WWF

REPORT

2019

# SHARKS IN CRISIS:

## A CALL TO ACTION FOR THE MEDITERRANEAN

# ACKNOWLEDGEMENTS

Written and edited by WWF Mediterranean Marine Initiative / Evan Jeffries (*www.swim2birds.co.uk*), based on data contained in: Bartolí, A., Polti, S., Niedermüller, S.K. & García, R. 2018. Sharks in the Mediterranean: A review of the literature on the current state of scientific knowledge, conservation measures and management policies and instruments.

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Front cover photo: Blue shark (*Prionace glauca*)
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WWF is one of the world's largest and most respected independent conservation organizations, with more than 5 million supporters and a global network active in over 100 countries. WWF's mission is to stop the degradation of the Earth's natural environment and to build a future in which humans live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.



# CONTENTS

# SHARKS AND RAYS IN CRISIS

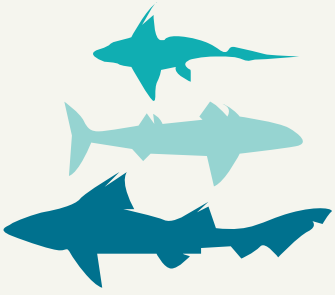
**Humans and sharks have a relationship stretching back into ancient history. This is particularly clear in the Mediterranean, where sharks were traded and consumed more than 4,000 years ago in the Chalcolithic era and during the Bronze Age. Culturally they've been significant for thousands of years, and even appear in the schemes of the mythological Greek gods.[1]**

Times have changed, but sharks are as important as ever. As well as playing vital roles in the ecosystem they're an indicator for the overall state of the marine environment – and in the Mediterranean, a full-blown crisis is unfolding.

Nearly 80% of assessed fish stocks in the region are overexploited, and serious action needs to be taken to improve fisheries management right across the region to preserve resources for future generations. As for sharks and the wider chondrichthyan class, the situation is even worse.

Sharks and rays play crucial and diverse roles in the Mediterranean, from apex predators which keep the food pyramid steady, to rays which support the complexity of sea-bottom ecosystems, to devil rays which transfer nutrients and energy from the deep to surface levels of the ocean. They need to be managed as carefully as any other fisheries resource – and this need has never been more acute than it is today.

**80+**
**SPECIES**



## CONSERVATION STATUS: FROM BAD TO WORSE

The Mediterranean Sea is a biodiversity hotspot for chondrichthyans – more than 80 species have been described there. According to the latest list from the International Union for the Conservation of Nature (IUCN), there are currently 73 species living in its waters – and more than half are under threat.

### THE CHONDRICHTHYAN CLASS

Chondrichthyan is the class of cartilaginous fishes which comprises sharks, rays, skates and chimeras. The first three groups are part of the elasmobranch subclass, while the last is the only surviving group in the holocephali subclass. There are just two species of chimera found in the Mediterranean: the rabbit fish (*Chimaera monstrosa*), and – found for the first time only recently – the large-eyed rabbit fish (*Hydrolagus mirabilis*), which comes in from Atlantic waters.

What's particularly worrying is that the situation in the Mediterranean appears to be getting worse, not better. When the IUCN carried out an assessment in 2007, it found that 43% of chondrichthyans were threatened.[2] Despite the warnings and management efforts that followed, the latest assessment report almost 10 years later showed no genuine improvement for any of the species assessed, while the situation worsened by at least one Red List Category for 11 species.[3]

# SHARKS UNDER THREAT IN THE MEDITERRANEAN – THE IUCN RED LIST

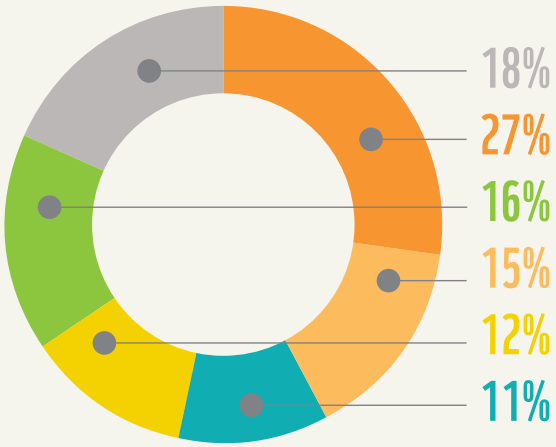



***Figure 1:*** *IUCN Red List figures for the Mediterranean, showing shark and ray species at risk of extinction - more than half are severely threatened.*

## KEY

- Critically endangered: 20 species
- Endangered: 11 species
- Vulnerable: 8 species
- Near threatened: 9 species
- Least concern: 12 species
- Data deficient: 13 species

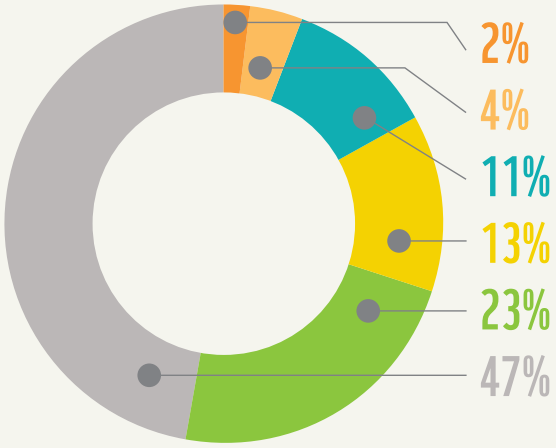



***Figure 2:*** *IUCN Red List figures for shark and ray species globally. The relative percentages highlight how serious the situation is in the Mediterranean.*

## KEY

- Critically endangered: 25 species
- Endangered: 43 species
- Vulnerable: 113 species
- Near threatened: 129 species
- Least concern: 229 species
- Data deficient: 465 species

Twenty Mediterranean species are classed as Critically Endangered, which means they face an extremely high risk of extinction in the wild. This is far worse than the broader global figures for species which there's enough data to assess. And when we compare these current figures to the previous assessment,[4] the downward trend in the Mediterranean is clear.

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## THE COMMON GUITARFISH

The common guitarfish (*Rhinobatos rhinobatos*) is listed as 'Endangered' in the region, and has completely disappeared from the Northern Mediterranean – yet it's the target of an unmanaged fishery in Tunisia, where there's a high risk of under-reported catches.[5] This underlines the importance of creating and implementing management plans that cover the whole Mediterranean region.

***Figure 3:*** *Despite their diversity, K-selection characterizes the life cycles of most shark and ray species.*

## K-SELECTION: THE SHARK STRATEGY

Most sharks and rays show what's known as a 'K-selected' life history. In basic terms, this means they focus on quality of offspring rather than quantity, taking their time to become efficient competitors for resources, living in stable populations. They're slow-growing, late to mature, reach a large body size, have long gestation periods, and produce few young (from two pups for the bigeye thresher to 135 for the blue shark).

On the positive side, this means they tend to have naturally high survival rates, and live for a long time. The negative, though, is that many species struggle to recover from population declines – a few years of overfishing, for example, can quickly decimate stocks which then fail to regenerate.[6] This is a trend visible for sharks and other chondrichthyans all over the Mediterranean.

However, new research shows that some shark populations could be fished sustainably, and that proper fisheries management might in fact be the best solution rather than simplified bans that fail to prevent mortalities from bycatch. Adequate data, controls, monitoring, transparency and traceability and long-term fisheries management are prerequisites for potential sustainable fisheries.[7]

# OVERFISHING: SHARK AND RAY BYCATCH

**The single biggest threat to shark and ray populations in the Mediterranean is overfishing.[8] Overfishing is rife in the Mediterranean, with almost 80 % of all assessed stocks regarded as overexploited.**

Unlike most other overfished species, though, sharks and rays are often not the intended target of the fishers who catch them: whether or not they find their way to market, technically speaking many of them are simply bycatch. Nevertheless, decreasing catches of other target species may well lead to fishers looking to land more sharks to supplement their diminishing returns. On the market, many consumers are unaware that some of the cheap seafood they're buying – that they think is swordfish, for example – is actually shark or ray.

## BYCATCH AND DISCARDS

Bycatch is the part of the catch that's 'unintentionally' captured during a fishing operation, in addition to target species. It can refer to other commercial species that are landed, commercial species that aren't landed (e.g. undersized, damaged etc), non-commercial species, or endangered, vulnerable or rare species (e.g. sea turtles, marine mammals, sharks etc).[9] Any part of the catch thrown back into the sea – whether or not the animals survive, and they often don't – is called 'discards'.

Large numbers of sharks and rays are caught as bycatch right across the Mediterranean, in many different fisheries and gear types, from surface longlines to bottom trawls. Some are kept on board and (often illegally) sold, others are discarded – this varies widely depending on fishers' strategies and their local market demand.[10]

There are also some seasonal small-scale fisheries that target sharks and rays – as catches of other species diminish in the Mediterranean, there may be an increasing regional shift towards deliberately targeting sharks and rays that would previously have been treated as bycatch species.


SPOTTED CATSHARK

## BYCATCH: VARYING VALUE

In the Balearic Islands a study found that 60% by weight of small-spotted catshark (*Scyliorhinus canicula*) caught were landed,[11] while a few hundred miles east in the central Aegean the same species was hardly commercialized.[12]

However, since catches classified as bycatch and discards are rarely included in national or international statistics, their overall extent and impact are hard to quantify accurately.

## TRAWLS

Trawling captures more fish in the Mediterranean than any other form of fishing, practised by about 10% of the fleet but bringing in just over 50% of the landed catch.[13] It also has the most negative impacts, including catching juvenile fish, damaging the seabed, and generating a high level of discards.[14]

**OVER 60 SPECIES OF SHARKS AND RAYS HAVE BEEN RECORDED IN TRAWL CATCHES**

Almost all the shark and ray species in the region can potentially be caught by both pelagic and bottom trawlers – 62 species have been recorded in trawl catches in Greece, 62 in Catalonia (Spain) and 74 in Italy. Bottom trawl catches were dominated by the blackmouth catshark (*Galeus melastomus*), the velvet belly (*Etmopterus spinax*) and the small-spotted catshark (*Scyliorhinus canicula*), as well as various smooth-hounds (*Mustelus* spp) and skates (*Rajidae* spp).[15]

### TRAWL DISCARDS

**Ikernderun Bay, Turkey:** shark and ray species made up 51% of the biomass of trawl discards – of these, the spiny butterfly ray (*Gymnura altavela)* made up 49%, and the common stingray (*Dasyatis pastinaca*) made up 32%.[16]

**Central Aegean, Greece:** 60% of shark and ray catches (including 30 different species – 13 sharks 16 rays, 1 chimera) came from bottom trawl fisheries targeting more valuable species. A large proportion – 93% by number, 64% by weight – were discarded.[17]

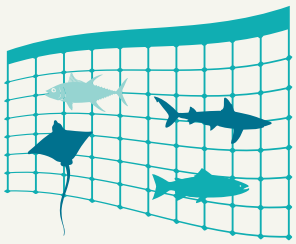
Pelagic species are also sometimes caught in trawls, mostly in the Adriatic. These include the common thresher shark (*Alopias vulpinus*), blue shark (*Prionace glauca*), white shark (*Carcharodon carcharias*), shortfin mako (*Isurus oxyrinchus*) and – occasionally – the basking shark (*Cetorhinus maximus*). Rays such as the common eagle ray (*Myliobatis aquila*) and giant devil ray (*Mobula mobular*) are also affected.[18]

## LONGLINES

Mediterranean fishers use surface longlines to catch highly prized tuna and swordfish – but at least 15 shark and ray species are found among the bycatch, making up 10-15% of the total biomass captured.[19] In the Alboran Sea, more than a third of the entire longline catch was of sharks and rays.[20]

**BLUE SHARKS MAKE UP MORE THAN 70% OF SURFACE LONGLINE BYCATCH**

The blue shark (*Prionace glauca*), listed as critically endangered in the Mediterranean, makes up more than 70% of reported surface longline shark bycatch, followed by the shortfin mako (*Isurus oxyrinchus*), another critically endangered species. Other species commonly caught on longlines include thresher (*Alopias vulpinus*), tope (*Galeorhinus galeus*) and porbeagle (*Lamna nasus*).[21]



## DRIFTNETS

Driftnets – passive nets targeting pelagic species – were banned from the Mediterranean by the EU and ICCAT in 2002 and 2003 respectively; yet it appears that they continue to be used illegally across the region by countries including France, Italy, Turkey, Algeria, Albania and Morocco.[22]

**DRIFTNETS CAN BE RESPONSIBLE FOR ENORMOUS BYCATCHES**

Driftnets can be responsible for enormous bycatches. In just one year, it's estimated that the Moroccan driftnet fleet caught 20,000-25,000 pelagic sharks in the Alboran Sea, and 62,000-92,000 around the Strait of Gibraltar.[23]

Blue sharks (*Prionace glauca*), thresher sharks (*Alopias vulpinus*), pelagic stingrays (*Pteroplatytrygon violacea*) and even basking sharks (*Cetorhinus maximus*) are known to be caught in driftnets. In addition, until they officially stopped being used in 2011, the pelagic gillnets (driftnets) of the Turkish swordfish fleet in the Aegean Sea were a major threat to the survival of the giant devil ray (*Mobula mobular*).[24]

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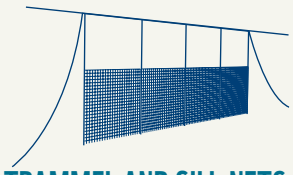

## TRAMMEL NETS AND GILLNETS

Small-scale vessels make up 83% of the Mediterranean fishing fleet, and fixed nets such as trammel and gill-nets are their most common gear.[25]

**TRAMMEL AND GILL-NETS ARE THE MOST COMMON FISHING GEAR IN THE MEDITERRANEAN**

Although less destructive than trawl fisheries, trammel and gill-nets still take a heavy toll on sharks and rays in the Mediterranean: in the Balearic Islands, 10 shark and two ray species made up 28% of the catch biomass; almost half of this was the common stingray (*Dasyatis pastinaca*).[26] In the Aegean, sharks and rays – mostly skate species (*Rajidae*) – represented 6-10% of the total catch by weight.[27]

Trammel nets also have an impact on endangered species: one study showed they were responsible for 30% of basking shark (*Cetorhinus maximus*) catches reported in the Mediterranean.[28]

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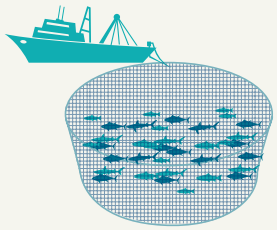

## PURSE SEINE

From the biggest species like bluefin tuna down to tiny anchovies, purse seines are used to catch many pelagics in the Mediterranean. Data on shark and ray bycatch is scarce, but it does occur.

**70% OF REPORTED CATCHES OF WHITE SHARKS ARE FROM PURSE SEINE USAGE**

In the central Mediterranean, purse seines are responsible for more than 70% of reported catches of critically endangered white sharks (*Carcharodon carcharias*). Shortfin mako (*Isurus oxyrinchus*), basking shark (*Cetorhinus maximus*) and common thresher (*Alopias vulpinus*) have also been reported.[29] In addition, there are reports of a targeted fishery on giant devil rays (*Mobula mobular*), which are endangered and protected.

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## THE MEDITERRANEAN GREAT WHITE SHARK

The presence of great white sharks in the Mediterranean would come as a surprise to many, but there are continuous records of *Carcharodon carcharias* in the region dating back as far as the year 476 AD.

Not much is known about them but scientists suspect that the ancestors of the Mediterranean white sharks were rather Australian immigrants than originating from the closer Atlantic and Indian Ocean. The population also shows little genetic diversity, making the Mediterranean white sharks extremely vulnerable to extinction. The potential nurseries in the Strait of Sicily, the Adriatic and the Aegean urgently need management to conserve this unique apex predator for the Mediterranean ecosystem – though the priority is to demonstrate the nurseries exist.

Recently there have been citizen reports of great white sharks being caught in purse seines in Tunisia, with one 750kg female apparently being marketed for €1,200. A baby specimen was also reported on a fish market in Sicily during the summer of 2018. Three juvenile great whites were reported to have been caught as bycatch in the coastal waters of the Turkish Aegean. However, similar-looking species like the mako may be responsible for some mistaken reports of the great white.[30]

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## SHARK FISHERIES

Historically, around 15 shark and ray species were deliberately targeted in the Mediterranean – but some, like angelsharks (*Squatina* spp.), have become commercially extinct and are now critically endangered.[31] Today just a few target fisheries persist in the Adriatic and in the Gulf of Gabes, Tunisia, where small-scale gillnetting vessels target smooth-hounds (*Mustelus* spp.), dogfish sharks (*Squalus* spp.), sandbar sharks (*Carcharhinus plumbeus*) and guitarfishes (*Rhinobatos* spp.).

This situation may change due to the growing regulation of tuna and swordfish fisheries – there's concern that pelagic sharks are increasingly being seen as alternative targets.[32]

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## RECREATIONAL FISHERIES

The impact of recreational fishing in the Mediterranean should not be underestimated: anecdotal evidence points to significant catches overall, but reliable data is scarce.[33] It affects about 20% of all shark and ray species.[34] A study analysing coastal areas in Spain, Italy, Turkey and France found that recreational fishers caught at least four currently endangered species – the thresher shark (*Alopias vulpinus*), common smoothhound (*Mustelus mustelus*), blue shark (*Prionace glauca*) and sawback angelshark (*Squatina aculeata*).[35]

Unlike in other parts of the world, most recreational fishing in the Mediterranean targets species for human consumption[36] – therefore catch and release is not common.[37]

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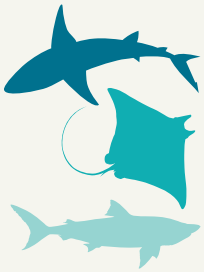
## FINNING – ENCOURAGING SIGNS

Worldwide, the greatest threat to shark populations is unregulated fishing. In many of the problematic fisheries so-called 'finning' is practiced– cutting the fins off captured sharks then throwing the shark back into the sea to die. The fins are sold in lucrative Asian markets to make shark-fin soup.Upper estimates suggest that as many as 73 million sharks are killed for the high demand of shark products each year.

This, though, is one area where authorities in the Mediterranean have made significant progress in recent years: in 2018, the General Fisheries Council for the Mediterranean (GFCM) put in place a regulation stating that all sharks must be landed with their fins naturally attached to their bodies. This complete ban on at-sea removal of shark fins closes previous loopholes which made partial bans much harder to enforce. It's now hoped that the International Commission for the Conservation of Atlantic Tunas (ICCAT) will follow suit and redraft its own anti-finning regulations on the same terms.

# BROADER THREATS



THEIR SLOW DEVELOPMENT MEANS THAT SHARKS AND RAYS ADAPT BADLY TO HABITAT CHANGE

## HUMAN ACTIVITIES AND HABITAT DEGRADATION

The Mediterranean is one of the most highly valued seas in the world, but for decades its marine environment has been under intense pressure from poorly-planned development, mass tourism, pollution and overfishing.[38]

Dense coastal populations and the sheer number of tourists in the region directly disturb marine biodiversity. Along with other factors this has a direct impact on critical habitats,[39] which can in turn change species abundance and distribution. Their slow development means that sharks and rays are especially badly adapted to withstand rapid habitat change resulting from human activity: while habitat requirements vary for different species during different lifecycle stages, the habitats all need to function properly to maintain the growth, reproduction, feeding and other needs of shark and ray populations.[40]

With the acceleration of coastal habitat loss and degradation due to rapid development, vital inshore nursery grounds – both estuarine and freshwater – are under particular pressure in the Mediterranean.[41]

Increased coastal fishing activity isn't helping either. As well as the direct pressure it exerts on populations, bottom trawling mechanically destroys sea floor habitats.[42] Ghost fishing from lost or abandoned gear is a direct issue for sharks and rays, which may in addition be indirectly harmed by ingesting debris from ghost gear.[43]

The sea floor is also severely impacted by deep-sea mining and oil drilling, degrading and destroying habitats that shark populations rely on. The issue is made worse by potential oil spills.[44]

## POLLUTION

As long-living apex predators, sharks and rays are prone to accumulating high levels of pollutants in their bodies[45]– and in the small and relatively enclosed Mediterranean, pollutants are a serious problem. Historically the Mediterranean has been used as a dumping ground for all kinds of substances, while receiving run-off containing heavy metals, pesticides and other products: many of these pollutants find their way into resident wildlife.

HIGH MERCURY CONCENTRATIONS HAVE BEEN FOUND IN MEDITERRANEAN SHARKS

High mercury concentrations have been found in Mediterranean sharks including the spiny dogfish (*Squalus acanthias*);[46] while studies have detected pesticide residues in species ranging from the gulper shark (*Centrophorus granulosus*) and longnose spurdog (*Squalus blainvillei*)[47] to the blue shark (*Prionace glauca*) and kitefin shark (*Dalatias licha*).[48]

However, while contaminated habitats and bioaccumulated pollutants clearly have some negative impact on the health and productivity of sharks and rays, little information currently exists on the detail, or the consequences for the overall dynamics of the marine food web.

This is in fact an issue that extends beyond the marine food web: high levels of pollutants in shark meat when it's sold also pose a potential risk to human health. Clearly this is an area that needs further careful research.



## PLASTIC

The issue of plastic in the oceans has come to the fore in recent years – and it is affecting sharks too. A recent study of blue sharks (*Prionace glauca*, pictured above) found that more than a quarter of the individuals tested had ingested plastic,[49] while sharks and rays can also get entangled in plastic debris like other marine animals.[50]

As demonstrated by WWF, the Mediterranean is one of the world's most plastic-polluted seas. Record levels of plastic pollution, especially microplastics, impact marine species as well as human health. You can read the report at 🔗 www.wwfmmi.org/what_we_do/plastic

## GHOST GEAR

Lost, abandoned or discarded fishing gear is a major concern – animals of all kinds, including sharks and rays, get entangled in it and die. This is known as 'ghost fishing' – it's know to be a deadly problem in the Mediterranean, but it's particularly difficult to monitor so there's a lack of data on its real impact on shark and ray species.[51]

# REDUCING THE PRESSURE: BYCATCH MITIGATION

**As the Mediterranean's waters become more developed and polluted, as fish stocks continue to be overexploited and food chains disrupted, and as the effects of climate change continue to make themselves felt, depleted species face an increasing struggle to survive: for sharks and rays, the worsening figures from the IUCN tell their own story.**

The importance of maintaining resilient species populations in challenging conditions is clear – and in the case of sharks and rays the most effective way of preserving them is to radically reduce the huge numbers killed across the region as bycatch.

The need for action on bycatch was clear more than a decade ago,[52] but unfortunately it's not a subject with a single simple solution. A number of factors influence bycatch mortality, including fisheries strategy, species, gear type, gear deployment conditions and handling at the vessel.

Given the amount of shark and ray bycatch that ends up being landed and sold, it's also important to consider the economic perspective of vessel skippers – their cooperation is an essential part of any bycatch mitigation strategy. Some suggest that observers on board or electronic monitoring might benefit overall compliance and animal handling, as well as allowing for species-specific identification and improved data collection to help fisheries management.[53]

## SUSTAINABLE FISHING STRATEGIES

### LOCATIONS TO AVOID

Certain areas of the Mediterranean are particularly important shark grounds or routes, and an obvious way of reducing bycatch is to avoid those areas – but spatial management is badly hindered by the relative lack of data. Better data collection will enable better ocean mapping.

Fisheries might struggle to avoid areas where sharks gather if they overlap with aggregation areas for target species such as tunas or swordfish[54] – but there are some locations where anecdotal reports from fishers describe infrequent yet high concentrations of sharks, suggesting mating, pupping or nursery grounds.[55] Better scientific information on these areas and events would help fishers avoid unwanted shark bycatch.

## CRITICAL HABITATS TO CONSERVE

There's an urgent need to identify critical shark and ray habitats around the Mediterranean, such as breeding areas, nursery areas, mating areas, aggregation areas and foraging areas, so measures can be taken to conserve them.

Some important known areas include the Gulf of Gabès,[56] the strait of Sicily,[57] the Gulf of Lion,[58] the Adriatic,[59] parts of the Aegan Sea, and the Gulf of Cadiz to the Alboran Sea.

As a nursery ground for sandbar sharks (*Carcharhinus plumbeus*), Boncuk Cove is one of the Fisheries Restricted Areas (FRA) in Turkey's Gokova MPA.[60,61] Sandbar sharks are present there year-round. Sandbar sharks also aggregate in Hadera, Israel, apparently attracted by warm water outflows from coastal power plants.[62]

## TIME AND DEPTH FACTORS TO CONSIDER

Whatever fishing gear is used, time and depth are factors to consider in avoiding shark bycatch – and they're often species-specific. For example, blue sharks (*Prionace glauca*) range throughout the epipelagic and mesopelagic zones (0-1,000m depth), while thresher sharks (*Alopias* spp.) are found at depth during the day but forage near the surface at night.[63]

A study in the Pacific showed that deep daytime sets reduced bycatch of both sharks and turtles, although they increased turtle haulback mortality. Trade-offs may also come as different populations are impacted by mitigation attempts: fishing in a different season might almost eliminate the bycatch of one shark species, but drastically increase bycatch of another.[64] In the same way, altering bait or hooks to mitigate one bycatch species may reduce the catch of target species or increase the catch of other endangered species.[65] Generally, C-hooks baited with fish will catch more sharks and J-hooks baited with squid will catch more turtles.[66]

Obviously, soak time is an important factor in the condition of animals that are hauled in as bycatch, and will influence their survival chances after release.[67]

# GEAR MODIFICATIONS

## LONGLINES

Efforts to reduce the bycatch of sharks by longline have produced mixed results, reflecting the complexity of the factors involved.

Hook shape is a controversial question. Circle hooks have a reputation for reducing bycatch, but a meta-analysis of studies found no significant difference in catch rates for sharks – however, circle hooks did appear to reduce at-vessel mortality.[68] Studies in the Pacific, meanwhile, suggest that hook size may be even more important than hook shape.[69]

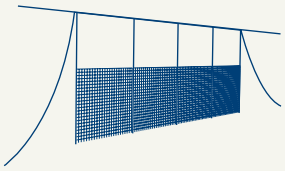
Whether a wire or nylon leader is used on the line is also not a simple question. Wire leaders have been shown to catch more sharks, but if it's assumed that bite-offs with nylon leaders could also be sharks then the difference in catchability disappears – and if sharks that bite off nylon leaders have been hooked in the gut, mortality rates could be higher than estimated.[70]

The key point for reducing bycatch in any longline operation is to prepare a set and strategy geared to the fishery type and location,[71] taking into account all the variables: fishery-specific assessments are needed to determine and manage the relative risks.[72]

## TRAWLS

Trawls produce the second largest shark bycatch in the Mediterranean – and in many fisheries, most of the sharks are discarded.[73] Considering the high mortality of trawl discards, the best solution would be to prevent sharks entering nets in the first place. However, trials of so-called bycatch reduction devices (BRDs) are only at the experimental stage,[74] and studies on their effectiveness are inconclusive.

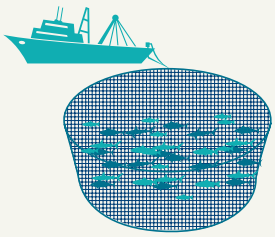
The use of tickler chains in the ground gear of the trawl increases the catch of sharks and rays, while the duration of the tow and deck-time influence at-vessel mortality.



## GILLNETS AND TRAMMELS

Gillnets and trammels can take a significant bycatch of sharks, and mortality is typically very high.[75] In the Mediterranean the gear is a particular threat to basking sharks (*Cetorhinus maximus*),[76] and incidental catches of juvenile white sharks (*Carcharodon carcharias*) have been reported.[77] A recent project trialled a sensorized trammelnet which would detect this unwanted bycatch species and sound an alarm to the fishers,[78] but the results aren't yet publicly available.

There are several other net bycatch mitigation measures which could be tried, but none have yet been tested in commercial fisheries. These include mesh size restrictions, temporal restrictions, restricted net lengths, limiting soak time, changes to mesh size, net hanging ratio and height, and modifying the thickness and colour of netting material.[79]



## PURSE SEINES

Purse seines are responsible for 70% of the white shark (*Carcharodon carcharias*) bycatch in the Ionian Sea, and also catch shortfin makos (*Isurus oxyrinchus*), basking sharks (*Cetorhinus maximus*), common threshers (*Alopias vulpinus*) and stingrays.[80] There have been reports of high bycatch mortality (>90%) where no procedures or handling methods are in place.[81] However, little is known about efforts to mitigate purse seine bycatch of sharks and rays in the Mediterranean.[82]

Internationally, a guidebook for skippers has been produced which includes guidelines for shark bycatch mitigation in purse seines.[83] However, differences in fishery techniques and bycatch species mean the guidelines would need to be adapted for use in the Mediterranean region.

## RECREATIONAL FISHERIES

Outside the commercial fleet, recreational fishers have a role to play too – it's important for authorities to understand their behaviour. In fishing terms, proper use of dehooking devices and C-hooks to avoid deep hooking can improve post-release mortality – but recreational fishers can also act as citizen scientists in conservation and management efforts, helping collect data on the shark and ray species they catch.[84]

A number of guides have been issued in the region to aid identification, and some highlight protected species.[85]

## DISCARDS: MORTALITY AND POST-RELEASE SURVIVAL

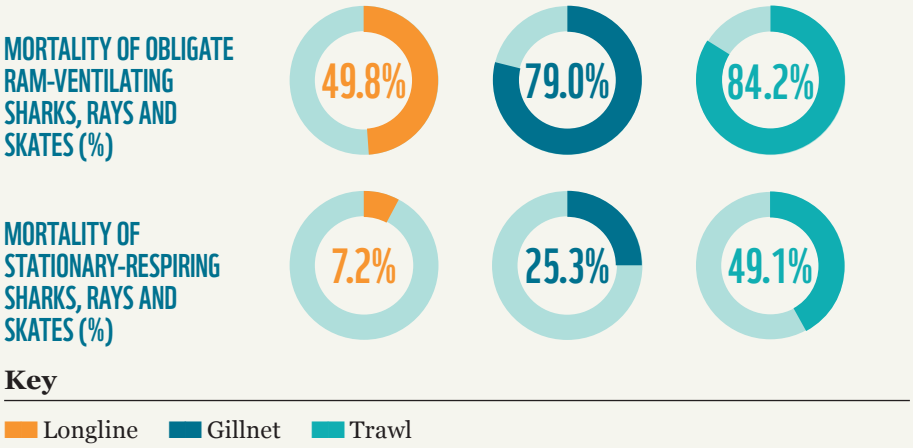
To get a full picture of the impact of discarded shark and ray bycatch on stocks and biodiversity, we need to understand their survival chances post release. Unfortunately, the current lack of research on the subject was highlighted when a recent literature review[86] included only one study located in the Mediterranean.[87]

Other studies have, however, provided useful material on reducing post-release mortality. Hooking location has a major effect – in one study the vast majority of blue sharks (*Prionace glauca*) that swallowed the hook were injured or dead, while almost all the healthy ones were hooked in the mouth – of the latter, none at all died after release.[88]

## SPECIES-SPECIFIC FACTORS

There are clear differences between species in terms of their 'hardiness', with some showing inherent vulnerability to capture stress.[89] Size and gender are also relevant, with smaller individuals and males being less resistant to stress and showing high post-release mortality.[90] One study indicated that for blue sharks (*Prionace glauca*), a common Mediterranean bycatch species, size was the most important factor determining haulback mortality.[91]

The respiration mode of the species also makes a big difference to discard mortality levels. Obligate ram-ventilating species (which need to maintain forward motion) fare much worse than stationary-respiring species, as a recent study of discard mortality (both immediate and post-release) across different gears shows.[92]




## HANDLING

Once an animal is brought to the vessel, correct handling is a very important factor in its chances of post-release survival.[93] It's critical that fishers are aware of legislation requiring them to release certain Mediterranean species unharmed, and that they're aware of bycatch mitigation and shark handling guidelines – these have been produced internationally[94] and also specifically for the Mediterranean.[95]

## FACTORS THAT HELP REDUCE BYCATCH MORTALITY

- Gear adaptation:
  - Longlines – hook type to reduce probability of gut hooking (but risk of increased shark bycatch must be assessed)
  - Trawls – removal of tickler chains, use of bycatch reduction devices (needs further study)
  - Trawls/gillnets – adapted mesh size/material to prevent trauma from getting caught in mesh
- Reduction of soak/trawl time
- Species-specific gear depth sets
- Longline fishery time/location risk assessments to inform setting strategy
- Reduction of time bycatch spends on deck and/or at vessel
- Proper handling by vessel crew



## WWW.BYCATCH.ORG

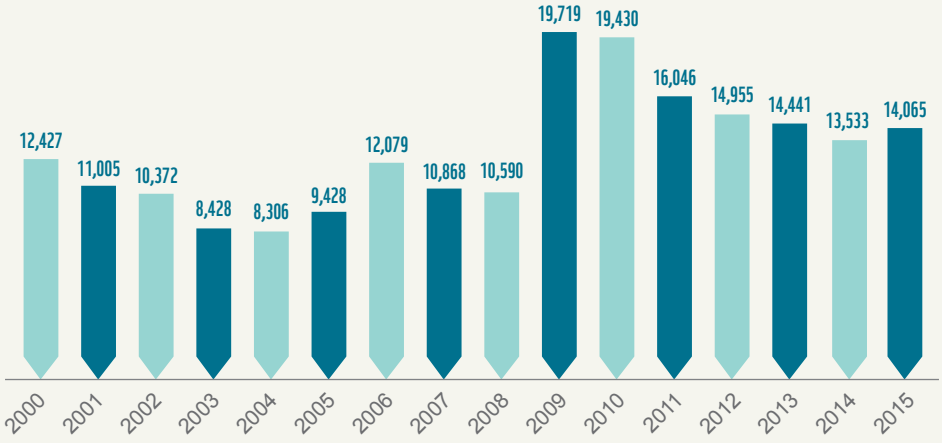
An online hub aimed at reducing wildlife bycatch – including sharks – has recently been launched. While it brings together a great deal of information and is useful for a wide range of stakeholders, the current content on the site illustrates the scarcity of studies on shark and ray bycatch in the Mediterranean, and underlines the need for further research.[96]

# MARKETS

## REPORTED SHARK AND RAY CATCHES

From 2000-2008 shark and ray catches in the Mediterranean stood at a relatively stable 8,000-12,000 tonnes. They peaked in 2009-2010, with catches of nearly 20,000 tonnes, before slowly decreasing to 14,000 tonnes in 2015.

***Figure 4:*** *Mediterranean shark catches reported to FAO 2000-2015 (tonnes)*




As for the countries catching them, two countries stand way ahead of the others: Libya (4,260 tonnes) and Tunisia (4,161 tonnes) report around three times as much as Italy (1,347 tonnes) and Egypt (1,141 tonnes), next on the list.

***Figure 5:*** *2015 Chondrichthyes* reported catches by country (tonnes) (FAO)*

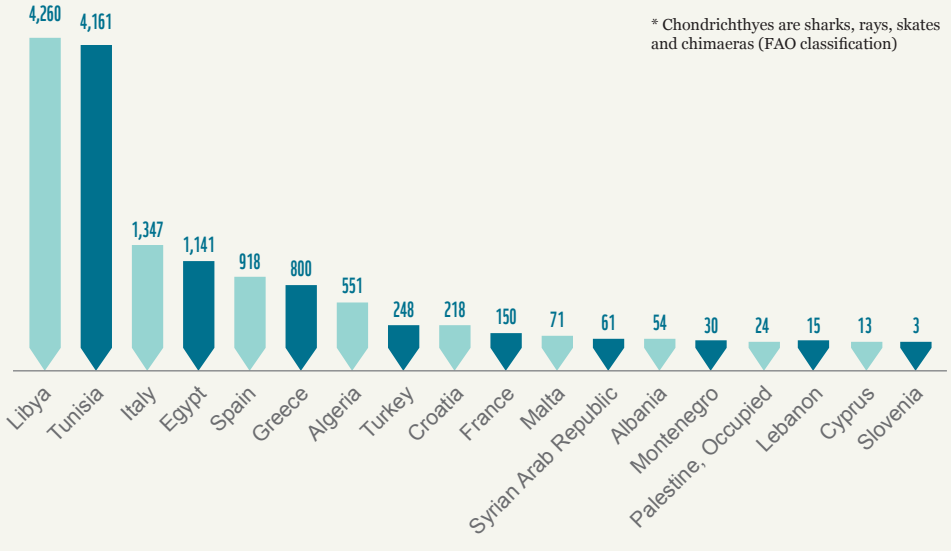
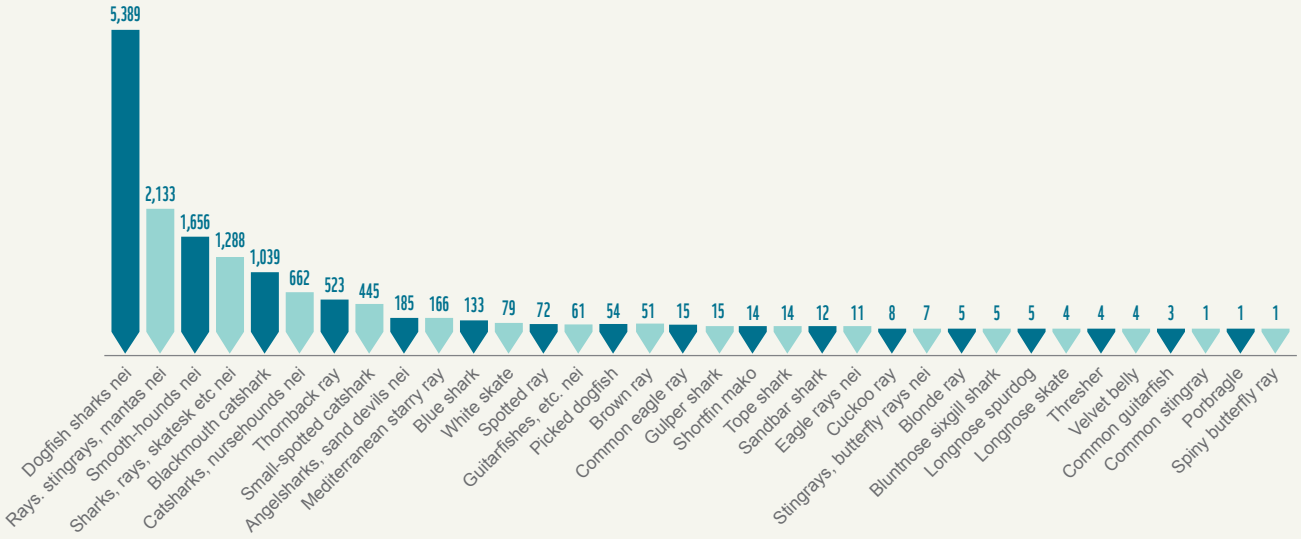


***Figure 6:*** *2015 reported catches per species/category (tonnes) (FAO)*




The catch was reported under 34 possible FAO categories of cartilaginous fishes. Nine of these are species groups, some as wide as 'Sharks, rays, skates, et. nei' Since the aggregated categories make up more than 80% of the total catch, this shows how much information is still needed on individual species to achieve adequate management of the fisheries.

What's more, whereas some countries (e.g. Spain) report their catch in many different categories, others (e.g. Egypt) simply report a single 'shark and ray' category. This means the overall quality of the species catch data is poor, and masks catches of elasmobranchs: in fact 97% of sharks and rays caught in the region are not reported by species, consistently undermining management efforts.[97]

What this data also shows is that prohibited species (under the binding recommendation GFCM/42/2018/2) are regularly captured. These include white skate, tope, shortfin mako, common guitarfish and other guitarfish species, giant devil ray, spiny butterfly ray, porbeagle, and angel shark species.

## SHARK AND RAY TRADE

The FAO collects import and export figures for shark and ray products in Mediterranean basin countries, but many areas of detail are lacking. Most obviously there's no information on the origin of the products, so they could come from anywhere in the world where a nation's fleet has a presence. There's also only one species category in the database (porbeagle, a protected species), and two aggregated species categories ('dogfish (*Squalidae*)' and 'catsharks, nursehounds'). The two other categories are very broad – 'sharks nei' or 'rays and skates'.

On the level of products, either there is no category except those listed above, or they fall under one of 'fillets' or 'fins'. Shark fins are never identified by species, which doesn't help managing control and enforcement. The most prominent feature of all is the dominance of Spain: it imports and exports far more shark and ray products than any other Mediterranean country. Globally, only Korea imports more – and most Korean imports are of rays and skates. Italy is the world's third-largest importer.

***Figure 7:*** *Chondrichthyes' products imports (tonnes) per country in 2013*

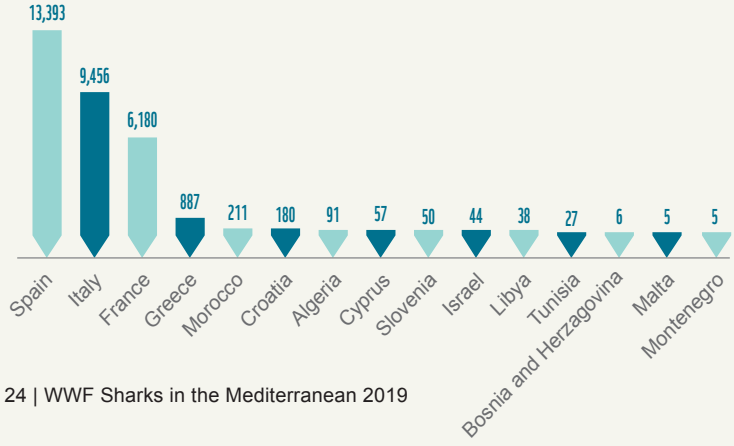
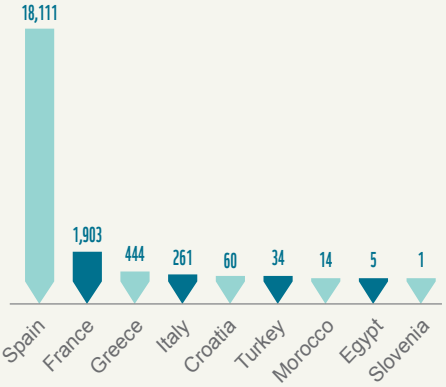



***Figure 8:*** *Chondrichthyes' products exports (tonnes) per country in 2013*

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# SEAFOOD FRAUD

The lack of a harmonized, standard, detailed and reliable reporting and classification system for shark and ray products – whether at time of catch or at time of sale – makes traceability and therefore stock management virtually impossible. It hinders efforts to uncover illegal, unreported and unregulated (IUU) catches, also making seafood fraud easier to carry out and harder to detect.

Sharks and rays are usually marketed skinned or as steaks or fillets, which makes it harder for consumers to know what they're buying (see picture, above). One striking study found blue shark (*Prionace glauca*) and shortfin mako (*Isurus oxyrinchus*) sold as swordfish (*Xiphias gladius*) in 32 out of 80 samples taken from several different types of sellers, both retail and wholesale.[98] The Italian coastguard says that shark sold as swordfish is one of the three most common seafood frauds in Italy.[99]

DNA investigations have also found shark species mislabelled as others: 56% of samples in a Greek market were incorrectly classified, including endangered and protected species which were being (illegally) marketed to consumers.[100] In another case, 80% of smooth hound species sampled in Italy were found to be mislabelled.[101]

Seafood fraud is not only a concern for conservation: it also gives rise to food safety and consumer health concerns. Consumers may unwittingly be eating unsafe meat: mercury levels in some shark species (e.g. blue shark, mako) have been found to be up to four times higher than the legal maximum.[102] In cases where fraud is detected the product is removed from the market, but this relies on random sampling – there's no standard testing regime in place.

At a minimum, consumers have a right to seafood labelling that includes species name, gear type and catch location (except for highly processed products).[103] Furthermore, shark derivatives are used in a wide variety of products from cosmetics to supplements, and uncertainty over their type and origin is in nobody's interest. In the EU, legislation is in place to ensure consumers receive information on species, gear and origin of seafood but there's a lack of compliance. A system to support and inform producers, traders and vendors has been put in place.[104]

# MANAGEMENT AND CONSERVATION REGIMES

**There are many binding and non-binding initiatives and instruments in place to manage and conserve sharks and related species, at international, regional and national levels.**

## INTERNATIONAL

### IPOA SHARKS

The FAO Code of Conduct for Responsible Fisheries is a voluntary Code setting out principles and international standards of behaviour for responsible fishing activities.[105] Within its framework, the International Plan of Action for Sharks (IPOA Sharks) is an instrument aimed at conserving and managing shark stocks: it encourages states to develop national plans of action (NPOAs) to ensure sustainability for all chondrithyan species and types of catches (directed, bycatch, commercial, recreational etc).

### THE IPOA SHARKS SETS OUT 10 AIMS FOR NPOAS:

1. Ensure that shark catches from directed and non-directed fisheries are sustainable.
2. Assess threats to shark populations, determine and protect critical habitats and implement harvesting strategies consistent with the principles of biological sustainability and rational long-term economic use.
3. Identify and provide special attention, in particular to vulnerable or threatened shark stocks.
4. Improve and develop frameworks for establishing and coordinating effective consultation involving all stakeholders in research, management and educational initiatives within and between states.
5. Minimize the unutilized incidental catch of sharks.
6. Contribute to the protection of biodiversity and ecosystem structure and function.
7. Minimize waste and discards from shark catches, in accordance with Article VII.2.2(g) of the Code (e.g. by requiring the retention of sharks from which fins are removed).
8. Encourage full use of dead sharks.
9. Facilitate improved species-specific catch and landings data and monitoring of shark catches.
10. Facilitate the identification and reporting of species-specific biological and trade data.

## EUPOA SHARK

In 2009, the European Commission adopted its own EU Action Plan for the Conservation and Management of Sharks (EUOPA Shark)[106] that applies to the whole EU fleet, wherever it operates. Although voluntary, member states are encouraged to implement it.

**EUPOA Shark proposes concrete actions under three objectives:**

1. To broaden knowledge of shark fisheries, shark species and their role in the ecosystem
2. To ensure that directed shark fisheries are sustainable and shark bycatch is properly regulated
3. To encourage a coherent approach to shark policy across the EU.

## EU

A number of EU regulations are relevant for sharks and rays in the Mediterranean including the annual Regulation for fishing opportunities (COUNCIL REGULATION (EU) 2019/124) and the EU Regulation concerning management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea (COUNCIL REGULATION (EC) No 1967/2006). This prohibits the catch of the following sharks by bottom-set nets: six-gilled shark (*Hexanchus griseus*), basking shark (*Cetorhinus maximus*), and all Alopiidae, Carcharhinidae, Sphyrnidae, Isuridae and Lamnidae; but allows accidental by-catches of no more than three specimens of these shark species.

## CITES

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is a global treaty aiming to ensure that international trade in plants and animals does not threaten their survival in the wild. There are currently 183 parties, including all the states with a Mediterranean coast.

CITES regulates the trade through a system of permits and certificates which ensure that such trade is legal, sustainable and traceable. If these conditions can't be met, a permit will likely not be granted.

Species protected under CITES are listed in appendices. Appendix 1 includes species threatened with extinction, while Appendix 2 is for species which, although not currently threatened, may become so without trade controls. As of May 2019 CITES lists 20 commercially important shark and ray species gloablly, of which eight are relevant for the Mediterranean (see Annex, p34).

## CMS

The Convention on Migratory Species (CMS) is a framework treaty with numerous regional or global Agreements (binding) and Memorandums of Understanding (MOU, non-binding) focused on the conservation and management of species that cross national boundaries or are in areas beyond national jurisdiction. Parties are called on to promote cooperation and support research on migratory species, and to take immediate action to protect any that are threatened. All Mediterranean states except Turkey are parties to CMS.

Twenty-nine shark and ray species have been listed on the CMS Appendices since 1999. For species listed on Appendix I, parties should try to conserve and if possible restore important habitats, minimize obstacles on migratory routes, control exotic species and prohibit the catching of listed animals. Appendix II requires parties to conclude global or regional agreements on specified species.

A 2010 CMS MoU on the conservation of migratory sharks applies to all species in Appendices I and II. As of December 2016, this MOU had 41 signatories, including the EU, Egypt, Libya and Syria. In 2012 the signatories adopted a conservation plan[107] aiming to increase understanding of migratory shark and ray populations through improved research; ensure sustainability of directed and non-directed fisheries; protect critical habitats and migration corridors; increase public engagement; and enhance cooperation at all levels. A recent report highlights the lack of national protection for many species listed on Appendix I, and the overall lack of capacity within developing countries to fulfil goals under the Convention.

### CBD

The Convention on Biological Diversity (CBD) promotes the conservation and sustainable use of biodiversity, and equitable sharing of the benefits of genetic resources.[108] All Mediterranean states in this review are parties to it. Several recommendations concerning the management of sharks and related species in the Mediterranean have been adopted under the CBD, particularly for pelagic species.[109]

## REGIONAL

### THE BARCELONA CONVENTION

The Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (the Barcelona Convention) aims to fight pollution, protect the marine environment and contribute to sustainable development. Twenty-one Mediterranean countries and the EU are parties to it.

One of the Barcelona Convention's protocols concerns sharks and related species, mandating maximum possible protection for species listed in its Annex II and regulated exploitation of species in its Annex III.

### GFCM

The General Fisheries Commission for the Mediterranean (GFCM) is an RFMO established by the FAO to ensure the conservation and sustainable use of marine and aquaculture resources in the Mediterranean and Black Sea.[110] It currently has 24 parties (23 member countries plus the EU) and three cooperating non-contracting parties (Bosnia and Herzegovina, Georgia and Ukraine).

**The GFCM can make binding recommendations to its parties and is active on many different fronts. Measures related to sharks and related species include the following:**[111]

- A fins-attached landing policy to prohibit shark-finning
- Shark species listed in Annex II of the Barcelona Convention protocol (see above) cannot be retained on board, transhipped, landed, transferred, stored, sold, displayed or offered for sale[112]
- Parties must ensure high protection from fishing activity for these Annex II species, which must be released unharmed to the extent possible
- Tope sharks (*Galeorhinus galeus*) caught with bottom-set gillnets, longlines and in tuna traps shall be promptly released unharmed to the extent possible;
- To enhance the protection of coastal sharks, fishing activities carried out with trawl nets are prohibited within three nautical miles of the coast or within the 50 metres isobath, where that depth is reached at a shorter distance from the coast
- To improve the protection of vulnerable demersal species, there are gear requirements for demersal fisheries and trawling is banned at depths greater than 1,000 metres
- Numbers and species of highly migratory sharks caught are recorded in the logbooks
- Beheading and skinning of sharks on board and before landing is prohibited. Beheaded and skinned sharks may not be marketed at the first sale markets after landing.

The GFCM has also established seven Fisheries Restricted Areas (FRAs) to protect important habitats.[113]

There are, however, serious concerns about implementation of and compliance with GFCM measures. National reports are submitted late, are inaccurate or lack information. National legislation implementing GFCM decisions is delayed. In addition, specific information requested on fisheries management measures for the conservation of sharks and rays has not been submitted.

## ICCAT

The EU, Morocco, Libya, Tunisia, Algeria, Turkey, Syria, Egypt and Albania are parties to the International Commission for the Conservation of Atlantic Tunas (ICCAT). Among its other tuna-related activities, one ICCAT panel focuses on the management and conservation of sharks and related species caught as bycatch in tuna fisheries.

**ICCAT measures relevant to sharks and related species include:[114]**

- The IPOA-Shark is to be fully implemented by Contracting Parties
- Shark catches in accordance with ICCAT data reporting requirements, effort by gear type, landings and trade of shark products are to be reported by Contracting Parties
- Shark finning is prohibited and regulated by the application of a five percent fin-to-body weight ratio rule for finned sharks on board vessels, and Contracting Parties fisheries are to fully utilize their entire catches of sharks
- Released of live sharks (especially juveniles) in fisheries that are not targeted at these species is encouraged
- Catches and trade of thresher sharks (*Alopias superciliosus*), oceanic whitetip sharks (*Carcharhinus longimanus*), hammerhead sharks of the family Sphyrnidae (except for the *Sphyrna tiburo*), and silky sharks (*Carcharhinus falciformis*) are prohibited. Discards or releases (dead or alive) of oceanic whitetip, hammerhead and silky sharks have to be reported
- ICCAT has conducted a stock assessment for porbeagle (*Lamna nasus*), shortfin mako (*Isurus oxyrinchus*) and blue shark (*Prionace glauca*)
- Promptly release unharmed, to the extent practicable, porbeagle sharks caught in association with ICCAT fisheries when brought alive on board the vessel
- ICCAT encourages research towards improved gear selectivity and for the identification of shark mating, pupping and nursery areas (in particular for shortfin mako)
- ICCAT has produced shark identification guides.

The amendment of the Convention agreed by ICCAT Contracting Parties this year, is an important change for elasmobranchs' management in the Mediterranean and the Atlantic. The scope of the Convention will no longer be just focused on tuna and tuna-like species, but will also include elasmobranchs that are oceanic, pelagic and highly migratory. The Commission will therefore be responsible to carry out studies and research for such species and will have to manage those stocks according to the principles of the Convention.

## THE BERN CONVENTION

The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention)[115] is the only binding regional convention of its kind worldwide – 50 countries and the EU have signed up to it. Focusing on the conservation of endangered and vulnerable species and their habitats, the Bern Convention lists the basking shark (*Cetorhinus maximus*), white shark (*Carcharodon carcharias*) and the giant devil ray (*Mobula mobular*) in its second Appendix on strictly protected fauna species.

# CONCLUSIONS AND RECOMMENDATIONS

**In theory, there's a far-reaching legal framework in place to protect sharks and rays in the Mediterranean. In practice, they have never been more threatened. If we don't take urgent action to put shark and ray populations on a long-term sustainable footing there is every chance that we'll witness further stock collapses and local extinctions. The wider ramifications for marine ecosystems across the Mediterranean are deeply worrying.**

We also need to know more about the trade in shark products and its markets in the Mediterranean. The approach to bycatch is changing, and new markets for shark meat are emerging where it used to be discarded – this will put further pressure on populations. Seafood fraud is widespread too, and shark is often found being marketed as other more expensive species.

There's a huge amount of work ahead to ensure that current regulations concerning sharks and rays are properly implemented, to fill in the numerous knowledge gaps on the subject, and to effectively incorporate sharks and rays in multi-annual fishery management plans, whether as target species or as bycatch.

Sound management relies on detailed knowledge – we need to know more in particular about fishery impact and geographical distribution, and data collection programmes need to be put in place. This data – particularly when paid for by public funds – needs as far as possible to be publicly accessible.

Shark and ray fisheries suffer from exceptional undermanagement. While there's no 'one size fits all' solution for this diverse and complex group of species that span many countries and cultures, it's clear that proper implementation of existing regulations would be a good start in all areas. Beyond this, a great deal more analysis is needed to support improved management of the high number of species under fishing pressure.

The current lack of management of sharks and rays reflects the broader situation in the Mediterranean, which is considered to be the most overfished sea on the world. Improved fishery management regimes are needed across the board to save the swiftly declining populations of key species – the recent increase of small shark species at markets in some countries is an indicator of the dire state of other stocks, as original target species disappear.

Sharks and rays play an important role in food security in some areas, so improved fisheries management will also be crucial in providing alternative sources of protein to take the pressure off endangered species.

Consumers and markets have a role to play as well. The lack of transparency, traceability and proper labelling leaves the field open for seafood fraud, which has worrying implications for public health as well as for conservation. The impact of this uncertainty can be felt across global markets far beyond the Mediterranean.

Since the vast majority (83%) of Mediterranean fisheries are small-scale, innovative, low-cost and practical solutions are needed. Better data collection, gear selectivity and overall fishery sustainability are essential, and they need to be developed in collaboration with direct stakeholders so the solutions are truly applicable and easy to put into operation.

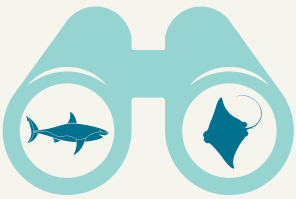
We'll only achieve a healthy future for shark and ray species in the Mediterranean if all stakeholders – states, fishers, merchants, businesses, scientists, communities, civil society – come together and focus on working towards it. It's all hands on deck!

## RECOMMENDATION 1: BETTER DATA COLLECTION, MONITORING AND CONTROLS

- Support development of species-specific data collection tools, designed by management bodies and states with the end users to ensure long-term suitability.
- Pilot innovative resource-efficient approaches for small-scale fisheries in particular.
- Strengthen cooperation between authorities and stakeholders at regional and national levels to ensure that fishing prohibitions don't lead to a lack of biodiversity data.
- Encourage the collection of traditional fisheries knowledge to help bridge the data gap and support historical analyses of shark and ray occurrence and catches.
- Support awareness and education programmes for national management authorities and fishing sectors, with a priority given to southern Mediterranean countries.
- Support GFCM/ICCAT data reporting activities.
- Collect and spread best practice (e.g. EU labelling regulation could also work in southern Mediterranean).
- Improve the creation (non-EU countries) and implementation (EU countries) of labelling regulations[116] for shark and ray species.
- Analyse trade and supply chain of shark and ray products, with particular focus on Spain and Italy, to better understand international and domestic markets for elasmobranch products and their implications for conservation of sharks and rays.
- Encourage nationally-mandated DNA testing along supply chains to suppress seafood fraud and combat the marketing of prohibited species.
- Support enhanced EU and CITES trade regulation compliance in southern Mediterranean and third countries.
- Establish stakeholder collaboration at all levels (national management authorities, national CITES authorities, RFMOs, fishers, intergovernmental organizations etc) to improve knowledge, data sharing, monitoring and enforcement.
- Bring nations together to enforce ICCAT driftnet ban in Morocco and other countries.

## RECOMMENDATION 2: BYCATCH MITIGATION AND MANAGEMENT

- Include shark and ray bycatch and discard management in EU multiannual fisheries plans.
- Assess member state implementation and enforcement of GFCM and ICCAT protection measures.
- Promote GFCM bycatch and discard management recommendations for key fisheries.
- Build fisher capacity through regional and national programmes to manage bycatch, including technical measures, data collection and reporting.
- Strengthen the cooperation between authorities and stakeholders to ensure that prohibitions lead to better fisheries management with decreased mortalities of threatened species.
- Assess perspective of professional and recreational fishers to understand their behaviour and ensure their buy-in to bycatch reduction and data collection initiatives.
- Increase research on health of discarded species and improve assessment protocols.
- Consider multi-stakeholder research on experimental design modifications in longline fisheries to reduce pelagic shark bycatch; and in trawls (e.g. excluder devices) – but be aware of potential trade-offs.



## RECOMMENDATION 3: CRITICAL HABITAT AND SPECIES PROTECTION

- Promote proper stock assessments and catch limits for threatened species via regional management bodies (GFCM, STEFC).
- Develop research programmes with partners to improve knowledge on critical shark and ray habitats in the Mediterranean.
- Support research on spatial and temporal closures of fisheries areas identified as critical habitats, and urge action from regional and national management bodies and authorities based on the findings.
- Map and assess collaborative platforms and improve mechanisms for coordination to accelerate data collection, research and conservation; where necessary establish collaborations, taking in all stakeholders from fishers to NGOs.
- Promote the inclusion of Critically Endangered and Endangered species in the Barcelona Convention, 'upgrade' risk for some species, establish adequate protection measures through the GFCM and CITES listings.

# ANNEX

## Species status and protection related to relevant binding and non-binding instruments and measures for elasmobranchs in the Mediterranean Sea

| MEDITERRANEAN SHARKS AND RAYS | | RELEVANT BINDING AND NON-BINDING INSTRUMENTS AND MEASURES FOR SHARKS AND RAYS IN THE MEDITERRANEAN | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| SCIENTIFIC NAME | COMMON NAME | IUCN 2016 | UNCLOS[1] | CITES[2] | CMS[3] | CMS Sharks MoU[4] | BAR. CONV[5] | GFCM | ICCAT |
| *Carcharias taurus* | Sand Tiger Shark | CR | | | | | Annex II | Protected | |
| *Carcharodon carcharias* | Great White Shark | CR | Annex I | Appendix II | Appendix I & II | Annex I | Annex II | Protected | |
| *Centrophorus granulosus* | Gulper Shark | CR | | | | | Annex III | | |
| *Dipturus cf. batis* | Blue Ray | CR | | | | | Annex II | Protected | |
| *Gymnura altavela* | Spiny Butterfly Ray | CR | | | | | Annex II | Protected | |
| *Isurus oxyrinchus* | Shortfin Mako | CR | Annex I | | Appendix II | Annex I | Annex II | Protected | |
| *Lamna nasus* | Porbeagle | CR | Annex I | Appendix II | Appendix II | Annex I | Annex II | Protected | Release if alive |
| *Leucoraja circularis* | Sandy Ray | CR | | | | | Annex II | Protected | |
| *Leucoraja fullonica* | Shagreen Ray | CR | | | | | | | |
| *Leucoraja melitensis* | Maltese Ray | CR | | | | | Annex II | Protected | |
| *Odontaspis ferox* | Smalltooth Sand Tiger | CR | | | | | Annex II | Protected | |
| *Oxynotus centrina* | Angular Rough Shark | CR | | | | | Annex II | Protected | |
| *Prionace glauca* | Blue Shark | CR | Annex I | | Appendix II | | Annex III | | |
| *Pristis pectinata* | Smalltooth Sawfish | CR | | Appendix I | Appendix I & II | Annex I | Annex II | Protected | |
| *Pristis pristis* | Largetooth Sawfish | CR | | | Appendix I & II | Annex I | Annex II | Protected | |
| *Aetomylaeus bovinus* | Bull Ray | CR | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Sphyrna zygaena* | Smooth Hammerhead | CR | Annex I | Appendix II | | Annex I | Annex II | Protected | Protected |
| *Squatina aculeata* | Sawback Angelshark | CR | | | | | Annex II | Protected | |
| *Squatina oculata* | Smoothback Angel Shark | CR | | | | | Annex II | Protected | |
| *Squatina squatina* | Angelshark | CR | | | Appendix I & II | Annex I | Annex II | Protected | |
| *Alopias superciliosus* | Bigeye Thresher | EN | Annex I | Appendix II | Appendix II | Annex I | | Protected | Protected |
| *Alopias vulpinus* | Thresher | EN | Annex I | Appendix II | Appendix II | Annex I | Annex III | | |
| *Carcharhinus plumbeus* | Sandbar Shark | EN | Annex I | | | | Annex III | | |
| *Cetorhinus maximus* | Basking Shark | EN | Annex I | Appendix II | Appendix I & II | Annex I | Annex II | Protected | |
| *Echinorhinus brucus* | Bramble Shark | EN | | | | | | | |
| *Glaucostegus cemiculus* | Blackchin Guitarfish | EN | | | | | Annex II | Protected | |
| *Mobula mobular* | Devil Ray | EN | | Appendix II | Appendix I & II | Annex I | Annex II | Protected | |
| *Raja radula* | Rough Ray | EN | | | | | | | |
| *Rhinobatos rhinobatos* | Common Guitarfish | EN | | | Appendix I & II (+) | Annex I | Annex II | Protected | |
| *Rostroraja alba* | White Skate | EN | | | | | Annex II | Protected | |
| *Squalus acanthias* | Piked Dogfish | EN | | | Appendix II | Annex I | Annex III | | |
| *Dalatias licha* | Kitefin Shark | VU | | | | | | | |
| *Bathytoshia centroura* | Roughtail Stingray | VU | | | | | | | |
| *Dasyatis pastinaca* | Common Stingray | VU | | | | | | | |
| *Galeorhinus galeus* | Tope Shark | VU | | | | | Annex II | Protected | |
| *Mustelus asterias* | Starry Smooth-hound | VU | | | | | Annex III | | |
| *Mustelus mustelus* | Common Smooth-hound | VU | | | | | Annex III | | |
| *Mustelus punctulatus* | Blackspotted Smooth-hound | VU | | | | | Annex III | | |
| *Myliobatis aquila* | Common Eagle Ray | VU | | | | | | | |
| *Chimaera monstrosa* | Rabbit Fish | NT | | | | | | | |

| MEDITERRANEAN SHARKS AND RAYS | | RELEVANT BINDING AND NON-BINDING INSTRUMENTS AND MEASURES FOR SHARKS AND RAYS IN THE MEDITERRANEAN | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| SCIENTIFIC NAME | COMMON NAME | IUCN 2016 | UNCLOS[1] | CITES[2] | CMS[3] | CMS Sharks MoU[4] | BAR. CONV[5] | GFCM | ICCAT |
| *Galeus atlanticus* | Atlantic Sawtail Catshark | NT | | | | | | | |
| *Leucoraja naevus* | Cuckoo Ray | NT | | | | | | | |
| *Raja clavata* | Thornback Ray | NT | | | | | | | |
| *Raja asterias* | Mediterranean Starry Ray | NT | | | | | | | |
| *Raja brachyura* | Blonde Ray | NT | | | | | | | |
| *Raja undulata* | Undulate Ray | NT | | | | | | | |
| *Scyliorhinus stellaris* | Nursehound | NT | | | | | | | |
| *Centroscymnus coelolepis* | Portuguese Dogfish | LC | | | | | | | |
| *Etmopterus spinax* | Velvet Belly Lanternshark | LC | | | | | | | |
| *Galeus melastomus* | Blackmouth Catshark | LC | | | | | | | |
| *Hexanchus griseus* | Bluntnose Sixgill Shark | LC | Annex I | | | | | | |
| *Pteroplatytrygon violacea* | Pelagic Stingray | LC | | | | | | | |
| *Raja miraletus* | Brown Ray | LC | | | | | | | |
| *Raja montagui* | Spotted Ray | LC | | | | | | | |
| *Raja polystigma* | Speckled Ray | LC | | | | | | | |
| *Scyliorhinus canicula* | Small Spotted Catshark | LC | | | | | | | |
| *Tetronarce nobiliana* | Electric Ray | LC | | | | | | | |
| *Torpedo marmorata* | Marbled Electric Ray | LC | | | | | | | |
| *Torpedo torpedo* | Common Torpedo | LC | | | | | | | |
| *Carcharhinus altimus* | Bignose Shark | DD | Annex I | | | | | | |
| *Carcharhinus brachyurus* | Cooper Shark | DD | Annex I | | | | | | |
| *Carcharhinus limbatus* | Blacktip Shark | DD | Annex I | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Carcharhinus obscurus* | Dusky Shark | DD | Annex I | | Appendix II | Annex I | | | |
| *Dasyatis marmorata* | Marbled Stingray | DD | | | | | | | |
| *Heptantrias perlo* | Sharpnose Sevengill Shark | DD | | | | | | | |
| *Hexanchus nakamurai* | Bigeyed Sixgill Shark | DD | | | | | | | |
| *Isurus paucus* | Longfin Mako | DD | | | Appendix II | Annex I | | | |
| *Rhinoptera marginata* | Lusitanian Cownose Ray | DD | | | | | | | |
| *Somniosus rostratus* | Little Sleeper Shark | DD | | | | | | | |
| *Squalus blainville* | Longnose Spurdog | DD | | | | | | | |
| *Squalus megalops* | Shortnose Spurdog | DD | | | | | | | |
| *Taeniurops grabatus* | Round Stingray | DD | | | | | | | |
| *Carcharhinus brevipinna** | Spinner Shark | NA | Annex I | | | | | | |
| *Himantura uarnak** | Honeycomb Stingray | NA | | | | | | | |
| *Sphyrna mokarran** | Great Hammerhead | NA | Annex I | Appendix II | Appendix II | Annex I | Annex II | Protected | Protected |
| *Sphyrna lewini** | Scalloped Hammerhead | NA | Annex I | Appendix II | Appendix II | Annex I | Annex II | Protected | Protected |

## Key

Binding  Non-binding  Mediterranean endemic species  Probably endemic

* Those species are vagrant or probably vagrant, or Lessepsian immigrants from the Red Sea and not included in IUCN assessment

**1 Annex I:** requires cooperation for the management of of straddling stocks and highly migratory species in the EEZs and the high seas

**2 App I:** includes species threatened with extinction and provides the greatest level of protection, including restrictions on commercial trade; App II: includes species that, although currently not threatened with extinction, may become so without trade controls. It also includes species that resemble other listed species and need to be regulated in order to effectively control the trade in those other listed species

**3 App I:** Range States Parties should endeavour to conserve and, where feasible and appropriate, restore important habitats of those species, minimize obstacles on migratory routes, control the introduction of exotic species and prohibit the catching of listed animals; App II: CMS acts as a framework convention – it does not provide any specific protection to them, but requires that Parties conclude global or regional agreements on specified species

**4 Annex I:** CMS MoU signatories adopted a conservation plan. Updated to COP12 new listings.

**5 Annex II:** List of endangered and threatened species; Annex III: List of species whose exploitation is regulated

**(+)** *Rhinobatos rhinobatos* is listed in CMS as Appendix I (Mediterranean population) and Appendix II (Global population)

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# SHARKS IN THE MEDITERRANEAN: IN NUMBERS

## GLOBAL SHARK MEAT TRADE

Spain is the world's number one importer and exporter of shark products

## 80%

Almost 80% of assessed fished stocks in the Mediterranean are threatened by overfishing – this lack of sustainable management is the single greatest danger for sharks and rays

© Manu San Felix

## >50%

More than 50% of sharks and rays in the Mediterranen are threatened with extinction

## 80+

There are more than 80 species of sharks and rays in the Mediterranean

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To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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