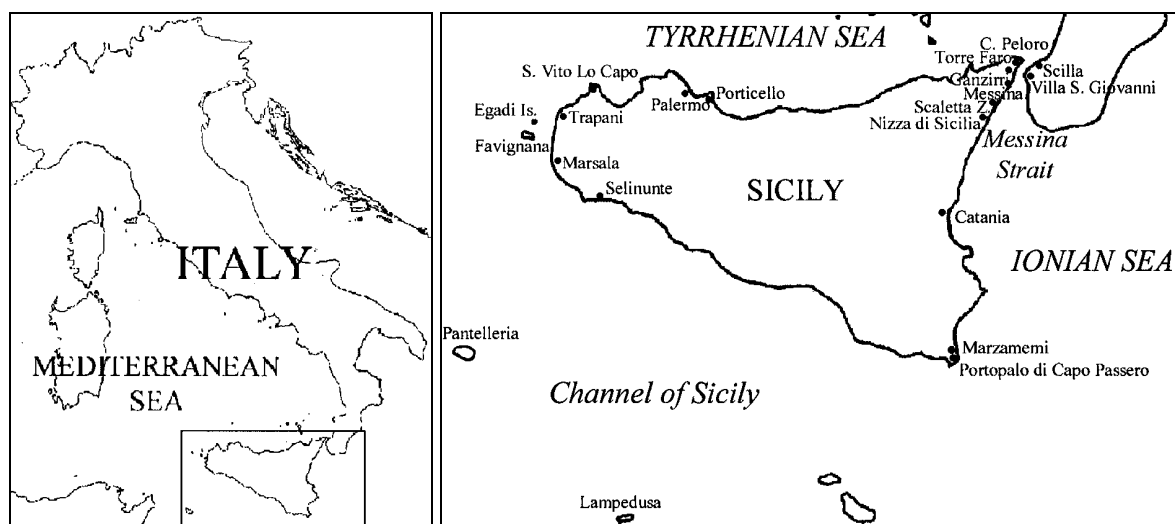


Fig. 1: Area of the Central Mediterranean Sea showing the locations of hammerhead shark captures and sightings presented in this work (Drawing: A. De Maddalena).

Sl. 1: Območje osrednjega dela Sredozemskega morja z lokalitetami, na katerih so bili opažene in ujete v tem članku predstavljene kladvenice (Risba: A. De Maddalena).

up to December 2004. This program is a regional initiative led by the Italian Ichthyological Society (Società Ittiologica Italiana).

The study has been conducted primarily by maintaining contacts with the fishermen and through examination of the fish caught and landed in the area. Through these contacts, many specimens reported by the fishermen were added to those that had been personally examined by one of the authors (A.C.). Additionally, we actively solicited the collaboration and participation of sport fishermen and scuba divers in the study area.

Whenever possible, the following data were collected for each captured specimen: size, weight, sex, stomach contents, fishing gear used for capture, location and date of capture, and catalogue number (cat. no.) in the museum collections. When possible, the size of each specimen was recorded as total length (TOT) measured as a straight line extending from the tip of the snout to the tip of the upper lobe of caudal fin, with the caudal fin in the depressed position; this is also the maximum length (Compagno, 1984). In many cases, however, specimens were not measured but their size was merely estimated by fishermen and divers.

RESULTS

Data of hammerheads from Sicily reported in the previous literature are extremely scarce and all refer to *S. zygaena*. Doderlein (1879–1884) wrote that parturition of *S. zygaena* off Sicily occurs in spring and summer and litter size is between 10–40 embryos, and that in Sicily it is more common in fall and winter. According to Tuttolomondo (1899), in the waters off Catania it is more common in summer. Tortonese (1956) reported captures from Palermo and Messina. According to Bini (1967), it is relatively more abundant in Sicilian waters than in the rest of the Mediterranean. Costa (1991) said this species is rather common in the Messina Strait during June–August. Vanni (1992) reported that a juvenile female caught off Messina on 27 July 1903 is preserved in the Museum of Natural History "La Specola" of the University of Florence (cat. no. 5796). The Museum of Zoology of the University of Palermo keeps four specimens (cat. nos. P-556, P-557, P-558, P-559), whose capture location is unknown but for which it is easy to hypothesise that they may be from Sicilian waters, and a specimen caught in the "Sea of Sicily" before 1890 (cat. no. PL-283).

In the Messina Strait, hammerheads have always been highly valued by professional fishermen. In this area hammerheads were caught with a certain frequency and throughout the year. On average, 10–12 hammerheads were caught each year. From mid-February to end of May, on average 5–7 specimens were taken as by-catch, caught accidentally while fishing for tuna with hook and line. The bait used was the Atlantic mackerel,

Scomber scombrus Linnaeus, 1758, or European sprat, *Sprattus sprattus* (Linnaeus, 1758). From early June to mid-September, numerous hammerheads were sighted from the "feluche", the fishing boats used for capturing swordfish *Xiphias gladius* Linnaeus, 1758, Mediterranean spearfish *Tetrapturus belone* Rafinesque, 1810, and tuna. From the end of September to early December, in the waters Western-North of Capo Peloro, groups of 8 to 12 smooth hammerheads (but maybe only the visible part of larger schools) were sighted quite often even from the seashore. In this season schools of bullet tuna *Auxis rochei rochei* (Risso, 1810) pass from these waters, and hammerheads preyed upon them, as shown by the high number of bullet tuna found in the stomach of some caught hammerheads. Schools of hammerheads were observed in the Messina Strait and closer waters until 1998, but since then their presence that had already decreased in time was no longer observed.

In the summer of 1978, a hammerhead of about 30 kg was caught with a harpoon off Ganzirri by fisherman Antonino Donato, who still has the set of jaws of this specimen preserved (A. Donato, *pers. comm.*). On 2 July 1980, a female weighing about 50 kg was harpooned off Ganzirri; teleost remains, probably chub mackerels *Scomber japonicus* Houttuyn, 1782, were found in its stomach (G. Arena, *pers. comm.*). The set of jaws of this specimen is preserved in one of the author's (A.C.) personal collection. In the summer of 1981, an approx. 100 kg pregnant female hammerhead was caught with a harpoon in the waters of Messina Strait (A. Arena, *pers. comm.*). A 22 kg hammerhead was harpooned and captured off Ganzirri on 4 September 1982. On 16 September 1982, an approx. 70 kg specimen was caught off Torre Faro; the fishing gear used was a drift net called "motulara", used for bullet tuna and Atlantic bonitos, *Sarda sarda* (Bloch, 1793) (F. La Fauci, *pers. comm.*). On 18 July 1983, a male hammerhead of about 130 kg was harpooned from a "feluca" off Scaletta Zanclea; this specimen had one of his claspers cut in half, with a well-healed scar. In the stomach of this specimen, half of a small-sized dolphin, probably a bottlenose dolphin *Tursiops truncatus* (Montagu, 1821), or a striped dolphin *Stenella coeruleoalba* (Meyen, 1833), was found (D. Lis-ciotto, *pers. comm.*). On 24 October 1983, a 38 kg hammerhead was caught between Punta Pezzo and Villa San Giovanni; the fisherman was fishing for bullet tuna with gear called "filosa", a line carrying twenty hooks with coloured wool as bait. The shark was hooked, and when brought to the surface, the fisherman killed it with harpoon (F. Bagnato, *pers. comm.*). On 10 July 1984, a hammerhead was sighted from a "feluca" off Capo San Ranieri, Messina, and the fishermen approached it with the aim of capturing it, but it escaped (L. Mancuso, *pers. comm.*). A juvenile specimen, weighing only about 15 kg, was caught on 19 October 1984 off Scilla in a drift net (G. Scarfi, *pers. comm.*). On

14 November 1985, off Torre Bianca (Torre Faro), two hammerheads were sighted by a fisherman fishing for bullet tuna with a line from a small boat; the fisherman succeeded in capturing one of the two sharks, weighing about 180 kg, with harpoon, while the second specimen rapidly disappeared (G. Rando, *pers. comm.*). On 23 August, an estimated 250 cm hammerhead was encountered off Nizza di Sicilia by fishermen who were fishing for Atlantic saury *Scomberesox saurus saurus* (Walbaum, 1792); the fishing gear used was a special surrounding net called "ravastina", used only in the Messina Strait by fishermen from Sicily and Calabria. The fishermen attempted to capture the shark, but it escaped (Franco Arena, *pers. comm.*). In the Messina Strait, a large hammerhead was hooked in the night of 26 February 1987 with a line for tuna with European eel *Anguilla anguilla* (Linnaeus, 1758) as bait, but it broke the line (P. Arena, *pers. comm.*). A 96 kg specimen was harpooned and caught in the Strait on 4 August 1987 (F. Donato, *pers. comm.*). In September 1989, a 150 kg male hammerhead was harpooned from a small boat, 600 m off the Strait coast (G. Mancuso, *pers. comm.*). A photograph reproduced in this work (Fig. 2) (C. Pavone, *pers. comm.*), is testimony of the capture of a smooth hammerhead caught in a drift net off the Ionian coast of Sicily in the '90s. A 33 kg male was harpooned and caught off Ganzirri on 14 July 1991 (G. Currò, *pers. comm.*). A 31 kg female was captured with a harpoon off Torre Faro on 26 May 1993 (M. La Fauci, *pers. comm.*). A 41 kg male was harpooned and caught off Ganzirri on 5 August 1999 (A. Arena, *pers. comm.*), and a 130 kg specimen was captured in the same year with hook and line used for capturing tuna and examined by one of the authors (A.C.). At noon on 23 July 2002, an estimated 300 cm hammerhead was seen swimming southwards with its dorsal fin protruding above the surface between Capo Peloro and Scilla; some fishermen who were fishing for swordfish approached the shark in order to capture it, but the animal disappeared (G. Bardetta, *pers. comm.*). On 13 March 2004, a hammerhead estimated to be over 200 cm in length was sighted in the Messina Strait by one of the authors (A.C.).

Another area, where hammerhead sharks were common, was off Palermo. In these waters numerous hammerheads were caught with longlines and drift nets. Porticello di Santa Flavia was the most important landing site in this area. Hammerheads were once abundant in these waters, and 300–400 specimens were caught each year during the summer months in drift nets used for capturing swordfish ("spadare") by one hundred boats belonging to fishermen operating from Porticello di Santa Flavia. Another 50 hammerheads were caught each year in pelagic longlines. But after the late '70s, these sharks become conspicuously less abundant and shortly collapsed. Today the hammerhead is uncommon in these waters, and only 1–2 specimens are caught

each year. The fishermen themselves are perfectly aware that the main reason for this disaster has been the drift net called "spadare". The last hammerhead recorded from this area, an estimated 35 kg gutted specimen, was caught in the summer of 2004 in one of these drift nets (C. Orlando, *pers. comm.*).

In the area around Trapani, the most important landing site is Marsala, where some specimens are caught each year between September and October, by fishing vessels that use pelagic longlines for swordfish with mackerel as bait, fishing about 30 miles north-east of Ustica Island. Hammerheads caught by these vessels are usually landed in Marsala or in San Vito Lo Capo. Until the early '90s, hammerheads were regularly caught by Marsala fishermen in waters 30 miles north of Ustica Island. In this area, each fishing boat caught about 100

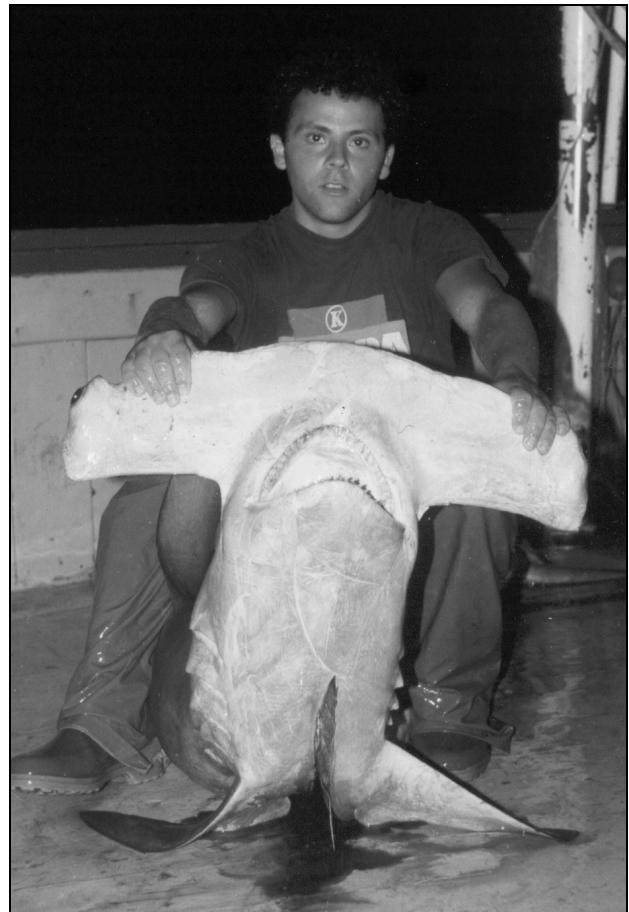


Fig. 2: Smooth hammerhead *Sphyrna zygaena* (Linnaeus, 1758) caught in a drift net off the Ionian coast of Sicily, Italy, in the '90s. (Photo reproduced by permission of C. Pavone)

Sl. 2: Navadna kladvenica *Sphyrna zygaena* (Linné, 1758), ujeta v devetdestih letih prejšnjega stoletja v višočo mrežo v Jonskem morju nedaleč od Sicilije. (Fotografija reproducirana z dovoljenjem C. Pavoneja)

hammerheads each year as by-catch of swordfish fishery. Specimens captured in the '80s included even some large individuals, weighing between 150 and 200 kg. Sometimes, hammerheads were also caught in tuna-traps, between spring and summer. A capture that occurred a long time ago in the tuna-trap of Favignana, Egadi Islands, is still remembered by fishermen. From the period 1998–1999, captures of hammerheads from the Trapani area have decreased. An approx. 200 cm hammerhead, probably a male, was caught off Trapani in the late spring 2003, in a net used for capturing bullet tuna (S. Lombardo, *pers. comm.*). Nowadays, hammerheads are uncommon in the Trapani area.

In Selinunte, there are small-medium sized fishing boats that fish for swordfish using longlines, about 10 miles off the western-southern Sicilian coast. Captures of hammerheads were once quite common, but for at least 15 years, these sharks have been rarely encountered in these waters. The last record seems to be that of an estimated 200 cm long specimen, probably a male, caught around the summer of 1998 (V. Cottone, *pers. comm.*).

In the area of Portopalo di Capo Passero and Marzamemi, 6–7 specimens were once captured each year in drift nets and occasionally in tuna-traps, but our search for records from this area seems to indicate that no sightings or captures have occurred for at least ten years.

In the area of Catania, hammerheads were once caught with regularity, both with nets and with longlines for swordfishes and tuna, but since the period 1998–1999, only 1–2 captures occur each year.

Another area frequented by hammerheads is the one around Lampedusa Island in the Sicilian Channel. Until the early '90s, hammerheads were caught regularly by fishermen of Lampedusa, especially from March to September (G. Bolino, *pers. comm.*). These sharks were usually caught along the bank of Levante, 12 miles east of Lampedusa. According to many fishermen, it was quite common to sight from 5 to 10 small sized hammerheads swimming with their dorsal fin protruding above the surface. A single longline usually captured about 6–8 hammerheads. Each fishing boat landed 700–800 kg of hammerheads each year. Almost all specimens were small sized: most had a gutted weight between 15 and 30 kg, but specimens between 7 and 8 kg were also frequently captured. Pregnant females bearing yellow ova of about a centimetre in diameter were also recorded. The fishing gear was usually a pelagic longline used to catch sharks, with the terminal part of the line made of steel. Links between continental Italy and Lampedusa were scarce, and the population of this island used to dry a large amount of fish, included hammerheads and other sharks. Other fishing gears that occasionally captured hammerheads in Lampedusa waters were trammels and hook and line, but usually the specimens caught with the latter system were very small

and fishermen set them free still alive or the sharks even broke the monofilament by themselves. Sometimes, one or two hammerheads would approach fishing boats when these were catching European squids *Loligo vulgaris* (Lamarck 1798) late in the afternoon. Off Lampedusa, squid fishing is carried out as follows. About 80–100 boats cast the anchor in an area of about 400 m², and then attract squids by lights, and these cephalopods congregate in the area in large numbers (G. Bolino, *pers. comm.*). Nowadays hammerheads are rarely sighted along the bank of Levante, and even in this case fishermen are aware that the main reason for this almost total disappearance has been the excessive fishing pressure.

In waters around Lampedusa, encounters with divers have also been recorded. An encounter occurred during a late morning dive, in August 1972, about 10 miles off-shore, about 10 m deep, when the sea was calm. Alessandro Olschki was spearfishing with Paolo Notarbartolo and other divers. Some hammerhead sharks estimated to be about 200 cm long swam at the surface. The sharks simply ignored the divers and left (A. Olschki, *pers. comm.*). In the same area, another encounter took place in the early '80s off Lampedusa coast. Paolo Notarbartolo was filming underwater, when he noticed some hammerhead sharks. Even in this case, the sharks ignored the diver, remaining far from him and then swam away (A. Olschki, *pers. comm.*). Stefano Carletti had some underwater encounters with hammerhead sharks off Lampedusa. One of these encounters occurred in the summer of 1965 off Capo Grecale, at a depth of about 60 m, where a pinnacle rises from the sandy sea bottom. Carletti was spearfishing and was about 15–18 m above the sea floor when he caught sight of an immense school of hammerhead sharks swimming at a depth of about 30 m. The water was limpid, and Carletti had a perfect view of the hammerhead sharks, silhouetted against the surface light. The school consisted of several dozens of individuals measuring up to at least 2 m, swimming in northern direction, completely ignoring both the diver and its speared grouper. During other dives, Stefano Carletti has encountered other hammerheads off Lampedusa, but in these cases the animals occurred singly (S. Carletti, *pers. comm.*).

DISCUSSION

Even if in almost all cases the exact species of hammerhead was not reported, we have to suppose that at least the large majority of the cases reported have to be referred to *S. zygaena*, the only species recorded to date in Sicilian waters.

The specimens, for whom the dimensions were given, ranged from 200 to 300 cm in length and from 15 to 180 kg in weight. The lengths of the specimens fell within the ranges previously described for *S. zygaena* (at least 370 or 400 cm according to Compagno, 1984).

In the study area, hammerhead sharks feed principally on bony fish. Bullet tuna, probably chub mackerels and half of one small-sized dolphin, likely to be bottlenose or striped dolphin, were found in hammerhead stomachs. This latter case is especially interesting since to the best of our knowledge, even if data of hammerhead diet are numerous in literature (Lineaweaver & Backus, 1970; Ellis, 1983; Compagno, 1984; Stevens, 1984; Castro, 1989; Stevens & Lyle, 1989; Smale, 1991; Last & Stevens, 1994; Cliff, 1995; Barrull *et al.*, 1999); no other cases of *Sphyrna* feeding on dolphins had been reported previously. It is impossible to know whether the young dolphin was alive or dead when it was eaten by the hammerhead. Hammerheads have also been observed feeding on European squid.

A larger sample of adults is required before drawing any conclusions concerning the sex ratio. Gonads were not examined, but at least some specimens had to be mature, on the basis of their size. Pregnant females and numerous juveniles, most probably including newborn specimens, were recorded, indicating that the Sicilian Channel is a potential reproductive area for *S. zygaena*.

These sharks rarely approach divers closely. We are unaware of any aggressive behaviour or incidents involving humans in these waters.

The fact that smooth hammerhead sharks often occur in schools, sometimes of huge size, has been already reported from North Carolina, U.S.A., and South Africa (Bigelow & Schroeder, 1948; Lineaweaver & Backus, 1970; Bass *et al.*, 1975); the reason for these gatherings should be migratory (Bigelow & Schroeder, 1948; Compagno, 1984). The cases recorded in the study area confirm that the behaviour of school forming is common even in the Mediterranean Sea. The regular occurrence of hammerhead schools along the bank of Levante, off Lampedusa, may indicate a behaviour similar to the one described by Klimley *et al.* (1988) for the scalloped hammerheads resident in the area of the sea mount El Bajo Espiritu Santo, Sea of Cortez, where these sharks regularly gather in schools during the day.

Today hammerhead sharks are rarely caught by professional fishermen operating in the study area. Most hammerheads are taken as by-catch, caught accidentally while fishing for other commercial species. Nowadays a specific fishery for hammerhead sharks does not exist in Sicily. There are no regulations or control over the hammerhead shark fishery in Italy. The types of fishing gear used are pelagic longlines, drift nets, hook and line, harpoons and tuna-traps. The baits used are Atlantic mackerels, European sprats, European eels and European flying squid. The pelagic longlines, in which hammerhead sharks are more often caught, are those used for capturing swordfish. The main line is 3.0–5.0 mm thick. At intervals of at least 25 m, 10–25 m long and 1.2–mm thick monofilament lines are attached, each carrying a hook. The total length of these pelagic longlines is usu-

ally 2–40 km, with a total of 200–1500 hooks.

These sharks were retained and sold for human consumption. In Italy, hammerhead shark meat is marketed fresh or frozen for human consumption. It is particularly appreciated in Sicily, where it is considered of high quality and usually destined for domestic consumption and sometimes shipped to other parts of Sicily but rarely to North Italy, where it has low market appeal. In Sicily, hammerhead meat is marketed under the name of "magnusa" (one of the regional names of these sharks), while in other Italian regions it is often marketed under incorrect names and sold as "palombo" (smooth-hound). Hammerheads are often sold at a quite high price in Sicily, up to 7–10 Euro/kg. In the '70s, when hammerheads were caught in large numbers, their price was high, 2000–4000 lire/kg (about 30% of swordfish price at that time).

The absence of previous data on the hammerhead shark fishery in the area does not allow an assessment of the status of their stocks in these waters. According to the local fishermen and to the available data, however, there is no doubt that these sharks have greatly declined in the waters off Sicily. The collected data show that the area off Palermo was the one where hammerhead sharks were captured in higher numbers. A rough estimate, that we have been able to make from the gathered data in respect of this area, indicates a decrease of hammerhead captures of at least 96–98% in the last 30 years.

The abundance of potential food in Sicilian waters was the main reason for the relative abundance of large sharks in the area, as also demonstrated by the data collected on two other species, the great white shark *Carcharodon carcharias* (Linnaeus, 1758) (De Maddalena, 2002) and the bluntnose sixgill shark *Hexanchus griseus* (Bonnaterre, 1788) (*unpubl. data*). Due to its wide distribution, wide prey spectrum, and the fact that it has almost no enemies, the smooth hammerhead may have an important influence on the Mediterranean marine food chain. The dramatic decrease of this species observed in recent decades in the study area have unknown effects on the local fauna.

The reproductive biology of sharks (long sexual maturation times, low fecundity, long gestation periods and relatively small litter size) makes them extremely vulnerable to fishing pressures (Vannuccini, 1999). The collapse of hammerhead presence in Sicilian waters is a clear example of how vulnerable hammerhead sharks can be when they assemble in large schools, and how quickly they can become extinct due to overexploitation.

How badly the pelagic longlines used for tuna and swordfish fishing can endanger the Mediterranean sharks has already been pointed out by numerous authors (Di Natale, 1997; Buencuerpo *et al.*, 1998; Vannuccini, 1999; De Maddalena & Reckel, 2003; Soldo, 2003; De Maddalena & Kideys, 2004; Lipej *et al.*, 2004). Another

threat to sharks is the drift net which, as shown by this study, has greatly damaged hammerhead populations in the past. We found out that this fishing gear is still utilized by some Sicilian fishermen, despite the fact that it was banned in Italy in 1998, following the resolutions of the General Assembly of the ONU (UNGA) and the International Commission for the Conservation of Atlantic Tunas (ICCAT), which expressly prohibited the countries involved to continue using this kind of drift net. The number of fishermen still using the banned "spadare" is unknown.

Immediate effective management of fisheries is needed in order to avoid the hammerheads' total disappearance in the very near future. It is particularly necessary to improve management of fisheries in which sharks constitute a significant by-catch.

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KLADVENICE (CHONDRICHTHYES: SPHYRNIDAE) V SICILIJANSKIH VODAH (OSREDNJE SREDOZEMSKO MORJE): ZGODOVINSKI IN NOVEJŠI PODATKI O POJAVLJANJU TEH MORSKIH PSOVI

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POVZETEK

Avtorji članka predstavljajo pregled pojavljanja kladvenic v sicilijanskih vodah na osnovi zgodovinskih in novejših podatkov o teh morskih psih. Identificirana je bila le vrsta navadna kladvenica *Sphyrna zygaena*. Po podatkih o brejih samicah in mladostnih osebkih bi Sicilski preliv lahko bil razmnoževalni okoliš za navadno kladvenico. Ti morski psi se hranijo s trupci, verjetno pa tudi z lokardami in lignji. Prvič pa je bil zabeležen tudi primer, da se je kladvenica hranila z delfinom. Opazovane navadne kladvenice so se pogosto pojavljale v jatah. Ulovljene so bile s parangali, visečimi mrežami, na trnek, s harpunami in pastmi za tune. V preučevanem območju se je število kladvenic v zadnjih letih močno zmanjšalo; podatki iz palermskih voda celo kažejo, da se je ulov teh morskih psov v zadnjih tridesetih letih skrčil kar za neverjetnih 96–98%.

Ključne besede: Chondrichthyes, Sphyrnidae, *Sphyrna zygaena*, ribištvo, Sicilija, Italija, Sredozemsko morje

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