OVERVIEW OF THE CONSERVATION STATUS OF THE MARINE FISHES OF THE MEDITERRANEAN SEA

Compiled by Dania Abdul Malak, Suzanne R. Livingstone, David Pollard, Beth A. Polidoro, Annabelle Cuttelod, Michel Bariche, Murat Bilecenoglu, Kent E. Carpenter, Bruce B. Collette, Patrice Francour, Menachem Goren, Mohamed Hichem Kara, Enric Massutí, Costas Papaconstantinou and Leonardo Tunesi

MEDITERRANEAN

The IUCN Red List of Threatened Species™ – Regional Assessment

SSC Species Survival Commission

TURKISH MARINE RESEARCH FOUNDATION

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Assessments of the Mediterranean cartilaginous fishes (sharks, rays and chimaeras), the results of which are also discussed in the present report, were completed at an earlier chondrichthyan assessment workshop held in San Marino under the auspices of the IUCN Centre for Mediterranean Cooperation and the IUCN Species Survival Commission's Shark Specialist Group in September 2003, and those who contributed to this earlier workshop are acknowledged in the subsequent report on this initiative (Cavanagh and Gibson 2007).

Participating experts at the Mediterranean Marine Fish Assessment Workshop held in Istanbul (Turkey) in November 2007. Photo: © Murat Bilecenoglu.

Executive summary

Aim

This report reviews the conservation status of all native marine fishes occurring in the Mediterranean Sea, based on the assessments for 513 species and 6 subspecies using the IUCN's Red List methodology. It identifies those marine fish species that are threatened with extinction at the regional level so that appropriate conservation actions can be taken to improve their conservation status.

Scope

The geographical scope of this report is the Mediterranean Sea, from the Gibraltar Strait to the Marmara Sea. The Black Sea and the adjacent Atlantic waters are not included in this study.

Conservation status assessment

The conservation status of the Mediterranean marine fishes was assessed using the IUCN Red List Categories and Criteria (IUCN 2001). This assessment was carried out during the course of two workshops, the first held in Istanbul (Turkey) in November 2007, and the second in Sète (France) in February 2008, as well as through correspondence with the relevant experts. More than 25 experts participated in this assessment process.

For those species that are endemic to the Mediterranean Sea, the regional assessments are also considered to be global assessments (i.e. representing the entire global population of the species). Non-endemic Mediterranean species (meaning species that also have populations outside the Mediterranean Sea) were assessed at the regional level using the *Guidelines for Application of IUCN Red List Criteria at Regional Levels* (IUCN 2003a). All of these assessments are available on the IUCN Red List website: www.iucnredlist.org/initiatives/mediterranean.

Results

Out of the 519 native marine fish species and subspecies included in this regional assessment, more than 8% (43 species) were classified in threatened categories (Critically Endangered, Endangered or Vulnerable).

Of the 15 (3%) most threatened species (assessed as Critically Endangered, the highest threat category), 14 (93%) are sharks and rays. Thirteen species (2.5%) are listed as Endangered, 9 of these being sharks and rays, while 15 species (3%) are considered Vulnerable, with roughly equal numbers of sharks (8 species) and bony fishes (7 species). An additional 22 species (4%), including 10 sharks and rays, are listed as Near Threatened, suggesting that these species need to be monitored in case their conservation status becomes more serious.

Almost one-third (151 species) of the Mediterranean marine fishes were listed as Data Deficient, meaning that there were not enough data available for these species to estimate their risk of extinction. Once more data are available, these (often rare) species might prove to be threatened. The true proportion of threatened species might therefore be much higher.

Seventy-four marine fish species (14% of the assessed species) were considered to be endemic to the Mediterranean Sea (as defined in this report). These endemic species are more frequently found in the western half of the Mediterranean Sea, especially around the Ligurian, Tyrrhenian and Tunisian coastlines. Four of these endemic species (5%) are threatened, including one ray (*Leucoraja melitensis,* Critically Endangered) and three bony fishes *(Pomatoschistus tortonesei* and *Syngnathus taenionotus,* both Endangered, and *Opeatogenys gracilis,* Vulnerable). Two endemic species (the speckled skate *Raja polystigma* and the narrow-snouted pipefish *Syngnathus tenuirostris*) are listed as Near Threatened.

More than 40% (30 species) of Mediterranean endemic marine fishes are listed as Data Deficient, suggesting that many of the Mediterranean Sea's fishes are either not very well known or threats within their ranges cannot be easily quantified. More information is needed, as many of these Data Deficient species may in fact be threatened.

Conclusions

- Over half of the marine fish species present in the Mediterranean Sea are threatened by targeted fishing or incidental capture as by-catch.

- Pollution, habitat loss and human disturbance are also important threats in this region.

- In addition, vulnerable life history characteristics contribute to the threat status of many Mediterranean fishes, particularly the sharks and rays and some of the larger-bodied commercially exploited bony fish species.

- Protection and effective management plans are urgently required. Although some species are afforded protection under national, regional or international conventions, the vast majority of threatened species are under no protection or effective management plan.

- Regional conservation management, such as the designation of 'no-take zones' or the creation of effective marine protected areas, should be implemented to reduce pressures on fish populations and safeguard critical fish habitats. This should be combined with improved political will to further integrate biodiversity conservation into marine policy sectors.

- Further funding and research into the status of endemic Mediterranean marine fish species is a high priority.

- Another striking feature is the substantial lack of information on the conservation status of nearly a third of the native Mediterranean marine fish species, a significant proportion of which are endemic to this sea. However, when data become available, these species might well prove to be threatened. Increased funding and research thus also needs to be directed towards these Data Deficient species. Although limited data availability is often cited as a problem, it should not, however, be used to justify the lack of management.

- Regional collaboration, especially among the southern and eastern Mediterranean countries, should be strengthened. Information is still lacking from many countries, particularly those bordering the southern and eastern shores of the Mediterranean Sea. It is essential that this strong regional cooperation continues and that new collaborations with other countries are forged, so that the work carried out to produce this first evaluation of the threat status of native Mediterranean marine fishes can be consolidated and updated as new information becomes available.

The cardinal fish, *Apogon imberbis*, is a colourful species widespread in the Mediterranean. It displays astonishing reproductive behaviour, as once the eggs are fertilized the male keeps them in his mouth until they hatch, to protect them. Its habitats include caves, where it is likely protected from many threats. The Cardinal fish is thus classed as Least Concern. Photo: © Andrea Molinari.

Introduction

The Mediterranean Sea is home to a wealth of marine resources. Its unique warm temperate marine ecosystem is characterized by unusually high biodiversity, and its marine species have supported human livelihoods and national economies in the region for several millennia. However, growing human populations and increased demands on marine resources have led to concern over the decline of fish species and marine diversity in general in the region. In addition to the potential over-exploitation of marine resources, other anthropogenic threats to marine species in the Mediterranean Sea include pollution, eutrophication, urban development and habitat degradation (Caddy 1993).

In November 2007, the International Union for the Conservation of Nature (IUCN) Centre for Mediterranean Cooperation, in collaboration with the IUCN Species Programme and Species Survival Commission (SSC), established a regional group of experts to complete an assessment of the regional conservation status of all native marine fishes (other than the sharks and rays, which had already been assessed) in the Mediterranean Sea. A summary of the overall results of the assessments for the entire known native Mediterranean marine fish fauna (including the sharks and rays) is presented in this current report, which highlights species of greatest conservation concern as well as listing those of lesser concern. The results for the chondrichthyan fishes included here have been previously published (Cavanagh and Gibson 2007), based on the prior assessments of these species conducted in 2003. It is envisaged that the information contained within this current report will help to facilitate the development of priority research, conservation and management actions for marine fish species in the region. This regional assessment also complements and contributes to the comprehensive global level assessments of the world's marine fish species that are being carried out through the IUCN Species Programme under the Global Marine Species Assessment (Polidoro *et al.* 2009a).

The near-endemic golden goby, *Gobius auratus*, with its striking colour, is a widespread and abundant species throughout the northern Mediterranean Sea. It lives in a variety of habitats, such as rocky bottoms covered by vegetation, and does not currently face any major known threats. It is currently categorized as Least Concern. Photo: © Tahsin Ceylan.

1.1 The Mediterranean Sea

The Mediterranean Sea covers an area of around 2.5 million km^2 (excluding the Black Sea), representing ~0.7% of the world's total ocean area (Figure 1.1). It is bordered by 21 countries and almost entirely enclosed by land: in the south by Africa, in the east by Asia and in the north by Europe. Its coastline extends for around 46,000km, along which the inflowing coastal rivers show high concentrations of freshwater species endemism (Garcia *et al.* 2010). The Mediterranean Sea ranges in depth to around 5,200m (in the Ionian Sea), with an average depth of ~1,500m (Zenetos *et al.* 2002).

The oceanographic environmental conditions of the Mediterranean Sea contribute to a unique circulation system, creating areas of upwelling and high productivity, with the highest levels of productivity occurring along the coastlines, especially near major cities and in estuaries. Evaporation in the Mediterranean Sea greatly exceeds the total of precipitation and river runoff (by a factor of around three), a fact that is central to the water circulation within the basin. Evaporation is especially high in its eastern half, causing the water level to decrease and the salinity to increase in an eastwards direction. This draws relatively cool, low-salinity water from the Atlantic eastwards across the basin, where it warms and becomes saltier as it travels east, then sinks in the region of the Levant and circulates westwards, to eventually spill over the sill at the bottom of the Strait of Gibraltar and back into the Atlantic Ocean. Thus, seawater flows eastwards in this Strait's surface waters, and westwards below; once in the Atlantic, this chemically distinct 'Mediterranean Intermediate Water' can persist for thousands of kilometres away from its source.

1.2 The fish fauna of the Mediterranean Sea

The Mediterranean Sea is considered to be a biodiversity 'hotspot' as it has unusually high species diversity for a temperate sea (FAO 2003a and b). It contains around 7% of the total global marine fish species (Bianchi and Morri 2000), with a wide range of both temperate and tropical species being present. This high diversity can be explained by geologic and paleogeographic factors, as well as environmental factors including climate, temperature and salinity gradients, and hydrology. Past environmental conditions within this basin, including almost complete desiccation between 5 and 6 million years ago, have heavily influenced the presence and distribution of the fish species found in the region today.

Figure 1.1 The Mediterranean Sea

Currently, there are more than 600 marine fish species in the Mediterranean Sea, most of them being of Atlantic origin (Quignard and Tomasini 2000). However, in the Eastern Mediterranean, due to the east-west gradient of both salinity and temperature, fish diversity decreases to around 400 species.

Many species found today in the Mediterranean Sea are not originally native to this region. This is particularly true in the eastern basin, where Indo-Pacific marine species continue to reach the Mediterranean Sea through the ongoing 'Lessepsian' migration of marine fishes from the Red Sea through the Suez Canal, contributing significantly to the fish biodiversity and the fisheries of the Eastern Mediterranean. Around 80 fish species (Golani and Appelbaum-Golani 2010) have been identified as invasive or vagrant species in the Mediterranean Sea, the majority of which have come from the Red Sea. Some examples of the latter include the blue-spotted cornetfish (*Fistularia commersonii*), the Red Sea pufferfish (*Lagocephalus sceleratus*), the narrow-barred Spanish mackerel (*Scomberomorus commerson*), the dusky spinefoot (*Siganus luridus*), and the honeycomb stingray (*Himantura uarnak*). These Lessepsian migrants, as well as Atlantic vagrants and introduced and diadromous fish species, have been excluded from this regional assessment. A checklist of the 519 native marine fish species and subspecies which were regionally assessed is provided in Appendix 1.

The 3 main marine fish groups present in the Mediterranean Sea are:

Agnathans, or jawless fishes, which include the lampreys and the hagfishes. These are not very common in the Mediterranean Sea and are very rare or absent in the Eastern Mediterranean. Only the Atlantic hagfish is considered here, as the lampreys are primarily diadromous river-dwelling forms and therefore are excluded from this analysis.

Chondrichthyans, or cartilaginous fishes, are represented by 76 species of sharks, rays and chimaeras native to the Mediterranean Sea. They are characterized by their primitive cartilaginous skeletons. They are generally slow-growing, late to mature, have low fecundity and productivity, long gestation periods, high natural survivorship of all age classes, and a relatively long lifespan (Cailliet *et al.* 2005; Camhi *et al.* 1998). These intrinsic biological traits result in a low reproductive potential and thus a low capacity for population increase and recovery in the case of many species. Such intrinsic biological characteristics have serious implications for the survival of chondrichthyan populations, especially in this almost enclosed sea, severely limiting their capacity to sustain fisheries or to recover from significant fishery-induced population declines (Cailliet *et al.* 2005, Camhi *et al.* 1998).

Osteichthyans, or bony fishes, which are characterized by their bony skeletons, total around 442 native species in the Mediterranean Sea. Although most bony fishes have a better capacity for population recovery than the chondrichthyan fishes, some of them, such as the larger tunas (several species in the family Scombridae, subfamily Thunninae), are also relatively long-lived

Cartilaginous fishes include rays, sharks, and chimaeras. Their skeleton is made of cartilage rather than bone. They are relatively primitive species, some of them being truly 'living fossils'. They generally give birth to few offspring. Photo: Common angelshark, *Squatina squatina,* are Critically Endangered at the Mediterranean level, as they constitute a by-catch in many other fisheries. Photo: © Simon Rogerson.

Bony fishes, in contrast, have a skeleton made of bone. They are an extremely diverse and abundant group, in both form and behaviour. They inhabit all sorts of habitats: from rocks, sand or *Posidonia* meadows to open waters or deep-sea environments. Some species are tiny (less than 10mm), while others are huge (up to 5m) or heavy (up to 1 tonne). Photo: Brown meagre, *Sciaena umbra*, Vulnerable at the Mediterranean level. Photo: © Tahsin Ceylan.

fishes that may also have difficulty in recovering from significant population declines. Some other bony fish species, such as the flatfishes (order Pleuronectiformes), which are adapted to living on the bottom and can reach more than 20 years of age, are particularly susceptible to bottom trawling.

Although endemism of fishes in the Mediterranean Sea was earlier thought to account for 20–30% of all Mediterranean marine fish species (Bianchi and Morri 2000, Briand and Giuliano 2007), only 74 (~14%) of the 519 species and subspecies assessed for the IUCN Red List are here considered to be endemic to the Mediterranean Sea.

Endemic species in the case of this report are defined as those occurring within the confines of the Mediterranean Sea, including a few species with ranges that also extend into the Black Sea and others that occur as occasional 'stragglers' just outside the Mediterranean to the west of the Strait of Gibraltar, along the northern coast of Morocco or the southern coast of Portugal. Species also occurring slightly further afield in the Atlantic outside the mouth of the Mediterranean, as far as the Atlantic coasts of Portugal to the north and Morocco to the south, but which are obviously of Mediterranean derivation, are considered here to be 'near endemics'. Species that occur only in the Black Sea but not in the Mediterranean Sea or in the Sea of Marmara are not included in this report.

1.3 Objectives of the regional assessment

The main objective of this regional assessment was to assess the native marine fishes present in the Mediterranean Sea using the IUCN Red List Categories and Criteria, not only to determine their conservation status, but also:

- To develop a network of regional experts to enable species assessments to be continually updated as new information is discovered and to provide expert opinion on policy and management recommendations;
- To provide support to regional planning initiatives and policy development for the conservation and sustainable management of Mediterranean marine fishes by providing comprehensive reports informing on their current status;
- To produce a database containing information on distribution, population, habitat preference, major threats, conservation measures and key literature references for each Mediterranean native marine fish species as a baseline dataset, in a format suitable for use by scientists, stakeholders and decision makers;
- To store, manage, analyse and make widely available this information on the conservation status of the native marine fish fauna of the Mediterranean Sea within the IUCN Species Survival Commission's (SSC) data management system, the Species Information Service (SIS), and throughout the regional and global presence of IUCN and its partners.

This report summarises the results of the Mediterranean regional bony fishes workshops held in Istanbul (Turkey) in November 2007 and in Sète (France) in February 2008, together with the updated results of the Mediterranean regional chondrichthyan workshop held in San Marino in September 2003 (Cavanagh and Gibson 2007). It thus provides a regional overview of the conservation status of the entire native marine fish fauna of the Mediterranean Sea.

The main outputs presented in this report are:

- A comprehensive species list of all Mediterranean native marine fishes (not including vagrant, introduced or diadromous species);
- An IUCN Red List categorization of each species;
- A summary of the main threats affecting Mediterranean fishes;
- Recommendations for the future conservation of Mediterranean marine fishes and their habitats.

IUCN will facilitate wide dissemination of this document to concerned decision-makers, scientists and non-governmental organizations in order to mobilize Mediterranean native marine fish conservation action at the local, national and regional levels.

2. Assessment methodology

2.1 IUCN Red List of Threatened Species

The IUCN Red List of Threatened Species™ (IUCN Red List) is widely recognised as the most comprehensive, scientifically-based source of information on the global conservation status of plant and animal species. IUCN Red List Categories and Criteria are applied to individual species assessments (which contain species-specific information on taxonomy, distribution, population status, ecology, life history, habitat, threats and conservation measures), to determine each species' relative probability or risk of extinction. Threatened species are listed as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU). Taxa that are either close to meeting the threatened thresholds, or would be threatened were it not for ongoing conservation programmes, are classified as Near Threatened (NT). Taxa evaluated as having a relatively low risk of extinction are classified as Least Concern (LC). Also highlighted by the IUCN Red List process are taxa whose extinction risk cannot be evaluated due to insufficient knowledge, and which have therefore been classified as Data Deficient (DD) (see Figure 2.1). This latter category does not necessarily mean that the species is not threatened. On the contrary, when data become available, numerous Data Deficient species often prove to be at risk; therefore it is important to focus conservation efforts and research on these Data Deficient species as well.

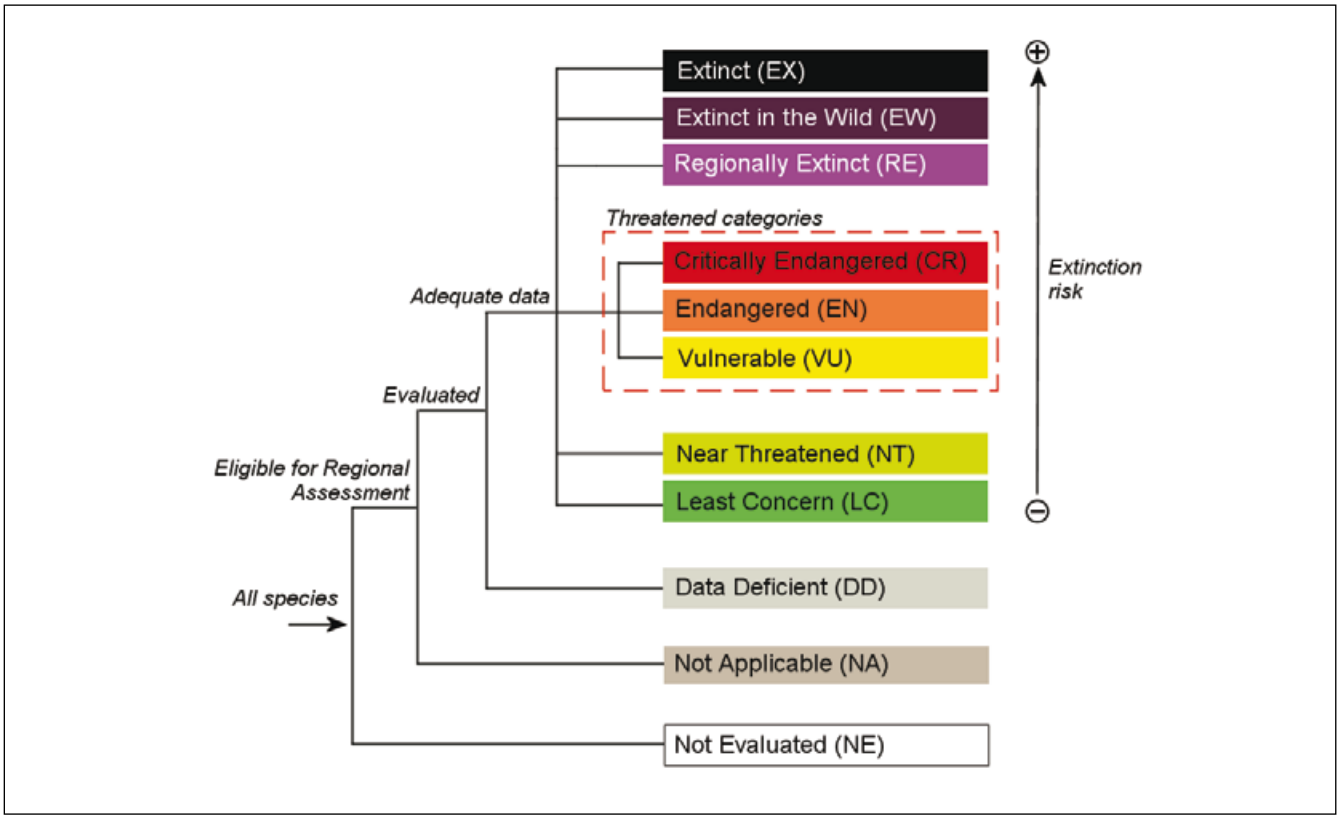
As these IUCN Red List assessments can be regularly updated when new information becomes available, they can be used as a tool for measuring and monitoring changes in the status of both marine fish biodiversity and our knowledge of the individual taxa. They are an essential basis for setting priorities and for monitoring the long term success of management and conservation initiatives.

2.2 IUCN Red List marine assessments initiative

2.2.1 The Global Marine Species Assessment

Conservationists are well aware that a broad range of marine species are under threat of extinction and that marine biodiversity is experiencing potentially irreversible

Figure 2.1 IUCN Red List categories at the regional scale



degradation due to, amongst other things, over-fishing, by-catch, climate change, invasive species and coastal development. However, in the past marine organisms in general have been poorly represented on the IUCN Red List of Threatened Species, with less than 5% of the 45,000 species currently on the IUCN Red List (IUCN Red List 2009) being marine.

To address this gap, the Global Marine Species Assessment (GMSA), a joint initiative of IUCN and Conservation International, has been formed to complete Red List assessments for approximately 20,000 marine species by the year 2012. The GMSA is systematically working to provide a large global data set of species-specific information on distribution, population status, habitat and ecology, major threats, utilization and conservation measures, used to assess each species by expert peer review, in order to determine its probability of extinction and IUCN Red List category. The efforts of the GMSA will substantially increase the number of marine species assessed against IUCN Red List Categories and Criteria, and provide a wealth of baseline data for local, regional and global marine conservation initiatives. The Mediterranean regional assessment is one of the first regional assessments of marine fish that has been completed under the GMSA.

2.2.2 Mediterranean regional assessment

The present regional assessment of native marine fish species is part of a wider project aimed at assessing the overall status of Mediterranean Biodiversity. Reviews of all mammals (including cetaceans), reptiles, amphibians, endemic freshwater fish, dragonflies and aquatic plants have been conducted according to IUCN regional Red Listing guidelines, in order to identify those species threatened with extinction at the regional level (*see* list of publications available at the end of this report). This regional assessment, together with the results and conclusions gained, comprises the first complete conservation status evaluation of the native marine fish fauna of any entire sea that has been undertaken to date. It also contributes to a more comprehensive assessment of these species at the global level.

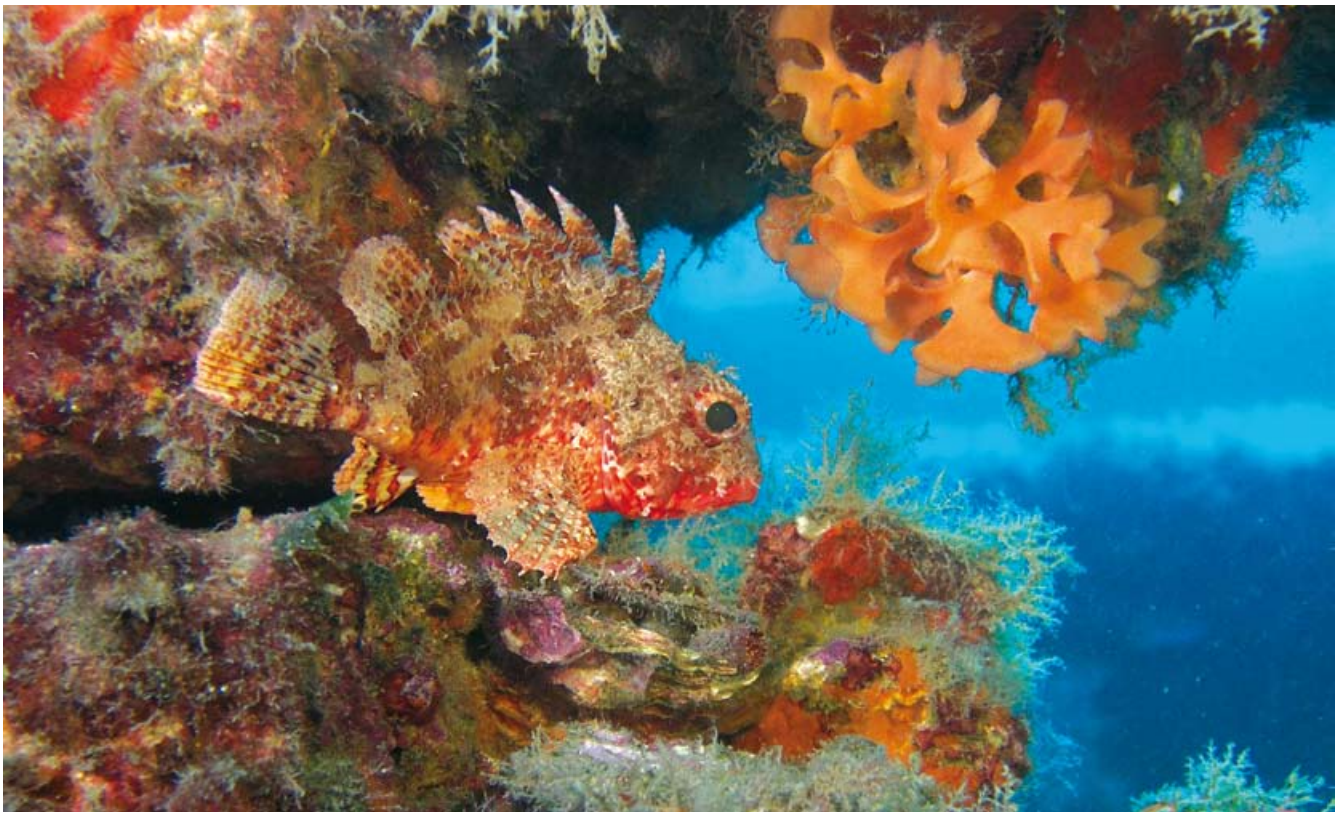
2.3 IUCN Red List process

2.3.1 Taxonomic scope

More than 600 fish species were initially indentified as occurring in the Mediterranean region, including native, vagrant, introduced and diadromous fish species. However, in this report, only native marine fish species

The slender goby, *Gobius geniporus*, is a small fish which is endemic to the Mediterranean Sea. It lives near the coasts and mimics the sand and gravel of the bottom. Its occurrence is limited to the western and north-eastern parts of the Mediterranean. It is not considered to be threatened, and is listed as Least Concern. Photo: © Melih Ertan Cinar.

The small red scorpionfish, *Scorpaena notata,* is common in Mediterranean coralligenous assemblages and rocky littoral habitats. It is a small (about 15cm), sedentary fish. Its spiked dorsal fin is venomous. However, its flesh is tasty and it is used in making the famous 'bouillabaisse' soup. The small red scorpionfish is widely distributed in the Mediterranean and adjacent waters of the Atlantic and is classified as Least Concern. Photo: © Andrea Molinari.



were assessed at the regional scale due to the timing, present state of knowledge, and funding available for these assessments. All non-native marine species (e.g. Lessepsian migrants from the Red Sea, known Atlantic vagrant species, and introduced and diadromous species) were therefore excluded from assessment and analysis in the case of this study. The endemic freshwater fishes of the Mediterranean basin have already been assessed (Smith and Darwall 2006).

2.3.2 Geographical scope

In this study, the region assessed extends from the Sea of Marmara to the Strait of Gibraltar. Species endemic to the Black Sea and those found only in adjacent Atlantic waters are therefore not included.

2.3.3 Regional and global assessments

For species that are endemic to the Mediterranean Sea, these regional assessments are also considered to be global assessments (i.e. representing the entire global population of the species). Non-endemic Mediterranean species (meaning species that also have populations outside the Mediterranean Sea) were assessed at the regional level using the the *Guidelines for Application of IUCN Red List Criteria at the Regional Level* (IUCN 2003a, Gärdenfors *et al.* 2001). For these species, any finalized global assessment categories are also presented (Appendix 1) (i.e. for the chondrichthyans, the Atlantic bluefin tuna *Thunnus thynnus*, groupers and wrasses). Global assessments for the majority of the marine fishes that are present in but not endemic to the Mediterranean Sea are still in progress and will not be available until these species have been completely assessed across their entire geographic ranges through the ongoing process of the Global Marine Species Assessment (GMSA) programme.

The results presented in this report are thus regional assessments of the native Mediterranean marine fish species based on the IUCN Red List methodology (IUCN 2001) (Figure 2.3.1). These assessments are available online on the IUCN Red List website: www.iucnredlist.org/initiatives/mediterranean.

2.3.4 Data collection, assessment, and review

Four of the team of Mediterranean fish experts (Michel Bariche, Hichem Kara, Andrea Molinari and Angelo Palmeri) collated species specific information on distribution, population, habitat, life history, threats and

conservation measures, obtained from primary literature and data analysis, and provided a preliminary assessment for all native Mediterranean fish species prior to their group assessment at the IUCN Red List workshop. A digital distribution map for each species was also created using ArcGIS software.

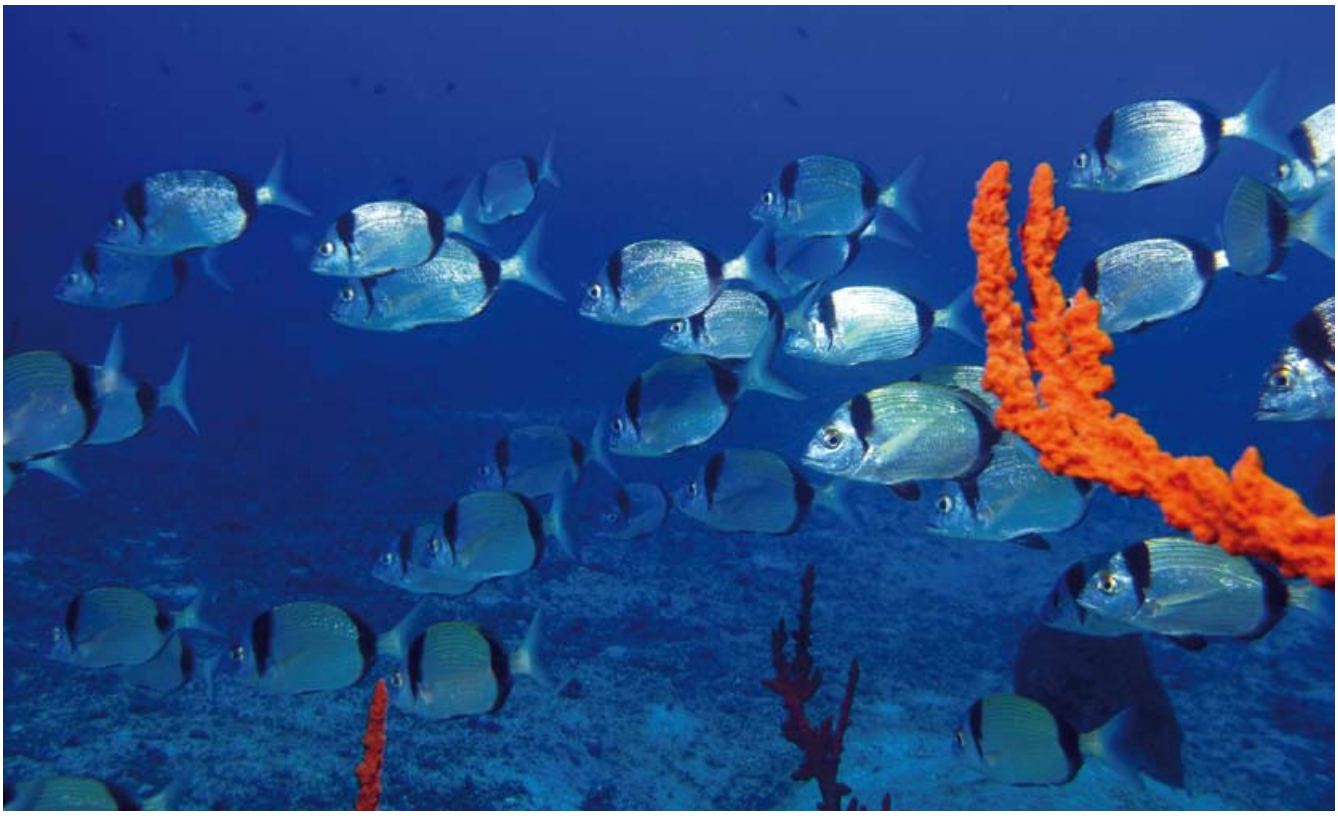
More than 20 regional and international fish species experts attended the IUCN Red List Workshop on Mediterranean Marine Fishes held in Istanbul, Turkey, in November 2007. This workshop was conducted in collaboration with the Turkish Marine Research Foundation (TUDAV), the IUCN Centre for Mediterranean Cooperation, the IUCN Species Programme and the GMSA, and was funded by the MAVA and TOTAL Foundations.

During the workshop, experts contributed and evaluated available species-specific information and distribution maps to collectively apply the IUCN Red List Categories and Criteria for 519 native Mediterranean fishes. Outside consultation and follow-up was conducted after the workshop when additional information was needed but not available at the workshop. Additionally, 5 Mediterranean fish experts also attended a second bony fish workshop in Sète, France, in February 2008, with the objective of evaluating 2 remaining taxonomic groups (Pleuronectiformes and Ophidiiformes), which could not be assessed at the Istanbul workshop due to a lack of time. After these 2 workshops, experts from Mediterranean regional countries and elsewhere reviewed the species summary reports using a peer review methodology. Subsequent comments and additional up-to-date information from these sources were included in the assessments.

Regional assessments for 71 species of chondrichthyans, or cartilaginous fishes, were conducted using similar methods at the Red List workshop held in San Marino in 2003 (Cavanagh and Gibson 2007). In 2009, global assessments for all known chrondrichthyan species were also completed by the IUCN SSC Shark Specialist Group. Due to a number of taxonomic changes and new information since 2003, there are now 76 species of sharks, rays and chimaeras that are considered native to the Mediterranean region, and updated assessments for these are available both regionally and globally.

Supported by relevant data sources, scientific literature, and expert peer review, these final regional Red List assessments are thus the outcome of information exchange and scientific consensus between numerous marine fish specialists and their networks of informed experts in the Mediterranean region and elsewhere.

The two-banded bream, *Diplodus vulgaris,* is easy to recognise with its two black stripes. It measures 25 to 45cm. Living in groups, it often occurs in seagrass meadows or rocky shallows. It is an important food fish. It is listed as Least Concern in the Mediterranean Sea. Photo: © Tahsin Ceylan.



3. Results and discussion

3.1 All native marine fishes

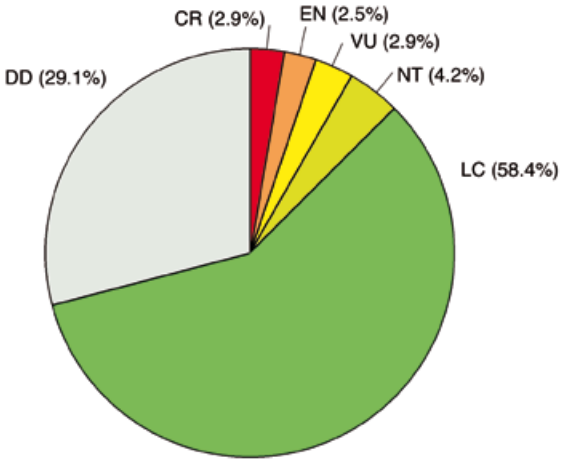
3.1.1 Threat status

Of the 519 native marine fish species and subspecies assessed in the Mediterranean Sea, 43 species (~8%) were regionally classified in threatened categories (Critically Endangered, Endangered or Vulnerable) (Figure 3.1 and Table 3.1). Of the 15 species (3%) listed as Critically Endangered, the highest threat category, 14 (93%) are sharks and rays. Thirteen species (2.5%) are listed as Endangered, 9 being sharks and rays, while 15 species (3%) are listed as Vulnerable, with roughly equal numbers of sharks (8 species) and bony fishes (7 species). These species must be monitored particularly closely and, crucially, appropriate management and recovery plans for them should be implemented without delay. Further research and monitoring should also be conducted to better understand these species' biology, threats and conservation needs.

An additional 22 species (4%), including 10 sharks and rays, were listed as Near Threatened, suggesting that these species need to be monitored in case their conservation status becomes more serious in the future.

The most striking figure is the number of Data Deficient species; for almost one-third (151 species) of Mediterranean native marine fishes, there were not enough data available to apply the IUCN Red List Criteria and define their risk of extinction! It should be stressed that classification of species as Data Deficient does not imply that these species are not threatened, but rather that data were not available or could not be quantified to determine the impact of potential or known threats. More research is urgently needed for some of these species. On a more positive note, more than half (303 species) of Mediterranean native marine fishes are listed as Least Concern, indicating that they are not facing an immediate risk of extinction.

Figure 3.1 Regional Red List status of all the native marine fish species (including both bony and cartilaginous fishes) present in the Mediterranean Sea



Categories are abbreviated as: CR—Critically Endangered; EN—Endangered; VU—Vulnerable; NT—Near Threatened; LC—Least Concern; DD—Data Deficient.

Table 3.1 Number of native marine fish species (including both bony and cartilaginous fishes) in each IUCN Red List category

	IUCN Red List Categories	No of native species	No of endemic species
Threatened categories	Critically Endangered (CR)	15	1
	Endangered (EN)	13	2
	Vulnerable (VU)	15	1
	Near Threatened (NT)	22	2
	Least Concern (LC)	303	39
	Data Deficient (DD)	151	29
	Total number of species assessed	**519**	**74**
	Total number (and %) of threatened species	**43 (8.3%)**	**4 (5.4%)**

Table 3.2 List of threatened native marine fish species in the Mediterranean Sea

Class	Order	Family	Genus species	Category	Endemic
CHONDRICHTHYES	LAMNIFORMES	LAMNIDAE	Isurus oxyrinchus	CR	
	LAMNIFORMES	LAMNIDAE	Lamna nasus	CR	
	LAMNIFORMES	ODONTASPIDIDAE	Carcharias taurus	CR	
	MYLIOBATIFORMES	GYMNURIDAE	Gymnura altavela	CR	
	PRISTIFORMES	PRISTIDAE	Pristis pectinata	CR	
	PRISTIFORMES	PRISTIDAE	Pristis pristis	CR	
	RAJIFORMES	RAJIDAE	Dipturus batis	CR	
	RAJIFORMES	RAJIDAE	Leucoraja circularis	CR	
	RAJIFORMES	RAJIDAE	Leucoraja melitensis	CR	Endemic
	RAJIFORMES	RAJIDAE	Rostroraja alba	CR	
	SQUALIFORMES	OXYNOTIDAE	Oxynotus centrina	CR	
	SQUATINIFORMES	SQUATINDAE	Squatina aculeata	CR	
	SQUATINIFORMES	SQUATINDAE	Squatina oculata	CR	
	SQUATINIFORMES	SQUATINDAE	Squatina squatina	CR	
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Pomatoschistus microps	CR	
CHONDRICHTHYES	CARCHARHINIFORMES	CARCHARHINIDAE	Carcharhinus plumbeus	EN	
	CARCHARHINIFORMES	TRIAKIDAE	Mustelus asterias	EN	
	CARCHARHINIFORMES	TRIAKIDAE	Mustelus mustelus	EN	
	LAMNIFORMES	LAMNIDAE	Carcharodon carcharias	EN	
	MYLIOBATIFORMES	MOBULIDAE	Mobula mobular	EN	
	RAJIFORMES	RAJIDAE	Raja undulata	EN	
	RHINOBATIFORMES	RHINOBATIDAE	Rhinobatos cemiculus	EN	
	RHINOBATIFORMES	RHINOBATIDAE	Rhinobatos rhinobatos	EN	
	SQUALIFORMES	SQUALIDAE	Squalus acanthias	EN	
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Pomatoschistus tortonesei	EN	Endemic
	PERCIFORMES	SCOMBRIDAE	Thunnus thynnus	EN	
	PERCIFORMES	SERRANIDAE	Epinephelus marginatus	EN	
	SYNGNATHIFORMES	SYNGNATHIDAE	Syngnathus taenionotus	EN	Endemic
CHONDRICHTHYES	CARCHARHINIFORMES	CARCHARHINIDAE	Prionace glauca	VU	
	CARCHARHINIFORMES	SPHYRNIDAE	Sphyrna zygaena	VU	
	HEXANCHIFORMES	HEXANCHIDAE	Heptranchias perlo	VU	
	HEXANCHIFORMES	HEXANCHIDAE	Hexanchus griseus	VU	
	LAMNIFORMES	ALOPIIDAE	Alopias vulpinus	VU	
	LAMNIFORMES	CETORHINIDAE	Cetorhinus maximus	VU	
	LAMNIFORMES	ODONTASPIDIDAE	Odontaspis ferox	VU	
	SQUALIFORMES	CENTROPHORIDAE	Centrophorus granulosus	VU	
OSTEICHTHYES	GADIFORMES	MERLUCCIIDAE	Merluccius merluccius	VU	
	GOBIESOCIFORMES	GOBIESOCIDAE	Opeatogenys gracilis	VU	Endemic
	PERCIFORMES	GOBIIDAE	Pomatoschistus minutus	VU	
	PERCIFORMES	LABRIDAE	Labrus viridis	VU	
	PERCIFORMES	SCIAENIDAE	Sciaena umbra	VU	
	PERCIFORMES	SCIAENIDAE	Umbrina cirrosa	VU	
	PERCIFORMES	SPARIDAE	Dentex dentex	VU	

Of the 519 species and subspecies assessed, 74 species (14%) are considered to be endemic to the Mediterranean region in this report (see section 1.2) (Table 3.1). Four of these endemic species (5%) are threatened: one ray (*Leucoraja melitensis,* Critically Endangered), and three bony fishes *(Pomatoschistus tortonesei* and *Syngnathus taenionotus,* both Endangered, and *Opeatogenys gracilis,* Vulnerable). Two endemic species (the speckled skate *Raja polystigma* and the narrow-snouted pipefish *Syngnathus tenuirostris*) are listed as Near Threatened. Almost 40% (29 species) of Mediterranean endemic fishes are listed as Data Deficient, suggesting that many marine fishes in the Mediterranean Sea are either not very well known or threats within their range cannot be easily quantified. This lack of knowledge of the status of endemic marine fish species, which are by definition unique to the Mediterranean Sea, makes further research a high priority in order to identify the threatened species amongst them and to protect what are in fact their entire global populations.

3.1.2 Status by major taxonomic group

The chondrichthyan species, or sharks, rays and chimaeras, are by far the most threatened class of marine fishes in the Mediterranean Sea, with 31 species (40%) in threatened categories (Table 3.2). A greater proportion of the chondrichthyan fishes are in threatened categories compared to the bony fishes as many shark and ray species have a higher intrinsic vulnerability, largely because they are longer-lived, slower-growing, later-maturing and have a lower fecundity, and are therefore slower to recover from any population declines. Species in the orders Hexanchiformes, Lamniformes, Pristiformes, Rhinobatiformes, and Squatiniformes are of particular concern, as 67–100% of species in these orders are in threatened categories. Additionally, 60% of species in the Rajiformes and Myliobatiformes are considered threatened or Near Threatened. Even though the sharks and rays are among the most studied marine fish species, 6 orders (Carcharhiniformes, Chimaeriformes, Hexanchiformes, Myliobatiformes, Squaliformes, and Torpediniformes) have relatively high numbers of species (33–100%) listed as Data Deficient in the Mediterranean Sea.

Among the 22 orders of bony fishes, or osteichthyans, assessed (442 species), 4 (Gadiformes, Gobiesociformes, Perciformes, and Syngnathiformes) contain threatened species. The most threatened orders are the Gobiesociformes and Syngnathiformes, with 12.5% and 9.1% of their species under threat, respectively. Within the latter order, the family Syngnathidae warrants special mention, as 6 (55%) of the 11 syngnathid species found in the Mediterranean Sea are considered to be threatened or Near Threatened at the regional level. The most speciose order of bony fishes, with more than half (or 222) of the bony fish species present, is the order Perciformes. Most (68%) perciform species are listed as Least Concern, 26% as Data Deficient, and only nine species (4%) are listed in threatened categories, with less than 2% being classified as Near Threatened. Within the order Perciformes, the family with the largest number of species (49) and the highest number (29) and proportion (59%) of endemic species is the family Gobiidae. Three of these gobies are in threatened categories.

One of the most common fish in the Mediterranean Sea, the **salema**, *Sarpa salpa,* is grey-blue, with about 10 or 11 yellow horizontal lines and yellow eyes and fins. Like several other Sparidae species, it changes sex during its life. *Sarpa salpa* was reportedly consumed as a recreational drug during the time of the Roman empire. It is assessed as Least Concern. Photo: © Annabelle Cuttelod.

The single agnathan species assessed, the Atlantic hagfish (*Myxine glutinosa*), is listed as Least Concern. This species is found from around 40 to 1200m depth and may be restricted to waters off the coast of north-western Africa. Although it is not known from many records in the Mediterranean Sea, it is not targeted commercially and there are no known major threats to its survival.

3.1.3 Spatial distribution

The distribution of the 519 marine fish species and subspecies included in this assessment is not homogeneous. The western end of the Mediterranean Sea, which is linked through the Strait of Gibraltar to the Atlantic Ocean, has surface waters which are better oxygenated than at the eastern end (Caddy 1993), resulting in generally higher productivity and a richer species composition (Figure 3.2).

Coastal habitats in more heavily populated areas are under higher levels of stress (through the impact of anthropogenic activities such as urbanization, pollution, tourism, etc.), as highlighted by the distribution of threatened species. Relatively denser concentrations of threatened species are thus observed in the Western Adriatic Sea, the Ligurian Sea, and the Gulf of Lions (Figure 3.3.).

The distribution of the endemic species found in the Mediterranean indicates a concentration in the western basin, especially around the Gulf of Lions and the Ligurian and Tyrrhenian Seas, as well as along the Tunisian coastline (Figure 3.4.).

Table 3.3 Red List status of native Mediterranean marine fishes, listed by order

Class	Order	CR	EN	VU	NT	LC	DD	Total No spp.	% threatened	% DD	% LC
AGNATHA	MYXINIFORMES					1		**1**	0	0	100
CHONDRICHTHYES	CARCHARHINIFORMES		3	2	1	2	11	**19**	26	57.8	10
	CHIMAERIFORMES						1	**1**	0	100	0
	HEXANCHIFORMES			2			1	**3**	67.5	33.5	0
	LAMNIFORMES	3	1	3			1	**8**	88	12	0
	MYLIOBATIFORMES	1	1		4		4	**10**	20	40	0
	PRISTIFORMES	2						**2**	100	0	0
	RAJIFORMES	4	1		5	3	2	**15**	33.3	13.3	20
	RHINOBATIFORMES		2					**2**	100	0	0
	SQUALIFORMES	1	1	1		3	4	**10**	30	40	30
	SQUATINIFORMES	3						**3**	100	0	0
	TORPEDINIFORMES					2	1	**3**	0	33.3	66.7
OSTEICHTHYES	ANGUILLIFORMES					12	8	**20**	0	40	60
	ATHERINIFORMES					2	1	**3**	0	33.3	66.7
	AULOPIFORMES					10	4	**14**	0	28.6	71.4
	BATRACHOIDIFORMES						1	**1**	0	100	0
	BELONIFORMES					5	6	**11**	0	54.5	45.5
	BERYCIFORMES					1	1	**2**	0	50	50
	CLUPEIFORMES					4	1	**5**	0	20	80
	GADIFORMES			1		23	8	**32**	3.1	25	71.9
	GOBIESOCIFORMES			1		4	3	**8**	12.5	37.5	50
	LAMPRIFORMES						5	**5**	0	100	0
	LOPHIIFORMES					2	1	**3**	0	33.3	66.7
	MYCTOPHIFORMES					16	2	**18**	0	11.1	88.9
	NOTACANTHIFORMES					2		**2**	0	0	100
	OPHIDIIFORMES					6	4	**10**	0	40	60
	OSMERIFORMES					3	3	**6**	0	50	50
	PERCIFORMES	1	3	5	4	151	58	**222**	4.1	26.1	68
	PLEURONECTIFORMES				3	17	8	**28**	0	28.6	60.7
	SCORPAENIFORMES					17	5	**22**	0	22.7	77.3
	STOMIIFORMES					11	2	**13**	0	15.4	84.6
	SYNGNATHIFORMES		1		5	3	2	**11**	9.1	18.2	27.3
	TETRAODONTIFORMES					1	3	**4**	0	75	25
	ZEIFORMES					2		**2**	0	0	100
Grand Totals	No Orders = 34	15	13	15	21	304	151	**519**	8.3	29.0	58.6

Figure 3.2 Species richness of native marine fishes in the Mediterranean Sea

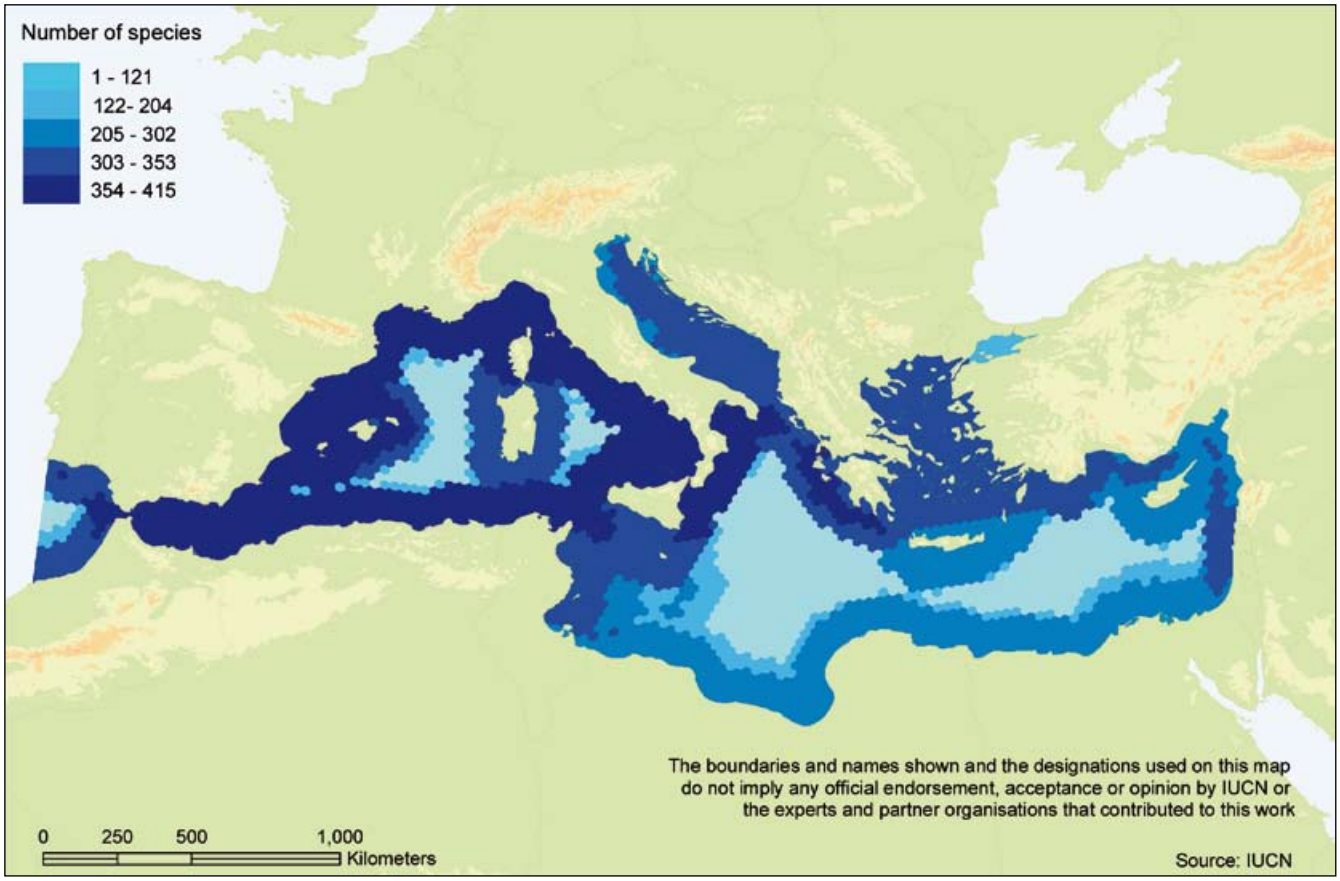


Figure 3.3 Distribution of threatened native marine fish species in the Mediterranean Sea

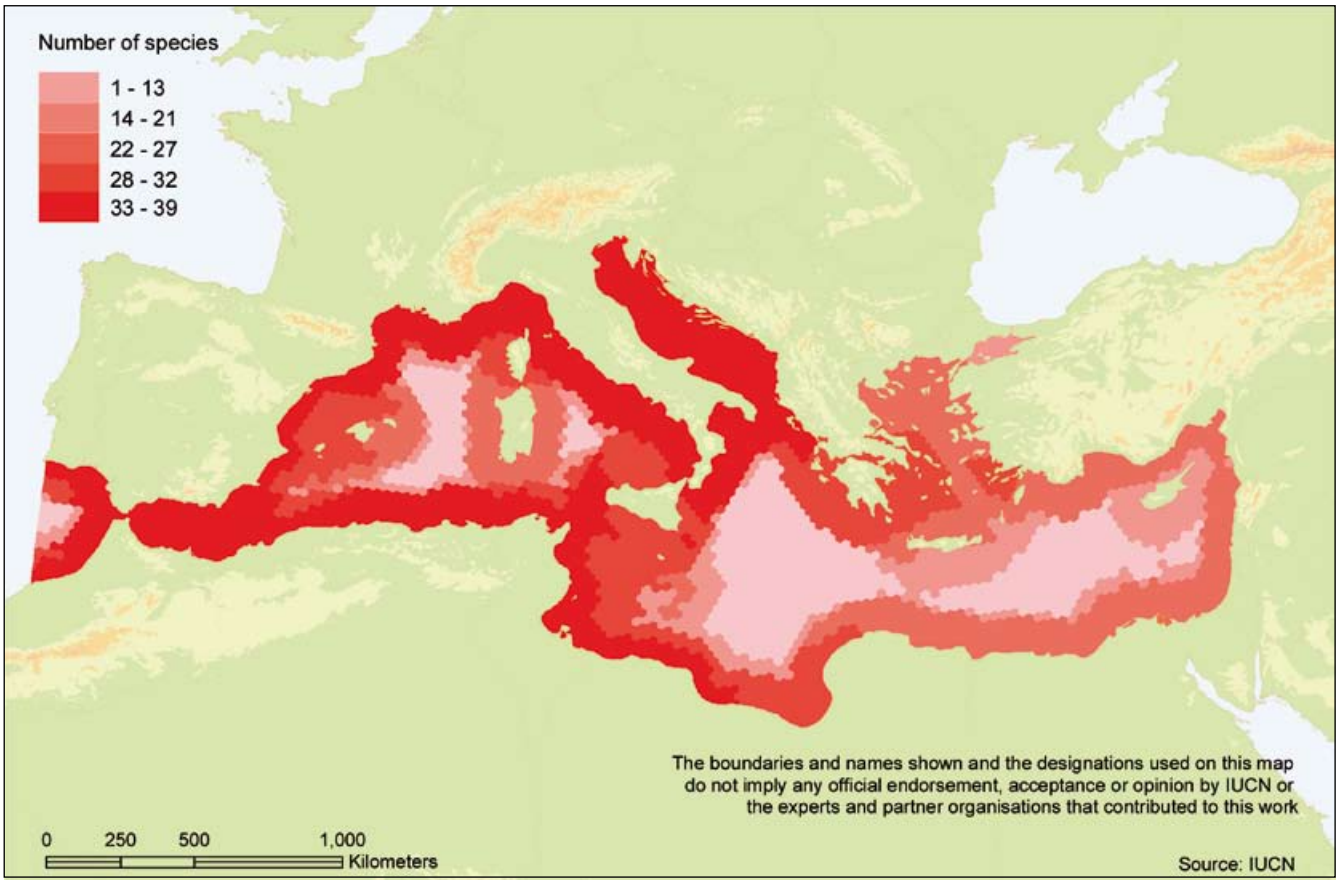
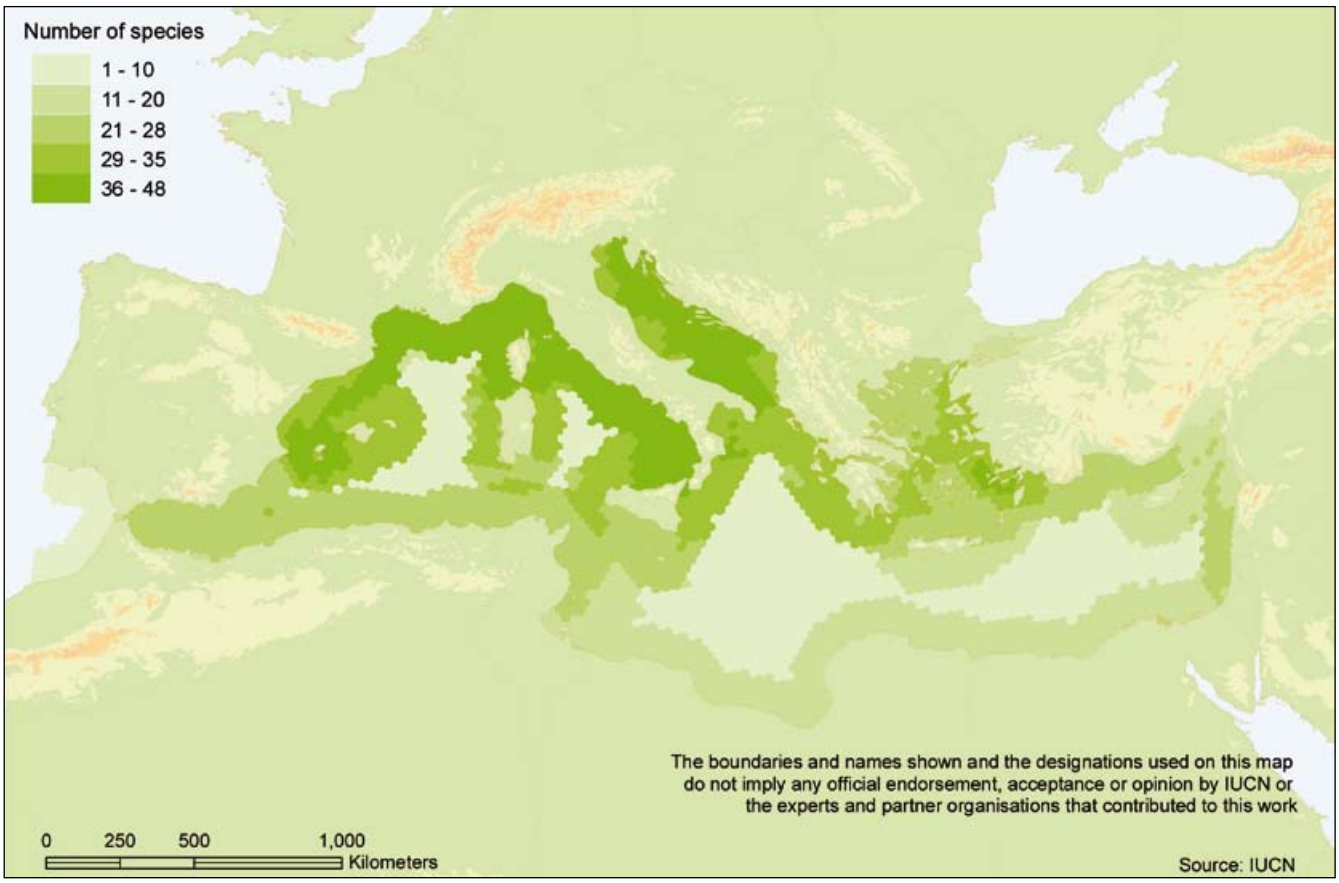


Figure 3.4 Distribution of endemic marine fish species in the Mediterranean Sea



3.2 Sharks, rays and chimaeras

According to the IUCN's assessment of the cartilaginous fishes in the Mediterranean Sea conducted in 2003 (Cavanagh and Gibson 2007), 42% of the regionally assessed Mediterranean chondrichthyan fishes (30 out of 72 species) were considered to be threatened within this region (i.e. Critically Endangered, Endangered, or Vulnerable), compared with only ~20% of the then globally assessed chondrichthyan species found to be threatened at the global scale (110 out of 546 species). Based on the 2009 IUCN Red List, all 1045 known species of sharks and rays have now been assessed globally, of which about 17% are in threatened categories. From this more recent assessment, there are now 76 species of sharks and rays that are considered native to the Mediterranean Sea, although a number of additional Lessepsian species which occur in the Mediterranean are not assessed here.

As previously mentioned, 40% (31 of 76 species) of chondrichthyans native to the Mediterranean Sea are now listed in threatened categories (CR, EN, VU) at the regional level (Figure 3.5). Thus, a much higher proportion of Mediterranean shark and ray species are threatened compared to the current global average (17%). Fourteen species (18%) are assessed as Critically Endangered, having the highest probability of extinction, nine species (12%) as Endangered, and 8 (10%) as Vulnerable in the

The giant devilray, *Mobula mobular,* is restricted to the Mediterranean Sea. This huge plankton-feeding ray occurs in offshore deep waters and occasionally in shallow waters. It only gives birth to one pup at unknown intervals. Due to its large size, it is easily taken as by-catch on longlines, in swordfish pelagic driftnets, purse seines, trawls and fixed tuna traps, at unsustainable levels. It is therefore listed as Endangered. Photo: © Maurizio Wurtz–artescienza s.a.s.

region. Ten species (13%) are listed as Near Threatened, and only 10 species (13%) are considered to be of Least Concern.

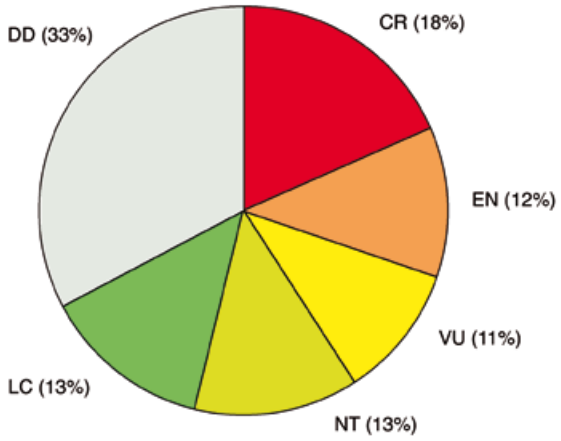
Twenty-five chondrichthyan species (33%) are listed as Data Deficient, this probably being primarily due to a lack of research on them, or their rarity or limited or unknown distributions in the Mediterranean Sea (Cavanagh and Gibson 2007). Some of this relatively large number of Data Deficient species could thus also be suffering from unknown threats in this region. Of these 25 Data Deficient species, 11 are also listed as Data Deficient globally, but 9 of them are listed as Near Threatened, 3 as Vulnerable, and 2 as Endangered globally (see Appendix 1), and all of the remaining chondrichthyan species present in the Mediterranean Sea are classified as being either equally or more threatened there than they are globally, except for 1 (*Centroscymnus coelolepis*, which is LC in the Mediterranean but NT globally). In general, this indicates that amongst the Data Deficient species in the Mediterranean a large proportion would probably be found to be threatened if more information was available on them.

Two of the three cartilaginous fish species endemic to the Mediterranean Sea are threatened or Near Threatened, namely *Leucoraja melitensis* (Critically Endangered) and *Raja polystigma* (Near Threatened), and 1 endemic species, *Raja radula*, is Data Deficient.

3.2.1 Threatened sharks, rays and chimaeras

Of the 14 chondrichthyan species listed as Critically Endangered in the Mediterranean Sea (Table 3.4.), several are bottom-dwelling species that have unique life histories, making them especially vulnerable to threats such as intensive trawling. All 3 species of angel sharks, *Squatina* spp., are listed as Critically Endangered (Table 3.3). Each of these species has suffered severe declines and range contractions (Walker *et al.* 2005) due to intense demersal fishing pressure. Combined with a low rate of exchange between isolated populations, *Squatina* spp. are now very prone to local depletion, and at least one species, the sawback angelshark, *Squatina aculeata,* is considered to be locally extirpated or commercially extinct (Cavanagh and Gibson 2007). Other demersal chondrichthyan species such as the angular rough shark, *Oxynotus centrina*, the common skate, *Dipturus batis*, the white skate, *Rostroraja alba*, and the spiny butterfly ray, *Gymnura altavela*, all of which are listed as Critically Endangered, are also all large species with declines linked to intensive trawling, particularly of their juvenile life history stages (Cavanagh and Gibson 2007).

Figure 3.5 Regional Red List status of 76 native cartilaginous fish species in the Mediterranean Sea



Categories are abbreviated as: CR—Critically Endangered; EN—Endangered; VU—Vulnerable; NT—Near Threatened; LC—Least Concern; DD—Data Deficient.

Table 3.4 Number of Mediterranean cartilaginous fish species in each IUCN Red List Category

	IUCN Red List Categories	No of native species	No of endemic species
Threatened categories	Critically Endangered (CR)	14	1
	Endangered (EN)	9	-
	Vulnerable (VU)	8	-
	Near Threatened (NT)	10	1
	Least Concern (LC)	10	-
	Data Deficient (DD)	25	1
	Total number of species assessed	**76**	**3**
	Total number (and %) of threatened species	**31 (40.8%)**	**1 (33.3%)**

Table 3.5 Regional IUCN Red List status of the threatened sharks and rays assessed in the Mediterranean Sea

Order	Family	Scientific name	Common name	Category	Endemic
LAMNIFORMES	Lamnidae	*Isurus oxyrinchus*	Shortfin mako shark	CR	
LAMNIFORMES	Lamnidae	*Lamna nasus*	Porbeagle shark	CR	
LAMNIFORMES	Odontaspididae	*Carcharias taurus*	Sand tiger shark	CR	
MYLIOBATIFORMES	Gymnuridae	*Gymnura altavela*	Spiny butterfly ray	CR	
PRISTIFORMES	Pristidae	*Pristis pectinata*	Smalltooth sawfish	CR	
PRISTIFORMES	Pristidae	*Pristis pristis*	Common sawfish	CR	
RAJIFORMES	Rajidae	*Dipturus batis*	Common skate	CR	
RAJIFORMES	Rajidae	*Leucoraja circularis*	Sandy skate	CR	
RAJIFORMES	Rajidae	*Leucoraja melitensis*	Maltese skate	CR	Endemic
RAJIFORMES	Rajidae	*Rostroraja alba*	White skate	CR	
SQUALIFORMES	Oxynotidae	*Oxynotus centrina*	Angular roughshark	CR	
SQUATINIFORMES	Squatinidae	*Squatina aculeata*	Sawback angelshark	CR	
SQUATINIFORMES	Squatinidae	*Squatina oculata*	Smoothback angelshark	CR	
SQUATINIFORMES	Squatinidae	*Squatina squatina*	Common angelshark	CR	
CARCHARHINIFORMES	Carcharhinidae	*Carcharhinus plumbeus*	Sandbar shark	EN	
CARCHARHINIFORMES	Triakidae	*Mustelus asterias*	Starry smoothhound	EN	
CARCHARHINIFORMES	Triakidae	*Mustelus mustelus*	Smoothhound	EN	
LAMNIFORMES	Lamnidae	*Carcharodon carcharias*	Great white shark	EN	
MYLIOBATIFORMES	Mobulidae	*Mobula mobular*	Giant devilray	EN	
RAJIFORMES	Rajidae	*Raja undulata*	Undulate skate	EN	
RHINOBATIFORMES	Rhinobatidae	*Rhinobatos cemiculus*	Blackchin guitarfish	EN	
RHINOBATIFORMES	Rhinobatidae	*Rhinobatos rhinobatos*	Common guitarfish	EN	
SQUALIFORMES	Squalidae	*Squalus acanthias*	Spiny dogfish	EN	
CARCHARHINIFORMES	Sphyrnidae	*Sphyrna zygaena*	Smooth hammerhead	VU	
HEXANCHIFORMES	Hexanchidae	*Heptranchias perlo*	Sharpnose sevengill shark	VU	
HEXANCHIFORMES	Hexanchidae	*Hexanchus griseus*	Bluntnose sixgill shark	VU	
LAMNIFORMES	Alopiidae	*Alopias vulpinus*	Thresher shark	VU	
LAMNIFORMES	Cetorhinidae	*Cetorhinus maximus*	Basking shark	VU	
LAMNIFORMES	Odontaspididae	*Odontaspis ferox*	Smalltooth sand tiger	VU	
SQUALIFORMES	Centrophoridae	*Centrophorus granulosus*	Gulper shark	VU	
CARCHARHINIFORMES	Carcharhinidae	*Prionace glauca*	Blue shark	VU	

The Mediterranean endemic Maltese skate (*Leucoraja melitensis*) was formerly common within its restricted range (Stehmann and Burkel 1984) but, with a depth range that coincides with that of trawling activity, it is now considered rare within a decreasing area of occurrence, and is listed as Critically Endangered. Both species of sawfish (*Pristis pectinata* and *Pristis pristis*) are listed as Critically Endangered, as they have been either wholly or nearly extirpated from large areas of their former ranges by fishing and habitat modification. Sawfishes are extremely vulnerable to by-catch in nets due to their large rostra. Unsustainable fisheries (both target and by-catch, usually by longlines) are the main threats to other highly threatened species, including the porbeagle shark, *Lamna nasus,* which is listed as Critically Endangered, the shortfin mako shark, *Isurus oxyrinchus* (Criticaly Endangered*)*, the sandbar shark, *Carcharhinus plumbeus* (Endangered), the giant devilray, *Mobula mobular* (Endangered), and the blue shark, *Prionace glauca* (Vulnerable). Without timely intervention, there is a high probability that many of these species will become extinct in the Mediterranean Sea, if this is not already the case. The status of these highly threatened sharks and rays needs to be consistently monitored, and the implementation of species-specific management and recovery plans is urgently needed.

3.2.2 Near Threatened sharks, rays and chimaeras

Ten species of chondrichthyans are listed as Near Threatened. These species come close to qualifying for a threatened category, and may do so in the near future. Some of these species listed as Near Threatened, such as the sharpnose skate, *Dipturus oxyrinchus*, the common stingray, *Dasyatis pastinaca,* and the common eagleray, *Myliobatis aquila,* are taken as by-catch in fisheries, yet may be unable to withstand continued indirect exploitation pressure (Cavanagh and Gibson 2007). The nursehound, *Scyliohinus stellaris,* is commonly found in shallow waters, and is fished by a variety of gears including bottom trawls, gill nets, bottom-set long lines, handlines and fixed bottom nets. Although limited data are available on its exploitation and trends in abundance, this species has also been listed as Near Threatened based on declines indicated in the north-western Mediterranean Sea, particularly around the Balearic Islands.

The blackchin guitarfish, *Rhinobatos cemiculus,* used to be quite common in the northern Mediterranean, but is now extirpated from several areas. This large ray can reach up to 2.3m and swims slowly on the bottom of the sea. Often targeted for its large and valuable fins, it also falls victim to by-catch and is listed as Endangered, both at the Mediterranean and at the global level. Photo: © Tahsin Ceylan.

3.2.3 Least Concern and Data Deficient sharks, rays and chimaeras

Ten species of chondrichthyans found in the Mediterranean Sea are listed as Least Concern. The majority of these species are wide ranging, abundant, and subjected to only relatively limited fishing pressure in the Mediterranean Sea (Cavanagh and Gibson 2007). Twenty-five species of sharks and rays are listed as Data Deficient in the Mediterranean. In many cases, threats to these species are known but cannot be quantified. For example, the endemic rough ray, *Raja radula,* is a relatively small skate that is common in shallow waters (< 40m depth) in some parts of its range, such as the Balearic Islands, but considered to be rare in other areas. It comprises about 25% in abundance and 12% in biomass of the total elasmobranch catch in the trammel net fishery in the Balearic Islands, but no specific data are available on catches in other parts of its range, where it is taken as by-catch in demersal trawl, gillnet, trammel net and bottom longline fisheries. Many of the large shark species such as the bigeye thresher shark, *Alopias superciliosus*, the copper shark, *Carcharhinus brachyurus*, the dusky shark, *Carcharhinus obscurus,* and the spinner shark, *Carcharhinus brevipinna,* pose a particular dilemma as it is not known if these species are rare in the Mediterranean, or just rarely caught and reported there (Cavanagh and Gibson 2007). Studies such as the Mediterranean Large Elasmobranch Monitoring Project (MEDLEM) should provide more information on the status of such species in the near future (Walker *et al.* 2005), and should be encouraged and expanded (Cavanagh and Gibson 2007).

3.3 Bony fishes

Only 12 (2.7%) of the 442 native marine bony fishes in the Mediterranean Sea are listed in threatened categories (Figure 3.6). This is a relatively low proportion compared with other regional marine bony fish assessments, such as that for the Eastern Tropical Pacific (Polidoro *et al.* 2009b). However, this assessment for the Mediterranean region contained relatively more oceanic offshore and deeper water fishes, which are more likely to be resilient to anthropogenic threats, than were included in some other regional assessments (e.g. the one above, which concentrated primarily on coastal species). An additional twelve species (2.7%) are listed as Near Threatened and two-thirds (66%) of the bony fishes are listed as Least Concern.

The blue shark, *Prionace glauca,* inhabits deep waters and is widely distributed. It is heavily impacted by by-catch and, as a result, assessed as Vulnerable at the Mediterranean level. Photo: © Jeremy Stafford-Deitsch.

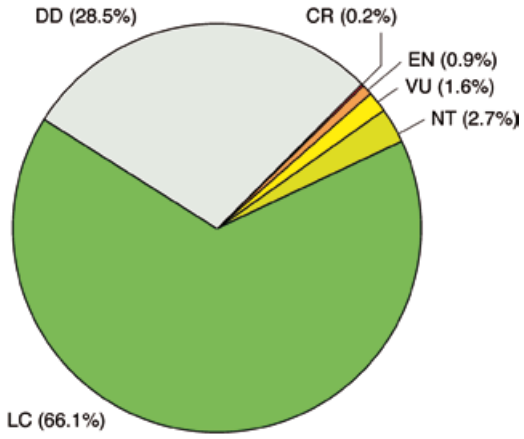
The most striking figure in relation to the native bony fishes in this region is that almost one-third (126 species) are listed as Data Deficient. This is the first time that all of the marine fish species in an entire sea have been assessed, including under-researched species in offshore deeper waters and the open sea. For many of these species, little is known on their distributions, population status, life history characteristics, or impacts of potential major threats. Therefore, many of these species may indeed be threatened, but better information on distribution, population status and life history is needed in order to quantify the effects of current or past major threats on each species' population. In many cases, species listed as Data Deficient are known to be experiencing population declines due to habitat degradation, unsustainable fishing practices, coastal development, pollution and invasive species, but these declines cannot be quantified due to a lack of information on certain variables or baseline data (such as distribution, suitable measures of population decline or surrogates for population decline, habitat loss rates, or species longevity, for example), and therefore the numerical threshold for meeting a threatened category under any of the 5 Red List Criteria cannot be met. In view of the long history of fishing in the Mediterranean Sea, larger population declines for many species may have occurred well before the maximum allowable time frame for calculating declines under IUCN Criteria, or before reliable baseline data were available.

3.3.1 Threatened bony fishes

The most threatened bony fish in the Mediterranean Sea is the common goby, *Pomatoschistus microps,* which is listed as Critically Endangered as it has suffered an estimated 80% decline in population over the past 10 years due to reduced habitat quality and incidental capture in fixed net and trap net fisheries. Additionally, this species is also affected by the relatively recent increase in water temperatures in the Mediterranean Sea associated with global climate change (Lejeusne *et al.* 2010). The endemic Tortonese's goby, *Pomatoschistus tortonesei,* is listed as Endangered. This species is only found in shallow coastal lagoons in 3 localities, with an area of occupancy estimated to be less than 500 km^2. It is undergoing population decline due to both habitat loss and coastal pollution.

The darkflank pipefish, *Syngnathus taenionotus,* is also endemic to the Mediterranean Sea and is listed as Endangered. This slow-growing species also has a restricted range and a specific habitat type. The only known population is along the Italian Adriatic coast

Figure 3.6. Regional Red List status of 442 native marine bony fish species in the Mediterranean Sea



Categories are abbreviated as: CR—Critically Endangered; EN—Endangered; VU—Vulnerable; NT—Near Threatened; LC—Least Concern; DD—Data Deficient.

Table 3.6 Number of Mediterranean bony fish species in each IUCN Red List Category

	IUCN Red List Categories	No of native species	No of endemic species
Threatened categories	Critically Endangered (CR)	1	-
	Endangered (EN)	4	2
	Vulnerable (VU)	7	1
	Near Threatened (NT)	12	1
	Least Concern (LC)	292	39
	Data Deficient (DD)	126	28
	Total number of species assessed	**442**	**71**
	Total number (and %) of threatened species	**12 (2.7%)**	**3 (4.2%)**

The painted comber, *Serranus scriba*, is widespread and common throughout most of its range. Solitary and territorial, this species will defend its territory. Facing only minor fishing threats, it is currently categorized as Least Concern at the Mediterranean regional level. Photo: © Andrea Molinari.

Table 3.7 Regional IUCN Red List status of the threatened bony fishes assessed in the Mediterranean Sea

Order	Family	Scientific name	Common name	Regional category
PERCIFORMES	GOBIIDAE	*Pomatoschistus microps*	Common goby	CR
PERCIFORMES	GOBIIDAE	*Pomatoschistus tortonesei*	Tortonese's goby	EN
PERCIFORMES	SCOMBRIDAE	*Thunnus thynnus*	Atlantic bluefin tuna	EN
PERCIFORMES	SERRANIDAE	*Epinephelus marginatus*	Dusky grouper	EN
SYNGNATHIFORMES	SYNGNATHIDAE	*Syngnathus taenionotus*	Darkflank pipefish	EN
GADIFORMES	MERLUCCIIDAE	*Merluccius merluccius*	Common hake	VU
GOBIESOCIFORMES	GOBIESOCIDAE	*Opeatogenys gracilis*	Pygmy clingfish	VU
PERCIFORMES	GOBIIDAE	*Pomatoschistus minutus*	Freckled goby	VU
PERCIFORMES	LABRIDAE	*Labrus viridis*	Green wrasse	VU
PERCIFORMES	SCIAENIDAE	*Sciaena umbra*	Brown meagre	VU
PERCIFORMES	SCIAENIDAE	*Umbrina cirrosa*	Shi drum	VU
PERCIFORMES	SPARIDAE	*Dentex dentex*	Common dentex	VU

(other records have only been of single individuals), where it occupies patches of brackish and freshwater-influenced coastal habitats. It is threatened by loss and degradation of seagrass meadows and other shallow-water habitats due to coastal development, trawling and pollution (oil spills, eutrophication, sewage, etc.).

The iconic and commercially important Atlantic bluefin tuna, *Thunnus thynnus,* is also listed as Endangered, based on recent calculations of population decline due to decades of over-fishing. Although a number of uncertainties exist in the reported data, the best estimates from the most recent stock assessment (ICCAT SCRS 2009) indicate that there was a 63% decline over a recent 20-year period (1985–2005) in the eastern Atlantic population. This species is primarily caught with purse seines, and it is generally agreed that the stock will likely continue to be over-fished (Fromentin 2009) due to its high economic value and inadequate protection and management. A quota system was put in place to set catch levels at around maximum sustainable yield (ICCAT SCRS 2006), but this has led to increased unreliability in reported landings (see case study for this species below).

Another commercial species, the dusky grouper, *Ephinephelus marginatus,* is also listed as Endangered due to previous over-fishing. This species is very slow maturing and forms spawning aggregations which are particularly vulnerable to over-fishing. There have been reported localized declines in catch of up to 95% in some parts of the Mediterranean, along with reports that spawning aggregations are being targeted in other parts of its range. As fisheries data from many parts of its range are lacking, this species was very conservatively estimated to have suffered a more than 50% decline over the past 20 years (1990–2010) throughout the Mediterranean Sea as a whole. However, as data are lacking from many countries,

The dusky grouper, *Epinephelus marginatus,* is the best known grouper in the Mediterranean Sea. With its large body and large mouth, it is familiar to most divers. Rather solitary, it likes to live among rocks and often selects a specific cave as its lair. One striking feature of this species is the fact that it changes sex during its life: young groupers are mainly female, but transform into males later. It is extremely slow to reach sexual maturity and forms spawning aggregations which are particularly vulnerable to over-fishing. Alarming declines in population have been observed in the Mediterranean, and the dusky grouper is now assessed as Endangered at the Mediterranean level. Photo © Andria Molinari.

once information on additional landings and catch per unit effort becomes available, this species may qualify for a higher threat category.

Seven bony fish species in the Mediterranean region are listed as Vulnerable. The endemic clingfish, *Opeatogenys gracilis,* is restricted to *Posidonia* seagrass habitat, which has declined by over 30% in the past 10 years. The sand goby, *Pomatoschistus minutus,* has experienced severe local declines over the past 10 years due to incidental capture in fixed traps and nets throughout its range. It is also thought to be affected by the relatively recent increase in water temperatures in the Mediterranean Sea associated with global climate change (Lejeusne *et al.* 2010). Both the green wrasse, *Labrus viridis,* and the common dentex, *Dentex dentex,* have experienced declines of between 30 and 50% in the Mediterranean region due to spearfishing for sport and food. Similarly, the hake, *Merluccius merluccius,* is of high commercial importance in the Mediterranean region, and is caught with a variety of gears including trawls, fixed nets, seines, bottom longlines and set-nets. There has been an estimated 10 to 40% decline in landings of this species over a recent 10-year period (1996–2005), due to over-fishing, with assumed equivalent or increased effort. Finally, two croaker species, *Sciaena umbra* and *Umbrina cirrosa*, are also listed as Vulnerable, their declines being primarily due to commercial fishing and recreational spearfishing. Although data are lacking for both species in many parts of their ranges, catch landings have declined by between 30 and 50% over a recent 15-year period (1990–2005), based on an average decline of up to 67% over 25 years, with no indication of any widespread decrease in effort. However, with better information on effort and landings, many of these commercial species may qualify for a higher threat category.

3.3.2 Near Threatened bony fishes

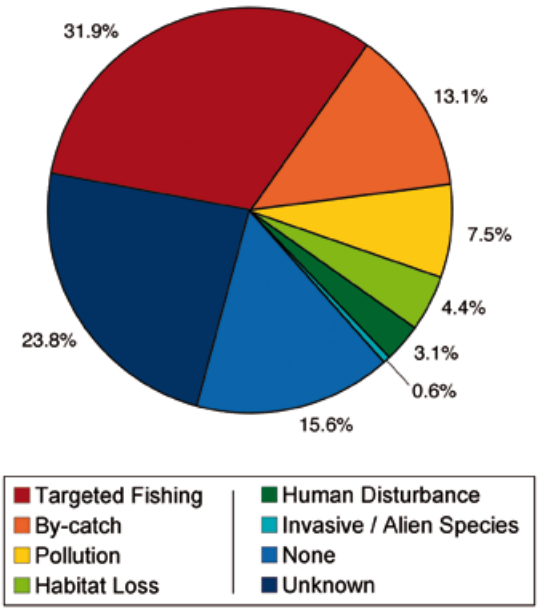
Of the 12 bony fishes listed as Near Threatened, five are seahorses or pipefishes (Syngnathidae). Although only one, *Syngnathus tenuirostris*, is endemic, all of these syngnathids are primarily threatened by loss and degradation of seagrass meadows and other shallow-water habitats, caused by coastal development, trawling and pollution in the Mediterranean Sea.

The other 7 species listed as Near Threatened are highly commercial species, namely the European plaice (*Pleuronectes platessa*), the Baltic flounder (*Platichthys flesus*), the European seabass (*Dicentrarchus labrax*), the white grouper (*Epinephelus aeneus*), the swordfish (*Xiphias*

The long-snouted seahorse, *Hippocampus guttulatus,* occurs mostly in shallow waters, its long tail wrapped around algae. Eggs are carried by the males in a ventral pouch for 3 to 5 weeks. All seahorses are protected by CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora), but are often caught incidentally. Their habitat is also often degraded by human activities, and the long-snouted seahorse is considered Near Threatened at the Mediterranean level. Photo: © Nicholas Samaras–GuyLian.

The swallowtail seaperch, *Anthias anthias,* is a deep-water species that lives in large groups amongst rocks, gravel, coral and in marine caves on the continental shelf and upper slope. It is nocturnal, and feeds on crustaceans and small fishes. Common and abundant, it is assessed as Least Concern in the Mediterranean. Photo: © Bayram Öztürk–TUDAV.

Figure 3.7 Threats to Data Deficient bony fishes in the Mediterranean Sea



gladius), the Atlantic chub mackerel (*Scomber colias*) and the turbot (*Psetta maxima).* Many of these species have suffered localized historical or current declines due to over-fishing, and their recovery is often hindered by the presence of other threats. For example, the Baltic flounder (*Platichthys flesus*) is a highly commercial species caught with seines and trawls. However, this estuarine and brackish-water species is also threatened by habitat and range loss caused by the decrease in freshwater inflow as a result of dam construction and river water abstraction within its range, in addition to increases in water temperatures and pollution.

3.3.3 Data Deficient bony fishes

Approximately one-third (126 species) of the bony fishes in the Mediterranean Sea, 28 of which are considered to be endemic to the Mediterranean, were listed as Data Deficient. As previously mentioned, some of these species may qualify for a threatened category in the future when more information becomes available. For example, over 44% of Data Deficient species are affected by targeted fishing and/or capture as by-catch, but their population declines cannot be quantified (Figure 3.7) due to inadequate data (for example, lack of specific fishery landing or fishing effort information). For 24% of Data Deficient species, the major threats are unknown. These are primarily offshore and deeper-water species that are not well known and are only rarely studied. That this latter figure is much higher (i.e. double) compared with the case of bony fishes in general (12%, see Figure 4.1 *below*) is thus not surprising.

The zvonimiri blenny, *Parablennius zvonimiri,* is endemic to the Mediterranean and Black Seas. However, there is little information about the range and population of this species. It inhabits holes and caves in shallow rocky shores. It often leaves its hole to feed, using its pectoral fins to cling onto the rocks to resist the movements of the waves. Threats to the species are not very well known either. Therefore it is classified as Data Deficient. Photo: © Andrea Molinari.

3.3.4 Least concern bony fishes

Almost two-thirds (292 species) of bony fishes are listed as Least Concern in the Mediterranean Sea. Many of these species are generally abundant and/or relatively widespread; are subject to only limited fishing pressure; are not particularly susceptible to fisheries; and/or are relatively productive and resilient to other current threats and pressures. Additionally, many are small-bodied bony fishes that are early maturing, fast growing, highly fecund and short lived. Benefits associated with early maturity include increased probability of surviving to reproduce and an increased rate of gene input into the population, resulting in a reduced generation time. However, some of these species may still benefit from conservation management action.

The John Dory or St Pierre Fish, *Zeus faber,* has a very distinct appearance, with its flattened olive-yellow body sporting a large dark spot and long spines on the dorsal fin. The dark spot confuses prey and predators. Generally solitary, it is found in areas close to the sea bed, living at depths from 5 to 400m. As it is a rather common and widespread species, it is classified as Least Concern in the Mediterranean Sea. Photo: © Bayram Öztürk–TUDAV.

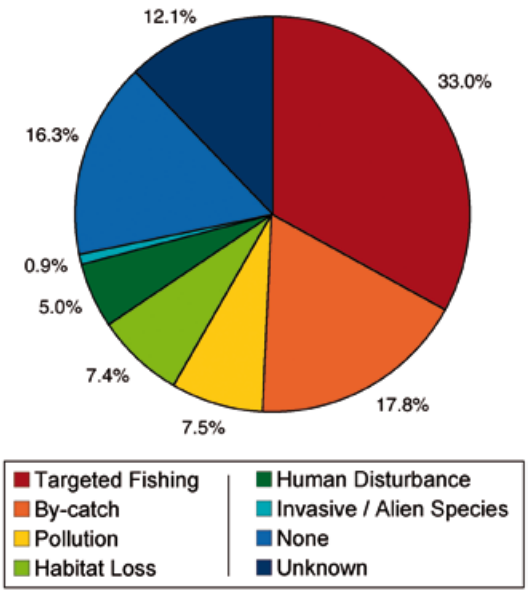
4. Major threats

Available evidence indicates that fish populations in the Mediterranean Sea are generally rapidly declining in abundance as a consequence of a number of threats, worsened by the almost enclosed nature of the Mediterranean Sea and the particularly intense fishing activity throughout its coastal and pelagic waters. Much of the coastal fishing activity in this region involves localized, small-scale, multi-species fisheries which target a wide variety of inshore fish species.

Marine fishes in the Mediterranean Sea are affected by a number of major threats (Figure 4.1). Over half of all species are affected either directly or indirectly by fishing activities. Fishing, either through targeted or multi-species fisheries, is by far the most common threat to marine fishes, affecting 33% of native marine fish species in the Mediterranean Sea, with an additional 18% of species being threatened by by-catch. Larger coastal species (which are biologically the most vulnerable to exploitation) and species that occur in areas subjected to prolonged and/or intensive fishing pressure are of particular concern.

Other important threats to marine fishes include pollution (affecting 7.5% of species), habitat loss (affecting 7.4% of species) and human disturbance (affecting 5% of species). Only a very low percentage (<1%) of species are affected by invasive or alien species, which is remarkable considering the number of Lessepsian species that have entered the Mediterranean Sea through the Suez Canal, some of which have become important components of fisheries in the Eastern Mediterranean basin (Zenetos *et al.* 2008, Golani and Appelbaum-Golani 2010). More research is thus needed on the ecological effects of these 'introduced' Lessepsian species.

Figure 4.1 Summary of threats to all 519 native marine fishes in the Mediterranean Sea



4.1 Targeted fisheries

In the past century, fishing pressure has increased rapidly in the Mediterranean Sea (Zenetos *et al.* 2002), changing from a primarily artisanal activity into intensive industrial exploitation (Goñi *et al.* 2000). At present, the majority of the Mediterranean commercial fish stocks are over-exploited (FAO 2006, Dulvy *et al.* 2003). The General Fisheries Commission for the Mediterranean (GFCM) and the International Commission for the Conservation of Atlantic Tunas (ICCAT, 2006) report that anchovy, sea breams, hake, red mullet and Atlantic bluefin tuna are all being fished outside of safe biological limits, with some stocks reported to be fully exploited (FAO 2006). Among over-fished species, stocks of small pelagics such as anchovy and sardine are in better condition than demersal stocks such as hake and red mullet, or larger pelagics such as Atlantic bluefin tuna (EAA 2009). Increased fishing intensity and technological advancement of fishing gears over the past 50 years or so pose a threat to many commercially captured fish species in the north-western Mediterranean Sea (Aldebert 1997, Walker *et al.* 2005). Fishing methods include benthic trawling, which alters benthic habitats, modifies the structure of seagrass meadows and their associated faunal assemblages, and reduces the number of species and the area of suitable habitat. Other fishing gears such as longlines and driftnets can result in significant by-catch of turtles, sea birds, sharks and cetaceans (Caminas *et al.* 2006, Tudela 2004, Tudela *et al.* 2005). Driftnetting, once used widely throughout the Mediterranean, is now prohibited; however, illegal driftnetting still occurs (WWF 2005).

Depletion of top-level predators in the Mediterranean Sea, such as monk seals, sharks, tunas, swordfish and groupers, has altered marine food webs and changed the ecology of many areas of the Mediterranean (Sala 2004). Commercial fishing for chondrichthyans is of particular concern, with the main targeted species being

smoothounds (*Mustelus* spp.), skates (rajids), catsharks (*Scyliorhinus* spp.), dogfishes (*Squalus* spp.), eagle rays (myliobatids) and whiptail stingrays (dasyatids) (Walker *et al.* 2005). Recreational sport fisheries have also increased noticeably over the past few decades, though catch and target species information for these fisheries are limited (SGRST 2003, Walker *et al.* 2005).

Targeted fisheries are the primary threat to commercially valuable fish species. According to the European Environment Agency, more than 65% of commercial fish stocks in the Mediterranean are now being fished outside of safe limits, risking the future of entire species. Of the commercially valuable species, Atlantic bluefin tuna has been undergoing heavy over-fishing for more than a decade (Fromentin and Powers 2005). The Mediterranean Sea is one of only two known breeding areas of the Atlantic bluefin tuna, and fishing fleets target not only the adults in their breeding grounds, but also a large proportion of the juvenile tuna. Wild caught juvenile tuna are now "farmed" in sea cages and fattened for export, increasing fishing pressure on the wild tuna population, and requiring the input of huge quantities of smaller fish for feed.

Increased fishing intensity and technologies are the main threat to most fishes in the Mediterranean Sea, either by directly targeting commercial species or through by-catch. Benthic trawling also results in the complete destruction of the habitats (meadows, coralligenous reefs, etc.) of the sea bottom. Photo: © Annabelle Cuttelod.

4.2 By-catch

By-catch, or the capture of non-target species, is estimated to comprise 40% of the world's total fish catch (Davies *et al.* 2009). The majority of by-catch is discarded at sea, representing enormous waste and destruction of marine life. After directly targeted fisheries, by-catch represents the second major threat to fish populations in the Mediterranean, affecting 18% of all fish species assessed in this report. By-catch is poorly documented both globally and in the Mediterranean, and data are rarely incorporated into national and international (e.g. FAO) fisheries statistics. Therefore, the extent of biomass lost as by-catch can only be crudely estimated (Camhi *et al.* 1998).

Although trawling is probably the fishing method of highest concern from this perspective, among the by-catch-prone fishing techniques, driftnets are also an acute problem. These nets are designed to entrap almost anything that swims into them, failing therefore to discriminate between targeted fish and all other marine life. Air-breathing dolphins, whales, sea birds and turtles are often the nets' unintended victims, along with unwanted sharks, rays and large bony fishes. An estimated 85% of animals caught in driftnets are thrown back into the sea, making the method highly unsustainable. Although such nets are now technically banned in the Mediterranean Sea, their illegal use continues in certain areas.

Bycatch is the capture of animals (fish, but also dolphins, whales, sea birds or turtles) caught unintentionally in a fishery that is targeting other fish. Most of these animals die in the process. Photo: © Bayram Öztürk–TUDAV.

4.3 Pollution, habitat loss and human disturbance

Fisheries activities such as intensive bottom-trawling reduce the complexity of benthic habitats, affecting the epiflora and epifauna and reducing the availability of suitable habitats for some fish species (Stevens *et al.* 2005). Illegal and destructive harvesting has caused serious declines in characteristic Mediterranean habitat-forming species such as the red coral, *Corallium rubrum* (Santangelo *et al.* 1993, UNEP/MAP/RAC/SPA 2007), and the depletion of inshore rocky habitats due to the harvesting of date mussels, *Lithophaga lithophaga* (Fanelli *et al.* 1994). Moreover, the increasing presence of Lessepsian migrant species coming from the Red Sea could be indicative of a generally northward range expansion of these species, spurred in part by the recent warming trend observed in the Mediterranean Sea, which is probably related to longer term climate change. The percentage of species affected by habitat loss is therefore probably under-estimated, due to all the unknown indirect effects of such habitat modification.

Pressures resulting from rapid human population growth along the coastline are also detrimentally affecting the marine ecosystem and contributing to the threats faced by marine fishes. Rapid urban and industrial development and associated pollution have degraded critical coastal habitats, such as fish nursery and spawning areas (Camhi *et al.* 1998, Stevens *et al.* 2005, UNEP/MAP/RAC/SPA 2003). Pollution adds to the contamination of food sources, bioaccumulating in animals at the top of the food chain and potentially affecting their health and reproductive success (UNEP/MAP/ RAC/SPA 2003). A number of studies have shown that some Mediterranean cartilaginous fishes contain mercury concentrations that exceed levels considered to be safe for human consumption (Storelli *et al.* 2002), as well as trace metals and organochlorine residues in their eggs, muscles, livers and kidneys (UNEP/MAP/RAC/SPA 2002).

Urbanization poses a major threat to coastal biodiversity. It drastically increases the level of pollution in coastal waters, and has both direct and indirect impacts on the degradation and loss of the main habitats of marine fish species, such as fish nursery and spawning areas. Photo: © Fabrizio Manco.

5. Family and species case studies

The following families and species are discussed in greater detail to illustrate the distribution of threatened, Near Threatened, non-threatened and Data Deficient species at the family level. The first two families, Sparidae and Labridae, are examples of typical inshore marine fish groups which are exposed to coastal fishing pressures. The third case study, of the Atlantic bluefin tuna (family Scombridae), is of an open ocean predator which is highly sought after and of high commercial value. Case studies for a number of sharks and rays are presented in the report on the regional assessment of these species (Cavanagh and Gibson 2007).

5.1 Family Sparidae

The family Sparidae (sea breams) has 21 species which are native to the Mediterranean Sea. In general, most of the Mediterranean sparid species are relatively well known, all of them having been formally described prior to 1850, and their taxonomic validity is generally well accepted. Nearly all are Atlanto-Mediterranean species, some of which are Mediterranean near endemics, with only a single subspecies (*Diplodus sargus sargus*) considered to be a true endemic.

Many Mediterranean sparids are shallow-water, demersal (i.e. living on or near the bottom of the sea), inshore coastal species, relatively sedentary in macroalga-dominated rocky reef habitats, though some also occur in seagrass beds and in coastal lagoons. About half of the species extend to deeper-water coralligenous rocky and soft-bottom habitats. Most Mediterranean sparids are relatively common and appear to have fairly stable populations.

Sparids are important food fishes and are caught in both commercial and local artisanal fisheries in the Mediterranean region. Several target species are very heavily fished, and others are regularly caught as by-catch and utilized for food. Many of them are sought after by recreational fishers, and are targeted by spear fishing. A number of species are also important in sea cage aquaculture. Because of their inshore coastal habitats, sparids are susceptible to anthropogenic habitat degradation and water pollution. The majority suffer from relatively poor fisheries and conservation management, though most are present within some form of marine protected area.

The common dentex, *Dentex dentex,* is a heavily exploited species, the major threat to it being spear fishing. It is a top predator and its populations are not likely to recover quickly. It is currently categorized in this Mediterranean regional assessment as Vulnerable. Photo: © Tahsin Ceylan.

Only one sparid species, the dentex, *Dentex dentex,* which is listed as Vulnerable, is considered to be threatened in the Mediterranean Sea. This large-bodied (~100cm max. TL) fish is a highly sought-after food fish that is susceptible to spear fishing, especially as it can be commonly found in relatively shallow waters (between 15 and 50m depth). It is relatively long lived and its populations are slow to recover. FAO reported landings for this species have steadily declined over a recent 15 year period, from a peak of ~7,000 tonnes in 1990 to less than 1,000 tonnes in 2005. Recovery recommendations for this species include the establishment of a minimum catch size and a restriction of spear fishing in critical areas.

One of the most commercially important sparids, the gilthead sea bream, *Sparus aurata*, has been largely depleted by industrial and recreational fishing in several key areas of its range. However, since the advent of intensive sea cage aquaculture, this species has become much more abundant, possibly due to the presence in the wild of aquaculture escapees. Aquaculture production is now reported to exceed 100,000 tonnes per year. At present the species is listed as Least Concern. However, the status of this species in the Mediterranean will need to continue to be monitored, as wild stocks may be at risk of 'genetic pollution' by interbreeding with artificially selected aquaculture escapees.

The most resilient and unthreatened of the sparid species assessed was the bogue, *Boops boops*. Although it is heavily fished, its annual catch in the Mediterranean Sea remains relatively stable at between ~20,000 and ~30,000 tonnes, with effort assumed to be consistent or increasing. This species is ubiquitous throughout the Mediterranean, and also widespread in the Eastern Atlantic. Overall, with only a single Vulnerable species, the family Sparidae appears to be in relatively good conservation status within the Mediterranean region.

5.2 Family Labridae

The family Labridae (wrasses) contains 19 species native to the Mediterranean Sea, together with several occasional Atlantic Ocean vagrant species and a single Lessepsian species, which has invaded the Mediterranean Sea from the Red Sea via the Suez Canal. There is also a single parrotfish (previously in the family Scaridae, now Scarinae, a sub-family of the Labridae), which is now part of the wrasse family, but which has not been included in the 19 species discussed here. In general, most of the Mediterranean wrasse species are relatively well known, having been formally described prior to 1850, and their taxonomic validity is generally well accepted. Most are Atlanto-Mediterranean species, many of which are near endemic to the Mediterranean, and several are true Mediterranean endemics (the species in the latter two categories are primarily from the genus *Symphodus*).

In terms of their habitat, Mediterranean wrasses are generally relatively shallow-water, demersal, inshore coastal species, generally sedentary in macroalga-dominated rocky reef habitats, but some also occur in seagrass beds and in coastal lagoons, and a few extend to deeper-water coralligenous habitats. Most species are relatively common in the Mediterranean and appear to have fairly stable populations.

Primarily due to their small size, they are generally not heavily targeted (i.e. they are mainly caught in local artisanal fisheries), though at least one species (*Labrus viridis*) is considered to be over-fished (primarily due to spear fishing), and many others are caught as by-catch and also utilized for food. Other species are also fished recreationally, and some are taken for the commercial marine aquarium fish trade (e.g. *Coris julis*). Because they generally occupy inshore coastal habitats, members of the family Labridae are susceptible to anthropogenic habitat degradation, and water pollution. All of them suffer from relatively poor fisheries and conservation management, though most are present within some form of marine protected area in the region.

The ornate wrasse, *Thalassoma pavo*, mainly occurs in the south and east of the Mediterranean Sea. During the night, it buries itself in the sand, sometimes also to escape predators. The male and female have different colour patterns. They live in small groups, usually a male with his harem of females. Interestingly, this fish changes sex during its life. Generally, when the male dies, the oldest female turns into a male and replaces him. The ornate wrasse is listed as Least Concern at the Mediterranean level. Photo: © Tahsin Ceylan.

Based on an analysis of their relative resilience or otherwise, the most threatened species is the green wrasse, *Labrus viridis*, which has been assessed as Vulnerable. This species is the largest wrasse in the Mediterranean region, reaching a maximum total length (TL) of >55cm, and is highly sought after as a food fish. Its populations have been largely depleted by fishing, in particular by spearfishing, in several key areas of its range. For this reason it is now relatively uncommon in these areas, and fishing threats are ongoing.

The only species of Mediterranean wrasse assessed as Data Deficient (DD) was Baillon's wrasse, *Symphodus bailloni*. This species is probably the rarest wrasse in the region, being found only in a restricted area in the north-western Mediterranean basin. It is categorized as DD due to the very limited information available on its resilience and threat susceptibility.

Of the remaining Mediterranean wrasse species, only a few are targeted in commercial fisheries, though a number of them may be taken as by-catch in artisanal fisheries throughout the region. All of these were assessed as Least Concern (LC). The two most resilient species appear to be the scale-rayed wrasse, *Acantholabrus palloni,* and the axillary wrasse, *Symphodus mediterraneus*. The former occurs in deeper offshore bathyal zone waters (down to ~500m), and is also widespread outside the Mediterranean in the Eastern Atlantic; the latter also occurs in deeper waters (down to ~70m) than its congeners. Overall, with only a single vulnerable species, the Labridae appear to be in relatively good conservation status within the Mediterranean region.

5.3 The Atlantic bluefin tuna (family Scombridae)

The Atlantic bluefin tuna, *Thunnus thynnus,* is restricted to the Atlantic Ocean, and is now considered to be a separate species from the Pacific bluefin, *Thunnus orientalis* (Collette 1999); it has for even longer been considered separate from the southern bluefin, *Thunnus maccoyii* (Gibbs and Collette 1967). It is present in the eastern Atlantic from Norway to the Canary Islands and has been reported from Mauritania (Maigret and Ly 1986) and off South Africa (Gibbs and Collette 1967). Bluefin tuna fisheries in the Norwegian Sea and North Sea suddenly collapsed in 1963 (Fromentin 2009). Eastern Atlantic bluefin tuna are also present in the Mediterranean Sea and the southern Black Sea. In the Black Sea, bluefin tuna were well documented in ancient times and there was an annual migration from the Black Sea to the eastern Mediterranean spawning grounds. However, after World War II, environmental conditions in the Black Sea deteriorated and now bluefin tuna rarely occur in Black Sea waters. Atlantic bluefin tuna were present in the western Atlantic from Canada to Brazil, including the Gulf of Mexico and the Caribbean Sea, although the bulk

The Atlantic bluefin tuna, *Thunnus thynnus,* is a heavily exploited commercial species throughout its range. It is highly valued for the Japanese sashimi markets, which has led to severe over-fishing in both the eastern and western Atlantic. It is currently categorized in this Mediterranean regional assessment as Endangered. Photo: © NOAA.

of the population off Brazil has now disappeared (Porch 2005). The Atlantic bluefin tuna is a highly migratory species and is listed in Annex I of the 1982 Convention on the Law of the Sea (FAO 1994).

Thunnus thynnus is a pelagic, oceanodromous species that seasonally can be found close to shore and can tolerate a wide range of temperatures. It schools by size, sometimes together with albacore, yellowfin, bigeye, or skipjack tunas, etc. It preys on small schooling fishes (anchovies, sauries, hakes) and on squids and crabs. A recent study on the Mediterranean bluefin tuna diet reported that the juveniles prey mainly on zooplankton and small pelagic coastal fishes; sub-adults prey on medium-sized pelagic fishes, shrimps and cephalopods; and adults prey mainly on cephalopods and larger fishes (Sarà and Sarà 2007). The species has a maximum size of over 300cm (FL), and commonly grows as large as 200cm. Longevity is at least 35 years and possibly up to 50 years (Neilson and Campana 2008, Santamaria *et al.* 2009). Average annual fecundity is about 10 million eggs (~128.5 eggs/gramme/female/year). Estimated relative batch fecundity is greater (more than 90 oocytes/gramme body weight) than estimated for other tunas in the genus *Thunnus* (Collette and Nauen 1983, Sissenwine *et al.* 1998, Corriero *et al.* 2003, Rooker *et al.* 2007, Boustany *et al.* 2008, Rooker *et al.* 2008, Collette 2010).

Genetic differentiation, homing to breeding sites, and otolith microconstituent analysis indicate that there are two main reproductively isolated stocks of this species (Secor *et al.* 2002, Block *et al.* 2005, Carlsson *et al.* 2007, Boustany *et al.* 2008), although there is considerable trans-Atlantic migration of individuals from both stocks (Rooker *et al.* 2008). One population spawns in the Gulf of Mexico and the second in the Mediterranean Sea. Suggestions have been made that there may be additional spawning sites in the western Atlantic (Galuardi *et al.* 2010) but no solid evidence for this has yet been published. The Gulf of Mexico spawned population is found from Labrador and Newfoundland south into the Gulf of Mexico and Caribbean Sea; the eastern Atlantic stock extends from Norway south to the Canary Islands and throughout the Mediterranean Sea but some individuals move into the western Atlantic for feeding. There is spawning site fidelity for this species both in the Mediterranean Sea and in the Gulf of Mexico (Block *et al.* 2005, Fromentin and Powers 2005). Tagging, genetics, and microconstituent analysis of otoliths indicate that the eastern and western populations mix when foraging along the eastern seaboard of North America, with a significant component of adolescent bluefin off North Carolina being of eastern origin (Block *et al.* 2005, Carlsson *et al.* 2007, Boustany *et al.* 2008, Rooker *et al.* 2008, Schloesser *et al.* 2010, Wilson *et al.* 2010).

This is a highly valued species for the Japanese sashimi markets, which has led to severe over-fishing in both the eastern and western Atlantic. In January 2010, one giant bluefin tuna weighing 233kg was sold for US$177,000 in an auction at the wholesale fish market in Tokyo, Japan (Associated Press 2010). Atlantic bluefin are also an important gamefish, particularly in the United States and Canada. The main fishing gears used for its commercial capture are purse-seines, longlines and traps. Commercial ranching (sea-cage fattening) of the species occurs in the Mediterranean Sea.

Worldwide reported landings of Atlantic bluefin tuna were relatively stable from 1950 to 1993, fluctuating between 15,000 and 39,000 tonnes per year. Reported catches peaked at 52,785 tonnes in 1996, but declined to 38,830 tonnes in 2006 (FAO 2009). However, in many regions, the catch statistics for this species are considered unreliable (STEFC 2009). They have become rare because of massive over-fishing (Fromentin and Powers 2005, Majkowski 2007, Fromentin 2009, MacKenzie *et al.* 2009). The species has experienced declines in range and reported catch per unit effort (CPUE) since the 1960s.

Under IUCN Red List Criterion A2, a species qualifies for a threatened category by meeting the threshold for estimated population decline (>30% decline for Vulnerable, >50% decline for Endangered, or >80% decline for Critically Endangered) over a maximum allowable time frame of 3 generation lengths (IUCN 2001). Generation length is defined as the average age of parents of the current cohort (i.e., newborn individuals in the population), and therefore reflects the turnover rate of breeding individuals in a population. Where generation length varies under threat, such as exploitation in fisheries, the more natural or pre-disturbance generation length should be used (IUCN 2001). Generation length may be estimated in a number of ways depending on the taxon concerned and the type of information available (IUCN 2008). For fish species, it is best calculated from life history tables related to fecundity and survivorship to determine the time taken for most (>50%) individuals to reach maximum reproductive output or the age at which 50% of total reproductive output is achieved. If these data are not available or exist only for post-disturbance conditions, other methods can be used, such as 1/adult natural mortality + age of first reproduction, or the age of first reproduction + 0.5*length of the reproductive period

(IUCN 2008). For bluefin tuna, different estimates for age of first maturity and longevity exist for eastern and western Atlantic stocks, which may reflect different methodologies or changing reproductive and life history strategies in response to fishing pressure over time, and pre-disturbance generation length is difficult to determine.

5.3.1 Eastern Atlantic and Mediterranean stock

In the eastern Atlantic and Mediterranean Sea stock, age at first maturity is about 3 to 5 years (115–121cm FL), with a longevity of 35 years or more (Corriero *et al.* 2003, Santamaria *et al.* 2009, Rooker *et al.* 2007, Rooker *et al.* 2008). The average age of mature individuals (one generation length) is conservatively estimated to be 6.5 years in the eastern Atlantic. There are several spawning grounds throughout the Mediterranean (Oray and Karakulak 2005).The eastern Atlantic stock spawns in the Mediterranean Sea from May to August at temperatures of 22.5–25.5°C. Maturity begins at age 3 and by age 5 all fish are fully mature. Females weighing between 270 and 300kg produce as many as 10 million eggs per spawning season (Corriero *et al.* 2005). At 24°C, embryo development lasts about 32 hours and larval stages about 30 days. Egg size is 1.0mm, and larval length at hatching is 2.8mm. During early life stages (2.8–8mm) larvae may grow 0.3mm/day (Itoh *et al.* 2000, Miyashita *et al.* 2000, García-Rodríguez *et al.* 2006).

Bluefin tuna have been fished in the Mediterranean for hundreds of years, and scientists and managers generally agree that the bluefin tuna is currently being over-fished in the Mediterranean Sea. It is also generally agreed that the stock will continue to be over-fished because of its high economic value and inadequate protection. However, because catch statistics are unreliable, assessment models are challenging. When reported catches from the eastern Atlantic and Mediterranean stock peaked in 1996 (at 50,807t), managers and fisheries scientists decided it was over-fished and a quota system was implemented. Subsequently, ranching of wild-caught individuals became an important means to increase the biomass of exported tuna. Once caged, larger individuals can increase up to 25% in size while smaller ones can increase by 100% or more (Di Natale, pers. comm. 2008). All of this compounds the difficulties of interpreting the data. Based on the 2006 ICCAT report, the 2003–2004 fishing mortality rate (under the current overall fishing pattern) may be more than three times higher than that which would allow the stock to stabilize at the maximum sustainable yield, or MSY, level. Current fishing is expected to continue to drive the spawning biomass to a very low level.

In the eastern Atlantic and Mediterranean, annual catches during 2000–2004 ranged between 32,000 and 35,000 tonnes, and the status of the stock is over-exploited (Majkowski 2007). The current quota system was predicated on a maximum sustainable yield (MSY) of 29,000t, but current models put the MSY at 15,000t (ICCAT SRCS 2006). The official estimate (ICCAT SCRS 2006) of the catch in the Mediterranean Sea that is caged after being caught is around 32,000t, but the actual caged tonnage is probably closer to 39,000t.

In the eastern Atlantic, age composition structure has changed over time and the population is now dominated by young age groups. Based on this trend of changing age structure and taking into account under-reporting of catches (ICCAT SCRS 2009), spawning stock biomass has declined by 63% over the past 20 years (1985 to 2005), and spawning stock abundance has declined by approximately 32% to a current population of 990,000 adults (Y. Uozumi, pers. comm. 2009). Based on a generation length of 6.5 years, this stock is categorized as Endangered under IUCN Red List Criterion A2bd.

5.3.2 Western Atlantic stock

In the western Atlantic, this species occupies the Gulf of Mexico from January to early July and peak spawning has been proposed to occur from mid-April to June at temperatures of 22.6–27.5°C (Teo *et al.* 2007, Teo and Block 2010). There are distinct behaviours during spawning time, most noticeably associated with changes in diving times and depths (Teo *et al.* 2007). Spawning success may be reduced in 2010 due to the April 2010 BP Deepwater Horizon oil spill. Relatively little development toward maturity was evident in age classes 1 through 7 in the western stock so it is unlikely that they could reach sexual maturity before age 8 (Baglin 1982). Recent analysis indicates that sexual maturity begins at 10 and peaks at 15 years of age. The average age of mature individuals (one generation length) is therefore conservatively estimated to be 12.8 years in the western Atlantic (Block *et al.* 2005, Restrepo *et al.* 2009, Diaz 2010).

In the western Atlantic, annual catches during 2000–2004 ranged between 2,000 and 3,000 tonnes/year and the status of the stock is depleted (Majkowski 2007). The age composition of the stock has become more truncated

over time, and is now dominated by young age groups. Based on this trend and taking account of catch under-reporting (ICCAT SCRS 2009), spawning stock biomass has declined by at least 70% over the past 30 years (1980 to 2007), or three generation lengths, while spawning stock abundance declined by 67% to a current population of 41,000 adults (Y. Uozumi, pers. comm. 2009). Therefore, based on a generation length of 12.8 years, this stock is considered Endangered under Red List Criterion A2bd. To illustrate the effect of a hypothetical 20-year generation length, declines over a maximum of 60 years are greater than 80% and would place this stock between Endangered (50–80% decline) or possibly as high as Critically Endangered (>80% decline). The western Atlantic stock was listed as Critically Endangered in 1996 because of the marked declines in abundance that occurred over 40 years ago (1960–1970s). However, based on the lower generation time currently used, the current assessment under Red List criteria can only evaluate declines in the past 30 years (since 1980) even though the overall population decline situation is worse than it was in 1996.

5.3.3 Conservation

The eastern Atlantic and western Atlantic bluefin tuna stocks were considered to be Overexploited and Depleted, respectively, by Majkowski (2007), seriously over-fished by Joseph (2009), and Critically Endangered by MacKenzie *et al.* (2009). Safina and Klinger (2008) consider the western Atlantic stock to be Critically Endangered as it was evaluated in the 1996 IUCN assessment.

Several conservation measures have been enacted, mainly based on regulation of fisheries activities. The International Commission for the Conservation of Atlantic Tunas (ICCAT) was established in 1967. Fisheries quotas were first implemented in the 1980s in the western Atlantic and then in 1998 in the eastern Atlantic. Directed fishing effort for Atlantic bluefin on their primary spawning grounds in the Gulf of Mexico has been prohibited since the 1980s (Teo and Block 2010). A comprehensive multi-annual recovery action plan was adopted by the ICCAT contracting parties in 2007, which includes time closure for fishing activities and mandated reduction in fishing capacity. A proposal to list Atlantic bluefin tuna on CITES was introduced at the Doha meeting of the parties in March 2010 by Monaco and supported by the United States and several European countries, but the proposal failed. In May 2010, the Center for Biological Diversity petitioned the United States Department of Interior to list both eastern and western Atlantic populations of the Atlantic bluefin tuna as endangered under the United States Endangered Species Act (Center for Biological Diversity 2010). In addition to the great reduction in population size, they pointed out the potential breeding disaster likely to be produced by the April 2010 BP Deepwater Horizon oil spill in the northern Gulf of Mexico, which occurred right during the breeding season for this species. Some countries, such as Taiwan (Chinese Taipei), have ceased fishing in the Mediterranean, despite having a quota to fish there. However, many conservation measures have not been fully enforced and illegal catches continue. Heightened enforcement of existing measures is needed to prevent extinction of the species. Also, although more data have been collected on Atlantic bluefin tuna than for most other fish species, uncertainties make much of this information unreliable. It is crucial to improve data quality to allow fisheries managers to enhance their management methods and predictions. High priority also needs to be given to protecting spawning adults and their spawning areas in both the Gulf of Mexico and the Mediterranean Sea. By-catch of bluefin by the yellowfin tuna fisheries during the peak of the bluefin spawning season in April and May needs to be further restricted to facilitate rebuilding the stock (Teo and Block 2010). Large adults in the northern foraging region in the Gulf of Maine and Gulf of St Lawrence also need protection because these habitats represent critical refugia for the western population (Rooker *et al.* 2008) as well as feeding grounds for a portion of the eastern stock.

6. Conservation measures in the Mediterranean Sea

Few effective protection measures are currently in place, either for species or ecosystems, in the Mediterranean region (Bianchi and Morri 2000). National protection status of a species varies according to country. However, widespread concerns are emerging over declines in abundance of fish species, especially in the northern Mediterranean.

6.1 Fishing restrictions and management in the Mediterranean region

6.1.1 Deep sea fisheries

The General Fisheries Council for the Mediterranean (GFCM), the main body governing Mediterranean fisheries, recently decided to refrain from expanding deep-water fishing operations below the depth limit of 1,000m. This decision was adopted at the 29th session of the GFCM held in Rome in February 2005 and came into force in September 2005 (FAO 2006). It significantly reduces the threat of potential exploitation pressure on highly vulnerable deep-water species, many of which are seriously threatened outside the Mediterranean. The restriction of deep-water fisheries has made it possible to list the Portuguese dogfish, *Centroscymnus coelolepis,* and the little sleeper shark, *Somniosus rostratus,* as being of Least Concern within the Mediterranean region, because these species occur below 1,000m and are now protected from fisheries. However, many other deep-sea chondrichthyan species occur at depths less than 1,000m (Sion *et al.* 2004), and are therefore still vulnerable to fishing in the Mediterranean Sea.

6.1.2 Driftnetting

The United Nations global moratorium on all large-scale pelagic driftnet fishing was adopted in 1992. Driftnetting with nets greater than 2.5km in length was prohibited in the Mediterranean by the European Commission (EC) in the same year and under a binding Resolution by the GFCM in 1997. A total ban on driftnet fishing came into force at the beginning of 2002. In 2003, the International Commission on the Conservation of Atlantic Tunas (ICCAT) banned the use of driftnets, making it illegal for both non-European Union and EU fleets to use driftnets in the Mediterranean Sea. Despite these bans, driftnetting continues illegally, with a large-scale Moroccan driftnet fleet and sizeable Italian, French and Turkish driftnet fleets still in operation (Tudela 2004, Tudela *et al.* 2005, WWF 2005). Loopholes in Mediterranean fishing regulations have created a new category of 'anchored floating gillnets'. These modified gillnets have been described as an attempt to disguise driftnet fishing under another name, since they are still large-scale driftnetting gears targeting large fish species (WWF 2005).

6.1.3 Shark finning

Shark finning refers to the removal and retention of shark fins with the rest of the shark generally being discarded at sea. This cruel and wasteful practice results in the utilization of only 2 to 5% of the shark. Finning threatens not only many shark stocks, but the stability of marine ecosystems, sustainable traditional fisheries and socio-economically important recreational fisheries (IUCN 2003b). Increasing demand for shark fins, driven by traditional Asian cuisine, has led to such a dramatic increase in world shark fin prices that they are now extremely valuable. Thus the increased incentive to target and fin sharks that might previously have been released alive is now a major global concern (Rose and McLoughlin 2001).

The current extent of shark finning within the Mediterranean region is unknown. Two finning regulations apply within Mediterranean waters: the EU has adopted a finning ban (Regulation 1185/2003, Europa 2006b), as has the International Council for the Conservation of Atlantic Tunas (ICCAT 2005). Finning was likely occurring extensively prior to these regulations (SGRST 2003). To date there is no information on the enforcement of these regulations in the Mediterranean, but concerns have been voiced that the EU Regulation may be ineffective because it allows permits to be issued for removing shark fins on board and landing them separately from the carcasses. The allowable fin to carcass ratio adopted in the EU and under ICCAT is also higher than in other regions of the world and can potentially enable fishers to land fewer sharks than were actually finned (Fordham 2006, IUCN 2003b).

6.2 Marine Protected Areas

Marine Protected Areas (MPAs) have been advocated as an important marine conservation tool, an approach that considers the ecosystem as a whole, rather than that of using the more traditional species-specific management practices (Lubchenco *et al.* 2003). Marine protected areas allow for the conservation of species and their biophysical environments, and may therefore be an effective way to safeguard ecosystem services. When carefully designed and managed, MPAs can increase fish species richness (Tunesi and Molinari 2005). The recovery of the original fish assemblage compositions in coastal waters can then provide benefits both to ecosystems and to humans (Halpern and Warner 2002, Halpern 2003, Gell and Roberts 2003, Claudet *et al.* 2008).

Currently, marine protected areas comprise only 3.8% of the Mediterranean Sea. The majority of these areas are coastal and located in the north of the region, highlighting the need for more MPAs along the southern and eastern coasts, as well as in pelagic areas (Abdulla *et al.* 2008). Protection within Mediterranean MPAs is highly variable due to the quality of the enforcement (Guidetti *et al.* 2008), with many areas being insufficiently monitored, often due to a lack of capacity. The majority of MPAs have been classified as multiple-use marine areas, where certain human activities are still permitted (Harmelin 2000, Badalamenti *et al.* 2000, Francour *et al.* 2001). Strictly protected areas, or marine reserves, cover only 202 km², representing a mere 0.01% of the total surface area of the Mediterranean Sea and 2.2% of the total surface area of the existing MPAs. A more integrated approach is needed to establish a network of MPAs that cover a diversity of habitats and are ecologically connected rather than independent entities. At present, the spacing of MPAs is too wide, with 75% being separated by more than 55km (Abdulla *et al.* 2008).

6.3 International conventions

There are four conventions relevant to the conservation and management of the Mediterranean marine fish fauna under various regional and international conventions, a summary of which is presented in Appendix II.

6.3.1 The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

CITES was established in recognition that international cooperation is essential for the protection of certain

Marine Protected Areas, such as the Port-Cros National Park in the south of France, are key instruments to ensure the protection of marine fish. They ensure spawning grounds and a space for fish to grow and eventually to disperse into the surrounding area. New protected areas are especially needed in the south and east of the Mediterranean Sea. Photo: © Marina Gomei.

species from over-exploitation through international trade. It creates the international legal framework for the prevention of trade in endangered species of wild fauna and flora and for the effective regulation of international trade in other species which may become threatened in the absence of such regulation. Species at risk are listed in the Appendices, which reflect the extent of threat to each species and the controls that apply to its trade. Appendix I lists species threatened with extinction and for which the trade in wild-caught specimens is illegal. CITES Appendix II lists species that are not currently endangered, but for which trade must be controlled to avoid endangering the species. CITES Appendix III contains species for which one member country has asked other CITES Parties for assistance in controlling the trade. These species are typically not threatened globally, but may be at risk locally. In these cases, trade is only permitted with an appropriate export permit and a certificate of origin.

A few Mediterranean species are listed under Appendix II of CITES, such as *Hippocampus* spp. (seahorses), as well as some cartilaginous fishes such as *Cetorhinus maximus* (basking shark) and *Carcharodon carcharias* (great white shark) (CITES 2006). A proposal to list Atlantic bluefin tuna, *Thunnus thynnus,* under Appendix I of CITES was recently defeated in March 2010, failing to grant protection to a species that has been clearly over-fished, and is listed as Endangered on the IUCN Red List.

6.3.2 The Bern Convention on the Conservation of European Wildlife and Natural Habitats

The Bern Convention aims to conserve wild flora and fauna and their natural habitats, especially where the cooperation of several states is required (SGRST 2003). Species listed by the Bern Convention are also added to the EU Habitats Directive (Council Directive 92/43/ EEC on the conservation of natural habitats and of wild flora and fauna). The main aim of the EC Habitats Directive is to promote the maintenance of biodiversity. The Directive requires Member States to take measures to maintain or restore natural habitats and wild species (listed in its Annexes) at a favourable conservation status, introducing robust protection for those habitats and species of European importance (JNCC 2006). This requires measures to be taken to maintain, or restore to favourable conservation status in their natural range, habitats and species of wild flora and fauna of Community interest listed in the Annexes to the Directive (SGRST 2003).

6.3.3 The Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean

The Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention) was adopted in 1976 and came into force in 1978, followed by a succession of landmark Protocols. It was revised in 1995 (UNEP 2005). Species listed under these instruments have continued to decline without any management, and are in urgent need of protection measures (Serena 2005). In the framework of this Convention, a specific Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean (UNEP/MAP/RAC/SPA 2003) was approved at the XIII Conference of Contracting Parties to the Barcelona Convention. In addition to guiding activities within the context of the Barcelona Convention, the Shark Action Plan was also developed in line with the FAO International Plan of Action for the Conservation and Management of Sharks, the UN Fish Stocks Agreement and the World Summit for Sustainable Development.

6.3.4 The Convention on the Conservation of Migratory Species of Wild Animals (CMS or Bonn Convention).

The Convention on the Conservation of Migratory Species of Wild Animals, also known as CMS or the Bonn Convention, is an intergovernmental treaty conducted through the United Nations Environmental Programme. The convention was signed in 1979 and entered into force in 1983, and currently comprises 113 nation parties. CMS parties strive towards strictly protecting the migratory species threatened with extinction that are listed in Appendix I, by conserving or restoring their habitats and by mitigating obstacles that might endanger them. Migratory species that need or would significantly benefit from international cooperation are listed in Appendix II of the Convention (CMS 2006).

6.3.5 Summary of species protected under international conventions

Only two species, the white shark, *Carcharodon carcharias*, and the basking shark, *Cetorhinus maximus*, are listed on the appendices of all four international conventions. The long- and short-snouted seahorses, *Hippocampus guttulatus* and *Hippocampus hippocampus*, receive

protection under three of these conventions, namely Appendix II of the Bern Convention, Appendix II of CITES (which includes all seahorses), and Annex II (List of endangered or threatened species) of the Barcelona Convention.

The giant devil ray, *Mobula mobular*, also receives some protection, as it is listed on Appendix II of the Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention) and on Annex II (List of endangered or threatened species) of the Barcelona Convention. The Bern Convention lists *M. mobular* as a strictly protected species, and requires that Parties endeavour to carry out appropriate measures with the aim of ensuring the species is maintained in a favourable conservation state.

A further 8 species (shortfin mako shark, *Isurus oxyrinchus*; porbeagle shark, *Lamna nasus*; blue shark, *Prionace glauca*; angel shark, *Squatina squatina*; white skate, *Raja alba;* dusky grouper, *Epinephelus marginatus;* brown meagre, *Sciaena umbra;* and shi drum, *Umbrina cirrosa*) are listed on Appendix III of the Bern Convention and on Annex III of the Barcelona Convention. The Bern Convention Appendix III listing requires Parties to protect these species, but a certain amount of exploitation is permitted if population levels allow (COE 2006). The Annex III listing on the Barcelona Convention also requires the exploitation of these species to be regulated (Europa 2006a). In addition, listing in Annex III of the Barcelona Convention calls for the regulation of the exploitation of the Atlantic bluefin tuna (*Thunnus thynnus*) and the swordfish (*Xiphias gladius*).

However, relatively few of the species currently listed in the IUCN threatened categories have been listed under any of the above conventions (Figure 6.1). Of the 43 species of marine fishes listed as threatened in the Mediterranean Sea, only 16 (37%) are granted some form of protection under an international convention, leaving the rest (63%) with no protection. Of the 15 Critically Endangered species, only five (33%) are afforded any type of protection.

Several national initiatives exist to protect various fish species in parts of their range, such as the spearfishing ban in place since 1993 along the French Mediterranean and Monaco coast for the Endangered *Epinephelus marginatus* (Cottalorda and Francour 2007, Ganteaume and Francour 2007).

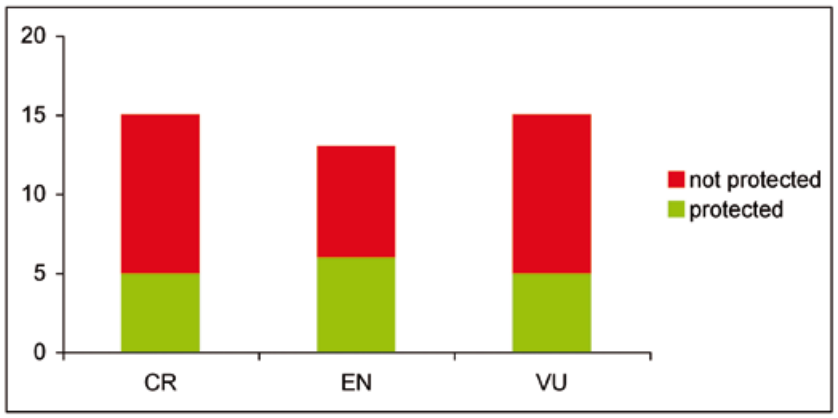
6.4 Other relevant conventions

6.4.1 United Nations Convention on the Law of the Sea (UNCLOS)

UNCLOS provides a framework for the conservation and management of fisheries and other uses of the sea by giving coastal states the right and responsibility for the management and use of fishery resources within their national jurisdiction (the territorial sea, which can extend up to 12 nautical miles offshore). UNCLOS also recognises coastal states' rights to claim an exclusive economic zone (EEZ) of up to 200 nautical miles from shore. The management goal adopted by UNCLOS (Article 61(3)) is that of maximum sustainable yield, qualified by environmental and economic factors.

Within the Mediterranean region, the majority of states have established their 12-mile territorial waters (except for Greece and Turkey). A few countries are in the process of claiming an EEZ. However, because of the difficulties

Figure 6.1 Number of threatened marine fish species (Critically Endangered, Endangered or Vulnerable) granted some form of protected status in the Mediterranean Sea



associated with the delimitation of EEZ in a relatively narrow sea, and because most states prefer to maintain basin-wide access to fisheries, few have claimed an EEZ (Chevalier 2005). As a consequence, there is a large area of high seas in the Mediterranean which requires cooperation between coastal states to ensure the sustainable use of fisheries resources and the conservation of marine biodiversity within it (Chevalier 2005).

6.4.2 United Nations Agreement on the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UNFSA)

UNFSA was established to implement the provisions of UNCLOS pertaining to the conservation and management of straddling and highly migratory fish stocks. UNSFA (adopted in 1995, ratified in 2001) calls for Parties to protect marine biodiversity, minimize pollution, monitor fishing levels and stocks, provide accurate reporting of and minimize by-catch and discards, and gather reliable, comprehensive scientific data as the basis for management decisions. In the absence of scientific certainty, it mandates a precautionary approach to the management of straddling and highly migratory stocks and species. Cooperation for such species is achieved though regional fisheries arrangements or organizations. According to Annex I to UNCLOS, coastal states and other states which fish in areas where highly migratory species occur are required to ensure the conservation and optimum utilization of listed species (FAO 1994).

7. Conclusions and recommendations

This report presents the first comprehensive regional IUCN Red List assessment of the native marine fish fauna for an entire sea, in this case the Mediterranean Sea. It highlights the **substantial lack of information on the conservation status of nearly one-third of these Mediterranean marine fishes** (which were assessed as Data Deficient), a significant proportion of which is considered endemic to the region. Even though marine resources in the Mediterranean Sea have been exploited for thousands of years and are relatively well studied, the Data Deficient group may in fact include a large proportion of threatened fishes. Increased funding and research therefore need to be directed towards such Data Deficient species.

Five hundred and nineteen marine fish species and subspecies were regarded as native to the Mediterranean Sea, 43 (>8%) of them being considered threatened (3% Critically Endangered, 2.5% Endangered, and 3% Vulnerable), and an additional 22 species (4%) being listed as Near Threatened. The relatively low number of threatened species may be related to the fact that the region is considered to be relatively 'young' in terms of its fish fauna, as marine species only began to colonize this enclosed sea around 5 million years ago, and may thus be intrinsically relatively resilient and robust, as is often the case with typically successful colonizing species. However, this percentage would rise to 38% if all of the Data Deficient species were proven to be threatened.

Furthermore, the Mediterranean region has **some of the most threatened cartilaginous fish populations in the world**, with 40% of the 76 species of sharks, rays and chimaeras present in the Mediterranean Sea being listed in threatened categories. Particularly vulnerable life history characteristics have contributed to the threatened status of many Mediterranean fishes, particularly the chondrichthyans and some of the larger-bodied commercially exploited osteichthyan species.

Over half of the 519 native marine fishes assessed in the Mediterranean Sea are **threatened by targeted fishing or capture as by-catch**. However, **pollution, habitat loss and human disturbance are also important threats in this region**.

Although some species are afforded protection under national, regional or international conventions, the vast majority of threatened species are under no protection or effective management plan. However, the **effective implementation (and control) of existing measures,** especially with respect to fisheries, **is critical to ensure the survival of Mediterranean marine fishes.** In particular, this applies to the implementation of Council Regulation (EC) Nº 1967/2006, of 21 December 2006, concerning management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea, with respect to:

1. The improvement of bottom trawl selectivity, with special emphasis on the implementation of the 40mm square mesh panels in the cod-end (Article 9);

2. The prohibition of fishing with trawl nets and dredges above protected habitats (*Posidonia oceanica*, coralligenous habitats and mäerl beds) and below 1000m depth (Article 4);

3. The prohibition of the use of towed gears (bottom trawls among them) within 3 nautical miles of the coast or within the 50m isobaths where that depth is reached at a shorter distance from the coast;

4. The adoption of technical specifications for trawl nets, limiting the maximum dimension of float-line, ground-rope, circumference or perimeter of the trawl nets (and also the dimension and weight of the doors) for a standardized bottom trawler of 500HP engine power.

Regional conservation management, such as the **designation of 'no-take zones' or the creation and effective management of marine protected areas (MPAs)**, should be implemented to reduce pressures on fish populations and safeguard critical fish habitats to allow the recovery of the original, natural composition (in both species composition and size classes) of the coastal fish assemblages. Furthermore, this management tool should be applied for the protection of open water areas, as most of the existing MPAs are in coastal areas. Finally, although limited data availability is often cited as a problem, it should not, be used to justify the lack of management.

Assessing the threat status of Mediterranean marine fishes would not have been possible without the collaboration

of experts from most countries within the region. However, information is still lacking from some countries, particularly those bordering the southern and eastern shores of the Mediterranean Sea. It is essential that this **strong regional cooperation continues** and that new collaborations with other countries are forged, so that the work carried out to produce this first evaluation of the threat status of native Mediterranean marine fishes can be strengthened and updated as new information becomes available.

The Madeira rockfish, *Scorpaena maderensis*, inhabits shallow coastal waters. It prefers rocky substrates. This is a widespread and common species in suitable habitats. Therefore this species is listed as Least Concern at the Mediterranean level. Photo: © Andrea Molinari.

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Appendix 1. IUCN Red List status of native Mediterranean marine fish species

Class	Order	Family	Genus species	Mediterranean Regional Red List	Mediterranean Endemic	Global Red List
AGNATHA	MYXINIFORMES	MYXINIDAE	Myxine glutinosa	LC		
CHONDRICHTHYES	CARCHARHINIFORMES	CARCHARHINIDAE	Carcharhinus altimus	DD		DD
CHONDRICHTHYES	CARCHARHINIFORMES	CARCHARHINIDAE	Carcharhinus brachyurus	DD		NT
CHONDRICHTHYES	CARCHARHINIFORMES	CARCHARHINIDAE	Carcharhinus brevipinna	DD		NT
CHONDRICHTHYES	CARCHARHINIFORMES	CARCHARHINIDAE	Carcharhinus falciformis	DD		NT
CHONDRICHTHYES	CARCHARHINIFORMES	CARCHARHINIDAE	Carcharhinus limbatus	DD		NT
CHONDRICHTHYES	CARCHARHINIFORMES	CARCHARHINIDAE	Carcharhinus obscurus	DD		VU
CHONDRICHTHYES	CARCHARHINIFORMES	CARCHARHINIDAE	Carcharhinus plumbeus	EN		VU
CHONDRICHTHYES	CARCHARHINIFORMES	CARCHARHINIDAE	Prionace glauca	VU		NT
CHONDRICHTHYES	CARCHARHINIFORMES	SCYLIORHINIDAE	Galeus atlanticus	DD		NT
CHONDRICHTHYES	CARCHARHINIFORMES	SCYLIORHINIDAE	Galeus melastomus	LC		LC
CHONDRICHTHYES	CARCHARHINIFORMES	SCYLIORHINIDAE	Scyliorhinus canicula	LC		LC
CHONDRICHTHYES	CARCHARHINIFORMES	SCYLIORHINIDAE	Scyliorhinus stellaris	NT		NT
CHONDRICHTHYES	CARCHARHINIFORMES	SPHYRNIDAE	Sphyrna lewini	DD		EN
CHONDRICHTHYES	CARCHARHINIFORMES	SPHYRNIDAE	Sphyrna mokarran	DD		EN
CHONDRICHTHYES	CARCHARHINIFORMES	SPHYRNIDAE	Sphyrna zygaena	VU		VU
CHONDRICHTHYES	CARCHARHINIFORMES	TRIAKIDAE	Galeorhinus galeus	DD		VU
CHONDRICHTHYES	CARCHARHINIFORMES	TRIAKIDAE	Mustelus asterias	EN		LC
CHONDRICHTHYES	CARCHARHINIFORMES	TRIAKIDAE	Mustelus mustelus	EN		VU
CHONDRICHTHYES	CARCHARHINIFORMES	TRIAKIDAE	Mustelus punctulatus	DD		DD
CHONDRICHTHYES	CHIMAERIFORMES	CHIMAERIDAE	Chimaera monstrosa	DD		NT
CHONDRICHTHYES	HEXANCHIFORMES	HEXANCHIDAE	Heptranchias perlo	VU		NT
CHONDRICHTHYES	HEXANCHIFORMES	HEXANCHIDAE	Hexanchus griseus	VU		NT
CHONDRICHTHYES	HEXANCHIFORMES	HEXANCHIDAE	Hexanchus nakamurai	DD		DD
CHONDRICHTHYES	LAMNIFORMES	ALOPIIDAE	Alopias superciliosus	DD		VU
CHONDRICHTHYES	LAMNIFORMES	ALOPIIDAE	Alopias vulpinus	VU		VU
CHONDRICHTHYES	LAMNIFORMES	CETORHINIDAE	Cetorhinus maximus	VU		VU
CHONDRICHTHYES	LAMNIFORMES	LAMNIDAE	Carcharodon carcharias	EN		VU
CHONDRICHTHYES	LAMNIFORMES	LAMNIDAE	Isurus oxyrinchus	CR		VU
CHONDRICHTHYES	LAMNIFORMES	LAMNIDAE	Lamna nasus	CR		VU
CHONDRICHTHYES	LAMNIFORMES	ODONTASPIDIDAE	Carcharias taurus	CR		VU
CHONDRICHTHYES	LAMNIFORMES	ODONTASPIDIDAE	Odontaspis ferox	VU		VU
CHONDRICHTHYES	MYLIOBATIFORMES	DASYATIDAE	Dasyatis centroura	NT		LC
CHONDRICHTHYES	MYLIOBATIFORMES	DASYATIDAE	Dasyatis chrysonota marmorata	DD		DD
CHONDRICHTHYES	MYLIOBATIFORMES	DASYATIDAE	Dasyatis pastinaca	NT		DD
CHONDRICHTHYES	MYLIOBATIFORMES	DASYATIDAE	Pteroplatytrygon violacea	NT		LC
CHONDRICHTHYES	MYLIOBATIFORMES	DASYATIDAE	Taeniura grabata	DD		DD
CHONDRICHTHYES	MYLIOBATIFORMES	GYMNURIDAE	Gymnura altavela	CR		VU
CHONDRICHTHYES	MYLIOBATIFORMES	MOBULIDAE	Mobula mobular	EN		EN

Class	Order	Family	Genus species	Mediterranean Regional Red List	Mediterranean Endemic	Global Red List
CHONDRICHTHYES	MYLIOBATIFORMES	MYLIOBATIDAE	Myliobatis aquila	NT		DD
CHONDRICHTHYES	MYLIOBATIFORMES	MYLIOBATIDAE	Pteromylaeus bovinus	DD		DD
CHONDRICHTHYES	MYLIOBATIFORMES	RHINOBATIDAE	Rhinoptera marginata	DD		NT
CHONDRICHTHYES	PRISTIFORMES	PRISTIDAE	Pristis pectinata	CR		CR
CHONDRICHTHYES	PRISTIFORMES	PRISTIDAE	Pristis pristis	CR		CR
CHONDRICHTHYES	RAJIFORMES	RAJIDAE	Dipturus batis	CR		CR
CHONDRICHTHYES	RAJIFORMES	RAJIDAE	Dipturus oxyrhynchus	NT		NT
CHONDRICHTHYES	RAJIFORMES	RAJIDAE	Leucoraja circularis	CR		VU
CHONDRICHTHYES	RAJIFORMES	RAJIDAE	Leucoraja fullonica	NT		NT
CHONDRICHTHYES	RAJIFORMES	RAJIDAE	Leucoraja melitensis	CR	Endemic	CR
CHONDRICHTHYES	RAJIFORMES	RAJIDAE	Leucoraja naevus	NT		LC
CHONDRICHTHYES	RAJIFORMES	RAJIDAE	Raja asterias	LC		LC
CHONDRICHTHYES	RAJIFORMES	RAJIDAE	Raja brachyura	DD		NT
CHONDRICHTHYES	RAJIFORMES	RAJIDAE	Raja clavata	NT		NT
CHONDRICHTHYES	RAJIFORMES	RAJIDAE	Raja miraletus	LC		LC
CHONDRICHTHYES	RAJIFORMES	RAJIDAE	Raja montagui	LC		LC
CHONDRICHTHYES	RAJIFORMES	RAJIDAE	Raja polystigma	NT	Endemic	NT
CHONDRICHTHYES	RAJIFORMES	RAJIDAE	Raja radula	DD	Endemic	DD
CHONDRICHTHYES	RAJIFORMES	RAJIDAE	Raja undulata	EN		EN
CHONDRICHTHYES	RAJIFORMES	RAJIDAE	Rostroraja alba	CR		EN
CHONDRICHTHYES	RHINOBATIFORMES	RHINOBATIDAE	Rhinobatos cemiculus	EN		EN
CHONDRICHTHYES	RHINOBATIFORMES	RHINOBATIDAE	Rhinobatos rhinobatos	EN		EN
CHONDRICHTHYES	SQUALIFORMES	CENTROPHORIDAE	Centrophorus granulosus	VU		VU
CHONDRICHTHYES	SQUALIFORMES	DALATIIDAE	Dalatias licha	DD		NT
CHONDRICHTHYES	SQUALIFORMES	ECHINORHINIDAE	Echinorhinus brucus	DD		DD
CHONDRICHTHYES	SQUALIFORMES	ETMOPTERIDAE	Etmopterus spinax	LC		LC
CHONDRICHTHYES	SQUALIFORMES	OXYNOTIDAE	Oxynotus centrina	CR		VU
CHONDRICHTHYES	SQUALIFORMES	SOMNIOSIDAE	Centroscymnus coelolepis	LC		NT
CHONDRICHTHYES	SQUALIFORMES	SOMNIOSIDAE	Somniosus rostratus	LC		DD
CHONDRICHTHYES	SQUALIFORMES	SQUALIDAE	Squalus acanthias	EN		VU
CHONDRICHTHYES	SQUALIFORMES	SQUALIDAE	Squalus blainvillei	DD		DD
CHONDRICHTHYES	SQUALIFORMES	SQUALIDAE	Squalus megalops	DD		DD
CHONDRICHTHYES	SQUATINIFORMES	SQUATINDAE	Squatina aculeata	CR		CR
CHONDRICHTHYES	SQUATINIFORMES	SQUATINDAE	Squatina oculata	CR		CR
CHONDRICHTHYES	SQUATINIFORMES	SQUATINDAE	Squatina squatina	CR		CR
CHONDRICHTHYES	TORPEDINIFORMES	TORPEDINIDAE	Torpedo marmorata	LC		DD
CHONDRICHTHYES	TORPEDINIFORMES	TORPEDINIDAE	Torpedo nobiliana	DD		DD
CHONDRICHTHYES	TORPEDINIFORMES	TORPEDINIDAE	Torpedo torpedo	LC		DD
OSTEICHTHYES	ANGUILLIFORMES	CHLOPSIDAE	Chlopsis bicolor	LC		
OSTEICHTHYES	ANGUILLIFORMES	CONGRIDAE	Ariosoma balearicum	LC		
OSTEICHTHYES	ANGUILLIFORMES	CONGRIDAE	Conger conger	LC		
OSTEICHTHYES	ANGUILLIFORMES	CONGRIDAE	Gnathophis mystax	LC		
OSTEICHTHYES	ANGUILLIFORMES	HETERENCHELYIDAE	Panturichthys fowleri	DD	Endemic	DD
OSTEICHTHYES	ANGUILLIFORMES	MURAENESOCIDAE	Cynoponticus ferox	DD		
OSTEICHTHYES	ANGUILLIFORMES	MURAENIDAE	Anarchias euryurus	DD		

Class	Order	Family	Genus species	Mediterranean Regional Red List	Mediterranean Endemic	Global Red List
OSTEICHTHYES	ANGUILLIFORMES	MURAENIDAE	Gymnothorax unicolor	DD		
OSTEICHTHYES	ANGUILLIFORMES	MURAENIDAE	Muraena helena	LC		
OSTEICHTHYES	ANGUILLIFORMES	NEMICHTHYIDAE	Nemichthys scolopaceus	LC		
OSTEICHTHYES	ANGUILLIFORMES	NETTASTOMATIDAE	Facciolella oxyrhyncha	DD		
OSTEICHTHYES	ANGUILLIFORMES	NETTASTOMATIDAE	Nettastoma melanurum	LC		
OSTEICHTHYES	ANGUILLIFORMES	NETTASTOMATIDAE	Saurenchelys cancrivora	DD		
OSTEICHTHYES	ANGUILLIFORMES	OPHICHTHIDAE	Apterichtus anguiformis	LC		
OSTEICHTHYES	ANGUILLIFORMES	OPHICHTHIDAE	Apterichtus caecus	LC		
OSTEICHTHYES	ANGUILLIFORMES	OPHICHTHIDAE	Dalophis imberbis	LC		
OSTEICHTHYES	ANGUILLIFORMES	OPHICHTHIDAE	Echelus myrus	LC		
OSTEICHTHYES	ANGUILLIFORMES	OPHICHTHIDAE	Ophichthus rufus	LC	Endemic	LC
OSTEICHTHYES	ANGUILLIFORMES	OPHICHTHIDAE	Ophisurus serpens	LC		
OSTEICHTHYES	ANGUILLIFORMES	SYNAPHOBRANCHIDAE	Dysomma brevirostre	DD		
OSTEICHTHYES	ATHERINIFORMES	ATHERINIDAE	Atherina boyeri	LC		
OSTEICHTHYES	ATHERINIFORMES	ATHERINIDAE	Atherina hepsetus	LC		
OSTEICHTHYES	ATHERINIFORMES	ATHERINIDAE	Atherina presbyter	DD		
OSTEICHTHYES	AULOPIFORMES	ALEPISAURIDAE	Alepisaurus ferox	DD		
OSTEICHTHYES	AULOPIFORMES	AULOPIDAE	Aulopus filamentosus	LC		
OSTEICHTHYES	AULOPIFORMES	CHLOROPHTHALMIDAE	Bathypterois grallator	DD		
OSTEICHTHYES	AULOPIFORMES	CHLOROPHTHALMIDAE	Chlorophthalmus agassizi	LC		
OSTEICHTHYES	AULOPIFORMES	EVERMANNELLIDAE	Evermannella balbo	LC		
OSTEICHTHYES	AULOPIFORMES	IPNOPIDAE	Bathypterois mediterraneus	LC	Endemic	LC
OSTEICHTHYES	AULOPIFORMES	PARALEPIDIDAE	Arctozenus risso	LC		
OSTEICHTHYES	AULOPIFORMES	PARALEPIDIDAE	Lestidiops jayakari	LC		
OSTEICHTHYES	AULOPIFORMES	PARALEPIDIDAE	Lestidiops sphyrenoides	LC		
OSTEICHTHYES	AULOPIFORMES	PARALEPIDIDAE	Paralepis coregonoides	LC		
OSTEICHTHYES	AULOPIFORMES	PARALEPIDIDAE	Paralepis speciosa	LC	Endemic	LC
OSTEICHTHYES	AULOPIFORMES	PARALEPIDIDAE	Sudis hyalina	DD		
OSTEICHTHYES	AULOPIFORMES	SYNODONTIDAE	Bathysaurus mollis	DD		
OSTEICHTHYES	AULOPIFORMES	SYNODONTIDAE	Synodus saurus	LC		
OSTEICHTHYES	BATRACHOIDIFORMES	BATRACHOIDIDAE	Halobatrachus didactylus	DD		
OSTEICHTHYES	BELONIFORMES	BELONIDAE	Belone belone	LC		
OSTEICHTHYES	BELONIFORMES	BELONIDAE	Belone svetovidovi	DD		
OSTEICHTHYES	BELONIFORMES	BELONIDAE	Tylosurus acus	LC		
OSTEICHTHYES	BELONIFORMES	EXOCOETIDAE	Cheilopogon exsiliens	DD		
OSTEICHTHYES	BELONIFORMES	EXOCOETIDAE	Cheilopogon heterurus	DD		
OSTEICHTHYES	BELONIFORMES	EXOCOETIDAE	Exocoetus obtusirostris	DD		
OSTEICHTHYES	BELONIFORMES	EXOCOETIDAE	Exocoetus volitans	DD		
OSTEICHTHYES	BELONIFORMES	EXOCOETIDAE	Hirundichthys rondeletii	LC		
OSTEICHTHYES	BELONIFORMES	EXOCOETIDAE	Hirundichthys speculiger	DD		
OSTEICHTHYES	BELONIFORMES	HEMIRAMPHIDAE	Hyporhamphus picarti	LC		
OSTEICHTHYES	BELONIFORMES	SCOMBERESOCIDAE	Scomberesox saurus	LC		
OSTEICHTHYES	BERYCIFORMES	BERYCIDAE	Beryx decadactylus	DD		
OSTEICHTHYES	BERYCIFORMES	TRACHICHTHYIDAE	Hoplostethus mediterraneus	LC		
OSTEICHTHYES	CLUPEIFORMES	CLUPEIDAE	Sardina pilchardus	LC		

Class	Order	Family	Genus species	Mediterranean Regional Red List	Mediterranean Endemic	Global Red List
OSTEICHTHYES	CLUPEIFORMES	CLUPEIDAE	Sardinella aurita	LC		
OSTEICHTHYES	CLUPEIFORMES	CLUPEIDAE	Sardinella maderensis	LC		
OSTEICHTHYES	CLUPEIFORMES	CLUPEIDAE	Sprattus sprattus	DD		
OSTEICHTHYES	CLUPEIFORMES	ENGRAULIDAE	Engraulis encrasicolus	LC		
OSTEICHTHYES	GADIFORMES	GADIDAE	Gadiculus argenteus	LC		
OSTEICHTHYES	GADIFORMES	GADIDAE	Merlangius merlangus	LC		
OSTEICHTHYES	GADIFORMES	GADIDAE	Micromesistius poutassou	LC		
OSTEICHTHYES	GADIFORMES	GADIDAE	Trisopterus luscus	DD		
OSTEICHTHYES	GADIFORMES	GADIDAE	Trisopterus minutus	LC		
OSTEICHTHYES	GADIFORMES	LOTIDAE	Gaidropsarus biscayensis	LC		
OSTEICHTHYES	GADIFORMES	LOTIDAE	Gaidropsarus granti	DD		
OSTEICHTHYES	GADIFORMES	LOTIDAE	Gaidropsarus mediterraneus	LC		
OSTEICHTHYES	GADIFORMES	LOTIDAE	Gaidropsarus vulgaris	LC		
OSTEICHTHYES	GADIFORMES	LOTIDAE	Molva dypterygia	LC		
OSTEICHTHYES	GADIFORMES	LOTIDAE	Molva macrophthalma	DD		
OSTEICHTHYES	GADIFORMES	LOTIDAE	Molva molva	DD		
OSTEICHTHYES	GADIFORMES	MACROURIDAE	Caelorinchus caelorhincus	LC		
OSTEICHTHYES	GADIFORMES	MACROURIDAE	Caelorinchus mediterraneus	LC	Endemic	LC
OSTEICHTHYES	GADIFORMES	MACROURIDAE	Caelorinchus occa	DD		
OSTEICHTHYES	GADIFORMES	MACROURIDAE	Coryphaenoides guentheri	LC		
OSTEICHTHYES	GADIFORMES	MACROURIDAE	Coryphaenoides mediterraneus	LC		
OSTEICHTHYES	GADIFORMES	MACROURIDAE	Hymenocephalus italicus	LC		
OSTEICHTHYES	GADIFORMES	MACROURIDAE	Nezumia aequalis	LC		
OSTEICHTHYES	GADIFORMES	MACROURIDAE	Nezumia sclerorhynchus	LC		
OSTEICHTHYES	GADIFORMES	MACROURIDAE	Trachyrincus scabrus	LC		
OSTEICHTHYES	GADIFORMES	MERLUCCIIDAE	Merluccius merluccius	VU		
OSTEICHTHYES	GADIFORMES	MORIDAE	Eretmophorus kleinenbergi	DD	Endemic	DD
OSTEICHTHYES	GADIFORMES	MORIDAE	Gadella maraldi	LC		
OSTEICHTHYES	GADIFORMES	MORIDAE	Guttigadus latifrons	DD		
OSTEICHTHYES	GADIFORMES	MORIDAE	Lepidion guentheri	LC		
OSTEICHTHYES	GADIFORMES	MORIDAE	Lepidion lepidion	LC	Endemic	LC
OSTEICHTHYES	GADIFORMES	MORIDAE	Mora moro	LC		
OSTEICHTHYES	GADIFORMES	MORIDAE	Physiculus dalwigki	LC		
OSTEICHTHYES	GADIFORMES	MORIDAE	Rhynchogadus hepaticus	DD	Endemic	DD
OSTEICHTHYES	GADIFORMES	PHYCIDAE	Phycis blennoides	LC		
OSTEICHTHYES	GADIFORMES	PHYCIDAE	Phycis phycis	LC		
OSTEICHTHYES	GOBIESOCIFORMES	GOBIESOCIDAE	Apletodon dentatus	DD		
OSTEICHTHYES	GOBIESOCIFORMES	GOBIESOCIDAE	Apletodon incognitus	DD		
OSTEICHTHYES	GOBIESOCIFORMES	GOBIESOCIDAE	Diplecogaster bimaculata	LC		
OSTEICHTHYES	GOBIESOCIFORMES	GOBIESOCIDAE	Gouania willdenowi	DD	Endemic	DD
OSTEICHTHYES	GOBIESOCIFORMES	GOBIESOCIDAE	Lepadogaster candollei	LC		
OSTEICHTHYES	GOBIESOCIFORMES	GOBIESOCIDAE	Lepadogaster lepadogaster lepadogaster	LC	Endemic	LC
OSTEICHTHYES	GOBIESOCIFORMES	GOBIESOCIDAE	Lepadogaster lepadogaster purpurea	LC		

Class	Order	Family	Genus species	Mediterranean Regional Red List	Mediterranean Endemic	Global Red List
OSTEICHTHYES	GOBIESOCIFORMES	GOBIESOCIDAE	Opeatogenys gracilis	VU	Endemic	VU
OSTEICHTHYES	LAMPRIFORMES	LAMPRIDAE	Lampris guttatus	DD		
OSTEICHTHYES	LAMPRIFORMES	LOPHOTIDAE	Lophotus lacepede	DD		
OSTEICHTHYES	LAMPRIFORMES	REGALECIDAE	Regalecus glesne	DD		
OSTEICHTHYES	LAMPRIFORMES	TRACHIPTERIDAE	Trachipterus trachypterus	DD		
OSTEICHTHYES	LAMPRIFORMES	TRACHIPTERIDAE	Zu cristatus	DD		
OSTEICHTHYES	LOPHIIFORMES	CHAUNACIDAE	Chaunax pictus	DD		
OSTEICHTHYES	LOPHIIFORMES	LOPHIIDAE	Lophius budegassa	LC		
OSTEICHTHYES	LOPHIIFORMES	LOPHIIDAE	Lophius piscatorius	LC		
OSTEICHTHYES	MYCTOPHIFORMES	MYCTOPHIDAE	Benthosema glaciale	LC		
OSTEICHTHYES	MYCTOPHIFORMES	MYCTOPHIDAE	Ceratoscopelus maderensis	LC		
OSTEICHTHYES	MYCTOPHIFORMES	MYCTOPHIDAE	Diaphus holti	LC		
OSTEICHTHYES	MYCTOPHIFORMES	MYCTOPHIDAE	Diaphus metopoclampus	LC		
OSTEICHTHYES	MYCTOPHIFORMES	MYCTOPHIDAE	Diaphus rafinesquii	LC		
OSTEICHTHYES	MYCTOPHIFORMES	MYCTOPHIDAE	Diogenichthys atlanticus	DD		
OSTEICHTHYES	MYCTOPHIFORMES	MYCTOPHIDAE	Electrona risso	LC		
OSTEICHTHYES	MYCTOPHIFORMES	MYCTOPHIDAE	Gonichthys coccoi	LC		
OSTEICHTHYES	MYCTOPHIFORMES	MYCTOPHIDAE	Hygophum benoiti	LC		
OSTEICHTHYES	MYCTOPHIFORMES	MYCTOPHIDAE	Hygophum hygomii	LC		
OSTEICHTHYES	MYCTOPHIFORMES	MYCTOPHIDAE	Lampanyctus crocodilus	LC		
OSTEICHTHYES	MYCTOPHIFORMES	MYCTOPHIDAE	Lampanyctus pusillus	LC		
OSTEICHTHYES	MYCTOPHIFORMES	MYCTOPHIDAE	Lobianchia dofleini	LC		
OSTEICHTHYES	MYCTOPHIFORMES	MYCTOPHIDAE	Lobianchia gemellarii	DD		
OSTEICHTHYES	MYCTOPHIFORMES	MYCTOPHIDAE	Myctophum punctatum	LC		
OSTEICHTHYES	MYCTOPHIFORMES	MYCTOPHIDAE	Notoscopelus bolini	LC		
OSTEICHTHYES	MYCTOPHIFORMES	MYCTOPHIDAE	Notoscopelus elongatus	LC	Endemic	LC
OSTEICHTHYES	MYCTOPHIFORMES	MYCTOPHIDAE	Symbolophorus veranyi	LC		
OSTEICHTHYES	NOTACANTHIFORMES	NOTACANTHIDAE	Notacanthus bonapartei	LC		
OSTEICHTHYES	NOTACANTHIFORMES	NOTACANTHIDAE	Polyacanthonotus rissoanus	LC		
OSTEICHTHYES	OPHIDIIFORMES	BYTHITIDAE	Bellottia apoda	LC		
OSTEICHTHYES	OPHIDIIFORMES	BYTHITIDAE	Cataetyx alleni	LC		
OSTEICHTHYES	OPHIDIIFORMES	BYTHITIDAE	Cataetyx laticeps	LC		
OSTEICHTHYES	OPHIDIIFORMES	BYTHITIDAE	Grammonus ater	LC	Endemic	LC
OSTEICHTHYES	OPHIDIIFORMES	CARAPIDAE	Carapus acus	DD		
OSTEICHTHYES	OPHIDIIFORMES	CARAPIDAE	Echiodon dentatus	LC	Endemic	LC
OSTEICHTHYES	OPHIDIIFORMES	OPHIDIIDAE	Benthocometes robustus	DD		
OSTEICHTHYES	OPHIDIIFORMES	OPHIDIIDAE	Ophidion barbatum	LC		
OSTEICHTHYES	OPHIDIIFORMES	OPHIDIIDAE	Ophidion rochei	DD	Endemic	DD
OSTEICHTHYES	OPHIDIIFORMES	OPHIDIIDAE	Parophidion vassali	DD	Endemic	DD
OSTEICHTHYES	OSMERIFORMES	ALEPOCEPHALIDAE	Alepocephalus rostratus	LC		
OSTEICHTHYES	OSMERIFORMES	ARGENTINIDAE	Argentina sphyraena	LC		
OSTEICHTHYES	OSMERIFORMES	ARGENTINIDAE	Glossanodon leioglossus	LC		
OSTEICHTHYES	OSMERIFORMES	MICROSTOMATIDAE	Microstoma microstoma	DD		
OSTEICHTHYES	OSMERIFORMES	MICROSTOMATIDAE	Nansenia iberica	DD	Endemic	DD
OSTEICHTHYES	OSMERIFORMES	MICROSTOMATIDAE	Nansenia oblita	DD		

Class	Order	Family	Genus species	Mediterranean Regional Red List	Mediterranean Endemic	Global Red List
OSTEICHTHYES	PERCIFORMES	AMMODYTIDAE	Gymnammodytes cicerelus	LC		
OSTEICHTHYES	PERCIFORMES	APOGONIDAE	Apogon imberbis	LC		
OSTEICHTHYES	PERCIFORMES	BLENNIIDAE	Aidablennius sphynx	LC		
OSTEICHTHYES	PERCIFORMES	BLENNIIDAE	Blennius ocellaris	LC		
OSTEICHTHYES	PERCIFORMES	BLENNIIDAE	Coryphoblennius galerita	LC		
OSTEICHTHYES	PERCIFORMES	BLENNIIDAE	Hypleurochilus bananensis	DD		
OSTEICHTHYES	PERCIFORMES	BLENNIIDAE	Lipophrys adriaticus	DD	Endemic	DD
OSTEICHTHYES	PERCIFORMES	BLENNIIDAE	Lipophrys canevae	LC		
OSTEICHTHYES	PERCIFORMES	BLENNIIDAE	Lipophrys dalmatinus	DD	Endemic	DD
OSTEICHTHYES	PERCIFORMES	BLENNIIDAE	Lipophrys nigriceps	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	BLENNIIDAE	Parablennius gattorugine	LC		
OSTEICHTHYES	PERCIFORMES	BLENNIIDAE	Parablennius incognitus	LC		
OSTEICHTHYES	PERCIFORMES	BLENNIIDAE	Parablennius pilicornis	LC		
OSTEICHTHYES	PERCIFORMES	BLENNIIDAE	Parablennius rouxi	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	BLENNIIDAE	Parablennius sanguinolentus	LC		
OSTEICHTHYES	PERCIFORMES	BLENNIIDAE	Parablennius tentacularis	LC		
OSTEICHTHYES	PERCIFORMES	BLENNIIDAE	Parablennius zvonimiri	DD	Endemic	DD
OSTEICHTHYES	PERCIFORMES	BLENNIIDAE	Paralipophrys trigloides	LC		
OSTEICHTHYES	PERCIFORMES	BLENNIIDAE	Salaria basilisca	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	BLENNIIDAE	Salaria pavo	LC		
OSTEICHTHYES	PERCIFORMES	BLENNIIDAE	Scartella cristata	LC		
OSTEICHTHYES	PERCIFORMES	BRAMIDAE	Brama brama	DD		
OSTEICHTHYES	PERCIFORMES	CALLANTHIIDAE	Callanthias ruber	LC		
OSTEICHTHYES	PERCIFORMES	CALLIONYMIDAE	Callionymus fasciatus	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	CALLIONYMIDAE	Callionymus lyra	LC		
OSTEICHTHYES	PERCIFORMES	CALLIONYMIDAE	Callionymus maculatus	LC		
OSTEICHTHYES	PERCIFORMES	CALLIONYMIDAE	Callionymus pusillus	LC		
OSTEICHTHYES	PERCIFORMES	CALLIONYMIDAE	Callionymus reticulatus	DD		
OSTEICHTHYES	PERCIFORMES	CALLIONYMIDAE	Callionymus risso	LC		
OSTEICHTHYES	PERCIFORMES	CALLIONYMIDAE	Synchiropus phaeton	LC		
OSTEICHTHYES	PERCIFORMES	CARANGIDAE	Alectis alexandrinus	LC		
OSTEICHTHYES	PERCIFORMES	CARANGIDAE	Campogramma glaycos	DD		
OSTEICHTHYES	PERCIFORMES	CARANGIDAE	Caranx crysos	LC		
OSTEICHTHYES	PERCIFORMES	CARANGIDAE	Caranx hippos	DD		
OSTEICHTHYES	PERCIFORMES	CARANGIDAE	Caranx rhonchus	LC		
OSTEICHTHYES	PERCIFORMES	CARANGIDAE	Lichia amia	DD		
OSTEICHTHYES	PERCIFORMES	CARANGIDAE	Naucrates ductor	LC		
OSTEICHTHYES	PERCIFORMES	CARANGIDAE	Pseudocaranx dentex	DD		
OSTEICHTHYES	PERCIFORMES	CARANGIDAE	Seriola dumerili	LC		
OSTEICHTHYES	PERCIFORMES	CARANGIDAE	Trachinotus ovatus	LC		
OSTEICHTHYES	PERCIFORMES	CARANGIDAE	Trachurus mediterraneus	LC		
OSTEICHTHYES	PERCIFORMES	CARANGIDAE	Trachurus picturatus	LC		
OSTEICHTHYES	PERCIFORMES	CARANGIDAE	Trachurus trachurus	LC		
OSTEICHTHYES	PERCIFORMES	CENTRACANTHIDAE	Centracanthus cirrus	LC		
OSTEICHTHYES	PERCIFORMES	CENTRACANTHIDAE	Spicara maena	LC		

Class	Order	Family	Genus species	Mediterranean Regional Red List	Mediterranean Endemic	Global Red List
OSTEICHTHYES	PERCIFORMES	CENTRACANTHIDAE	Spicara smaris	LC		
OSTEICHTHYES	PERCIFORMES	CENTROLOPHIDAE	Centrolophus niger	LC		
OSTEICHTHYES	PERCIFORMES	CENTROLOPHIDAE	Schedophilus medusophagus	LC		
OSTEICHTHYES	PERCIFORMES	CENTROLOPHIDAE	Schedophilus ovalis	LC		
OSTEICHTHYES	PERCIFORMES	CEPOLIDAE	Cepola macrophthalma	LC		
OSTEICHTHYES	PERCIFORMES	CLINIDAE	Clinitrachus argentatus	LC		
OSTEICHTHYES	PERCIFORMES	CORYPHAENIDAE	Coryphaena equiselis	DD		
OSTEICHTHYES	PERCIFORMES	CORYPHAENIDAE	Coryphaena hippurus	LC		
OSTEICHTHYES	PERCIFORMES	ECHENEIDAE	Remora australis	DD		
OSTEICHTHYES	PERCIFORMES	ECHENEIDAE	Remora brachyptera	DD		
OSTEICHTHYES	PERCIFORMES	ECHENEIDAE	Remora osteochir	DD		
OSTEICHTHYES	PERCIFORMES	ECHENEIDAE	Remora remora	LC		
OSTEICHTHYES	PERCIFORMES	EPIGONIDAE	Epigonus constanciae	DD		
OSTEICHTHYES	PERCIFORMES	EPIGONIDAE	Epigonus denticulatus	LC		
OSTEICHTHYES	PERCIFORMES	EPIGONIDAE	Epigonus telescopus	LC		
OSTEICHTHYES	PERCIFORMES	EPIGONIDAE	Microichthys coccoi	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	EPIGONIDAE	Microichthys sanzoi	DD	Endemic	DD
OSTEICHTHYES	PERCIFORMES	GEMPYLIDAE	Ruvettus pretiosus	LC		
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Buenia affinis	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Chromogobius quadrivittatus	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Chromogobius zebratus	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Corcyrogobius liechtensteini	DD	Endemic	DD
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Crystallogobius linearis	LC		
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Deltentosteus collonianus	LC		
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Deltentosteus quadrimaculatus	LC		
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Didogobius bentuvii	DD	Endemic	DD
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Didogobius schlieweni	DD	Endemic	DD
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Didogobius splechtnai	DD	Endemic	DD
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Gammogobius steinitzi	DD	Endemic	DD
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Gobius ater	DD	Endemic	DD
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Gobius auratus	LC		
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Gobius bucchichi	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Gobius cobitis	LC		
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Gobius couchi	DD		
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Gobius cruentatus	LC		
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Gobius fallax	DD		
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Gobius geniporus	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Gobius kolombatovici	DD	Endemic	DD
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Gobius niger	LC		
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Gobius paganellus	LC		
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Gobius roulei	DD		
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Gobius strictus	DD	Endemic	DD
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Gobius vittatus	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Gobius xanthocephalus	DD		
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Knipowitschia caucasica	LC	Endemic	LC

Class	Order	Family	Genus species	Mediterranean Regional Red List	Mediterranean Endemic	Global Red List
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Lebetus guilleti	DD		
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Lesueurigobius friesii	LC		
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Lesueurigobius suerii	LC		
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Mesogobius batrachocephalus	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Millerigobius macrocephalus	DD	Endemic	DD
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Odondebuenia balearica	DD	Endemic	DD
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Pomatoschistus bathi	DD	Endemic	DD
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Pomatoschistus knerii	DD	Endemic	DD
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Pomatoschistus marmoratus	LC		
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Pomatoschistus microps	CR		
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Pomatoschistus minutus	VU		
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Pomatoschistus norvegicus	DD		
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Pomatoschistus pictus	DD		
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Pomatoschistus quagga	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Pomatoschistus tortonesei	EN	Endemic	EN
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Proterorhinus marmoratus	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Pseudaphya ferreri	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Speleogobius trigloides	DD	Endemic	DD
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Thorogobius ephippiatus	LC		
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Thorogobius macrolepis	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Zebrus zebrus	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	GOBIIDAE	Zosterisessor ophiocephalus	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	HAEMULIDAE	Parapristipoma octolineatum	DD		
OSTEICHTHYES	PERCIFORMES	HAEMULIDAE	Plectorhinchus mediterraneus	LC		
OSTEICHTHYES	PERCIFORMES	HAEMULIDAE	Pomadasys incisus	LC		
OSTEICHTHYES	PERCIFORMES	ISTIOPHORIDAE	Tetrapturus albidus	DD		
OSTEICHTHYES	PERCIFORMES	ISTIOPHORIDAE	Tetrapturus belone	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	KUHLIIDAE	Kuhlia rubens	DD	Endemic	DD
OSTEICHTHYES	PERCIFORMES	KYPHOSIDAE	Kyphosus sectator	DD		
OSTEICHTHYES	PERCIFORMES	LABRIDAE	Acantholabrus palloni	LC		LC
OSTEICHTHYES	PERCIFORMES	LABRIDAE	Coris julis	LC		LC
OSTEICHTHYES	PERCIFORMES	LABRIDAE	Ctenolabrus rupestris	LC		LC
OSTEICHTHYES	PERCIFORMES	LABRIDAE	Labrus merula	LC		LC
OSTEICHTHYES	PERCIFORMES	LABRIDAE	Labrus mixtus	LC		LC
OSTEICHTHYES	PERCIFORMES	LABRIDAE	Labrus viridis	VU		VU
OSTEICHTHYES	PERCIFORMES	LABRIDAE	Lappanella fasciata	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	LABRIDAE	Symphodus bailloni	DD		LC
OSTEICHTHYES	PERCIFORMES	LABRIDAE	Symphodus cinereus	LC		LC
OSTEICHTHYES	PERCIFORMES	LABRIDAE	Symphodus doderleini	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	LABRIDAE	Symphodus mediterraneus	LC		LC
OSTEICHTHYES	PERCIFORMES	LABRIDAE	Symphodus melanocercus	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	LABRIDAE	Symphodus melops	LC		LC
OSTEICHTHYES	PERCIFORMES	LABRIDAE	Symphodus ocellatus	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	LABRIDAE	Symphodus roissali	LC		LC
OSTEICHTHYES	PERCIFORMES	LABRIDAE	Symphodus rostratus	LC	Endemic	LC

Class	Order	Family	Genus species	Mediterranean Regional Red List	Mediterranean Endemic	Global Red List
OSTEICHTHYES	PERCIFORMES	LABRIDAE	Symphodus tinca	LC		LC
OSTEICHTHYES	PERCIFORMES	LABRIDAE	Thalassoma pavo	LC		LC
OSTEICHTHYES	PERCIFORMES	LABRIDAE	Xyrichtys novacula	LC		LC
OSTEICHTHYES	PERCIFORMES	LOBOTIDAE	Lobotes surinamensis	LC		
OSTEICHTHYES	PERCIFORMES	LUVARIDAE	Luvarus imperialis	LC		
OSTEICHTHYES	PERCIFORMES	MORONIDAE	Dicentrarchus labrax	NT		
OSTEICHTHYES	PERCIFORMES	MORONIDAE	Dicentrarchus punctatus	LC		
OSTEICHTHYES	PERCIFORMES	MUGILIDAE	Chelon labrosus	LC		
OSTEICHTHYES	PERCIFORMES	MUGILIDAE	Liza aurata	LC		
OSTEICHTHYES	PERCIFORMES	MUGILIDAE	Liza ramado	LC		
OSTEICHTHYES	PERCIFORMES	MUGILIDAE	Liza saliens	LC		
OSTEICHTHYES	PERCIFORMES	MUGILIDAE	Mugil cephalus	LC		
OSTEICHTHYES	PERCIFORMES	MUGILIDAE	Oedalechilus labeo	LC		
OSTEICHTHYES	PERCIFORMES	MULLIDAE	Mullus barbatus	LC		
OSTEICHTHYES	PERCIFORMES	MULLIDAE	Mullus surmuletus	LC		
OSTEICHTHYES	PERCIFORMES	NOMEIDAE	Cubiceps capensis	DD		
OSTEICHTHYES	PERCIFORMES	NOMEIDAE	Cubiceps gracilis	DD		
OSTEICHTHYES	PERCIFORMES	POLYPRIONIDAE	Polyprion americanus	DD		DD
OSTEICHTHYES	PERCIFORMES	POMACENTRIDAE	Chromis chromis	LC		
OSTEICHTHYES	PERCIFORMES	POMATOMIDAE	Pomatomus saltatrix	LC		
OSTEICHTHYES	PERCIFORMES	PRIACANTHIDAE	Priacanthus arenatus	DD		
OSTEICHTHYES	PERCIFORMES	SCARIDAE	Sparisoma cretense	LC		LC
OSTEICHTHYES	PERCIFORMES	SCIAENIDAE	Argyrosomus regius	LC		
OSTEICHTHYES	PERCIFORMES	SCIAENIDAE	Sciaena umbra	VU		
OSTEICHTHYES	PERCIFORMES	SCIAENIDAE	Umbrina canariensis	DD		
OSTEICHTHYES	PERCIFORMES	SCIAENIDAE	Umbrina cirrosa	VU		
OSTEICHTHYES	PERCIFORMES	SCIAENIDAE	Umbrina ronchus	DD		
OSTEICHTHYES	PERCIFORMES	SCOMBRIDAE	Acanthocybium solandri	LC		
OSTEICHTHYES	PERCIFORMES	SCOMBRIDAE	Auxis rochei rochei	LC		
OSTEICHTHYES	PERCIFORMES	SCOMBRIDAE	Auxis thazard thazard	LC		
OSTEICHTHYES	PERCIFORMES	SCOMBRIDAE	Euthynnus alletteratus	LC		
OSTEICHTHYES	PERCIFORMES	SCOMBRIDAE	Katsuwonus pelamis	LC		
OSTEICHTHYES	PERCIFORMES	SCOMBRIDAE	Orcynopsis unicolor	LC		
OSTEICHTHYES	PERCIFORMES	SCOMBRIDAE	Sarda sarda	LC		
OSTEICHTHYES	PERCIFORMES	SCOMBRIDAE	Scomber colias	NT		
OSTEICHTHYES	PERCIFORMES	SCOMBRIDAE	Scomber scombrus	LC		
OSTEICHTHYES	PERCIFORMES	SCOMBRIDAE	Scomberomorus tritor	LC		
OSTEICHTHYES	PERCIFORMES	SCOMBRIDAE	Thunnus alalunga	LC		
OSTEICHTHYES	PERCIFORMES	SCOMBRIDAE	Thunnus thynnus	EN		
OSTEICHTHYES	PERCIFORMES	SERRANIDAE	Anthias anthias	LC		
OSTEICHTHYES	PERCIFORMES	SERRANIDAE	Epinephelus aeneus	NT		NT
OSTEICHTHYES	PERCIFORMES	SERRANIDAE	Epinephelus caninus	DD		DD
OSTEICHTHYES	PERCIFORMES	SERRANIDAE	Epinephelus costae	DD		DD
OSTEICHTHYES	PERCIFORMES	SERRANIDAE	Epinephelus haifensis	DD		DD
OSTEICHTHYES	PERCIFORMES	SERRANIDAE	Epinephelus marginatus	EN		EN

Class	Order	Family	Genus species	Mediterranean Regional Red List	Mediterranean Endemic	Global Red List
OSTEICHTHYES	PERCIFORMES	SERRANIDAE	Mycteroperca rubra	LC		LC
OSTEICHTHYES	PERCIFORMES	SERRANIDAE	Serranus atricauda	LC		
OSTEICHTHYES	PERCIFORMES	SERRANIDAE	Serranus cabrilla	LC		
OSTEICHTHYES	PERCIFORMES	SERRANIDAE	Serranus hepatus	LC		
OSTEICHTHYES	PERCIFORMES	SERRANIDAE	Serranus scriba	LC		
OSTEICHTHYES	PERCIFORMES	SPARIDAE	Boops boops	LC		
OSTEICHTHYES	PERCIFORMES	SPARIDAE	Dentex dentex	VU		
OSTEICHTHYES	PERCIFORMES	SPARIDAE	Dentex gibbosus	DD		
OSTEICHTHYES	PERCIFORMES	SPARIDAE	Dentex macrophthalmus	DD		
OSTEICHTHYES	PERCIFORMES	SPARIDAE	Dentex maroccanus	DD		
OSTEICHTHYES	PERCIFORMES	SPARIDAE	Diplodus annularis	LC		
OSTEICHTHYES	PERCIFORMES	SPARIDAE	Diplodus cervinus	DD		
OSTEICHTHYES	PERCIFORMES	SPARIDAE	Diplodus puntazzo	LC		
OSTEICHTHYES	PERCIFORMES	SPARIDAE	Diplodus sargus sargus	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	SPARIDAE	Diplodus vulgaris	LC		
OSTEICHTHYES	PERCIFORMES	SPARIDAE	Lithognathus mormyrus	LC		
OSTEICHTHYES	PERCIFORMES	SPARIDAE	Oblada melanura	LC		
OSTEICHTHYES	PERCIFORMES	SPARIDAE	Pagellus acarne	LC		
OSTEICHTHYES	PERCIFORMES	SPARIDAE	Pagellus bogaraveo	LC		
OSTEICHTHYES	PERCIFORMES	SPARIDAE	Pagellus erythrinus	LC		
OSTEICHTHYES	PERCIFORMES	SPARIDAE	Pagrus auriga	DD		
OSTEICHTHYES	PERCIFORMES	SPARIDAE	Pagrus caeruleostictus	DD		
OSTEICHTHYES	PERCIFORMES	SPARIDAE	Pagrus pagrus	LC		
OSTEICHTHYES	PERCIFORMES	SPARIDAE	Sarpa salpa	LC		
OSTEICHTHYES	PERCIFORMES	SPARIDAE	Sparus aurata	LC		
OSTEICHTHYES	PERCIFORMES	SPARIDAE	Spondyliosoma cantharus	LC		
OSTEICHTHYES	PERCIFORMES	SPHYRAENIDAE	Sphyraena sphyraena	LC		
OSTEICHTHYES	PERCIFORMES	SPHYRAENIDAE	Sphyraena viridensis	LC		
OSTEICHTHYES	PERCIFORMES	STROMATEIDAE	Stromateus fiatola	DD		
OSTEICHTHYES	PERCIFORMES	TETRAGONURIDAE	Tetragonurus cuvieri	LC		
OSTEICHTHYES	PERCIFORMES	TRACHINIDAE	Echiichthys vipera	LC		
OSTEICHTHYES	PERCIFORMES	TRACHINIDAE	Trachinus araneus	LC		
OSTEICHTHYES	PERCIFORMES	TRACHINIDAE	Trachinus draco	LC		
OSTEICHTHYES	PERCIFORMES	TRACHINIDAE	Trachinus radiatus	LC		
OSTEICHTHYES	PERCIFORMES	TRICHIURIDAE	Lepidopus caudatus	LC		
OSTEICHTHYES	PERCIFORMES	TRICHIURIDAE	Trichiurus lepturus	LC		
OSTEICHTHYES	PERCIFORMES	TRIPTERYGIIDAE	Tripterygion delaisi	LC		
OSTEICHTHYES	PERCIFORMES	TRIPTERYGIIDAE	Tripterygion melanurus	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	TRIPTERYGIIDAE	Tripterygion tripteronotus	LC	Endemic	LC
OSTEICHTHYES	PERCIFORMES	URANOSCOPIDAE	Uranoscopus scaber	LC		
OSTEICHTHYES	PERCIFORMES	XIPHIIDAE	Xiphias gladius	NT		
OSTEICHTHYES	PERCIFORMES	ZOARCIDAE	Melanostigma atlanticum	DD		
OSTEICHTHYES	PLEURONECTIFORMES	BOTHIDAE	Arnoglossus imperialis	LC		
OSTEICHTHYES	PLEURONECTIFORMES	BOTHIDAE	Arnoglossus kessleri	DD	Endemic	DD
OSTEICHTHYES	PLEURONECTIFORMES	BOTHIDAE	Arnoglossus laterna	LC		

Class	Order	Family	Genus species	Mediterranean Regional Red List	Mediterranean Endemic	Global Red List
OSTEICHTHYES	PLEURONECTIFORMES	BOTHIDAE	Arnoglossus rueppelii	LC		
OSTEICHTHYES	PLEURONECTIFORMES	BOTHIDAE	Arnoglossus thori	LC		
OSTEICHTHYES	PLEURONECTIFORMES	BOTHIDAE	Bothus podas	LC		
OSTEICHTHYES	PLEURONECTIFORMES	CITHARIDAE	Citharus linguatula	LC		
OSTEICHTHYES	PLEURONECTIFORMES	CYNOGLOSSIDAE	Symphurus ligulatus	LC		
OSTEICHTHYES	PLEURONECTIFORMES	CYNOGLOSSIDAE	Symphurus nigrescens	LC		
OSTEICHTHYES	PLEURONECTIFORMES	PLEURONECTIDAE	Platichthys flesus	NT		
OSTEICHTHYES	PLEURONECTIFORMES	PLEURONECTIDAE	Pleuronectes platessa	NT		
OSTEICHTHYES	PLEURONECTIFORMES	SCOPHTHALMIDAE	Lepidorhombus boscii	LC		
OSTEICHTHYES	PLEURONECTIFORMES	SCOPHTHALMIDAE	Lepidorhombus whiffiagonis	LC		
OSTEICHTHYES	PLEURONECTIFORMES	SCOPHTHALMIDAE	Psetta maxima	NT		
OSTEICHTHYES	PLEURONECTIFORMES	SCOPHTHALMIDAE	Scophthalmus rhombus	LC		
OSTEICHTHYES	PLEURONECTIFORMES	SCOPHTHALMIDAE	Zeugopterus regius	DD		
OSTEICHTHYES	PLEURONECTIFORMES	SOLEIDAE	Bathysolea profundicola	DD		
OSTEICHTHYES	PLEURONECTIFORMES	SOLEIDAE	Buglossidium luteum	LC		
OSTEICHTHYES	PLEURONECTIFORMES	SOLEIDAE	Dicologoglossa cuneata	DD		
OSTEICHTHYES	PLEURONECTIFORMES	SOLEIDAE	Microchirus azevia	LC		
OSTEICHTHYES	PLEURONECTIFORMES	SOLEIDAE	Microchirus ocellatus	LC		
OSTEICHTHYES	PLEURONECTIFORMES	SOLEIDAE	Microchirus variegatus	LC		
OSTEICHTHYES	PLEURONECTIFORMES	SOLEIDAE	Monochirus hispidus	DD		
OSTEICHTHYES	PLEURONECTIFORMES	SOLEIDAE	Pegusa impar	DD		
OSTEICHTHYES	PLEURONECTIFORMES	SOLEIDAE	Pegusa lascaris	DD		
OSTEICHTHYES	PLEURONECTIFORMES	SOLEIDAE	Solea aegyptiaca	LC	Endemic	LC
OSTEICHTHYES	PLEURONECTIFORMES	SOLEIDAE	Solea solea	LC		
OSTEICHTHYES	PLEURONECTIFORMES	SOLEIDAE	Synapturichthys kleinii	DD		
OSTEICHTHYES	SCORPAENIFORMES	COTTIDAE	Taurulus bubalis	DD		
OSTEICHTHYES	SCORPAENIFORMES	DACTYLOPTERIDAE	Dactylopterus volitans	LC		
OSTEICHTHYES	SCORPAENIFORMES	LIPARIDAE	Eutelichthys leptochirus	DD	Endemic	DD
OSTEICHTHYES	SCORPAENIFORMES	LIPARIDAE	Paraliparis murieli	DD	Endemic	DD
OSTEICHTHYES	SCORPAENIFORMES	PERISTEDIIDAE	Peristedion cataphractum	LC		
OSTEICHTHYES	SCORPAENIFORMES	SCORPAENIDAE	Pontinus kuhlii	DD		
OSTEICHTHYES	SCORPAENIFORMES	SCORPAENIDAE	Scorpaena elongata	LC		
OSTEICHTHYES	SCORPAENIFORMES	SCORPAENIDAE	Scorpaena loppei	LC		
OSTEICHTHYES	SCORPAENIFORMES	SCORPAENIDAE	Scorpaena maderensis	LC		
OSTEICHTHYES	SCORPAENIFORMES	SCORPAENIDAE	Scorpaena notata	LC		
OSTEICHTHYES	SCORPAENIFORMES	SCORPAENIDAE	Scorpaena porcus	LC		
OSTEICHTHYES	SCORPAENIFORMES	SCORPAENIDAE	Scorpaena scrofa	LC		
OSTEICHTHYES	SCORPAENIFORMES	SCORPAENIDAE	Scorpaenodes arenai	DD		
OSTEICHTHYES	SCORPAENIFORMES	SEBASTIDAE	Helicolenus dactylopterus	LC		
OSTEICHTHYES	SCORPAENIFORMES	TRIGLIDAE	Aspitrigla cuculus	LC		
OSTEICHTHYES	SCORPAENIFORMES	TRIGLIDAE	Chelidonichthys lastoviza	LC		
OSTEICHTHYES	SCORPAENIFORMES	TRIGLIDAE	Chelidonichthys lucernus	LC		
OSTEICHTHYES	SCORPAENIFORMES	TRIGLIDAE	Chelidonichthys obscurus	LC		
OSTEICHTHYES	SCORPAENIFORMES	TRIGLIDAE	Eutrigla gurnardus	LC		
OSTEICHTHYES	SCORPAENIFORMES	TRIGLIDAE	Lepidotrigla cavillone	LC		

Class	Order	Family	Genus species	Mediterranean Regional Red List	Mediterranean Endemic	Global Red List
OSTEICHTHYES	SCORPAENIFORMES	TRIGLIDAE	Lepidotrigla dieuzeidei	LC		
OSTEICHTHYES	SCORPAENIFORMES	TRIGLIDAE	Trigla lyra	LC		
OSTEICHTHYES	STOMIIFORMES	GONOSTOMATIDAE	Cyclothone braueri	LC		
OSTEICHTHYES	STOMIIFORMES	GONOSTOMATIDAE	Cyclothone microdon	LC		
OSTEICHTHYES	STOMIIFORMES	GONOSTOMATIDAE	Cyclothone pygmaea	LC	Endemic	LC
OSTEICHTHYES	STOMIIFORMES	GONOSTOMATIDAE	Gonostoma denudatum	DD		
OSTEICHTHYES	STOMIIFORMES	PHOSICHTHYIDAE	Ichthyococcus ovatus	LC		
OSTEICHTHYES	STOMIIFORMES	PHOSICHTHYIDAE	Vinciguerria attenuata	LC		
OSTEICHTHYES	STOMIIFORMES	PHOSICHTHYIDAE	Vinciguerria poweriae	LC		
OSTEICHTHYES	STOMIIFORMES	STERNOPTYCHIDAE	Argyropelecus hemigymnus	LC		
OSTEICHTHYES	STOMIIFORMES	STERNOPTYCHIDAE	Maurolicus muelleri	LC		
OSTEICHTHYES	STOMIIFORMES	STOMIIDAE	Bathophilus nigerrimus	LC		
OSTEICHTHYES	STOMIIFORMES	STOMIIDAE	Borostomias antarcticus	DD		
OSTEICHTHYES	STOMIIFORMES	STOMIIDAE	Chauliodus sloani	LC		
OSTEICHTHYES	STOMIIFORMES	STOMIIDAE	Stomias boa	LC		
OSTEICHTHYES	SYNGNATHIFORMES	CENTRISCIDAE	Macroramphosus scolopax	LC		
OSTEICHTHYES	SYNGNATHIFORMES	SYNGNATHIDAE	Hippocampus guttulatus	NT		DD
OSTEICHTHYES	SYNGNATHIFORMES	SYNGNATHIDAE	Hippocampus hippocampus	NT		DD
OSTEICHTHYES	SYNGNATHIFORMES	SYNGNATHIDAE	Nerophis maculatus	DD		
OSTEICHTHYES	SYNGNATHIFORMES	SYNGNATHIDAE	Nerophis ophidion	LC		
OSTEICHTHYES	SYNGNATHIFORMES	SYNGNATHIDAE	Syngnathus abaster	DD		LC
OSTEICHTHYES	SYNGNATHIFORMES	SYNGNATHIDAE	Syngnathus acus	NT		
OSTEICHTHYES	SYNGNATHIFORMES	SYNGNATHIDAE	Syngnathus phlegon	DD		
OSTEICHTHYES	SYNGNATHIFORMES	SYNGNATHIDAE	Syngnathus taenionotus	EN	Endemic	EN
OSTEICHTHYES	SYNGNATHIFORMES	SYNGNATHIDAE	Syngnathus tenuirostris	NT	Endemic	NT
OSTEICHTHYES	SYNGNATHIFORMES	SYNGNATHIDAE	Syngnathus typhle	NT		
OSTEICHTHYES	TETRAODONTIFORMES	MOLIDAE	Mola mola	DD		
OSTEICHTHYES	TETRAODONTIFORMES	MOLIDAE	Ranzania laevis	DD		
OSTEICHTHYES	TETRAODONTIFORMES	TETRAODONTIDAE	Ephippion guttifer	DD		
OSTEICHTHYES	TETRAODONTIFORMES	TETRAODONTIDAE	Lagocephalus lagocephalus	LC		
OSTEICHTHYES	ZEIFORMES	CAPROIDAE	Capros aper	LC		
OSTEICHTHYES	ZEIFORMES	ZEIDAE	Zeus faber	LC		

Appendix 2. Legally protected native Mediterranean marine fishes

CITES Convention on International Trade in Endangered Species of Wild Fauna and Flora (1975)	**Appendix I** ***Species threatened with extinction–trade permitted only in exceptional circumstances***	**Appendix II** ***Species not currently threatened with extinction but trade must be controlled in order to avoid utilization incompatible with the survival of the species***	**Appendix III** ***Species protected in at least one country, which has asked other CITES Parties for assistance in controlling trade***
		Basking shark *Cetorhinus maximus* White shark *Carcharodon carcharias* Seahorses *Hippocampus* spp.	
Bern Convention Convention on the Conservation of European Wildlife and Natural Habitats (1979)	**Appendix I** ***Strictly protected flora species***	**Appendix II** ***Strictly protected fauna species***	**Appendix III** ***Protected fauna species***
		White shark *Carcharodon carcharias* Basking shark *Cetorhinus maximus* Giant devil ray *Mobula mobular* Long-snouted seahorse *Hippocampus guttulatus* Short-snouted sea horse *Hippocampus hippocampus* Tortonese's goby *Pornatoschistus tortonesei*	Shortfin mako shark *Isurus oxyrinchus* Porbeagle shark *Lamna nasus* Blue shark *Prionace glauca* Angel shark *Squatina squatina* White skate *Raja alba* Dusky grouper *Epinephelus marginatus* Brown meagre *Sciaena umbra* Shi drum *Umbrina cirrosa* Common goby *Pomatoschistus microps* Sand goby *Pomatoschistus minutus* Tubenose goby *Proterorhinus marmoratus*

CMS or Bonn Convention Convention on the Conservation of Migratory Species of Wild Animals (1983)	**Appendix I** ***Strictly protected endangered migratory species***	**Appendix II** ***Migratory species with an unfavourable conservation status that would benefit from international cooperation***	
	White shark *Carcharodon carcharias* Basking shark *Cetorhinus maximus*	White shark *Carcharodon carcharias* Basking shark *Cetorhinus maximus* Shortfin mako shark *Isurus oxyrinchus* Porbeagle shark *Lamna nasus* Dogfish *Squalus acanthias*	
Barcelona Convention (Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean) (1976, amended in 1995) Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SAP-Bio) (1995)	**Annex I** ***Common criteria for the choice of marine and coastal areas that could be included in the SPAMI list***	**Annex II** ***List of endangered or threatened species***	**Annex III** ***List of species whose exploitation is regulated***
		White shark *Carcharodon carcharias* Basking shark *Cetorhinus maximus* Giant devil ray *Mobula mobular* Long-snouted seahorse *Hippocampus guttulatus* Short-snouted sea horse *Hippocampus hippocampus*	Shortfin mako shark *Isurus oxyrinchus* Porbeagle shark *Lamna nasus* Blue shark *Prionace glauca* Angel shark *Squatina squatina* Bluefin tuna *Thunnus thynnus* Swordfish *Xiphias gladius* White skate *Rostroraja alba* Dusky grouper *Epiephelus marginatus* Brown meagre *Sciaena umbra* Shi drum *Umbrina cirrosa*

IUCN – The Species Survival Commission

The Species Suvrvival Commission (SSC) is the largest of IUCN's six volunteer commissions, with a global membership of 8,000 experts. SSC advises IUCN and its members on the wide range of technical and scientific aspects of species conservation and is dedicated to securing a future for biodiversity. SSC has significant input into the international agreements dealing with biodiversity conservation.
www.iucn.org/ssc

IUCN – Species Programme

The IUCN Species Programme supports the activities of the IUCN Species Survival Commission and individual Specialist Groups, as well as implementing global species conservation initiatives. It is an integral part of the IUCN Secretariat and is managed from IUCN's international headquarters in Gland, Switzerland. The Species Programme includes a number of technical units covering Species Trade and Use, The IUCN Red List, Freshwater Biodiversity Assessment Initiative (all located in Cambridge, UK), and the Global Biodiversity Assessment Initiative (located in Washington DC, USA).
www.iucn.org/species

IUCN - Centre for Mediterranean Cooperation

The Centre was opened in October 2001 and is located in the offices of the Parque Tecnológico de Andalucía, in Malaga. IUCN has over 179 members in the Mediterranean region, including 15 governments. Its mission is to influence, encourage and assist Mediterranean societies to conserve and use sustainably the natural resources of the region.
www.iucn.org/mediterranean

IUCN Red List of Threatened Species™ – Regional Assessments

The Status and Distribution of Freshwater Biodiversity in Eastern Africa. Compiled by William R.T. Darwall, Kevin G. Smith, Thomas Lowe and Jean-Christophe Vié, 2005

The Status and Distribution of Freshwater Fish Endemic to the Mediterranean Basin. Compiled by Kevin G. Smith and William R.T. Darwall, 2006

The Status and Distribution of Reptiles and Amphibians of the Mediterranean Basin. Compiled by Neil Cox, Janice Chanson and Simon Stuart, 2006

The Status and Distribution of European Mammals. Compiled by Helen J. Temple and Andrew Terry, 2007

Overview of the Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea. Compiled by Rachel D. Cavanagh and Claudine Gibson, 2007

The Status and Distribution of Freshwater Biodiversity in Southern Africa. Compiled by William R.T. Darwall, Kevin G. Smith, Denis Tweddle and Paul Skelton, 2009

European Red List of Amphibians. Compiled by Helen J. Temple and Neil Cox, 2009

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The Status and Distribution of Mediterranean Mammals. Compiled by Helen J. Temple and Annabelle Cuttelod, 2009

The Status and Distribution of Dragonflies of the Mediterranean Basin. Compiled by Elisa Riservato, Jean-Pierre Boudot, Sonia Ferreira, Milos Jovic, Vincent J. Kalkman, Wolfgang Schneider and Boudjéma Samraoui, 2009

The Status and Distribution of Freshwater Biodiversity in North Africa. Compiled by Nieves Garcia, Annabelle Cuttelod, and Dania Abdul Malak, 2010.

European Red List of Butterflies. Compiled by Chris van Swaay, Sue Collins, Annabelle Cuttelod, Dirk Maes, Miguel López Munguira, Martina Šašić, Josef Settele, Teo Verstrael, Rudi Verovnik, Martin Warren, Martin Wiemers and Irma Wynhof, 2010

European Red List of Dragonflies. Compiled by Vincent J. Kalkman, Jean-Pierre Boudot, R. Bernard, Klaus-Jürgen Conze, Geert De Knijf, Elena Dyatlova, Sonia Ferreira, Miloš Jović, Jürgen Ott, Elisa Riservato and Göran Sahlén, 2010.

European Red List of Saproxylic Beetles. Compiled by Ana Nieto and Keith N.A. Alexander, 2010

THE IUCN RED LIST
OF THREATENED SPECIES ™

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