



FIELD IDENTIFICATION GUIDE TO THE SHARKS AND RAYS OF THE MEDITERRANEAN AND BLACK SEA



FAO SPECIES IDENTIFICATION GUIDE FOR FISHERY PURPOSES

FIELD IDENTIFICATION GUIDE TO THE SHARKS AND RAYS OF THE MEDITERRANEAN AND BLACK SEA

by

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PREPARATION OF THIS DOCUMENT

This document was prepared under the coordination of the Species Identification and Data Programme of the Marine Resources Service, Fishery Resources and Environment Division, Fisheries Department, Food and Agriculture Organization of the United Nations (FAO).

At a meeting of the Sub-Committee on Marine Environment and Ecosystems of the General Fishery Commission for the Mediterranean (GFCM) in February 2001 in Palma de Majorca, some member countries concerned with the protection of sharks and other cartilaginous species suggested that a field guide for the identification of cartilaginous species be prepared. At its fourth session in June 2001 in Athens, the Scientific Advisory Committee (SAC) endorsed the suggestion and asked the COPEMED Project GCP/REM/O57/SPA to support the preparation of the field guide.

This increasing recognition of the significance of sharks and batoid fishes as ecosystem health indicators, as well as their particular importance in exploited ecosystems in the Mediterranean, have been key considerations to promote the preparation of this field guide.

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Abstract

This volume presents a fully illustrated field guide for the identification of the sharks and rays most relevant to the fisheries of the Mediterranean and Black Sea. An extensive literature review was carried out for the preparation of this document. A total of 49 sharks, 34 batoids and 1 chimaera are fully treated. The presence of 5 sharks and 2 batoids included in this field guide, need, however, to be confirmed. The guide includes sections on technical terms and measurements for sharks and batoids, and fully illustrated keys to those orders and families that occur in the region. Each species account includes: at least one annotated illustration of the species highlighting its relevant identification characters; basic information on nomenclature, synonyms and possible misidentifications; FAO common names; basic information on size, habitat and biology, distribution, importance to fisheries, and conservation and exploitation status. Colour plates for a large number of the species are included as well as two plates showing the egg cases.

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INTRODUCTION

After a long period of adaptation starting 450 million years ago, since the Cretaceous (about 100 million years) the cartilaginous fish have not experienced any further noticeable morphological or physiological changes. Today the group occupies almost all aquatic environments: rivers, lakes, estuaries, coastal lagoons, coastal waters, open seas and deep seas, extending as far as the Antarctic convergence. This may be facilitated by the fact that sharks are mostly predators, and have adapted to all sort of diets, some being scavengers. The few species that are plankton-feeders are characterized by large dimensions, which discourages predation.

This guide provides a list and brief description of the species of sharks, batoid fishes and chimaeras living in the Mediterranean and Black Sea. While for some species there are no doubts regarding their presence in the area, for other rare species, their presence remains doubtful pending further information.

Commercial fishing samples constitute the main source of cartilaginous specimens, in particular, for rare species. Some species, once considered rare, may become common due to the increased use of a particular gear or during fishing on new grounds.

Fishing may produce negative effects on biodiversity: overexploitation of resources may directly or indirectly lead to the depletion of some species, especially those that do not have a good resilience as regards to fishing disturbance, such as the cartilaginous fish. In these cases it is quite frequent to observe the disappearance, albeit locally, of some species.

One major problem using official landing statistics in any analysis is the difficulty to secure correct identification of the species of cartilaginous fish, as they are often grouped in collective codes. Apart from spotted dog sharks, thorn rays and a few other species, caught as bycatch, a targeted fishery aiming at catching cartilaginous species does not exist in the Mediterranean and Black Sea, and for the time being, finning is not mentioned either. In trawl fisheries discard may be a critical aspect especially for juveniles of some species.

Physical and Chemical Characteristics of the Region

Geology and Physical Features

The Mediterranean Sea, Black Sea excluded, constitutes 0.81% (2.514 million km²) of the total water surface of the planet. Twenty-two different countries border its coastline. It extends from the Straits of Gibraltar to the Bosphorus for about 4 000 km. The Mediterranean reaches its maximum depth (5 121 m) in the Ionian Sea.

The birth of the Mediterranean was caused by the collision of the African and European continents about 50–60 million years ago in the area presently called Gibraltar. During the “Messinian regression” the Mediterranean basin became completely closed and the water level descended reaching its minimum 6 million years ago. About 5.5 million years ago, communication through the Straits of Gibraltar opened again and Atlantic waters invaded the Mediterranean basin. From then on the Mediterranean Sea began a new life and assumed the characteristics of a temperate sea.

The Mediterranean Sea can be divided into two main basins: western and eastern separated by the Sicily-Tunisia ridge. Within these basins, regional seas may be defined, connected by channels and straits (Fig. 1). The eastern basin is characterized by a great oceanographic variability on the surface with temperatures of 16°C in winter and up to 29°C in summer, as opposed to 12° and 23°C in the western basin and salinities of 39‰ to the east as opposed to 36‰ in the west.

Currently the Gibraltar threshold, with a maximum depth of about 320 m and a distance of only 25 km between the European and African continental masses, allows the passage of the Atlantic upper layers with an average temperature of about 15°C.

The slow circulation of water masses, the rate of exchange of Mediterranean waters and the consequent poor water replacement, contributes in keeping the temperature constant year round, particularly in deep waters.

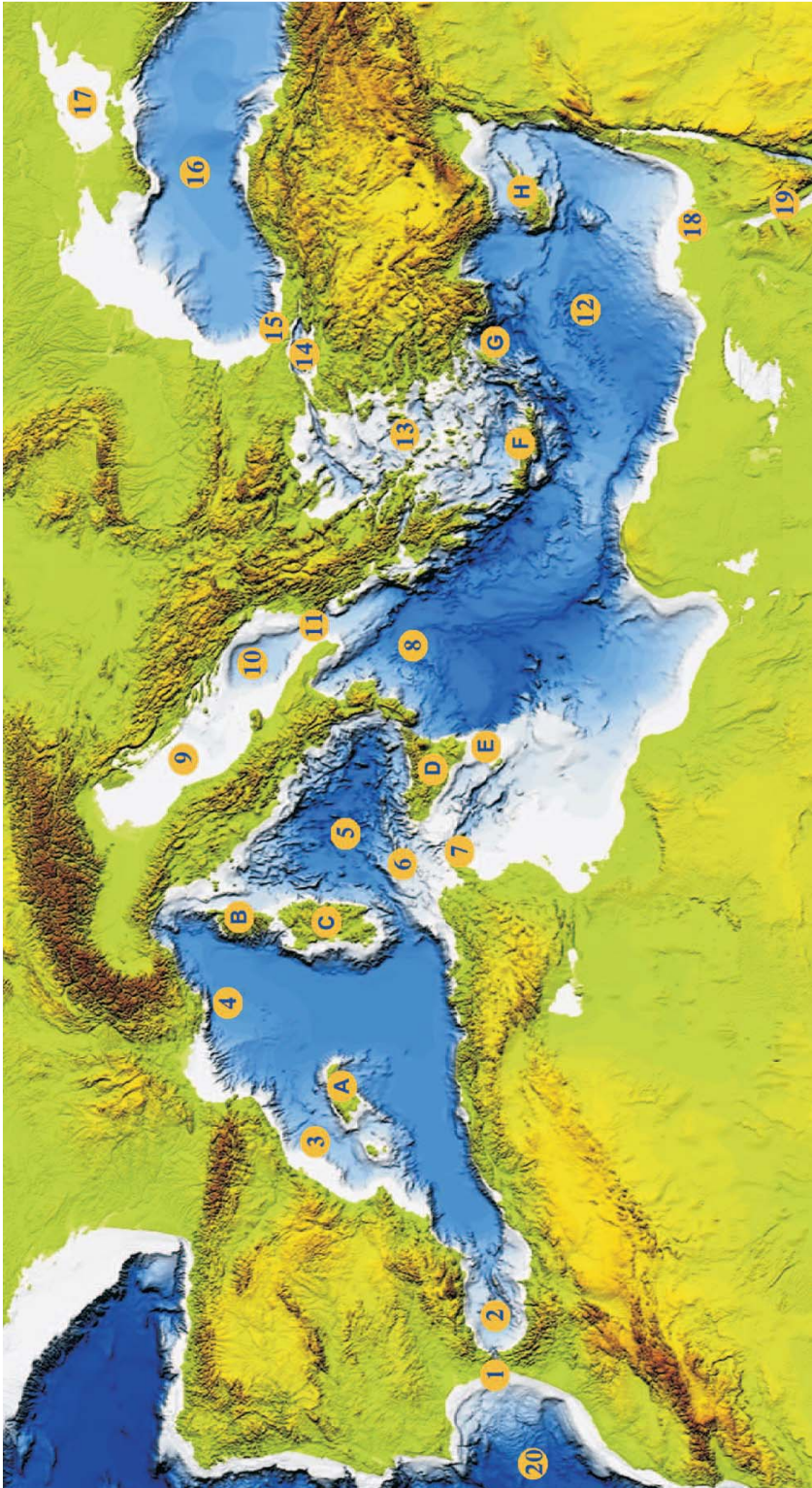


Fig. 1 Mediterranean geography and its main sub-basins

A = Balearic Islands; **B** = Corsica; **C** = Sardinia; **D** = Sicily; **E** = Malta; **F** = Crete; **G** = Rhodes; **H** = Cyprus

1 = Straits of Gibraltar; **2** = Alboran Sea; **3** = Catalan Sea; **4** = Liguro-Provençal Basin; **5** = Tyrrhenian Sea; **6** = Sicily Tunisian Ridge; **7** = Cape Bon; **8** = Ionian Sea; **9** = Adriatic Sea; **10** = Pomo Pit; **11** = Dajmato Garganic Threshold; **12** = Levantine Sea; **13** = Aegean Sea; **14** = Marmara Sea; **15** = Bosphorus; **16** = Black Sea; **17** = Azov Sea; **18** = Suez; **19** = Red Sea; **20** = Atlantic

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The Black Sea occupies an area of about 465 000 km² and has a maximum depth of 2 245 m. The Marmara Sea connects the Black Sea with the Mediterranean. Its salinity is low and does not exceed 22‰ throughout the whole water column, however surface waters may have lower values, down to 16–18‰. In winter the surface temperature decreases to 3–6°C and often, in some coastal areas, the water freezes, especially in the Azov Sea. At depths over 150 m the temperature is practically constant, about 9°C. The waters of the southern coasts (Anatolia) show greater average temperatures and are separated by an isothermal front of 15°C. One of the main characteristics of this sea is the complete lack of dissolved oxygen at depths over 150–200 m; from this depth to the bottom sulphurous concentration is very high (Murray, 1991; Oguz, 1992, 1993).

Oceanographic Features

The distribution of marine organisms in the environment is clearly related to bottom characteristics, nutrients abundance and oceanographic conditions. These circumstances are naturally linked to water masses large movements, both near the surface and in deep waters, and are also influenced by meteorological conditions such as wind intensity, surface temperature and chlorophyll concentration (Figs 2, 3 and 4).

The superficial layers of Atlantic waters flow in through the Straits of Gibraltar, progressing over the entire surface of the Mediterranean basin area. These waters become warmer and progressively saltier due to evaporation and their great density as they sink. Part of the general flow will return to the Atlantic as intermediate waters, while another part will mix with deep waters. Heburn (1992) and Garibaldi and Caddy (1998) distinguish three different ecological areas based on species distribution. Three types of water that fundamentally characterize the balance of the whole Mediterranean can be suggested:

- The Modified Atlantic Water (MAW), which mainly constitutes the surface water (0–200 m) of the whole area. It initially flows close to the North African coasts, from Morocco to Cape Bon and then splits into three main directions: the first one constitutes the cyclonic circuit of the Balearic Islands, the second moves towards the Tyrrhenian Sea (Astraldi *et al.*, 1999) and the last one towards the Levantine Sea (Millot, 1999) (Fig. 5).
- The Levantine Intermediate Water (LIW) (200–1 000 m, mainly around 400 m depth) that constitutes the main component of the returning

flow towards the ocean. This water is mainly produced in the eastern basin (Lascarotes *et al.*, 1992, 1993) and, to a lesser extent in the western basin contributing to the Tyrrhenian movement (Fig. 6).

- The Mediterranean Eastern and Western Deep Waters (MDW, Mediterranean Deep Water) (>1 000 m), that are produced respectively in the Liguro-Provençal area of the basin (Send and Shott, 1992) and in the Southern Adriatic Sea (Fig. 7).

The general circulation in the Black Sea consists of several sub-basin scale gyres. The anticyclonic coastal eddies appear to play a fundamental role on the ultimate distribution of the Cold Intermediate Water (Oguz *et al.*, 1992, 1993; Millot, 2005; Korataev *et al.*, 2003) (Fig. 5).

In the area of entrance of the Atlantic waters (the Alboran Sea), there are important phenomena having repercussions on the entire Mediterranean basin (Fig. 8). These waters show an almost permanent anticyclonic gyre in the west and a more variable circuit in the east, (Allain, 1960; Lanoix, 1974; Heburn and La Violette, 1990; Davies *et al.*, 1993; Viudez *et al.*, 1996). The main flow is from Spain to the Algerian coast, commonly named “the Almeria-Oran jet” (Priour and Sournia, 1994). After about 80–100 years the Mediterranean waters (LIW and MDW) return to the Atlantic Ocean with different velocity running below the surface (Bryden and Kinder, 1991) (Fig. 9).

Biodiversity and Biogeographical Characteristics of the Region

The current level of biodiversity of the Mediterranean and Black Sea fauna was defined by the alternation of periods of glaciation and interglaciation, which brought about dramatic changes in climatic conditions. Also in recent times, biodiversity has been enriched both through internal speciation phenomena and through species colonization from outside Mediterranean areas (Golani *et al.*, 2002).

Even though the Mediterranean and Black Seas represent less than 1% of the total area of world seas, the fish biodiversity and absolute number of species are relatively high. In fact, it is possible to find about 6% of the entire world's species in this area (Fredj *et al.*, 1992) and probably the 84 cartilaginous fish species found in the area represent about 8% of the total number of species of this group in the world.

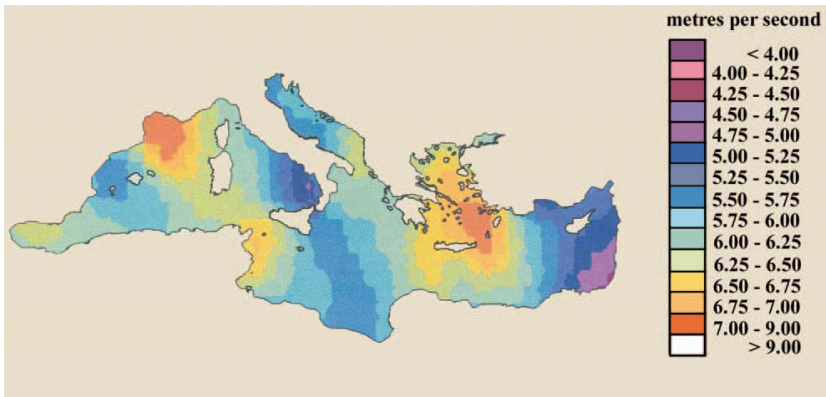


Fig. 2 Average wind speed (metres per second)

The Gulf of Lion and the Aegean Sea close to the island of Rhodes are the most windy areas
(Satellite imagery: © OCEAN Project, 2000)

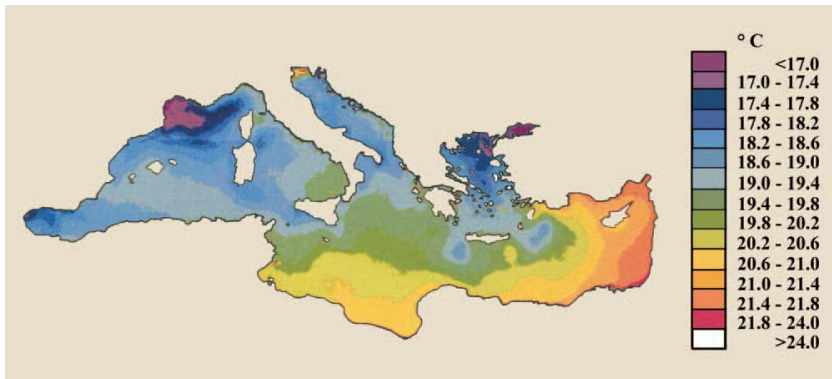


Fig. 3 Average sea surface temperature (°C)

The Gulf of Lion and the northern part of Aegean Sea are colder areas
(Satellite imagery: © OCEAN Project, 2000)

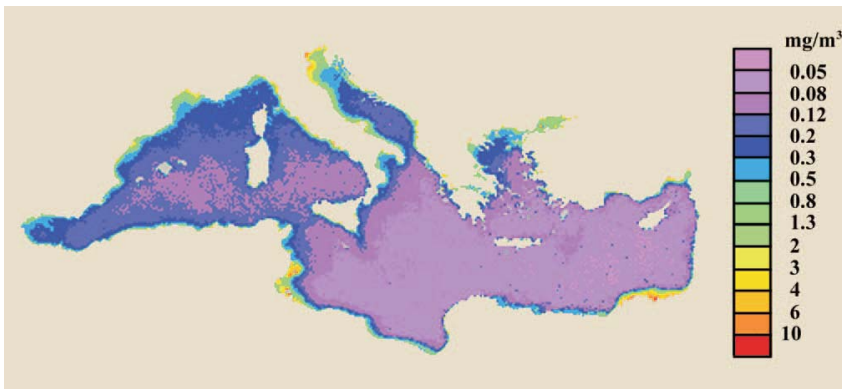


Fig. 4 Average concentration of chlorophyll (milligrammes per m³)

The Gulf of Lion and Adriatic Sea are richer areas
(Satellite imagery: © OCEAN Project, 2000)

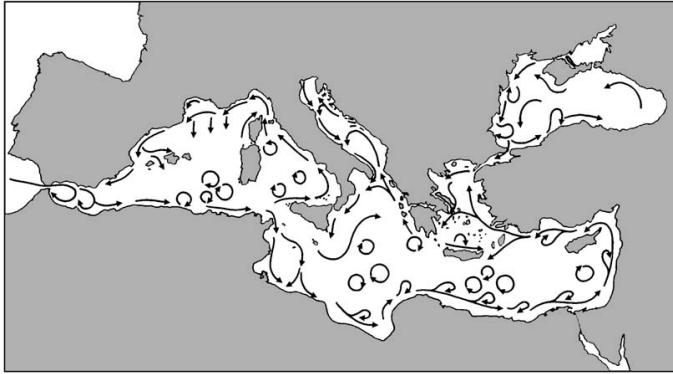


Fig. 5 General circulation of the superficial currents (~0–200 m depth)

(redrawn from Millot (1999) for the western basin also considering information from Heburn and La Violette (1990) and Tziperman and Malanotte-Rizzoli (1991). The dynamics of the eastern basin come from the information of Robinson and Golnaraghi (1994) in Malanotte-Rizzoli and Robinson (1994) and Millot and Taupier-Letage, 2004).



Fig. 6 The dynamics of the Intermediate Waters (~200–1 000 m)

(from Millot (1987), Robinson and Golnaraghi (1994) for the western basin and Malanotte-Rizzoli *et al.* (1999); Millot and Taupier-Letage, 2004 for the eastern basin, modified)

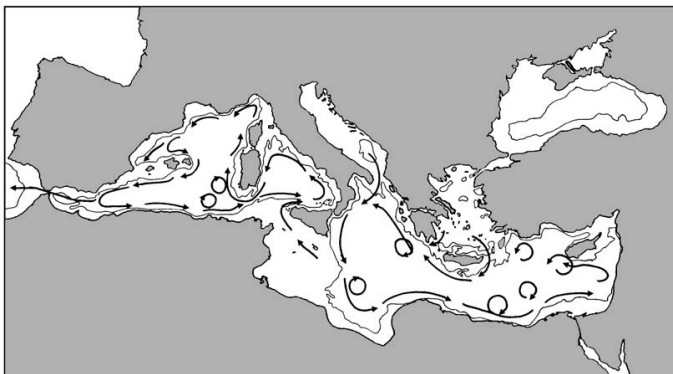


Fig. 7 The dynamics of Deep Waters (<1 000 m depth)

(after Millot (1987), Lacombe *et al.* (1985) for the western basin. The movements of the deep currents in the eastern basin have been simplified (Anati, 1977; Roether and Schlitzer, 1991; Millot and Taupier-Letage, 2004)

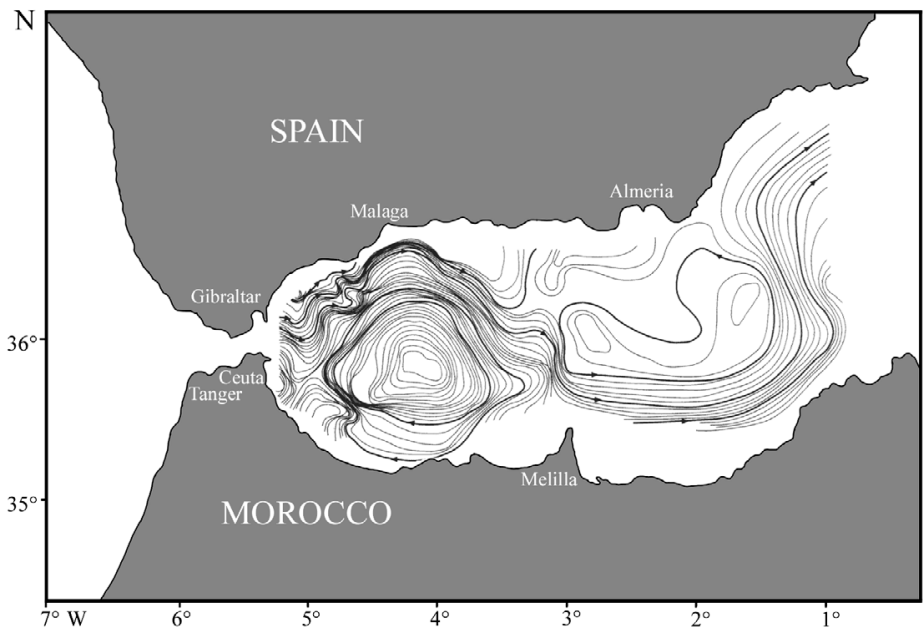


Fig. 8 Noteworthy dynamic superficial waters referring to 200 m depth
(from Lanoix, 1974 in La Violette, 1984)

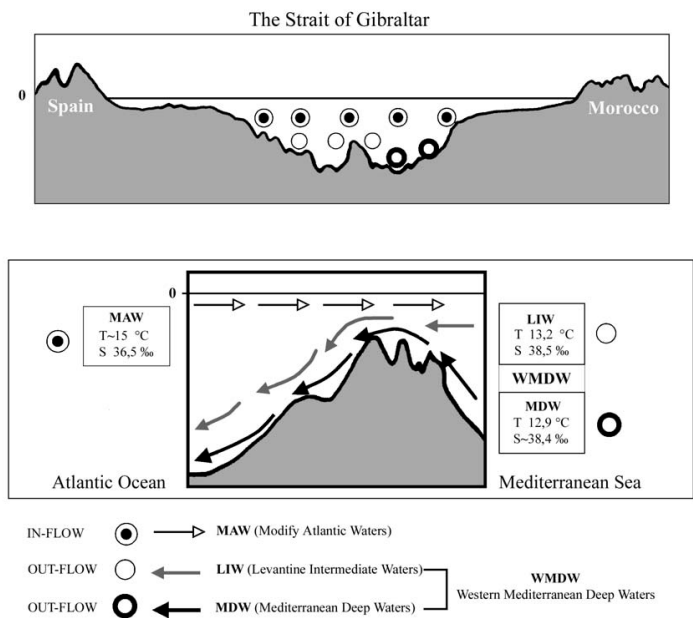


Fig. 9 Inflow and outflow currents through the Strait of Gibraltar:
a) transversal section, b) longitudinal section.

LIW spreads and mixes but remains a distinct water mass all the way to the Gibraltar Strait (Gascard and Richez, 1985); LIW and MDW probably do not mix completely and flow out of Gibraltar Strait with different velocity (Millot, 1999). The yearly average temperatures and salinity of LIW, MDW and MAW are illustrated respectively (Kinder and Bryden, 1990; Millot, 1999; Robinson and Golnaraghi, 1994; Tintoré *et al.*, 1988; Kinder and Parrilla, 1987). The renewal of the waters of the entire Mediterranean basin is not known exactly; the eastern circulation is now known to consist of a single cell encompassing both the Ionian and Levantine basins, with a turnover time estimated at about 125 years. More research is needed to define the western cell (Roether and Schlitzer, 1991).

Two main features can be highlighted concerning Mediterranean fish communities:

- Biodiversity decreases from west to east, probably due to physical conditions such as the presence of threshold-strait or canal effects (Gibraltar, Sicily-Tunisia, Bosphorus, and Suez). The diversity in number of species shows the same negative eastward gradient that has been found for nutrients (Murdoch and Onuf, 1972). Minimum biodiversity is present in the Adriatic and Black Sea (Fredj and Maurin, 1987; Garibaldi and Caddy, 1998).
- There is a meridionalization from the southern to the northern coasts (Riera *et al.*, 1995) and a warming trend in the deep waters of the western Mediterranean (Berthoux *et al.*, 1990).

There are approximately 1170 valid species of cartilaginous fish in the world's waters; about 50 of them are chimaeras, 650 batoids and 470 sharks. In the Mediterranean and Black Sea, 7 orders are represented by 23 families, 42 genera and a total number of species of about 47 sharks, 34 batoid fishes and 1 chimaera. Endemism is low; up to four species of rays could be considered indigenous.

In the Adriatic Sea, the presence of cartilaginous fish species is scarce especially in the northern part. Besides its oceanographic characteristics that may limit biodiversity, this area was populated more recently than other parts of the Mediterranean. This occurred after the sinking of the Dalmato-Garganic threshold, which was still above sea level in the Pleistocene. A total of 52 species of cartilaginous fish have been recorded in the Adriatic Sea. Only 10 species are widely distributed. Some bathyal species of the group inhabit exclusively the central and southern parts of this sea (Jardas, 1984).

In the Black Sea the number of cartilaginous fish species is less. The Pontic fauna is composed of Mediterranean species and most of the organisms present are eurythermic and euryhaline. Twelve cartilaginous fish species are assumed to live in the Black Sea (Tortonese, 1969; Bouchot, 1984; Roux *in* FNAM, 1984; McEachran and Capapé, *in* FNAM, 1984; Fredj and Maurin, 1987). Murat *et al.* (2002) consider only 8 elasmobranchs along the Turkey coast of the Black Sea.

The Mediterranean Sea comprises several sub-basins characterized by more or less widely diverging oceanographic conditions and faunistic features. Bearing this situation in mind, and also considering the proximity of the Mediterranean Sea to the Atlantic Ocean, strictly speaking the Mediterranean fauna can be defined as the fauna of a single, well-known, well-defined basin, and in a

wider sense the term also covers the forms existing in the adjacent part of the Atlantic, between Portugal and Mauritania including the Azores, Canary and Madeira islands (Tortonese, 1989).

For the last 5.5 million years, the Straits of Gibraltar have never constituted a rigid boundary, and there is, therefore a reciprocal influence between the Atlantic Ocean and the Mediterranean Sea. In fact, the classical statement of Ekman (1953) considers the Atlantic-Mediterranean area as a single faunistic unit, and divides it into three areas: Lusitanic, Mauretanic and Mediterranean Region.

Even if considering only the Mediterranean basin, the distribution of cartilaginous fish species is not homogeneous. This phenomenon is often linked to the typology of the sea bottoms or to the chemical and physical characteristics of the different sub-basins. Basically, the bathymetry delimits three distinct ecological areas, which can be used to categorize species distribution patterns and hence habitat preference. Obviously, species could belong to more than one category or to all of them (Garibaldi and Caddy, 1998): **1)** those living over the shelf (0–200 m); **2)** demersal on the slope, oceanic and mesopelagic species within the water column over the 200–1 000 m depth; and **3)** oceanic, mesopelagic and bathypelagic species occupying waters over 1 000 m depth.

The superficial Atlantic current, which comes through the Straits of Gibraltar, is of crucial importance for Mediterranean Sea life as it facilitates the immigration of oceanic species. In a very synthetic way we can state the following biodiversity considerations on several biogeographical areas of the Mediterranean basin:

- The Alboran Sea is rich in Atlantic species.
- The northwestern area of the Mediterranean, including the Catalan, Ligurian and north Tyrrhenian seas, is characterized by the presence of Atlantic boreal elements.
- The central zone, that includes waters around the Balearic Islands, Corsica and Sardinia and the northern coasts of Sicily, shows specific Mediterranean or Atlantic-Mediterranean characteristics; many subtropical species are found in this area.
- The Tunisian and Libyan coasts, characterized by the presence of rare tropical Atlantic species, are the southernmost areas and are closest to subtropical in their characteristics.
- The eastern region, that includes the coasts of Egypt, Israel, Lebanon and Syria, is inhabited by many species coming from the Red Sea.

- The Adriatic Sea that does not reach great depths (50–60 m in average), apart from the “Pomo Pit” (south Adriatic Sea) where depth reaches about 1 200 m; the most abundant marine organisms in this area are prevalently species of Atlantic-boreal origin.
- The Black Sea is characterized by species of Sarmatic origin.

The Fishery

In all the seas of the world, the cartilaginous fish species are exploited for their fins, skin, jaws or meat (Vannuccini, 1999). Sometimes they are directly targeted by commercial and recreational fisheries while in other cases they are incidentally caught as bycatch. In many areas of the world a decline in cartilaginous fish species landings has been observed while fishing effort has generally increased. This especially applies to fisheries targeting shark fins. Moreover, most countries report shark statistics without distinction between species or, worse still, the species are not recorded at all. As a result, it is impossible to identify the species in multispecific fishery and hence estimate and monitor fishing mortality.

Because of their life history characteristics, sharks and rays are especially susceptible to over-exploitation and it is very difficult to restore depleted populations. Very often species have restricted distribution, small population size, dependence on mating, spawning, nursery and breeding grounds or specific habitats. Well- documented cases of collapsed shark fisheries have been reported (Musick *et al.*, 2000). In such cases a sudden collapse of yields can occur and consequently the local extinction of a particular species.

No marine fish is yet known to have been driven to biological extinction due to fishing (Musick, 1999) but regional stocks of some species can be considered to have disappeared, such as *Squatina* sp. (Vacchi and Notarbartolo di Sciarra, 2000). The assumption that marine fish are not vulnerable to extinction because they live in open seas, where their movements are unlimited, is unfounded. Sharks also constitute a bycatch in open sea fisheries targeting highly migratory species such as tunas.

The fishing methods used to catch cartilaginous fish species in the Mediterranean are highly varied: the two most efficient gears for sharks are gillnets and longlines, while a frequent method for catching batoids in general and some smaller sharks like smoothhound, catsharks, etc. is the bottom trawl. This fishing gear is probably responsible for a large

amount of bycatch and discard of cartilaginous fish throughout the world (Bonfil, 2002).

Bottom trawl fishing activity is commonly performed throughout the Mediterranean area. The cartilaginous fish species most frequently caught with these gears are *Galeus melastomus*, *Scyliorhinus canicula*, *Etmopterus spinax*, *Raja clavata*, *Squalus acanthias* (Bertrand *et al.*, 2000; Relini *et al.*, 2000; Baino *et al.*, 2001; Serena *et al.*, 2005). Some species such as the starry ray (*Raja asterias*) are constantly captured as bycatch and in large amounts in several Italian fisheries, especially in the Tyrrhenian Sea. The fishing gear employed is a modified beam trawl targeting sole (Minervini *et al.*, 1985; Serena and Abella, 1999; Abella and Serena, 2005).

Even in the Adriatic Sea, accessory catches of many species of cartilaginous fish species are carried out with set gears and the most frequent species caught are *Squalus acanthias*, *Mustelus* spp., *Raja* spp., *Torpedo* spp., *Scyliorhinus* spp., *Galeorhinus galeus*, *Alopias vulpinus* and juveniles of *Carcharhinus plumbeus* (Costantini *et al.*, 2000).

Large individuals of *Hexanchus griseus* as well as those of *Galeus melastomus*, *Centrophorus granulosus*, etc. are captured with bottom longlines targeting hake. The drifting longlines set near the surface, targeting tuna and swordfish, also capture *Prionace glauca*, *Pteroplatytrygon violacea*, *Alopias vulpinus*, *Isurus oxyrinchus*, *Lamna nasus*, *Sphyrna (Sphyrna) zygaena*, *Hexanchus griseus*, *Carcharhinus* spp., *Mobula mobular*, etc. (Fleming and Papageorgiou, 1997; Kabasakal, 1998; Hemida, 1998; De Metrio *et al.*, 2000; Garibaldi and Orsi Relini, 2000; Orsi Relini *et al.*, 2000).

Driftnets are largely used to catch cartilaginous fish species, and in the recent past they were extensively utilized throughout the Mediterranean. Fortunately nowadays their use is prohibited in European countries. It is advisable that the use of this gear be prohibited, and this should be extended to all Mediterranean countries in order to find a definitive solution to the problem. The main species caught with driftnets are *Prionace glauca*, *Alopias vulpinus*, *Isurus oxyrinchus*, *Lamna nasus*, *Carcharhinus* spp., *Cetorhinus maximus*, *Sphyrna* spp., *Mobula mobular*, *Pteroplatytrygon violacea* (De Metrio *et al.*, 2000).

Occasionally, species such as *Prionace glauca*, *Cetorhinus maximus*, *Sphyrna* spp. and *Mobula mobular* are caught with purse seines (Notarbartolo di Sciarra and Serena, 1988). In such cases the

catches have to be considered incidental rather than accessory, the same applies to some artisanal fisheries (Serena *et al.*, 1999a, b). No official practice of “finning” has been reported in the Mediterranean Sea so far, but mortality through discarding from trawls, gillnets, purse seines and longlines is significant (De Metrio *et al.*, 1984). However, in the past the fishing activity with the greatest incidence in cartilaginous fish species catches was tuna traps. Some years ago, these fishing structures were widely distributed all around the Mediterranean area. In countries such as Spain, France and Turkey, and particularly along the Italian coasts, the use of the tuna trap was due to the presence of the prevailing migration routes of tuna, directed towards not only the rich waters of the Liguro-Provençal basin but also in the Adriatic Sea (FAO, 1985). Between 1890 and 1914, there were 37–54 tuna traps (Cushing, 1988) in Italy. Today only a few units are still present, mainly concentrated on the major Italian islands. The large-sized cartilaginous fish species more commonly present in catches were *Alopias vulpinus*, *Cetorhinus maximus*, *Sphyrna mokarran*, *Prionace glauca*, *Mobula mobular* and sometimes *Carcharodon carcharias* (Boero and Carli; 1979, Vacchi *et al.*, 2002).

Significant bycatch mainly constituted by *Alopias vulpinus* and *Prionace glauca* is caught by fishing performed with small swordfish-driftnets targeting swordfish, carried out mainly in the southern part of the Mediterranean by Italy, Malta, Morocco, Tunisia, and others. Very few and geographically localized fishing activities can be considered, targeting species of this group in the Mediterranean. Traditionally *Hexanchus griseus* is caught with bottom longlines in the Ligurian Sea (Aldebert, 1997) and also along the southern Italian coasts. In this area, drifting surface longlines, called “stese” are also utilized in spring for the catch of large individuals of *Prionace glauca*. These are short lines with hooks that are set near the surface. In the northern Adriatic, gillnets are utilized to catch *Mustelus mustelus*, *Mustelus punctulatus*, *Squalus acanthias*, *Scyliorhinus stellaris*, *Myliobatis aquila* and *Galeorhinus galeus* during winter and spring; and *Prionace glauca*, *Pteromylaeus bovinus* and *Alopias vulpinus* during summer (Costantini *et al.*, 2000).

Important catches of Carcharhinidae species (*Carcharhinus brachyurus*, *Carcharhinus brevipinna*, *Carcharhinus falciformis*, *Carcharhinus obscurus*, *Carcharhinus plumbeus* and *Carcharhinus altimus*) are also made by offshore pelagic longline fishery operating from ports in the east of Algeria (Hemida and Labidi, 2000). The recent FAO-COPMED-MBRC report by Lamboeuf (2000) analyses the artisanal fishery in Libya showing some examples of fisheries targeting

cartilaginous fish such as Carcharhinidae, Lamnidae, *Rhinobathos* and *Squatina squatina* caught by fixed gillnet, bottom set and drifting longlines.

Finally, we cannot neglect the role of recreational fishing that has recently grown in popularity causing concern. Following the development that occurred in the United States and in Australia, the number of angler associations has also notably increased in the Mediterranean, mainly in the northern Adriatic (Bianchi *et al.*, 1997) and in the Tyrrhenian but also in other countries such as France and Spain. The targets of game fishing are essentially *Alopias vulpinus*, *Prionace glauca* and *Hexanchus griseus*. However, juveniles compose most of the catch and, sometimes, they are recently born individuals. Currently, there are no specific laws or a suitable control aimed at the protection of any cartilaginous fish. This may soon lead to a rarefaction of the populations of the two above-mentioned species as has already occurred in Cornwall, United Kingdom (Vas, 1995).

Cartilaginous fish catches in the 1970–2002 period represent only 1.1% of the total landings in Mediterranean ports (FAO, 2000a). The most important landings of this group occurred in the Ionian and Black seas each one with 30% of the total Mediterranean catches; Sardinian, Adriatic and Balearic waters show catches of 12%, 8% and 7%, respectively of the Mediterranean total.

The catches during the last 30 years (Fig. 10) show an increasing trend from 10 000 to 25 000 tonnes attained in 1985 and since then a regular decrease to 15 000 tonnes to present (FAO, 2000b). This is mainly due to the Turkish and Italian catches of sharks and rays in the Black and Ionian seas, respectively. Unfortunately it cannot be stated whether these variations are real or if they are simply due to changes in recording procedures (i.e. in some years at least part of them were reported as sharks and in others generically as marine fishes).

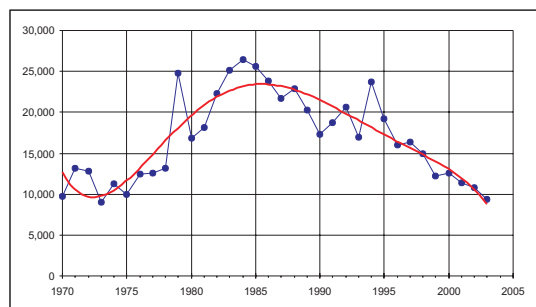


Fig. 10 Mediterranean and Black Seas trend of cartilaginous catches in the last 30 years

Fishery Management

The life history strategy of cartilaginous fish species suggests the need for conservative management of a balanced population and a compatible fishery activity. However, most shark fisheries are completely unmonitored and unmanaged (Shotton, 1999). About 50% of the estimated global catch of cartilaginous fish species is gathered as bycatch and these are not mentioned in official fishery statistics (Stevens *et al.*, 2000).

In general, the contribution of cartilaginous fish to the market is low because of their scarce economic value. Consequently they are also a low priority for research and management if compared to bony fishes, although recently, certain products such as shark fins have become important in the trade.

Cartilaginous fish resources management needs particular attention, above all in order to maintain biodiversity and ecosystem structures. The interactions between species in marine ecosystems, as well as the impact of the removal of top predators on other marine organisms on the functionality of the whole ecosystem are poorly understood. Basically, besides an adequate identification guide, we need to know the abundance of each species, life history characteristics, fishing effort, catches, discards, etc. In the case of the Mediterranean, many fisheries belonging to different countries are taking place and the resources are often shared between nations. This situation requires cooperative management at the intergovernmental level and a precautionary approach for their exploitation (FAO, 1995a, 1995b, 1996).

Finally, for the successful management of cartilaginous fish species we must simultaneously consider biological and fishery information. The choice of suitable mathematical models for stock assessment of these resources is not easy and it has to take into consideration the long life span and late maturation of many sharks and rays. Therefore, the effects of changes in fishing effort and other management measures will be apparent only many years later.

Conservation

The cartilaginous fish species belong to an ancient, conservative taxonomic group that was formerly very abundant in the world's oceans. Despite the evolutionary success of the species which have survived until the present day, some are now threatened with extinction, regionally or globally,

often as a result of human activities. The main reason for this is that a K-selected life-history traits characterize many species; they grow slowly, mature at a relatively late age, have only a few young with low natural mortality rates, and their populations increase very slowly (Hamlett, 1999, 2005). As apex predators occupying the top of the marine food web, many cartilaginous fish species are also naturally rare compared with other fish species but have a vital role in maintaining the balance of marine ecosystems. Their biological characters make them susceptible to population depletion as a result of anthropogenic activity, including unsustainable fisheries supplying local demand or international trade, bycatch, habitat modification and persecution (particularly of species perceived as dangerous to man) (Myers and Worm, 2003).

The IUCN–World Conservation Union Species Survival Commission's Shark Specialist Group is currently assessing global- and regional-extinction risks for all species of sharks and their relatives, including Mediterranean populations. This list is updated annually as new information becomes available and may be consulted on www.redlist.org. The Red List has no legal standing, but is widely used to monitor changes in the status of biodiversity and to set conservation and management priorities. Regional networks of experts are involved in assessing and reassessing the Red List status of species, drawing upon information collected by stock assessment and other research projects within the region (Fowler *et al.*, 2005).

Recognition of the threatened status of sharks and their relatives has been recognized through the addition of several species to national, regional and international species and fisheries conservation and management instruments. A number of species of sharks and rays are listed in the Appendices of the Barcelona Convention for the protection of the marine and coastal environment of the Mediterranean (Protocol concerning Specially Protected Areas and Biological Diversity) and the Bern Convention for the Conservation of European Wildlife and Natural Habitats, which specifically cover populations in the Mediterranean. Other species are listed in the Convention on Migratory Species, the Convention on International Trade in Endangered Species (CITES), and the UN Fish Stocks Agreement. Since some of these lists change fairly regularly readers are advised to consult the appropriate Convention web pages for the most up-to-date information.

It is important to note that the biological vulnerability of sharks^{1/}, recognized in the FAO International Plan of Action for the Conservation and Management of Sharks (FAO IPOA-Sharks, 1998) means that it is important to monitor the status of all species and to ensure that appropriate management measures are introduced in order to guarantee the sustainable use of all shark stocks, not only those which are listed in the Conventions or the IUCN Red List of Threatened Species.

Concerns over the sustainability of shark fisheries led to the development and adoption in 1999 of the FAO IPOA-Sharks, 1998, elaborated within the framework of the Code of Conduct for Responsible Fisheries (FAO, 2000). This voluntary plan urges states to carry out a regular assessment of the status of shark stocks subject to fishing, in order to determine if there is a need for development of a shark plan, and to adopt a national plan of action (Shark-plan) for conservation and management of shark stocks (if their vessels conduct directed fisheries for sharks or if their vessels regularly catch sharks in non-directed fisheries). It also recognizes the importance of international collaboration for the sustainable management of transboundary, straddling, highly migratory and high seas shark stocks, including, where appropriate, the development of subregional or regional shark plans.

The European Union considers that sharks are fish species whose conservation falls within the domain of the Common Fishery Policy, therefore their management should be addressed by measures dictated by the EC for implementation within EU countries. The European Plan of Action, announced at the FAO Committee on Fisheries (COFI) meeting held in Rome in February 2001, is still to be released. Meanwhile, two meetings of the *ad hoc* Elasmobranch's Working Group of the Scientific, Technical and Economic Committee for Fisheries-Subgroup on review of stocks (STECF-SGRST) have been held (2002 and 2003) in order to address elasmobranch fisheries with a view to preparing a Community Plan of Action as requested by the FAO-IPOA Sharks. The draft Italian National Shark Action Plan recognizes the need for regional cooperation in addition to national action for Mediterranean shark species. This was the starting point for Italy's active involvement within the relevant international and regional organizations, such as FAO and UNEP-MAP 2003. This stimulated the formulation of a Mediterranean Action Plan for the conservation and management

of cartilaginous fishes, proposed during meetings of the GFCM-SAC working group on the environment in 2001 and 2002, and accepted by the National Focal Points to the SPA Protocol in 2001. The approved Action Plan was scheduled for adoption in November 2003. It strongly recommended that the representative parties grant urgent legal protection status to a list of priority species assessed as Critically Endangered or as Endangered by the IUCN at the Mediterranean level and urges assessment of the extinction risk to species, such as hammerhead sharks and guitarfishes, for which data are lacking. The representative parties are also asked to develop management programmes for sustainable fisheries for a number of commercially important species, to identify and protect critical habitats and to develop research, monitoring and training programmes.

Although legal instruments for the conservation of some cartilaginous-fish species in the Mediterranean have been in place for over eight years, implementation has not yet followed. For example, species listed under Appendix III of both the Barcelona and the Bern Conventions, which call for the regulation of their exploitation, have continued to decline without any management during this period. There is now a critical need for a concerted action and synergy of both fisheries and environmental agencies throughout the region to ensure the conservation and sustainable use of this vulnerable group, and hence the maintenance of the stability of the Mediterranean ecosystem. Such action should stem from the frameworks of all those institutions whose mandate involves environmental and fisheries policies within the Mediterranean basin and the application of the ecosystem approach and precautionary principle. It should also be mentioned that an Action Plan for the Conservation of Cartilaginous Fishes in the Mediterranean has been proposed (UNEP MAP RAC/SPA, 2003).

Codes for Conservation and Exploitation Status

With the aim of assigning status categories regarding the overall human utilization of sharks, the FAO (Castro *et al.*, 1999) allocated sharks species into two main groups: "exploited" and "not exploited" species. The group "exploited species" is successively divided into five numerical categories. These categories and criteria for inclusion are explained as follows. Unfortunately batoids are not yet considered in the FAO status evaluation.

^{1/} The term "shark" is used here in the sense of the Convention on International Trade in Endangered Species (CITES) and the FAO International Plan of Action for the Conservation and Management of Sharks (IPOA-SHARKS).

A. **Not exploited species:** species that are not currently targeted by fisheries and are not normally found as bycatch of any fisheries.

B. **Exploited species:** species that are directly exploited by fisheries or caught as bycatch.

Category 1: exploited species that cannot be placed in any of the subsequent categories because of lack of data.

Category 2: species pursued in directed fisheries and/or regularly found in bycatch, whose catches have not decreased historically, probably due to their high reproductive potential.

Category 3: species that are exploited by directed fisheries or bycatch and, due to a limited reproductive potential and/or their life history characteristics, are especially vulnerable to overfishing and/or are being fished in their nursery areas.

Category 4: species that show substantial historical declines in catches and/or have become locally extinct.

Category 5: species that have become rare throughout the ranges where they were formerly abundant, based on historical records, catch statistics or experts' reports.

The conservation and exploited status of the Mediterranean Chondrichthyans fish have been discussed in several meetings, UNEP-RAC/SPA in Rome, December 2002 (UNEP 2003), STECF in Brussels, July 2003, (STECF 2003) and IUCN-SSG in San Marino, September 2003 (IUCN 2003). Some other information proceeding from elaborations of the data gathered during national and international surveys (GRUND, MEDITS, project N° 97/50 DG XIV/C1, etc.) (Relini *et al.*, 2000; Bertrand *et al.*, 2000; Megalofonou *et al.*, 2000; Baino *et al.*, 2001).

Some species as *Chimaera monstrosa*, *Galeus melastomus*, *Raja miraletus* and *Raja clavata*, are referred to as having a "stable biomass" in some areas from the exploitation point of view (Abella and Serena, 2005; Serena *et al.*, 2003).

CLASSIFICATION AND SYSTEMATIC ARRANGEMENT

Considering that the purpose of this document is to provide a simple user-friendly guide for species identification, no reference will be found here to dichotomy keys for single species. It is important that the classification used in this guide be defined, as available literature is not always in agreement with this presentation. The classification of this group is still under review as no consensus has been found to reconcile different authors' positions.

For more information and further specific details on the taxonomy and biology of cartilaginous fish species, refer to Tortonese, 1956; Hureau and Monod 1979; Whitehead *et al.*, 1984; Fischer *et al.*, 1987; Fredj and Maurin, 1987; Compagno, 1988, 2005; Nelson, 1994; Shirai, 1996; Mould, 1998. The consultation of FishBase <http://www.fishbase.org> (Froese and Pauly, 2000) proved very useful. The most fundamental references are Compagno's catalogues issued in 1984 and his recent revision partially issued in 2001.

This guide follows the systematic organization proposed by Compagno (1999, 2001) and the classification reflects a cladogram attempt where a new concept of cladistic classification is used. For instance, the batoids are raised to the order (Rajiformes) belonging to the superorder of the Squalomorphi, even if perhaps a more suitable name should be found to indicate both Rajiformes and Squaliformes. At the same time the sawsharks group is raised to the order Pristiophoriformes. So the batoids have been diversely allocated with respect to the previous taxonomic organizations. However, even if this new phylogenetic classification is considered valid, for practical reasons sharks and batoids are described separately in the text.

Taking only modern sharks into consideration, we can adopt the following, simplified classification (the orders with no representatives in the Mediterranean Sea are indicated by an asterisk):

- Class Chondrichthyes (cartilaginous fishes)
 - Subclass Holocephali (chimaeras)
 - Order Chimaeriformes (chimaera and silver sharks)
 - Subclass Elasmobranchii (sharks)
 - Superorder Squalomorphi (squalomorph sharks)
 - Order Hexanchiformes (cow and frilled sharks)
 - Order Squaliformes (dogfish sharks)
 - Order Squatiniformes (angel sharks)
 - Order Pristiophoriformes (sawsharks) *
 - Order Rajiformes (batoids)
 - Superorder Galeomorphi (galeomorph sharks)
 - Order Heterodontiformes (bullhead sharks) *
 - Order Lamniformes (mackerel sharks)
 - Order Orectolobiformes (carpet sharks) *
 - Order Carcharhiniformes (ground sharks)

The species inside the families and in the orders are mentioned in alphabetical order according to genus. For both orders and families, some summary descriptions with their most significant characteristics are included. The current status is described for each single species on an individual sheet where, in addition to a drawing, scientific name and more recent synonyms and significant misidentifications in some important cases, other synthetic information is given, i.e. FAO common names, maximum size, habitat and biology, methods of capture and, when available, exploitation and conservation status. Arrows are superimposed on the drawings to indicate features that help in species identification.

When possible the type of spiral valve which characterizes the intestine of cartilaginous fishes is shown. There are large variations in the anatomy of the spiral valve, three different types have been described: columnar spiral with funnels pointing either backward or forward; spiral ring valve and cylindrical (scroll) valve (Compagno, 1988; Hamlett, 1999).

Local names are not included considering the large number of names used in the various Mediterranean countries. Feeding behaviour is indicated only in some cases. Remarks are indicated for species whose taxonomic status or presences are dubious.

For the purpose of this guide, a number of dubious species have not been considered as valid for the Mediterranean:

- *Carcharhinus leucas* (Valenciennes, 1841) is a doubtful species; it is neither recognized by Compagno nor in this guide.
- *Carcharhinus longimanus* (Poey, 1865) is a doubtful species; it is considered “probable” by Compagno but is not included in this guide.
- *Rhinobatos halavi* (Forsskål, 1775) was recorded by Tortonese (1951a) from the Egyptian part of the Mediterranean Sea but Ben-Tuvia (1966) noted that no specimens of this species were available to confirm its presence in this sea.
- *Torpedo alexandrinsis* Mazhar, 1982 and *Torpedo fuscomaculata* Peters, 1855 are not considered a valid species. *Torpedo alexandrinsis* is known by only five syntypes mentioned in the original paper from Alexandria (Egypt) (Séret, pers. comm.); therefore its taxonomic status is doubtful. The second *Torpedo* species recorded only once in Alexandria (Egypt) needs to be verified and is probably synonymous of *Torpedo* (*Torpedo*) *marmorata* (Séret, pers. comm.).
- The species *Raja africana* Capapé, 1977, previously defined as dubious by Compagno (1999), is now indicated as not a valid species (syntypes lost).

– *Raja rondeleti* Bougis, 1959 is probably based on an abnormal specimen of *R. fullonica* and considered as *Leucoraja* cfr. *fullonica*. The taxonomic status of four specimens from French and Italian coasts is doubtful (Séret, pers. comm.).

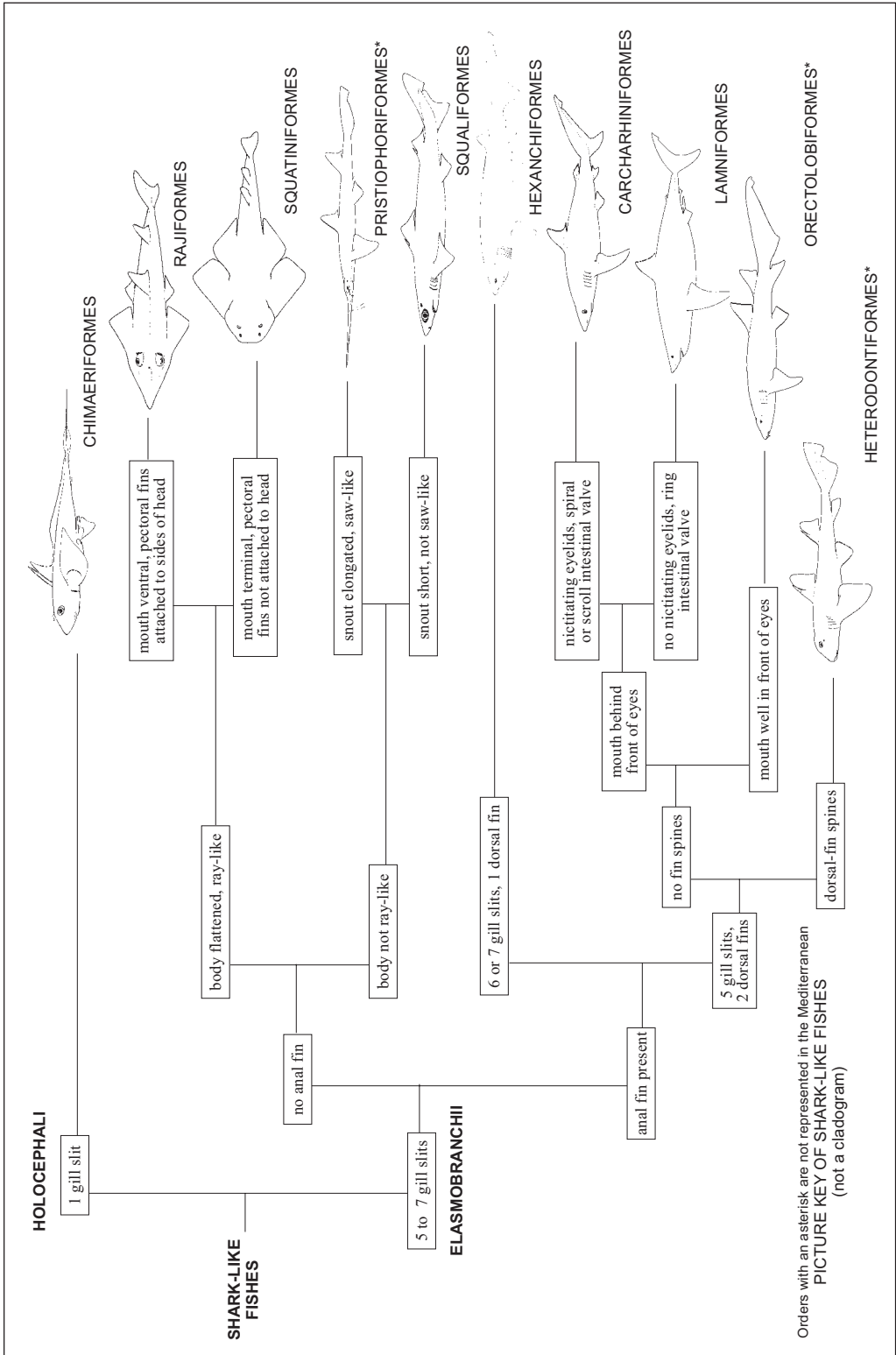
How to use this guide

Readers are advised to follow these simple steps in order to successfully identify any sharks, batoids and chimaera found in the region. First, refer to the picture key of shark-like and batoid fishes then read carefully through the description of key characters listed under each order and family. Use the illustrations of the families under each order or suborder only as a secondary aid in making certain that the right order or suborder has been found. Then proceed to narrow down the family of the specimen using the illustration for each family and key characters annotated in each illustration; make use of the size data included for each family. Once the family has been identified, move to the corresponding pages where the species for that family are illustrated. These illustrations and the key characters indicated should allow proper identification for all sharks and batoids known for the area.

In a few cases the considered area is wider than the Mediterranean basin; it refers to the CLOFNAM area (Hureau and Monod, 1979): Mediterranean and northeastern Atlantic between 30° and 80° of Latitude north, -30° and +60° of Longitude, Azores and Madeira Islands included (Whitehead *et al.*, 1984).

Although *Chimaera monstrosa* (Linnaeus, 1758) is represented in the sharks cladogram as indicated by Compagno, 2001, the species account is inserted at the end of the guide to follow the taxonomic sense. Eventhough there is only one chimaera species in the Mediterranean Sea, the author thought it was important to illustrate the technical terms and description of this order.

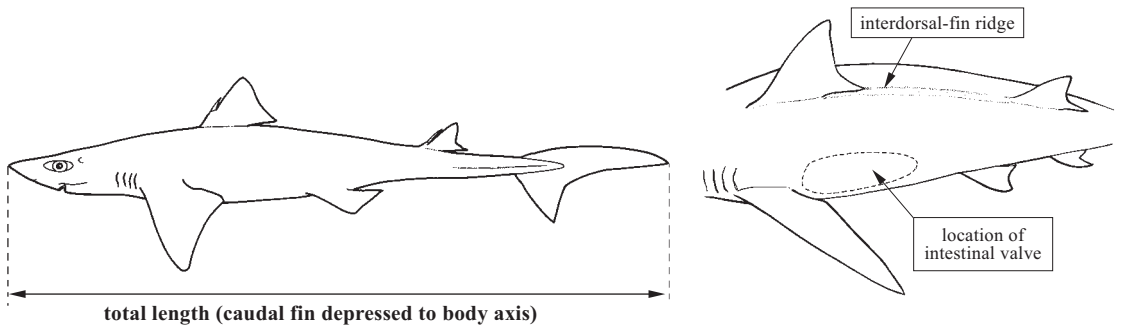
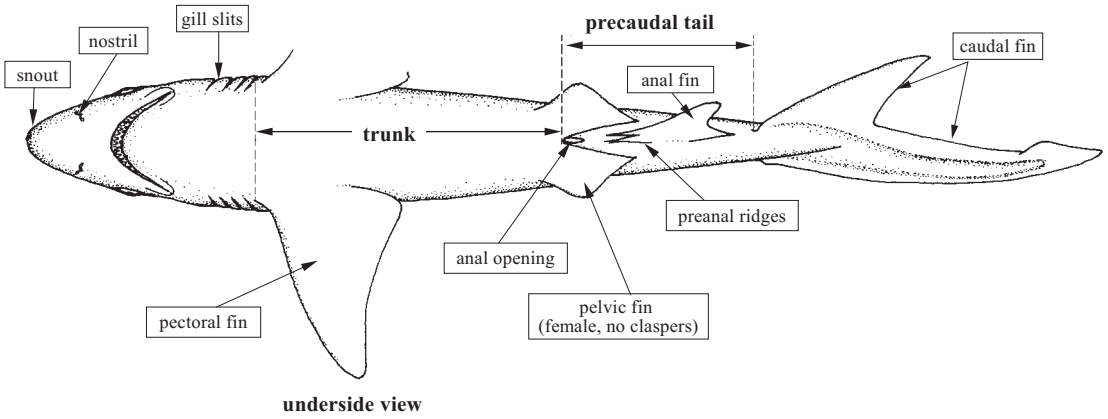
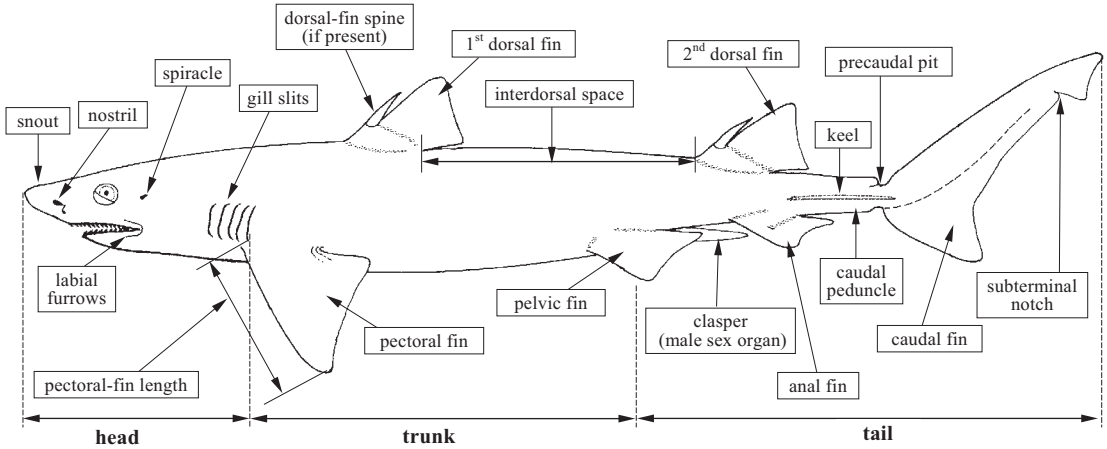
SHARKS AND CHIMAERAS

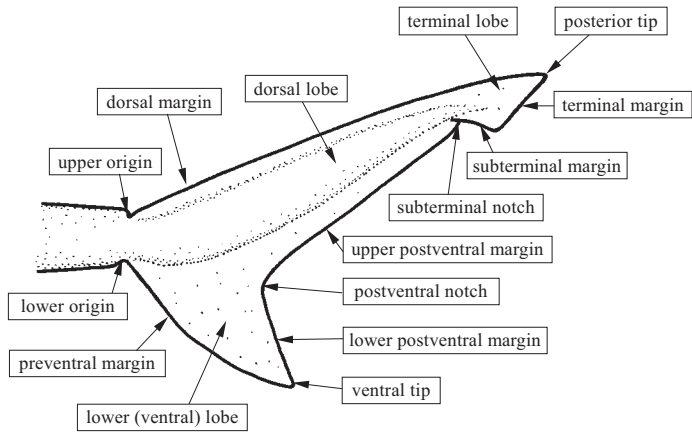


(from Compagno, 2001)

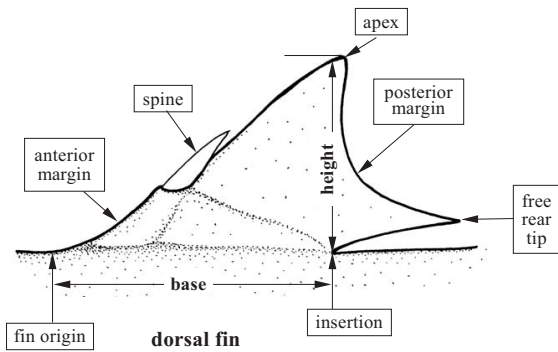
SHARKS

TECHNICAL TERMS AND MEASUREMENTS

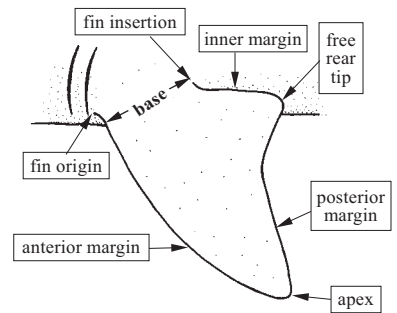




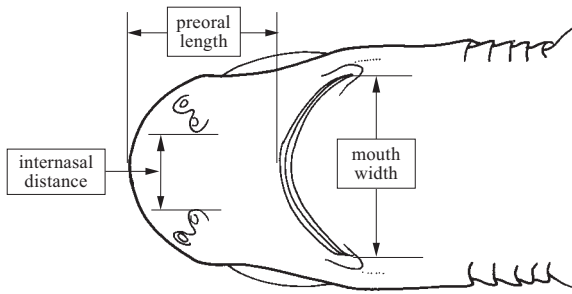
caudal fin



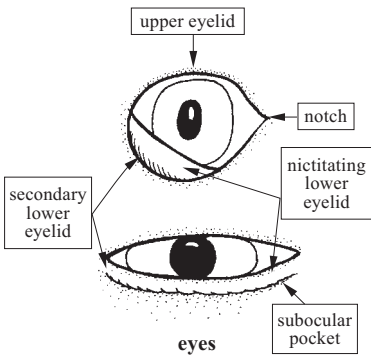
dorsal fin



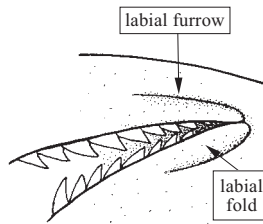
pectoral fin



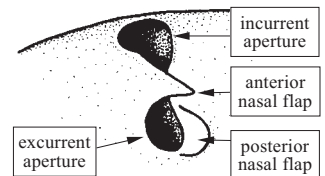
head (ventral view)



eyes



mouth corner



nostril

LIST OF ORDERS, FAMILIES AND SPECIES OCCURRING IN THE AREA

A question mark (?) before the scientific name indicates that presence in the area needs confirmation.

Order **HEXANCHIFORMES**

Family **HEXANCHIDAE**

- Heptranchias perlo*
- Hexanchus griseus*
- Hexanchus nakamurai*

Order **SQUALIFORMES**

Family **ECHINORHINIDAE**

- Echinorhinus brucus*

Family **SQUALIDAE**

- Squalus acanthias*
- Squalus blainvillei*
- ? *Squalus megalops*

Family **CENTROPHORIDAE**

- Centrophorus granulosus*
- ? *Centrophorus uyato*

Family **ETMOPTERIDAE**

- Etmopterus spinax*

Family **SOMNIOSIDAE**

- Centroscymnus coelelepis*
- Somniosus (Rhinoscymnus) rostratus*

Family **OXYNOTIDAE**

- Oxynotus centrina*

Family **DALATIIDAE**

- Dalatias licha*

Order **SQUATINIFORMES**

Family **SQUATINIDAE**

- Squatina aculeata*
- Squatina oculata*
- Squatina squatina*

Order **LAMNIFORMES**

Family **ODONTASPIDIDAE**

- Carcharias taurus*
- Odontaspis ferox*

Family **ALOPIIDAE**

- Alopias superciliosus*
- Alopias vulpinus*

Family **CETORHINIDAE**

- Cetorhinus maximus*

Family **LAMNIDAE**

- Carcharodon carcharias*
- Isurus oxyrinchus*

? *Isurus paucus*

- Lamna nasus*

Order **CARCHARHINIFORMES**

Family **SCYLIORHINIDAE**

- Galeus atlanticus*
- Galeus melastomus*
- Scyliorhinus canicula*
- Scyliorhinus stellaris*

Family **TRIAKIDAE**

- Galeorhinus galeus*
- Mustelus asterias*
- Mustelus mustelus*
- Mustelus punctulatus*

Family **CARCHARHINIDAE**

- Carcharhinus altimus*
- Carcharhinus brachyurus*
- Carcharhinus brevipinna*
- Carcharhinus falciformis*
- Carcharhinus limbatus*
- ? *Carcharhinus melanopterus*
- Carcharhinus obscurus*
- Carcharhinus plumbeus*

? *Galeocerdo cuvier*

- Prionace glauca*
- Rhizoprionodon acutus*

Family **SPHYRNIDAE**

- Sphyrna (Mesozygaena) tudes*
- Sphyrna (Sphyrna) lewini*
- Sphyrna (Sphyrna) mokarran*
- Sphyrna (Sphyrna) zygaena*

GUIDE TO THE ORDERS AND FAMILIES OF SHARKS OCCURRING IN THE AREA

Order HEXANCHIFORMES – Cow sharks

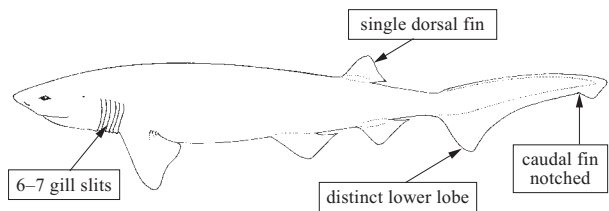
Six or seven pairs of gill slits; single dorsal fin without spines; anal fin present; eyes without nictitating eyelid; spiracle present but small.

HEXANCHIDAE

Page 24

Cow sharks

Three species in the Mediterranean. Mostly demersal, from shallow depths to 1 800 m. Size to 480 cm TL.



Order SQUALIFORMES – Dogfish sharks

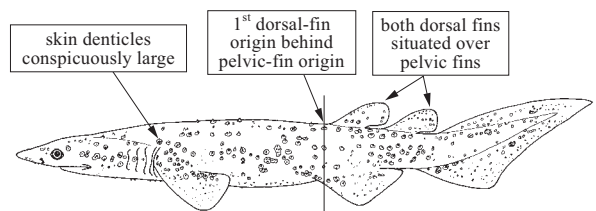
Five pairs of gill slits; two dorsal fins often with spines on the anterior margin; mouth extending behind front of eyes; no anal fin, caudal peduncle without precaudal pits. Seven families and nine valid species (occurrence of other two species to be confirmed).

ECHINORHINIDAE

Page 25

Bramble sharks

One genus with one species. Demersal sluggish sharks, mostly in cold and deep waters to at least 100 m; occasionally found in the upper shelf. Size to 270 cm TL.

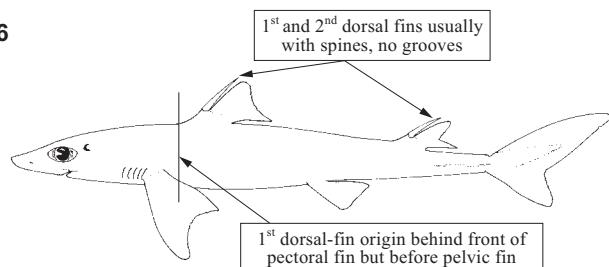


SQUALIDAE

Page 26

Dogfishes

One genera and two species, plus one dubious. Demersal and pelagic to depths of over 2 000 m. Size to 160 cm TL.

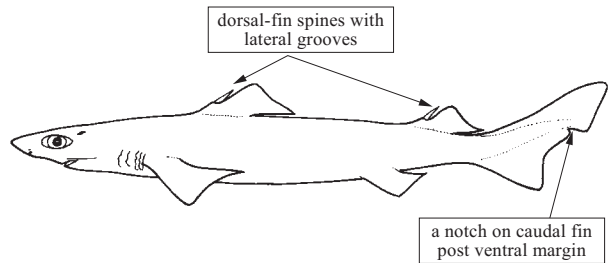


CENTROPHORIDAE

Page 27

Gulper sharks

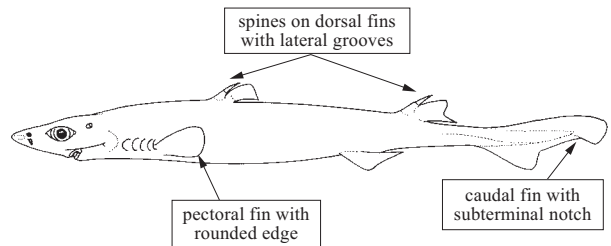
Primarily demersal deep-water sharks from depths of 200 to at least 2 400 m. Size to 170 cm TL. Two species in the region, but one questionable.

**ETMOPTERIDAE**

Page 28

Lantern sharks

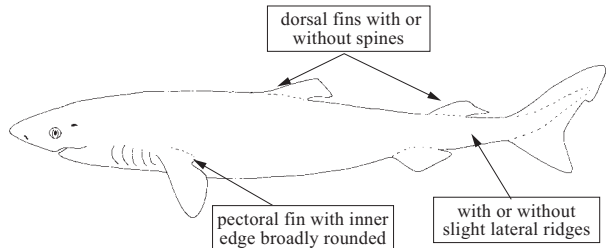
Benthic on shelf and slopes, from depths of 70 to 2 000 m, mostly 200 m. Size to 45 cm TL. One species in the region.

**SOMNIOSIDAE**

Page 29

Sleeper sharks

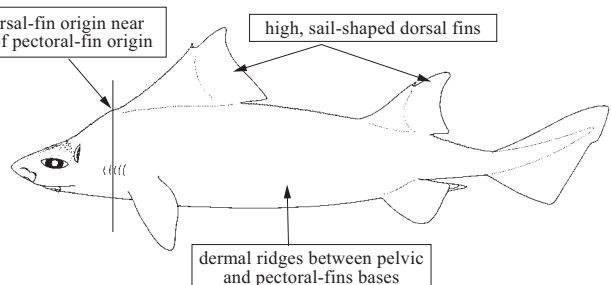
Benthic on slopes. Size up to 100 cm TL. Two genera and two species in the Mediterranean.

**OXYNOTIDAE**

Page 30

Rough sharks

Body very high and compressed, triangular in cross-section with longitudinal ridges, one species. Demersal from depths of 60 to 660 m. Size up to 150 cm TL.

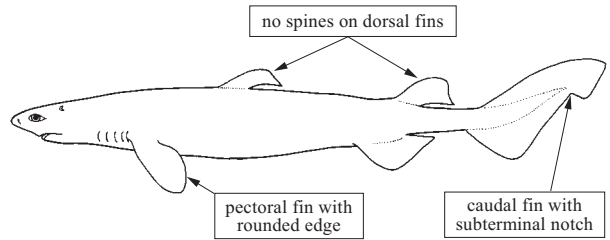


DALATIIDAE

Page 30

Kitefin sharks (Liche sharks)

Benthic to mesopelagic, primarily on slopes at depths of 300 to 600 m. Size to 180 cm TL. One species present in the area.



Order SQUATINIFORMES – Angel sharks

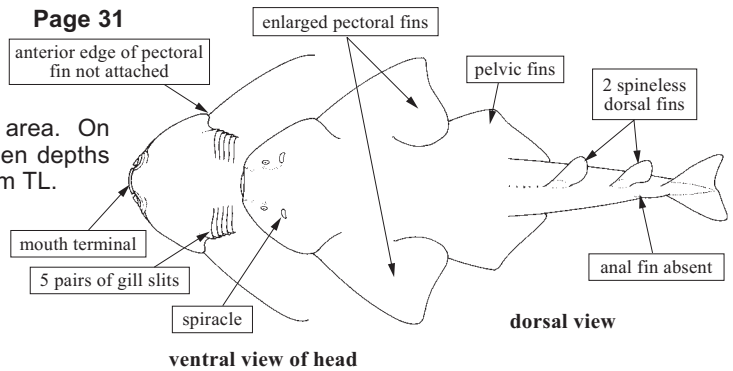
Five pairs of gill slits; eyes dorsal; two spineless dorsal fins; pectoral fins greatly expanded along sides of head as a free triangular lobe; no anal fin. Only one family and three species in the Mediterranean.

SQUATINIDAE

Page 31

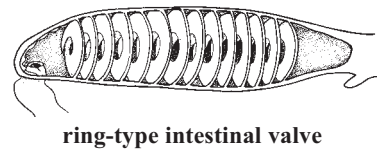
Angel sharks

Three species occurring in the area. On continental slope and shelf between depths of 30 and 500 m. Size up to 190 cm TL.



Order LAMNIFORMES – Mackerel sharks

Five pairs of gill slits; two dorsal fins without spines; anal fin present; no movable nictitating eyelid; mouth strongly arched and extending behind front of eyes; ring-type intestinal valve. Four families reported in the Mediterranean.

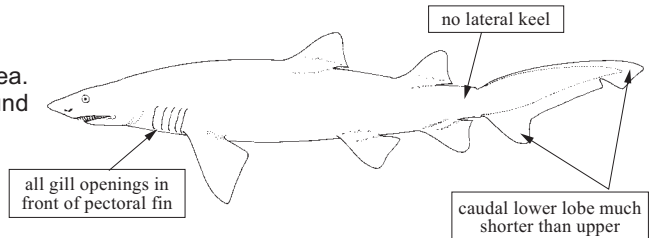


ODONTASPIDIDAE

Page 32

Sand tiger sharks

Two species in the Mediterranean area. Neritic, in shallow water down to around 200 m. Size to 320 cm TL.

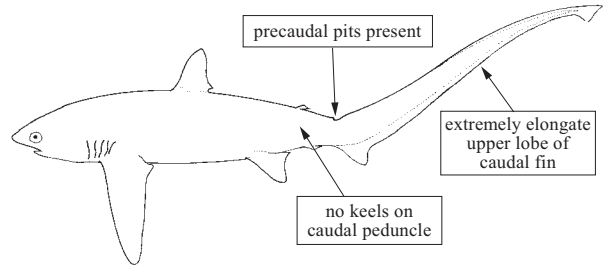


ALOPIIDAE

Page 33

Thresher sharks

Two species reported in the Mediterranean. Oceanic and coastal, to depths of 500 m. Size to 610 cm TL.

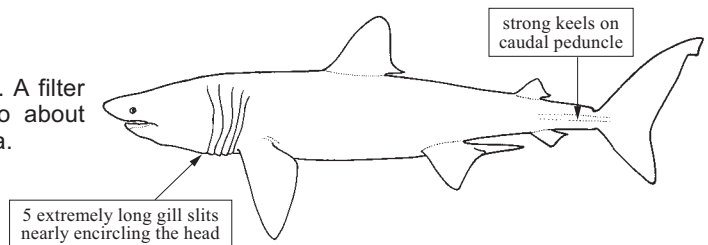


CETORHINIDAE

Page 34

Basking sharks

Coastal and on the continental shelf. A filter feeder, gills slits elongated. Size to about 1 000 cm TL. One species in the area.

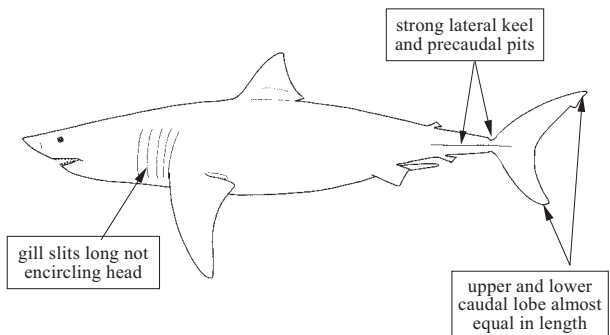


LAMNIDAE

Page 35

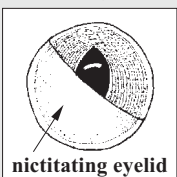
Mackerel sharks

Three species present in the Mediterranean. The presence of a fourth species, *Isurus paucus*, in the area needs confirmation. Coastal and epipelagic, from the surface to depths of around 1 200 m. Size probably up to 700 cm TL. Gillrakers absent.

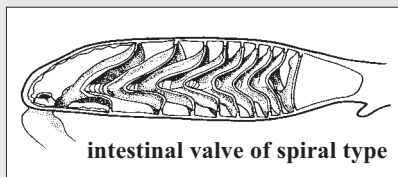


Order CARCHARHINIFORMES – Ground sharks

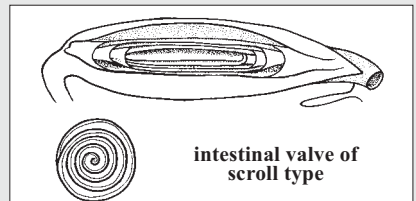
Five pairs of gill slits, gillrakers absent; two dorsal fins without spines; anal fin present; movable nictitating eyelid; mouth arched and extending behind anterior edge of eyes; intestinal valve of scroll or spiral type. Four families in the Mediterranean.



nictitating eyelid



intestinal valve of spiral type



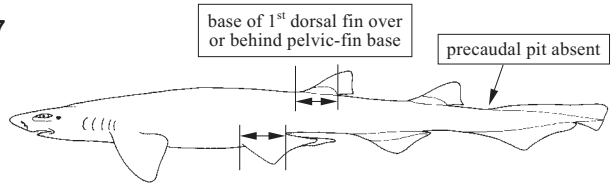
intestinal valve of scroll type

SCYLIORHINIDAE

Page 37

Catsharks

Four species and two genera. Mostly demersal from shallow inshore waters to 700 m. Size to 120 cm TL. Spiral type intestinal valve.

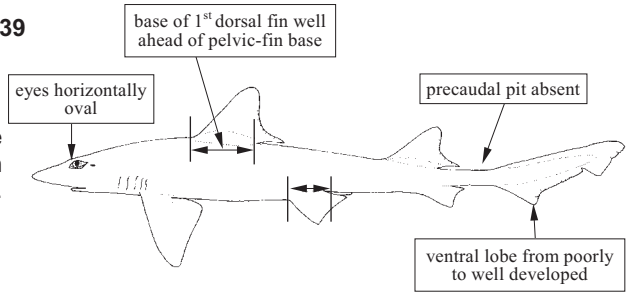


TRIAKIDAE

Page 39

Hound sharks

Four species and two genera in the Mediterranean. From inshore shallow depth to around 400 m. Size to about 200 cm TL. Spiral Intestinal valve.

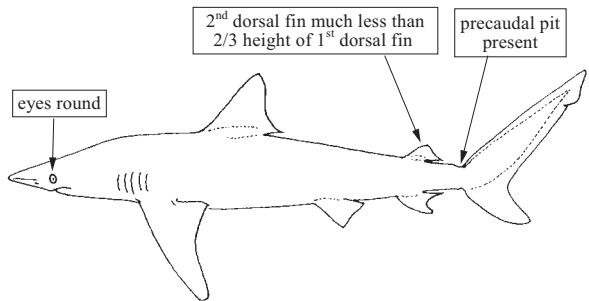


CARCHARHINIDAE

Page 41

Requiem sharks

Nine species and three genera. Other two species and one genus are doubtful. The presence of *Galeocerdo cuvier* needs confirmation. Neritic and oceanic pelagic to depth of 600 m. Size to 400 cm TL.

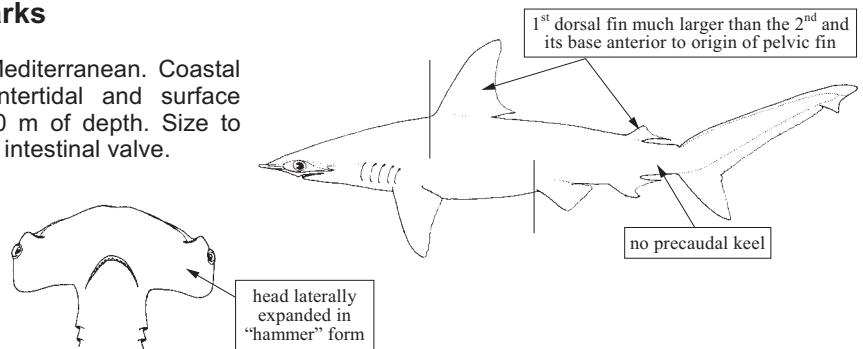


SPHYRNIDAE

Page 46

Hammerhead sharks

Four species in the Mediterranean. Coastal and oceanic, from intertidal and surface waters to at least 260 m of depth. Size to 600 cm TL. Scroll type intestinal valve.



underside of head

HEXANCHIDAE

Heptranchias perlo (Bonnaterre, 1788)

(Plate I, 1)

Frequent synonyms / misidentifications: *Heptranchias cinereus* (Gmelin, 1789) / None.

FAO names: En – Sharpnose seven-gill shark; Fr – Requin perlon; Sp – Cañabota bocadulce.

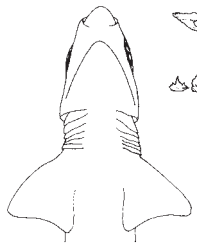
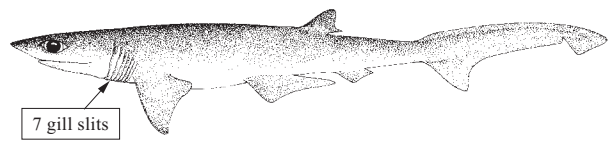
Size: From 100 to 140 cm TL.

Habitat and biology: Usually benthic at depths from 50 to 400 m, occasionally to 1 000 m, often near shelf edge, in warm waters. Ovoviviparous, litters of about 9 to 20.

Distribution: Whole Mediterranean, absent in the north Adriatic and Black Sea and north African coasts. Atlantic northern limit in the Bay of Biscay. Probably worldwide in tropical and subtropical waters but nowhere common.

Importance to fisheries: Seldom caught as bycatch by bottom trawls and longlines in epibathyal and bathyal grounds.

Conservation and exploitation status: FAO, B1; IUCN, Near Threatened; Mediterranean, threatened.



upper and lower teeth

underside of head

Hexanchus griseus (Bonnaterre, 1788)

(Plate I, 2)

HEXANCHIDAE

Frequent synonyms / misidentifications: *Notidanus griseus* Cuvier, 1817 / None.

FAO names: En – Bluntnose six-gill shark; Fr – Requin gris; Sp – Cañabota gris.

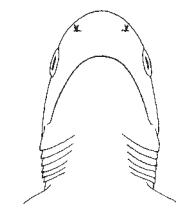
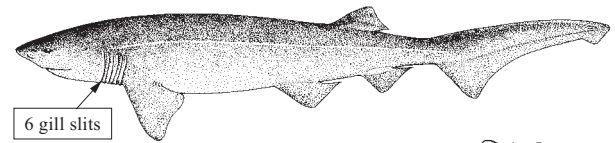
Size: To 500 cm TL.

Habitat and biology: Usually deep and cool waters, close to the bottom (100–1 000 m), possibly rising to surface at night. Ovoviviparous, litters of about 20 to 50, possibly up to 100 embryos.

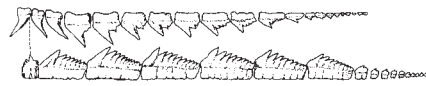
Distribution: Common in the Mediterranean, absent in the north Adriatic and Black Sea. Reaching southern Norway and Iceland (rare) in the Atlantic. Probably worldwide in temperate or subtropical seas.

Importance to fisheries: Rarely caught as bycatch by bottom trawls and longlines in epibathyal and bathyal grounds. Occasional a target species.

Conservation and exploitation status: FAO, B3; IUCN, Near Threatened; Mediterranean, vulnerable species.



upper and lower frontal teeth



upper and lower teeth

underside of head

***Hexanchus nakamurai* Teng, 1962**

(Plate I, 3)

HEXANCHIDAE

Frequent synonyms / misidentifications:
Hexanchus vitulus Springer and Waller, 1969 / None.

FAO names: **En** – Bigeyed six-gill shark; **Fr** – Requin vache; **Sp** - Cañabota ojigrande.

Size: To 180 cm TL.

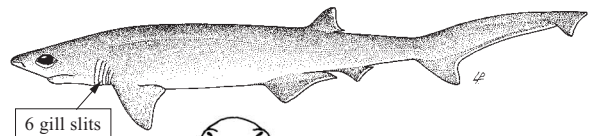
Habitat and biology: Probably mesopelagic to benthic in deep waters (90–350 m), possibly with intrusion to surface or shallow waters. In warmer seas than *H. griseus*. Ovoviviparous, litters of up to 26 embryos.

Distribution: Rare in the Mediterranean. Spottily distributed in warmer waters of North Atlantic. Elsewhere, Florida, Gulf of Mexico, Caribbean area and southwestern Indian Ocean.

Importance to fisheries: Occasional bycatch of bottom trawls and longlines.

Conservation and exploitation status: FAO, A; IUCN, Data Deficient (Near Threatened eastern Pacific); Mediterranean, occasional, vulnerable species.

Remarks: *Hexanchus vitulus* Springer and Waller, 1969 is considered synonym by Whitehead *et al.*, 1984, dubious in the sheets of FAO (Fischer *et al.*, 1987) and valid species in Compagno (1984). Tortonese (1986) considers the possibility to change the name from *vitulus* to *nakamurai* as suggested by Teng (1962). Recently Compagno (pers. comm.) confirmed the species but changed its name to *H. nakamurai*.



6 gill slits



underside of head



upper and lower frontal teeth



upper and lower teeth

ECHINORHINIDAE***Echinorhinus brucus* (Bonnaterre, 1788)**

(Plate I, 4)

Frequent synonyms / misidentifications:
Squalus spinosus Gmelin, 1789 / None.

FAO names: **En** – Bramble shark; **Fr** – Squalé bouclé; **Sp** – Tiburón de clavos.

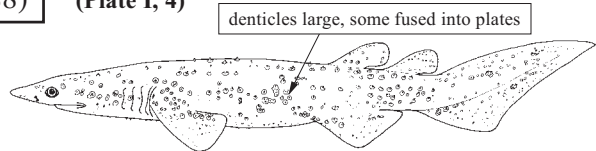
Size: To 310 cm TL.

Habitat and biology: Occasionally on shallow shelf areas, mostly deep waters (200–900 m), also found inshore in cold-temperate areas. Probably ovoviviparous.

Distribution: Present in the Mediterranean, absent in the Black Sea, very rare in the Levantine basin. Present in all oceans.

Importance to fisheries: Bycatch in trawl fisheries.

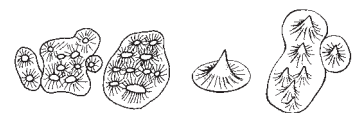
Conservation and exploitation status: FAO, B4; IUCN, Data Deficient, to be urgently investigated; Mediterranean, occasional, rare species.



denticles large, some fused into plates



underside of head



dermal denticles



upper and lower frontal teeth

SQUALIDAE

***Squalus acanthias* Linnaeus, 1758**

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Spotted spiny dogfish; **Fr** – Aiguillat commun; **Sp** – Mielga.

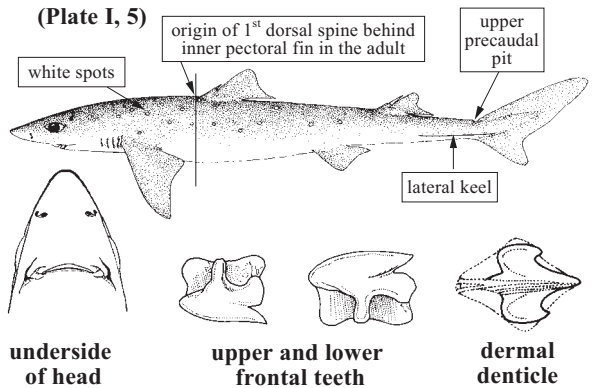
Size: From 60 to 105 cm TL.

Habitat and biology: Benthic on soft bottoms (10–700 m), rather sluggish but migratory, often forming large schools. Ovoviviparous, one litter every two years with 1 to 20 embryos, gestation from 18 to 22 months.

Distribution: Mediterranean and Black Sea, southern Greenland, Iceland and the Murmansk coasts south to Madeira, Morocco and Canary Islands, western Atlantic and North Pacific.

Importance to fisheries: Caught by trawls, longlines and gillnets. In western Mediterranean areas the stock has collapsed.

Conservation and exploitation status: FAO, B4; IUCN, Near Threatened, to be urgently investigated, vulnerable in the North Atlantic and Mediterranean.

***Squalus blainvillei* (Risso, 1826)**

(Plate I, 6)

SQUALIDAE

Frequent synonyms / misidentifications: *Squalus fernandinus* (non Molina, 1782) / None.

FAO names: **En** – Longnose spurdog; **Fr** – Aiguillat-coq; **Sp** – Galludo.

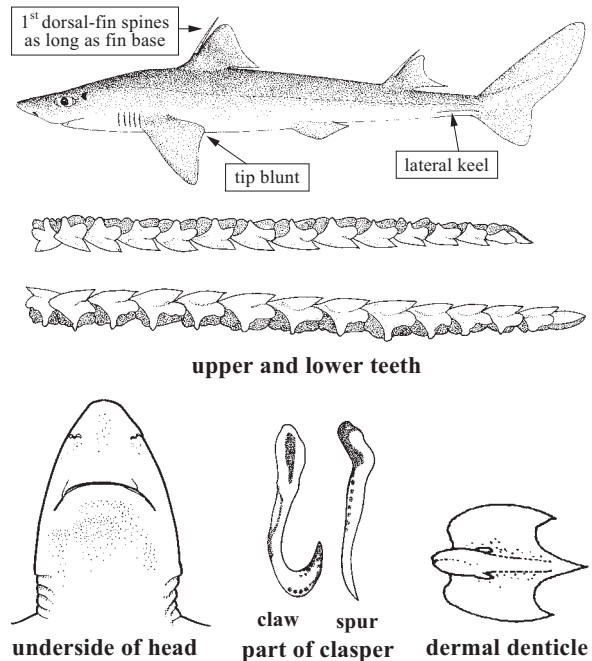
Size: From 50 to 80 cm; occasionally to 110 cm TL.

Habitat and biology: Benthic at intermediate depth (15–720 m). Demersal on the continental shelf, living in tropical and temperated waters. Ovoviviparous, one litter every two years with 4 to 9 embryos.

Distribution: Mediterranean and Black Sea. Present in south Atlantic, Pacific and Indian oceans.

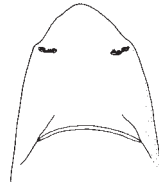
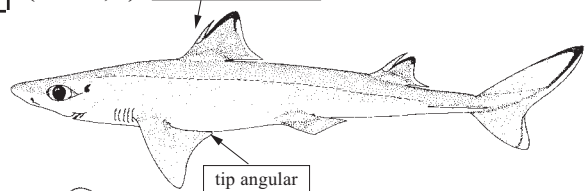
Importance to fisheries: Incidentally caught by bottom trawls and longlines.

Conservation and exploitation status: FAO, B1; Mediterranean, vulnerable species.



***Squalus cf. megalops* (Macleay, 1881)**

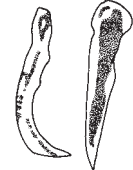
(Plate I, 7)

1st dorsal-fin spine shorter than fin base**SQUALIDAE****Frequent synonyms / misidentifications:**
None / None.**FAO names:** En – Shortnose spurdog;
Fr – Aiguillat nez court; Sp – Galludo ñato.**Size:** To 70 cm TL.**Habitat and biology:** Common dogfish of temperate and tropical seas, forming dense and large schools, found on the continental shelf and upper slope at depths between 50 and 750 m. Ovoviviparous, males maturing at about 42 cm, females at 55 cm TL; gestation period of about two years. Usually 3 young per litter.

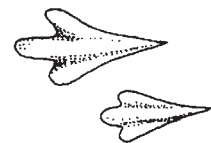
underside of head



upper and lower teeth



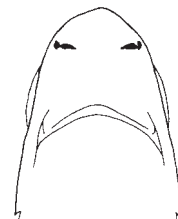
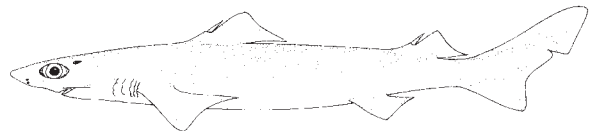
claw spur part of clasper

Distribution: Rare in the Mediterranean, absent in the Black Sea. Eastern Atlantic, Western Indian Ocean and Western Pacific.**Importance to fisheries:** Incidentally caught by bottom trawls.**Conservation and exploitation status:** FAO, B1; IUCN, Least Concern (Australia only); Mediterranean, rare species.

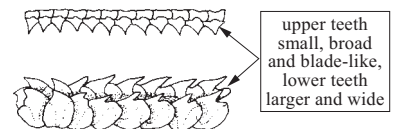
dermal denticles

Remarks: Described for the Mediterranean Sea by Muñoz-Chapuli *et al.*, 1984, has been considered very difficult to identify and for this reason indicated as *S. cf. megalops*.**CENTROPHORIDAE*****Centrophorus granulosus* (Bloch and Schneider, 1801)**

(Plate I, 8)

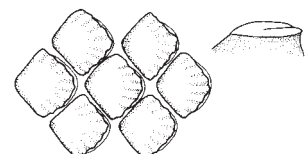
Frequent synonyms / misidentifications:
None / None.**FAO names:** En – Gulper shark; Fr – Squale-chagrin commun; Sp – Quelvacho.**Size:** To 120 cm TL.**Habitat and biology:** Benthic over the upper slope (150–1 400 m) mostly at depths between 200 and 500 m. Ovoviviparous with 1 or 2 embryos.**Distribution:** Mediterranean, absent in the Black Sea, northwestern Atlantic, eastern Atlantic, Western Indian Ocean.**Importance to fisheries:** Bycatch in bottom trawl, longline and game fisheries.**Conservation and Exploitation Status:** FAO, B1; IUCN, Vulnerable (A1abd+2d); Mediterranean, vulnerable species.

underside of head



upper and lower teeth

upper teeth small, broad and blade-like, lower teeth larger and wide



dermal denticles

***Centrophorus uyato* (Rafinesque, 1810)**

(Plate I, 9)

CENTROPHORIDAE

Frequent synonyms / misidentifications:
None / *Centrophorus granulosus* (Bloch and Schneider, 1801).

FAO names: **En** – Little gulper shark; **Fr** – Petit squalé-chagrin; **Sp** – Quelva.

Size: To 100 cm usually from 40 to 90 cm TL.

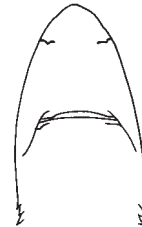
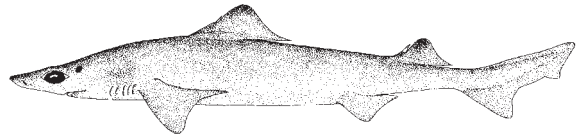
Habitat and biology: Benthic on outer shelf and upper slope at depths from 50 to 1 400 m, usually 500 to 1 000 m. Ovoviviparous usually with only one young, born at 40 cm TL. Females mature at 75 to 89 cm, males at 81 to 94 cm TL.

Distribution: Rare in the western Mediterranean, dubious in the east and absent in the Black Sea. East Atlantic, north of Gibraltar. Elsewhere, south of Angola; Gulf of Mexico, southern Mozambique and Taiwan Province of China.

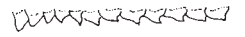
Importance to fisheries: Occasionally caught as bycatch by deep bottom trawls and longlines.

Conservation and exploitation status: FAO, B1; IUCN, Data Deficient; Mediterranean, rare species.

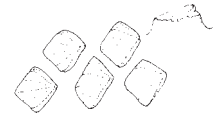
Remarks: Probably the holotype has to be related to a still undetermined species of *Squalus* (Compagno, pers. comm.). Nevertheless it seems there is another valid species of *Centrophorus* in the Mediterranean Sea other than *C. granulosus*. This genus needs revision worldwide (Lloris and Rucabado, 1998).



underside of head



upper and lower teeth



dermal denticles

ETMOPTERIDAE***Etmopterus spinax* (Linnaeus, 1758)**

(Plate II, 10)

Frequent synonyms / misidentifications:
None / None.

FAO names: **En** – Velvet belly; **Fr** – Sagre commun; **Sp** – Negrito.

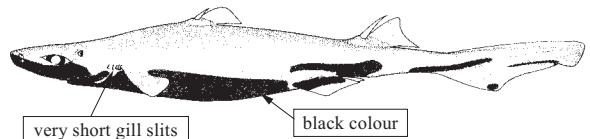
Size: To 60 cm TL.

Habitat and biology: Benthic on shelf and slopes (100–1 000 m) mostly below 300 m. Feeds on fishes, cephalopods and other invertebrates. Ovoviviparous, with 6 to 20 embryos, young born at 9 to 11 cm.

Distribution: Western Mediterranean, absent in the north Adriatic, and Black Sea. Rarely occurring in the North Sea. Northward to Iceland and Norway, south to Senegal and southern Africa.

Importance to fisheries: Bycatch in bottom trawl and longline fisheries (discarded).

Conservation and exploitation status: FAO, B1; Mediterranean, stable biomass.



upper and lower teeth



dermal denticles

SOMNIOSIDAE

***Centroscymnus coelolepis* Bocage and Capello, 1864** (Plate II, 11)**Frequent synonyms / misidentifications:**

None / None.

FAO names: **En** – Portuguese dogfish;
Fr – Pailona commun; **Sp** – Pailona.

Size: To 120 cm TL.

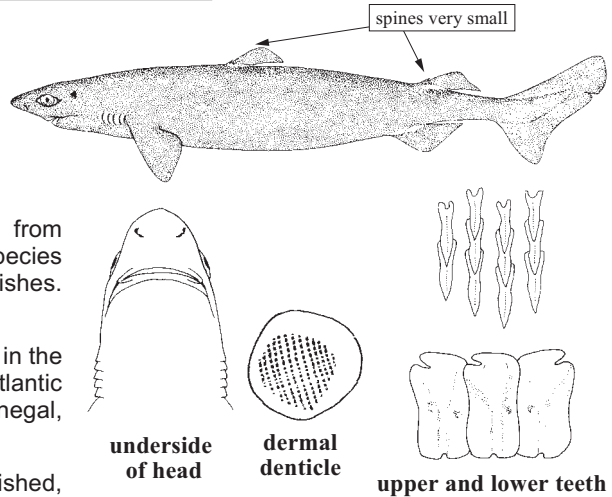
Habitat and biology: Deepwater benthic from depths of 400 to 2 700 m; this sluggish species prefers cold waters of 12–13°C. Feeds on fishes. Ovoviviparous with 13 to 16 embryos.

Distribution: Western Mediterranean, absent in the east except in the Cretan Sea. Neighbouring Atlantic from Morocco to Iceland, south to Senegal, northwestern Atlantic.

Importance to fisheries: Not commercially fished, accidentally caught as bycatch in bottom trawls.

Conservation and exploitation status: FAO, B1; IUCN, Near threatened; Mediterranean, vulnerable species.

Remarks: The occurrence of this species in the eastern Mediterranean was recorded using video cameras: between 1 500 and 2 500 m in the Cretan Sea and between 2 300 and 3 850 m in the Rhodos Basin (Priede and Bagley, 2000).

***Somniosus (Rhinoscymnus) rostratus* (Risso, 1810)** (Plate II, 12)

SOMNIOSIDAE

Frequent synonyms / misidentifications:*Somniosus bauchotae* Quérou, 1976 / None.

FAO names: **En** – Little sleeper shark;
Fr – Laimargue de la Méditerranée;
Sp – Tollo boreal.

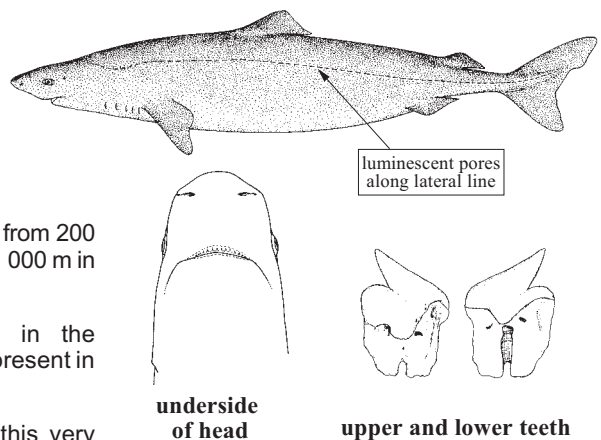
Size: To 100 cm TL.

Habitat and biology: Benthic on slope in depths from 200 to 1 000 m; prefers bathyal grounds deeper than 1 000 m in the western Mediterranean basin. Ovoviviparous.

Distribution: Western Mediterranean, rare in the Levantine Basin, absent in the Black Sea. Also present in Madeira.

Importance to fisheries: No information on this very rare shark.

Conservation and exploitation status: FAO, B1; IUCN, to be urgently investigated; Mediterranean, occasional/rare species.



OXYNOTIDAE

Oxynotus centrina (Linnaeus, 1758)

(Plate II, 13)

Frequent synonyms / misidentifications:
None / None.

FAO names: **En** – Angular rough shark;
Fr – Centrine commune; **Sp** – Cerdo marino.

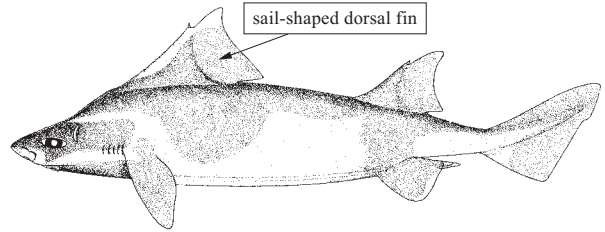
Size: To 150 cm, usually from 50 to 70 cm TL.

Habitat and biology: Benthic on continental shelf and upper slope from depths of 60 to 660 m. Ovoviviparous with probably 7 or 8 young. Maturing at about 50 to 70 cm.

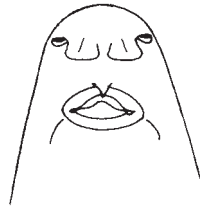
Distribution: Whole Mediterranean, absent in the Black Sea. Neighbouring Atlantic. Southward to South Africa, rarely to northern waters.

Importance to fisheries: Bycatch in deep-sea trawling.

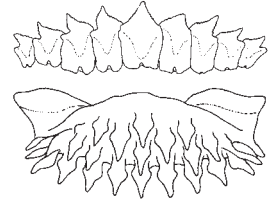
Conservation and exploitation status: FAO, B1; IUCN, to be urgently investigated; Mediterranean, threatened species.



sail-shaped dorsal fin



underside of head



upper and lower teeth

DALATIIDAE

Dalatias licha (Bonnaterre, 1788)

(Plate II, 14)

Frequent synonyms / misidentifications:
Scymnorhinus licha (Bonnaterre, 1788) / None.

FAO names: **En** – Kitefin shark; **Fr** – Squale liche; **Sp** – Carochó.

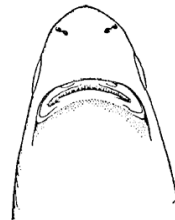
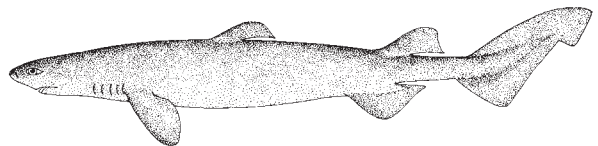
Size: From 150 to 180 cm TL.

Habitat and biology: Benthic to mesopelagic from 90 to 1 000 m. Mainly on slopes at depths of 300 to 600 m. Ovoviviparous, 3 to 16 juveniles born at 30 cm. Maturing at 77 to 121 cm for males and 117 to 159 cm for females.

Distribution: Mediterranean, absent in the north Adriatic and Black Sea. In general in the Atlantic and Pacific temperate zones.

Importance to fisheries: Bycatch in bottom trawl fishery.

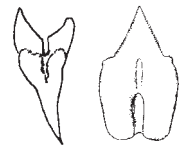
Conservation and exploitation status: FAO, B3; IUCN, Data Deficient; Near Threatened for the North Eastern Atlantic populations. To be urgently investigated; Mediterranean, vulnerable species.



underside of head



fringes lips



upper and lower teeth



dermal denticles

SQUATINIDAE

Squatina aculeata Dumeril, in Cuvier, 1817

Frequent synonyms / misidentifications:
None / None.

FAO names: **En** – Sawback angelshark;
Fr – Ange de mer épineux; **Sp** – Angelote espinudo.

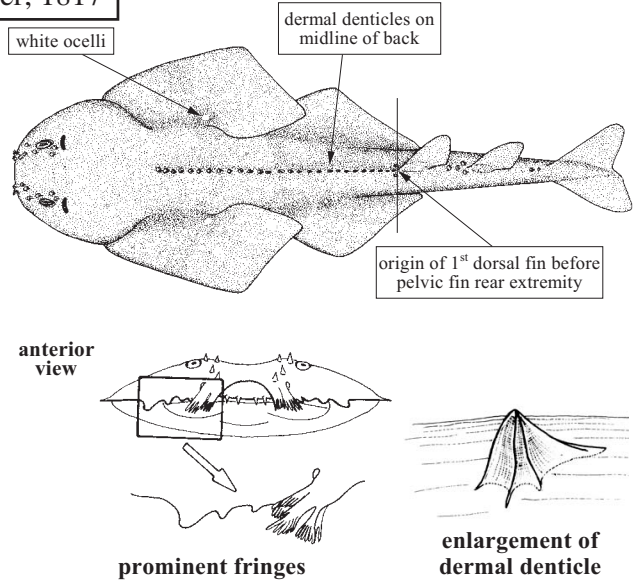
Size: From 150 to 180 cm TL..

Habitat and biology: Prefers temperate and tropical waters and muddy bottoms at depths from 50 to 500 m. Ovoviviparous, maturing at 124 cm.

Distribution: Mediterranean, rare in the eastern, absent in the Black Sea. Atlantic, Morocco to Angola.

Importance to fisheries: Caught with bottom trawls and probably by other artisanal fishing gears.

Conservation and exploitation status: FAO, B1; IUCN, to be urgently investigated; Mediterranean, threatened species.

*Squatina oculata* Bonaparte, 1840

Frequent synonyms / misidentifications:
None / None.

FAO names: **En** – Smoothback angelshark;
Fr – Ange de mer de Bonaparte; **Sp** – Pez angel.

Size: To 150 cm TL.

Habitat and biology: Bottom dweller on sand and mud from depths of 20 to 560 m, more common between 50 and 100 m. Ovoviviparous, males maturing at 140 cm.

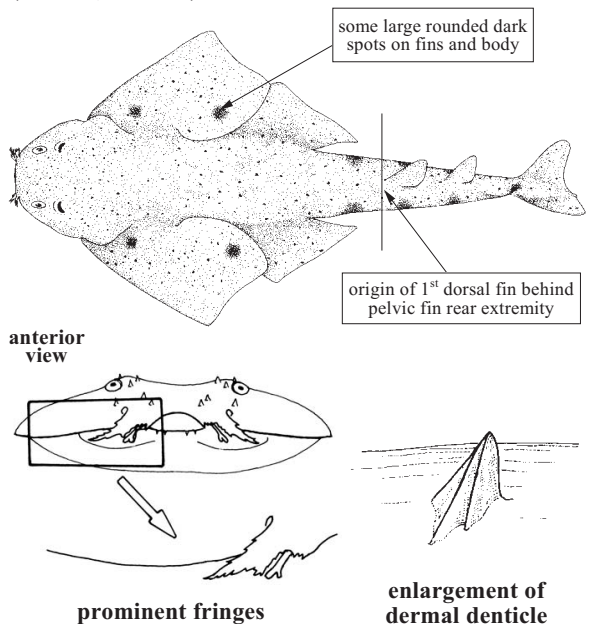
Distribution: Whole Mediterranean, absent in the Black Sea. Atlantic, Morocco to Angola.

Importance to fisheries: Caught by bottom trawls and probably other artisanal fishing gears.

Conservation and exploitation status: FAO, B1; IUCN, Endangered (A1abd+A2d); Mediterranean, threatened species.

(Plate II, 15 & 16)

SQUATINIDAE



Squatina squatina* (Linnaeus, 1758)*SQUATINIDAE**

Frequent synonyms / misidentifications: *Squatina vulgaris* Risso, 1810; *S. angelus* Blainville, 1816 / None.

FAO names: **En** – Angelshark; **Fr** – Ange de mer commun; **Sp** – Angelote.

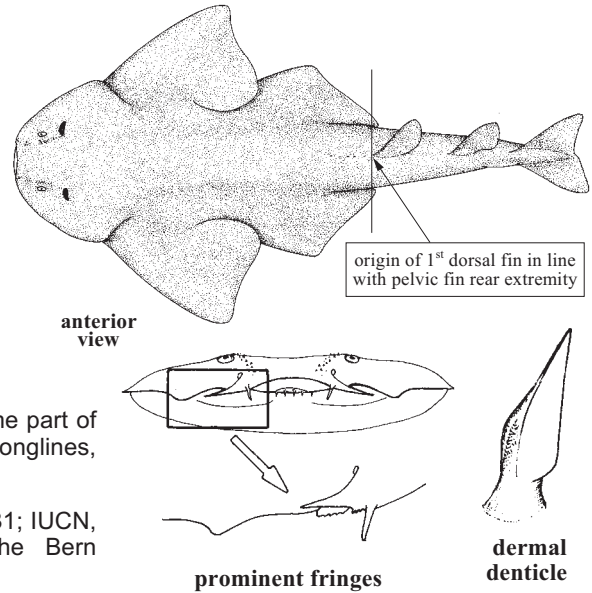
Size: To 250 cm TL.

Habitat and biology: A bottom dweller on sand or mud at moderate depth (5–100 m).

Distribution: Whole Mediterranean including Black Sea, Atlantic from southern North Sea to Mauritania.

Importance to fisheries: Target species in some part of the Mediterranean, usually caught by gillnet, and longlines, probably also caught by bottom trawls.

Conservation and exploitation status: FAO, B1; IUCN, Vulnerable (A1abcd+A2d) Appendix 3 of the Bern Convention; Mediterranean, vulnerable species.

**ODONTASPIDIDAE*****Carcharias taurus* Rafinesque, 1810**

(Plate III, 17 & 18)

Frequent synonyms / misidentifications: *Eugomphodus taurus* (Rafinesque, 1810); *Odontaspis taurus* (Rafinesque, 1810) / None.

FAO names: **En** – Sandtiger shark; **Fr** – Requin taureau; **Sp** – Toro bacota.

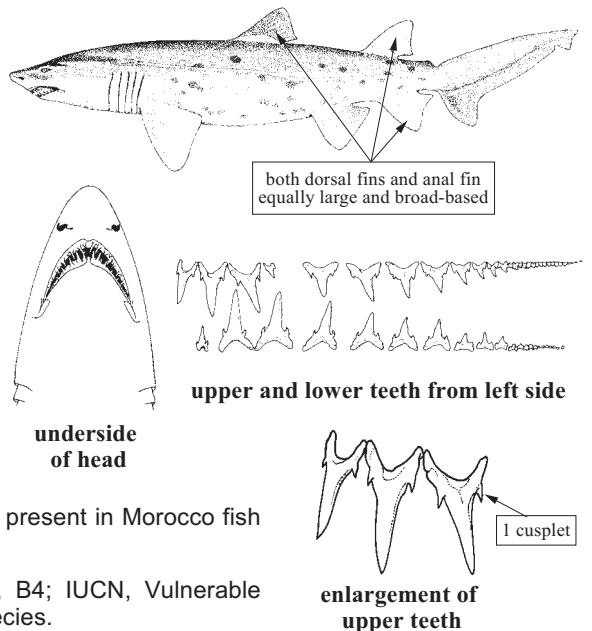
Size: To about 320 cm TL.

Habitat and biology: Mostly on or close to bottom; coastal species, entering bays. From the surface to 200 m, mainly less than 70 m; migratory. Ovoviviparous usually with two young; size at birth 95 to 105 cm; males mature at 220 to 257 cm, females at 220 to 300 cm.

Distribution: Whole Mediterranean, absent in the Black Sea. Widely distributed throughout the oceans.

Importance to fisheries: Bycatch, occasionally present in Morocco fish markets.

Conservation and exploitation status: FAO, B4; IUCN, Vulnerable (A1ab+A2d); Mediterranean, occasional/rare species.



***Odontaspis ferox* (Risso, 1810)**

(Plate III, 19)

ODONTASPIDIDAE

Frequent synonyms / misidentifications: *Odontaspis herbsti* Whitly, 1950; *Carcharias ferox* Risso, 1826 / None.

FAO names: **En** – Smalltooth sand tiger; **Fr** – Requin féroce; **Sp** – Solrayo.

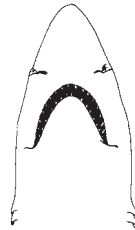
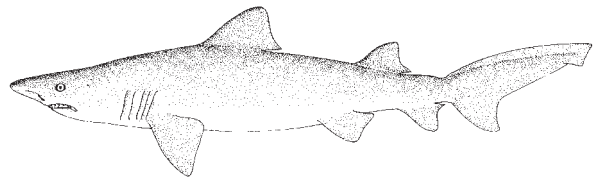
Size: To about 410 cm TL.

Habitat and biology: Epipelagic or benthic on continental and insular shelves and slopes from depths of 15 to 420 m. Probably ovoviviparous; males mature at 275 cm, females at 350 cm; size at birth about 105 cm.

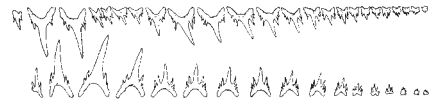
Distribution: Whole Mediterranean, absent in the Black Sea. Atlantic, Pacific and Indian Oceans temperate zones.

Importance to fisheries: Occasionally caught as bycatch with gillnets, lines and trawls.

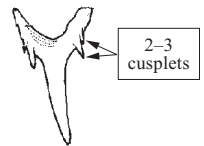
Conservation and exploitation status: FAO, A; IUCN, Data Deficient (Vulnerable for Australia); Mediterranean, occasional/rare species.



underside of head



upper and lower teeth



enlargement of tooth

ALOPHIIDAE

***Alopias superciliosus* (Lowe, 1839)**

(Plate III, 20)

Frequent synonyms / misidentifications: *Alopias profundus* Nakamura, 1935 / None.

FAO names: **En** – Bigeye thresher; **Fr** – Renard à gros yeux; **Sp** – Zorro ojón.

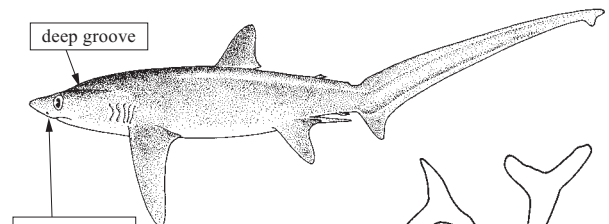
Size: From about 400 to 460 cm TL.

Habitat and biology: Epipelagic, oceanic and coastal in warm-temperate and tropical waters, in depth to 1 000 m. Ovoviviparous with litter of 2 to 4 embryos; size at birth probably about 65 to 106 cm.

Distribution: Western Mediterranean. Neighbouring Atlantic, temperate and tropical areas of all oceans.

Importance to fisheries: Bycatch of tuna longlines fisheries.

Conservation and exploitation status: FAO, B3; IUCN, Data Deficient; Mediterranean, occasional/rare species.



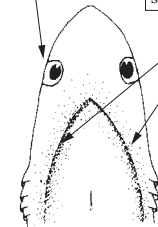
deep groove

eyes large, reaching the dorsal surface of head

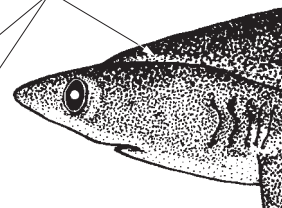


upper and lower teeth

strong grooves



underside of head

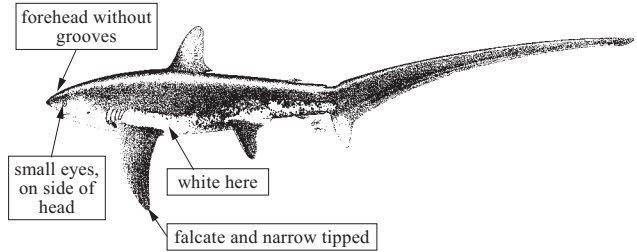


lateral view of head

***Alopias vulpinus* (Bonnaterre, 1788)**

(Plate III, 21)

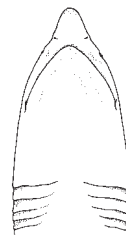
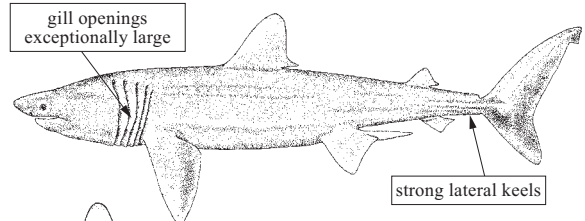
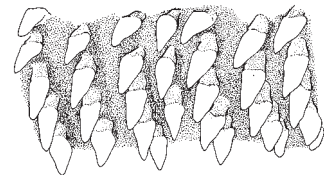
ALOPIIDAE

Frequent synonyms / misidentifications:*Squalus vulpinus* Bonnaterre, 1788;
S. vulpes Gmelin, 1789 / None.**FAO names:** En – Thresher shark;
Fr – Renard de mer; Sp – Zorro.**Size:** From about 420 to 560 cm, possibly
610 cm TL for females.**Habitat and biology:** Epipelagic, oceanic and
coastal in cold-temperate to tropical waters from the surface to 360 m.
Migratory. Ovoviviparous with litters of 2 to 7 embryos; size at birth from 115 to
150 cm TL. Males mature at 350 cm, females at 400 cm. Reproduction in
summer.**Distribution:** Whole Mediterranean, absent in the Black Sea. Atlantic, Pacific
and Indian Oceans temperate zones.**Importance to fisheries:** Bycatch of tuna fisheries caught by game fishery.**Conservation and Exploitation Status:** FAO, B4; IUCN, Data Deficient; Near threatened for Californian
population; Mediterranean, vulnerable species.

upper and lower teeth

CETORHINIDAE***Cetorhinus maximus* (Gunnerus, 1765)**

(Plate III, 22 & 23)

Frequent synonyms / misidentifications:*Squalus maximus* Gunnerus, 1765 / None.**FAO names:** En – Basking shark; Fr – Pélerin;
Sp – Peregrino.**Size:** Males up to 900 cm, females to about
980 cm TL.**Habitat and biology:** Epipelagic, oceanic,
towards the coast mainly in spring and summer.
Migratory, probably linked to feeding and
reproduction. Feeds on minute crustaceans.
Viviparous; apparently about 160 cm at birth;
gestation period assumed long (3.5 years).**Distribution:** Whole Mediterranean, rare in the
eastern basin absent in the Black Sea. Elsewhere
in boreal, temperate and warm temperate seas.**Importance to fisheries:** Bycatch of artisanal fisheries or occasionally in pelagic trawls.**Conservation and exploitation status:** FAO, B3; IUCN, Vulnerable (A1ad+A2d); Endangered (A1ad)
for NE Atlantic and N Pacific; Mediterranean, Vulnerable species. Appendix 2 of Berne Convention;
Appendix 2 of Barcelona Convention. Also listed in CITES Appendix II.underside
of head

upper teeth

LAMNIDAE

***Carcharodon carcharias* (Linnaeus, 1758)**

(Plate IV, 24)

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Great white shark; **Fr** – Grand requin blanc; **Sp** – Jaqueton blanco.

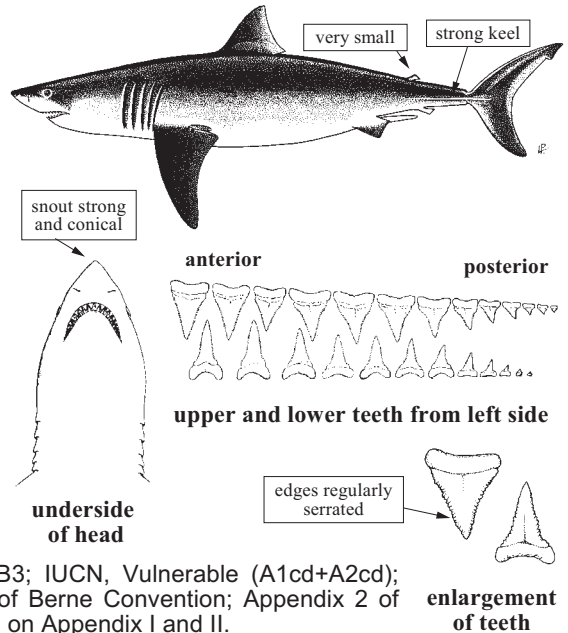
Size: To 650 cm, generally from 300 to 600 cm TL.

Habitat and biology: Epipelagic, coastal and offshore, from surfaces to 1 300 m. Viviparous, mature at about 400 cm with 9 or 10 embryos from 60 to 140 cm at birth.

Distribution: Whole Mediterranean, absent in the Black Sea. Almost anywhere else in temperate oceans, rarely found in tropical waters.

Importance to fisheries: Bycatch in tuna traps. Bottom set trammel nets positioned may catch large sized individuals. Nowadays limited to mainly “recreational” fisheries for the jaws, teeth and fins.

Conservation and exploitation status: FAO, B3; IUCN, Vulnerable (A1cd+A2cd); Mediterranean, Vulnerable species. Appendix 2 of Berne Convention; Appendix 2 of Barcelona Convention. Proposed for CITES listing on Appendix I and II.



***Isurus oxyrinchus* Rafinesque, 1810**

(Plate IV, 25)

LAMNIDAE

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Shortfin mako; **Fr** – Requin-taupe bleu; **Sp** – Marrajo dentuso.

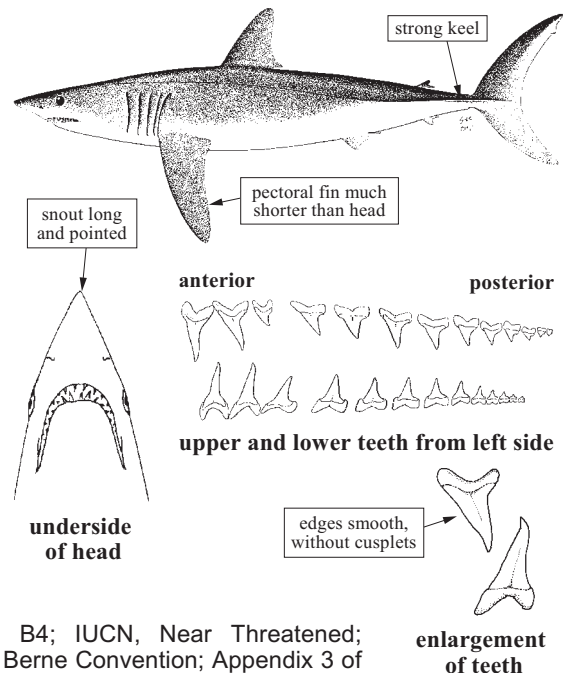
Size: To 400 cm, generally from 300 to 370 cm TL.

Habitat and biology: Pelagic, coastal and oceanic, occurring at or near the surface or deeper, down to 400 m. Ovoviviparous with 1 to 6 (rarely 10) young; size at birth from 60 to 70 cm. Males mature at 180 to 284 cm, females at 280 to 394 cm.

Distribution: Whole Mediterranean, absent in the Black Sea; cosmopolitan in temperate and tropical waters of Atlantic, Pacific and Indian Ocean.

Importance to fisheries: Caught mainly in tuna longline fisheries and occasionally by the swordfish fishery using longlines and driftnets.

Conservation and exploitation status: FAO, B4; IUCN, Near Threatened; Mediterranean, Vulnerable species. Appendix 3 of Berne Convention; Appendix 3 of Barcelona Convention. Proposed for CITES listing on Appendix I and II.



***Isurus paucus* Guitart Manday, 1966**

(Plate IV, 26)

LAMNIDAE

Frequent synonyms / misidentifications: *Isurus alatus* Garrick, 1967 / None.

FAO names: En – Longfin mako; Fr – Petit requin-taube; Sp – Marrajo carite.

Size: To about 290 cm TL.

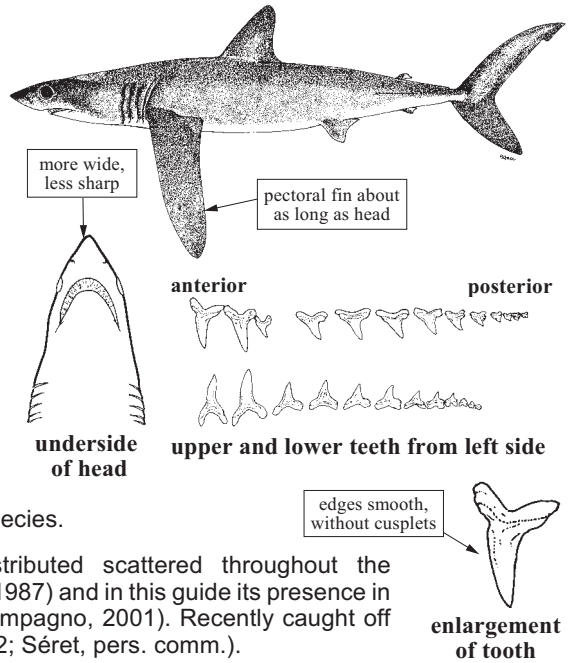
Habitat and biology: Pelagic. Ovoviviparous, number of young usually 2 with size at birth 92 cm. Males mature at 245 cm, females at 245 to 280 cm.

Distribution: Rare in the Mediterranean. Elsewhere in warm waters of Atlantic, Pacific and Indian oceans.

Importance to fisheries: Bycatch tuna and swordfish fisheries.

Conservation and exploitation status: FAO, B3; IUCN, Data Deficient; Mediterranean, Rare species.

Remarks: It is a circumtropical species, distributed scattered throughout the Mediterranean Sea. It is not included in Bauchot, (1987) and in this guide its presence in the Mediterranean is considered as probable (Compagno, 2001). Recently caught off Algeria (Hemida, 2000; Hemida and Capapé, 2002; Séret, pers. comm.).



***Lamna nasus* (Bonnaterre, 1788)**

(Plate IV, 27)

LAMNIDAE

Frequent synonyms / misidentifications: None / None.

FAO names: En – Porbeagle; Fr – Requin-taube commun; Sp – Marrajo sardinero.

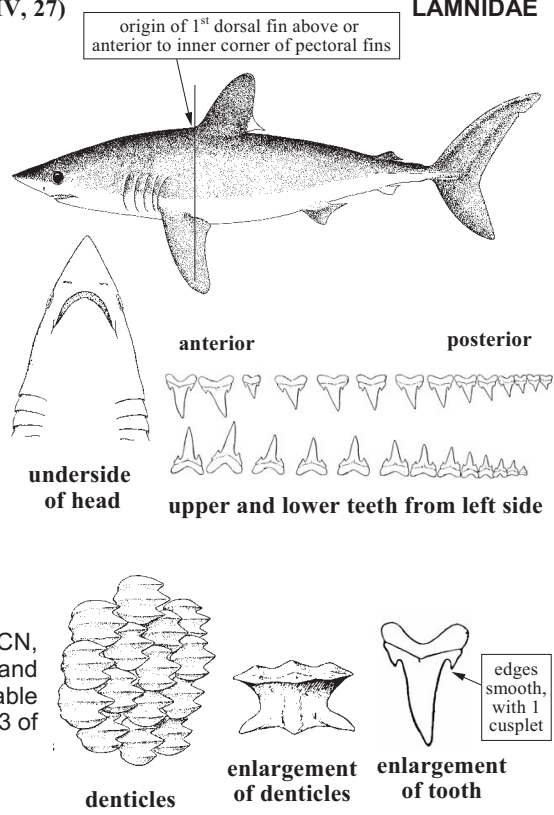
Size: To over 300 cm, generally from 100 to 260 cm TL.

Habitat and biology: Epipelagic, coastal and oceanic, occurring in deep midwaters at depths of 200 to 700 m (usually 370 m) occasionally also on or close to the surface. Ovoviviparous with few young (1–5); size at birth from 50 to 75 cm. Females mature at 150 to 220 cm, males 220 to 260 cm.

Distribution: Whole Mediterranean, absent in the Black Sea. Temperate waters of Northern and Southern Hemisphere.

Importance to fisheries: Heavily fished as bycatch of pelagic fisheries, drifting lines and longlines targeting tuna and swordfish especially in the past in northeastern Atlantic and the Mediterranean.

Conservation and exploitation status: FAO, B4; IUCN, Near Threatened; vulnerable (A1bd) for NE Atlantic and Low Risk/cd for NW Atlantic; Mediterranean, Vulnerable species. Appendix 3 of Berne Convention; Appendix 3 of Barcelona Convention.



SCYLIORHINIDAE

Galeus atlanticus (Vaillant, 1888)

(Plate IV, 28)

SCYLIORHINIDAE

Frequent synonyms / misidentifications: *Pristiurus atlanticus* Vaillant, 1888 / *Galeus melastomus* (Rafinesque, 1810).

FAO names: **En** – Atlantic catshark; **Fr** – Chien atlantique; **Sp** – Pintarroja atlántica.

Size: From about 34 to 44 cm TL.

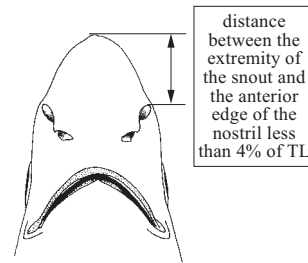
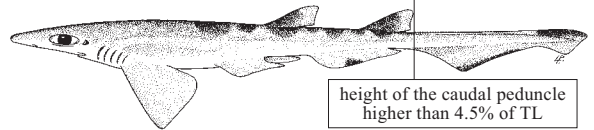
Habitat and biology: Bathydemersal from 400 m to 600 m. Males matures at 38 cm, females at 40 cm.

Distribution: Mediterranean, only in the Alboran Sea. Eastern-central Atlantic, northwest coast of Morocco.

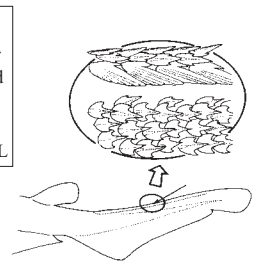
Importance to fisheries: Caught as bycatch by bottom trawls and artisanal fisheries.

Conservation and exploitation status: Mediterranean, rare species.

Remarks: *Galeus atlanticus* has been well described by Muñoz-Chapuli and Perez-Ortega (1985) for a very restricted area (Alboran Sea). Previously considered as synonymous of *G. melastomus* it is a valid species but needs more study.



underside of head



caudal upper edge with small denticles



dermal denticle



lower teeth

***Galeus melastomus*** Rafinesque, 1810

(Plate IV, 29)

SCYLIORHINIDAE

Frequent synonyms / misidentifications: *Scyllium melanostomus* Bonaparte, 1834 / *Galeus atlanticus* (Vaillant, 1888).

FAO names: **En** – Blackmouth catshark; **Fr** – Chien espagnol; **Sp** – Pintarroja bocanegra.

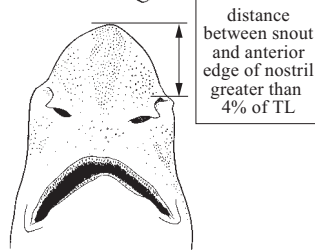
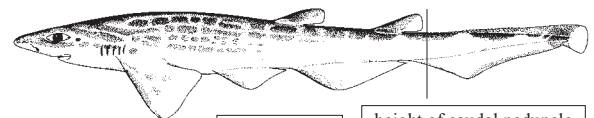
Size: Up to 52 cm, usually from 20 to 40 cm TL.

Habitat and biology: Benthic, from upper continental slope at depths of 200 to 1 200 m, mainly at 300 to 400 m. Feeds on bottom-living invertebrates and fishes, also scavenger. Oviparous, spawning all year round with a peak in spring and summer. Males mature at 34 to 42 cm, females 38 to 45 cm.

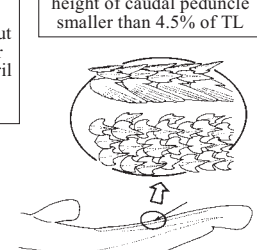
Distribution: Whole Mediterranean, absent in the north Adriatic and Black Sea. Atlantic from the Faeroes to Senegal.

Importance to fisheries: Bycatch of deepsea trawl fisheries.

Conservation and exploitation status: FAO, B1; Mediterranean, very common, its population seems not to be depleted at the moment (stable biomass).



underside of head



caudal upper edge with greater denticles



dermal denticle



lower teeth



***Scyliorhinus canicula* (Linnaeus, 1758)**

(Plate IV, 30)

SCYLIORHINIDAE

Frequent synonyms / misidentifications: *Scyllium canicula* Cuvier, 1817 / *Scyliorhinus stellaris* (Linnaeus, 1758).

FAO names: En – Smallspotted catshark; Fr – Petite roussette; Sp – Pintarroja.

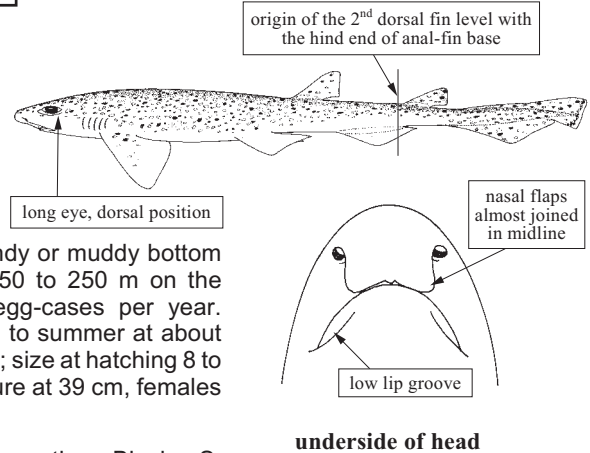
Size: To about 90 cm, generally 20 to 50 cm TL.

Habitat and biology: Benthic over gravelly, sandy or muddy bottom from shallow water up to 550 m, mainly from 50 to 250 m on the continental shelf. Oviparous with 90 to 115 egg-cases per year. Egg-laying (two egg-cases at time) from autumn to summer at about 200 m of depth (depth considered a nursery area); size at hatching 8 to 10 cm TL, 9 to 11 months incubation. Males mature at 39 cm, females at 34 to 45 cm.

Distribution: Whole Mediterranean including the Black Sea. Neighboring Atlantic from Shetlands and Norway to Senegal.

Importance to fisheries: Bottom trawl fishery bycatch, represent an important part of shark landings in Europe.

Conservation and exploitation status: FAO, B1 (though exploited in the Mediterranean); Mediterranean, this species is very common and its population does not seem depleted at the moment.



underside of head

***Scyliorhinus stellaris* (Linnaeus, 1758)**

(Plate IV, 31)

SCYLIORHINIDAE

Frequent synonyms / misidentifications: *Scyllium acanthonotus* Filippi and Verany, 1853 / *Scyliorhinus canicula* (Linnaeus, 1758).

FAO names: En – Nursehound; Fr – Grande roussette; Sp – Alitán.

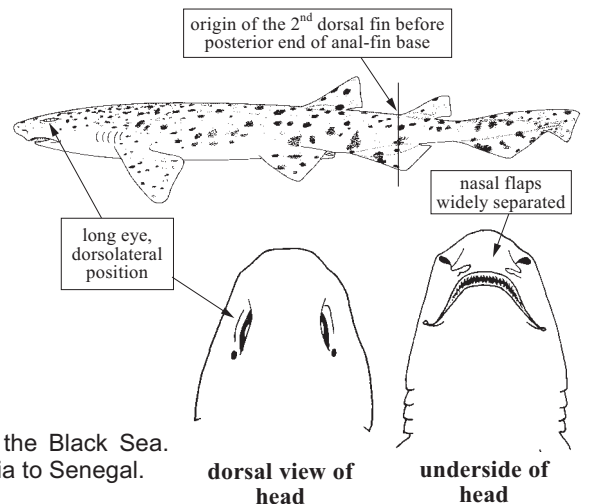
Size: To 162 cm, usually 110 cm TL.

Habitat and biology: Benthic over rough, rocky or coralline grounds from 20 m to about 100 m. Oviparous egg-laying (two egg-cases at time) all year round, mainly from spring to summer. Size at hatching 16 cm TL about 9 months incubation. Males mature at 77 cm, females at 79 cm.

Distribution: Whole Mediterranean, absent in the Black Sea. Atlantic from Shetlands and southern Scandinavia to Senegal.

Importance to fisheries: Bycatch in bottom trawl and artisanal fisheries.

Conservation and exploitation status: FAO, B1; Mediterranean, occasional rare and vulnerable species.



dorsal view of head

underside of head

TRIAKIDAE

Galeorhinus galeus (Linnaeus, 1758)

Frequent synonyms / misidentifications: *Squalus galeus* Linnaeus, 1758 / None.

FAO names: **En** – Tope shark; **Fr** – Requin Hâ; **Sp** – Cazón.

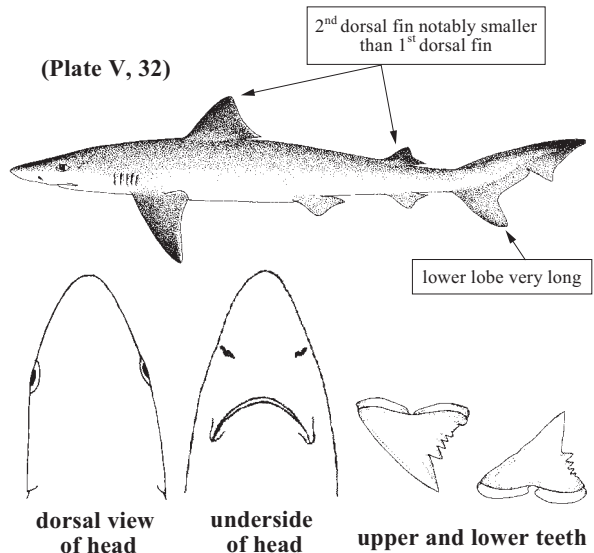
Size: To over 200 cm, common from 80 to 120 cm TL.

Habitat and biology: Coastal to epipelagic, demersal within continental temperate waters from depths of 20 to 470 m. Ovoviviparous, number of young up to 52, common 25 to 35; size at birth 25 to 40 cm TL; gestation period about 10 months. Males mature at 120 to 170 cm, females at 130 to 185 cm TL.

Distribution: Whole Mediterranean but rare, absent in the Black Sea. All oceans temperate waters.

Importance to fisheries: Traditionally caught by gillnets in the northern Adriatic Sea and as bycatch of trammel nets in the same area.

Conservation and exploitation status: FAO, B4; IUCN, Vulnerable (A1bd; A2d); Conservation dependent (Australasia); Mediterranean, vulnerable.



Mustelus asterias Cloquet, 1821

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Starry smoothhound; **Fr** – Émissole tachetée; **Sp** – Musola estrellada.

Size: To 140 cm, common from 50 to 100 cm TL.

Habitat and biology: Coastal, benthic on the continental shelf to 300 m, usually at 100 m. Ovoviviparous, gestation period about 12 months, 7 to 15 young of about 30 cm TL at birth. Males mature at 75 to 85 cm, females at 85 to 96 cm.

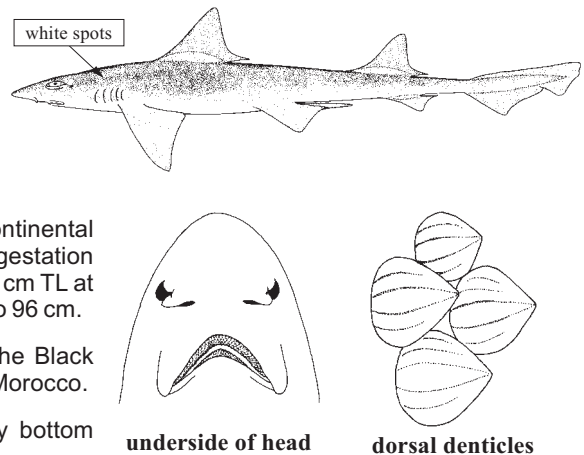
Distribution: Whole Mediterranean, absent in the Black Sea. Atlantic: Shetland, North Sea, Madeira and Morocco.

Importance to fisheries: Frequently caught by bottom trawl fisheries in the Alboran Sea shelf.

Conservation and exploitation status: FAO, B1; IUCN, Least Concern; however in the Mediterranean, vulnerable species, probably disappeared in some areas.

(Plate V, 33)

TRIAKIDAE



Mustelus mustelus (Linnaeus, 1758)

Frequent synonyms / misidentifications: *Mustelus canis* (Mitchell, 1815); *Squalus canis* Mitchell, 1815 / None.

FAO names: **En** – Smoothhound; **Fr** – Émissole lisse; **Sp** – Musola.

Size: To 160 cm, common between 60 and 120 cm TL.

Habitat and biology: Coastal demersal species on the continental shelf and upper slope to 450 m, more frequently from 5 to 50 m. Viviparous, 4 to 15 young, born at cm 35 cm TL. Males mature at 70 to 96 cm, females at 80 cm.

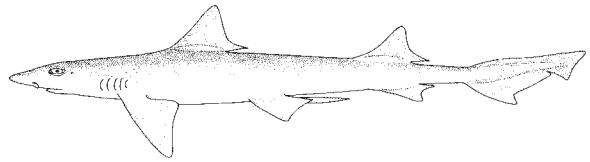
Distribution: Whole Mediterranean, absent in the Black Sea. Eastern Atlantic from British Isles to South Africa.

Importance to fisheries: Traditionally caught by gillnets in the northern Adriatic Sea and as bycatch in bottom trawl fisheries.

Conservation and exploitation status: FAO, B1; Mediterranean, vulnerable species.

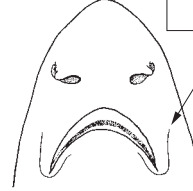
(Plate IV, 34)

TRIAKIDAE

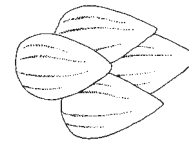


snout fairly pointed

upper lateral lip furrows equal to or slightly larger than lower



underside of head



dorsal denticle



upper and lower teeth

Mustelus punctulatus Risso, 1826

Frequent synonyms / misidentifications: *Mustelus mediterraneo* Quignard and Capapé, 1972 / None.

FAO names: **En** – Blackspotted smoothhound; **Fr** – Émissole pointillée; **Sp** – Musola pimienta.

Size: To 190 cm, common from 70 to 120 cm TL.

Habitat and biology: Coastal benthic on the continental shelf to 200 m. Viviparous, size at birth 38 to 43 cm. Males mature at 50 to 90 cm, females at 60 to 70 cm.

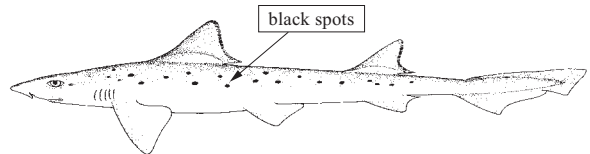
Distribution: Whole Mediterranean, absent in the Black Sea. Eastern Atlantic from British Isles to South Africa.

Importance to fisheries: Bottom trawl fisheries bycatch.

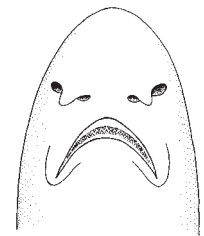
Conservation and exploitation status: FAO, B1; Mediterranean, vulnerable species.

(Plate IV, 35)

TRIAKIDAE



black spots



underside of head

CARCHARHINIDAE

Carcharhinus altimus (Springer, 1950)

(Plate IV, 36)

Frequent synonyms / misidentifications:

Carcharhinus radamae Fourmanoir, 1961 /
Carcharhinus obscurus (Lesueur, 1818);
C. plumbeus (Nardo, 1827).

FAO names: **En** – Bignose shark; **Fr** – Requin babosse; **Sp** – Tiburón baboso.

Size: To 300 cm TL.

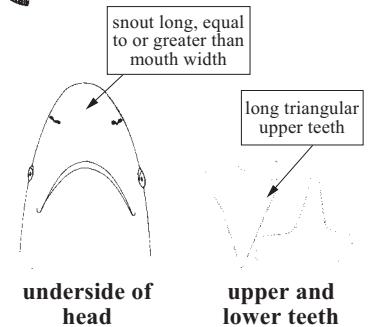
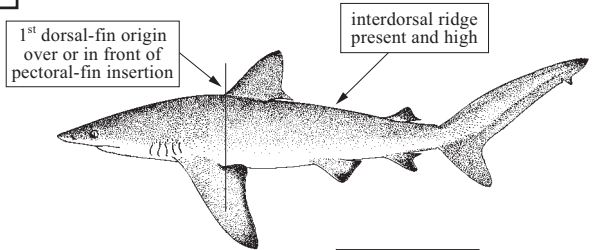
Habitat and biology: Benthic, found off the continental shelves and upper slope, at depths from 100 to 450 m. Viviparous with 3 to 15 young per litter; size at birth 70 to 90 cm TL. Males mature at 216 to 267 cm, females at 226 to 282 cm. Reproduction from August to September.

Distribution: Rare in the western and eastern Mediterranean, absent in the Black Sea. Widely distributed in tropical, subtropical and warm temperate waters in all oceans.

Importance to fisheries: Bycatch of deep-sea longlines and pelagic longline fishery in the eastern Algerian coast.

Conservation and exploitation status: FAO, B1; IUCN, Least Concern (Australia only); Mediterranean, occasional/rare species.

Remarks: This is a presumably circumtropical species and spottily distributed in the Mediterranean Sea. Not included in Clofnam area but described in Golani *et al.* (2002) and considered in this guide as a valid species. Immigrant species through the Straits of Gibraltar.

***Carcharhinus brachyurus*** (Günther, 1870)

(Plate V, 37)

CARCHARHINIDAE

Frequent synonyms / misidentifications:

Carcharhinus acronotus (Poey, 1860) / *Carcharhinus acarenatus* Morenos and Hoyos, 1983.

FAO names: **En** – Copper shark; **Fr** – Requin cuivre; **Sp** – Tiburón cobrizo.

Size: To about 300 cm TL.

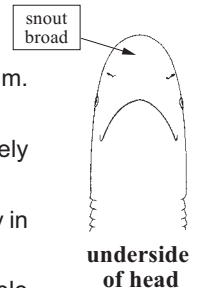
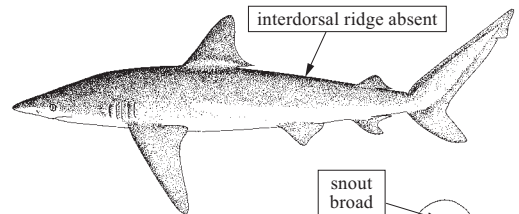
Habitat and biology: Pelagic on the continental shelf from the surface to 100 m. Specimens mature at 200 cm, 13 to 20 young with 59 to 67 cm of TL at birth.

Distribution: Western Mediterranean, probable in the south Levantine coasts. Widely distributed in tropical, subtropical and warm temperate waters in all oceans.

Importance to fisheries: Bycatch of deep-sea longlines and pelagic longline fishery in the eastern Algerian coast.

Conservation and exploitation status: FAO, B3; IUCN, Near Threatened (Vulnerable eastern Asia, Data Deficient eastern Pacific, Least Concern Australia, New Zealand and South Africa); Mediterranean, occasional/rare species.

Remarks: This is presumably a circumtropical species, described in Golani *et al.* (2002) and considered in this guide as present in the Mediterranean. Cigala Fulgosi, 1983; Vacchi *et al.*, 1996 and Orsi Relini, 1998 describe some specimens of this species for the Mediterranean Sea. Moreno and Hoyos (1983) mentioned this species in the Alboran Sea as *C. acarenatus*, successively considered synonym of *C. brachyurus*.



upper and lower teeth

Carcharhinus brevipinna (Müller and Henle, 1839)(Plate V, 38) **CARCHARHINIDAE****Frequent synonyms / misidentifications:**

Carcharhinus jonsoni Smith, 1951;
C. maculipinnis (Poey, 1865) / *Carcharhinus*
limbatus (Valenciennes, 1839); *C. melanopterus*
 (Quoy and Gaimard, 1824).

FAO names: En – Spinner shark; Fr – Requin tisserand; Sp – Tiburón aleta negra.

Size: To 278 cm, common to 220 cm TL.

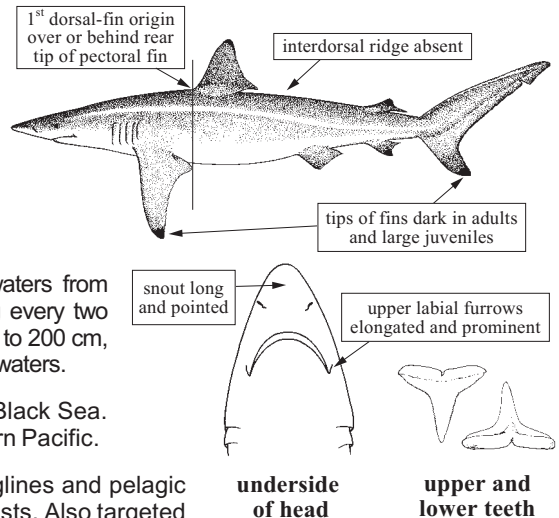
Habitat and biology: Pelagic in coastal and open waters from surface to 100 m. Viviparous, 1 litter of 6 to 20 young every two years; size at birth 60 to 75 cm TL. Males mature at 160 to 200 cm, females at 130 to 200 cm. Parturition occurs in coastal waters.

Distribution: Whole Mediterranean, absent in the Black Sea. All temperate and tropical waters except in the eastern Pacific.

Importance to fisheries: Bycatch of deep sea longlines and pelagic longline fishery in eastern Algerian and Tunisian coasts. Also targeted by game fishery.

Conservation and exploitation status: FAO, B1; IUCN, Near Threatened (Vulnerable (A1bd+A2d) in Northwest Atlantic); Mediterranean, occasional/rare species.

Remarks: Before the 1980s Ben-Tuvia (1978) erroneously recorded Spinner shark as a Red Sea migrant but it is an indigenous species in the Mediterranean. Por (1978) rejects some cases of Lessepsian migrant species. Also Golani (1996) in the list of Lessepsian fish migrants and their distribution in the eastern Mediterranean does not report *C. brevipinna*.

***Carcharhinus falciformis*** (Bibron, in Müller and Henle, 1839)**CARCHARHINIDAE**
(Plate V, 39)

Frequent synonyms / misidentifications: None / *Carcharhinus obscurus* (Lesueur, 1818).

FAO names: En – Silky shark; Fr – Requin soyeux; Sp – Tiburón jaquetón.

Size: To 330 cm TL.

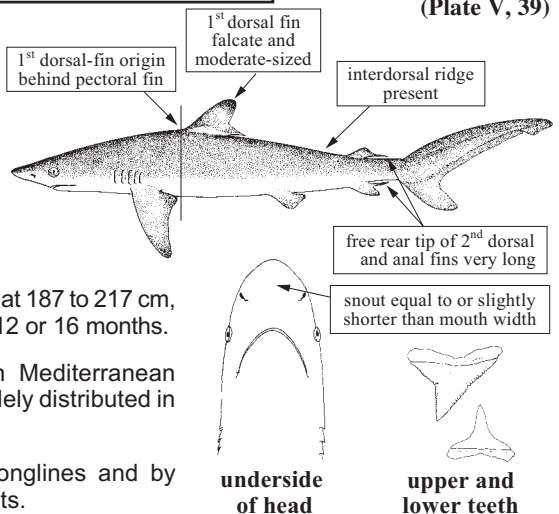
Habitat and biology: Coastal and oceanic, common near shelves and slopes from the surface to 500 m. Viviparous with 2 to 14 young apparently born in pelagic waters; size at birth 70 to 87 cm. Males mature at 187 to 217 cm, females at 213 to 230 cm; gestation period, possibly 12 or 16 months.

Distribution: Occurs occasionally in the western Mediterranean along the coasts of Spain, Italy and North Africa. Widely distributed in tropical and subtropical coastal in all oceans.

Importance to fisheries: Bycatch of deep sea longlines and by pelagic longline fishery in the eastern Algerian coasts.

Conservation and exploitation status: FAO, B3; IUCN, Least Concern (Data Deficient in the Northern Indian Ocean, Tropical Pacific and Western North Atlantic); Mediterranean, occasional/rare species.

Remarks: Atlantic immigrant species.



Carcharhinus limbatus (Valenciennes, *in* Müller and Henle, 1839)**CARCHARHINIDAE**
(Plate VI, 40)

Frequent synonyms / misidentifications: None / *Carcharhinus brevipinna* (Müller and Henle, 1839), *C. melanopterus* (Quoy and Gaimard, 1824).

FAO names: **En** – Blacktip shark; **Fr** – Requin bordé; **Sp** – Tiburón macuira.

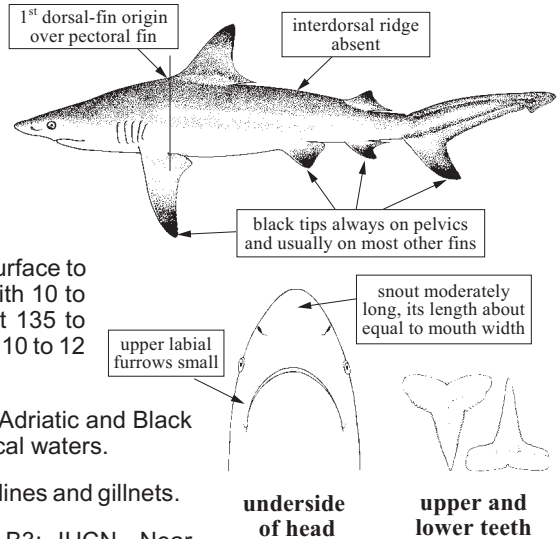
Size: To 255 cm, common to 150 cm TL.

Habitat and biology: Pelagic, coastal and offshore but not a truly oceanic species. From the surface to 100 m depth. Viviparous, 1 litter every two years with 10 to 14 pups born at 38 to 72 cm TL. Males mature at 135 to 180 cm, females at 120 to 190 cm. Gestation period 10 to 12 months; nursery area usually in coastal lagoons.

Distribution: Whole Mediterranean, absent in the Adriatic and Black Sea. Cosmopolitan species in temperate and tropical waters.

Importance to fisheries: Caught with surface longlines and gillnets.

Conservation and exploitation status: FAO, B3; IUCN, Near Threatened (Vulnerable A1bd+2d in NW Atlantic); Mediterranean, occasional/rare species.

***Carcharhinus melanopterus*** (Quoy and Gaimard, 1824)**(Plate VI, 41) CARCHARHINIDAE**

Frequent synonyms / misidentifications: *Squalus (Carcharhinus) commersoni* Blainville, 1816 / *Carcharhinus brevipinna* (Müller and Henle, 1839); *C. limbatus* (Valenciennes, 1839).

FAO names: **En** – Blacktip reef shark; **Fr** – Requin pointes noires; **Sp** – Tiburón de puntas negras.

Size: To about 200 cm, common to 160 cm TL.

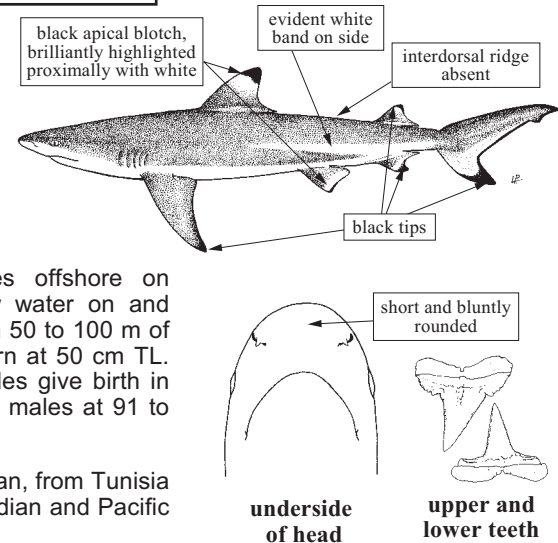
Habitat and biology: Inshore and sometimes offshore on continental and insular shelves; prefers shallow water on and around coral reefs, territorial and aggressive; from 50 to 100 m of depth. Viviparous, litter of about 4 to 14 pups born at 50 cm TL. Gestation period may be 12 to 16 months; females give birth in coastal waters, they are mature at 96 to 112 cm, males at 91 to 100 cm.

Distribution: Probably in the eastern Mediterranean, from Tunisia to Israel. In temperate and tropical areas of the Indian and Pacific Ocean also in the Red Sea.

Importance to fisheries: Caught with longlines and gillnets in coastal fisheries.

Conservation and exploitation status: FAO, B1; IUCN, Near Threatened; Mediterranean, doubtful species.

Remarks: Even if Compagno (1984) states the presence of *C. melanopterus* in the eastern Mediterranean, the presence of this species in the basin can be considered anecdotal. In fact, although this species was reported by Tortonese (1951b) in the Mediterranean, based on observations from the coast of Egypt, no specimen has been preserved (Golani *et al.*, 2002).



***Carcharhinus obscurus* (Lesueur, 1818)**

Frequent synonyms / misidentifications: *Squalus obscurus* Lesueur, 1818 / *Carcharhinus altimus* (Springer, 1950), *C. falciformis*, (Bibron, 1839) and *C. plumbeus*, (Nardo, 1827).

FAO names: **En** – Dusky shark; **Fr** – Requin sombre; **Sp** – Tiburón arenero.

Size: To 400 cm TL.

Habitat and biology: Epipelagic in coastal and open oceanic waters, demersal in coastal waters down to 400 m. Viviparous with 6 to 14 embryos, born at 69 to 100 cm TL. Gestation period may be 16 months, with two separated breeding populations of females; mature at 257 to 300 cm TL, males at 280 cm.

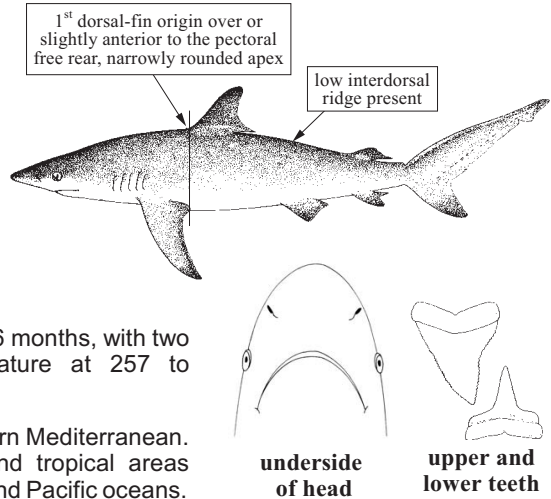
Distribution: Rarely found in the western and eastern Mediterranean. Cosmopolitan species distributed in temperate and tropical areas along the continental shelves of the Atlantic, Indian and Pacific oceans.

Importance to fisheries: Bycatch of deep-sea longlines. Important catches are obtained by pelagic longline fishery in eastern Algerian coasts.

Conservation and exploitation status: FAO, B4; IUCN, Near Threatened (Vulnerable A1bd+2d in Northern western Atlantic and Gulf of Mexico); Mediterranean, threatened species.

(Plate VI, 42)

CARCHARHINIDAE

***Carcharhinus plumbeus* (Nardo, 1827)**

Frequent synonyms / misidentifications: *Carcharhinus milberti* (Valenciennes, in Müller and Henle, 1839) / *Carcharhinus altimus* (Springer, 1950), *C. obscurus* (Lesueur, 1818).

FAO names: **En** – Sandbar shark; **Fr** – Requin gris; **Sp** – Tiburón trozo.

Size: To 300 cm, common to 240 cm TL.

Habitat and biology: Coastal-pelagic, on continental and insular shelves and in deep water adjacent to them up to 280 m. Viviparous, one litter every 2 to 3 years, with 6 to 18 young born at 50 to 75 cm TL. Gestation period 11 to 12 months and parturition occurs in coastal waters. Females mature at 144 to 182 cm, males at 130 to 178 cm TL.

Distribution: Whole Mediterranean, absent in the Black Sea. Neighboring Atlantic and most temperate and tropical waters except in the eastern Pacific.

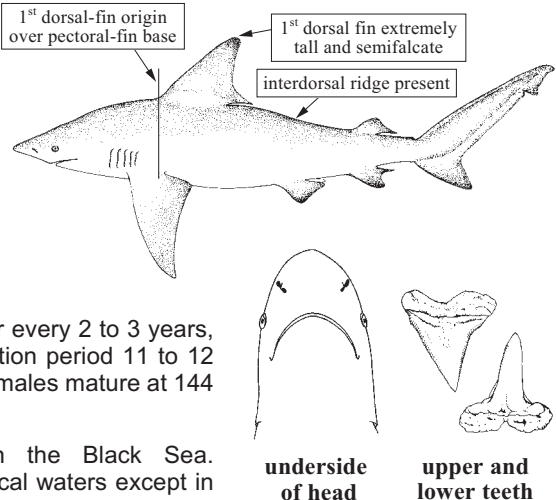
Importance to fisheries: Sometimes juveniles of this species are caught as bycatch of trammel nets in the Adriatic Sea. In other parts of Mediterranean bycatch of pelagic longline fisheries. Important catches are made by pelagic longline in the eastern Algerian coast.

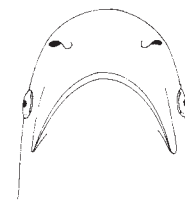
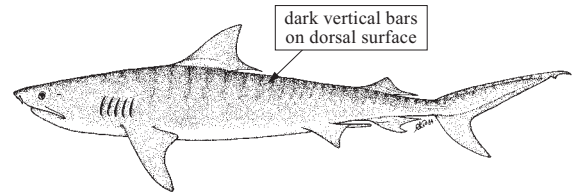
Conservation and exploitation status: FAO, B4; IUCN, Near Threatened (Vulnerable A1bd+2d in North Western Atlantic); Mediterranean, threatened species.

Remarks: This species is one of the most widely distributed representatives of this genus in the Mediterranean, and it has important nursery grounds in the Aegean Sea along the Turkish coast (Cló and De Sabata pers.com.).

(Plate VI, 43)

CARCHARHINIDAE



Galeocerdo cuvier* (Péron and Lesueur, in Lesueur, 1822)**(Plate VI, 44) **CARCHARHINIDAE*Frequent synonyms / misidentifications:***Galeocerdo arcticus* (Faber, 1829) / None.**FAO names:** **En** – Tiger shark; **Fr** – Requin tigre commun; **Sp** – Tiburón tigre.**Size:** Common to about 400 cm TL.**Habitat and biology:** Coastal to pelagic waters, usually close to the bottom but also occurring near the surface; often in shallow waters, including estuaries and rivers. Omnivorous. Ovoviviparous, large litter between 10 and 80 young usually near 40, born at 60 to 80 cm TL. Gestation period about 16 months.**Distribution:** Presence in the Mediterranean to be confirmed. Rare along the Atlantic coasts of Europe. Elsewhere, cosmopolitan in temperate and tropical areas.**Importance to fisheries:** Occasionally caught by longline and bottom gillnets fisheries.**Conservation and exploitation status:** FAO, B1; IUCN, Near Threatened.**Remarks:** The presence of this species in the Mediterranean Sea is doubtful (Fischer *et al.*, 1987; Compagno, 1984; Notarbartolo di Sciara and Bianchi, 1998). In fact, only two records for waters off Malaga (Spain) (Pinto de la Rosa, 1994) and off Messina (Italy) (Celona, 2000) are reported. In both papers only the jaws are described while any other parts of the body of the specimens are not mentioned at all. At the moment this species cannot be considered confirmed for the Mediterranean Sea even though Barrull and Mate (2002) described a Spanish specimen killed by the local Guard Coast.

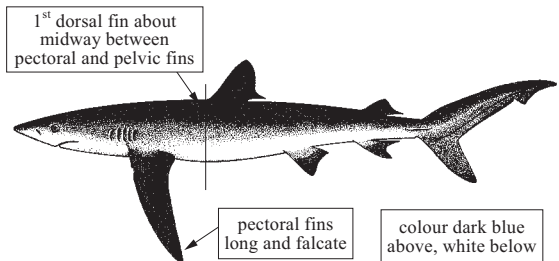
underside of head



upper and lower teeth

***Prionace glauca* (Linnaeus, 1758)**

(Plate VI, 45)

CARCHARHINIDAE**Frequent synonyms / misidentifications:****FAO names:** **En** – Blue shark; **Fr** – Peau bleue; **Sp** – Tiburón azul.**Size:** To at least about 400 cm TL.**Habitat and biology:** Open oceanic waters outside continental shelf but occurring also in coastal waters, often swimming near the surface down to 150 m. Viviparous, litters up to 135 young. Pups born at 35 to 45 cm TL. Gestation period from 9 to 12 months. Females mature at 173 to 221 cm, males at 182 to 281 cm TL.**Distribution:** Whole Mediterranean, absent in the Black Sea. Cosmopolitan in tropical to cold-temperate waters.**Importance to fisheries:** Along the Calabria and Apulia (Italian southern regions) a special artisanal fishery targeting *P. glauca* takes place using drifting surface longlines known as "stese" in spring. Bycatch of tuna and swordfish longline and small driftnet fishery, especially in Italy, Malta, Morocco, Tunisia and Crete. Target species of game fishing, in the past on of the main elasmobranch species caught in tuna traps.**Conservation and exploitation status:** FAO, B3; IUCN, Near Threatened; Mediterranean, vulnerable species. Appendix 3 of the Berne Convention; Appendix 3 of the Barcelona Convention (ASPIM protocol, Asp. 3).

very long snout



underside of head



upper and lower teeth

***Rhizoprionodon acutus* (Rüppell, 1837)**

Frequent synonyms / misidentifications: *Carcharias acutus* Rüppell, 1835; *Scoliodon terra-novae* Fowler, 1936; *S. acutus* Fowler, 1936; *Rhizoprionodon (Rhizoprionodon) acutus* Springer, 1964 / *Carcharias fissidens* Bennett, 1830.

FAO names: **En** – Milk shark; **Fr** – Requin museau pointu; **Sp** – Tiburón lechoso.

Size: Less than 110 cm, exceptionally 178 cm TL.

Habitat and biology: Inshore and offshore shark, from surfline to depths of about 200 m. Viviparous, litters of 2 to 8 young born at 25 to 39 cm TL. Gestation period 1 year; females mature at 70 to 81 cm, males at 68 to 72 cm TL.

Distribution: Only one specimen described in the central Mediterranean. Tropical Atlantic and Indian Ocean, Red Sea and Japan.

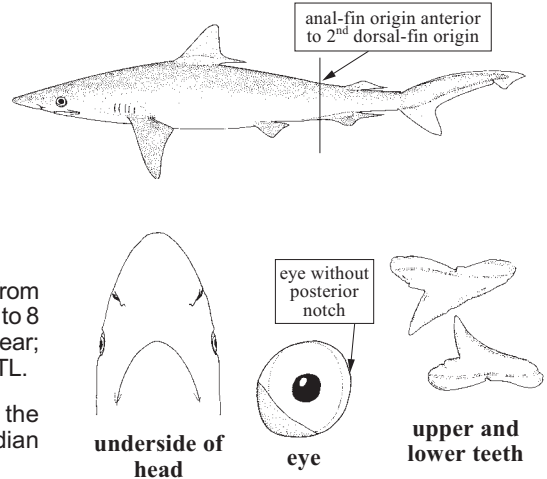
Importance to fisheries: Only one specimen caught in the Mediterranean (Ionian Sea). Caught by longlines, gillnets and trawls outside off the Mediterranean.

Conservation and exploitation status: FAO, 1; IUCN, Data Deficient; Mediterranean, very rare species.

Remarks: This species, previously not considered by Compagno (1984), is now included in this guide as valid species. Only one specimen was found in the Ionian Sea and described by Pastore and Tortonese (1985). Atlantic immigrant species from the Straits of Gibraltar.

(Plate VI, 46)

CARCHARHINIDAE



SPHYRNIDAE

***Sphyrna (Mesozygaena) tudes* (Valenciennes, 1822)**

Frequent synonyms / misidentifications: *Sphyrna bigelowi* Bigelow and Schroeder, 1948 / *Sphyrna couardi* Cadenat, 1950 and *S. mokarran* (Rüppell, 1837).

FAO names: **En** – Smalleye hammerhead; **Fr** – Requin-marteau à petits yeux; **Sp** – Cornuda ojichica.

Size: To 150 cm TL.

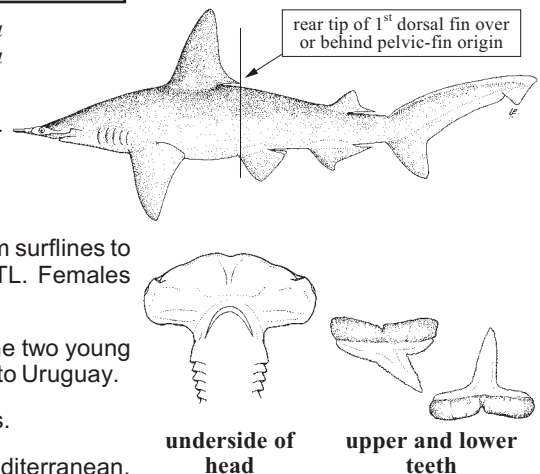
Habitat and biology: Coastal on continental shelf from surfline to 12 m. Viviparous with 6 to 9 young born at 30 cm TL. Females mature at 120 to 148 cm, males at 110 to 134 cm TL.

Distribution: Mediterranean (only known by one of the two young syntypes from Nice); western Atlantic from Venezuela to Uruguay.

Importance to fisheries: Bycatch in coastal fisheries.

Conservation and exploitation status: FAO, B3; Mediterranean, occasional/rare species.

Remarks: Compagno (1984) did not consider this species in the Mediterranean but recently McEachran and Séret (1987) confirmed its occasional presence. The first finding of *S. tudes* in the Mediterranean is described by Tortonese (1951b) at present stored in the Museum of Natural History of Calci (University of Pisa) with code No. 2347.



***Sphyrna (Sphyrna) lewini* (Griffith and Smith, in Cuvier, Griffith and Smith, 1834)**(Plate VI, 47) **SPHYRNIDAE**

Frequent synonyms / misidentifications: *Sphyrna diplana* Springer, 1941 / *Sphyrna mokarran* (Rüppell, 1837).

FAO names: En – Scalloped hammerhead; Fr – Requin-marteau halicorne; Sp – Cornuda común.

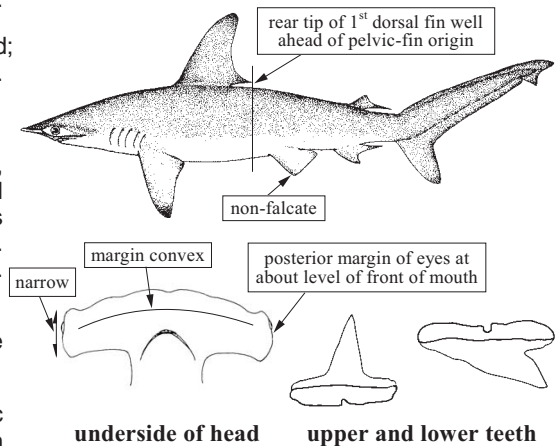
Size: To about 420 cm, usually 360 cm TL.

Habitat and biology: From inshore to offshore, coastal, epipelagic and semi-oceanic in tropic and warm areas over continental and insular shelves from the surface (10–25 m) to about 250 m. Juveniles common in estuaries and shallow bays. Viviparous, with 15 to 31 young per litter.

Distribution: Western Mediterranean. Elsewhere in temperate and tropical waters of all oceans.

Importance to fisheries: Bycatch of pelagic longline and purse-seine fisheries, also caught with gillnets by artisanal fisheries.

Conservation and exploitation status: FAO, B3; IUCN, Near Threatened (Least Concern in Australia); Mediterranean, occasional/rare species.

***Sphyrna (Sphyrna) mokarran* (Rüppell, 1837)**

(Plate VII, 48)

SPHYRNIDAE

Frequent synonyms / misidentifications: *Zigaena mokarran* Rüppell, 1837 / *Sphyrna lewini* (Griffith and Smith, 1834) and *S. tudes* (Valenciennes, 1822).

FAO names: En – Great hammerhead; Fr – Grand requin-marteau; Sp – Cornuda gigante.

Size: To more than 600 cm TL.

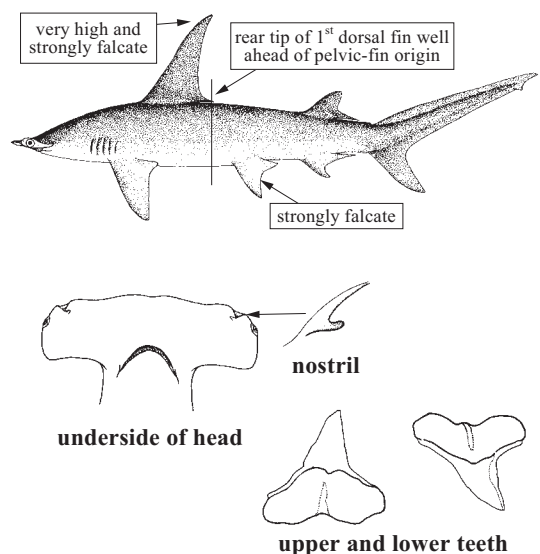
Habitat and biology: Coastal, pelagic and semi-oceanic over continental and island shelves from coast to 80 m. Viviparous, 13 to 42 young per litter, born at 50 to 70 cm TL. Females mature at 250 to 300 cm, males at 234 to 269 cm TL. Gestation period at least 7 months.

Distribution: South and northwestern Mediterranean (only one specimen). Circumtropical.

Importance to fisheries: Bycatch of pelagic longline and purse-seine fisheries, also caught by artisanal fisheries gillnets.

Conservation and exploitation status: FAO, B3; IUCN, Data Deficient (Least Concern for Australasia); Mediterranean, very rare species.

Remarks: Atlantic immigrant species, only one valid specimen recorded in the northwestern Mediterranean, well described by Boero and Carli (1977).



***Sphyrna (Sphyrna) zygaena* (Linnaeus, 1758)**

(Plate VII, 49 & 50)

SPHYRNIDAE

Frequent synonyms / misidentifications: None / None.

FAO names: En – Smooth hammerhead;
Fr – Requin-marteau commun; Sp – Cornuda cruz.

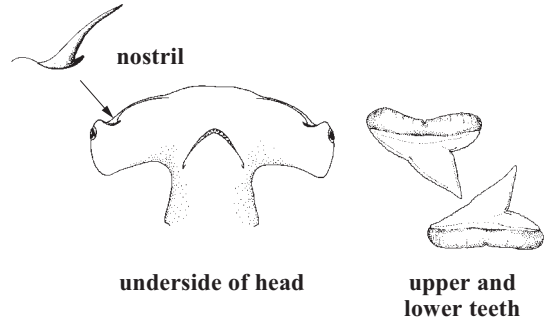
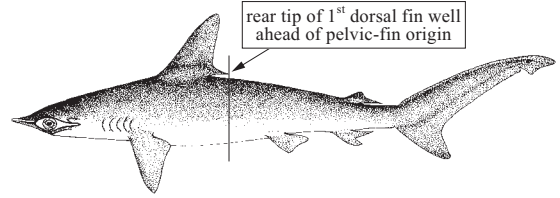
Size: To 400 cm.

Habitat and biology: Coastal-pelagic, mainly on continental shelf from coast to 20 m. Viviparous, up to 37 embryos, born at 50 to 60 cm TL. Female mature at 300 cm, males at 210 to 240 cm TL.

Distribution: Whole Mediterranean, only one record in Black Sea to be confirmed. Temperate and tropical areas of all oceans.

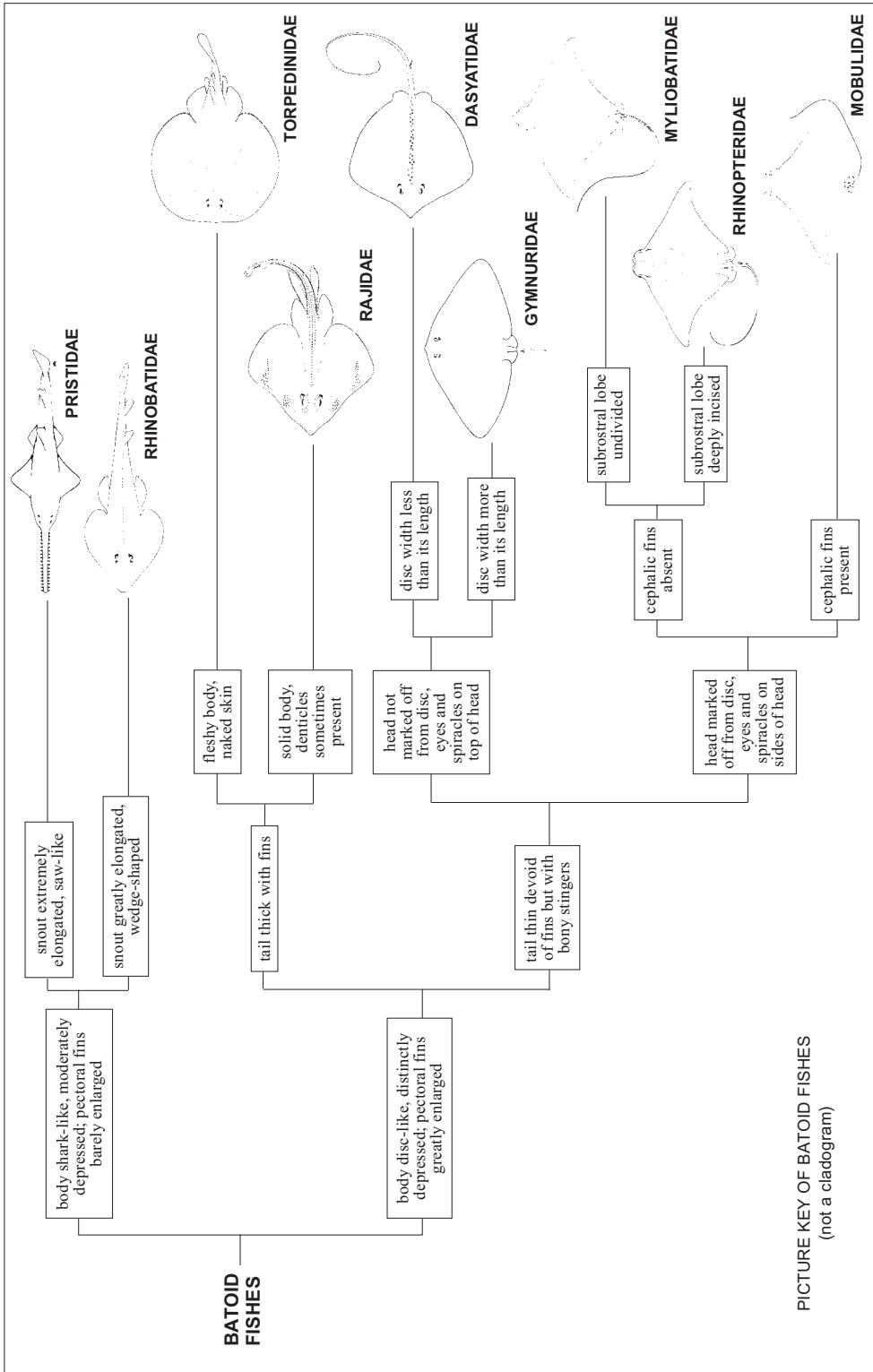
Importance to fisheries: Common bycatch of pelagic fisheries.

Conservation and exploitation status: FAO, B1; IUCN, Near Threatened (least Concern for Australasia); Mediterranean, vulnerable species.



BATOID FISHES

(sawfishes, guitarfishes, electric rays, skates, rays, and stingrays)

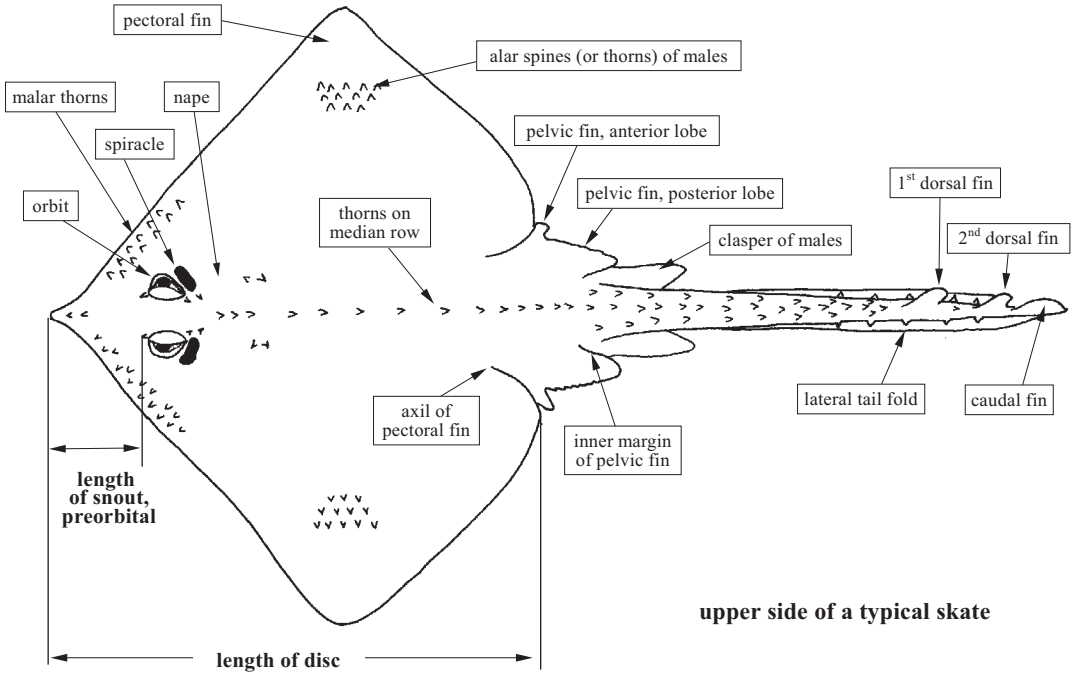


PICTURE KEY OF BATOID FISHES
(not a cladogram)

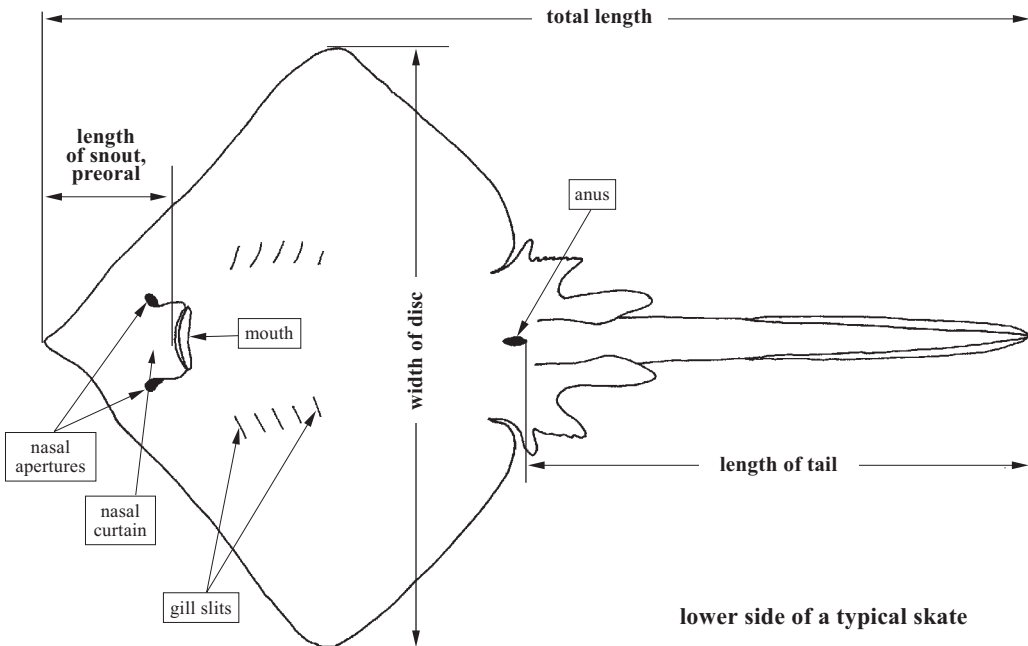
BATOID FISHES

Rays, Skates, Guitarfishes and Mantas

TECHNICAL TERMS AND MEASUREMENTS



upper side of a typical skate



lower side of a typical skate

LIST OF ORDERS, SUBORDERS, FAMILIES AND SPECIES OCCURRING IN THE AREA

A question mark (?) before the scientific name indicates that presence in the area needs confirmation.

Order **RAJIFORMES**

? Suborder **PRISTOIDEI**

? Family **PRISTIDAE**

? *Pristis pectinata*

? *Pristis pristis*

Suborder **RHINOBATOIDEI**

Family **RHINOBATIDAE**

Rhinobatos (Glaucostegus) cemiculus

Rhinobatos (Rhinobatos) rhinobatos

Suborder **TORPEDINOIDEI**

Family **TORPEDINIDAE**

Torpedo (Tetronarce) nobiliana

Torpedo (Torpedo) marmorata

Torpedo (Torpedo) sinuspersici

Torpedo (Torpedo) torpedo

Suborder **RAJOIDEI**

Family **RAJIDAE**

Dipturus batis

Dipturus oxyrinchus

Leucoraja circularis

Leucoraja fullonica

Leucoraja melitensis

Leucoraja naevus

Raja asterias

Raja brachyura

Raja clavata

Raja miraletus

Raja montagui

Raja polystigma

Raja radula

Raja undulata

Rostroraja alba

Suborder **MYLIOBATOIDEI**

Family **DASYATIDAE**

Dasyatis centroura

Dasyatis marmorata

Dasyatis pastinaca

Himantura uarnak

Pteroplatytrygon violacea

Taeniura grabata

Family **GYMNURIDAE**

Gymnura altavela

Family **MYLIOBATIDAE**

Myliobatis aquila

Pteromylaeus bovinus

Family **RHINOPTERIDAE**

Rhinoptera marginata

Family **MOBULIDAE**

Mobula mobular

GUIDE TO THE ORDERS AND FAMILIES OF BATOID FISHES OCCURRING IN THE AREA

Order RAJIFORMES – Sawfishes, Guitarfishes, Electric rays, Skates, Rays and Stingrays

Body dorsoventral depressed; anterior edge of the pectoral fin attached to side of head; gill slits ventral; nostrils when present, on the upperside of the head. Tail stout, shark-like or slender and whip-like; anal fin absent; eyes and spiracles on dorsal surface.

Suborder PRISTOIDEI – Sawfishes

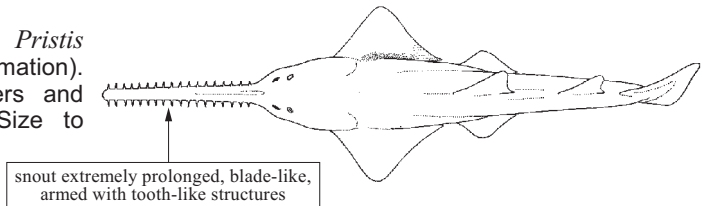
A large body shark-like with a saw-like elongated snout bearing a row of strong lateral teeth on each side; barbels absent; two dorsal fins and a caudal fin.

PRISTIDAE

Page 56

Sawfishes

Perhaps two species of the genus *Pristis* (their presence needs confirmation). Demersal in shallow marine waters and estuaries, entering fresh water. Size to 730 cm TL.



Suborder RHINOBATOIDEI – Guitarfishes, wedgefishes and shark-rays

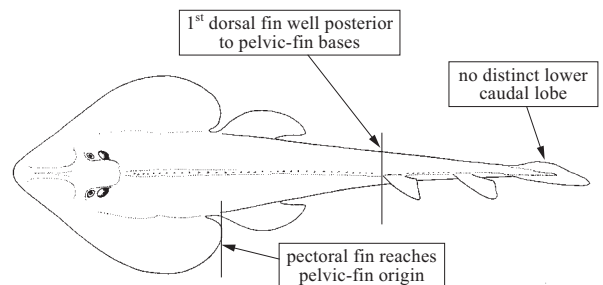
Body elongated and shark-like with pectoral fins expanded and fused with head and trunk; two subequal and well-separated dorsal fins; no saw-like snout.

RHINOBATIDAE

Page 57

Guitarfishes

Demersal, in inshore waters and sometimes in deep waters of the upper slope; off sandy beaches, muddy bays, estuaries and off river mouths. From intertidal down to 366 m. Size to 300 cm TL. Two species of the same genera in the area.



Suborder TORPEDINOIDEI – Electric rays

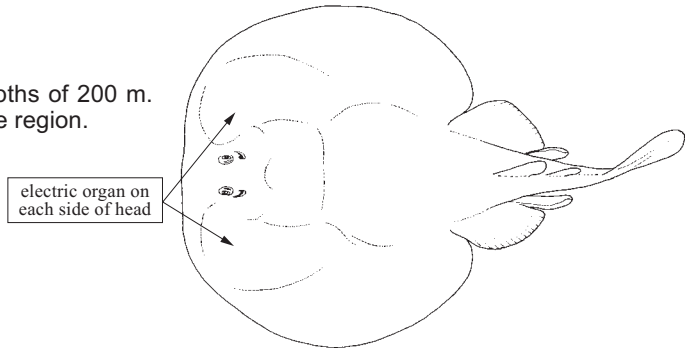
Pectoral fins greatly expanded and fused with head and trunk, forming a large oval disc; tail stout and shark-like, without any spines, a large electric organ on each side of head, usually partially visible under the skin as a pattern of hexagonal markings.

TORPEDINIDAE

Page 58

Electric rays

Demersal, from shallow waters to depths of 200 m. Size to 130 cm TL. Four species in the region.



Suborder RAJOIDEI – Skates and rays

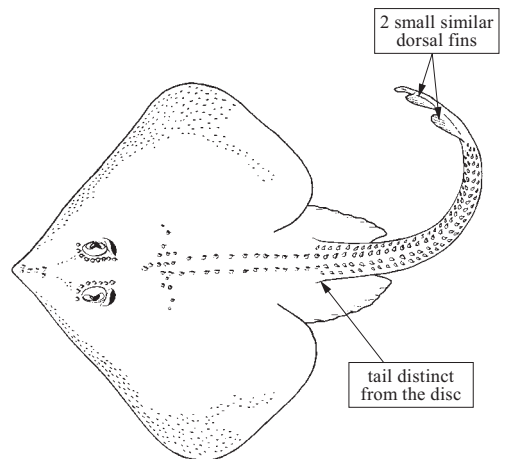
Greatly enlarged pectoral fins, strongly depressed as a rhomboid disc, fused completely to sides of head and trunk. Upper surfaces sparsely to densely covered with prickles and small and/or distinct thorn-lets and thorns. Caudal fin rudimentary.

RAJIDAE

Page 60

Skates and Rays

Demersal from shallow depths to nearly 2 000 m. Size to 130 cm disc width. Four genera and 16 species in the Mediterranean.



Suborder MYLIOBATOIDEI – Stingrays, butterfly rays, eagle rays and mantas

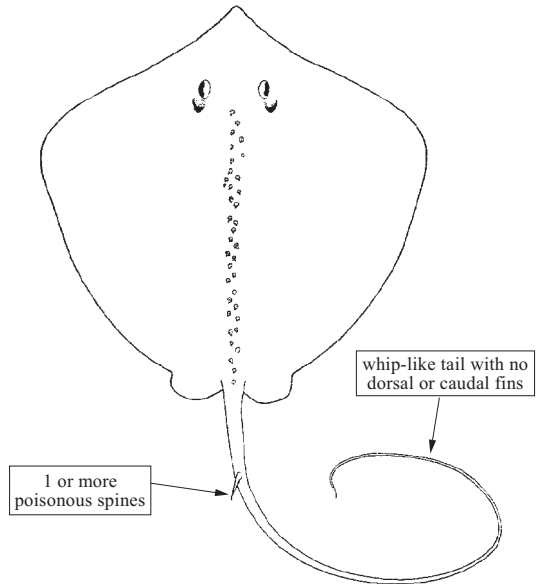
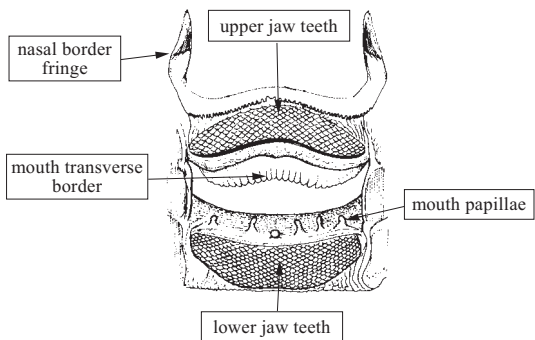
Body flattened with pectoral fins greatly expanded and fused with head and trunk; tail slender or whip-like, usually with one or several spines; usually with a single dorsal fin, but no caudal fin. No electric organ.

DASYATIDAE

Page 67

Stingrays

Mostly demersal in marine, estuarine and fresh-water habitats, down to 480 m of depth. Size to 200 cm disc width. Three genera and six species in the region.

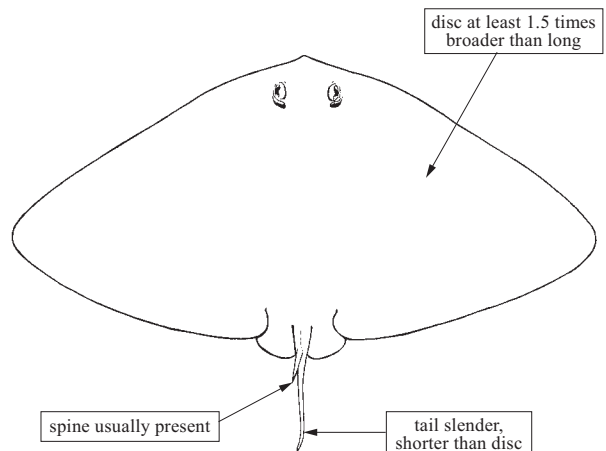


GYMNURIDAE

Page 70

Butterfly rays

Demersal, inshore waters off sandy beaches, estuaries, enclosed bays and lagoons, offshore banks down to a depth of 110 m. Size to 250 cm disc width. A single species in the region.

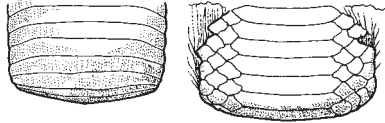


MYLIOBATIDAE

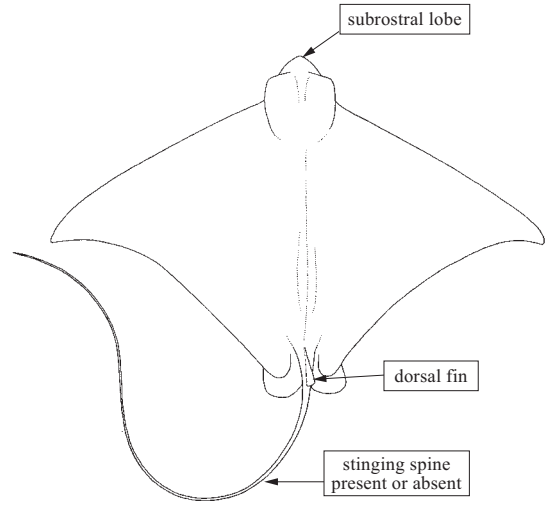
Page 71

Eagle rays

Coastal to depths of around 100 m. Size to 180 cm disc width. Two genera and two species reported in the Mediterranean.



enlargement of teeth



RHINOPTERIDAE

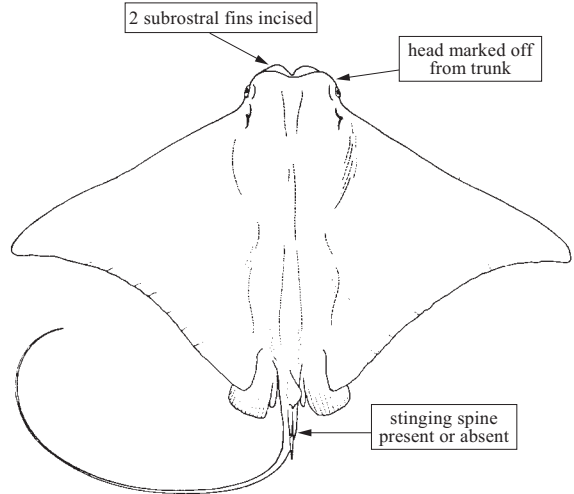
Page 72

Cownose rays

Semipelagic inshore and offshore, off sandy beaches, estuaries, enclosed bays and lagoons and offshore banks; from the intertidal to at least 26 m of depth. Size to 150 cm disc width. One species in the region.



enlargement of teeth

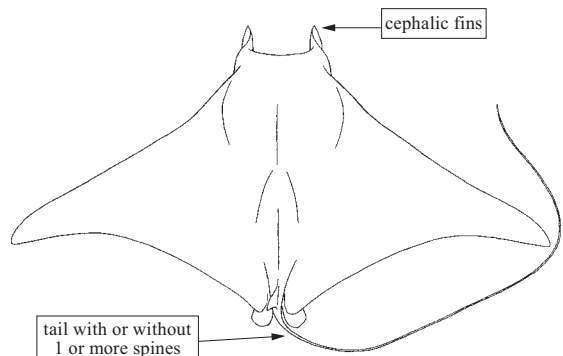


MOBULIDAE

Page 72

Mantas and devil rays

The only living vertebrates with three pairs of functional limbs. Pelagic, in coastal and oceanic waters from the intertidal to the epipelagic zone. Size to at least 670 cm disc width. A single species in the region.



PRISTIDAE

Pristis pectinata Latham, 1794

(Plate VII, 51)

Frequent synonyms / misidentifications:
None / None.

FAO names: **En** – Smalltooth sawfish;
Fr – Poisson-scie tident; **Sp** – Peje-peine.

Size: To about 500 cm TL.

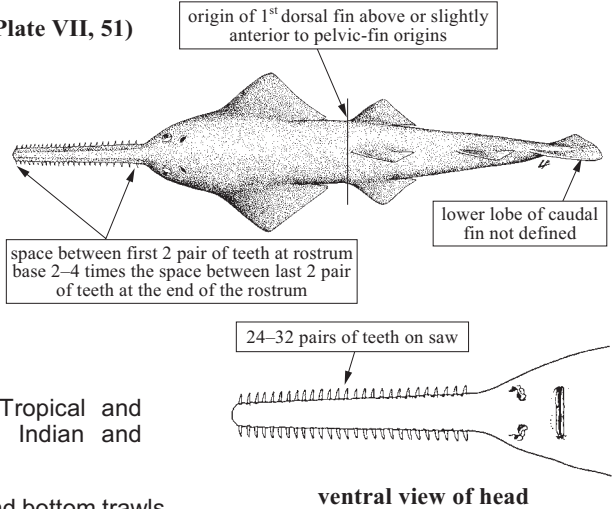
Habitat and biology: In shallow bays (5–100 m), lagoons and estuaries, also enters fresh water. Ovoviviparous with 15 to 20 embryos.

Distribution: Rare in the Mediterranean. Tropical and subtropical Atlantic. Presence uncertain in Indian and Pacific Oceans.

Importance to fisheries: Caught with lines and bottom trawls. Severely depleted, it needs strong conservation measures.

Conservation and exploitation status: IUCN, Endangered (Aabcd+2cd); Critically Endangered (A1bcd+2cd) in the North and South West Atlantic; Mediterranean, rare or absent.

Remarks: Tortonese (1987) did not consider Pristidae (sawfishes) to be present in the Mediterranean. Other authors however report occurrences in the eastern Mediterranean (Stehmann and Buerkel *in* Whitehead *et al.*, 1984; Golani 1996).



ventral view of head

Pristis pristis (Linnaeus, 1758)origin of 1st dorsal fin anterior to pelvic-fin origin

PRISTIDAE

Frequent synonyms / misidentifications:
None / None.

FAO names: **En** – Common sawfish;
Fr – Poisson-scie commun; **Sp** – Pez sierra común.

Size: To about 450 cm TL.

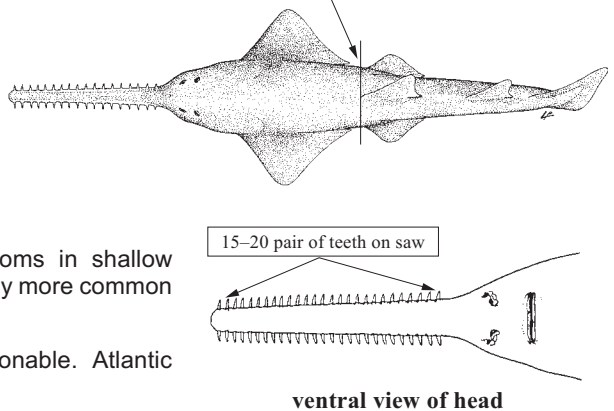
Habitat and biology: Benthic on soft bottoms in shallow coastal waters. Rare in northern regions, locally more common along African Atlantic coast. Ovoviviparous.

Distribution: Mediterranean records questionable. Atlantic from Portugal to Angola.

Importance to fisheries: Caught with line and bottom trawls. Severely depleted, it needs strong conservation measures.

Conversation and exploitation status: IUCN, Critically Endangered; Mediterranean, rare or absent species.

Remarks: Tortonese (1987) did not consider Pristidae (sawfishes) to be present in the Mediterranean. Other authors however report occurrences in the eastern Mediterranean (Stehmann and Buerkel *in* Whitehead *et al.*, 1984; Golani, 1996).



ventral view of head

RHINOBATIDAE

Rhinobatos (Glaucostegus) cemiculus Geoffroy St-Hilaire, 1817

(Plate VII, 52)

Frequent synonyms / misidentifications:

None / None.

FAO names: **En** – Blackchin guitarfish; **Fr** – Guitare de mer fousseuse; **Sp** – Guitarra barbanegra.

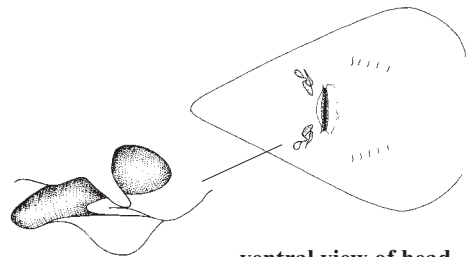
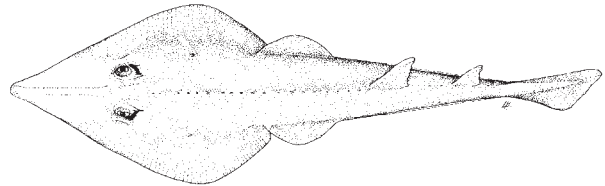
Size: To about 180 cm TL.

Habitat and biology: Benthic on sandy and muddy bottom and seabeds, from shallow water to about 100 m. Ovoviviparous, one or two litters per year, of 4 to 6 embryos.

Distribution: Whole Mediterranean, absent in the Black Sea. Atlantic from Portugal to Angola.

Importance to fisheries: In some areas of the Mediterranean basin usually caught by gillnet, bottom set and drifting longlines. Bycatch in bottom trawl fisheries.

Conversation and exploitation status: IUCN, needs to be investigated; Mediterranean, nowadays relatively rare, threatened species.



left nostril

ventral view of head

Rhinobatos (Rhinobatos) rhinobatos (Linnaeus, 1758)

(Plate VII, 53) RHINOBATIDAE

Frequent synonyms / misidentifications:

None / None.

FAO names: **En** – Common guitarfish; **Fr** – Guitare de mer commune; **Sp** – Guitarra comun.

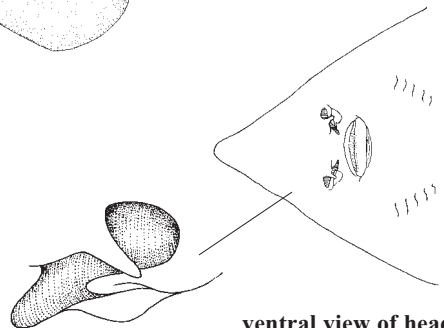
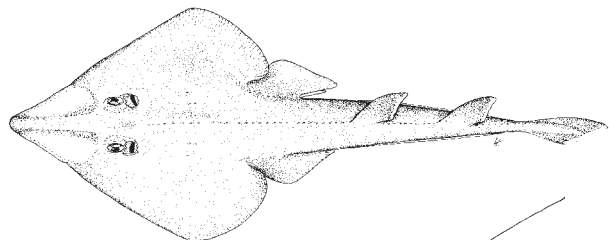
Size: To about 100 cm TL.

Habitat and biology: Benthic on sandy and muddy bottom and seabeds, from shallow water to about 100 m. Ovoviviparous, one or two litters per year, of 4 to 10 embryos.

Distribution: Whole Mediterranean, absent in the Black Sea. Atlantic from Bay of Biscay to Angola.

Importance to fisheries: In some areas of the Mediterranean basin usually caught by gillnet, bottom set and drifting longlines. Bycatch in bottom trawl fisheries.

Conversation and exploitation status: IUCN needs to be investigated; Mediterranean, threatened species.



left nostril

ventral view of head

TORPEDINIDAE

***Torpedo (Tetronarce) nobiliana* Bonaparte, 1835**

(Plate VII, 54)

Frequent synonyms / misidentifications:
Torpedo (Tetronarce) nobiliana Fowler, 1936 /
 None.

FAO names: En – Electric ray; Fr – Torpille
 noire; Sp – Tremolina negra.

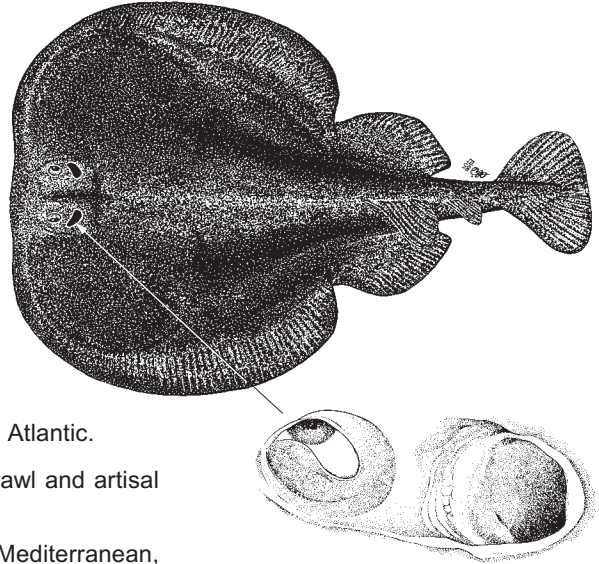
Size: To about 180 cm TL.

Habitat and biology: Juveniles benthic on
 soft bottoms, adults frequently pelagic or
 semipelagic, from 10 to 150 m. The adults can
 be pelagic or semipelagic, reported migrating
 over large distances. Probably ovoviviparous.

Distribution: Whole Mediterranean, absent in
 the Black Sea. Atlantic northward to Scotland,
 rare in the North Sea, South Africa and western Atlantic.

Importance to fisheries: Bycatch in bottom trawl and artisanal
 demersal fisheries in coastal grounds.

Conservation and exploitation status: Mediterranean,
 vulnerable species.



eye and spiracle with smooth
 margins, no papillae

***Torpedo (Torpedo) marmorata* Risso, 1810**

(Plate VII, 55)

TORPEDINIDAE

Frequent synonyms / misidentifications:
 None / None.

FAO names: En – Marbled electric ray;
 Fr – Torpille marbrée; Sp – Tremolina mármol.

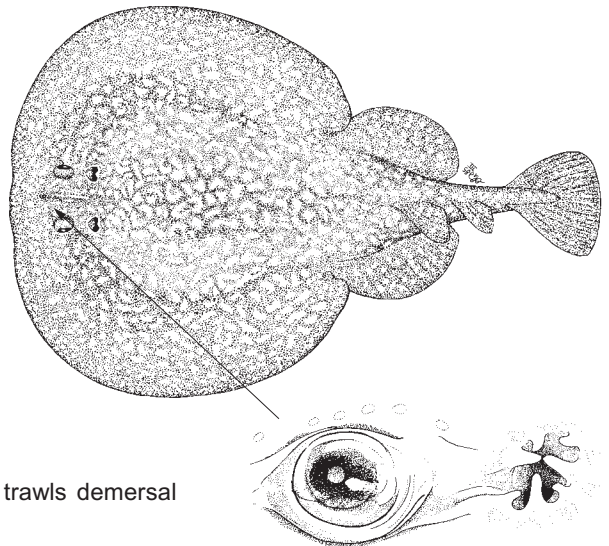
Size: To about 100 cm TL.

Habitat and biology: Benthic on soft as well
 as rocky bottoms, between 10 and 100 m of
 depth. Ovoviviparous, females mature at
 about 40 cm, males at 29 cm TL. Gestation of
 about ten months from November to
 December, 2 to 13 embryos, their number
 depending on size of female.

Distribution: Whole Mediterranean, absent
 in the Black Sea. Atlantic northward to Brittany
 and South Africa.

Importance to fisheries: Bycatch of bottom trawls demersal
 fisheries in coastal grounds.

Conversation and exploitation status: Mediterranean,
 vulnerable species.



eye and spiracle with
 6-8 tentacles

Torpedo (Torpedo) sinuspersici Olfers, 1831

(Plate VIII, 56)

TORPEDINIDAE

Frequent synonyms / misidentifications:
None / *Torpedo panthera* Olfers, 1831.

FAO names: En – Marbled electric ray.

Size: To 1.3 m total length, 90 cm disc width.

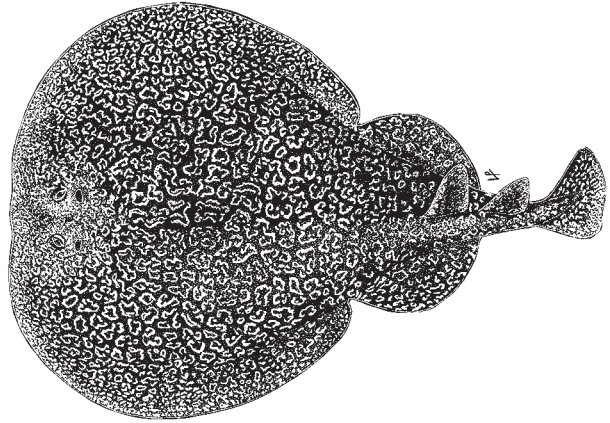
Habitat and biology: Inshore waters over sandy bottoms, down to a depth of 200 m. Can deliver a strong electric shock. Ovoviviparous with 9 to 22 per litter

Distribution: Mediterranean, in the Levantine Sea. From South Africa to India, including the Red Sea.

Importance to fisheries: Caught with hook-and-lines and bottom trawls. Flesh edible.

Conservation and exploitation status: Unknown.

Remarks: Lessepsian species recently reported in the Mediterranean by Saad *et al.*, 2004.

***Torpedo (Torpedo) torpedo*** (Linnaeus, 1758)

(Plate VIII, 57)

TORPEDINIDAE

Frequent synonyms / misidentifications:
Torpedo ocellata Rafinesque, 1810 / None.

FAO names: En – Common torpedo; **Fr** – Torpille ocellée; **Sp** – Tremolina comun.

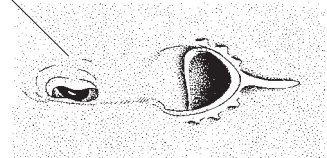
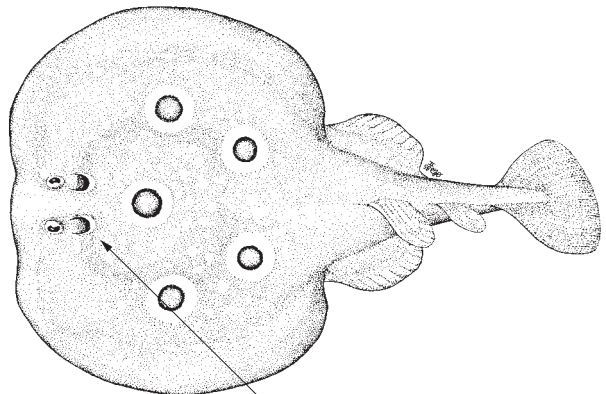
Size: From 30 to 40 cm, to about 60 cm TL.

Habitat and biology: Benthic on soft bottoms, usually inshore up to 70 m, occasionally deeper. Ovoviviparous, gestation period from March to October; 3 to 21 young of 8 to 10 cm TL, depending on female size.

Distribution: Whole Mediterranean, absent in the Black Sea, most common in tropical waters.

Importance to fisheries: Bycatch in bottom trawls coastal fisheries.

Conservation and exploitation status: Mediterranean, vulnerable species.



eye and spiracle with small papillae

RAJIDAE

***Dipturus batis* (Linnaeus, 1758)**

(Plate VIII, 58)

Frequent synonyms / misidentifications:

Raya batis Linnaeus, 1758 / None.

FAO names: En – Skate; Fr – Pocheteau gris; Sp – Noriega.

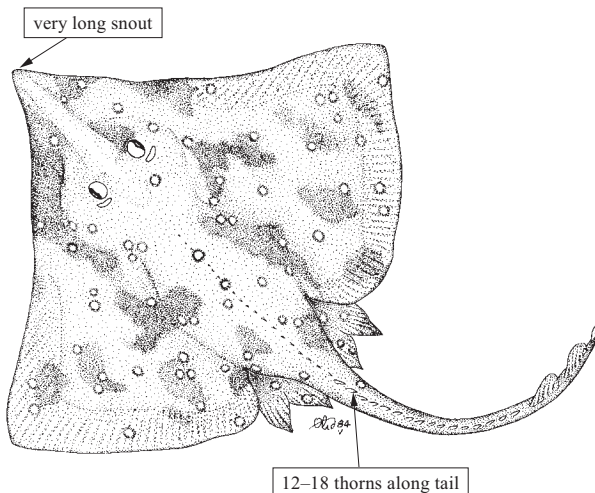
Size: To about 250 cm TL.

Habitat and biology: Benthic on sandy bottom, from coastal waters to 600 m. Oviparous with egg-cases from 150 to 250 mm in length and 80 to 150 mm in width. Females lays egg-cases mainly in spring and summer.

Distribution: Western Mediterranean including Adriatic Sea, absent in the Black Sea and in the Levantine basin. Atlantic from Norway to Madeira and northern Morocco, western Baltic Sea.

Importance to fisheries: Captured by trawlers and longliners mainly in northern Europe.

Conservation and exploitation status: IUCN, Endangered (A1abcd+2bcd); Critically Endangered (A1abcd+2bcd) in shelf and enclosed areas; Mediterranean, threatened species/locally disappeared.



***Dipturus oxyrinchus* (Linnaeus, 1758)**

(Plate VIII, 59)

RAJIDAE

Frequent synonyms / misidentifications:

Raya oxyrinchus Linnaeus, 1758 / None.

FAO names: En – Longnose skate; Fr – Pocheteau noir; Sp – Picón.

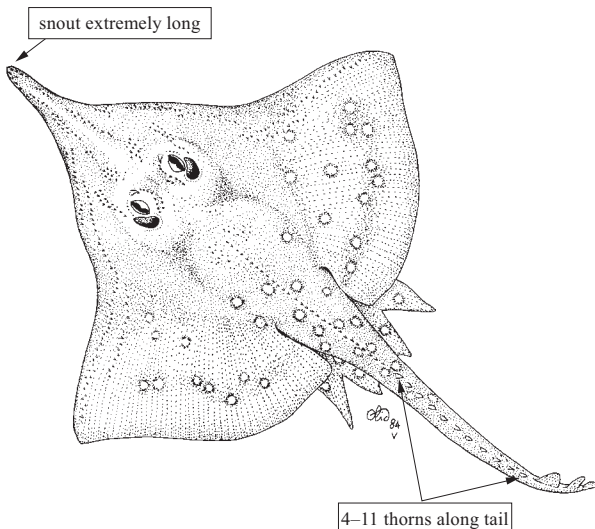
Size: Common from 60 to 100 cm, but maximum total length also 150 cm TL.

Habitat and biology: Benthic on sandy bottom from 90 to 900 m, common around 200 m. Oviparous, egg-cases from 100 to 150 mm in length, laid from February to May.

Distribution: Whole Mediterranean, absent in the Black Sea. Neighbouring Atlantic.

Importance to fisheries: Landed by trawlers and longliners especially in northern Europe.

Conservation and exploitation status: Mediterranean, vulnerable species.



Leucoraja circularis (Couch, 1838)

(Plate VIII, 60)

RAJIDAE

Frequent synonyms / misidentifications:
Raja circularis Couch, 1838 / None.

FAO names: **En** – Sandy ray; **Fr** – Raie circulaire; **Sp** – Raya falsa vela.

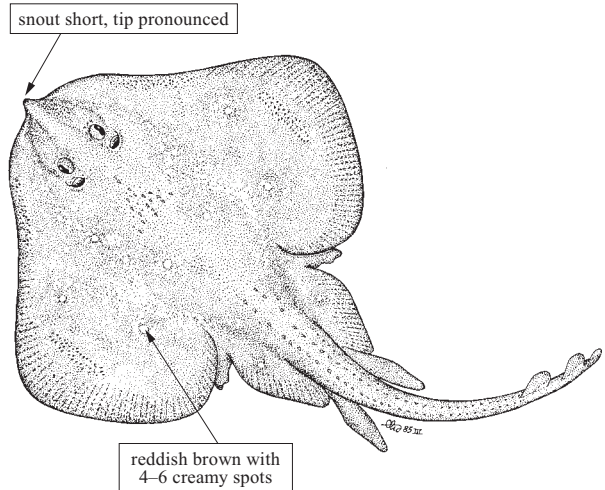
Size: To about 120 cm, usually 70 cm TL.

Habitat and biology: Benthic in offshore shelf waters and on upper slope from 70 to 275 m, common around 100 m. Oviparous, females lay their egg-cases of about 90 by 50 mm size from November to August.

Distribution: Western Mediterranean to Libya, absent in the Black Sea. Atlantic from Scotland and southern Norway possibly to Senegal.

Importance to fisheries: Species of local fishery importance, caught by bottom trawl fisheries.

Conservation and exploitation status: Mediterranean, occasional/rare species.

***Leucoraja fullonica*** (Linnaeus, 1758)

(Plate VIII, 61)

RAJIDAE

Frequent synonyms / misidentifications:
Raja fullonica Linnaeus, 1758 / None.

FAO names: **En** – Shagreen ray; **Fr** – Raie chardon; **Sp** – Raya cardadora.

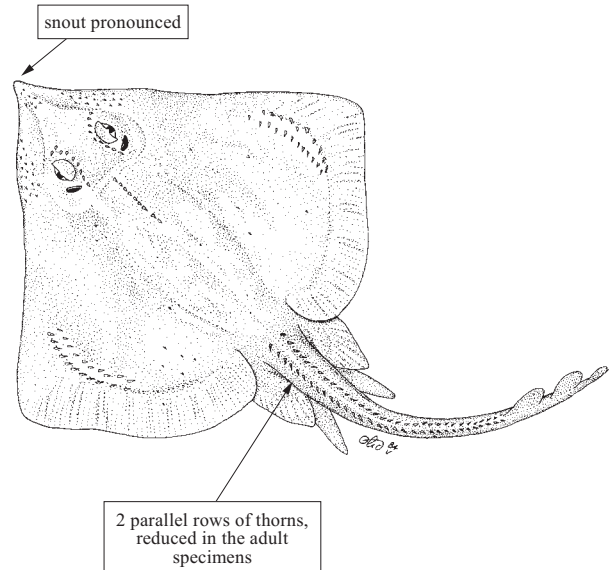
Size: To about 100 cm TL.

Habitat and biology: Benthic in relatively cold coastal waters and on upper parts of continental slopes from 30 to 550 m. Oviparous, size of egg-cases about 80 by 50 mm.

Distribution: Western Mediterranean including Adriatic Sea absent in the Black Sea. Atlantic from Iceland to Madeira and northern Morocco.

Importance to fisheries: Caught by bottom trawl fisheries and landed in northern parts of area by longliners.

Conservation and exploitation status: Mediterranean, occasional/rare species.



***Leucoraja melitensis* (Clark, 1926)**

(Plate VIII, 62)

RAJIDAE

Frequent synonyms / misidentifications: *Raja melitensis* Clark, 1926 / None.

FAO names: En – Maltese ray; Fr – Raie de Malte; Sp – Raya de Malta.

Size: To about 50 cm TL.

Habitat and biology: Benthic in about 60 to 600 m. Oviparous, reproduction activity throughout the year, ripe females observed mainly in spring and autumn; egg-cases unknown.

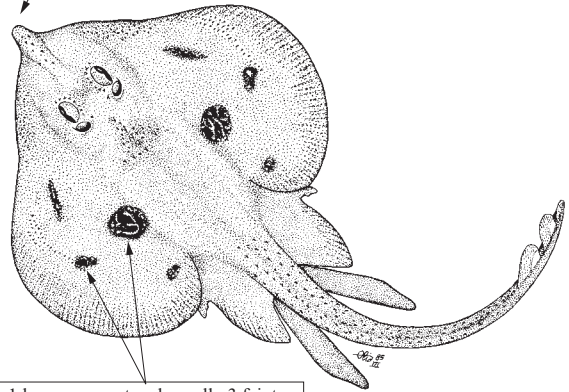
Distribution: Only in the western part of the Mediterranean, Tunisia coasts around Malta (rare in Algeria and Italy).

Importance to fisheries: Bycatch of local trawl fishery.

Conservation and exploitation status: Mediterranean, occasional/rare species, need to be investigated.

Remarks: Endemic species in the Mediterranean. It is probably quite rare around Malta, which is at the northern border of the distribution (Schembri *et al.*, 2003).

snout short, tip pronounced



1 large eye-spot and usually 3 fainter dusky blotches on each pectoral fin

***Leucoraja naevus* (Müller and Henle, 1841)**

(Plate VIII, 63)

RAJIDAE

Frequent synonyms / misidentifications: *Raja naevus* Müller and Henle, 1841 / None.

FAO names: En – Cuckoo ray; Fr – Raie fleurie; Sp – Raya santiguosa.

Size: To about 70 cm TL.

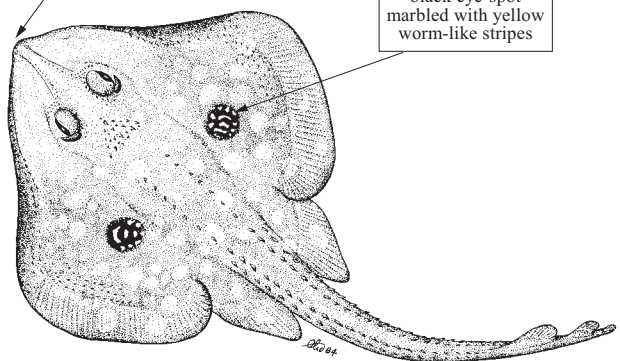
Habitat and biology: Benthic in coastal waters from 20 to 250 m. Oviparous, up to 102 egg-cases per female laid throughout the year mainly in springtime, size from 40 to 60 mm. Embryonic development about eight months until hatching of young at 120 mm. Size of first maturity at 60 cm in females.

Distribution: Western Mediterranean, to Tunisia and western Greece including Adriatic Sea. Atlantic from Ireland and North Sea to northern Morocco, also reported in Senegal.

Importance to fisheries: Bycatch of bottom trawl fisheries.

Conservation and exploitation status: Mediterranean, occasional/rare species.

snout short



black eye-spot marbled with yellow worm-like stripes

***Raja asterias* Delaroche, 1809**

(Plate IX, 64)

RAJIDAE

Frequent synonyms / misidentifications:
None / None.

FAO names: **En** – Starry ray; **Fr** – Raie étoilée;
Sp – Raya estrellada.

Size: To about 80 cm TL.

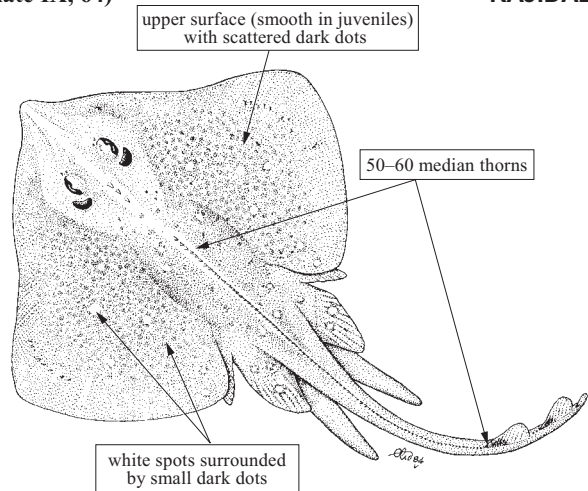
Habitat and biology: Benthic in inshore waters on sandy bottom from 2 to about 200 m, more common between 20 and 50 m. Oviparous with about 30 to 112 egg-cases per year (depending on size of females) from 30 to 45 mm in length. Egg-cases laid mainly in summer and autumn at depth of 30 to 40 m; embryos development in 5 to 6 months. Young specimens of about 80 to 90 mm found in very shallow waters mainly in winter-time. Females mature at about 56 cm, males at 52 cm TL.

Distribution: Mediterranean, less common in the eastern part, absent in the Black Sea. Probably propagated to the near Atlantic region.

Importance to fisheries: Regularly caught as bycatch in the bottom trawl fisheries. As secondary target species is caught by beam trawl. Juvenile specimens are frequently caught by trammel net in very shallow waters (2–15 m) and discarded still alive.

Conservation and exploitation status: Mediterranean, stable biomass species.

Remarks: It can probably be considered an endemic species in the Mediterranean Sea.

***Raja brachyura* Lafont, 1873**

(Plate IX, 65)

RAJIDAE

Frequent synonyms / misidentifications:
None / None.

FAO names: **En** – Blonde ray; **Fr** – Raie lisse; **Sp** – Raya boca de rosa.

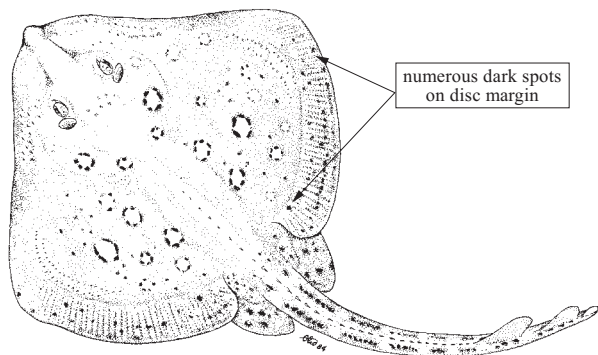
Size: To about 120 cm TL.

Habitat and biology: Benthic in inshore waters mainly on sandy bottoms to about 100 m. Oviparous, about 30 egg-cases per year laid from February to August with 80 to 120 cm length. Development of embryo in about 7 months.

Distribution: Western Mediterranean and one doubtful record from the northern Aegean Sea, presence in the Black Sea not confirmed. Atlantic from Shetlands and North Sea to Madeira and Morocco.

Importance to fisheries: Bycatch in the bottom fishing in coastal grounds; regularly landed in northern Europe.

Conservation and exploitation status: Mediterranean, occasional/rare species.



***Raja clavata* Linnaeus, 1758**

(Plate IX, 66)

RAJIDAE

Frequent synonyms / misidentifications:
None / None.

FAO names: **En** – Thornback ray; **Fr** – Raie bouclée; **Sp** – Raya de clavos.

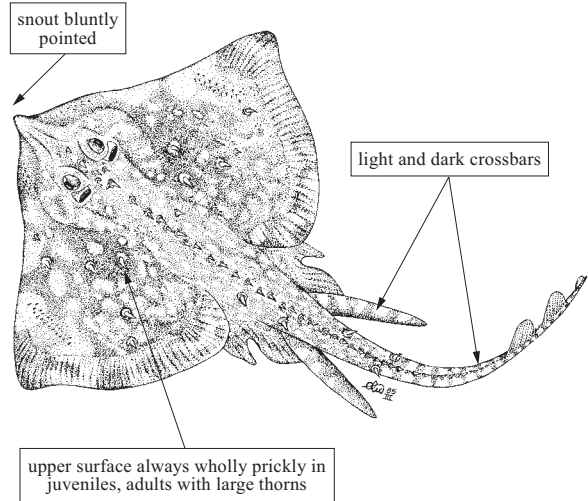
Size: To about 110 cm TL.

Habitat and biology: Benthic from shallow water to the bathyal zone (20–700 m). Oviparous, 140 to 170 egg-cases per year (60–90 mm length) laid mainly in winter and spring, development of embryo in about 5 months, with young hatching at 100 to 110 mm TL. Females mature at 85 cm, males at 75 cm TL.

Distribution: Whole Mediterranean including the Black Sea especially in the western part. Atlantic from Iceland and Norway to Madeira and Morocco, South Africa and southwestern Indian Ocean.

Importance to fisheries: Locally commercially important in the Mediterranean; bycatch of the demersal fishery.

Conservation and exploitation status: IUCN, Lower Risk (near threatened) in the North Sea; Mediterranean, very common, stocks currently not depleted, stable biomass.

***Raja miraletus* Linnaeus, 1758**

(Plate IX, 67)

RAJIDAE

Frequent synonyms / misidentifications:
None / None.

FAO names: **En** – Brown ray; **Fr** – Raie miroir; **Sp** – Raya de espejos.

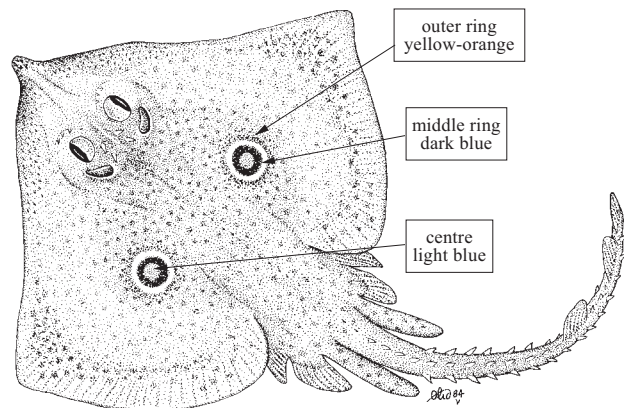
Size: To about 60 cm TL.

Habitat and biology: Benthic from shallow water to 450 m mainly from 50 to 150 m on sandy and hard bottoms. Oviparous, egg-cases laid from spring to summer, 45 to 52 mm length, embryonic development until hatching takes about 5 months with young from 10 to 11 cm TL. Females mature at 24 cm, males at 22 cm disc width.

Distribution: Atlantic coasts from Madeira and Morocco northward to northern Portugal, whole Mediterranean, southward to South Africa and southwestern Indian Ocean.

Importance to fisheries: Commonly caught as bycatch by bottom trawl fisheries.

Conservation and exploitation status: Mediterranean, stable biomass.



***Raja montagui* Fowler, 1910**

(Plate IX, 68)

RAJIDAE

Frequent synonyms / misidentifications:
None / *Raja polystigma* Regan, 1923.

FAO names: En – Spotted ray; Fr – Raie douce; Sp – Raya pintada.

Size: To about 80 cm TL.

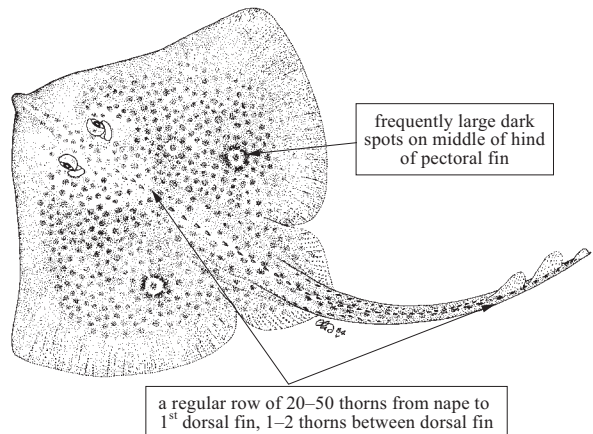
Habitat and biology: Benthic from shallow waters to 650 m, more common at about 100 m on sandy and muddy bottoms. Oviparous, 24 to 60 egg-cases per year (64–77 mm length) laid in summer, embryos developing in 5 to 6 months with young hatching at size of 11 to 12 cm TL. Sexual maturity reached at about 60 cm TL.

Distribution: Western Mediterranean (to Tunisia and western Greece) rare in the eastern Levantine basin, presence in the Black Sea not confirmed. Atlantic from Shetlands and North and Baltic Sea to Morocco.

Importance to fisheries: Bycatch of bottom trawl fisheries.

Conservation and exploitation status: Mediterranean, stable biomass.

Remarks: Probably misidentified with *R. polystigma*, needs to be investigated.

***Raja polystigma* Regan, 1923**

(Plate IX, 69)

RAJIDAE

Frequent synonyms / misidentifications:
None / *Raja montagui* Fowler, 1910.

FAO names: En – Speckled ray; Fr – Raie tachetée; Sp – Raya manchada.

Size: To about 50–60 cm TL.

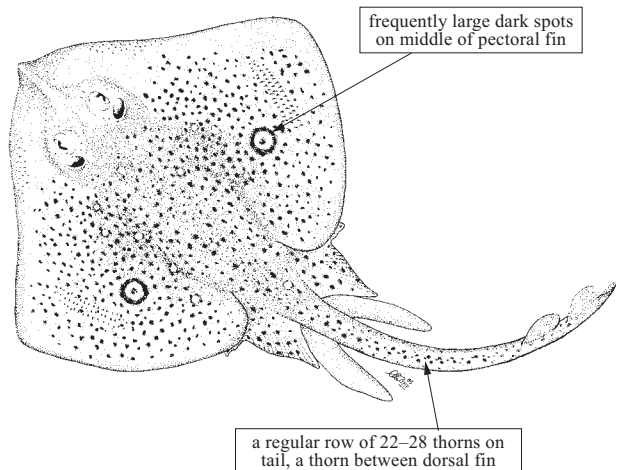
Habitat and biology: Benthic mainly on soft bottoms from 100 to 400 m. Oviparous, 20 to 62 egg-cases about 35 to 46 mm in length. Ripe females occur mostly in autumn. Males and females mature at 53 cm TL.

Distribution: Probably present only in the western Mediterranean (more common on the southern coast).

Importance to fisheries: Bycatch of bottom trawl fisheries.

Conservation and exploitation status: Mediterranean, vulnerable species.

Remarks: Probably misidentified with *R. montagui*, needs to be investigated. Considered as a Mediterranean endemic skate.



Raja radula Delaroche, 1809

(Plate IX, 70)

RAJIDAE

Frequent synonyms / misidentifications:
Raya atra Müller and Henle, 1841 / None.

FAO names: En – Rough ray; Fr – Raie râpe;
 Sp – Raya aspera.

Size: To about 70 cm TL.

Habitat and biology: Benthic from coastal water to 350 m. Oviparous, egg-cases (51–57 mm length) laid throughout the year mainly in spring and summer, embryos developing in about 4 months. Females mature at 34 cm, males at 30 cm of disc width.

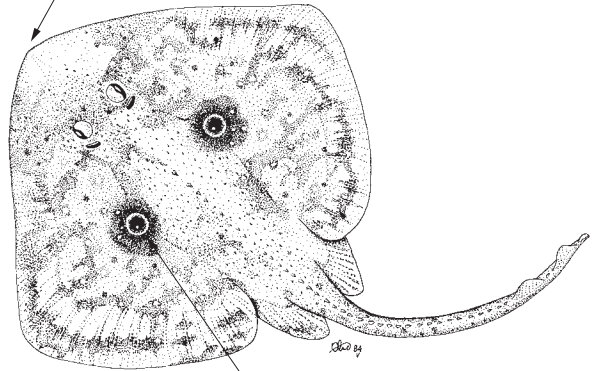
Distribution: Whole Mediterranean mainly in the western part, absent in the Black Sea.

Importance to fisheries: Bycatch in the bottom fisheries in coastal grounds.

Conservation and exploitation status: Mediterranean, occasional/rare species, needs to be investigated.

Remarks: Apparently passing into Atlantic Ocean, where reported from off Portugal and northern coasts of Morocco but such records are not confirmed. Could be considered as endemic in the Mediterranean.

snout short
and obtuse



a large eye-spot with dark centre encircled by a yellowish ring and a dark outer edge with light dots

Raja undulata Lacépède, 1802

(Plate IX, 71)

RAJIDAE

Frequent synonyms / misidentifications:
 None / None.

FAO names: En – Undulate ray; Fr – Raie brunette;
 Sp – Raya mosaica.

Size: To about 120 cm TL.

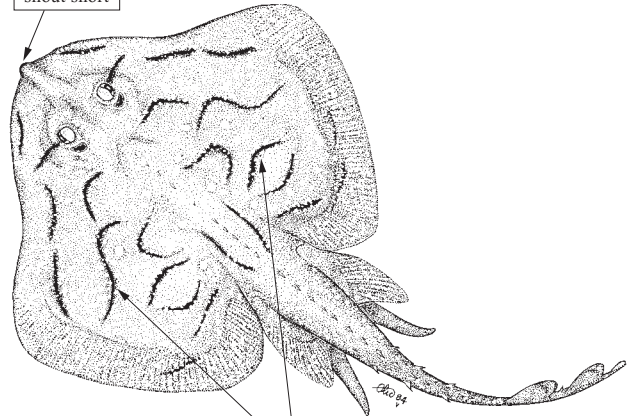
Habitat and biology: Benthic in shallow waters to about 300 m, on soft and sandy bottoms. Oviparous, 30 egg-cases from 50 to 90 mm in length, laid from March to September mainly in spring-time.

Distribution: Western Mediterranean, few records along the coasts of Israel and Turkey. Atlantic from southern Ireland and southwestern England to Mauritania.

Importance to fisheries: Bycatch in the bottom trawl and artisanal fisheries.

Conservation and exploitation status: Mediterranean, occasional/rare species.

snout short



several undulating dark bands with white spots

***Rostroraja alba* Lacépède, 1803**

(Plate X, 72)

RAJIDAE

Frequent synonyms / misidentifications:

Raja alba Lacépède, 1803; *Raja marginata* Lacépède, 1803; *Raja bicolor* Risso, 1826 / *Raja maroccana* Schneider, 1801.

FAO names: **En** – White skate; **Fr** – Raie blanche; **Sp** – Raya bramante.

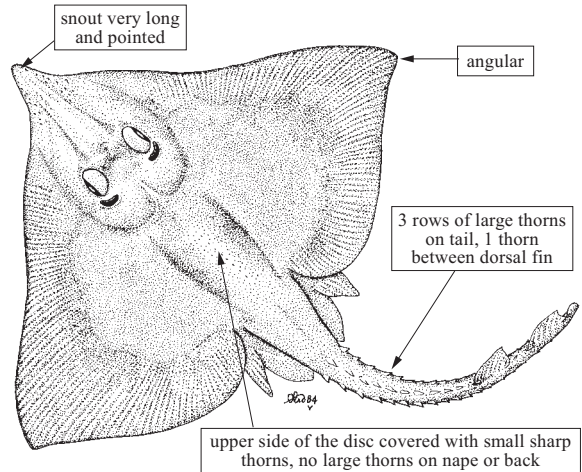
Size: To about 200 cm TL.

Habitat and biology: Benthic from coastal waters to upper slope region from 40 to 500 m, on the sandy and detritic bottoms. Oviparous, 55 to 156 egg-cases per year, about 160 to 200 mm length. Embryos developing in about 15 months (other sources state 4–5 months). Females mature at 130 cm, males at 120 cm TL; mature females observed from April to June.

Distribution: Whole Mediterranean except southeastern Levantine basin and Black Sea. Atlantic from southwestern Ireland to South Africa and southwestern part of the Indian Ocean.

Importance to fisheries: Rarely recorded in the Mediterranean; occasionally caught as bycatch by bottom trawl fisheries.

Conservation and exploitation status: Mediterranean, vulnerable species.



DASYATIDAE

***Dasyatis centroura* (Mitchill, 1815)**

(Plate X, 73)

Frequent synonyms / misidentifications: *Dasyatis aspera* (Cuvier, 1816) / None.

FAO names: **En** – Roughtail stingray; **Fr** – Pastenague épineuse; **Sp** – Raya látigo lija.

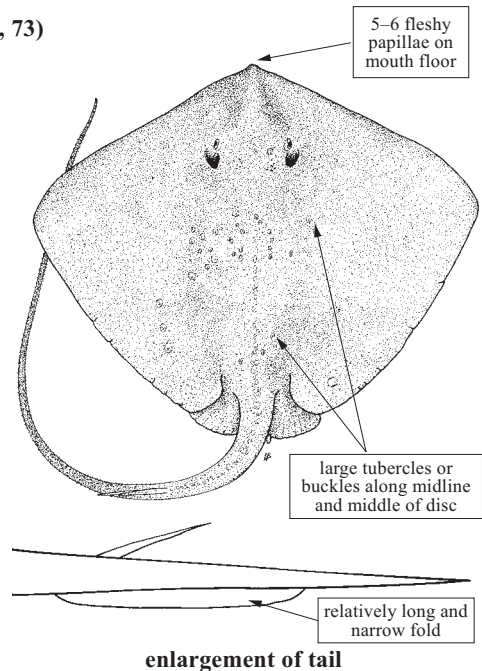
Size: Common between 100 and 130 cm, up to 210 cm disc width, 396 cm of TL.

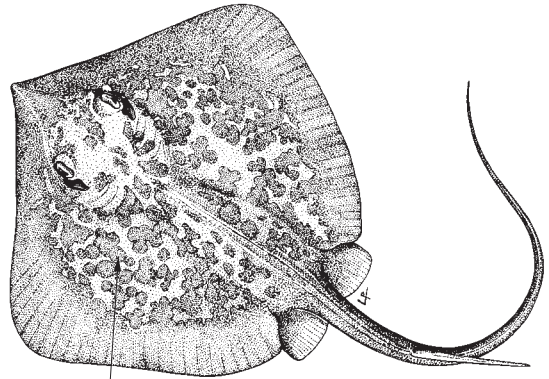
Habitat and biology: Benthic on sandy and muddy bottoms from shallow waters to 200 m. Ovoviviparous, gestation period about 4 months with only 2 to 4 young per year at 34 to 36 cm disc width at birth produced especially in autumn and early winter.

Distribution: Whole Mediterranean, absent in the Black Sea. Eastern Atlantic from southern Bay of Biscay, Madeira and Morocco to the Congo, western Atlantic from George's Bank to Florida and eastern Gulf of Mexico, from Uruguay to southern Brazil.

Importance to fisheries: Incidentally caught by trawl and artisanal (trammel and longlines) fisheries.

Conservation and exploitation status: Mediterranean, threatened species.

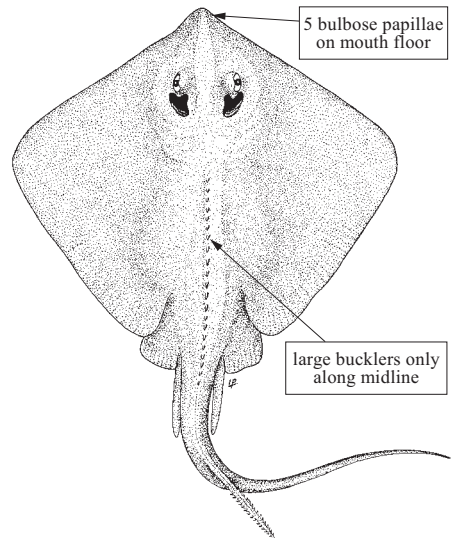


Dasyatis chrysonota marmorata* (Steindachner, 1892)** (Plate X, 74)**DASYATIDAE*Frequent synonyms / misidentifications:***Dasyatis chrysonota* (Smith, 1828) / None.**FAO names:** **En** – Marbled stingray; **Fr** – Pastenague marbrée; **Sp** – Raya látigo jaspeada.**Size:** To 30 cm disc width, 60 cm TL.**Habitat and biology:** Benthic on continental shelf 12 to 65 m on sand and muddy bottoms. Ovoviparous, females mature at 32 cm, males at 30 cm TL. Gestation period 3 months. Four litters per year usually with nine pups.**Distribution:** Recently recorded in the Mediterranean in the south of Tunisia and along the coast of Turkey. Eastern Atlantic from Morocco to South Africa.**Importance to fisheries:** Occasionally caught by bottom trawl fisheries.**Conservation and exploitation status:** Mediterranean, rare/occasional species.**Remarks:** This name is an interim solution (Compagno pers. comm). It may become *D. marmorata* after DNA studies (Last pers. comm.). Séret considers as *D. marmorata* in the “Eastern Central Atlantic Guide” (in preparation).

conspicuous bright blue blotches and branching lines on a golden background

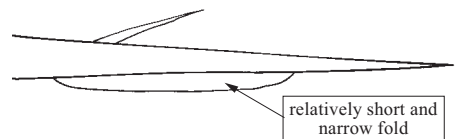
***Dasyatis pastinaca* (Linnaeus, 1758)**

(Plate X, 75)

DASYATIDAE**Frequent synonyms / misidentifications:** *Dasyatis tortonesei* Capapé, 1977; *Trygon pastinaca* Cuvier, 1817 / None.**FAO names:** **En** – Common stingray; **Fr** – Pastenague commune; **Sp** – Raya látigo común.**Size:** To 140 cm disc width, usually 45 cm, up to 250 cm TL.**Habitat and biology:** Benthic over sandy and muddy bottoms from shallow waters to 200 m. Ovoviparous with 4 to 9 young born twice per year and after a gestation period of about 4 months. Females mature at 38 cm, males at 32 cm disc width.**Distribution:** Whole Mediterranean including the Black Sea. Atlantic from Canaries to South Africa and from Madeira and Morocco to the British Isles, southern Norway and to western part of Baltic Sea.**Importance to fisheries:** Occasional bycatch in bottom trawl and gillnet fisheries.**Conservation and exploitation status:** Mediterranean, vulnerable species.**Remarks:** *Dasyatis tortonesei* Capapé, 1977, has been considered synonym of *D. pastinaca* by Tortonese (1987). Formerly considered dubious by Compagno (1999), is often confused with *D. pastinaca*. Probably a distinct *Dasyatis* species lives in the Mediterranean but with nomenclature problem and currently under investigation (Séret pers. comm.). The species *D. tortonesei* is not considered valid in this guide.

5 bulbose papillae on mouth floor

large bucklers only along midline



enlargement of tail

relatively short and narrow fold

***Himantura uarnak* (Forsskål, 1775)**

(Plate X, 76)

DASYATIDAE

Frequent synonyms / misidentifications: *Himantura punctata* (Günther, 1870); *Dasyatis uarnak* Ben Tuvia, 1955 / None.

FAO names: **En** – Forsskål's stingray; **Fr** – Pastenague indienne; **Sp** – Chupare oval.

Size: To 125 cm disc width, maximum total length at least 450 cm.

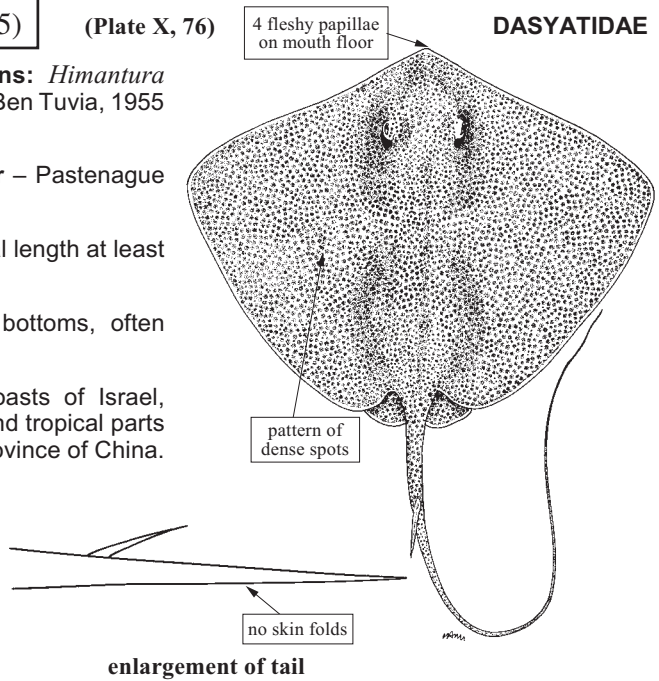
Habitat and biology: Benthic on soft bottoms, often intertidal but to depths up to 200 m.

Distribution: Eastern Mediterranean (coasts of Israel, probably Egypt and Lebanon), Red Sea and tropical parts of Indo-Pacific to Australia and Taiwan Province of China.

Importance to fisheries: Caught by gillnet fisheries some times by bottom trawls.

Conservation and exploitation status: Mediterranean, occasional/rare species.

Remarks: Immigrant Lessepsian species.



***Pteroplatytrygon violacea* (Bonaparte, 1832)**

(Plate X, 77)

DASYATIDAE

Frequent synonyms / misidentifications: *Dasyatis violacea* (Bonaparte, 1832) / None.

FAO names: **En** – Violet stingray; **Fr** – Pastenague violette; **Sp** – Raya látigo violeta.

Size: To 80 cm disc width, at least 190 cm TL.

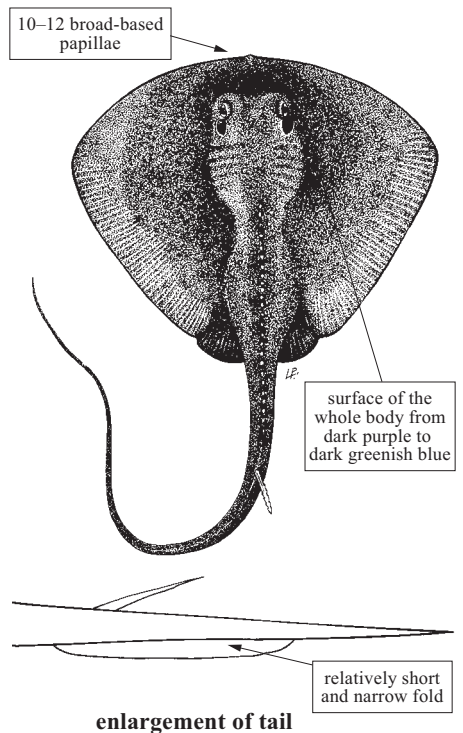
Habitat and biology: Pelagic in tropical to warm temperate waters, usually in the first 100 m, occasionally 240 m. Ovoviviparous; copulation in spring, 5 to 6 young produced in late summer. Feeds on coelenterates, squids, decapod crustaceans and pelagic fishes.

Distribution: Coasts of Mediterranean, absent in the Black Sea. Probably cosmopolitan in tropical and subtropical areas.

Importance to fisheries: Caught by drift nets and by drifting lines of hooks targeting tuna and swordfish. Discarded at sea because of their low or no commercial value.

Conservation and exploitation status: Mediterranean, vulnerable species.

Remarks: *Dasyatis violacea* (Bonaparte, 1832) has to be assigned to a different genus, *Pteroplatytrygon* Fowler, 1910. In this guide we consider *P. violacea*.



***Taeniura grabata* (Geoffroy St-Hilaire, 1817)**

Frequent synonyms / misidentifications: *Trygon grabatus* Geoffroy St-Hilaire, 1817 / None.

FAO names: **En** – Round stingray; **Fr** – Pastenague africaine; **Sp** – Chupare redondo.

Size: To 100 cm disc width, 150 cm TL.

Habitat and biology: Benthic on soft bottoms from shallow water to 100 m. Ovoviviparous.

Distribution: Mediterranean coasts from Tunisia to Turkey and northern Tyrrhenian Sea. Atlantic, temperate and tropical areas, from Cape Verde Islands to Senegal and Angola.

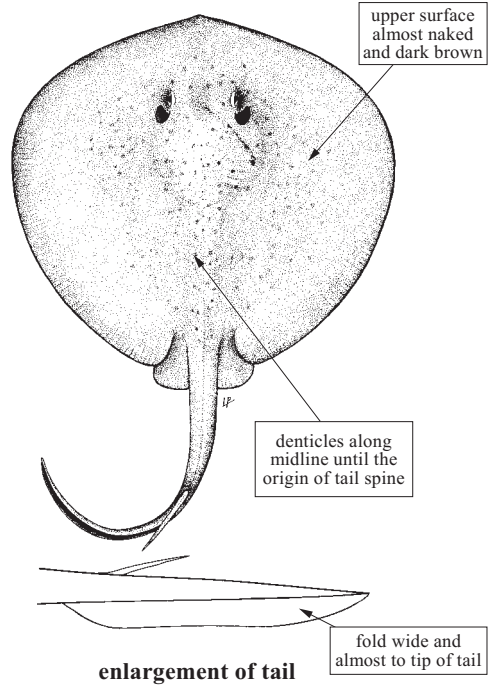
Importance to fisheries: Rarely caught by trammel nets sometime as incidental catches.

Conservation and exploitation status: Mediterranean, occasional/rare species.

Remarks: Immigrant species; Atlantic thermophilic species. Various authors wrongly considered this species in the Red Sea, where it does not exist, being only Atlantic-Mediterranean species.

(Plate X, 78)

DASYATIDAE



GYMNURIDAE

***Gymnura altavela* (Linnaeus, 1758)**

(Plate X, 79)

Frequent synonyms / misidentifications: *Pteroplatea altavela* Müller and Henle, 1841 / None.

FAO names: **En** – Spiny butterfly ray; **Fr** – Raie-papillon épineuse; **Sp** – Raya mariposa espinuda.

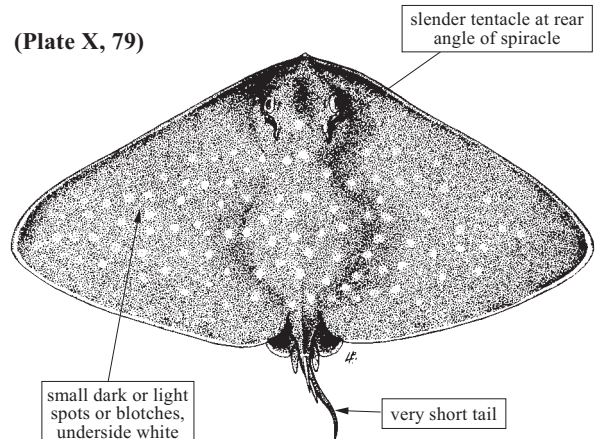
Size: To 400 cm disc width, 285 cm TL, common between 100 and 200 cm TL.

Habitat and biology: Benthic on sandy and muddy bottoms from shallow waters to 60 m. Ovoviviparous with 4 to 7 embryos per year, gestation period of about 6 months.

Distribution: Whole Mediterranean including the Black Sea. Eastern Atlantic from northern Portugal to Angola, western Atlantic from Massachusetts to the Rio de La Plata.

Importance to fisheries: Rarely caught by bottom trawl fisheries.

Conservation and exploitation status: Mediterranean, threatened species.



MYLIOBATIDAE

***Myliobatis aquila* (Linnaeus, 1758)** (Plate XI, 80)

Frequent synonyms / misidentifications: *Holorhinus aquila* Fowler, 1941 / None.

FAO names: En – Common eagle ray; Fr – Aigle commun; Sp – Aguila marina.

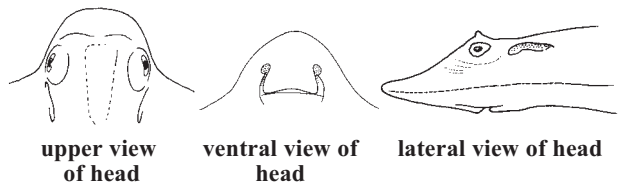
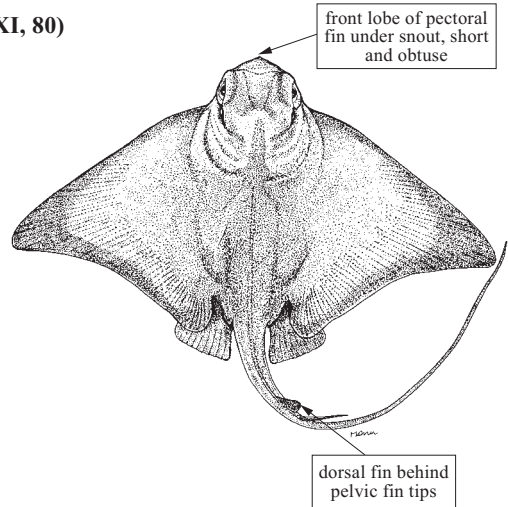
Size: To 83 cm disc width, maximum total length 260 cm.

Habitat and biology: Semipelagic in tropical to warm temperate coastal waters, occasionally oceanic, from shallow waters to 200 m. Ovoviviparous with 3 to 7 young, gestation period 6 to 8 months. Females mature at 60 cm, males at 40 cm disc width.

Distribution: Whole Mediterranean, absent in the Black Sea. Atlantic from Ireland and southwestern North Sea to Madeira Morocco and the Azores; South Africa.

Importance to fisheries: Caught by pelagic and bottom trawl and gillnet fisheries. In the northern Adriatic Sea gillnets have traditionally been utilized to catch this species.

Conservation and exploitation status: Mediterranean, vulnerable species.



***Pteromylaeus bovinus* (Geoffroy St-Hilaire, 1817)** (Plate XI, 81) **MYLIOBATIDAE**

Frequent synonyms / misidentifications: *Myliobatis bovina* Geoffroy St-Hilaire, 1817 / None.

FAO names: En – Bull ray; Fr – Aigle vachette; Sp – Chucho vaca.

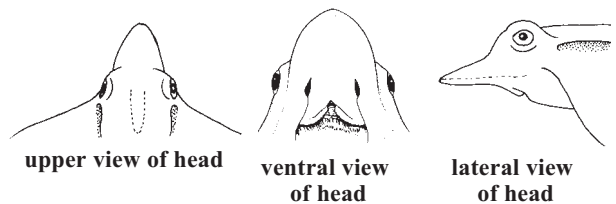
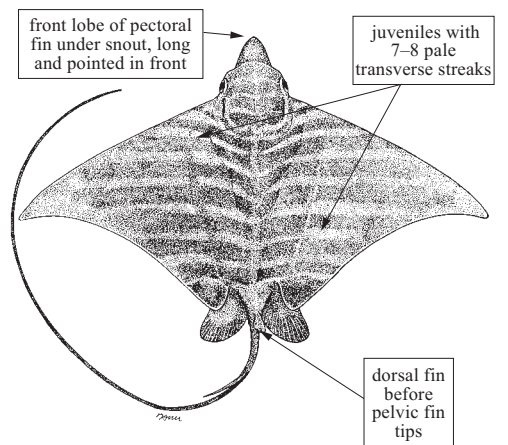
Size: To 250 cm disc width, common between 60 and 100 cm disc width.

Habitat and biology: Semipelagic in tropical to warm temperate coastal waters, occasionally oceanic up to 100 m. Ovoviviparous with 4 to 6 young having about 45 cm disc width at birth, gestation period about 6 months.

Distribution: Whole Mediterranean, absent in the Black Sea. Atlantic from Portugal Madeira and Morocco to South Africa, absent in the Azores.

Importance to fisheries: In the northern Adriatic Sea gillnets have traditionally been utilized for the catch of this species. Rarely juvenile specimens are caught as bycatch by trawl fisheries. Adult bull rays are caught by divers.

Conservation and exploitation status: Mediterranean, threatened species. Locally disappeared overfishing in the past.



RHINOPTERIDAE

Rhinoptera marginata (Geoffroy St-Hilaire, 1817)

Frequent synonyms / misidentifications: *Myliobatis marginata* Geoffroy St-Hilaire, 1817 / None.

FAO names: **En** – Lusitanian cownose ray; **Fr** – Mourine échancrée; **Sp** – Gavilán lusitánico.

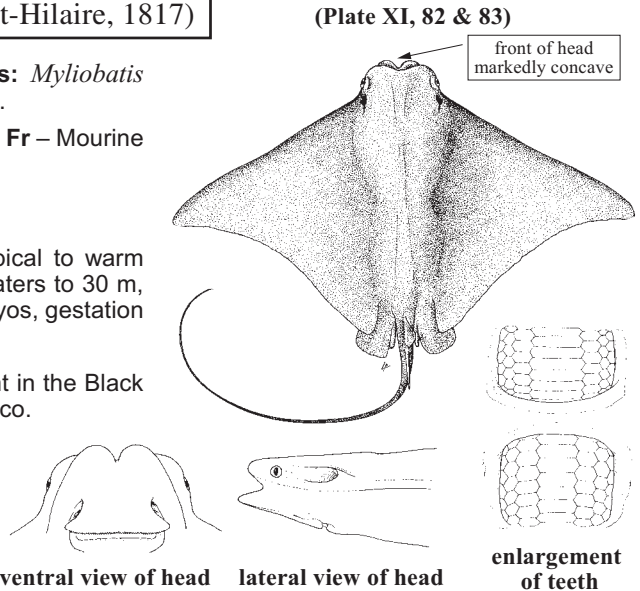
Size: To 200 cm disc width.

Habitat and biology: Semipelagic in tropical to warm temperate on muddy bottoms of coastal waters to 30 m, gregarious. Ovoviviparous with 2 to 6 embryos, gestation period up to 1 year.

Distribution: Whole Mediterranean, absent in the Black Sea. Atlantic from southern Spain to Morocco.

Importance to fisheries: Caught as bycatch by pelagic and bottom trawl fisheries, also with gillnets.

Conservation and exploitation status: Mediterranean, occasional/rare species.



MOBULIDAE

Mobula mobular (Bonnaterre, 1788)

(Plate XI, 84 & 85)

Frequent synonyms / misidentifications: *Cephaloptera giorna* (Lacépède, 1803) / *Mobula japonica* (Müller and Henle, 1841).

FAO names: **En** – Devil ray; **Fr** – Mante; **Sp** – Manta.

Size: To 520 cm disc width, 650 cm of TL, common 300 cm disc width.

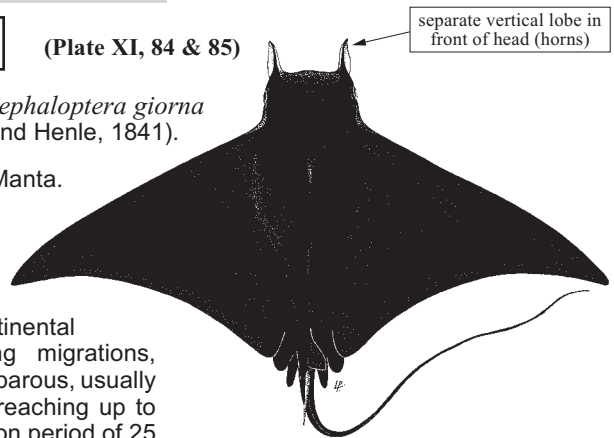
Habitat and biology: Semipelagic to pelagic in tropical and warm temperate seas over continental shelves. Gregarious apparently make long migrations, usually swimming close to the surface. Ovoviviparous, usually with 1 or more, rarely 2 young on the back reaching up to 180 cm of disc width at birth. Probably gestation period of 25 months and parturition in summer. Feeding on small pelagic fishes and crustaceans filtered out by gill plates.

Distribution: Whole Mediterranean, absent in the Black Sea. Eastern Atlantic probably from English Channel to Senegal, Azores and Canary Islands and western Atlantic.

Importance to fisheries: Occasional bycatch of purse seine and artisanal fisheries.

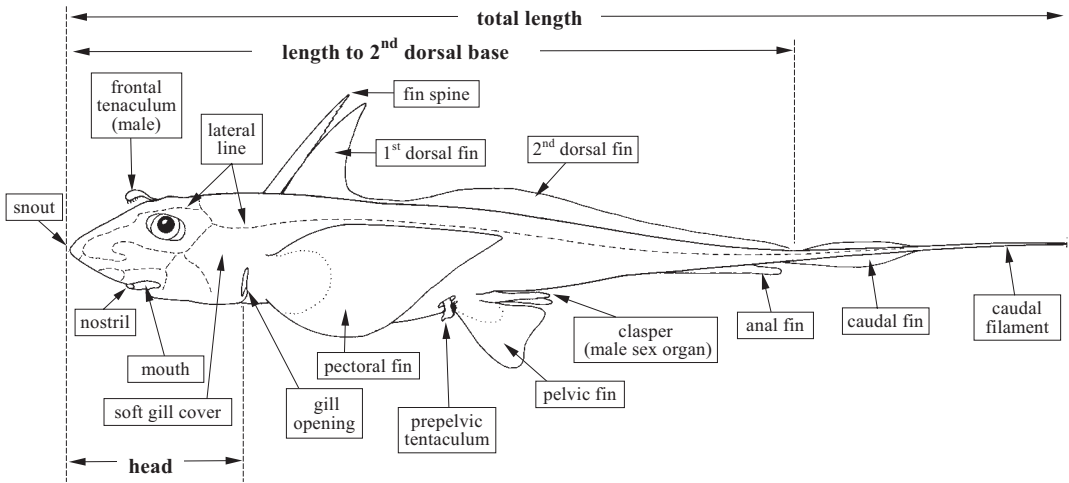
Conservation and exploitation status: IUCN, Vulnerable (A1cd); Mediterranean, occasional/rare species. Appendix 2 of Berna Convention; Appendix 2 of Barcelona Convention. Vulnerable to fisheries and declining habitat quality; rarely observed at the present, Mediterranean population strongly declined.

Remarks: Probably an endemic species in the Mediterranean, its presence in the Atlantic needs confirmation as it may be misidentified with *M. japonica* (Notarbartolo di Sciara, 1987).



CHIMAERAS

TECHNICAL TERMS AND MEASUREMENTS



ORDER, FAMILY AND SPECIES OF CHIMAERAS OCCURRING IN THE AREA

Order **CHIMAERIFORMES**

Family **CHIMAERIDAE**

Chimaera monstrosa

Order CHIMAERIFORMES – Chimaeras

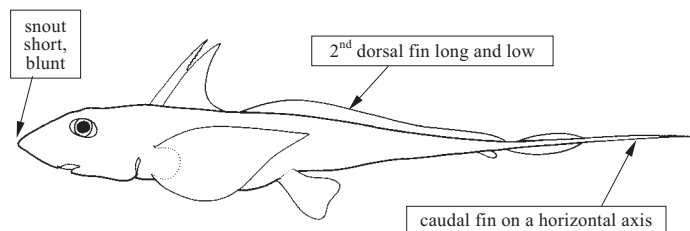
A cartilaginous skeleton; a simple external gill opening on each side of head; naked skin; 2 dorsal fins, the first with a long spine; elongate tapering tail. A single family and a species in the region.

CHIMAERIDAE

Page 74

Shortnose chimaeras

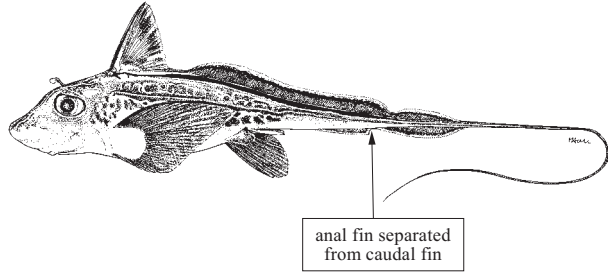
One species in the area. Demersal in depths between 300 and 1 200 m. Size to 100 cm TL.



CHIMAERIDAE

Chimaera monstrosa Linnaeus, 1758

(Plate XI, 86)

Frequent synonyms / misidentifications:
None / None.**FAO names:** En – Rabbitfish; Fr – Chimère commune; Sp – Quimera.**Size:** To about 100 cm TL.**Habitat and biology:** Benthopelagic in the upper continental slope area at 200 to 700 m, occasionally to 1 000 m, on mud bottom. Usually occurring in small groups. Oviparous, size at maturity over 70 cm TL (males and females), egg-cases deposited mainly in spring and summer and hatching after 9 to 12 months. Feed on bottom-living invertebrates.**Distribution:** Western Mediterranean (rare records from eastern part). Atlantic from Iceland and Norway to Morocco, Madeira and the Azores.**Importance to fisheries:** Bycatch in deep trawling fisheries (discarded).**Conservation and exploitation status:** Mediterranean, stable biomass.

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INDEX OF SCIENTIFIC AND VERNACULAR NAMES

EXPLANATION OF THE SYSTEM

- Italics* : Valid scientific names (double entry by genera and species)
- Italics* : Synonyms and misidentifications (double entry by genera and species)
- ROMAN** : Family names
- ROMAN : Names of orders, class, subclass
- Roman** : FAO names.

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Seret, B.

Plate VIII: Fig. 56

Sion, L.

Plate VII: Fig. 54

Ungaro, N.

Plate X: Fig. 77

PHOTO CREDITS OF EGG CASES

P. Bor

RAJIDAE: *Dipturus batis*

RAJIDAE: *Leucoraja circularis*

C. Mancusi

SCYLIORHINIDAE: *Scyliorhinus canicula*

SCYLIORHINIDAE: *Galeus melastomus*

SCYLIORHINIDAE: *Dipturus oxyrinchus*

RAJIDAE: *Raja miraletus*

RAJIDAE: *Raja polystigma*

E. Luchetti

CHIMAERIDAE: *Chimaera monstrosa*

F. Serena

SCYLIORHINIDAE: *Scyliorhinus stellaris*

RAJIDAE: *Raja asterias*

RAJIDAE: *Raja clavata*

Shark Trust

RAJIDAE: *Leucoraja naevus*

RAJIDAE: *Raja brachyura*

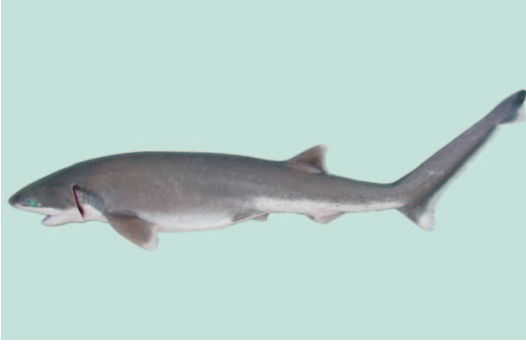
RAJIDAE: *Raja montagui*

RAJIDAE: *Raja undulata*

RAJIDAE: *Rostroraja alba*

COLOUR PLATES

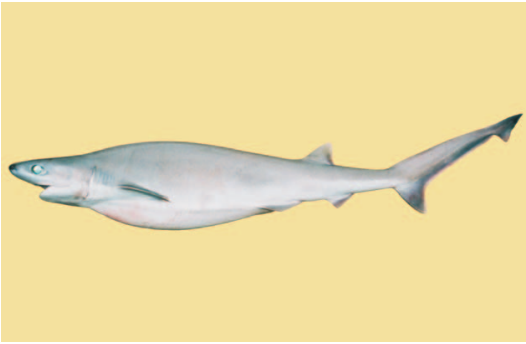
PLATE I



1. HEXANCHIDAE: *Heptranchias perlo*



2. HEXANCHIDAE: *Hexanchus griseus*



3. HEXANCHIDAE: *Hexanchus nakamurai*



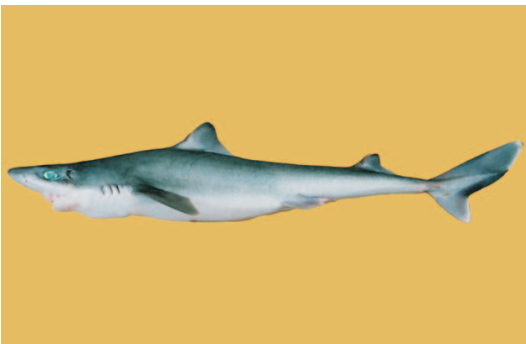
4. ECHINORHINIDAE: *Echinorhinus brucus*



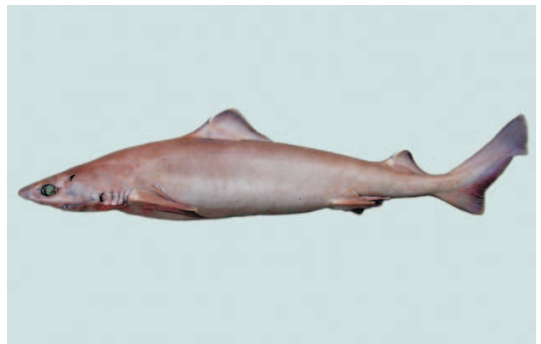
5. SQUALIDAE: *Squalus acanthias*



6. SQUALIDAE: *Squalus blainvillei*

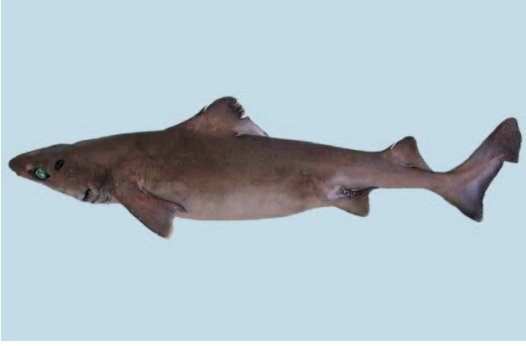


7. SQUALIDAE: *Squalus megalops*

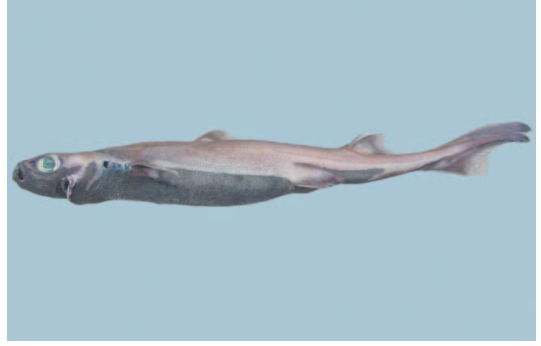


8. CENTROPHORIDAE: *Centrophorus granulosus*

PLATE II



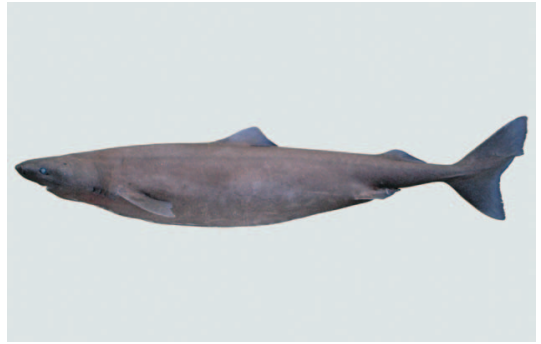
9. CENTROPHORIDAE: *Centrophorus uyato*



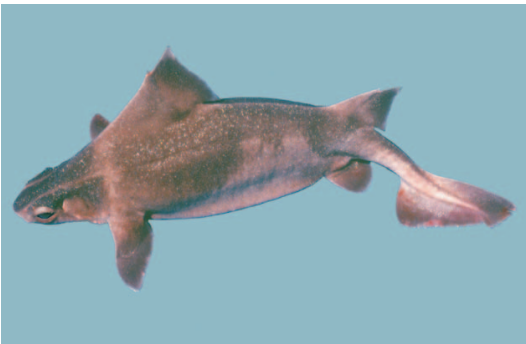
10. ETMOPTERIDAE: *Etmopterus spinax*



11. SOMNIOSIDAE: *Centroscymnus coelolepis*



12. SOMNIOSIDAE: *Somniosus (Rhinoscyrnus) rostratus*



13. OXYNOTIDAE: *Oxinotus centrina*



14. DALATIIDAE: *Dalatias licha*



15. SQUATINIDAE: *Squatina oculata*

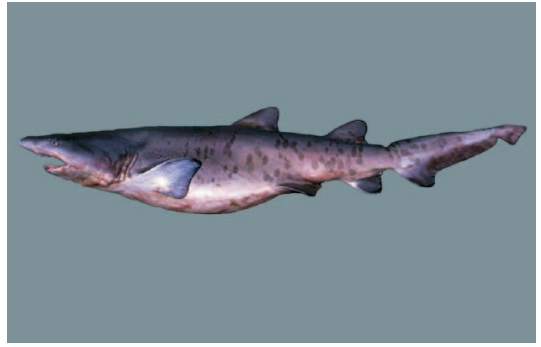


16. SQUATINIDAE: *Squatina oculata* (ventral view)

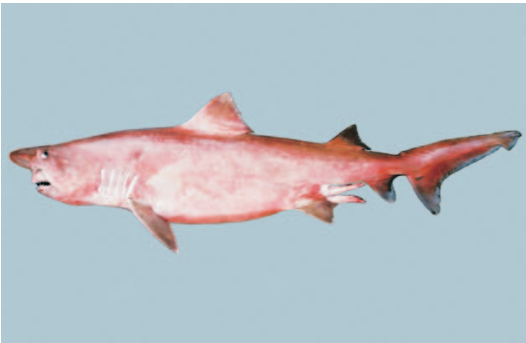
PLATE III



17. ODONTASPIDAE: *Carcharias taurus*



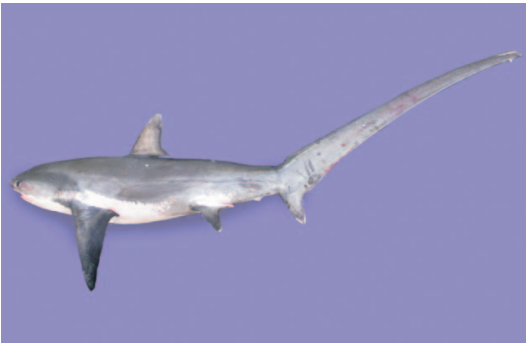
18. ODONTASPIDAE: *Carcharias taurus* (juvenile)



19. ODONTASPIDAE: *Odontaspis ferox*



20. ALOPIIDAE: *Alopias superciliosus*



21. ALOPIIDAE: *Alopias vulpinus*



22. CETORHINIDAE: *Cetorhinus maximus*
(juvenile head)

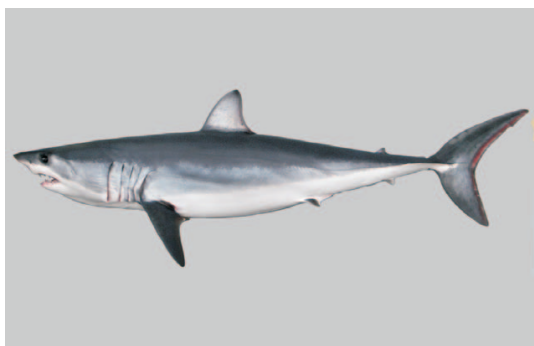


23. CETORHINIDAE: *Cetorhinus maximus*
(male head)

PLATE IV



24. LAMNIDAE: *Carcharodon carcharias*



25. LAMNIDAE: *Isurus oxyrinchus*



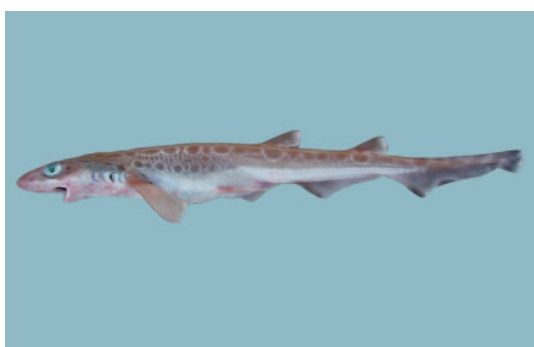
26. LAMNIDAE: *Isurus paucus* (head)



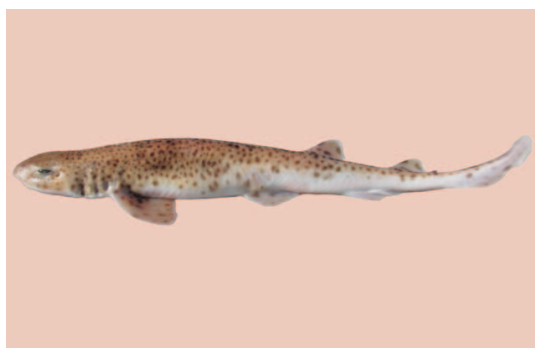
27. LAMNIDAE: *Lamna nasus*



28. SCYLIORHINIDAE: *Galeus atlanticus*



29. SCYLIORHINIDAE: *Galeus melastomus*

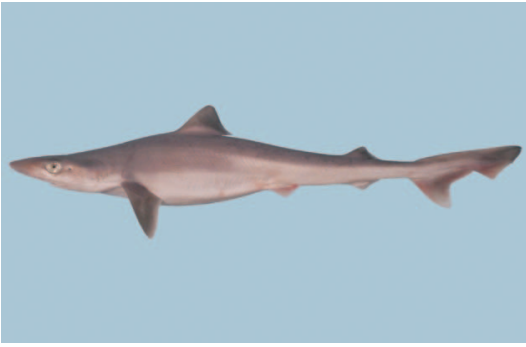


30. SCYLIORHINIDAE: *Scyliorhinus canicula*

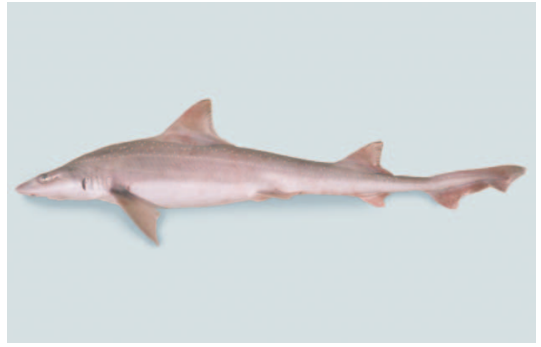


31. SCYLIORHINIDAE: *Scyliorhinus stellaris*

PLATE V



32. TRIAKIDAE: *Galeorhinus galeus*



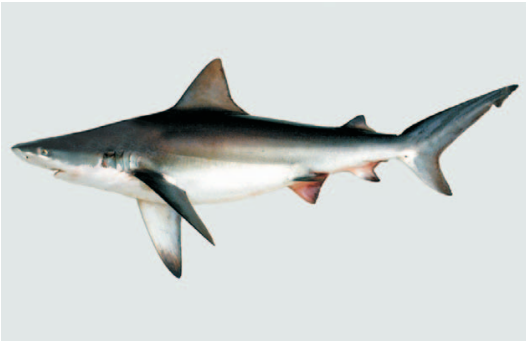
33. TRIAKIDAE: *Mustelus asterias*



34. TRIAKIDAE: *Mustelus mustelus*



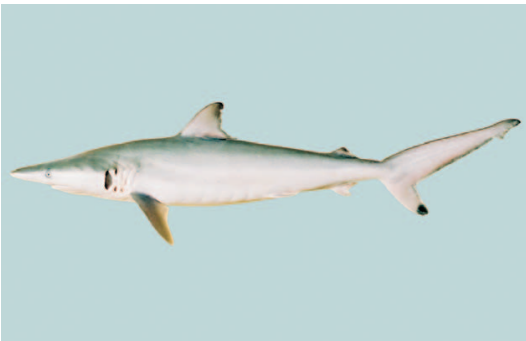
35. TRIAKIDAE: *Mustelus punctulatus*



36. CARCHARHINIDAE: *Carcharhinus altimus*



37. CARCHARHINIDAE: *Carcharhinus brachyurus*

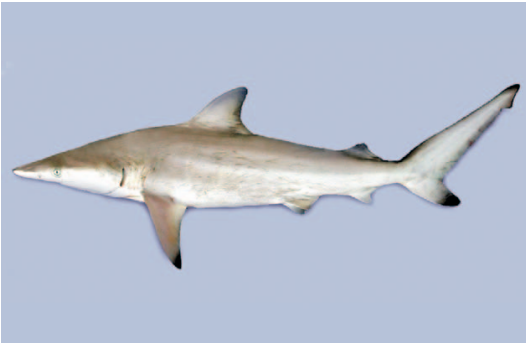


38. CARCHARHINIDAE: *Carcharhinus brevipinna*

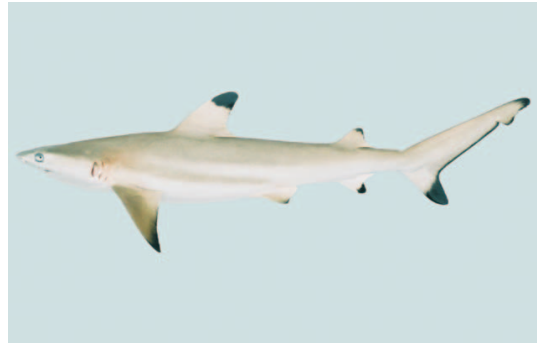


39. CARCHARHINIDAE: *Carcharhinus falciformis*

PLATE VI



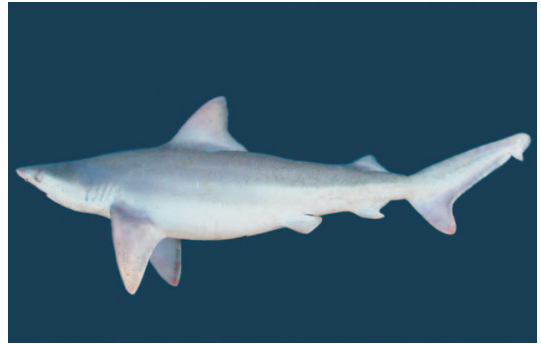
40. CARCHARHINIDAE: *Carcharhinus limbatus*



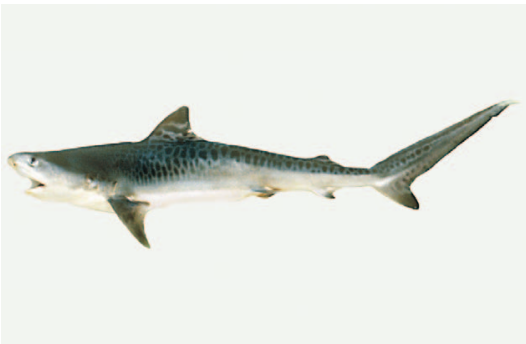
41. CARCHARHINIDAE: *Carcharhinus melanopterus*



42. CARCHARHINIDAE: *Carcharhinus obscurus*



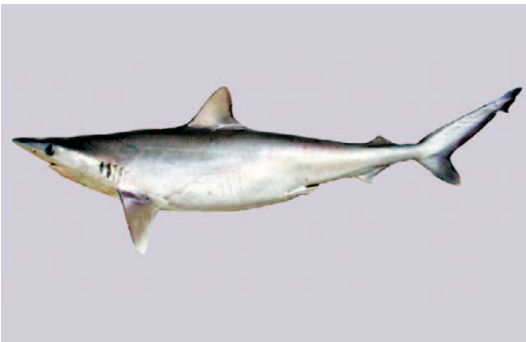
43. CARCHARHINIDAE: *Carcharhinus plumbeus*



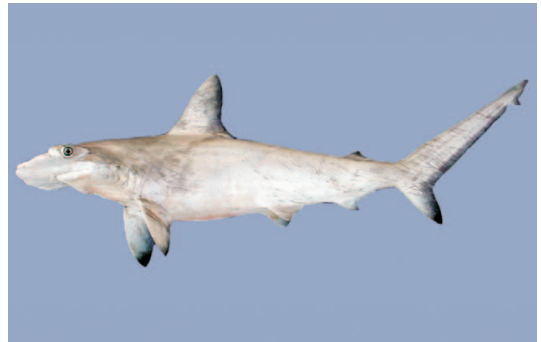
44. CARCHARHINIDAE: *Galeocerdo cuvier*



45. CARCHARHINIDAE: *Prionace glauca*

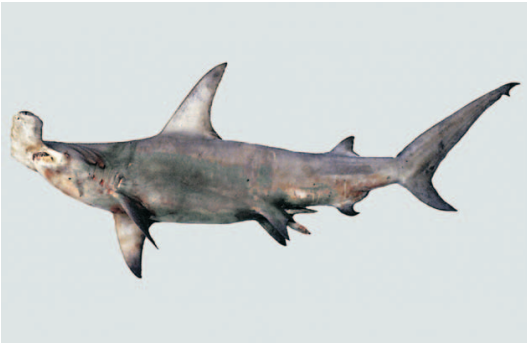


46. CARCHARHINIDAE: *Rhizoprionodon acutus*



47. SPHYRNIDAE: *Sphyrna (Sphyrna) lewini*
(juvenile)

PLATE VII



48. SPHYRNIDAE: *Sphyrna (Sphyrna) mokarran*



49. SPHYRNIDAE: *Sphyrna (Sphyrna) zygaena*



50. SPHYRNIDAE: *Sphyrna (Sphyrna) zygaena*
(head)



51. PRISTIDAE: *Pristis pectinata*



52. RHINOBATIDAE: *Rhinobatos (Glaucostegus) cemiculus*



53. RHINOBATIDAE: *Rhinobatos (Rhinobatos) rhinobatos*



54. TORPEDINIDAE: *Torpedo (Tetronarce) nobiliana*



55. TORPEDINIDAE: *Torpedo (Torpedo) marmorata*

PLATE VIII



56. TORPEDINIDAE: *Torpedo (Torpedo) sinuspersici*



57. TORPEDINIDAE: *Torpedo (Torpedo) torpedo*



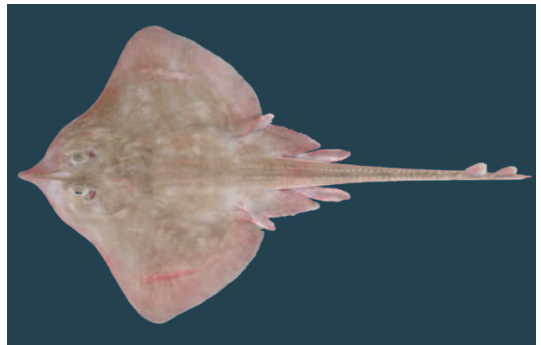
58. RAJIDAE: *Dipturus batis*



59. RAJIDAE: *Dipturus oxyrinchus*



60. RAJIDAE: *Leucoraja circularis*



61. RAJIDAE: *Leucoraja fullonica*



62. RAJIDAE: *Leucoraja melitensis*

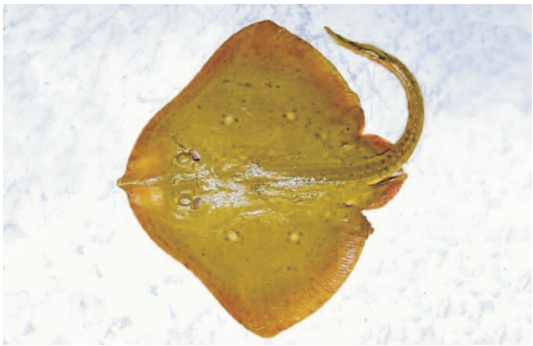


63. RAJIDAE: *Leucoraja naevus*

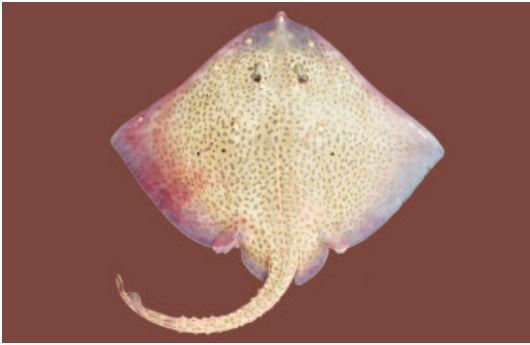
PLATE IX



64. RAJIDAE: *Raja asterias*



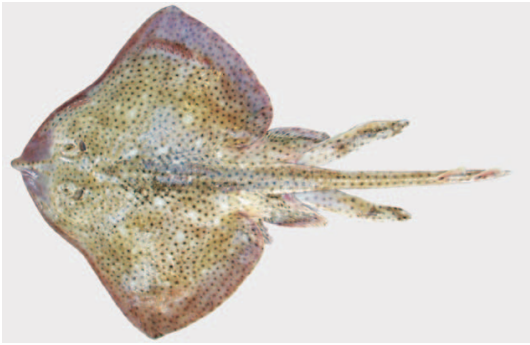
65. RAJIDAE: *Raja brachyura*



66. RAJIDAE: *Raja clavata*



67. RAJIDAE: *Raja miraletus*



68. RAJIDAE: *Raja montagui*



69. RAJIDAE: *Raja polystigma*



70. RAJIDAE: *Raja radula*



71. RAJIDAE: *Raja undulata*

PLATE X



72. RAJIDAE: *Rostroraja alba*



73. DASYATIDAE: *Dasyatis centroura*



74. DASYATIDAE: *Dasyatis marmorata*



75. DASYATIDAE: *Dasyatis pastinaca*



76. DASYATIDAE: *Himantura uarnak*



77. DASYATIDAE: *Pteroplatytrygon violacea*



78. DASYATIDAE: *Taeniura grabata*



79. GYMNURIDAE: *Gymnura altavela*

PLATE XI



80. MYLIOBATIDAE: *Myliobatis aquila*



81. MYLIOBATIDAE: *Pteromylaeus bovinus*



82. RHINOPTERIDAE: *Rhinoptera marginata*



83. RHINOPTERIDAE: *Rhinoptera marginata* (juvenile)



84. MOBULIDAE: *Mobula mobular* (adult)



85. MOBULIDAE: *Mobula mobular* (term embryo)



86. CHIMAERIDAE: *Chimaera monstrosa*

EGG CASES



SCYLIORHINIDAE:
Scyliorhinus canicula



SCYLIORHINIDAE:
Scyliorhinus stellaris



SCYLIORHINIDAE:
Galeus melastomus



RAJIDAE:
Dipturus batis



RAJIDAE:
Dipturus oxyrinchus



RAJIDAE:
Leucoraja circularis



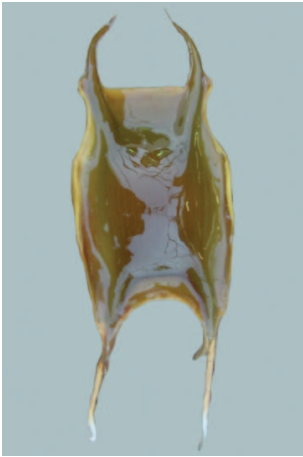
RAJIDAE:
Leucoraja naevus



RAJIDAE:
Raja asterias



RAJIDAE:
Raja brachyura



RAJIDAE:
Raja clavata



RAJIDAE:
Raja miraletus



RAJIDAE:
Raja montagui



RAJIDAE:
Raja polystigma



RAJIDAE:
Raja undulata



RAJIDAE:
Rostroraja alba



CHIMAERIDAE:
Chimaera monstrosa

This volume presents a fully illustrated field guide for the identification of the sharks and rays most relevant to the fisheries of the Mediterranean and Black Sea. An extensive literature review was carried out for the preparation of this document. A total of 49 sharks, 34 batoids and 1 chimaera are fully treated. The guide includes sections on technical terms and measurements for sharks and batoids, and fully illustrated keys to those orders and families that occur in the region. Each species account includes: at least one annotated illustration of the species highlighting its relevant identification characters; basic information on nomenclature, synonyms and possible misidentifications; FAO common names; basic information on size, habitat and biology, distribution, importance to fisheries, and conservation and exploitation status. Colour plates for a large number of the species are included as well as two plates showing the egg cases.

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