TÜRKİYE



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TÜRKIYE

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INTRODUCTION

Türkiye is a peninsular country, surrounded by the Black Sea, Aegean Sea, and Gulf of Antalya in the eastern Mediterranean Sea, the Turkish Straits System which stretches along the Dardanelles Strait, the Sea of Marmara, and the Bosphorus Strait. Türkiye has important fishing potential due to its geographical location, with the seas surrounding Türkiye's mainland stretching along a coastline of 8,333 km. Of this coastline, 33.66% extends along the Aegean Sea, followed by the Black Sea (20.34%), Mediterranean Sea (20.07%), and Sea of Marmara (11.20%). Of the 24,607,200 km² fishing area, 23,475,000 km² is located in the Black, Mediterranean, and Aegean Seas (Yavuz Önçırak, 2015).

There are several important oceanographical variables around Türkiye. These include the high hydrogen sulphide concentration prevailing below 150–200 m in the Black Sea, which is an important factor preventing the dispersal of fishes in the deep zones. The Turkish Straits System plays a significant and decisive ecological role in the dispersal of living organisms between the Mediterranean and Black Seas, since it constitutes a barrier, corridor, or an acclimatisation zone for marine species. The Aegean Sea is topographically divided into two basins: the North Aegean Sea which is characterised as an area of colder-water fauna and the South Aegean Sea as the sea of warmer-water fauna, which includes Lessepsian migrants. With the opening of the Suez Channel, as well as the general heating of the world oceans, the Mediterranean has been impacted by the phenomenon known as 'tropicalisation', which causes retreating of temperate species towards colder areas of the basin (Oğuz & Tuğrul, 1998).

There are 69 species of sharks, rays, and chimaeras (38 sharks, 30 rays, and one chimaera) reported in Turkish waters of the Mediterranean and Black Seas (Bilecenoğlu et al., 2014; Kabasakal 2021a; Turan et al., 2021). This corresponds to 77.5% of the total number of shark, ray, and chimaera species found in the Mediterranean and Black Sea region (n=89; Serena et al., 2020). Similar to the rest of the world, historically, the willingness or priority to study shark species occurring in Turkish waters was remarkably low (Camhi et al., 1998). Several pioneering lists dealing with sharks in Turkish waters have been published by various researchers (e.g., Ninni, 1923; Deveciyan, 1926; Ayaşlı, 1937; Erazi, 1942), but they represent only a small part of general ichthyology inventories. From this perspective, the chronology of shark and ray research in Turkish waters can be divided into two distinct eras: the first, which lasted until the late 1990s, was characterised by a paucity of shark- and ray-specific studies (Kabasakal, 2020a). During this time sharks were often considered as 'pests' with no, or limited, commercial value and the clear scientific neglect of shark-specific studies in Turkish waters resulted in a remarkable gap of knowledge about them (Kabasakal, 2019).

With markedly different oceanographic and ecological conditions, Türkiye waters provide a wide variety of habitats to sharks, rays, and chimaeras, that meet their needs as feeding and breeding grounds, as well as support seasonal aggregations. Among the habitats in question, the Sea of Marmara attracts particular attention. Before Atlantic Bluefin Tuna (*Thunnus thynnus*) stocks drastically declined, the Sea of Marmara was historically a feeding ground visited seasonally (autumn to spring) by the apex predator, White Shark (*Carcharodon carcharias*). However, due to the collapse of tuna stocks and environmental conditions that deteriorated drastically in the last quarter of the 20th century, White Shark are now considered extirpated from the Sea of Marmara (Kabasakal, 2003, 2016), though they are still reported elsewhere in the waters of Türkiye. This deterioration in environmental conditions, especially de-oxygenation, raised concerns about the survival of sharks in this sea. There are also concerns that the increasing de-oxygenation problem, especially in deepwaters, can lead to vertical habitat compression, trapping deepwater sharks in shallow waters (Kabasakal, 2022).

Unlike the Sea of Marmara, Türkiye's Aegean and Mediterranean waters offer broader living opportunities for shark, ray, and chimaera species, especially when it comes to breeding. Various areas of importance to reproduction have been determined in Aegean and eastern Mediterranean waters. In two previous studies, it was reported that the continental slope and bathyal grounds of the northeastern Aegean Sea, especially the northern coast of Gökçeada Island, may serve as a nursery ground for several sharks, rays, and chimaeras, including Bluntnose Sixgill Shark (*Hexanchus griseus*), Velvet Belly Lanternshark (*Etmopterus spinax*), Kitefin Shark (*Dalatias licha*), Blackmouth Catshark (*Galeus melastomus*), and Rabbitfish (*Chimaera monstrosa*; Kabasakal & Kabasakal, 2002, 2004). Newborn White Shark have been recorded in Edremit Bay in the northeast Aegean Sea almost every summer, indicating that this region is an important nursery ground (Kabasakal, 2020b). Likewise, Boncuk Bay in the south is the mating ground of Sandbar Shark (*Carcharhinus plumbeus*; Filiz & Gülşahin, 2015; Filiz, 2019). Incidental captures of young-of-the-year or juvenile specimens of 15 species within İskenderun and Mersin Bays suggest that the area serves as a nursery ground for species such as Blackmouth Catshark, Smallspotted Catshark (*Scyliorhinus canicula*), and Velvet Belly Lanternshark (Ergüden et al., 2022).

Over the past three decades, there has been a remarkable increase in the quality and quantity of studies on shark, ray, and chimaera species occurring in Turkish seas (Kabasakal, 2019). The publication of nearly 100 shark-specific scientific articles by the first author of this chapter and his colleagues between the 1990s–2022 significantly improved the available knowledge about sharks occurring in Turkish waters and in the broader area of the eastern Mediterranean. This notable increase in the number of shark, ray, and chimaera-specific studies and publications, characterises the second era: the rise of shark and ray research in Türkiye (Kabasakal, 2019).

Early research was often based on species inventories or population assessments of a limited number of exploited species, such as Spiny Dogfish (*Squalus acanthias*) and Thornback Skate (*Raja clavata*). This has now broadened to include several aspects of their biology (e.g., age and growth, feeding ecology, reproduction, behaviour, etc.). Based on the estimation that 41–49% of eastern Mediterranean sharks, rays, and chimaeras are threatened (Dulvy et al., 2021), Bengil and Başusta (2018) underlined that half of these species in Turkish waters are threatened, increasing concerns over their future in the eastern Mediterranean.

FISHERIES

Fleets

Türkiye's fishing fleet has a substantial number of vessels at approximately 15,000. Although the total number of vessels in the fishing fleet is high, the majority of vessels are <2 m in length. As of 2019, the fleet comprised of 13,726 (89.6%) vessels <12 m in length: and 1,586 (10.4%) vessels >12 m. In addition, there are 102 auxiliary vessels operating at sea. To protect the stocks of commercially important fish species and to decrease fishing pressure, a significant reduction in the total fleet has been observed size since 2010 (Çiloğlu, 2018; Şakıma & Çevrimli, 2021).

Gear

Shark, ray, and chimaera catches are recorded in multi-gear fisheries, in which bottom-trawls, gillnets, and trammel nets comprise the major types of gear (Bengil & Başusta, 2018). In Türkiye's marine fisheries, due to its operational methodology, bottom trawling yields a significant proportion of shark, ray, and chimaera that are captured incidentally. Nevertheless, more static fishing gears such as longlines and nets (gillnets and trammel –nets) can catch up to 72% and 97%, respectively, of sharks, rays, and chimaeras (Bengil & Başusta, 2018). Setting gillnets and trammel nets in critical habitats, such as possible nursery grounds of sharks, rays, and chimaeras, poses a major threat to the survival of these species. In Edremit Bay, where a northeastern Aegean Sea nursery ground of White Shark is likely found, accidental catches of young-of-the-year and juvenile animals occurred mainly in gillnet operations (Kabasakal, 2020b). Bottom-trawling over bathyal grounds of the northeastern Aegean Sea, especially off the northern coast of Gökçeada Island, is likely impacting a possible nursery ground for several deepwater sharks (Kabasakal & Kabasakal, 2004). Fishing pressure by bottom-trawling and netting on the nursery grounds of several sharks and ray species in Mersin and Iskenderun bays were also recently emphasised by Ergüden et al., (2022).

PRODUCTION

Overall landings

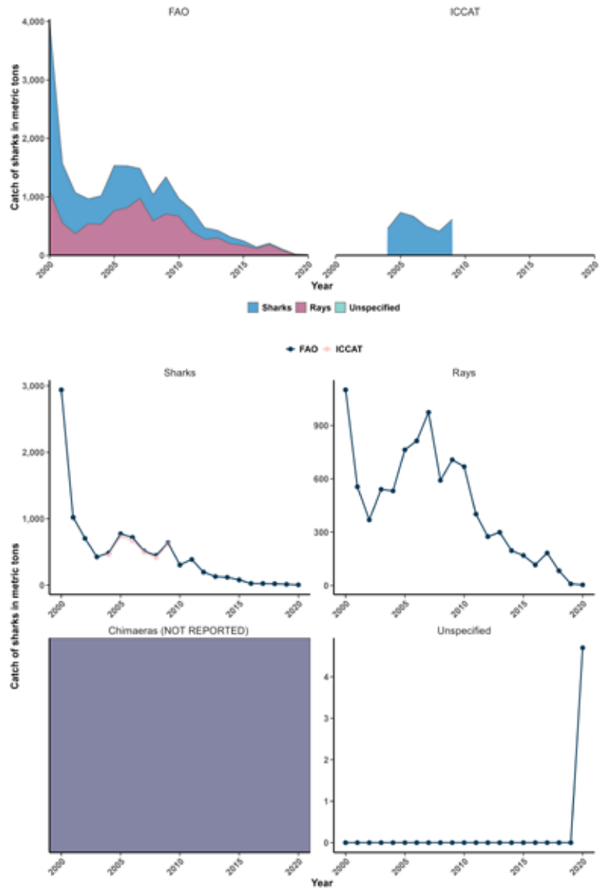
In the past, Spiny Dogfish and Thornback Skate composed major proportions of the sharks and rays landed by Türkiye (Prodanov et al., 1997). Based on landings data derived from Prodanov et al., (1997), annual landings of Spiny Dogfish and Thornback Skate in the Turkish Black Sea between 1967–1992 has declined (Figure 2). During this period, the highest quantities of Spiny Dogfish and Thornback Skate landed, representing 69% and 59% of total catches, respectively, were from Türkiye (Prodanov et al., 1997). This fishing effort combined with demersal fishing activities of other Black Sea nations, has contributed to the decline of stocks of both sharks and rays in the Black Sea.

Similar drastic declines in annual catches of Angelshark (*Squatina squatina*) and Tope (*Galeorhinus galeus*) have also been observed in the last decades. As a consequence of dramatic reductions in both stocks, they have been declared as protected species since 2018 by the Turkish Government.

Species-specific

Although not targeted by Turkish commercial fishers, large sharks (defined as species with a published maximum length >2 m; Ferretti et al., 2008), and rays occurring in Turkish waters are captured incidentally (Kabasakal, 2013a, 2013b, 2015a, 2015b; Kabasakal et al., 2017). Of these, Bluntnose Sixgill Shark comprised the greatest proportion (43%) of incidentally captured large sharks and rays (Kabasakal, 2013a). Incidental catches of Basking Shark (*Cetorhinus maximus*), are rare and mainly occur in floating or static gillnets (Kabasakal, 2013b). This type of fishing gear also captures Shortfin Mako (*Isurus oxyrinchus*) in the area (Kabasakal, 2015a). In a recent review on the distribution of large sharks in the seas of Türkiye, in which the occurrence of 392 animals was reported, the highest numbers of large sharks were recorded from the Sea of Marmara (n=151; 38.6%), Aegean Sea (n=121; 30.9%), and Levantine Sea (n=114; 29.1%), with a

Türkiye's total catch of shark, ray, chimaera, and unspecified species reported to the Food and Agriculture Organization (FAO) and International Commission for the Conservation of Atlantic Tunas (ICCAT) from 2000–2020 in metric tonnes (mt) | Source: FAO (2022), ICCAT (2022)



smaller proportion from the Black Sea (n=5; 1.2%; Kabasakal et al., 2017). Captures of large sharks in the Sea of Marmara were dominated by Bluntnose Sixgill Sharks (n=90; 60% of total captures; Kabasakal, 2013a, 2023). Young-of-the-year and juvenile White Shark are considered as rare bycatch, mainly by gillnetters in Türkiye's Aegean waters (Kabasakal, 2020c). Furthermore, sharks, rays, and chimaeras, such as Bramble Shark (*Echinorhinus brucus*), Angular Rough Shark (*Oxynotus centrina*), and Angelshark, are recorded mainly in demersal fisheries (Kabasakal & Bilecenoğlu, 2014; Kabasakal, 2015b, 2021).

Specific to large sharks, the cause of increasing mortality over the years is the increase in fisheries pressure, particularly in pelagic fisheries (e.g., purse-seining, drifting nets, etc.; Figure 5).

TRADE

Processing

Generally, shark and ray meat are not included in the current gastronomic preferences of Turkish recipes. Sharks and rays caught are retained whole. Finning is not a common practice in Turkish fisheries. However, in the past, wings of Common Blue Skate (*Dipturus batis*; *tırpana* in Turkish), angel sharks (*Squatina* spp.), Common Smoothhound (*Mustelus mustelus*), and Tope, have been retained by fishmongers and purchased by local consumers (Deveciyan, 1926). Nevertheless, due to the unusual appearance of sharks and rays, the smell of their meat, and religious beliefs, only limited quantities of sharks and rays are consumed (Kabasakal, 1998).

Domestic

The meat of dogfish (*Squalus* spp.) and smoothhounds (*Mustelus* spp.) is typically processed smoked or salted, or frozen for export, or in the case of angel sharks, marketed as fresh cut in steaks. Fins and oil-filled livers of sharks are also processed and exported, but no data are available on production quantities or reported destinations. Rays are typically processed as wings and marketed frozen without skin (Kabasakal, 1998).

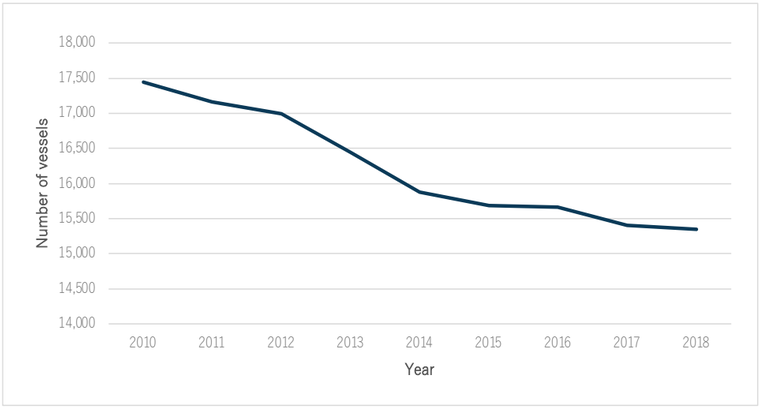
CULTURAL SIGNIFICANCE

In the past, sharks have been considered 'pests' with no, or limited, commercial value (Kabasakal, 2020a). This perception lasted until recent decades. In a previous report on the general community's perception of Bluntnose Sixgill Shark, of the 81 articles examined, the perception of the coverage was neutral in 40 (49.3%) articles, 37 (45.6%) were negative, and only 4 (4.9%) were positive (Kabasakal, 2010). In the neutral and negative articles, Bluntnose Sixgill Shark was frequently labelled as 'jaws' (in 27, 33.3% of the articles). A similar negative perception proliferated from news reports about White Shark, which has been stigmatised as a 'monster' or 'man eater' published during the last century (Kabasakal, 2020c). Despite this, the perception of news reports about White Shark has not been evaluated in detail. The most common attitudes used to describe Bluntnose Sixgill Shark within the 81 articles examined as follows: struggle (22.2%), aggressor (12.3%), anxiety/terror (12.3%), panic/fear (12.3%), astonishment (11.1%), intruder (4.9%), or nightmare (3.7%;

Industrial and small scale fishing vessels in Türkiye | Güldem Üstün | flickr.com (CC BY 2.0.)



Figure 1: Temporal change of fleet size in Türkiye's commercial fishing vessels in terms of vessel quantity since 2010. | Source: adopted based on the data derived from Şakıma & Çevrimli (2021)



Kabasakal, 2010). This suggests that negative news content may have contributed to both shark species still not being protected in Turkish waters. Similar stories that influence the perceptions of society with bloody stories are occasionally reflected in the press.

RESEARCH

Fisheries faculties of several universities conduct shark and ray related research, focusing primarily on taxonomy and several life history parameters. As part of the ongoing Med Bycatch programme, World Wildlife Fund (WWF) Türkiye has been performing field surveys to collect data on the proportions of sharks, rays, and chimaeras in overall bycatch in marine fishes for the last couple years. As of August 2022, the preliminary results of the study provided a clearer picture of sharks, rays, and chimaeras' bycatch in the seas of Türkiye in mixed fisheries. Following the foundation of the Ichthyological Research Society in early 2000, a non-governmental, non-profit, citizen scientist organisation dedicated to research of sharks, rays, and chimaeras, exploration efforts in the mentioned field have considerably increased. The Turkish Marine Research Foundation (TUDAV) also performs research on several aspects of sharks and rays occurring in the seas of Türkiye.

MANAGEMENT

Governance framework

The conservation management of sharks and rays is a shared responsibility of the Republic of Türkiye Ministry of Agriculture and Forestry General Directorate of Fisheries and Aquaculture, in cooperation with the Coast Guard.

Policy

The commitment of Türkiye to the conservation of sharks and rays in Turkish waters of the eastern Mediterranean Sea was underlined with the ratification of the Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean in 1976 (signed on 10 June 1995 and ratified on 18 February 2002). This includes the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (in 1995; SPA/BD) and its annexes (Öztürk, 2018). Following the revisions proposed in the technical contribution to a National Action Plan (Öztürk, 2018), which were positively implemented in the Fisheries Act of Türkiye (Official Gazette, 2016, 2018, 2020, 2022; Öztürk, 2018). The following sharks and rays are currently protected, as of 2023: Silky Shark (*Carcharhinus falciformis*), Sandbar Shark, Blue Shark (*Prionace glauca*), Tope, Smooth Hammerhead (*Sphyrna zygaena*), Basking Shark, Shortfin Mako, White Shark, Porbeagle (*Lamna nasus*), Bigeye Thresher (*Alopias superciliosus*), Common Thresher (*Alopias vulpinus*), Spiny Dogfish, Longnose Spurdog (*Squalus blainville*), Angular Roughshark, Sawback Angelshark (*Squatina aculeata*), Smoothback Angelshark (*Squatina oculata*), Angelshark, Common Guitarfish (*Rhinobatos rhinobatos*), Blackchin Guitarfish (*Glaucostegus cemiculus*), Spinetail Devil Ray (*Mobula mobular*), and Thornback Skate. The Fisheries Act prohibits any person under Türkiye's jurisdiction to kill and/or land the sharks from the list of protected species, and any violation of this law is sanctioned by a fine (Kabasakal, 2021a).

Enforcement and monitoring

To protect the resources and living environments of these species and to ensure their sustainable operation, inspections are carried out at the licensing phase, during fishing, during the landing of captured fishes, during transport, and at fish markets and retail outlets. Inspections are carried out routinely and based on notice, within the framework of the annual planned inspection program. In addition, simultaneous cross-audits are carried out with mobile inspection teams formed under the coordination of the Ministry of Agriculture and Forestry in provinces where fisheries potential and fishing activities are intense. Occasionally, coast guard boat personnel and ministry control officers jointly conduct inspections with ministry controlled boats and/or coast guard boats (General directorate of Fisheries and Aquaculture, 2019).

Community involvement

Previously, research on sharks, rays, and chimaeras was a professional activity carried out by relevant research organisations. However, as a result of the proliferation of the internet and social media over the past few decades, as well as the marked increase in personal smartphone use, citizen scientists seem to be more involved in shark, ray, and chimaera research today. These research methods, which can generally

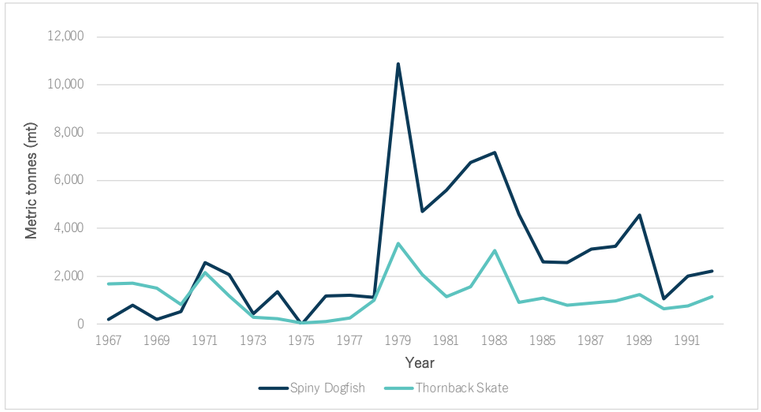


Figure 2: Commercial landings of Spiny Dogfish (Squalus acanthias) and Thornback Skate (Raja clavata) in the Turkish Black Sea between 1967–1992. | Source: adopted based on the data derived from Prodanov et al. (1997)

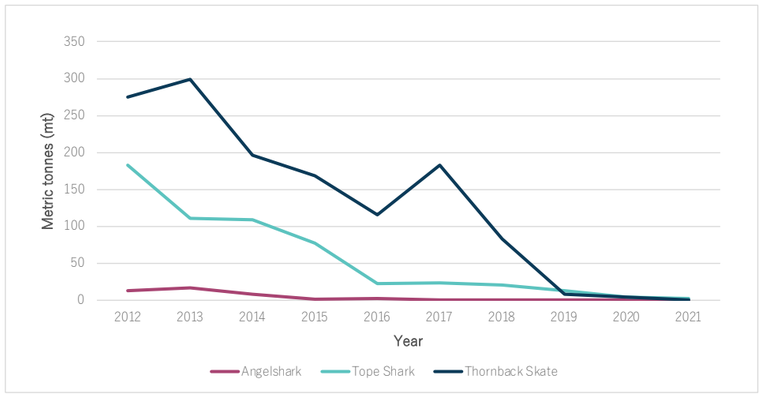


Figure 3: Annual landings of Angelshark (Squatina squatina), Tope (Galeorhinus galeus), and Thornback Skate (Raja clavata) in the last decade. | Source: adopted based on the data derived from Turkish Statistical Institution (TUIK, 2021)

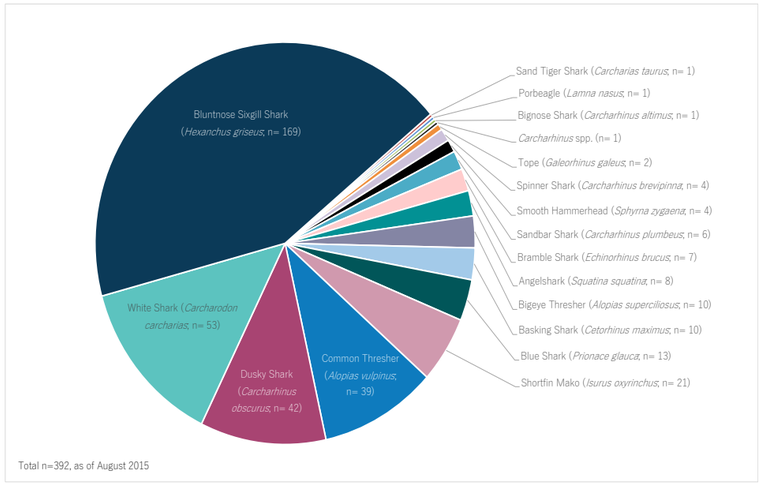


Figure 4: An overview of large sharks' incidental captures in the seas of Türkiye | Source: Kabasakal et al. (2017)

be described as opportunistic, can provide valuable data, especially in the case of threatened and rare species, where it is difficult to collect data through systematic field studies. Although not easily accepted in the traditional research approach, these opportunistic and citizen-scientist-based studies are increasingly used in research. For example, following a survey of internet-based media sources, 268 specimens of sharks representing ten families, 16 species, as well as two genera, were identified from Turkish seas (Kabasakal & Bilecenoğlu, 2020). The majority of the identified species comprised records of Bluntnose Sixgill Shark (51.8%, 139 out of 268 specimens), followed by Common Thresher (12.6%, n=34), Sandbar Shark (8.9%, n=24), Shortfin Mako (6.3%, n=17), and Bigeye Thresher (5.2%, n=14). There is an urgent need for a non-invasive and non-destructive method for data collection, legitimatising the reasonable use of internet-based media as a source of data in shark, ray, and chimaera research. Such an approach in extracting scientific data from digital sources requires a certain standardisation of best practice. Despite the current weaknesses of such a methodological approach, it can obviously allow an increased research effort at low cost in research, in a non-destructive way.

Gaps

It is an urgent necessity for some species, including large shark species of whose population structures we still do understand well, to be protected immediately. One of these species is White Shark, which is Critically Endangered in the Mediterranean Sea and was listed in Annex II (Endangered or Threatened species) of the SPA/BD Protocol of the Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean. Being a signatory state of the Barcelona Convention, Türkiye has recently acted and as of September 2022 White Shark, was declared as under protection, and any commercial and recreational fishing activities to capture or land the White Shark are banned in Turkish waters.

Likewise, the following three shark species, which are long-lived, late maturing, produce few offspring and therefore more likely to be negatively affected by fisheries, may be primarily protected in Turkish waters:

- Bluntnose Sixgill Shark: Which is incidentally captured especially in purse seine and trawl fishing. It is one of the large shark species found in Turkish waters (Kabasakal et al., 2017; Kabasakal, 2023).
- Bramble Shark: A rare shark species. Current studies reveal that although it is thought to be regionally extinct, it still occurs in the seas of Türkiye (Kabasakal et al., 2020q; Kabasakal et al., 2017, 2023).
- Smalltooth Sand Tiger: A species caught rarely in bottom fishing such as trawl and gillnet. Its presence in Turkish seas has been confirmed by a recent study (Kabasakal et al., 2024). However, there are no consistent data on the current status and population structure of this species in the seas of Türkiye.

RECOMMENDATIONS

Policy

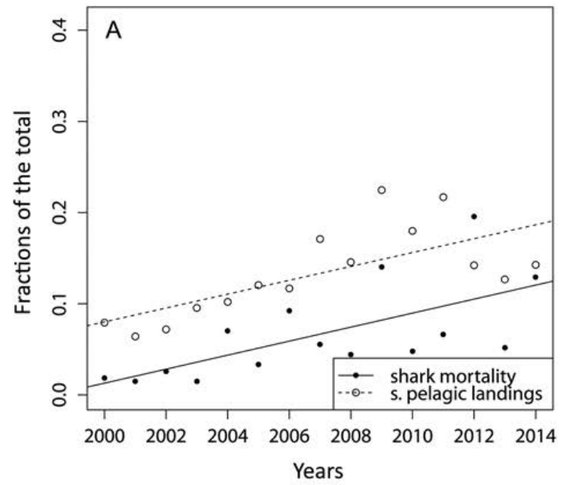
Topics indicated below were discussed for the sharks, rays, and chimaeras in Turkish waters and were identified as priority issues and measures required (Öztürk, 2018):

- Improve data collection to ensure sustainable fisheries and minimize bycatch;
- Understand conservation status of these species in Türkiye;
- Increase scientific studies;
- Improve statistical data collection at the species-specific level;
- Identify important habitats; and
- Raise public awareness.

As part of the National Action Plan, developing a programme for making fisheries of relevant sharks, rays, and chimaeras sustainable and continuing bycatch studies is crucial. Workshops and meetings with the General Directorate of Fisheries for developing special monitoring programs for bycatch of sharks and rays in Turkish waters should be organised. Those programmes are of high priority and should be implemented immediately, and the data shared openly with experts (Öztürk, 2018).

It is also important to have a national monitoring programme for sharks, rays, and chimaeras, which should be carried out by experts from relevant institutes (including universities) and partners (e.g., commercial fishers) with allocated funds by relevant Turkish authorities. It has been recorded in recent studies that there is a resident population of Sandbar Shark in Boncuk Bay, which as of 2023 is considered an Important Shark and Ray Area (ISRA). It is also recommended that the next step should be to conduct studies on population dynamics, specifically to assess population sizes. Based on evidence indicating that Edremit Bay (an ISRA) is a nursery ground for White Shark in the northeastern Aegean Sea, more research has focused on this in recent years. Similar studies should be carried out in other bay waters. However, artisanal coastal fisheries, mainly gillnets and longlines that operate year-round, jeopardize the survival of young-of-the-year and juvenile White Shark in Edremit Bay. Therefore, a monitoring programme should be started urgently to determine the seasonality of occurrence of White Shark in the region (Kabasakal, 2020b).

Figure 5: The increasing trend of shark mortality in sharks over the years compared to commercial fish landings from pelagic fisheries | Source: Kabasakal et al. (2017)



Some shark, ray, and chimaera species have been commercially exploited. Fisheries statistics have been improved, but still there are many gaps to fill to reflect the actual situation. In particular, species are usually aggregated together during data collection and not identified at the species-level in official statistics. Training seminars or publication of guidelines would be beneficial to arrange to improve species identification at fish markets. At the same time, data should be collected more regularly and strictly, so that they can be used to evaluate the population status of shark, ray, and chimaera species in the seas of Türkiye (Öztürk, 2018).

Science/knowledge/research

In general, there is a lack of information for the biology and ecology of most sharks, rays, and chimaeras found in the eastern Mediterranean Sea. Therefore, it is important to enhance and promote scientific studies on these species in the area. Development of standard methods and protocols for data collection to carry out such studies, for example, tagging, acoustic and visual monitoring are crucial steps. All data collected should be evaluated in a harmonised manner and comparable to those collected in neighbouring countries, as proposed in the "National action plan for the conservation of cartilaginous fishes in the Turkish water of the eastern Mediterranean Sea" (Öztürk, 2018). Recently there have been some important studies on these species but systematics and biodiversity studies are dominant. There are only a few studies on fishing methods, population dynamics, molecular studies, and reproductive biology. Research intensity should be increased on these species for the purpose of conservation biology.

Management/governance/conservation

Currently, only a few species have been nationally evaluated according to the IUCN Red List of Threatened Species criteria. All species of rays and sharks in the eastern Mediterranean need to be evaluated based on the best available knowledge. A committee or a task force will be established to assess the status in the short-term, so that this will be used to further develop conservation projects for some threatened species (Öztürk, 2018).



Neonate White Shark *Carcharodon carcharias* in the wholesale fish market | Hakan Kabasakal



Angel shark *Squatina* spp. fillets on display at a fishmonger in Istanbul | Hakan Kabasakal

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Blackchin Guitarfish *Glaucostegus cemiculus* and skates landed in Antalya, Türkiye | Fabrizio Serena



A Thornback Skate *Raja clavata* and Longnose Spurdog *Squalus blainville* neonates captured during a scientific bottom-trawl survey | Hakan Kabasakal