

review
received: 2003-07-18

UDK 597.3(262)

STATUS OF SHARKS IN THE MEDITERRANEAN

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ABSTRACT

In the Mediterranean, 47 shark species have been recorded so far. Some of these species are commercially important and have been exploited over the ages as target species or bycatch, while others are rare or very rare, and therefore have not been recorded on a regular basis. Due to the negative impact of irresponsible fisheries on sharks, a decline of some shark populations has been observed. The aim of this paper is to present the status of sharks in the Mediterranean and to propose some measures for their conservation and better management of their exploitation.

Key words: sharks, status, fisheries, conservation, Mediterranean

STATO DEGLI SQUALI NEL MEDITERRANEO

SINTESI

Quarantasette specie di squali sono state identificate nel mare Mediterraneo fino ad oggi. Alcune di esse hanno un alto valore commerciale e nel corso della storia sono state sfruttate come specie bersaglio o cacciate, mentre altre sono rare o molto rare e vengono avvistate solo occasionalmente. L'autore segnala il declino di alcune popolazioni di squali come conseguenza dell'impatto negativo di una pesca irresponsabile degli squali. Scopo dell'articolo è quello di fornire una corta descrizione dello stato degli squali nel mare Mediterraneo e di proporre alcune misure di conservazione e di migliore gestione del loro utilizzo.

Parole chiave: squali, stato, pesca, conservazione, mare Mediterraneo

INTRODUCTION

Ecologists classify sharks as strong "K selected species" due to their life history characteristics, such as slow growth rates, relatively late sexual maturation, long reproductive cycles, low fecundity potential and long life spans.

Many shark species, including commercially important species, are extremely slow growing. For instance, piked dogfish, *Squalus acanthias*, which is one of the most important commercial species in the Mediterranean, has been estimated to reach maturity at about 25 years (Jones & Geen, 1977). Hence, the sandbar shark, *Carcharhinus plumbeus*, also one of the commercially most important Mediterranean species, has been estimated to reach maturity from 15-16 years (Sminkey & Musick, 1995) to about 30 years (Casey & Natanson, 1992).

The reproductive cycle, which means how often the sharks reproduce, usually lasts for one or two years in most shark species, although longer cycles of three and four years have been also proposed for some species which, however, still need to be investigated more thoroughly. The gestation period, which is the time of embryonic development from fertilization to birth, also lasts for usually one or two years. For some species, such as the basking shark *Cetorhinus maximus*, it has been proposed that the gestation period lasts for 3.5 years (Compagno, 1984).

Sharks have low fecundity potential that is characterized by small number of young per litter, which usually ranges from two to twelve. Most of the carcharhinid sharks usually produce less than a dozen young per litter, with an exception of the blue shark, *Prionace glauca*, which produces over 30 pups, have often been reported (Castro *et al.*, 1999).

Some sharks have very long life span, e.g. tope shark, *Galeorhinus galeus*, which can live as long as 60-70 years (Vannuccini, 1999). Although the reproductive life span of many shark species still needs to be investigated comprehensively due to the long time that has to elapse before maturation and long reproductive cycles, it appears that a given female may only produce a few offspring in its lifetime (Sminkey & Musick, 1995), which makes the shark populations particularly vulnerable to overfishing. As there is no evidence of any compensatory mechanisms by female sharks that will increase brood size or decrease the length of ovarian and gestation cycles in response to overfishing, it is presumed that it is highly unlikely that those mechanisms can be evolved rapidly enough to compensate for the increase in mortality (Castro *et al.*, 1999).

The described life history characteristics, combined by integrated effects of mainly unmanaged and irresponsible fishing, pollution and habitat destruction, are causing changes in abundance, size structure and bio-

logical features of shark populations, which in the extreme could lead to extinction of some species in the Mediterranean. Hence, there are also indirect impacts on ecosystem due to changes in species prey-predator interactions that may lead to species replacement.

Rapid growth of shark fisheries in the early 1980s in the Mediterranean, as well as in the entire world, caused previously released or discarded sharks to be retained as bycatch and brought on board to be finned. Many shark species, which previously had no commercial value, became target species or important bycatch. From the facts that Mediterranean countries Italy and France are the major consuming countries of the shark meat, while Spain is the world's largest exporter of this meat (Vannuccini, 1999), it is obvious why public concern regarding the shark status in the Mediterranean is rising.

MATERIAL AND METHODS

Data presented in this paper were collected from scientific and popular literature, FAO fisheries statistics and the "Report of the meeting of experts for the elaboration of an action plan for the conservation of Mediterranean species of cartilaginous fish", which is a summary of the meeting held in Rome on 10-12 October 2002. All common and scientific names of sharks used in this paper follow Anonymus (2002).

RESULTS AND DISCUSSION

In the Mediterranean, 47 shark species (14 families) (Anonymus, 2002) have been recorded so far (Tab. 1). Some are common species and therefore of commercial importance as target species or bycatch, while some are rare or very rare and, therefore, not recorded on a regular basis. Currently, sharks are exploited by both commercial and recreational fisheries throughout the entire Mediterranean. Consequently, sharks are harvested by different fishing gear which ranges from large commercial gear (bottom and pelagic trawls, purse seines, floating longlines, driftnets...), small scale (artisanal) gear (bottom longlines, gillnets, trammel nets...) to recreational gear (trolling lines, hand lines, hooks...).

In IUCN's Red List of Mediterranean Sharks, one species has been characterized as endangered, 5 species are considered vulnerable, 16 species are in the category Lower risk (near threatened), while two species appear in the category Data deficient. Nevertheless, such list is based on currently existing and official assessments, while new preliminary reports show that overall situation is much worse.

It has to be pointed out that all assessments of shark species are mostly based on limited data due to the lack of biological and fisheries facts. Most fishery and ichthyological studies were concentrated on teleosts rather

than sharks, as those were of low economical value and were difficult to sample. Therefore shark biology has been neglected in the past. Although the situation has changed in the last two decades owing to an increase in the shark's economical value and rising of the general concern regarding their status, such studies are still rather slow moving and deficient. Regarding shark fishery, most of the countries do not report their data concerning shark landings, especially by species. There are many different reasons for such behaviour (which would not be elaborated in this paper), which leads to the conclusion that there will be no significant changes in the future. Consequently, there are no suitable models to assess shark populations. Moreover, most of the models are based on bony fishes, whose life history characteristics are quite different to those of the sharks, which mean that even if biological and fishery data would exist, results from such models would be questionable.

Knowing such limitations and with present data it is a great problem to determine the actual sharks' status. Nevertheless, based on known life history characteristics and available data, the following has been established as far as the status of Mediterranean sharks is concerned:

Family Hexanchidae

Both species from this family, the sharpnose seven-gill shark and bluntnose sixgill shark, are deep-water species and their landings in the Mediterranean have not been reported. However, although they are not target species, they have been caught as bycatch by trawls, bottom longlines and gillnets. It appears that their habitat, due to its depth where low number of fishing gear operates, is relatively protected, but data for the evaluation of bycatch impact are still insufficient. Although they belong to non-exploited species, their life history characteristics along with the fact that juveniles comes into very shallow waters (Castro *et al.*, 1999), where they are exposed to much larger number of fishing gear and therefore higher fishing pressure, makes them particularly vulnerable to overfishing. *H. griseus* is listed in IUCN/SSG Red List.

Family Centrophoridae

This family has been presented in the Mediterranean by 4 species: *Centrophorus granulosus*, *C. squamosus*, *C. uyato* and *Deania calcea*. As these species are of no interest to fisheries, therefore they belong to non-exploited species. Nevertheless, those deep-sea species are being exploited, as bycatch, by unmanaged fisheries, so studies are required to determine their poorly known life history characteristics and other parameters necessary for better management. According to current knowledge it can be said that their life history charac-

teristic makes them highly vulnerable to overexploitation and population depletion. *C. granulosus* is listed in IUCN/SSG Red List.

Family Dalatiidae

Regarding the number of its' representatives, *Centroscymnus coelolepis*, *C. crepidater*, *Dalatis licha*, *Etmopterus spinax*, *Oxynotus centrina*, *Scymnodon ringens* and *Somniosus rostratus*, the family Dalatiidae occupies a remarkable place among the Mediterranean sharks. None of these species belongs to target species, but they are often caught as bycatch of different fishing gears such as trawls, longlines, gillnets and trammel nets and even handlines. Similar to previously described family, life history characteristics are still poorly known, but based on the reported decline of *D. licha* in other areas and problems in determining of proper MSY (da Silva, 1983, 1987), this family deserves much greater attention and better management. *D. licha* is listed in IUCN/SSG Red List.

Family Echinorhinidae

Echinorhinus brucus, a deep-sea shark species, is the only representative of this family in the Mediterranean. This species is currently very rare in the Mediterranean, even locally extinct. As very little is known about its reproductive processes, it is suggested that its rarity and local disappearance indicate that this species may be very long-lived and slow-reproducing, and that bycatches of this species may be sufficient to prevent replacement of locally exploited populations (Castro *et al.*, 1999).

Family Squalidae

Squalus acanthias and *S. blainvillei* are the representatives of Squalidae in the Mediterranean, of which *S. acanthias* is probably the most abundant shark and the only species whose commercial importance can be compared to commercially important bony fishes (Compagno, 1984). Moreover, this species is one of the rare shark species whose landings have been officially reported by several Mediterranean countries. Hence, landings of *S. acanthias* in the Mediterranean show a dramatic decrease (Fig. 1) from 1490 tonnes reported in 1990 to only 95 tonnes in 1997, while more recent data from 2000 have shown an increase to 206 tonnes (FAO, 2002). Mostly, it is caught by bottom trawls, but even by gillnets and longlines. This shark is one of the most studied species, as it is one of the relatively few sharks that can be kept in captivity for a few years (Castro *et al.*, 1999). Accordingly, the vulnerability to overfishing of this species has been known for a long time, so in many countries all over the world its stocks are already

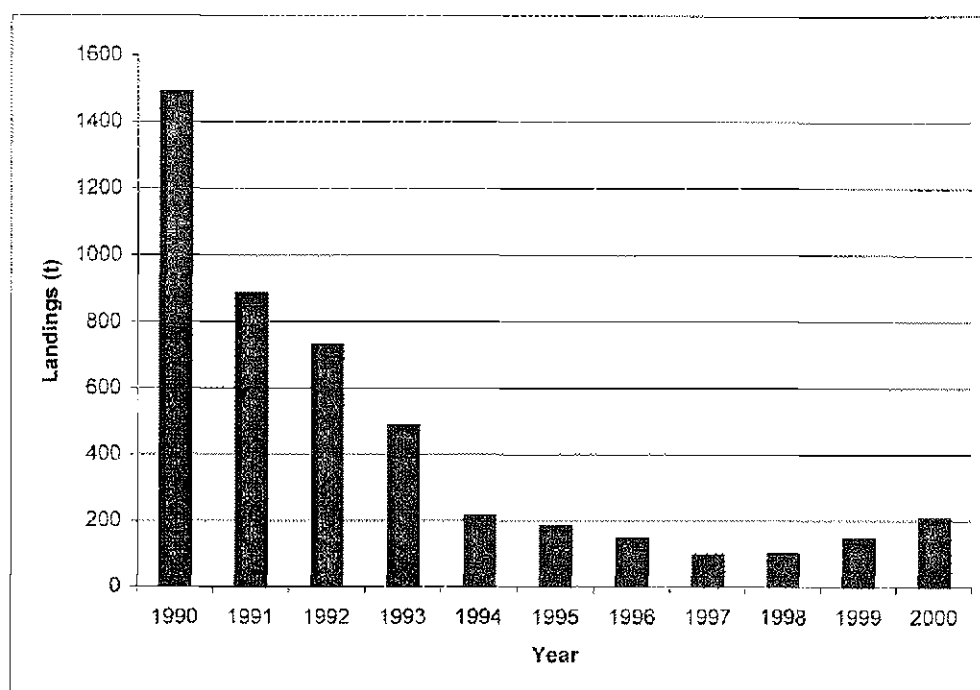


Fig. 1: *Squalus acanthias* landings for the Mediterranean area (FAO area 37) (FAO, 2002).

Sl. 1: Ulov morskega psa trneža *Squalus acanthias* v Sredozemskem morju v tonah (FAO predel 37) (FAO, 2002).

considered as overexploited by scientists (Vannuccini, 1999). Although some Mediterranean countries have reported its landings, the biggest fishing countries, such as Italy, have not reported any landings at all, while France and Spain have reported only on minor quantities, and even this only occasionally. Also, it still needs to be determined whether the reported landings concern *S. acanthias* only, or are mixed with catches of *S. blainvillei*. Some countries have reported on landings of this family as of a group (Dogfish sharks). These landings also showed decline as it can be seen in a case of Tunisia (from 1183 tonnes in 1992 to 19 tonnes in 1996) or Croatia (from 535 tonnes in 1993 to 50 tonnes in 2000). Other landings show smaller fluctuations, or have been reported sporadically. Therefore, knowing life history characteristics such deficient landing data suggest that appropriate management programs should be established for each country in order to prevent decline of these species in the entire Mediterranean. *S. acanthias* is listed in IUCN/SSG Red List.

Family Carcharhinidae

This is the largest family of sharks in the Mediterranean, represented by 10 small to large, bottom to pelagic species. It is also commercially most important family, as many of these species are used for food, fins, leather, etc. Some species are wide-ranging or cosmopolitan (Castro *et al.*, 1999). Mostly they are caught by

longlines, trawls and gillnets, but even with handlines, particularly in recreational fisheries.

Most of these species are slow growing species with late maturity. Thus, the smallest mature specimens of *Carcharhinus altimus* were a 213 cm TL male and 221 cm TL female (Springer, 1960). *C. brachyurus* sexual maturity age was calculated at 13-19 years for males and 19-20 years for females (Walter & Ebert, 1991). *C. brevipinna* (listed in IUCN/SSG Red List) males mature at 130 cm TL or 4-5 years, while females mature at 150-155 cm TL or 7-8 years (Branstetter, 1987). According to Bonfil *et al.* (1993), *C. falciformis* (listed in IUCN/SSG Red List) males mature at 225 cm TL (about 10 years) and females at 232-245 cm TL (more than 12 years old). Males of *C. leucas* (listed in IUCN/SSG Red List) mature at 210-220 cm TL or 14-15 years of age, while females mature at least at 225 cm TL, which corresponds to more than 18 years of age (Branstetter & Stiles, 1987). Wintner & Cliff (1996) determined the maturity age for *C. limbatus* (listed in IUCN/SSG Red List) females at 7 years, and 6 years for males. Seki *et al.* (1998) gave the size at maturity of *C. longimanus* (listed in IUCN/SSG Red List) for both males and females as 175-189 cm TL, corresponding to an age of 4-5 years. *C. obscurus* (listed in IUCN/SSG Red List) mature very late, males at about 279 cm TL, corresponding to 19 years of age, and females at about 284 cm TL, corresponding to 21 years of age (Nantanson *et al.*, 1995). *C. plumbeus* (listed in IUCN/SSG Red List) is also a very slow growing species, its maturity

age ranging for both sexes from 15-16 years (Sminkey & Musick, 1995) to 29-30 years (Casey & Natanson, 1992). Similar situation has been observed in the case of *Prionace glauca* (listed in IUCN/SSG Red List), whose maturity has indeed not been accurately determined as yet, but based on different studies it ranges from 4 to 7 years (Cailliet *et al.*, 1983; Nakano, 1994).

Minor and sporadic landings of these species in the Mediterranean have been reported only for blue shark from France and Portugal. Indications (severe declines) from other areas have shown that these species are highly vulnerable to overfishing. Among other "usual" difficulties, the ever-increasing problem as far as this shark family is concerned is the practice of finning (the removal and retention of shark fins, while the rest of the carcass has been discarded at sea), as this fishery activity particularly threatens this family. Finning obstruct the collection of the species-specific scientific data that are essential for monitoring catches and landings and implementing sustainable shark fisheries management. Moreover, there are often no accurate data on the quantities of shark fins taken, landed or exported due to the lack of classification in fisheries statistics and/or enforcement of reporting requests, so the limited reported shark landing data represent primarily the whole sharks. Owing to the fact that many of these sharks have become rare or even locally extinct and that many among them are cosmopolitan and tend to migrate throughout the entire Mediterranean, it is clear that these sharks are particularly vulnerable to overfishing. Therefore, it is essential to establish a proper management plan, based on accurate statistics, followed by wide biological and ecological studies, not only for each country, but also for the entire Mediterranean area.

Family Sphyrnidae

In the Mediterranean, hammerhead sharks are represented by three large species: *Sphyrna lewini*, *S. mokarran* and *S. zygaena*. They are caught mainly by longlines and gillnets, especially as bycatch in tuna and swordfish fishery. This family is also subject to finning practice in unidentified quantities. Landings of these sharks have not been reported in the Mediterranean either by species or by group. As large sharks, with life history characteristics similar to *Carcharhinidae*, these sharks are known for their vulnerability to overfishing all over the world. In *Draft action plan for the conservation of cartilaginous fishes (Chondrichthyans) in the Mediterranean Sea* all species were noted as data deficient with inadequate information and thus with urgent need for their assessment of extinction risk. Therefore, accurate statistics of landings, whether of whole or finned sharks, have to be established in order to provide sufficient data for a proper management plan, especially as it is known that all three species are listed in IUCN/SSG Red List.

Family Scyliorhinidae

This family of relatively small catsharks is represented by three species in the Mediterranean: *Galeus melastomus*, *Scyliorhinus canicula* and *S. stellaris*. They are not target species, but are as bottom sharks often caught by trawls as bycatch. There is no fishery statistic by species, but as a group *Scyliorhinus* spp. landings have been reported from Tunisia and, more recently, from Spain. Landings in the Mediterranean have highly increased from 36 tonnes in 1996 to 457 tonnes in 2000 on the account of some recent reports from Spain. Obviously, these species are caught by trawls from many countries, but with such deficient landing data it is hard to give a proper assessment. Nevertheless, these sharks should be included in fishery statistics, which will provide possibilities for future management.

Family Triakidae

In the Mediterranean, this family is represented by four species: *Galeorhinus galeus*, *Mustelus asterias*, *M. mustelus* and *M. punctulatus*. All four species have been intensively caught as bycatch in trawl, longline and gill-net fishery. Although these sharks are generally not classified as target species, they are treated as (locally) economically important in some areas. As a group, *Mustelus* spp. landings have been reported by many Mediterranean countries. Statistics showed severe decline from overall 13,437 tonnes in 1994 to 2980 tonnes in 1997. Landings of smooth-hound sharks in the Mediterranean amounted to as much as 67.7% of all world landings. Therefore, this family is one of the most commercially important shark families in the Mediterranean. However, some important fishing countries, such as Spain and France, seem not to have landed, according to the statistics, any smooth-hound shark at all in the area or have recorded only small quantities (Vannuccini, 1999). Knowing that the intensive fishery of *G. galeus* off the western coast of North America in the late 1930s and 1940s collapsed by 1950 due to overexploitation, and stocks have not recovered ever since (Castro *et al.*, 1999), it is feared that a similar situation could occur in the Mediterranean, particularly as with the exception of *M. punctulatus* all species have been listed in IUCN/SSG Red List (of which *G. galeus* is listed as globally vulnerable). Thus, a proper management plan is essential for the future preservation of these species.

Family Odontaspidae

Sand tiger sharks are in the Mediterranean represented by two species: *Eugomphodus taurus* and *Odontaspis ferox*. Landings of these species have not been reported by statistic data of any Mediterranean country. They are caught as bycatch by trawls, longlines

and gillnets. *E. taurus* is known to be a very vulnerable species, as it congregates in large numbers, probably during mating, at particular spots at specific times of year. These spots are known to commercial fishermen who can catch very large numbers of sand tigers with minimal effort, but with serious effect on the population (Castro et al., 1999). Severe population declines of this species throughout the world started in the 1960s and 1970s, and *E. taurus* was one of the first sharks to receive fully protected status anywhere in the world (Pollard, 1996). In many areas of the Mediterranean it is currently found rarely or very rarely. Its life history characteristics, especially very limited fecundity (two young per brood) probably contributes to its vulnerability (Castro et al., 1999). IUCN/SSG Red list has listed it as critically endangered. Hence, in *Draft action plan for the conservation of cartilaginous fishes (Chondrichthyan) in the Mediterranean Sea*, both species have been prioritised and recommended for urgent provision of legal protection status for the endangered species identified at the regional and national levels. Therefore, it is evident that both species need a proper management plan for their protection as soon as possible.

Family Alopiidae

Two large oceanic species, *Alopias superciliosus* and *A. vulpinus*, represent tresher sharks in the Mediterranean. Slow growth and limited reproductive potential characterize both species. Official landings in the Mediterranean have been reported only recently for *A. vulpinus* by France. Tresher sharks are caught mainly by fishing gear used in tuna, swordfish and small pelagic fishery (Fig. 2). Both species have suffered severe declines in catches throughout the world, and continued to decline in spite of numerous regulations restricting fishing (Hanan et al., 1993). Consequently, in order to avoid such situation in the Mediterranean area, proper management programs for sustainable fisheries should be developed for these species. *A. vulpinus* is also listed in IUCN/SSG Red List.

Family Cetorhinidae

The only member of this family, *Cetorhinus maximus*, is also the largest fish in the Mediterranean (Fig. 3). Landings of basking shark in the Mediterranean have been reported only recently and by Spain only (FAO, 2002). As it is known that lately only the landings in the Adriatic, by accidental captures, can be several tonnes per year (Zuffa et al., 2001; Soldo & Jardas, 2002a, b), it is obvious that the official statistics for the Mediterranean area (2-6 tonnes per year) is far from accurate. Basking sharks are not target species in the Mediterranean but are accidentally caught by numerous fishing

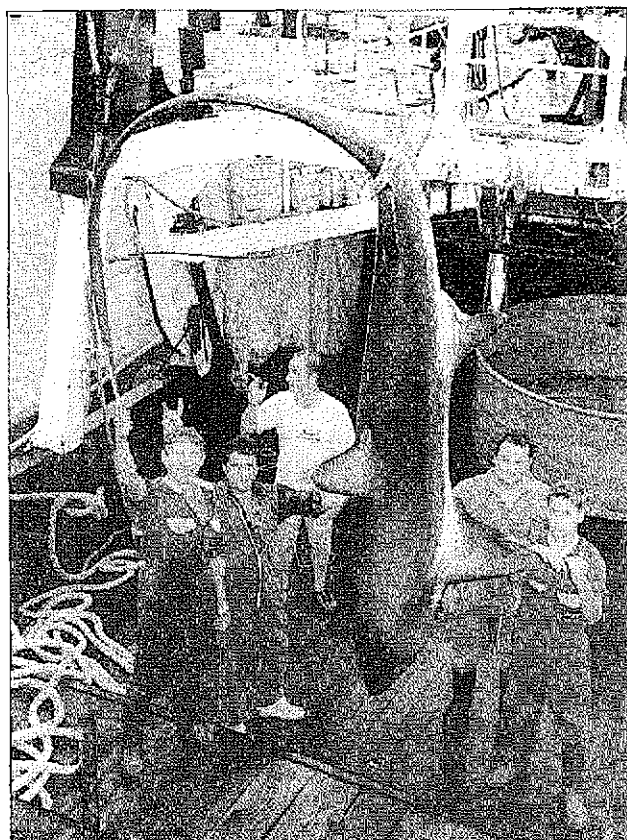


Fig. 2: Tresher sharks (*Alopias vulpinus*) are relatively often caught in the northern Adriatic. (Photo: B. Šuligoj)
Sl. 2: Morske lisice (*Alopias vulpinus*) so razmeroma pogost plen ribičev v severnem Jadranu. (Foto: B. Šuligoj)

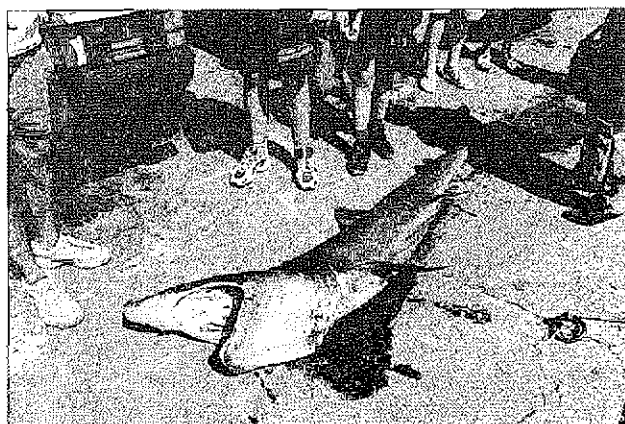


Fig. 3: Basking sharks are accidentally caught by numerous fishing gears. (Photo: B. Šuligoj)
Sl. 3: Morski psi orjaki se naključno zapletejo v različne vrste ribiških mrež. (Foto: B. Šuligoj)

gears. Thus, they are evidently vulnerable to overfishing, which has been recognized in the Mediterranean where they earned protective status by the Barcelona Convention. As most contracting parties have not yet implemented such status in their fishery legislative, there is still much work to be done on protection of this species, which is also listed in IUCN/SSG Red List.

Family Lamnidae

Mackerel sharks are in the Mediterranean represented by three large cosmopolitan sharks: *Carcharodon carcharias*, *Isurus oxyrinchus* and *Lamna nasus*. Official statistics show that the only landings in the Mediterranean have been reported by Portugal for *I. oxyrinchus* in 2000 (1 tonne) and in 1996 by Malta 1 tonne for *L. nasus* (FAO, 2002). These species are not target species in the Mediterranean area, but they are caught mainly as bycatch by longlines, driftnets and other fishing gear used in tuna, small pelagic fish and sword fisheries. Of these sharks, the largest and apex predator is the great white shark (listed in IUCN/SSG Red List). Although little is known of its reproduction, some studies show that its populations may be small and highly localized and very vulnerable to overexploitation (Strong *et al.*, 1992). In same Mediterranean areas, e.g. Eastern Adriatic where it used to be a common species, it has not been reported for at least 30 years (Soldo & Jardas, 2002b). The decline of records has also been observed in other areas, so the Barcelona Convention contracting parties have proclaimed this shark a protected species in the Mediterranean area (it is also listed in IUCN/SSG Red List). However, as in case of *C. maximus*, this still has to be incorporated in these countries' legislation.

Intensive fisheries of cosmopolitan species that depleted the stocks in areas out of Mediterranean have also a strong impact on the occurrence of these species in the Mediterranean. Studies showed that *I. oxyrinchus* and *L. nasus* have been common species in the Eastern Adriatic, but in the last 30 years there have been only few (porbeagle), or no records at all (shortfin mako) of these species in the area, although no fisheries of these two species have been reported in this area (Soldo & Jardas, 2002a). Even though there is a general lack of information regarding these species in the Mediterranean and that we are well acquainted with their life history characteristic and their vulnerability to overfishing (both species have been listed in IUCN/SSG Red List), it is obvious that they deserves rigorous attention as their populations are under serious threats of unmanaged and irresponsible fishing. Thus, a proper management programs should be developed and, upon accurate assessment, some local protection probably established.

Family Squatinidae

In the Mediterranean Sea, the flattened angel sharks are represented by three species: *Squatina aculeata*, *S. oculata* and *S. squatina*. They are not target species but caught as bycatch by trawls, gillnets and longlines. Landings of *S. squatina* have been reported by Tunisia (10-53 tonnes in the period 1991-2000), while several other countries have reported only on landings of these sharks as a group. Landings of Squatinidae show increase from 13 tonnes in 1992 to 171 tonnes in 1998. Apparently, or at least on the basis of this deficient data, a market for these sharks is growing. Thus a proper management plans for sustainable fisheries of these species should be developed, especially if it is known that some of these species (*S. squatina*) are already listed in IUCN/SSG Red List.

Tab. 1: Checklist of Mediterranean sharks.

Tab. 1: Seznam sredozemskih morskih psov.

Hexanchiformes

Hexanchidae

Heptanchias perlo (Bonnaterre, 1788), Sharpnose sevengill shark

Hexanchus griseus (Bonnaterre, 1788), Bluntnose sixgill shark

Squaliformes

Centrophoridae

Centrophorus granulosus (Schneider, 1801), Gulper shark

Centrophorus squamosus (Bonnaterre, 1788), Gulper shark

Centrophorus uyato (Rafinesque, 1810), Little gulper shark

Deania calcea (Lowe, 1839), Birdbeak dogfish

Dalatidae

Centroscymnus coelolepis (Bocage & Capello, 1864), Portuguese dogfish

Centroscymnus crepidater (Bocage & Capello, 1864), Longnose velvet dogfish

Dalatias licha (Bonnaterre, 1788), Kitefin shark

Etmopterus spinax (Linnaeus, 1758), Velvet-belly shark

Oxynotus centrina (Linnaeus, 1758), Angular rough shark

Scymnodon ringens (Bocage & Capello, 1864), Knifetooth shark

Somniosus rostratus (Risso, 1826), Little sleeper shark

Echinorhinidae

Echinorhinus brucus (Bonnaterre, 1788), Bramble shark

Squalidae

Squalus acanthias (Linnaeus, 1758), Piked dogfish

Squalus blainvillei (Risso, 1826), Longnose spurdog

Carcharhiniformes

Carcharhinidae

Carcharhinus altimus (Springer, 1950), Bignose shark

Carcharhinus brachyurus (Gunther, 1870), Copper shark
Carcharhinus brevipinna (Muller & Henle, 1841), Spinner shark
Carcharhinus falciformis (Bibron, 1841), Silky shark
Carcharhinus leucas (Valenciennes, 1841), Bull shark
Carcharhinus limbatus (Valenciennes, 1841), Blacktip shark
Carcharhinus longimanus (Poey, 1861), Oceanic white tip shark
Carcharhinus obscurus (LeSueur, 1818), Dusky shark
Carcharhinus plumbeus (Nardo, 1827), Sandbar shark
Prionace glauca (Linnaeus, 1758), Blue shark
Sphyrnidae
Sphyrna lewini (Griffith & Smith, 1834), Scalloped hammerhead
Sphyrna mokarran (Ruppell, 1835), Great hammerhead
Sphyrna zygaena (Linnaeus, 1758), Smooth hammerhead
Scyliorhinidae
Galeus melastomus (Rafinesque, 1810), Blackmouth catshark
Scyliorhinus canicula (Linnaeus, 1758), Smallspotted catshark
Scyliorhinus stellaris (Linnaeus, 1758), Nursehound
Triakidae
Galeorhinus galeus (Linnaeus, 1758), Tope shark
Mustelus asterias (Cloquet, 1821), Starry smoothhound
Mustelus mustelus (Linnaeus, 1758), Smoothhound
Mustelus punctulatus (Risso, 1826), Blackspotted smoothhound
Lamniformes
Odontaspidae
Eugomphodus taurus (Rafinesque, 1810), Sand tiger shark
Odontaspis ferox (Risso, 1810), Smalltooth sand tiger
Alopiidae
Alopias superciliosus (Lowe, 1840), Bigeye thresher
Alopias vulpinus (Bonnaterre, 1788), Thresher shark
Cetorhinidae
Cetorhinus maximus (Gunnerus, 1765), Basking shark
Lamnidae
Carcharodon carcharias (Linnaeus, 1758), Great white shark
Isurus oxyrinchus (Rafinesque, 1810), Shortfin mako
Lamna nasus (Bonnaterre, 1788), Porbeagle
Squatiniiformes
Squatinaidae
Squatina aculeata (Cuvier, 1829), Sawback
Squatina oculata (Bonaparte, 1840), Smoothback angelshark
Squatina squatina (Linnaeus, 1758), Angelshark

CONCLUSIONS

From previous facts it is obvious that there is a general lack of data on all sharks in the Mediterranean. It is most possible that some shark populations have suffered severe declines, due to unmanaged and irresponsible fisheries. It can also be said that the need for management of shark fisheries in order to ensure their long-term conservation has still not been recognized in the Mediterranean area. Some attempts have indeed been made, such as the *Draft action plan for the conservation of cartilaginous fishes (Chondrichthyans) in the Mediterranean Sea*, but such actions are unfortunately merely an exception and very slow in progress, which makes the future of the shark populations very uncertain. As Mediterranean fisheries are a multi-species fishery, severe resistance and actual rejections concerning the implementation of shark managing programs are coming from fishermen, especially trawlers, as they are afraid of possible regulations, which could have a strong effect on their fishing gear, technique, seasons etc., i.e. their incomes. A suitable way would therefore perhaps be to concentrate first on large pelagic species, which are most vulnerable but caught as bycatch by fishing gear, whose selectivity and fishing technique can be regulated much easier than trawls. That would open much more space for the introduction of management programs for target sharks, which are mainly bottom species caught by trawls. Of course, such actions should go along with public awareness building regarding the conservation and protection of sharks by various educational programs.

Management programs should ensure precise fisheries statistics of catches and landings by species. Critical habitats, namely mating areas, spawning and nursery grounds should be identified. Hence, scientific studies on biology and ecology of sharks should be continued and some new developed at the same time. Fishing gear and techniques that reduce shark bycatch and/or make possible live release should be encouraged, while wasteful fishing practices as finning should be banned. By regularly reviewed status of sharks, threatened species should be legally protected by national and international legislation. As many sharks are cosmopolitan, migratory species, regional coordination would be required for all these actions.

Generally, all management programs should respect the principles of sustainability, precautionary principles and conservation measures as defined in the *FAO Code of Conduct for Responsible Fisheries* and in the *International Plan of Action for the Conservation and Management of Sharks*.

Such approach will, hopefully, ensure conservation of shark populations and biodiversity of marine ecosystem of the Mediterranean Sea.

STATUS MORSKIH PSOVI V SREDOZEMSKEM MORJU

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POVZETEK

Doslej je bilo v Sredozemskem morju ugotovljenih 47 vrst morskih psov. Nekatere izmed njih so gospodarsko pomembne, tako da jih že stoletja lovijo načrtno ali pa zgolj naključno, medtem ko so druge vrste redke ali celo zelo redke, kar pomeni, da njihovo pojavljanje ni bilo zabeleženo na običajni osnovi. Sicer pa je bilo zaradi negativnih vplivov neodgovornih ribiških flot na morske pse opaženo upadanje populacij nekaterih vrst. Namen pričujočega članka je predstaviti status morskih psov v Sredozemskem morju in predlagati nekaj ukrepov za njihovo ohranitev in boljše upravljanje njihovega izkoriščanja.

Ključne besede: morski psi, njihov status, ribiška industrija, ohranjanje vrst, Sredozemlje

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