
REVISION OF THE RECORDS OF SHARK AND RAY SPECIES FROM THE MALTESE ISLANDS (CHORDATA: CHONDRICHTHYES)

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ABSTRACT

Records of sharks and rays from Maltese waters published in the scientific literature were critically evaluated by examining and accurately identifying specimens caught by fishers, seen by the authors and those kept in museum collections. Photographs of caught specimens but which were not preserved were also considered. Out of 37 species of sharks and 26 species of rays recorded from Malta, 24 sharks and 14 rays along with another two sharks, whose presence is a distinct probability although not encountered during this study, were authenticated. Other records have yet to be confirmed by actual specimens. Published records are discussed individually and indices of historic and recent abundance are assessed.

INTRODUCTION

The need for compiling an accurate inventory of the species that occur in a given region, as the basis for the implementation of management initiatives including conservation and food production, is practically self-evident and has often been emphasized (e.g. , see reviews in McNeely *et al.* , 1990; SA2000, 1994; Bisby, 1995). This philosophy is now entrenched in the Convention on Biological Diversity (1992) (Glowka *et al.* , 1999).

Located centrally in the Mediterranean Sea, between its western and eastern basins, the Maltese Islands afford a well-placed sampling point for the region's ichthyofauna. From as early as the 18th Century, naturalists, fishers and enthusiasts have compiled lists of the fish fauna of the Maltese Islands and while many such lists are now available, none are really satisfactory from a faunistic point of view. This is because all include a number of species that very probably do not actually form part of the Maltese fauna, partly as a result of doubtful records that have been cited from one publication to another without confirmation, and partly because records have been accepted on hearsay or on very flimsy evidence (Schembri, 2001). There is also the possibility that species that once existed or regularly entered Maltese waters no longer do so.

Clearly, there is a contemporary need to critically review all records of fish from waters around the Maltese Islands and this is particularly true for elasmobranchs, for a number of reasons. Firstly, many species of this group are top predators, widely distributed but relatively scarce and therefore not often encountered. Secondly, because of their size and difficulties with preservation, the larger species tend not to be well-represented in museums or other collections. Thirdly, similar species, such as 'requiem' or 'whaler' sharks of the genus *Carcharhinus*, tend to be confused with each other, particularly if they are not positively identified by a detailed examination of actual specimens.

In order to address this problem, a long-term study of the fish fauna of the Maltese Islands was carried out in which the evaluation of previous records was sought by examining and accurately identifying specimens caught by fishers, seen by the authors or kept in museum collections. Photographs of caught specimens but which were not preserved were also considered. The present work reports on the selachimorph (sharks) and rajimorph (rays and skates) elasmobranchs and is the result of four years of field and laboratory study.

HISTORICAL PERSPECTIVE

There are a number of early publications on the fish, including Chondrichthyes, of the Maltese Islands. Most are general descriptive accounts of Maltese fisheries, reports on the economic status of local fisheries issued by the Maltese authorities and others of a primarily culinary nature that are not useful for faunistic purposes. The first scientific work on fish is the list drawn up by Pehr Forsskål in his posthumously published '*Descriptiones Animalium*' (Forsskål, 1775),

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where under the heading '*Catalogus Piscium Melitensium a Medico Doctissimo Communicatus*', 114 Maltese fish (and two cetaceans), including 13 Chondrichthyes, are listed under their scientific names (pp. 18-19). For some, the Maltese vernacular name is also given. Although Forsskål does not give the name of his informant, this is generally held to be the Maltese physician Giorgio Giovan Battista Locano (Gulia, 1909a; Despott, 1919; Zammit Maempel, 1994). Another early publication that uses scientific names, and gives their vernacular equivalent in several languages, is that of specimens observed in local fish markets, produced by Gaetano Trapani, which includes eight species of sharks and the same number of rays (Trapani, 1838). Although scientific names are used, many of these seem to be inaccurate and difficult to assign to species as presently understood.

Gavino Gulia was the first to publish important scientific data together with the lists of species he collected. In his *Tentamen Ichthiologiae Melitensis* (Gulia, 1861a) and its translation *Pesci di Malta* (Gulia, 1861b), he gives a classified list of fish occurring in Maltese waters with occasional notes on coloration, abundance, distribution and taxonomy, as well as the description of new species (none of Chondrichthyes, however). This work is the first comprehensive scientific account of Maltese fish and lists 186 species including 27 of Chondrichthyes. It includes a general discussion on the fish fauna of the Maltese Islands, and indices. This was followed by his *Repertorio di Storia Naturale* (Gulia, 1858-59), in which he attempts to describe all animal and plant species recorded from the Maltese Islands and gives scientific names and some taxonomic and biological information. In this work, Gulia includes a section on the fish of Malta under the title '*Index Methodicus Melitensium Piscium*' (pp. 221-229). Essentially this is the same list published in his '*Tentamen*' less most of the biological data but with some additions, including one to the Chondrichthyes, bringing their total to 28 species. Gulia continued to add new records to his list of Maltese fish in notes published in the local scientific journal '*Il Barth*'. One such note concerned the elasmobranchs and enumerated 33 species (Gulia, 1872). He also contributed a list of local fish in Pietro Paolo Castagna's account of Malta (Castagna, 1888), however giving Maltese names only. Other authors, both local (for example, Medlycott, 1870) and foreign (for example, Carus, 1889-93) used Gulia's lists as a basis for their compilations.

Around the same period, George Gustave Crispo-Barbaro published his *Fishes of Malta*, which is a more or less faithful copy of Trapani's catalogue, however, unlike its predecessor, it does not give scientific names. Three editions of this work were published, with 160 species (Crispo-Barbaro, 1885) listed in the most recent one.

With the start of the 20th Century the study of Maltese ichthyology became more scientific. Several Maltese naturalists became interested in accumulating a complete, detailed account of the local fish fauna. Napoleon Tagliaferro recorded the occurrence of the Sharksucker *Echeneis naucrates* which attaches itself to sharks (Tagliaferro, 1893), but without any mention of 'host' species. Giovanni Gulia, son of Gavino, published an encyclopaedic list of local flora and fauna (Gulia, 1889-90), a popular list of fish as they occur month by month in local waters (Gulia, 1905), a bibliography of the main publications on the vertebrate fauna (including fish) of the Maltese Islands (Gulia, 1909a) and also added several species to the ever-growing list of local fish including the Devil Ray *Mobula mobular* (Gulia, 1909b) and the Rabbit-fish *Chimaera monstrosa* (Gulia, 1909c). However, Giovanni Gulia seems to have obtained his information mainly from his colleagues' unpublished notes and from previous publications and it is doubtful which species he actually collected or confirmed himself.

Most notable are the works of Giuseppe Despott, who was superintendent of fisheries and later curator of the natural history section of the Malta national museum. His publication entitled '*The Ichthyology of Malta*', originally published in parts in the local journal *Archivium Melitense* and then collated in the form of a booklet (Despott, 1919), gives a list of 272 species including 47 Chondrichthyes with short notes on each, mainly on abundance, occurrence, fisheries and commercial value. A valuable bibliography of works on local fish is included, as are indices to scientific, English, Italian and Maltese names; taxonomic and other scientific data in this work are very limited, however. Amongst his other works and reports on fish and fisheries, Despott also published the first documented capture of a Basking Shark (*Cetorhinus maximus*) in Maltese waters (Despott, 1930).

In 1961, Joseph Barbara, then with the Department of Fisheries, issued a guide in an attempt to standardise the names given to Mediterranean fish caught locally; this list includes 219 species of which 45 are Chondrichthyes (Barbara, 1961). It is clear from his introductory comments that Barbara was giving the vernacular Maltese names to species known to occur in the central Mediterranean, without any regard as to whether these species actually formed part of the Maltese fauna or not. A linguistic study of the Maltese names of fish and other marine animals and related terminology was published by Aquilina (1969), but this is of little faunistic value.

A milestone work was the comprehensive scientific catalogue of local fish by Guido Lanfranco, first published in 1958 as '*A complete guide to the fishes of Malta*' with a second and third edition with revisions in 1965 and 1974, respectively, and currently available as a fourth edition, again with revisions, under the title '*The fish around Malta*' (Lanfranco, 1993). This latest edition gives a systematically arranged list of 288 species including 51 Chondrichthyes, with colour plates, scientific and local nomenclatures as well as a brief description of the diagnostic features of each family and a description

of the coloration of each species and occasionally other notes. However, the author did not collect all the species recorded himself, but also included species on the basis of second-hand information from fishers, naturalists or others (G. Lanfranco, personal communication 2001). Since these informants were not trained ichthyologists and since Lanfranco did not verify all identifications himself, some records must be considered as doubtful or unconfirmed. Lanfranco also contributed the section on fish in both Maltese (Sultana, 1995) and English (Sultana & Falzon, 1996) versions of a popular publication on the wildlife of the Maltese Islands published by the (then) Environment Protection Department. These works include 120 colour paintings of fish, including a selection of 18 elasmobranchs, with an accompanying text that gives brief descriptions and some short notes on the biology of the species.

Another recent compilation on the fish of the Maltese Islands is that by Farrugia Randon & Sammut (1999) under the title of '*Fishes of Maltese Waters*'. This provides a classified list of species with scientific and vernacular names and basic data about distribution and biology. Methods of capture used in local and foreign fisheries are discussed in detail and other information on culinary and market value is also provided. The authors themselves collected some of the species claimed as part of the local fauna while others were observed at the local fish markets; furthermore, some species were included on the basis of information supplied by fishers and other persons as well as on reports in previous publications. Although some 60 species of Chondrichthyes are mentioned in this work, there is no critical evaluation of the records and it is not always clear which are considered to form part of the local fauna and which are not. Essentially the same material less the information on fisheries, market value and culinary aspects was published by Sammut (2001) under the title '*Mediterranean sea fishes*'. On the other hand, Farrugia Randon (2001) published a work in Maltese entitled '*Il-hut ta' Malta*' that is mainly concerned with the fishing industry and fishing methods and only gives limited information on a selection of locally occurring fish including two species of sharks and two of rays, although in a classified list of local species included in this work, 46 Chondrichthyes are given.

Jennings (1979) published a popular guide to Mediterranean fishes that appears to be heavily based on Maltese material, although no specific Maltese records are mentioned. Other popular guides with a Maltese connection that include sections on fish are those of Middleton (1997), Wood & Wood (1999) and Wood (2002). Another three works with a Maltese connection are those of Louis Zammit (undated and ?1991) who published a booklet on hazardous fish in which stingrays and sharks obviously featured (Zammit, undated) and a set of pen drawings of Maltese fish in booklet form (Zammit, ? 1991), and Attard & Muscat (1999) on the more common sharks of the Maltese Islands and the Mediterranean. However, despite the title, many of the species described in this publication are actually either uncommon, rare or exceptional around Malta or indeed throughout the wider Mediterranean Sea; e.g. the Sandtiger *Carcharias taurus*. None of these publications are really useful for faunistic purposes, since they only include a selection of species and limited local data.

Knowledge of local cartilagenous fish was improved through the work of Ian K. Fergusson and his colleagues. In the mid 1990s, Fergusson carried out fieldwork in Malta both at sea and at the local fish markets where he interviewed fishers, shark enthusiasts, divers and Government fisheries officers. As a result of this and using original landings data provided by the Central Fishmarket in Valletta, Fergusson & Marks (1996) submitted an unpublished report on the commercial landings of sharks and other elasmobranchs in Malta to the IUCN-SSC Shark Specialist Group. They included a checklist of 61 species of Maltese elasmobranchs [the same list with updated nomenclature is given as an appendix on Fergusson's website; Fergusson, 1998]. Not all the species on Fergusson's lists are based on verified specimens, but Fergusson & Marks (1996) are well aware of the problems of identification of species by fishers and enthusiasts and discuss these issues. Other work resulting from Fergusson's fieldwork and subsequent studies includes notes on the shark fauna of the Sicilian Channel (Fergusson, 1994), a proposal to the Malta Government's environment protection agency to conserve the Great White Shark *Carcharodon carcharias* in Maltese waters (Fergusson *et al.*, 1999), a first record of *Carcharhinus obscurus* from Maltese waters (Fergusson & Compagno, 2000), a report on predation by *Carcharodon carcharias* on chelonians based partly on a Maltese record (Fergusson *et al.*, 2000), and a wider revision of the occurrence and biology of *Carcharodon carcharias* in the Central Mediterranean Sea (Fergusson, 2002).

Material and methods

The majority of the species listed in the taxonomic section of the present work were identified by the authors from specimens that were collected or photographed personally, or from preserved material kept in private collections in Malta. Commercial species were obtained from the local fish markets in Valletta and Marsaxlokk, both on Malta; there is no fish market on Gozo. Major fish shops were also visited regularly as these are sometimes supplied directly by fishers or through small-scale fishing carried out by the owners. Specimens in excess of 1.5m (standard length) were usually examined and identified *in situ* but were not collected or purchased because of their size and the expense involved; additionally, such large specimens are often sectioned at sea and sold in parts to facilitate transport. The most common species found at the fish markets include those with the highest market value, as well as those that are commonly caught incidentally or as by-catch with the fishing methods adopted by local fishers. Identification of the larger sharks that are only occasionally captured is based on photographic records, obtained from local fishers.

Non-commercial species were not usually available at fish shops or at the fish markets. The majority of information about such species was obtained from private collectors, enthusiasts, reporters and fishers, usually in the form of photographs but sometimes as actual specimens. The majority of the species listed in this work are therefore supported by actual specimens or photographs of specimens. Species reported in the literature that could not be authenticated in the present study are considered as unconfirmed. The exception are those with obvious diagnostic features that were described in detail by their collectors; such species have provisionally been accepted but with the caveat that they need to be confirmed by actual specimens. For the purposes of this study, the (often regular) sighting reports of large sharks, typically purported as specimens of *Carcharodon carcharias*, cited in newsmedia accounts since 1995 but not substantiated by any physical proof (e.g. photo-video) were discounted.

An attempt was made to examine the material on which Lanfranco's catalogues are based (Lanfranco, 1993 and previous editions). However, only few specimens from his original collection still survive, some of which are housed at the National Museum of Natural History at Mdina and others at the Malta Centre for Fisheries Sciences at Fort St Lucian, Marsaxlokk. The illustrations accompanying this work were made by one of us (TS) based on specimens or from photographs, unless otherwise stated.

In the species list that follows, the common English names are taken from Fischer et al., 1987. Reference to Maltese waters means the 25 nautical mile (40.2 km) exclusive fisheries zone declared by Malta in 1978.

SPECIES LIST

SELACHIMORPHA

HEXANCHIDAE

***Heptanchias perlo* (Bonnaterre, 1788) - Fig. 1G**

[Seven-gilled shark]

Heptanchus cinereus (Rafin.): GULIA, 1861; *Heptanchus cinereus* Muller: GULIA, 1872; *Heptanchus cinereus* (Lin.): DESPOTT, 1919; *Heptanchias perlo*: BARBARA, 1961; *Heptanchias perlo* (Bonn.): LANFRANCO, 1993; *Heptanchias perlo* (Bonnaterre): FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Heptanchias perlo* (Bonnaterre): FARRUGIA RANDON & SAMMUT, 1999; *Heptanchias perlo* (Bonnaterre): SAMMUT, 2001.

Gulia (1872) reported that this species is 'rare' while Despott (1919), Lanfranco (1993), Farrugia Randon & Sammut (1999) and Sammut (2001) consider it as not common. We have regularly encountered this species offered for sale at both the Valletta and Marsaxlokk fish markets and therefore it could be considered as occurring frequently in local waters. However, local status is difficult to assess because a number of specimens marketed in Malta may originate from other parts of the Sicilian Channel, particularly the banks and seamounts to the northwest. These sharks are regularly sold for human consumption in southern Sicilian fisheries (e.g. Mazara del Vallo).

***Hexanchus griseus* (Bonnaterre, 1788) - Fig. 1H**

[Six-gilled shark]

Squalus griseus Linnaeus: TRAPANI, 1838; *Hexanchus griseus* (Rafin.): GULIA, 1861; *Hexanchus griseus* (Raf.): GULIA, 1872; *Hexanchus griseus* (Lin.): DESPOTT, 1919; *Hexanchus griseus*: BARBARA, 1961; *Hexanchus griseus* Bonn.: LANFRANCO, 1993; *Hexanchus griseus* (Bonnaterre): FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Hexanchus griseus* (Bonnaterre): FARRUGIA RANDON & SAMMUT, 1999; *Hexanchus griseus* (Bonnaterre): SAMMUT, 2001.

This species was considered as 'rare' by Trapani (1838) and Gulia (1872), however, in Despott's experience, it is sometimes rare but occasionally quite common (Despott, 1919) while Lanfranco (1993), Farrugia Randon & Sammut (1999) and Sammut (2001) agreed and reported it as 'occasional'. This species has been identified from photographs of specimens caught in local waters but no statements can be made on its frequency of occurrence. *Hexanchus griseus* is not uncommonly caught in artisanal fisheries operating along the southern and southwestern Maltese coasts. A considerable number of specimens have been marketed in recent years (post-1990) at the Central Fishmarket in Valletta, including adult examples of 3-4 metres total length (I. K. Fergusson, unpublished data and photographic records). Misidentification of *H. griseus* is evident in some local fisheries, confusing it with the Smalltooth Sandtiger *Odontaspis ferox*. Although no reliable measure of the abundance of *H. griseus* exists from fishery records, it is caught annually, especially during the winter months, both on demersal droplines and set bottom longlines, and sporadically near the surface nocturnally on drifting surface longlines for *Thunnus thynnus*, possibly while scavenging target species.

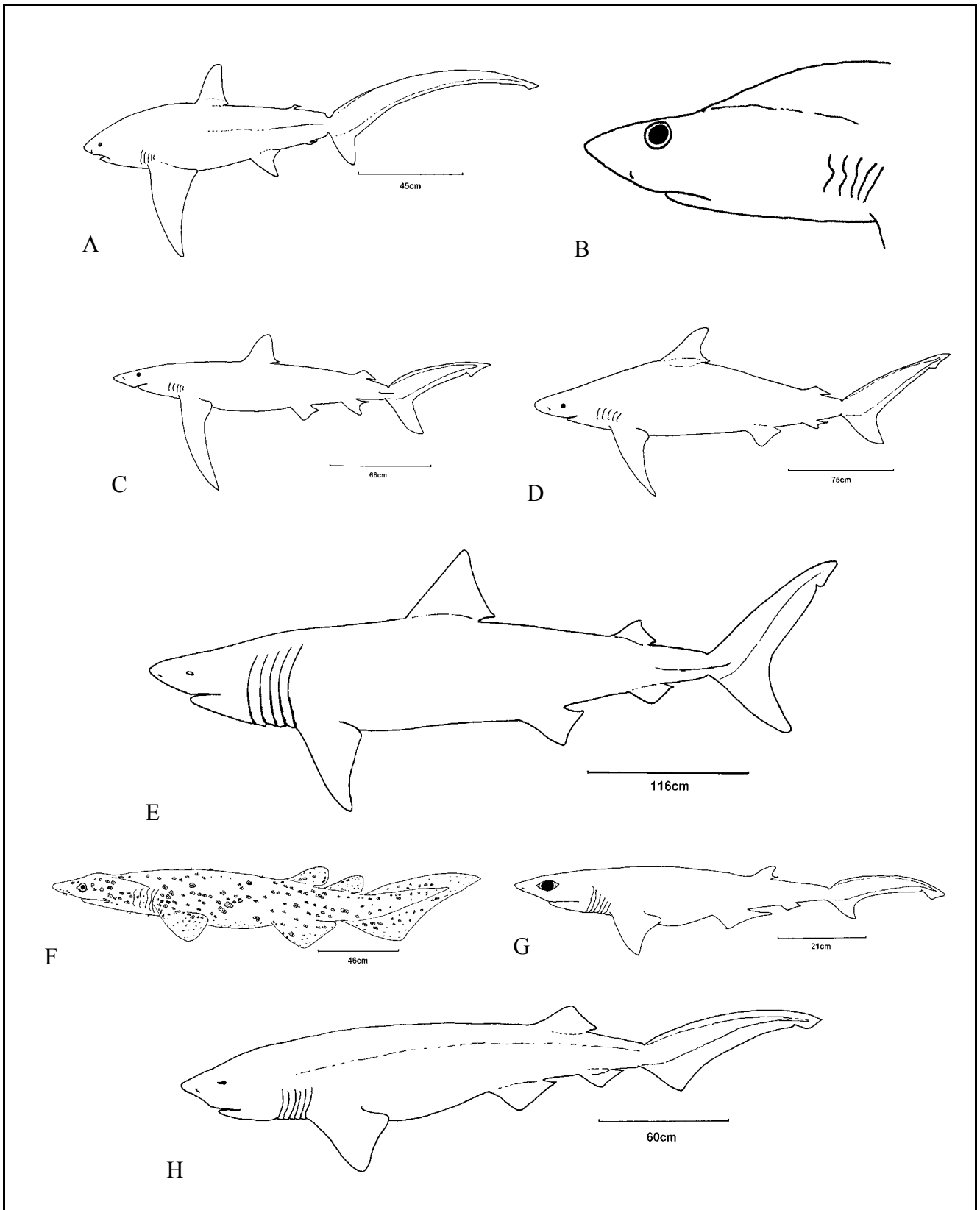


Fig. 1 Habit drawings of Maltese sharks. Diagrams are not shown to scale. Scale bar length is indicated on the drawings. **A** *Alopias vulpinus*; **B** Detail of head of *A. superciliosus*; **C** *Carcharinus obscurus*; **D** *Prionace glauca*; **E** *Cetorhinus maximus*; **F** *Echinorhinus brucus*; **G** *Hepranchias perlo*; **H** *Hexanchus griseus*.

ECHINORHINIDAE

Echinorhinus brucus (Bonnaterre, 1788) - Fig. 1 F

[Bramble shark]

Echinorhinus spinosus (Blainville): GULIA, 1861; *Echinorhinus spinosus* Bp.: GULIA, 1872; *Echinorhinus spinosus* (Lin.): DESPOTT, 1919; *Echinorhinus spinosus*: BARBARA, 1961; *Echinorhinus brucus* (Benn.), LANFRANCO, 1993; *Echinorhinus brucus* (Bonnaterre): FERGUSON & MARKS, 1996; FERGUSON, 1998; *Echinorhinus brucus* (Bonnaterre): FARRUGIA RANDON & SAMMUT, 1999; *Echinorhinus brucus* (Bonnaterre): SAMMUT, 2001.

Gulia (1872) reported that this species is 'rare' while it was not seen by Despott (1919) although he included it in his list as 'rare' based on reports by fishers. Lanfranco (1993), Farrugia Randon & Sammut (1999) and Sammut (2001) all reported it as 'not frequent'. No material related to this species has been obtained by the present authors, but fishers interviewed by Fergusson & Marks (1996) were quite familiar with it. Because of its conspicuous spiny scales it is quite unmistakable, so although formally unconfirmed in the present study, it almost certainly occurs, although apparently very sporadically.

SQUALIDAE

Squalus acanthias Linnaeus, 1758 - Fig. 4C (detail)

[Spur dogfish]

Squalus acanthias Linnaeus: TRAPANI, 1838; *Spinax acanthias* (Cloquet): GULIA, 1861; *Spinax acanthias* Clo.: GULIA 1872; *Squalus acanthias* (Lin.): DESPOTT, 1919; *Squalus acanthias*: BARBARA, 1961; *Squalus acanthias* (Linn.): LANFRANCO, 1993; *Squalus acanthias* (Smith & Radcliffe): FERGUSON & MARKS, 1996; FERGUSON, 1998; *Squalus acanthias* (Linnaeus): Farrugia Randon & Sammut, 1999; *Squalus acanthias*, Sammut, 2001.

Gulia (1872) stated that this species is 'common' and Despott (1919) implied the same. Lanfranco (1993) reported that it is 'frequent' as also seems to be the opinion of Farrugia Randon & Sammut (1999) and Sammut (2001). This species has been confirmed in the present study, however in the collection of data on landings it may be confused with its congener, the Longnose Spurdog *Squalus blainvillei* and possibly other squalids.

Squalus blainvillei (Risso, 1826) - Fig. 4D

[Longnose spurdog]

Acanthias blainvillei Risso: GULIA, 1872; *Squalus blainvillei* (Risso): DESPOTT, 1919; ?*Squalus fernandinus*: BARBARA, 1961; *Squalus blainvillei* (Riss.): LANFRANCO, 1993; *Squalus blainvillei* (Risso): FERGUSON & MARKS, 1996; FERGUSON, 1998; *Squalus blainvillei* (Risso): FARRUGIA RANDON & SAMMUT, 1999; *Squalus blainvillei*: FARRUGIA RANDON, 2001; *Squalus blainvillei* (Risso): SAMMUT, 2001.

Squalus fernandinus Molina 1782 is a synonym of *Squalus acanthias* Linnaeus, 1758 (Eschmeyer, 1998), however, Lanfranco (1993) noted Barbara's record under the present species name, presumably since Barbara (1961) also recorded *Squalus acanthias* under its valid name. Gulia (1872) stated that this species is 'very common' and Despott (1919) reported that it is more or less frequent, while Lanfranco (1993) wrote that it is 'frequent' as did Farrugia Randon & Sammut (1999) and Sammut (2001). As for the previous species, while occurrence can be confirmed, it may be confused with the Spur dogfish *Squalus acanthias* and possibly other species in the collection of data on landings.

CENTROPHORIDAE

Centrophorus granulosus (Bloch and Schneider, 1801) - Fig. 3C

[Gulper shark]

Centrophorus granulosus (Bl.): DESPOTT, 1919; *Centrophorus granulosus*: BARBARA, 1961; *Centrophorus granulosus* (Schn.): LANFRANCO, 1993; *Centrophorus granulosus* (Bloch and Schneider): FERGUSON & MARKS, 1996; FERGUSON, 1998; *Centrophorus granulosus* (Schneider): FARRUGIA RANDON & SAMMUT, 1999; *Centrophorus granulosus*: FARRUGIA RANDON, 2001; *Centrophorus granulosus* (Schneider): SAMMUT, 2001.

Despott (1919), Lanfranco (1993), Farrugia Randon & Sammut (1999) and Sammut (2001) all suggested that the Gulper shark occurs frequently. This species has been confirmed by the present study but information on its status is not available since landing records for this species probably include other squalids.

***Centrophorus uyato* (Rafinesque, 1809) - Fig. 3D**

[Little gulper shark]

Spinax uyatus (Bonaparte): GULIA, 1868; *Acanthias uyatus* M.: GULIA, 1872; *Centrophorus uyato* (Raf.): LANFRANCO, 1993; *Centrophorus uyato* (Rafinesque): FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Centrophorus uyato* (Rafinesque): FARRUGIA RANDON & SAMMUT, 1999; *Centrophorus uyato* (Rafinesque): SAMMUT, 2001.

Gulia (1872) described this species as 'rare' and, along with Lanfranco (1993), Farrugia Randon & Sammut (1999) and Sammut (2001) reported its occurrence as 'occasional'.

As for the Gulper shark (see previous species), this species can be confirmed but information on its status is not available since landing records probably include other squalids. This species was observed in some numbers at the Central Fishmarket during May 1995 by Fergusson & Marks (1996), with specimens being skinned and filleted for human consumption. It is also on sale regularly in fishmarkets of southern Sicily (Mazara del Vallo; I. K. Fergusson, personal observations; M. Vacchi, personal communication 2003). Specimens sold in Malta may, therefore, include specimens caught further northwest in the Sicilian Channel.

It has been recently suggested (Javier Guallart, personal communication 2003) that the Little Gulper Shark *Centrophorus uyato* does not actually occur in the Mediterranean, and that all previous records to this species should be attributed to *C. granulatus*.

DALATIIDAE

***Dalatias licha* (Bonnaterre, 1788) - Fig. 3E**

[Kitefin shark]

Dalatias licha: BARBARA, 1961; *Dalatias licha* (Bonn.): LANFRANCO, 1993; *Dalatias licha* (Bonnaterre): FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Dalatias licha* (Bonnaterre): FARRUGIA RANDON & SAMMUT, 1999; *Dalatias licha* (Bonnaterre): SAMMUT, 2001.

Lanfranco (1993) recorded this species as 'frequent' while Farrugia Randon & Sammut (1999) and Sammut (2001) reported that it is 'common'. This species is confirmed by the present study.

***Etmopterus spinax* (Linnaeus, 1758) - Fig. 3F**

[Velvet belly shark]

Squalus spinax: FORSSKÅL, 1775; *Etmopterus spinax* (Lin.): DESPOTT, 1919; *Etmopterus spinax*: BARBARA, 1961; *Etmopterus spinax* (Linn.): LANFRANCO, 1993; *Etmopterus spinax* (Linnaeus): FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Etmopterus spinax* (Linnaeus): FARRUGIA RANDON & SAMMUT, 1999; *Etmopterus spinax* (Linnaeus): SAMMUT, 2001.

Despott (1919) suggested that this species is rather rare while Lanfranco (1993) stated that it is usually rare but may occasionally be frequent, a statement repeated by Farrugia Randon & Sammut (1999) and Sammut (2001). This species is confirmed by the present study.

OXYNOTIDAE

***Oxynotus centrina* (Linnaeus, 1758) - Fig. 2F**

[Angular rough shark]

Centrina salviani (Risso): GULIA, 1861; *Centrina salviani* Risso: GULIA, 1872; *Centrina salviani* (Risso): DESPOTT, 1919; *Oxynotus centrina*: BARBARA, 1961; *Oxynotus centrina* Linn.: LANFRANCO, 1993; *Oxynotus centrina* (Linnaeus): FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Oxynotus centrina* (Linnaeus): FARRUGIA RANDON & SAMMUT, 1999; *Oxynotus centrina* (Linnaeus): SAMMUT, 2001.

According to Gulia (1872), the Angular Roughshark is rare in local waters but Despott (1919) disagreed and stated that its rarity is only apparent since it is landed very infrequently; Lanfranco (1993), Farrugia Randon & Sammut (1999) and Sammut (2001) agreed that it is frequent.

This species can be confirmed on the basis of specimens held in collections and from interviews with fishers. It can also be confirmed that this unmistakable species is more common than its occasional landings would suggest.

SQUATINIDAE

***Squatina aculeata* (Duméril, 1829)**

[Saw-backed angel shark]

Squatina aculeata (Dumeril): FERGUSSON & MARKS, 1996; FERGUSSON, 1998.

This species has only been listed by Fergusson & Marks (1996) and Fergusson (1998) without any detailed information. No specimens have been encountered during this study and therefore its occurrence cannot be confirmed.

***Squatina oculata* (Bonaparte, 1840)**

[Smoothback angel shark]

Squalina ocellata (Bonap.): GULIA, 1861; *Squatina oculata* Bp.: GULIA, 1872; *Squatina oculata* Bon.: LANFRANCO, 1993; *Squatina oculata* (Bonaparte): FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Squatina oculata* (Bonnaterre): FARRUGIA RANDON & SAMMUT, 1999; *Squatina oculata* (Bonnaterre): SAMMUT, 2001.

The reference to '*Squalina ocellata*' by Gulia (1861) was most likely a *lapsus*, since the genus does not exist and neither does any species named '*ocellata*' belonging to the Squatinidae (Eschmeyer, 1998); this view is reinforced by the corrected nomenclature in his 1872 paper (Gulia, 1872). Gulia (1872) stated that this species is 'rare' while Lanfranco (1993) reported it as 'not frequent'. Farrugia Randon & Sammut (1999) and Sammut (2001) only refer to it in passing and reported it as "rare". No specimens attributable to this species have been seen during the present study and although it may occur, it cannot be presently confirmed.

***Squatina squatina* (Linnaeus, 1758) - Fig. 4E**

[Angel shark]

Squalus squatina: FORSSKÅL, 1775; *Squatina angelus* (Dumereil): GULIA, 1861; *Squatina angelus* Dum.: GULIA, 1872; *Squatina squatina* (Lin.): DESPOTT, 1919; *Squatina squatina*: BARBARA, 1961; *Squatina squatina* (Linn.): LANFRANCO, 1993; *Squatina squatina* (Linnaeus): FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Squatina squatina* (Linnaeus): FARRUGIA RANDON & SAMMUT, 1999; *Squatina squatina* (Linnaeus): SAMMUT, 2001.

This species was regarded as 'very common' by Gulia (1872) and Despott (1919), and as 'frequent' by Lanfranco (1919). Farrugia Randon & Sammut (1999) and Sammut (2001) stated that it was previously common. The occurrence of this species is confirmed in this paper; however, it is easily confused with other angelsharks.

ODONTASPIDIDAE (= Carchariidae)

***Carcharias taurus* Rafinesque, 1810 - Fig. 2D**

[Sandtiger shark]

Odontaspis taurus Mull.: GULIA, 1872; *Odontaspis taurus* (Raf.): DESPOTT, 1919; *Carcharias taurus*: BARBARA, 1961; *Eugomphodus taurus* (Raf.): LANFRANCO, 1993; *Carcharias taurus* (Rafinesque): FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Eugomphodus taurus* (Rafinesque): FARRUGIA RANDON & SAMMUT, 1999; *Eugomphodus taurus* (Rafinesque): SAMMUT, 2001.

All authors who have recorded this species agree that it is rare in Maltese waters. We cannot at present confirm its occurrence in Maltese waters; all specimens of Sandtiger sharks examined by us were *Odontaspis ferox* and we are not aware of any confirmed recent Maltese records of *Carcharias taurus*. There is therefore considerable doubt as to whether any records of the Sandtiger shark from Maltese waters exist, other than the historical records listed above. Therefore for the time being *Carcharias taurus* must be regarded as unconfirmed, even if it may have occurred in the past. A recent review concluded that *C. taurus* is either exceptionally rare in the Mediterranean or essentially regionally extinct in some parts (Fergusson *et al.*, 2002). A few specimens have been confirmed post-1970 from the Sicilian Channel and off Croatia (Fergusson *et al.* 2002; Alen Soldo, Institute of Oceanography & Fisheries, Split, personal communication 2003).

***Odontaspis ferox* (Risso, 1810) - Fig. 2E**

[Small-tooth sandtiger]

Odontaspis ferox (Agassiz): GULIA, 1861; *Odontaspis ferox* Ag.: GULIA, 1872; *Odontaspis ferox* (Agass.): DESPOTT, 1919; *Carcharias ferox*: BARBARA, 1961; *Odontaspis ferox* (Riss): LANFRANCO, 1993; *Odontaspis ferox* (Risso): FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Odontaspis ferox* (Risso): FARRUGIA RANDON & SAMMUT, 1999; *Odontaspis ferox* (Risso): SAMMUT, 2001.

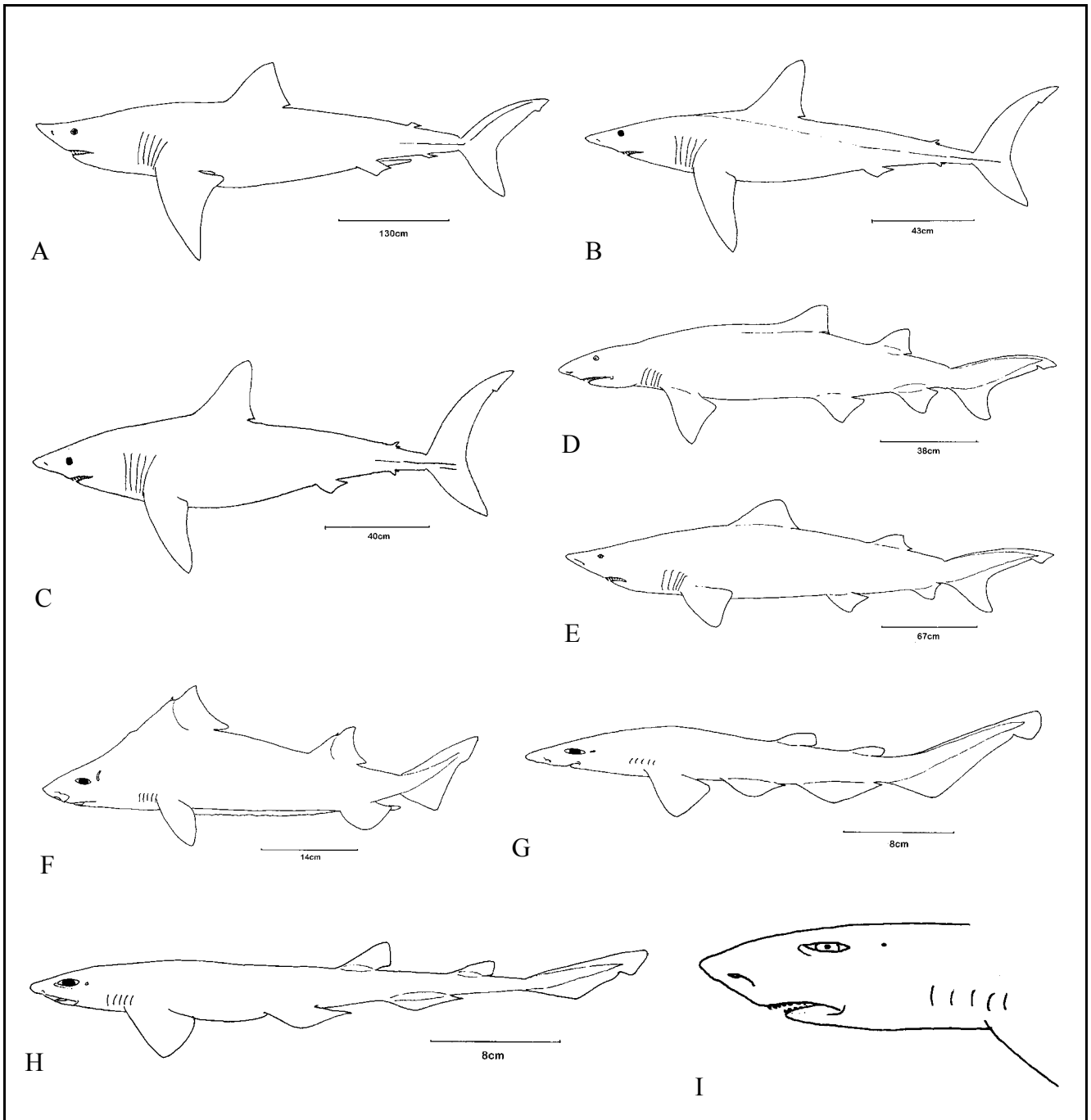


Fig. 2 Habit drawings of Maltese sharks. Diagrams are not shown to scale. Scale bar length is indicated on the drawings. **A** *Carcharodon carcharias*; **B** *Isurus oxyrinchus*; **C** *Lamna nasus*; **D** *Carcharias taurus*; **E** *Odontaspis ferox*; **F** *Oxynotus centrina*; **G** *Galeus melastomus*; **H** *Scyliorhinus canicula*; **I** Detail of head of *Scyliorhinus stellaris*.

Gulia (1872), Despott (1919) and Lanfranco (1993) all described this species as ‘rare’ while Sammut (2001) stated that it is ‘not common’. This present study confirms its occurrence and its rarity. Our data suggests that specimens may be taken annually in small numbers (perhaps 1-2 every year), particularly by bottom gillnets set in depths >50 m around Gozo. Adult female specimens to ca 360cm TL have been caught in 1998 and 1999 from Xlendi Bay and Marsalforn, Gozo (confirmed by photographs and dentition); there are further currently unverified records for 2002 and 2003 (Fergusson *et al.*, in press). Research elsewhere suggests that adult female individuals will make repeated visits to selected sites on an annual basis, especially in the summer, possibly for reproduction. Such localities are often coastal reefs and islets contiguous to deep water (Fergusson *et al.*, in press). This site fidelity makes *O. ferox* especially vulnerable, including around the Maltese islands, since it results in loose aggregations of sharks occurring within easy range of many fisheries and such activities as diving and spearfishing.

CETORHINIDAE

Cetorhinus maximus (Gunnerus, 1765) - Fig. 1E

[Basking shark]

? *Squalus lamia*: FORSSKÅL, 1775; ? *Squalus lamia* Linnaeus: TRAPANI, 1838; ? *Squalus maximus* Linnaeus: TRAPANI, 1838; *Cetorhinus maximus* (Gunner): DESPOTT, 1919; *Cetorhinus maximus* Gunner: DESPOTT, 1930; *Cetorhinus maximus* (Gunn.): LANFRANCO, 1993; *Cetorhinus maximus* (Gunnerus): FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Cetorhinus maximus* (Gunnerus): FARRUGIA RANDON & SAMMUT, 1999; *Cetorhinus maximus* (Gunnerus): SAMMUT, 2001.

The name *Squalus lamia* as used by Forsskål (1775) has been regarded as an invalid name coined by this author but without description, hence not attributable to any species (see Eschmeyer, 1998). However, Forsskål gives the Maltese name for *Squalus lamia* as “*il Gabdol*”, which is one local name for the Basking Shark *Cetorhinus maximus* to this day, although now spelled ‘*gabdoll*’ (see Lanfranco, 1993). It is here suggested, therefore, that Forsskål (1775) was actually referring to the Basking Shark even if he did not describe it, making it the earliest record of this fish in the Maltese Islands. It should be noted that ‘*gabdoll*’ is also the Maltese name for the Sperm Whale *Physeter macrocephalus*; however, it is not likely that Forsskål (1775) is referring to a cetacean since although he does include two cetaceans in his list of ‘fish’ (“*Delphinus orca*” and “*Delphinus delphis*”) he places these together at the head of his list while he places “*Squalus lamia*” with the sharks (all in the genus *Squalus*), after he lists the rays (all in the genus *Raja*). Alternatively, it is quite possible that Forsskål’s reference to *Squalus lamia* may refer to *Carcharodon carcharias*, given that ‘*lamia*’ has been widely used as a vernacular Mediterranean name for this species since ancient Greek times and similar nomenclature was used by later authors, apparently for the White Shark, notably *Carcharias lamia* by Rafinesque (1810) and the *Squalus* (*Carcharhinus*) *lamia* by Blainville (1816, 1825).

The records by Trapani (1838) present an interesting problem. This author recorded *Squalus lamia* Linnaeus, however Linnaeus never named such a species (see Eschmeyer, 1998), nor has any similar name ever been ascribed to the basking shark (see taxonomic notes in Compagno, 1984, 2001). Trapani gives the Maltese name for this species as ‘*Gaddoll*’, suggesting that he was actually referring to *Squalus lamia* Forsskål, which, as already stated above refers to the Basking Shark. Trapani (1838) also recorded *Squalus maximus* Linnaeus, however, again, Linnaeus never named such a species (see Eschmeyer, 1998). Trapani gives the Maltese name for this ‘*Squalus maximus* Linnaeus’ as ‘*pixxi tunnu*’, yet when Despott showed local fishers a specimen of the Basking Shark caught in 1928 (see below), none of them associated it with this name (Despott, 1930).

The vernacular term of ‘tuna shark’ (*piscitonno*) in neighbouring Sicilian waters has always been ascribed to *Carcharodon carcharias*, where it has a long historical association with traditional trap fisheries for Bluefin Tuna *Thunnus thynnus*. Thus again, the original juxtaposition of Trapani’s *pixxi tunnu* with *Squalus maximus* may be erroneous and actually confused the White Shark (i. e. the Sicilian ‘*piscitonno*’) with the basking shark, perhaps explaining the unfamiliarity described by Despott of local fishers with the latter. Equally, it is noted that some authors still give ‘*gabdoll*’ as a regular vernacular Maltese term for the White Shark (e.g. Lanfranco, 1993) and this may have been the case when Forsskål originally compiled his account.

Therefore the ‘*Squalus maximus* Linnaeus’ reported by Trapani (1838) probably does not refer to the Basking Shark, although there is a possibility that his reference to ‘*Squalus lamia* Linnaeus’ might refer to this species despite the likelihood that it refers to the Great White *Carcharodon carcharias*. Despott (1919) also included the Basking Shark in his 1919 list on the basis of Trapani’s record of “*pixxi tunnu*” [= ‘*Squalus maximus* Linnaeus’], however he only confirmed its presence years later when a specimen was caught off the northeast coast of Malta in 1928 (Despott, 1930). No other literature records of landed specimens have been traced.

Lanfranco (1993) reported that this species is ‘rare’ while Farrugia Randon & Sammut (1999) and Sammut (2001) make

general remarks but do not comment on the local status of this species. None of the fishers or fish vendors interviewed by Fergusson & Marks (1996) had seen this species. No material for this species is available but it has been accepted in this paper on the basis of the photograph of the Maltese specimen published by Despott (1930). It is also possible that due to its rarity and its unfamiliarity to local fishers, occasional sightings of this fish have occurred but were not recorded or were recorded under erroneous names (perhaps as Great White *Carcharodon carcharias*), since it was not recognised. The present study confirms that this species is very rare in Maltese waters.

LAMNIDAE

***Carcharodon carcharias* (Linnaeus, 1758) - Fig. 2A**

[Great white shark]

Squalus charcarias Linnaeus: TRAPANI, 1838; *Carcharodon lamia* Bonaparte: GULIA, 1861; *Carcharodon lamia* Bp.: GULIA, 1872; *Carcharodon carcharias* (Lin.): DESPOTT, 1919; *Carcharodon carcharias*: BARBARA, 1961; *Carcharodon carcharias* (Linn.): LANFRANCO, 1993; *Carcharodon carcharias* (Linnaeus), FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Carcharodon carcharias* (Linnaeus): FARRUGIA RANDON & SAMMUT, 1999; *Carcharodon carcharias* (Linnaeus): SAMMUT, 2001.

Trapani (1838) stated that this species is 'perennial' while according to Gulia (1872) it is frequent in summer but rarely taken by fishers; this same statement is repeated by Despott (1919). Lanfranco (1993) reports that it is 'rare' while Farrugia Randon & Sammut (1999) and Sammut (2001) made no statement on its status although they recorded a number of captures. The occurrence and status of the Great White in Maltese waters has been thoroughly documented and assessed by Fergusson (1998) who considered the species 'uncommon' to 'rare'. A number of sometimes compelling but wholly unverified sightings, reportedly of this species, have been cited from around the Maltese islands in the past decade. Whilst some of these may be genuine, it is certainly unquestionable that the level of local newsmedia hyperbole associated with the Great White Shark typically outweighs its actual occurrence around Malta. The last confirmed specimen for which photographic proof is available is an adult female, reputedly 713cm TL but possibly nearer 550cm, caught in April 1987 near Filfla (see Fergusson 1996, 2002 for details). Earlier verified records during the second half of the 20th century are large (>300 cm TL) specimens caught in 1964, 1973 and *ca* 1984, with a further indication of occurrence in 1956 (fatal attack on a bather, St. Thomas Bay). Anecdotal references by longstanding Maltese fishers suggest that *C. carcharias* was sporadically taken as bycatch in coastal tuna traps set in northern Maltese coastal waters. This suggestion mirrors confirmed capture data from elsewhere in the central Mediterranean for White Sharks incidentally caught in 'tonnara' (Sicily) or 'madrague' (Tunisia) trap nets, where specimens have declined markedly since the second half of the 20th century (Fergusson, 2002) and are now exceptional events. While sightings of large sharks seen around Malta in recent years may be attributed to the White Shark, they may also be attributable to the (equally rare) Basking Shark *Cetorhinus maximus* (see above under this species), or to adult Shortfin Makos *Isurus oxyrinchus*, or even large carcharhinids including *Carcharhinus obscurus*.

***Isurus oxyrinchus* (Rafinesque, 1810) - Fig. 2B**

[Short-fin mako]

Oxyrrhina spallanzani Bp.: GULIA, 1872; *Lamna oxyrinchus* (Raf.): DESPOTT, 1919; *Isurus oxyrinchus*: BARBARA, 1961; *Isurus oxyrinchus* Raf.: LANFRANCO, 1993; *Isurus oxyrinchus* Rafinesque: FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Isurus oxyrinchus* (Rafinesque): FARRUGIA RANDON & SAMMUT, 1999; *Isurus oxyrinchus* (Rafinesque): SAMMUT, 2001.

Gulia (1872) reported that this species is 'rare'; interestingly he reported the Maltese name as 'pixxi tunnu' but says that it is better known as 'pixxi tondu'; this opens the possibility that the 'pixxi tunnu' = *Squalus maximus* of Trapani (1838) referred to the present species (see under *Cetorhinus maximus*). Despott (1919) stated that it is of occasional occurrence while Lanfranco (1993) described its occurrence as 'frequent'. Farrugia Randon & Sammut (1999) and Sammut (2001) implied that this species is common. The present study confirms that this species occurs and is probably quite frequent, however, an assessment of its presence in Maltese waters based on sightings, catches and landings needs to be treated with caution since this species is often confused with and misidentified as *Lamna nasus*, and vice versa (Fergusson & Marks, 1996).

***Lamna nasus* (Bonnaterre, 1788) - Fig. 2C**

[Porbeagle shark]

Lamna cornubica (Bonaparte): GULIA, 1861; *Lamna cornubica* Cuv: GULIA, 1872; *Lamna cornubica* (Lin.): DESPOTT, 1919; *Lamna nasus*: BARBARA, 1961; *Lamna nasus* (Bonn.): LANFRANCO, 1993; *Lamna nasus* (Bonnaterre): FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Lamna nasus* (Bonnaterre): FARRUGIA RANDON & SAMMUT, 1999; *Lamna nasus* (Bonnaterre): SAMMUT, 2001.

Gulia (1872) and Lanfranco (1993) stated that this is a 'rare' species, whilst Despott (1919) reported it as 'occasional'. Farrugia Randon & Sammut (1999) and Sammut (2001) considered this species to be rather rare. No specimens have been seen during the course of this study and therefore its occurrence cannot be confirmed. Although the historic records listed above suggest that it does or used to occur, there is no adequate contemporary data to confirm the presence of this species in Maltese waters, albeit possible given its wide Mediterranean range. Existing landings data made available by the Central Fishmarket, specifically list this species coupled to the colloquial name 'pixxiplantu'. However, it is believed that this is erroneous and that the vast majority of Maltese landings attributed to *L. nasus*, if not all of them, actually refer to *Isurus oxyrinchus* (Fergusson & Marks, 1996).

ALOPIIDAE

***Alopias superciliosus* (Lowe, 1839) - Fig. 1B (detail)** [Bigeye thresher shark]

Alopias superciliosus (Lowe): FERGUSSON & MARKS, 1996; FERGUSSON, 1998.

Records of this species from Maltese waters are not based on observed specimens but on detailed descriptions by fishers as reported in Fergusson *et al.* (in preparation). It is hardly likely that a thresher shark is misidentified as anything else given the conspicuous characteristic tail, and the Maltese fishers interviewed clearly distinguished between two species of thresher, which they called 'pixxivolpi' (*Alopias vulpinus*, see below) and 'pixxivolpi falz'. For the latter they cited the key character that distinguishes *Alopias superciliosus* from *Alopias vulpinus*, that is, the prominent large eyes. There being no other species of threshers known from the Mediterranean, or anything which is similar, *Alopias superciliosus* is confirmed to occur in Maltese waters.

According to the fishers interviewed, this species is occasionally and incidentally taken in tuna long-lines laid from 10-90km offshore, but it is habitually discarded at sea as it is deemed not to be of economic value (Fergusson *et al.*, in preparation). The relative abundance of this species is difficult to estimate since specimens are discarded at sea and there is a dearth of landings data throughout the central Mediterranean; however, it is apparently regularly caught in Ionian Sea areas to the east and south-east of Malta (IKF, unpublished data).

***Alopias vulpinus* (Bonnaterre, 1788) - Fig. 1A** [Thresher shark]

Alopias vulpes (Müller): GULIA, 1861; *Alopias vulpes* Bp.: GULIA, 1872; *Alopias vulpes* (Gmel.): DESPOTT, 1919; *Alopias vulpinus*: BARBARA, 1961; *Alopias vulpinus* (Bonn.): LANFRANCO, 1993; *Alopias vulpinus* (Bonnaterre): FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Alopias vulpinus* (Bonnaterre): FARRUGIA RANDON & SAMMUT, 1999; *Alopias vulpinus* (Bonnaterre): SAMMUT, 2001.

The literature contains differing views on the abundance of this species in local waters. Gulia (1872) stated that this species is 'rare'. Despott (1919) wrote that it was reported to him that this species is occasionally caught, however, in his own experience it was unknown to fishers and fishmongers, while he himself had only seen one specimen that was caught in tunny nets set at St Paul's Bay. Lanfranco (1993) stated that it is 'sometimes frequent' while Sammut (2001) described it as 'occasionally frequent' in the seas around Malta. It is not likely that such a conspicuous shark is mistaken for anything else, apart from its cogener *Alopias superciliosus* (see above). Fishers interviewed by one of us (IKF) stated that it was sometimes incidentally captured in tuna long-lines but no specific landings data are available to assess its contemporary local abundance.

SCYLIORHINIDAE

***Galeus melastomus* (Rafinesque, 1809) - Fig. 2G** [Blackmouth catshark]

Scyllium melanostomum (Bonaparte): GULIA, 1861; *Scyllium melanostomum* Bp.: GULIA, 1872; *Pristiurus melanostomus* (Raf.): DESPOTT, 1919; *Galeus melastomus*: BARBARA, 1961; *Galeus melastomus* Raf.: LANFRANCO, 1993; *Galeus melastomus* Rafinesque: FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Galeus melastomus* (Rafinesque): FARRUGIA RANDON & SAMMUT, 1999; *Galeus melastomus* (Rafinesque): SAMMUT, 2001.

Gulia (1872) describes this species as "avventizio" meaning 'adventitious', implying that it is not native to Maltese waters. Despott (1919) stated that it is not rare but very infrequently landed. According to Lanfranco (1993), the occurrence of Black-mouth Catshark is frequent and Farrugia Randon & Sammut (1999) and Sammut (2001) stated that it is caught quite often.

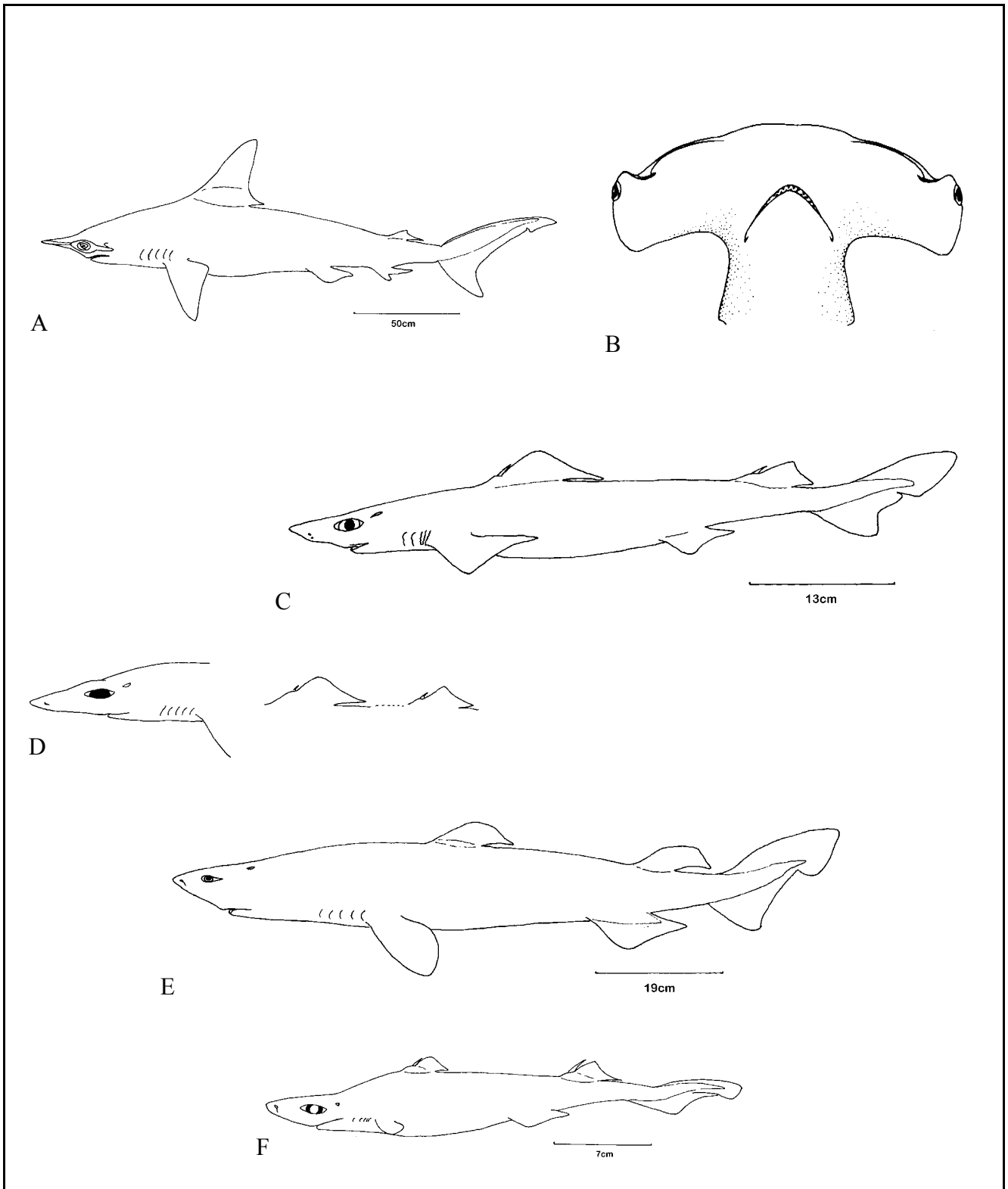


Fig. 3 Habit drawings of Maltese sharks. Diagrams are not shown to scale. Scale bar length is indicated on the drawings. **A** *Sphyrna zygaena*; **B** Detail of head of *S. zygaena*; **C** *Centrophorus granulosus*; **D** Detail of head and dorsal fins of *Centrophorus uyato*; **E** *Dalatias licha*; **F** *Etmopterus spinax*.

No specimens of this species have been seen during this study, and it therefore remains unconfirmed.

***Scyliorhinus canicula* (Linnaeus, 1758) - Fig. 2H**

[Small-spotted catshark]

Squalus catulus: FORSSKÅL, 1775; *Squalus catulus* Linnaeus: TRAPANI, 1838; *Scyllium canicula* (Cuv.): GULIA, 1861; *Scyllium canicula* Cuv.: GULIA, 1872; *Scylliorhinus canicula* (Lin.): DESPOTT, 1919; *Scyliorhinus caniculus*: BARBARA, 1961; *Scyliorhinus canicula* (Linn): LANFRANCO, 1993; *Scyliorhinus canicula* (Linnaeus): FERGUSON & MARKS, 1996; FERGUSON, 1998; *Scyliorhinus canicula* (Linnaeus): FARRUGIA RANDON & SAMMUT, 1999; *Scyliorhinus canicula* (Linnaeus): SAMMUT, 2001.

Gulia (1872) described this species as ‘very common’, Despott (1919) as ‘common’ and Lanfranco (1993) as ‘frequent’; somewhat surprisingly, Farrugia Randon & Sammut (1999) and Sammut (2001) make no statement on its status. This species has been regularly encountered during this present study at both Valletta and Marsaxlokk fish markets where it is offered for sale in relatively large numbers.

***Scyliorhinus stellaris* (Linnaeus, 1758) - Fig. 2I (detail)**

[Nursehound]

Squalus stellaris Linnaeus: TRAPANI, 1838; *Scyllium stellare* (Bonaparte): GULIA, 1861; *Scyllium stellare* Bp.: GULIA, 1872; *Scylliorhinus stellaris* (Lin.): DESPOTT, 1919; *Scyliorhinus stellaris*: BARBARA, 1961; *Scyliorhinus stellaris* Linn.: LANFRANCO, 1993; *Scyliorhinus stellaris* (Linnaeus): FERGUSON & MARKS, 1996; FERGUSON, 1998; *Scyliorhinus stellaris* (Linnaeus): FARRUGIA RANDON & SAMMUT, 1999; *Scyliorhinus stellaris* (Linnaeus): SAMMUT, 2001.

Gulia (1872) considered this species as ‘very common’ and Despott (1919) stated that it is ‘more or less common’. Lanfranco (1993) reported that it is ‘frequent’ while Farrugia Randon & Sammut (1999) and Sammut (2001) stated that it is ‘common’. This species has been encountered regularly during the course of this present study, although always in small numbers, at both the Valletta and Marsaxlokk fish markets.

TRIAKIDAE

***Galeorhinus galeus* (Linnaeus, 1758) - Fig. 4A**

[Tope shark]

Squalus galeus Linnaeus: TRAPANI, 1838; *Galeus canis* (Rond.): GULIA, 1861; *Galeus canis* Bp.: GULIA, 1872; *Galeorhinus galeus* (Lin.): DESPOTT, 1919; *Galeorhinus galeus*: BARBARA, 1961; *Galeorhinus galeus* (Linn.): LANFRANCO, 1993; *Galeorhinus galeus* (Linnaeus): FERGUSON & MARKS, 1996; FERGUSON, 1998; *Galeorhinus galeus* (Linnaeus): FARRUGIA RANDON & SAMMUT, 1999; *Galeorhinus galeus* (Linnaeus): SAMMUT, 2001.

This species is recorded as ‘common’ by Gulia (1872), ‘very frequent’ by Despott (1919), and as ‘frequent’ by Lanfranco (1993), Farrugia Randon & Sammut (1999) and Sammut (2001). This species has not been seen during this study and therefore for the time being it must be regarded as unconfirmed, even if it may have occurred in the past.

***Mustelus asterias* Cloquet, 1821 - Fig. 4B**

[Starry smoothhound]

Mustelus canis (Mitch.): DESPOTT, 1919; *Mustelus asterias*: BARBARA, 1961; *Mustelus asterias* Coq.: LANFRANCO, 1993; *Mustelus asterias* Cloquet: FERGUSON & MARKS, 1996; FERGUSON, 1998; *Mustelus asterias* (Cloquet): FARRUGIA RANDON & SAMMUT, 1999; *Mustelus asterias* (Cloquet): SAMMUT, 2001.

Despott (1919) and Lanfranco (1993) reported that this species is ‘common’ while Fergusson & Marks (1996) reported that it is frequently offered for sale at the fish markets. This species can be confirmed to occur but it should be noted that mustelids tend to be confused with each other in the collection of landing data so statements on the frequency of occurrence of individual species need to be treated with caution.

***Mustelus mustelus* (Linnaeus, 1758) - Fig. 4B**

[Smoothhound]

Mustelus mustelus (Lin.): DESPOTT, 1919; *Mustelus mustelus*: BARBARA, 1961; *Mustelus mustelus* (Linn.): LANFRANCO, 1993; *Mustelus mustelus* (Linnaeus): FERGUSON & MARKS, 1996; FERGUSON, 1998; *Mustelus mustelus* (Linnaeus): Farrugia Randon & Sammut, 1999; *Mustelus mustelus* (Linnaeus): Sammut, 2001.

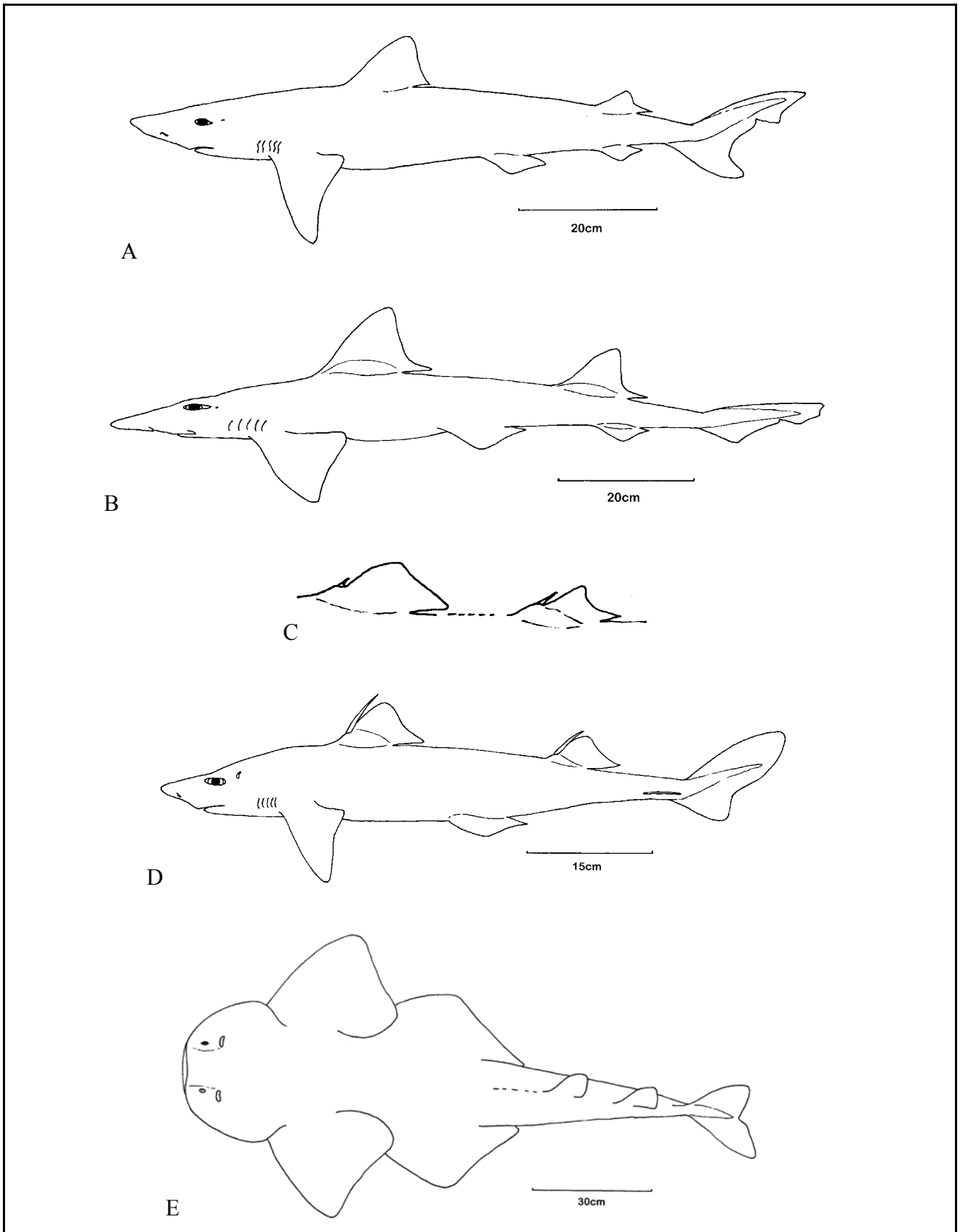


Fig. 4 Habit drawings of Maltese sharks. Diagrams are not shown to scale. Scale bar length is indicated on the drawing and maximum length (TL) is given in brackets. **A** *Galeorhinus galeus* (200 cm); **B** *Mustelus* sp. (200 cm); **C** Detail of dorsal fins of *Squalus acanthias*; **D** *Squalus blainvillei* (110 cm); **E** *Squatina squatina* (183 cm).

Despott (1919) reported that this species is offered for sale in good numbers and Lanfranco (1993), Farrugia Randon & Sammut (1999) and Sammut (2001) reported that it occurs frequently. Fergusson & Marks (1996) stated that this is one of three species that dominate market sales (the others are *Squalus blainvillei* and *Centrophorus granulosus*), where it is sold filleted for human consumption. This species is confirmed by the present study but as in the case of its congener, *Mustelus asterias*, landings data should be interpreted with caution.

***Mustelus punctulatus* Risso, 1826 - Fig. 4B**

[Blackspotted smoothhound]

Mustelus punctulatus (Risso): FERGUSSON & MARKS, 1996; FERGUSSON, 1998.

This species was only listed by Fergusson & Marks (1996) and Fergusson (1998) with a statement by the former that some numbers are caught with other mustelids. This species can be confirmed on the basis of a photograph of a specimen taken during fieldwork carried out by Fergusson & Marks in the mid 1990s.

CARCHARHINIDAE

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

Carcharhinus brachyurus (Günther): FERGUSSON & MARKS, 1996; FERGUSSON, 1998.

This species was only listed by Fergusson & Marks (1996) and Fergusson (1998) without any comments. Although no specimens have been seen at the Valletta and Marsaxlokk fishmarkets during the present study, some loose preserved dentition from a locally sourced example (collection of local enthusiast Mr. John Abela) was examined in 1994 by one of us (IKF). It is noted that *C. brachyurus* is already reliably recorded from neighbouring Sicilian Channel waters (Cigala-Fulgosi, 1984) and, based on other limited records, is known to range widely in the Mediterranean (Marino Vacchi & Ian Fergusson, unpublished species account for the IUCN Shark Specialist Group, prepared in 2003). Thus, the specimen from which the dentition in Abela's collection was taken may have been caught in Maltese coastal waters or alternatively, elsewhere in the Sicilian Channel. This species could therefore be considered as locally unconfirmed but likely to occur.

***Carcharhinus brevipinna* (Müller & Henle, 1839)**

[Spinner shark]

Carcharhinus brevipinnis (Mull & Henl): LANFRANCO, 1993; *Carcharhinus brevipinna* (Müller & Henle): FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Carcharhinus brevipinnis* (Muller & Henle): FARRUGIA RANDON & SAMMUT, 1999; *Carcharhinus brevipinnis* (Muller & Henle), SAMMUT, 2001.

Lanfranco (1993) reported this species as 'may be met with' but acknowledged that it is difficult to distinguish from some of its congeners, while both Farrugia Randon & Sammut (1999) and Sammut (2001) described it as occurring locally but rare. Fergusson & Marks (1966) stated that this species may be sporadically caught, however, with the exception of *Prionace glauca*, all other carcharhinids are grouped together under the name 'kelb griz' by local fishers and fisheries officers (Fergusson & Compagno, 2000) so it is difficult to make any statements on its occurrence on the basis of fisheries records. Moreover, it should be noted that such 'whaler' sharks may have been caught outside Maltese waters, especially in areas to the south where their presence is confirmed, e.g. near the Pelagian Islands, Tunisia and Libya.

No specimens that can be attributed to this species have been seen during this study, and while it can be considered to likely to occur sporadically, it must remain unconfirmed for the present.

***Carcharhinus limbatus* (Müller & Henle (ex Valenciennes), 1839)**

[Blacktip spinner shark]

Carcharhinus limbatus (Val.): LANFRANCO, 1993; *Carcharhinus limbatus* (Valenciennes): FARRUGIA RANDON & SAMMUT, 1999; *Carcharhinus limbatus* (Valenciennes): SAMMUT, 2001.

This species is only mentioned by Lanfranco (1993) who commented that it is occasionally sighted but is confused with its congeners, and by Farrugia Randon & Sammut (1999) and Sammut (2001) who stated that it is a rare species that has been recorded in the area.

This species was never encountered during the present study and therefore its presence is unconfirmed. Equally, no specimens have been recorded in southern Sicilian ports fishing in the neighbouring waters of the Sicilian Channel (Marino Vacchi, personal communication 2003) and it is thus an unlikely visitor to Malta.

Carcharhinus melanopterus (Quoy & Gaimard, 1824)

[Blacktip reef shark]

Carcharhinus melanopterus (Q. & G.): LANFRANCO, 1993; *Carcharhinus melanopterus* (Quen. & Gunn.): FARRUGIA RANDON & SAMMUT, 1999; *Carcharhinus melanopterus* (Quen. & Gunn.): SAMMUT, 2001.

This species is only mentioned by Lanfranco (1993) who commented that it is occasionally sighted but is confused with its congeners, and by Farrugia Randon & Sammut (1999) and Sammut (2001) who stated that it is a rare species that has been recorded in the area. This species was never encountered during the present study and therefore its presence is unconfirmed. Confusion with other sympatric black-tipped carcharhinids, such as *C. brevipinna*, is likely in the Mediterranean.

Carcharhinus obscurus (Lesueur, 1818) - Fig. 1C

[Dusky shark]

Carcharhinus obscurus (Lesueur): FERGUSON & MARKS, 1996; FERGUSON, 1998; *Carcharhinus obscurus* (Lesueur): FERGUSON & COMPAGNO, 2000

The only Maltese record of this species is based on a mature male specimen collected some 4km ESE of Filfla (Ferguson & Compagno, 2000). It is known in small numbers from other parts of the central Mediterranean, including Tunisia (Capapé *et al.*, 1979), Sicily (Ferguson & Compagno, 2000) and Libya (IKF unpublished photographic records). Thus, occasional reports from Malta, both inshore and offshore, are quite likely to be true.

Carcharhinus plumbeus (Nardo, 1827)

[Sandbar shark]

Carcharhinus plumbeus: BARBARA, 1961; *Carcharhinus plumbeus* (Nardo): LANFRANCO, 1993; *Carcharhinus plumbeus* (Nardo): FERGUSON & MARKS, 1996; FERGUSON, 1998; *Carcharhinus plumbeus* (Nardo): FARRUGIA RANDON & SAMMUT, 1999; *Carcharhinus plumbeus* (Nardo): SAMMUT, 2001.

As already observed by Lanfranco (1993), some members of the genus *Carcharhinus* may be difficult to distinguish from each other. Literature records of 'requiem' sharks, and thus statements as to their occurrence and abundance, should be treated with caution especially if not based on detailed examination of actual specimens. Lanfranco (1993) described this species as 'often frequent' while Farrugia Randon & Sammut (1999) and Sammut (2001) made a general statement that this is a common open-sea pelagic species but do not comment on local occurrence. On the basis of discussions with fishers and fisheries officers, Ferguson & Marks (1966) stated that this species is the most frequently caught carcharhinid after *Prionace glauca* but acknowledged that records of any *Carcharhinus* may actually refer to a number of species that are grouped together under the name 'kelb griz' in local fisheries statistics. However, captures of all carcharhinids, excepting *P. glauca*, are rare in Malta and the comparative frequency of their captures is unknown. No specimens have been seen during the present study that can definitely be attributed to this species and although it is likely to occasionally occur, its presence must be considered as unconfirmed at present.

Prionace glauca (Linnaeus, 1758) - Fig. 1D

[Blue shark]

Galeus glaucus (Rond.): GULIA, 1861; *Squalus glaucus* L.: GULIA, 1872; *Prionace glauca* (Lin.): DESPOTT, 1919; *Prionace glauca*: BARBARA, 1961; *Prionace glauca* (Linn.): LANFRANCO, 1993; *Prionace glauca* (Linnaeus): FERGUSON & MARKS, 1996; FERGUSON, 1998; *Prionace glauca*; (Linnaeus): FARRUGIA RANDON & SAMMUT, 1999; *Prionace glauca*, SAMMUT, 2001.

Gulia (1872) described this species as 'common', Despott (1919) as 'more or less common', Lanfranco (1993) as 'frequent' and Farrugia Randon & Sammut (1999) and Sammut (2001) as 'rather frequent'. The presence of this species is confirmed but it is less frequent now than in the past and on the basis of landings data examined from 1982 to 1992, its populations may be declining further (Ferguson & Marks, 1996).

SPHYRNIDAE

Sphyrna tudes (Valenciennes, 1822)

[Lesser hammerhead]

?*Platysgnolus tuburo* Gulia: GULIA, 1872; *Sphyrna tudes* (Cuv.): DESPOTT, 1919; *Sphyrna tudes* (Val.): LANFRANCO,

1993; *Sphyrna tudes* (Valenciennes): FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Sphyrna tudes*: FARRUGIA RANDON & SAMMUT, 1999; *Sphyrna tudes*: SAMMUT, 2001

It is very difficult to ascertain what species Gulia (1872) was referring to, as he seems to have coined the name himself; neither the genus nor the species are given in Eschmeyer (1998). As synonyms of his 'new' species Gulia gave "*Sphyrna tiburo* Raf." and "*Zygaena tudes* Risso". If by *Sphyrna tiburo* Gulia was referring to *Squalus tiburo* Linnaeus (not Rafinesque), then this is not a synonym of *Zygaena tudes* Valenciennes (not Risso) but a distinct species (now *Sphyrna tiburo*, an extra-Mediterranean species). Despott (1919) quoted Gulia's record under "*Sphyrna tudes* (Cuv.)" and this has been followed by subsequent authors (Lanfranco 1993; Farrugia Randon & Sammut, 1999; Sammut, 2001). If Gulia's record does actually refer to *Sphyrna tudes*, then he considered this species as 'very rare' (Gulia, 1872). Despott (1919) accepted the record on Gulia's authority and stated that he never found the species. Lanfranco (1993) described it as very rare, while Farrugia Randon & Sammut (1999) and Sammut (2001) only mentioned it in passing as a rarer species than *Sphyrna zygaena*. Fergusson & Marks (1996) pointed out that fishers probably confuse different species under the general name 'hammerhead' and apart from *Sphyrna zygaena* and *Sphyrna tudes*, which they accepted as occurring in Maltese waters, they also mentioned (based on previous Mediterranean faunal accounts) the possibility that *Sphyrna mokarran* and *Sphyrna lewini* may occur. Since *Sphyrna tudes*, or any other species of hammerhead apart from *Sphyrna zygaena*, was not authenticated in this present study, then at present all records of species other than *Sphyrna zygaena* must be regarded as unconfirmed and the validity of *S. tudes* as a Mediterranean species remains in doubt.

***Sphyrna zygaena* (Linnaeus, 1758) - Fig. 3A,B**

[Smooth hammerhead]

Squalus zygaena: FORSSKÅL, 1775; *Squalus zygaena* Linnaeus: TRAPANI, 1838; *Zygaena malleus* (Cuvier): GULIA, 1868; *Zygaena malleus* Cuv.: GULIA, 1872; *Sphyrna zygaena* (Lin.): DESPOTT, 1919; *Sphyrna zygaena*: BARBARA, 1961; *Sphyrna zygaena* (Linn.): LANFRANCO, 1993; *Sphyrna zygaena* Linnaeus: FERGUSSON & MARKS, 1996; *Sphyrna zygaena* (Linnaeus): FERGUSSON, 1998; *Sphyrna zygaena* (Linnaeus): FARRUGIA RANDON & SAMMUT, 1999; *Sphyrna zygaena* (Linnaeus): SAMMUT, 2001.

Trapani (1838) recorded this species as perennial, while both Gulia (1872) and Despott (1919) stated that it is 'common'. On the other hand, Lanfranco (1993) reported it as 'occasional', while Farrugia Randon & Sammut (1999) and Sammut (2001) made no statement on its status. From their discussions with Maltese fishers and fisheries officers, Fergusson & Marks (1996) concluded that hammerhead sharks (principally *Sphyrna zygaena* but possibly other species as well) have gradually declined in local waters. This species is confirmed on the basis of collection specimens, but it should be noted that from the historical records listed above, it does seem that this once common species has now become very infrequent.

RAJIMORPHA

PRISTIDAE

***Pristis pristis* (Linnaeus, 1758)**

[Sawfish]

Squalus pristis: FORSSKÅL, 1775; *Squalus pristis* Linnaeus: TRAPANI, 1838; *Pristis antiquorum* (Lath.): GULIA, 1861; *Pristis antiquorum* Lath.: GULIA, 1872; *Pristis antiquorum* (Lath.): DESPOTT, 1919; *Pristis pristis* (Linn.): LANFRANCO, 1993; *Pristis pristis* (Linnaeus): FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Pristis pristis* (Linnaeus): FARRUGIA RANDON & SAMMUT, 1999; *Pristis pristis* (Linnaeus): SAMMUT, 2001.

Gulia (1872) described this species as 'rare' while Despott (1919) reported that he had never encountered it although fishers reported it to him. Lanfranco (1993), Farrugia Randon & Sammut (1999) and Sammut (2001) all reported that it is very rare and sporadic in the Mediterranean, without giving any indication of the local status. The present authors have seen saws of this species kept as curios, however these are of unknown provenance and until actual specimens are captured in Maltese waters this species must be regarded as unconfirmed.

***Pristis pectinata* Latham, 1794**

[Saw-mouthed shark]

Pristis pectinatus (Latham): FARRUGIA RANDON & SAMMUT, 1999; *Pristis pectinatus* (Latham): SAMMUT, 2001.

This species was only mentioned by Farrugia Randon & Sammut (1999) and Sammut (2001) who stated that it is another rare species that may be encountered but give no indication that it actually occurs in Maltese waters. This species cannot be confirmed by this study.

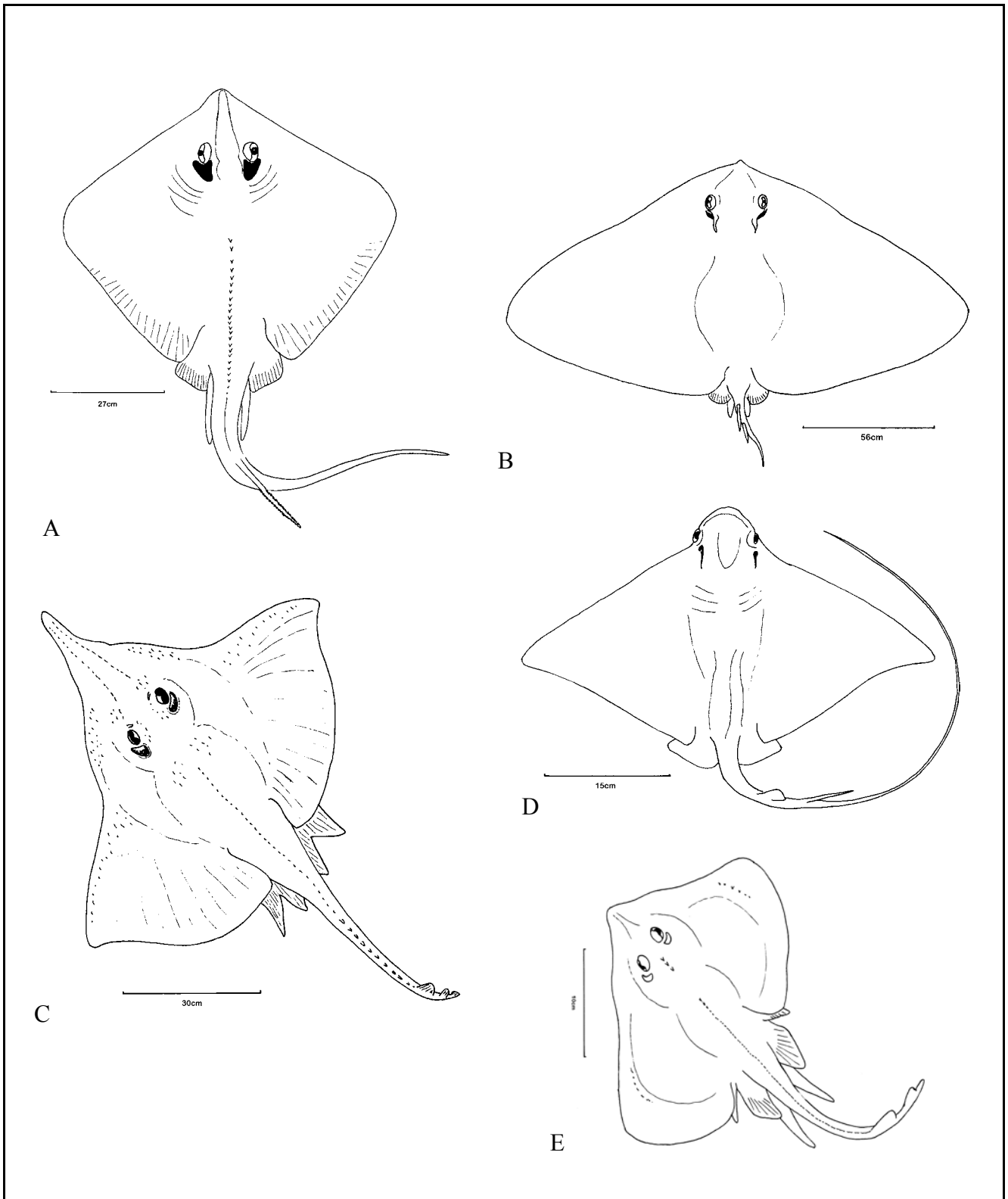


Fig. 5 Habit drawings of Maltese rays. Diagrams are not shown to scale. Scale bar length is indicated on the drawings. **A** *Dasyatis pastinaca*; **B** *Gymnura altavela*; **C** *Dipturus oxyrinchus*; **D** *Myliobatis aquila*; **E** *Raja asterias*.

Rhinobatidae

***Rhinobatos cemiculus* Geoffroy Saint-Hilaire, 1817**

[Blackchin guitarfish]

Rhinobatus halavi (Rupp.): DESPOTT, 1919; *Rhinobatos cemiculus* E.Geof: LANFRANCO, 1993; *Rhinobatos cemiculus* E. Geoffroy Saint-Hilaire: FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Rhinobatus cemiculus* (Geoffroy): FARRUGIA RANDON & SAMMUT, 1999; *Rhinobatus cemiculus* (Geoffroy): SAMMUT, 2001.

Despott (1919) reported that he only ever saw one specimen and described this species as very rare and a straggler, while Lanfranco (1993) reported it as 'not frequent'. Farrugia Randon & Sammut (1999) and Sammut (2001) considered it as 'rare'. The common Maltese name for Guitarfishes (genus *Rhinobatos*) is '*rebekkin*'. In discussions held with local fishers reports of occasional catches were given; this species is not likely to be confused with any other species. However, no specimens have been authenticated in the present study and since it is not possible to determine whether the fishers interviewed were referring to *R. cemiculus* or *R. rhinobatos*, the present species must remain unconfirmed.

***Rhinobatos rhinobatos* (Linnaeus, 1758)**

[Common guitarfish]

Rhinobatus columnae Bp.: GULIA, 1972; *Rhinobatus panduratus* (Raf.): DESPOTT, 1919; *Rhinobatos rhinobatos*: BARBARA, 1961; *Rhinobatos rhinobatos* (Linn.): LANFRANCO, 1993; *Rhinobatos rhinobatos* (Linnaeus): FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Rhinobatus rhinobatus* (Linnaeus): FARRUGIA RANDON & SAMMUT, 1999; *Rhinobatus rhinobatus* (Linnaeus): SAMMUT, 2001.

Gulia (1872) considered this species as 'common' but in contrast, Despott (1919) reported that it is extremely rare and that he only saw two specimens. Lanfranco (1993) also considered it as 'rare' as did Farrugia Randon & Sammut (1999) and Sammut (2001). The same comments as for *R. cemiculus* apply (see above) for this species and although it may occur, for the present it cannot be confirmed.

TORPEDINIDAE

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

[Electric ray]

Torpedo nobiliana (Bp.): DESPOTT, 1919; *Torpedo nobiliana*: BARBARA, 1961; *Torpedo (Tetronarce) nobiliana* Bon.: BARBARA, 1961; *Torpedo (Tetronarce) nobiliana* Bonaparte: FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Torpedo nobiliana* (Bonnaterre): FARRUGIA RANDON & SAMMUT, 1999; *Torpedo nobiliana* (Bonnaterre): SAMMUT, 2001.

Despott (1919) recorded this species on the basis of a single specimen that he examined; however, Lanfranco (1993) stated that it is usually rare but occasionally frequent, which statement is repeated by Farrugia Randon & Sammut (1999) and Sammut (2001).

No specimens that could be attributed to this species were seen during the present study and although it probably occurs, its presence must remain unconfirmed for the time being.

***Torpedo (Torpedo) marmorata* Risso, 1810 - Fig. 6D**

[Marbled electric ray]

Torpedo galvani (Risso): GULIA, 1861; *Torpedo galvanii* Bp.: GULIA, 1872; *Torpedo marmorata* (Risso): DESPOTT, 1919; *Torpedo marmorata*: BARBARA, 1961; *Torpedo (Torpedo) marmorata* Riss.: LANFRANCO, 1993; *Torpedo (Torpedo) marmorata* Risso: FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Torpedo marmorata* (Risso): FARRUGIA RANDON & SAMMUT, 1999; *Torpedo marmorata* (Risso): SAMMUT, 2001.

Gulia (1872) described this species as 'very common', Despott (1919) as 'common', and Lanfranco (1993), Farrugia Randon & Sammut (1999) and Sammut (2001) as 'frequent'. This species has been encountered regularly during the present study at both the Valletta and the Marsaxlokk fish markets.

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

[Common torpedo]

Raja torpedo: FORSSKÅL, 1775; *Raja torpedo* Linnaeus: TRAPANI, 1838; *Torpedo narce* (Bon.): GULIA, 1861; *Torpedo*

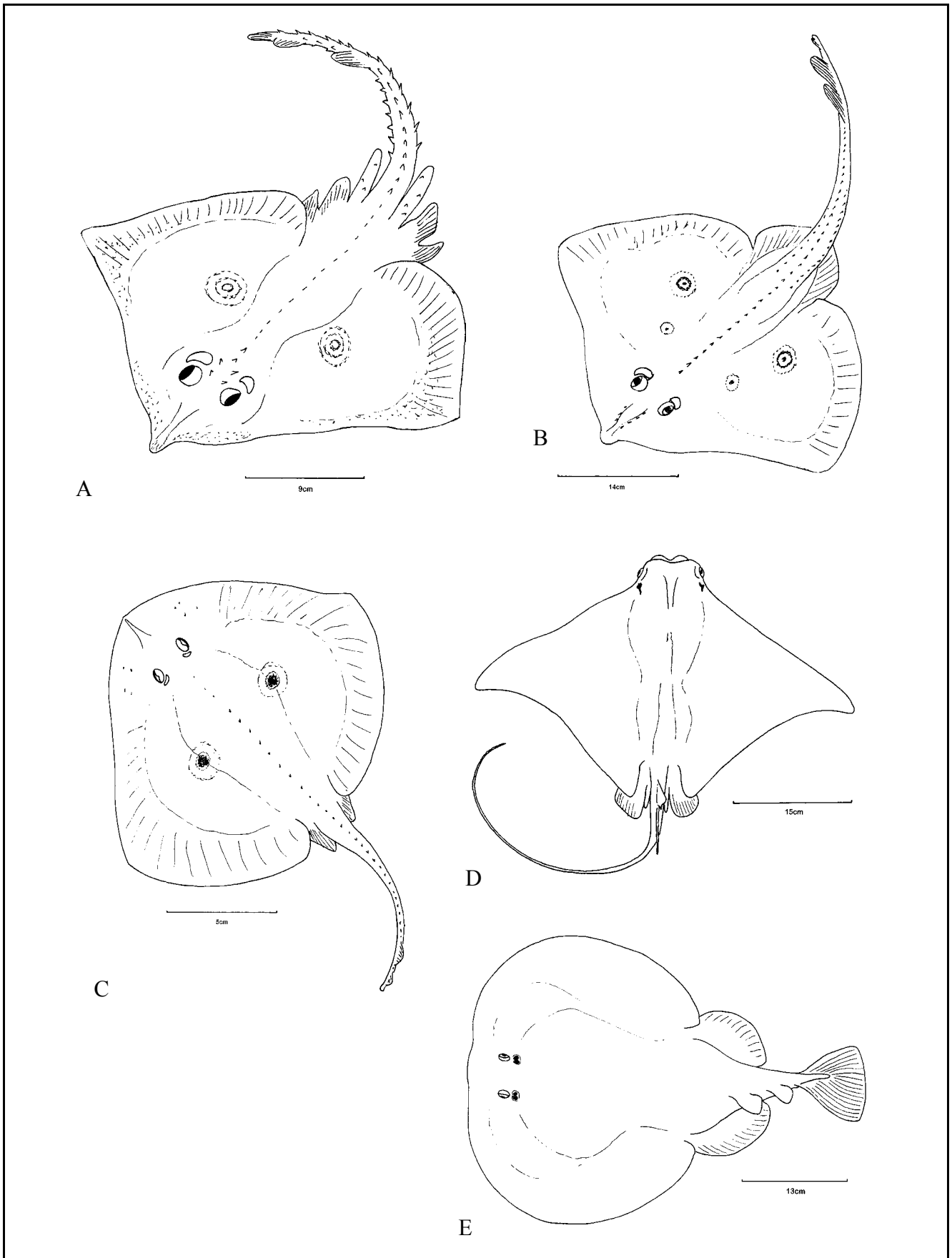


Fig. 6 Habit drawings of Maltese rays. Diagrams are not shown to scale. Scale bar length is indicated on the drawings. **A** *Raja miraletus*; **B** *Raja montagui*; **C** *Raja radula*; **D** *Torpedo marmorata*.

narce Cuv.: GULIA, 1872; *Torpedo ocellata* (Raf.): DESPOTT, 1919; *Torpedo torpedo*: BARBARA, 1961; *Torpedo (Torpedo) torpedo* (Linn.): LANFRANCO, 1993; *Torpedo (Torpedo) torpedo* (Linnaeus): FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Torpedo torpedo* (Linnaeus): FARRUGIA RANDON & SAMMUT, 1999; *Torpedo torpedo* (Linnaeus): SAMMUT, 2001.

Gulia (1872) reported this species as ‘very common’, Despott (1919) as ‘common’, and Lanfranco (1993), Farrugia Randon & Sammut (1999) and Sammut (2001) as often common. This species can be confirmed on the basis of an accurate description of a specimen that ‘electrocuted’ a marine biologist whilst diving (Mark Dimech, personal communication 2003).

RAJIDAE

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

[Skate]

Raja batis: FORSSKÅL, 1775; *Raja batis* Linnaeus: TRAPANI, 1838; *Raja batis* (Bonaparte): GULIA, 1861; *Raja batis* (Lin.): DESPOTT, 1919; *Raja batis*: BARBARA, 1961; *Raja (Dipturus) batis* Linn.: LANFRANCO, 1993; *Raja (Dipturus) batis* Linnaeus: FERGUSSON & MARKS, 1996; *Dipturus batis* (Linnaeus): FERGUSSON, 1998; *Raja batis* (Linnaeus): FARRUGIA RANDON & SAMMUT, 1999; *Raja batis* (Linnaeus): SAMMUT, 2001.

Gulia included this species in his 1861 list (Gulia, 1861) but curiously did not include it in his paper on Maltese elasmobranchs (Gulia 1872) although he did include “*Raja maculata* Montag” with the synonyms, “*R. asterias* Mull”, “*R. punctata* Risso” and “*R. batis* Risso”. *Raia maculata* Montagu 1818 is an invalid name that has been replaced by *Raja montagui* Fowler 1910; *Raja asterias* Delaroche 1809 (not Risso) is a valid species and not a synonym of *Raja batis*; *Raia punctata* Risso, 1810 is a synonym of *Raja asterias* (see Eschmeyer, 1998). It is difficult to be certain to which species Gulia (1872) was referring to by his “*Raja maculata*”. Despott (1919) included this species in his list based on Gulia’s (1861) record, however he stated that he never personally saw a specimen. On the other hand, Lanfranco (1993), Farrugia Randon & Sammut (1999) and Sammut (2001) give it as ‘not common’. This species is being regarded as unconfirmed for the present.

***Dipturus oxyrinchus* (Linnaeus, 1758) - Fig. 5C**

[Longnose skate]

Raja oxyrinchus Linnaeus: TRAPANI, 1838; *Laeviraja oxyrhynchus* (Bonaparte): GULIA, 1861; *Laeviraja oxyrhynchus* Bp: GULIA, 1872; *Raja oxyrinchus* (Lin.): DESPOTT, 1919; *Raja oxyrhynchus*: BARBARA, 1961; *Raja (Dipturus) oxyrinchus* Linn.: LANFRANCO, 1993; *Raja (Dipturus) oxyrinchus* Linnaeus: FERGUSSON & MARKS, 1996; *Dipturus oxyrinchus* (Linnaeus): FERGUSSON, 1998; *Raja oxyrinchus* (Linnaeus): FARRUGIA RANDON & SAMMUT, 1999; *Raja oxyrinchus* (Linnaeus): SAMMUT, 2001.

Gulia (1872) stated that this species is ‘very common’, Despott (1919) that it is ‘common’ and Lanfranco (1993) that it is ‘frequent’. Farrugia Randon & Sammut (1999) and Sammut (2001) described the abundance status of *Raja oxyrinchus* in the Maltese Islands as more frequently encountered than *Raja batis*, which they stated is not common. There is clearly no agreement amongst authors on the occurrence of this species. This is not surprising if these statements were based on landing data, since the different species of *Raja* are easily confused.

This species is confirmed by this present study and it is commonly found at both the Valletta and the Marsaxlokk fish markets.

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

[Shagreen ray]

Raja fullonica: BARBARA, 1961; *Raja (Leucoraja) fullonica* Linn.: LANFRANCO, 1993; *Raja (Leucoraja) fullonica* Linnaeus: FERGUSSON & MARKS, 1996; *Leucoraja fullonica* (Linnaeus): FERGUSSON, 1998; *Raja fullonica* (Linnaeus): FARRUGIA RANDON & SAMMUT, 1999; *Raja fullonica* (Linnaeus): SAMMUT, 2001.

Lanfranco (1993) described this species as ‘apparently rare’ implying that he may have never personally confirmed it. Farrugia Randon & Sammut (1999) and Sammut (2001) stated that it is ‘rare’. This species cannot be presently confirmed.

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

[Maltese brown ray]

Raja melitensis n. sp.: CLARK, 1926; *Raja melitensis* Clarke: DESPOTT, 1934; *Raja (Leucoraja) melitensis* Clark: LANFRANCO, 1993; *Raja (Leucoraja) melitensis* Clark: FERGUSON & MARKS, 1996; *Leucoraja melitensis* (Clark): FERGUSON, 1998; *Raja melitensis* (Linnaeus): FARRUGIA RANDON & SAMMUT, 1999; *Raja melitensis* (Linnaeus): SAMMUT, 2001.

This species was described by Clark (1926) based on specimens collected from Malta, hence the name, however it is not exclusive to Maltese waters being known also from the coasts of Algeria (where it is rare) and Tunisia. Despott did not include this species in his comprehensive 1919 list (Despott, 1919) but mentions it in his list of the Maltese names of fishes (Despott, 1934), without any other information. Lanfranco (1993) described this species as 'frequent' but adds that it may easily be confused with *Raja miraletus*. Farrugia Randon & Sammut (1999) and Sammut (2001) provided some notes on its depth range and habits but mentioned nothing about its frequency.

As the types come from Malta, this species is accepted as occurring locally, however, no specimens that could be attributed to this species have been seen during this study and it is probably quite rare around Malta, which is at the northern border of its distribution.

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

[Cuckoo ray]

Raja (Leucoraja) naevus Müller & Henle: FERGUSON & MARKS, 1996; *Leucoraja naevus* (Müller & Henle): FERGUSON, 1998; *Raja naevus* (Muller & Henle): FARRUGIA RANDON & SAMMUT, 1999; SAMMUT, 2001.

None of the authors who included this species in their lists provide any information on its status, although Farrugia Randon & Sammut (1999) and Sammut (2001) mentioned that it is a rare member of its family, without however indicating if it is rare in local waters or in the Mediterranean as a whole.

This species cannot presently be confirmed.

***Raja (Raja) asterias* Delaroche, 1809 - Fig. 5E**

[Starry ray]

Dasybatis asterias Bp.: GULIA, 1872; *Raja punctata* (Risso): DESPOTT, 1919; *Raja asterias*: BARBARA, 1961; *Raja (Raja) asterias* Del.: LANFRANCO, 1993; *Raja (Raja) asterias* Delaroche: FERGUSON & MARKS, 1996; *Raja asterias* Delaroche: FERGUSON, 1998; *Raja asterias* (Delaroche): FARRUGIA RANDON & SAMMUT, 1999; *Raja asterias* (Delaroche): SAMMUT, 2001.

Gulia (1872) reported this species as 'rare' and Despott (1919) stated that he only personally saw two specimens although it was reported to him that it was frequent. Lanfranco (1993) described it as 'common' and Farrugia Randon & Sammut (1999) and Sammut (2001) reported that it is quite commonly found. This species is confirmed and it is frequently landed and sold at the Valletta and the Marsaxlokk fish markets.

***Raja (Raja) clavata* Linnaeus, 1758**

[Thornback ray]

Raja clavata Linnaeus: TRAPANI, 1838; *Raja clavata* (Bon.): GULIA, 1861; *Dasybatis clavata* Blain: GULIA, 1872; *Raja clavata* (Lin.): DESPOTT, 1919; *Raja clavata*: BARBARA, 1961; *Raja (Raja) clavata* Linn.: LANFRANCO, 1993; *Raja (Raja) clavata* Linnaeus: FERGUSON & MARKS, 1996; FERGUSON, 1998; *Raja clavata* (Linnaeus): FARRUGIA RANDON & SAMMUT, 1999; *Raja clavata* (Linnaeus): SAMMUT, 2001.

Gulia (1872) stated that this species is 'rather common' and Despott (1919) agreed, while Lanfranco described it as 'frequent' and Farrugia Randon & Sammut (1999) and Sammut (2001) implied that it is more or less frequent. This species is confirmed by the present study but it is only occasionally caught.

***Raja (Raja) miraletus* Linnaeus, 1758 - Fig. 6A**

[Brown ray]

Raja miraletus Linnaeus: TRAPANI, 1838; *Raja miraletus* (Bon.): GULIA, 1861; *Raja miraletus* Lin.: GULIA, 1872; *Raja miraletus* (Lin.): DESPOTT, 1919; *Raja miraletus*: BARBARA, 1961; *Raja (Raja) miraletus* Linn.: LANFRANCO, 1993; *Raja (Raja) miraletus* Linnaeus: FERGUSON & MARKS, 1996; FERGUSON, 1998; *Raja miraletus* (Linnaeus): FARRUGIA RANDON & SAMMUT, 1999; *Raja miraletus* (Linnaeus): SAMMUT, 2001.

Gulia (1872) reported this species as ‘common’, Despott (1919) as ‘rather common’, Lanfranco (1993) as ‘frequent’, and Farrugia Randon & Sammut (1999) and Sammut (2001) as ‘common’. We confirm this species, which is quite frequent at the Valletta and the Marsaxlokk fish markets.

***Raja (Raja) montagui* Fowler, 1910 - Fig. 6B**

[Spotted ray]

Raja maculata Montag: GULIA 1872; *Raja (Raja) montagui* Fow.: LANFRANCO 1993; *Raja montagui* (Fowler): FARRUGIA RANDON & SAMMUT, 1999; *Raja montagui* (Fowler): SAMMUT, 2001.

Gulia (1872) uncharacteristically provided no information on abundance for this species while Despott did not list it. Lanfranco (1993) stated that this species is of doubtful occurrence and that records may refer to *Raja radula*. Fergusson & Marks (1996) and Fergusson (1998) did not list it, while Farrugia Randon & Sammut (1999) and Sammut (2001) stated that it is a rare member of its family, without however indicating if it is rare in local waters or in the Mediterranean as a whole. This species is confirmed by this present study, which, contrary to what the available literature suggests, appears to be frequent at the Valletta and the Marsaxlokk fish markets.

***Raja (Raja) radula* Delaroche, 1809 - Fig. 6C**

[Rough ray]

Raja radula (Delar.): DESPOTT, 1919; *Raja radula*: BARBARA, 1961; *Raja radula* Del.: LANFRANCO, 1993; *Raja (Raja) radula* Delaroche: FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Raja radula* (Delarosche): FARRUGIA RANDON & SAMMUT, 1999; *Raja radula* (Delarosche): Sammut, 2001.

Despott (1919) stated that he only saw two specimens of this species, while Lanfranco (1993) reported it as ‘frequent’ as did Farrugia Randon & Sammut (1999) and Sammut (2001). This species is confirmed by this present study, and is frequent at the Valletta and the Marsaxlokk fish markets.

***Raja macrorhynchus* Rafinesque, 1810**

Raja macrorhynchus (Rafin.): DESPOTT, 1919.

Despott (1919) is the only author to have mentioned this species, which, according to Quéro *et al.* (1990), is a valid one. Lanfranco (1993) referred to Despott’s record as a synonym of *Dipturus batis*, however, in his 1919 list (Despott, 1919) and also in his later checklist of common names (Despott, 1934), Despott gives both *Dipturus batis* (as *Raja batis*) and *Raja macrorhynchus* (as *Raja macrorhynchus*) and it is clear that he is referring to different species. Moreover, this “*Raja macrorhynchus*” does not appear to be rare since Despott (1919) stated that it is occasionally frequent and sometimes scarce. Unless new information comes to light, it is not possible to assess Despott’s record.

***Raja musmarinus* Forsskål, 1775**

Raja musmarinus (piscis novus): FORSSKÅL, 1775.

This species from Malta named by Forsskål (1775) as new, is invalid since no description or figure were given.

***Rostroraja alba* (Lacepède, 1803)**

[White skate]

Raja alba: BARBARA, 1961; *Raja (Rostroraja) alba* Lac.: LANFRANCO, 1993; *Raja (Rostroraja) alba* (Lacepède): FERGUSSON & MARKS, 1996; *Rostroraja alba* (Lacepède): FERGUSSON, 1998; *Raja alba* (Lacepède): FARRUGIA RANDON & SAMMUT, 1999; *Raja alba* (Lacepède): SAMMUT, 2001.

The first reference to this species in the literature on Maltese elasmobranchs is Barbara’s nomenclatural list (Barbara, 1961). Lanfranco included it in the latest edition of his guide to Maltese fish as a new record (Lanfranco, 1993) apparently on the basis of Barbara’s ‘record’ and on its inclusion in an undated and privately circulated wordlist of Maltese fish compiled by Victor Jaccarini of the University of Malta and used by Joseph Aquilina in the preparation of his Maltese dictionary (see Aquilina, 1987 p. xxvii; see also Lanfranco, 1993 p. ix). Fergusson & Marks (1996) and Fergusson (1998) just listed this species while Farrugia Randon & Sammut (1999) and Sammut (2001) stated that it is a rare member of the family without any indication as to whether they are referring to the situation in Malta or in the Mediterranean as a whole. There are therefore no clear records of this species from the Maltese Islands and thus it cannot be confirmed.

DASYATIDAE

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

[Roughtailed stingray]

Dasyatis brucco (Bp.) and *Dasyatis thalassia* (Mull.): DESPOTT, 1919; *Dasyatis centroura* (Mitch.): LANFRANCO, 1993; *Dasyatis centroura* (Mitchill): FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Dasyatis centroura* (Mitchill): FARRUGIA RANDON & SAMMUT, 1999; *Dasyatis centroura* (Mitchill): SAMMUT, 2001.

Despott (1919) recorded both *Dasyatis brucco*, based on a single specimen, and *Dasyatis thalassia* of which he saw “at least three examples”. Both names are synonyms of *Dasyatis centroura* (Eschmeyer, 1998). Like Lanfranco (1993), Farrugia Randon & Sammut (1999) and Sammut (2001) described it as ‘rare’.

Based on the historical records, this species may occur, however no attributable specimens have been examined in the present study and therefore it is presently being considered unconfirmed.

***Dasyatis pastinaca* (Linnaeus, 1758) - Fig. 5A**

[Common stingray]

Raja pastinaca: FORSSKÅL, 1775; *Raja pastinaca* Linnaeus: TRAPANI, 1838; *Trygon pastinaca* (Adanson): GULIA, 1861; *Trygon pastinaca* Adans: GULIA, 1872; *Dasyatis pastinaca* (Lin.): DESPOTT, 1919; *Dasyatis pastinaca*: BARBARA, 1961; *Dasyatis pastinaca* (Linn.): LANFRANCO, 1993; *Dasyatis pastinaca* (Linnaeus): FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Dasyatis pastinaca* (Linnaeus): FARRUGIA RANDON & SAMMUT, 1999; *Dasyatis pastinaca*: FARRUGIA RANDON, 2001; *Dasyatis pastinaca* (Linnaeus): SAMMUT, 2001.

This species was reported as ‘very common’ by Gulia (1872) and Despott (1919), as ‘common’ by Lanfranco (1993) and as ‘quite common’ by Farrugia Randon & Sammut (1999) and Sammut (2001). This species, which is more or less common, is confirmed by the present study .

***Dasyatis violacea* (Bonaparte, 1832)**

[Violet stingray]

Trygon violacea Bp.: GULIA, 1872; *Dasyatis violacea* (Bp.): DESPOTT, 1919; *Dasyatis violacea*: BARBARA, 1961; *Dasyatis violacea* (Bon.): LANFRANCO, 1993; *Dasyatis violacea* (Bonaparte): FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Dasyatis violacea* (Bonnaterre): FARRUGIA RANDON & SAMMUT, 1999; *Dasyatis violacea* (Bonnaterre): SAMMUT, 2001.

Gulia (1872) stated that he saw a few juveniles of this species and Despott (1919) just repeated Gulia’s statement suggesting that he (Despott) never encountered the species. Lanfranco (1993) described it as ‘mostly rare’. Farrugia Randon & Sammut (1999) stated that it is ‘somewhat rare’ however Sammut (2001) qualified this statement by writing “*somewhat rare in the Mediterranean Sea*”, making its occurrence around the Maltese Islands and its local abundance unclear.

No attributable specimens of this species have been seen during the present study and thus its presence remains unconfirmed for Maltese waters.

GYMNURIDAE

***Gymnura altavela* (Linnaeus, 1758) - Fig. 5B**

[Spiny butterfly ray]

Raja altavela: FORSSKÅL, 1775; *Gymnura altavela*: BARBARA, 1961; *Gymnura altavela* Linn.: LANFRANCO, 1993; *Gymnura altavela* (Linnaeus): FERGUSSON & MARKS, 1996; FERGUSSON, 1998; *Gymnura altavela* (Linnaeus): FARRUGIA RANDON & SAMMUT, 1999; *Gymnura altavela* (Linnaeus): SAMMUT, 2001.

It is interesting that this species was reported by Forsskål (1775) but not by Gulia (1861; 1872) or Despott (1919). Lanfranco (1993) simply stated that Barbara listed it and that it is “*sometimes reported*” while Farrugia Randon & Sammut (1999) and Sammut (2001) just mentioned that this is a very rare species. There is therefore a lack of specific records from the Maltese Islands. However, this species can be confirmed on the basis of a single specimen seen at the Valletta fish market (captured in the summer of 1997).

MYLIOBATIDAE

Myliobatis aquila (Linnaeus, 1758) - Fig. 5D

[Common eagle ray]

Raja aquila: FORSSKÅL, 1775; *Raja aquila* Linnaeus: TRAPANI, 1838; *Myliobatis aquila* (Dumereil): GULIA, 1861; *Myliobatis aquila* Bp.: GULIA, 1872; *Myliobatis aquila* (Lin.): DESPOTT, 1919; *Myliobatis aquila*: BARBARA, 1961; *Myliobatis aquila* (Linn.): LANFRANCO, 1993; *Myliobatis aquila* (Linnaeus): FERGUSON & MARKS, 1996; FERGUSON, 1998; *Myliobatis aquila* (Linnaeus): FARRUGIA RANDON & SAMMUT, 1999; *Myliobatis aquila* (Linnaeus): SAMMUT, 2001.

Gulia (1872) reported that this species is 'rare' while Despott (1919) described it as 'rather frequent' and Lanfranco (1993) as 'frequent'. This species is confirmed by the present study.

Pteromylaeus bovinus (Geoffroy Saint-Hilaire, 1817)

[Bull ray]

Myliobatis bovina (Geoff.): DESPOTT, 1919; *Myliobatis bovina*: BARBARA, 1961; *Pteromylaeus bovinus* (Geoff. S. H.): LANFRANCO, 1993; *Pteromylaeus bovinus* (E. Geoffroy Saint-Hilaire): FERGUSON & MARKS, 1996; FERGUSON, 1998; *Pteromylaeus bovinus* (Geoffroy): FARRUGIA RANDON & SAMMUT, 1999; *Pteromylaeus bovinus* (Geoffroy): SAMMUT, 2001.

The reports by Despott (1919) and Lanfranco (1993) are in agreement in that this species is frequent but often confused with *Myliobatis aquila*. Farrugia Randon & Sammut (1999) and Sammut (2001) stated that this species is very similar to the Common Eagle Ray *Myliobatis aquila* but it is less frequent. No specimens attributable to this species have been seen during this study and, although the historical records suggest that it may occur, it must be regarded as unconfirmed for the present.

RHINOPTERIDAE

Rhinoptera marginata (Geoffroy Saint-Hilaire, 1817)

[Lusitanian cownose ray]

Rhinoptera marginata (Geoff. S. H.): LANFRANCO, 1993; *Rhinoptera marginata* (E. Geoffroy Saint-Hilaire): FERGUSON & MARKS, 1996; FERGUSON, 1998.

Lanfranco (1993) stated that this species is "occasionally reported" but that it is usually mistaken for one of the myliobatids. This species can be confirmed on the basis of two specimens seen at the Marsaxlokk fish market (14th July 1999).

MOBULIDAE

Mobula mobular (Bonnaterre, 1788)

[Devil ray]

Cephaloptera giorna Risso: GULIA GIOV., 1909b; *Cephaloptera edentula* (Brunn.): DESPOTT, 1919; *Mobula mobular*: BARBARA, 1961; *Mobula mobular* (Bonn.): LANFRANCO, 1993; *Mobula mobular* (Bonnaterre): FERGUSON & MARKS, 1996; FERGUSON, 1998; *Mobular mobular* (Bonnaterre): FARRUGIA RANDON & SAMMUT, 1999; *Mobular mobular* (Bonnaterre): SAMMUT, 2001.

Despott (1919) stated that he only saw two specimens (one in 1910 and one in 1916) up to the time of his writing. Lanfranco (1993) described this species as 'very rare'. Farrugia Randon & Sammut (1999) and Sammut (2001) stated that this species is 'rare' but are not clear if they are referring to Maltese waters or to the Mediterranean in general. Although no specimens of this species have been encountered during this study, its presence is accepted on the basis of past documented records, which are most likely to be correct due to its very characteristic features.

DISCUSSION

In the published scientific literature reviewed in the present study that deals specifically with the Maltese ichthyological fauna (that is, excluding privately circulated material, works that do not use scientific names and purely popular works; these works are reviewed in the 'Introduction'), 37 species of sharks and 26 species of rays have been

recorded. These numbers exclude the species named but not described by Forsskål (1775), the “*Raja macrorhynchus* (Rafin.)” of Despott (1919), whose identity is uncertain, and the species listed by Farrugia Randon & Sammut (1999) and Sammut (2001), but not by any other authors, without any indication that they originate from Maltese waters. Of these 63 reported species, 38 (24 sharks and 14 rays) have been confirmed by this study as definitely occurring, while another two species (both sharks) have not been verified by us but almost certainly occur. Nine species (4 sharks and 5 rays) have been rejected by this study as not occurring (at least on presently available evidence), while another 14 species (7 sharks and 7 rays) may occur but presently are unconfirmed. These results are summarised in Table 1.

It is hardly surprising that most of the rejected and unconfirmed species belong to groups that are notoriously difficult to differentiate, unless examined closely, including the angel sharks (*Squatina* spp.), smoothhounds (*Mustelus* spp.), requiem or whaler sharks of the genus *Carcharhinus*, and rays of the family Rajidae. It is expected that further research will transfer some of the unconfirmed species to the confirmed list.

Although different sources give different estimates, around 45 species of sharks occur in the Mediterranean, of which some 43 occur in the western basin, 40 in the central Mediterranean area, and 34 in the eastern basin (Fischer *et al.*, 1987). Using these figures, the confirmed shark species of the Maltese Islands (including the two species that very likely occur) constitute about 57.8% of the total Mediterranean species and 65% of the Central Mediterranean species. Although a high number of Central Mediterranean sharks also occur in Maltese waters, a substantial number of other species are ‘missing’. Comparison of the list of confirmed species with that of the Central Mediterranean species shows that the ‘missing’ species are mainly deep-water demersal species with little or no current commercial value, which even if taken as by-catch, will not be landed. Useful future field research should therefore focus on *in situ* observations made on trawlers operating in deep water.

The corresponding figures for rays are 34 Mediterranean species of which 33 occur in the western basin, 30 in the Central Mediterranean, and 28 in the eastern basin (Fischer *et al.*, 1987). The Maltese ray fauna thus comprises about 41.2% of the total Mediterranean species and 46.7% of the Central Mediterranean species. The ratio of recorded species to the total for the Central Mediterranean is lower for rays than it is for sharks. This is hardly surprising given the greater difficulty in distinguishing between closely related species of rays, their predominantly benthic habits and hence low catchability except by trawling or by bottom longlines.

Statements on trends in abundance are very difficult to make since (i) many species are confused and are often reported under collective names (for example, ‘grey sharks’, referring to carcharhinids, and ‘rays’, referring to rajids and possibly members of other families; Fergusson & Marks (1996) give other examples); and (ii) past landing data were collected on the basis of what is marketed at the Valletta Central Fish Market and did not take into account the different fishery characteristics (e.g. fishing effort, fishing gear, fishing grounds and other variables) that change from year to year. This situation is now changing and since 2000, the Malta Centre for Fisheries Sciences has been collecting quantitative data on abundance, while it also holds catch and effort estimates for artisanal gear (Matthew Camilleri, personal communication 2003). Table 1 attempts to give some indication of abundance using a four-point scale of ‘common’, ‘frequent’, ‘occasional’ and ‘rare’; ‘occasional’ refers to those species that may be frequent to common in some years, but rare or absent in others. This table is based on those species included in the published local ichthyological literature, on landing data and on the authors’ experience. While subject to major errors, this preliminary analysis provides some interesting insights.

Out of the 25 sharks whose presence around the Maltese Islands has been confirmed by the present study, only four species are considered common (two ‘dogfish’ or catsharks, and two smoothhounds), another seven species are considered frequent, three are occasional, and six are rare; the status of the others is not known. Comparing the historic records with present day abundance estimates, it appears that one species, the Sharpnose Seven-gill shark *Heptanchias perlo*, that was previously considered rare, now appears to be more frequent, but that Blue shark *Prionace glauca*, and Smooth Hammerhead *Sphyrna zygaena*, are now much less common than they apparently were in the past. Of course there is always the possibility that certain fishing techniques are no longer used locally and therefore these species are less frequently caught, however, this decline seems to be Mediterranean-wide (Report of the IUCN SSC Shark Specialist Group Mediterranean Region Red List Workshop held in San Marino in September 2003, in preparation).

For the confirmed rays (14 species), only the Long-nosed Skate *Dipturus oxyrinchus* and the Common Stingray *Dasyatis pastinaca* are considered common, six species are frequent, two species are occasional, and three species are rare; the status of the others is not known.

Within the Mediterranean, a number of species are threatened and Table 1 gives those that are listed in the most recently available version of the IUCN’s Red Data List (IUCN, 2002). However, apart from those listed, a number of others are also suspected to be threatened. The IUCN Centre for Mediterranean Cooperation and the IUCN Shark Specialist Group recently convened a ‘Red List Workshop’ to assess the conservation status of chondrichthyan fishes in the Mediterranean

Sea and to identify vulnerable and threatened species (a key objective of the FAO-International Plan of Action for the Conservation and Management of Sharks – IPOA Sharks). The final Red List assessments are still under review, however, preliminary results indicate that approximately 46% of the species occurring in the Mediterranean are threatened (IUCN Categories: ‘Critically Endangered’, ‘Endangered’ or ‘Vulnerable’), 9% are ‘Near Threatened’, 15% are ‘Least Concern’ and 30% are ‘Data Deficient’ (Rachel Cavanagh, IUCN Shark Specialist Group, personal communication 2003). It is important to keep in mind that ‘Data Deficient’ does not mean that these taxa are not of conservation concern but only that there is a lack of scientific and fisheries research that could provide data on these poorly known fishes.

Highly threatened species include the Common (or Grey) Skate *Dipturus batis*. This once common species, highly vulnerable to trawl fisheries, has now virtually disappeared from the Mediterranean Sea. The two species of sandtiger sharks (*Carcharias taurus* and *Odontaspis ferox*) occurring in the Mediterranean Sea are also now extremely rare. These sharks congregate at specific sites and are especially vulnerable to coastal fisheries and the effects of habitat degradation (Report of the IUCN SSC Shark Specialist Group Mediterranean Region Red List Workshop held in San Marino in September 2003, in preparation). Other species of serious concern include the sawfishes (*Pristis* spp.) and the angel sharks (*Squatina* spp.) (Report of the IUCN SSC Shark Specialist Group Mediterranean Region Red List Workshop held in San Marino in September 2003, in preparation).

Species of direct relevance to Malta include: the Smalltooth Sandtiger *Odontaspis ferox*, which may be regionally declining and whose status requires monitoring; the Blue shark *Prionace glauca*, landings of which have markedly declined since 1984 (data published by the National Statistics Office, Valletta, Malta), and the Shortfin Mako *Isurus oxyrinchus*, both of which may be near threatened and require monitoring; the Smooth Hammerhead *Sphyrna zygaena* which has become very rare locally and which may also be threatened; the Bramble Shark *Echinorhinus brucus*, which very likely occurs, and which is highly vulnerable to habitat degradation and is on the decline within the Mediterranean (Report of the IUCN SSC Shark Specialist Group Mediterranean Region Red List Workshop held in San Marino in September 2003, in preparation); and all species of *Squatina*, which are threatened by habitat degradation (Report of the IUCN SSC Shark Specialist Group Mediterranean Region Red List Workshop held in San Marino in September 2003, in preparation).

In spite of this, only three species are protected by international treaties: the Great White Shark *Carcharodon carcharias*, the Basking Shark *Cetorhinus maximus* and the Devil Ray *Mobula mobular* (Table 1). These three species are also protected by local legislation enacted in terms of the Environment Protection Act (Legal Notice 49 of 1992 as amended by Legal Notice 161 of 1999); in the case of the White Shark, this protection is subject to the caveat that public security and civil protection authorities may take “any necessary steps” to ensure safety of bathers and other persons engaged in marine activities. Recently enacted regulations – the Flora, Fauna and Natural Habitat Protection Regulations, 2003 (Legal Notice 257 of 2003) – list these same three elasmobranchs under Schedule V, “Protected fauna” with the same caveat in the case of the Great White. Additionally, they list *Alopias vulpinus*, *Carcharias taurus*, *Carcharhinus brevipinna*, *Carcharhinus limbatus*, *Carcharhinus plumbeus*, *Galeorhinus galeus*, *Hexanchus griseus*, *Isurus oxyrinchus*, *Lamna nasus*, *Prionace glauca*, *Squatina squatina*, *Pristis pristis*, *Rostroraja alba* (as *Raja alba*), and *Leucoraja melitensis* (as *Raja melitensis*) in Schedule VI, which essentially gives species that need to be monitored in order to assess if measures should be taken to maintain the populations of these species in a favourable conservation status. At the time of writing, this legislation is in force but public comment has been invited.

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Table 1. Classified list of the species of sharks and rays recorded in the published scientific literature from the Maltese Islands with validation of their occurrence (Oc.), an estimate of their abundance (Ab.) in Maltese waters and their conservation and legal status.

	OC.	AB.	IUCN RED LIST CATEGORY (YEAR OF ASSESSMENT)	INTERNATIONAL TREATIES	MALTESE LEGISLATION
Hexanchidae					
<i>Heptranchias perlo</i> (Bonnaterre, 1788)	+	F			
<i>Hexanchus griseus</i> (Bonnaterre, 1788)	+	O	LR/nt (2000)		FFNHPR (VI)
Echinorhinidae					
<i>Echinorhinus brucus</i> (Bonnaterre, 1788)	(+)?				
Squalidae					
<i>Squalus acanthias</i> Linnaeus, 1758	+	?			
<i>Squalus blainvillei</i> (Risso, 1827)	+	?			
Centrophoridae					
<i>Centrophorus granulosus</i> (Bloch & Schneider,	+	?	VU (2000)		
<i>Centrophorus uyato</i> (Rafinesque, 1810)	+	?			
Dalatiidae					
<i>Dalatias licha</i> (Bonnaterre, 1788)	+	F	DD (2000)		
<i>Etmopterus spinax</i> (Linnaeus, 1758)	+	O			
Oxynotidae					
<i>Oxynotus centrina</i> (Linnaeus, 1758)	+	F			
Squatinae					
<i>Squatina aculeata</i> Cuvier (ex Dumeril), 1829	-				
<i>Squatina oculata</i> Bonaparte, 1840	(-)?				
<i>Squatina squatina</i> (Linnaeus, 1758)	+	F?	VU (2000)		FFNHPR (VI)
Odontaspidae (= Carchariidae)					
<i>Carcharias taurus</i> Rafinesque, 1810	-		VU (2000)		FFNHPR (VI)
<i>Odontaspis ferox</i> (Risso, 1810)	+	R			
Cetorhinidae					
<i>Cetorhinus maximus</i> (Gunnerus, 1765)	+	R	VU (2000)	SPABIM (II), BERN (II)	FFPR (II) FFNHPR (V)
Lamnidae					
<i>Carcharodon carcharias</i> (Linnaeus, 1758)	+	R	VU (2000)	SPABIM (II), BERN (II)	FFPR (II) FFNHPR (V)
<i>Isurus oxyrinchus</i> Rafinesque, 1810	+	F	LR/nt (2000)		FFNHPR (VI)
<i>Lamna nasus</i> (Bonnaterre, 1788)	(+)?		LR/nt (2000)		FFNHPR (VI)
Alopiidae					
<i>Alopias superciliosus</i> (Lowe, 1841)	+	O			
<i>Alopias vulpinus</i> (Bonnaterre, 1788)	+	F	DD (2001)		FFNHPR (VI)
Scyliorhinidae					
<i>Galeus melastomus</i> Rafinesque, 1810	(-)?				
<i>Scyliorhinus canicula</i> (Linnaeus, 1758)	+	C			
<i>Scyliorhinus canicula</i> (Linnaeus, 1758)	+	C			
<i>Scyliorhinus stellaris</i> (Linnaeus, 1758)	+	C			

<i>Scyliorhinus canicula</i> (Linnaeus, 1758)	+	C		
<i>Scyliorhinus stellaris</i> (Linnaeus, 1758)	+	C		
Triakidae				
<i>Galeorhinus galeus</i> (Linnaeus, 1758)	(-)?		VU (2000)	FFNHPR (VI)
<i>Mustelus asterias</i> Cloquet, 1821	+	C		
<i>Mustelus mustelus</i> (Linnaeus, 1758)	+	C		
<i>Mustelus punctulatus</i> Risso, 1827	+	?		
Carcharhinidae				
<i>Carcharhinus brachyurus</i> (Günther, 1870)	(-)?			
<i>Carcharhinus brevipinna</i> (Muller & Henle, 1839)	(-)?		LR/nt (2000)	FFNHPR (VI)
<i>Carcharhinus limbatus</i> [Muller & Henle (ex Valenciennes), 1839]	-		LR/nt (2000)	FFNHPR (VI)
<i>Carcharhinus melanopterus</i> (Quoy & Gaimard, 1824)	-		LR/nt (2000)	
<i>Carcharhinus obscurus</i> (LeSueur, 1818)	+	R	LR/nt (2000)	
<i>Carcharhinus plumbeus</i> (Nardo, 1827)	(-)?		LR/nt (2000)	FFNHPR (VI)
<i>Prionace glauca</i> (Linnaeus, 1758)	+	F?		FFNHPR (VI)
Sphyrnidae				
<i>Sphyrna tudes</i> (Valenciennes, 1822)	-			
<i>Sphyrna zygaena</i> (Linnaeus, 1758)	+	R	LR/nt (2000)	
Pristidae				
<i>Pristis pectinata</i> Latham, 1794	-			
<i>Pristis pristis</i> (Linnaeus, 1758)	(-)?		CR (2000)	FFNHPR (VI)
Rhinobatidae				
<i>Rhinobatos cemiculus</i> Geoffroy Saint-Hilaire, 1817	(-)?			
<i>Rhinobatos rhinobatos</i> (Linnaeus, 1758)	(-)?			
Torpedinidae				
<i>Torpedo (Tetronarce) nobiliana</i> Bonaparte, 1835	(-)?			
<i>Torpedo (Torpedo) marmorata</i> Risso, 1810	+	F		
<i>Torpedo (Torpedo) torpedo</i> (Linnaeus, 1758)	+	?		
Rajidae				
<i>Dipturus batis</i> (Linnaeus, 1758)	(-)?			
<i>Dipturus oxyrinchus</i> (Linnaeus, 1758)	+	C		
<i>Leucoraja fullonica</i> (Linnaeus, 1758)	-			
<i>Leucoraja melitensis</i> (Clark, 1926)	+	R		FFNHPR (VI)
<i>Leucoraja naevus</i> (Müller & Henle, 1841)	-			
<i>Raja asterias</i> Delaroche, 1809	+	F		
<i>Raja clavata</i> Linnaeus, 1758	+	O	LR/nt (2000)	
<i>Raja miraletus</i> Linnaeus, 1758	+	F		
<i>Raja montagui</i> Fowler, 1910	+	F		
<i>Raja radula</i> Delaroche, 1809	+	F		
<i>Rostroraja alba</i> (Lacepède, 1803)	-			FFNHPR (VI)

Dasyatidae					
<i>Dasyatis centroura</i> (Mitchill, 1815)	(-)?				
<i>Dasyatis pastinaca</i> (Linnaeus, 1758)	+	C			
<i>Dasyatis pastinaca</i> (Linnaeus, 1758)	+	C			
<i>Dasyatis violacea</i> (Bonaparte, 1832)	-				
Gymnuridae					
<i>Gymnura altavela</i> (Linnaeus, 1758)	+	R			
Myliobatidae					
<i>Myliobatis aquila</i> (Linnaeus, 1758)	+	F			
<i>Pteromylaeus bovinus</i> (Geoffroy Saint-Hilaire, 1817)	(-)?				
Rhinopterae					
<i>Rhinoptera marginata</i> (Geoffroy Saint-Hilaire, 1817)	+	O			
Mobulidae					
<i>Mobula mobular</i> (Bonnaterre, 1788)	+	R	VU (2000)	SPABIM (II)	FFPR (II)/ FFNHPR (V)

Key:

Occurrence:

- + Confirmed to occur;
- (+)? Not confirmed but almost certainly occur;
- Do not occur;
- (-)? Not confirmed but may occur

Abundance:

- C** Common;
- F** Frequent;
- O** Occasional;
- R** Rare;
- ? Status unknown.

IUCN Red List:

- CR** Critically endangered;
 - VU** Vulnerable;
 - LR/nt** Lower risk/near threatened;
 - DD** Data deficient.
- [Note: Apart from *Alopias vulpinus*, all other species were evaluated on ver 2.3 (1994) criteria]

International treaties:

- SPABIM (II)**: Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (Barcelona) - Annex II List of endangered or threatened species.
- BERN (II)**: Convention on the Conservation of European Wildlife and Natural Habitats (Bern) - Appendix II Strictly Protected Fauna Species

Maltese legislation:

- FFPR (II)**: Flora and Fauna Protection Regulations, 1992 as amended by the Flora and Fauna Protection (Amendment) Regulations, 1999 - Schedule II (Protected fauna).
- FFNHPR (V)/(VI)**: Flora, Fauna and Natural Habitat Protection Regulations, 2003 – Schedules V (Protected fauna) and Schedule VI (Animal and plant species of national importance and of importance to agreement states whose taking in the wild and exploitation may be subject to management measures).

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