Action and Site Management Plan for *Glaucostegus cemiculus* and *Gymnura altavela* Species on Samandağ Coast (Between Şahlankaya and Akıncı Cape, Hatay Province, Northeast Mediterranean)

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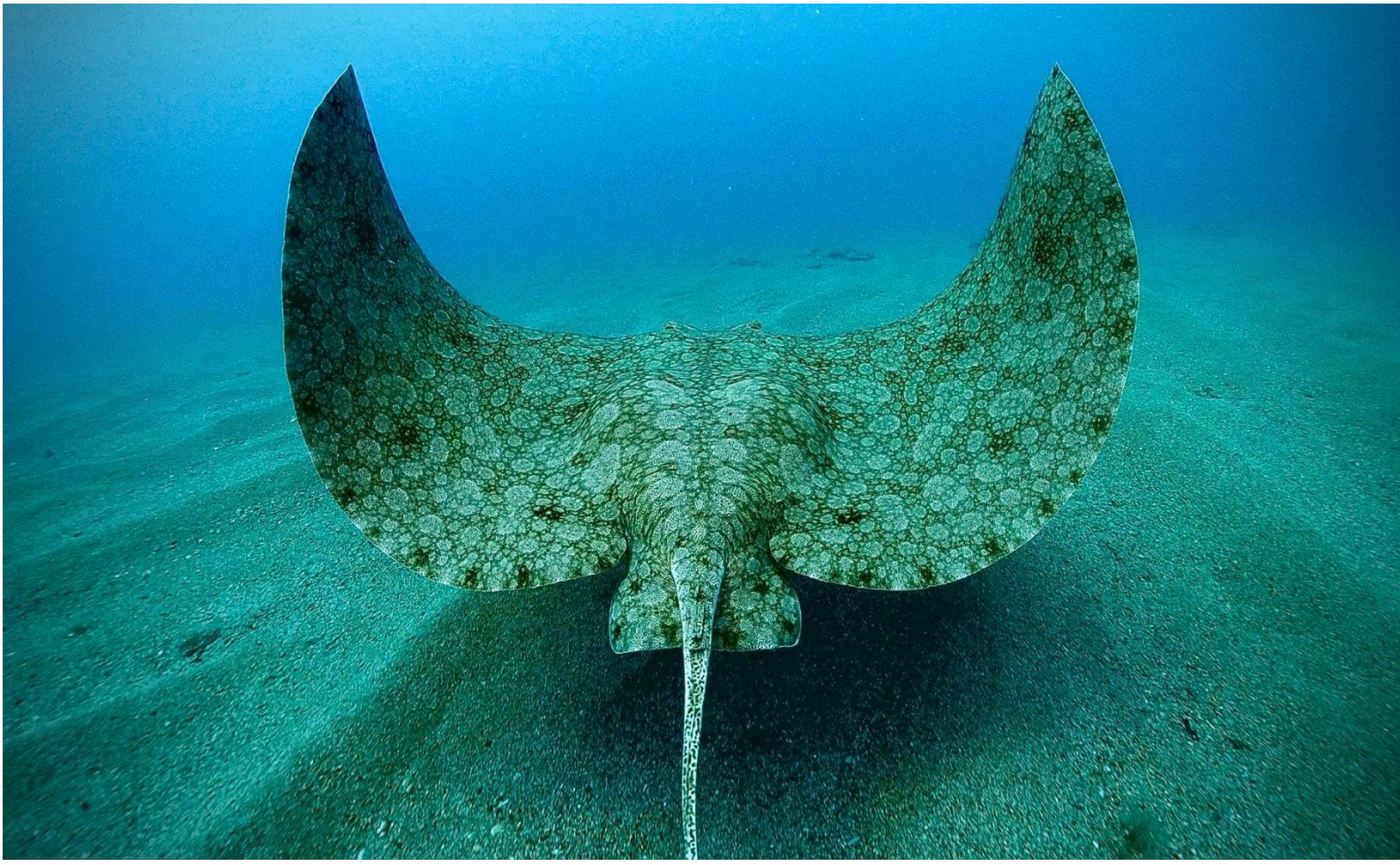

Contents

1.INTRODUCTION

We are on the brink of a severe crisis. If this crisis, which directly targets ocean life, is not averted, 1 in 3 cartilaginous fish species will likely become extinct or near extinction within this century (Dulvy et al., 2021). Although bony fishes (Teleostei), with about 35,000 species, constitute the overwhelming majority of the population in the fish kingdom in terms of species diversity (Ravi and Venkatesh, 2018), cartilaginous fishes, which have been roaming the oceans for at least 400 million years, play vital roles in maintaining crucial functions in the silent world with 1,282 identified species (Fowler et al., 2005; Heithaus et al., 2010; Serena et al., 2020). Almost half of this number of species (689 species) are batoids, generalized as flat cartilaginous fishes, including rays (Rajidae family), irinas (Dasyatidae family), sea eagles (Myliobatidae family), fiddlers (Rhinobathidae and Glaucostegidae families), foil fishes (Mobulidae family), torpedo fishes (Torpedinidae family), etc. (Serena et al., 2020). Researchers point out that if the predicted extinction crisis materializes, there could be a 44% loss in the functional diversity of the oceans (Pimiento et al., 2020). Considering the currently accepted definition of functional diversity - the amount of niche space occupied by species within a community (Legras et al., 2018), it is not far-fetched that the loss of cartilaginous fish would cause irreparable damage to ecological processes in the oceans!

The Mediterranean, home to approximately 17,000 species, has been described by many researchers as a "biodiversity hotspot" (Coll et al., 2010). Compared to the overall species diversity of the Mediterranean Sea, which is being flooded by invasive species and is becoming increasingly warmer, the 88 species of cartilaginous fish identified in the region, of which 43.18% (38 species) are flat cartilaginous fish (Serena et al., 2020; Barone et al., 2022), may seem like a minimal number. However, compared to the rest of the world, the Mediterranean is one of the regions where these species, which play key ecologically irreplaceable roles and most of which are "apex predators and meso predators" (Fanelli et al., 2023), face the threat of the "extinction crisis" highlighted above (Serena et al., 2020). In fact, the Mediterranean, which is emphasized as the place where cartilaginous fishes face the heaviest population losses other than the Indo-Pacific Biodiversity Triangle and the Red Sea, is defined as a "hotspot" where actions at national and international scales should be implemented without further delay for the conservation of cartilaginous fishes (Dulvy et al., 2014).

According to the most recent species list of marine fishes of Turkey and cartilaginous fishes focussed studies (Bilecenoğlu et al., 2014; Kabasakal, 2021; Turan et al., 2021), 30 of the 69 cartilaginous fish species distributed in Turkish seas consist of flat cartilaginous fish species. Two of these 30 cartilaginous fish species are *Glaucostegus cemiculus* (Geoffroy St. Hilaire, 1817) (fiddlefish) and *Gymnura altavela* (Linnaeus, 1758) (piletail fish) (Bilecenoğlu et al., 2014). In this document; gives a chronological summary of the studies focusing on the distribution of both species in our seas and the life history of the species, detailing the threats to these species in our the

current boundary of Iskenderun Bay, which was included in the scope of ISRA (Important Sharks and Ray Area) in 2023 (Mersin and Iskenderun Bays ISRA; Jabado et al, 2023) and present an action and management plan for the area between Keldağ and Cape Akıncı, where *G. cemiculus* and *G. altavela* populations are dense.

2. Outlines of İskenderun Bay

In the partitioning applied by the General Fisheries Council for the Mediterranean (GFCM) (Figure 1), Turkey's marine areas in the Mediterranean mostly fall within geographical sub-region 24 (referred to as GFCM GSA 24 in the following sections of this action plan; Carpentieri et al., 2021). Iskenderun Bay has the smallest surface area (2,275 km2) among the gulfs extending west-east along the Anatolian coast, which forms the northern land border of GFCM GSA 24 (Ergüden et al., 2022). The maximum depth of the 35 km wide gulf, which covers a vast continental shelf area, is 90 m (Ergüden et al., 2022). Although sandy and muddy bottom structure is dominant in the western parts of the gulf, where the main freshwater input is provided by the Asi and Ceyhan rivers, rocky bottom structure is common on the eastern shores of the bay (Ergüden et al., 2022).

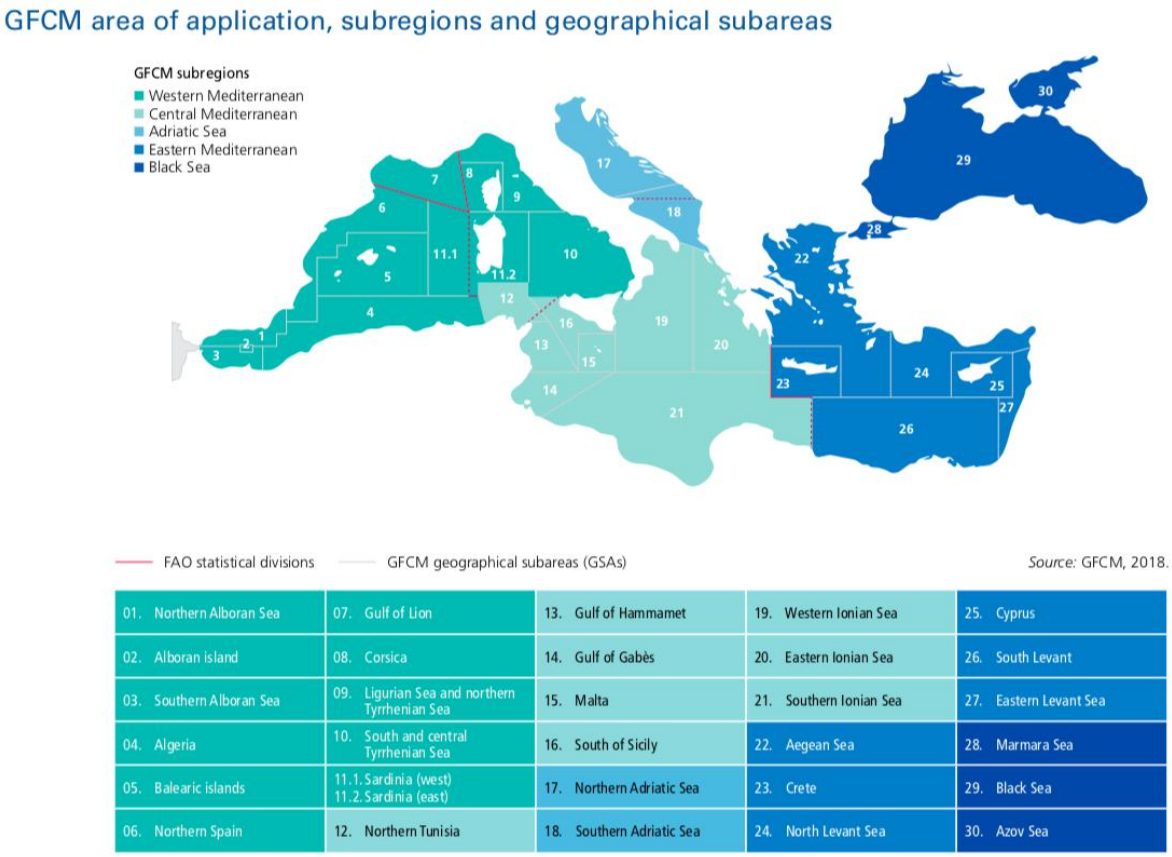

Figure 1. Distribution of cGFCM geographical sub-regions on the map. The area within the circle is Iskenderun Bay (Source: Carpentieri et al., 2021).

Although the eastern Mediterranean is considered to be one of the most oligotrophic regions in the world based on biomass and primary production values (Azov, 1991), İskenderun Bay, where productivity is high due to the effect of prevailing winds as well as upwelling and rich nutrient salt inputs of terrestrial origin (Yemişken et al., 2014), draws attention with its rich biodiversity and fisheries resources in the northeastern Mediterranean (Ergüden et al., 2022). It is known that a considerable amount of cartilaginous fish are bycatch in the gulf waters due to intensive bottom trawling activities in Iskenderun Bay, which is considered as an important region for trawl fisheries in the entire eastern Mediterranean region (GFCM GSAs 24-27; Carpentieri et al., 2021) (Yemişken et al., 2014; Yağlıoğlu et al., 2015; Ergüden et al., 2022).

Samandağ, which was determined as the study area, is the longest dune area in Turkey. The coastline of approximately 14 kilometres includes important coastal ecosystems such as Mileyha Wetland and Asi Delta. On the Samandağ coast, where biodiversity is high, intensive fishing, agriculture and tourism activities are carried out. In addition to the overfishing pressure in the region, invasive species, which have been continuing for a long time and increasing in number every day, damage biodiversity. Marine litter pollution, which has been seen intensively on the Samandağ coast in recent years, poses a serious threat to many living things, especially sea turtles (Özdilek et al., 2006, Sönmez, 2018). In addition to the pressure created by these threats that are effective on the living things living in and around Samandağ, the earthquakes of 6 February, which affected 10 cities together with Hatay, caused great destruction and destruction. It is very important to determine the pressure on biodiversity caused by the disaster that disrupts the functioning of the ecosystem.

3. Availability of the Species in Turkey Seas

Although *Glaucostegus cemiculus* and *Gymnura altavela* species were not included in the early ichthyological studies on cartilaginous fishes distributed in the seas of Turkey (Ninni, 1923; Deveciyan, 1926), the beginning of studies documenting the presence of both species in the Aegean Sea and the Mediterranean Sea dates back to the 18th century (Carus, 1889-1893, as Rhinobatus cemiculus and Pteroplatea altavela). It can be said that the earliest records of the presence of kemane and piletail fishes in our seas are Geldiay (1967), Akşıray (1987) and Bauchot (1987). Today, the distribution areas of both species in our seas are well known (Mater and Meriç, 1996; Bilecenoğlu et al., 2014). Although *G. cemiculus* is only found on the Aegean and Mediterranean coasts, *G. altavela* is a species that lives in all our seas from the Black Sea to the Mediterranean Sea (McEachran and Capapé, 1984a,b; Bauchot, 1987; Bilecenoğlu et al., 2014). However, the current presence of *G. altavela* in the Black Sea and the Sea of Marmara needs to be confirmed.

In an old study on the cartilaginous fishes of Iskenderun Bay, Başusta et al. (1998) reported the presence of *G. altavela* in the region, but did not mention the presence of *G. cemiculus*. However, recent studies conducted in the eastern Mediterranean proved the current presence of both species in İskenderun Bay (Yemişken et al., 2014; Yağlıoğlu et al., 2015). Both species have been observed to approach coastal areas, especially during

breeding periods and form temporary aggregations that create a perception of "false abundance" especially among fishermen (Bilgili and Kabasakal, 2023).

4. Species Descriptions and Brief Biology

4.1. *Glaucostegus cemiculus* (Geoffroy St. Hilaire, 1817)

Distinguishing features: Shark-like in appearance, with a long, thick tail, two large dorsal fins and an oval-shaped caudal fin; pectoral and pelvic fins flattened dorsally ventrally to form a relatively narrow body disc. Gill slits are on the underside of the head. The snout is wedge-shaped, the rostrum is narrow and extends to the tip of the snout. Spines on the inner margins of the eye sockets, on the shoulders, along the midline of the body and tail. The dorsal side is brown, without a distinct pattern; the ventral side is white, with a black spot on the tip of the snout, which is especially prominent in juveniles (Ebert and Stehmann, 2013).

Habitat characteristics: It is a demersal species distributed on sandy and muddy grounds, from shallow shores to about 150 m depth (Ebert and Stehmann, 2013).

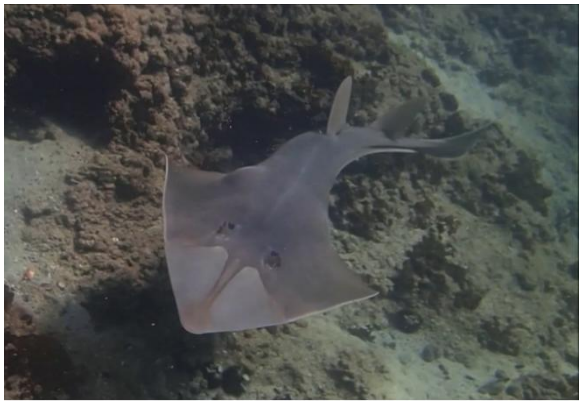

Figure 2. Kemane, *G. cemiculus* (Photo by Ata Bilgili).

Biological characteristics: Egg sac viviparous, giving birth to 9 to 16 young in one litter after a pregnancy lasting 4 to 6 months. It feeds on demersal invertebrates. Maximum length (TL) is ~230 cm in females, ~192 cm in males and ~34 cm in newborns (Ebert and Stehmann, 2013).

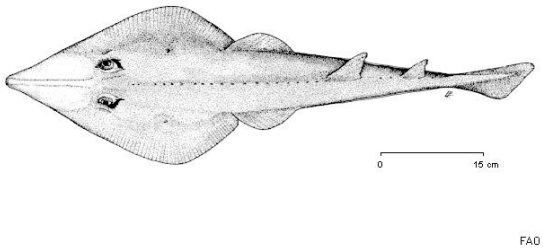

Figure 3. Kemane, *G. cemiculus* (FAO).

4.2. *Gymnura altavela* (Linnaeus, 1758)

Distinguishing features: The disc is a rhombus, very broadened horizontally, twice as long as it is wide; snout very short and blunt; tail slender and very short, up to four times the length of the disc, with a long, serrated spine at the base where the tail connects to the body. The spiraculum holes behind the eyes have one thick skin appendage (tentacle) extending posteriorly on the inner margin. Large individuals may have spines on the disc, the abdominal surface is smooth. Dorsum dark greyish or reddish brown, with dark and light spots on the ground colour, resembling a marble pattern; abdomen white (Ebert and Stehmann, 2013).

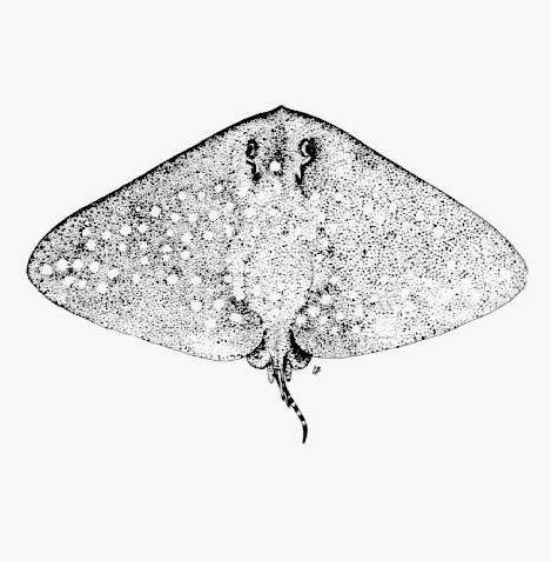

Figure 4. Kazıkkuyruk, *G. altavela* (FAO).

Habitat characteristics: It is a demersal species distributed on sandy and muddy grounds, from shallow shores to about 150 m depth (Ebert and Stehmann, 2013).

Biological characteristics: Egg sacs are viviparous, giving birth to 1 to 8 young in one litter after a pregnancy lasting 4 to 9 months. It feeds on demersal invertebrates. The maximum disc width is ~200 cm; the statement that the disc width can increase to ~400 cm is probably incorrect; the disc width reaches sexual maturity between 100 and 150 cm and the disc width in the newborn is 38 to 44 cm (Ebert and Stehmann, 2013).

Figure 5. *G. altavela* (Photo by Mahmut İğde)

5. Threats to *Glaucostegus cemiculus* and *Gymnura altavela* on the Samandağ Coast

The bycatch of species that are not targets of commercial fisheries is among the main causes of the decline in shark and cartilaginous flatfish populations worldwide, and the loss of life in these species (Favaro and Côte, 2013). The term "bycatch", which is used to refer to the untargeted and/or incidental capture of vulnerable species during commercial fishing, is seen as a serious threat that jeopardises sustainable and profitable fisheries as well as the protection of marine ecosystems (Carpentieri et al., 2021). The most important reason underlying the threat of the "depletion crisis", which is expected to result in the extinction of 1 in 3 cartilaginous fish species, is targeted or bycatch, and according to Dulvy et al. (2021), overfishing from fishing activities is responsible for 67.3% of the projected depletion. The Mediterranean Sea is one of the places where cartilaginous fishes are experiencing population declines worldwide due to their life cycles associated with low resistance to fishing pressure (Carpentieri et al., 2021).

The percentage of cartilaginous fish bycatch in commercial fisheries in İskenderun Bay has been the subject of various studies in the past (Yemişken et al., 2014; Yağlıoğlu et al., 2015; Yeldan, 2018; Bengil and Başusta, 2018; Dalyan, 2020; Ergüden et al., 2022). According to Yemişken et al. (2014), 0.9% of the total bycatch caught and discarded in trawl fisheries in Iskenderun Bay between May 2010 and January 2011 consisted of cartilaginous fish. The incidence of cartilaginous fish in bycatch was 29% for *G. altavela* and 26% for *G. cemiculus* (Yemişken et al., 2014).

In another study examining the bycatch rates of cartilaginous fishes in bottom trawl fisheries in the region, Yağlıoğlu et al. (2015) reported that cartilaginous fishes constituted 23% of the bycatch species in terms of live mass.According to Yağlıoğlu et al. (2015), *G. altavela* and Rhinobatos spp. accounted for 30% and 11% of the live mass of cartilaginous fish caught by bycatch in İskenderun Bay between 2009 and 2010. Since Rhinobatos rhinobatos and *G. cemiculus* were not distinguished at the species level in this study, the representation percentage in bycatch for the Rhinopristiformes order was stated for Rhinobatos spp. (Yağlıoğlu et al., 2015).

According to Bengil and Başusta (2018), who analysed the bycatch rates of cartilaginous fishes in commercial fisheries in Turkish seas based on 52 articles published between 1991 and 2018, the bycatch rates of *G. altavela* and *G. cemiculus* in the eastern Mediterranean were 4.41% and 3.31%, respectively. According to Filiz et al. (2018), the bycatch frequency of *G. altavela* in trawl fisheries in the Aegean Sea was calculated as 6.8 individuals/km2 .

According to Yeldan (2018), who calculated total mortality (Z) as 0.91/year and fishing-caused mortality (F) as 0.51/year for piletail in the Northeastern Mediterranean, *G. altavela* was overfished in the region between 2005 and 2018. Dalyan (2020), who examined the commercial and discard catch rates in bottom trawl fisheries in Iskenderun Bay, stated that cartilaginous fish classified as discards constituted 11% of the total catch. The discard rate of *G. cemiculus*, which is evaluated as catch per unit effort (CPUE), was calculated as

8 individuals (CPUEA=8 individuals/hour) or approximately 5 kilograms of live mass (CPUEW=4,951 g/hour) in 1 hour of trawling (Dalyan, 2020).

According to Yeldan (2018), the total mortality (Z) for the common pandora (Pagellus erythrinus) in the northeastern Mediterranean is 0.91/year, and the fishing mortality (F) is 0.51/year, indicating that *G. altavela* has been overfished between 2005 and 2018 in the region. Dalyan (2020), who examined the commercial and discard catch rates in trawl fisheries in İskenderun Bay, noted that cartilaginous fish classified as discard accounted for 11% of the total catch. The discard rates of *G. cemiculus*, assessed as catch per unit effort (CPUE), were calculated to be 8 individuals per hour of trawling (CPUEA=8 individuals/hour) or approximately 5 kilograms of live biomass (CPUEW=4,951 g/hour) (Dalyan, 2020). Another notable detail of the same study is that no *G. altavela* were caught in the bay waters (Dalyan, 2020). Compared with the results of other studies, the rare occurrence of *G. cemiculus* and the absence of *G. altavela* in the bay waters are attributed to the high percentage of muddy substrates in the bay, which both species dislike (Cem Dalyan, personal communication). The observation that the seabed between Şahlankaya and Keldağ on the Samandağ coast is predominantly sandy and that the majority of the populations of both species are confined to this area supports the hypothesis that they avoid muddy substrates and prefer sandy ones (Cem Dalyan, personal communication). The figures presented thus far indicate that *G. cemiculus* and *G. altavela* are bycatch in commercial fisheries in İskenderun Bay, posing a significant threat to both cartilaginous fish species. In addition to fishing activities, Dulvy et al. (2021) listed other threats affecting cartilaginous fish and their impact percentages as follows: habitat destruction and degradation (31.2%), climate change (10.2%), and pollution (6.9%). The coasts of İskenderun Bay are notable for their dense residential and industrial settlements (Sönmez and Balaban, 2009). The coastal area management and action plan for *G. cemiculus* and *G. altavela* (Figure 4) fall within the Arsuz (7B) and Samandağ (8A) sub-regions of the İskenderun Bay Coastal Area Integrated Planning and Management Project (Sönmez and Balaban, 2009). In these sub-regions, which host numerous townships and rural settlements along the coast, the increasing number of summer homes indicates intense coastal usage (Sönmez and Balaban, 2009). Furthermore, the presence of facilities such as ports, steel plants, LPG facilities, and oil transfer docks in the strategically significant İskenderun Bay increases the risk of coastal pollution due to accidents (İnan, 2011). Simulations to understand the spread of oil in the event of an accident predict that even a small amount of oil spilled from the Ceyhan coast would rapidly reach the Yumurtalık coast (İnan, 2011). Therefore, in the event of a major oil spill in the bay, it is not unlikely that the Akıncı Burnu-Şahlankaya coastal strip would be affected, harming the marine life there, including the *G. cemiculus* and *G. altavela* populations. Additionally, Türkmen and Aras (2011), in a study examining heavy metal accumulation in the sediment of İskenderun Bay, stated that preventive measures should be taken promptly to mitigate the threat of heavy metal pollution, which could affect the biodiversity of the bay ecosystem. Since *G. cemiculus* and *G. altavela* are benthic

cartilaginous fish species that feed on bottom invertebrates, it is possible for pollutants mixed into the seabed to directly affect both species and indirectly affect them through their prey. The mass deaths of the flat cartilaginous fish species Raja clavata and Dasyatis pastinaca reported in the Sea of Marmara, where there was an excessive mucilage bloom a few years ago and dissolved oxygen levels fell below the hypoxia threshold (2 mg/L) in deep waters (Karadurmuş and Sarı, 2022), exemplify how pollution threatens the lives of flat cartilaginous fish. In recent years, the Mediterranean Sea, where sea water temperatures have significantly increased, has been gradually tropicalizing (Bianchi and Morri, 2003). There is insufficient information recent years, the Mediterranean Sea, where sea water temperatures have significantly exemplify how pollution threatens the lives of flat cartilagious fish. In recent years, the Mediterranean Sea, where sea water temperature have significantly increased, has been gradually tropicalizing (Bianchi and Morri, 2003). There is insufficient information to predict how *G. cemiculus* and *G. altavela*, both of which are Atlanto-Mediterranean species (Ebert and Stehmann, 2013), will respond to tropicalization as the Mediterranean becomes increasingly suitable for thermophilic species.

Figure 6. Location of the Akıncı Burnu-Şahlankaya coastal area in the Gulf of İskenderun

In a study conducted in previous years in Antalya Bay, Özgür Özbek et al. (2016) reported that the abundance (individuals/km²), biomass (kg/km²), and frequency of occurrence of *G. altavela* reached their highest values in summer and dropped to their lowest levels in winter. According to Bilgili and Kabasakal (2023), who investigated the seasonal aggregations of some flat cartilaginous fish, including *G. cemiculus* and *G. altavela*, in Güllük Bay (Aegean Sea), these aggregations in the region peak in July when sea water temperature increases. In a similar study, Chaikin et al. (2020) reported that aggregations of some flat cartilaginous fish, including *G. cemiculus*, reached their peak in May off the coast of Hadera (Israel, Mediterranean). Aggregation observations in Hadera, located in the southeastern Mediterranean, show that these aggregations suddenly and drastically decrease in June when the sea water temperature rises above

28°C (Chaikin et al., 2020). In light of this information, it is understood that the seasonal aggregation dynamics and frequency of occurrence of *G. cemiculus* and *G. altavela* are influenced by sea water temperatures (Özgür Özbek et al., 2016; Chaikin et al., 2020; Bilgili and Kabasakal, 2023). Therefore, it is likely that these aggregations will be affected if sea water temperatures in the Mediterranean remain very high for most of the year due to tropicalization. The differences in the study areas of two research projects focused on trawl fishing in the region, conducted at similar times, provide important insights into the distribution of the *G. altavela* species (Figure 7). Dalyan (2020) did not encounter the species in 33 trawl operations within İskenderun Bay, whereas Yemişken et al. (2014) included the Samandağ coast in addition to İskenderun Bay in their study and found *G. altavela* in approximately 30% of 32 trawl operations. The 203 individuals they obtained is a significant number and indicates that the species primarily distributes in the area between Akıncı Cape and Keldağ. Ergin et al. (1998) revealed the presence of mud in the region's sediment and specifically noted that the sediment type along the coastlines south of Akıncı Cape, outside İskenderun Bay, is "slightly gravelly sandy mud." Future studies should certainly evaluate whether this type of sediment, which is rarely seen in the bay, plays an important role in the species' distribution.

Samandağ is one of the places most affected by the February 6 earthquakes, which resulted in the loss of thousands of lives and caused great destruction. It is known that debris and waste generated after the earthquake were initially dumped on the beaches, in addition to the coastal degradation caused by the disaster. Over time, the establishment of tent and container camps along the coasts has increased anthropogenic pressure on the ecosystem. The anthropogenic pressure originating from the shore creates a critical situation for the *G. cemiculus* species, which prefers sandy substrates and thus continues its population in the limited area between Şahlankaya and Keldağ and is occasionally observed near the shore (personal observations by Cem Dalyan and Emin Yoğurtçuoğlu). Determining the post-disaster status of species listed as high-priority for conservation on the IUCN Red List and identifying and eliminating threats to ensure the continuity of their populations in the region is highly important.

The potential threats to the populations of *G. cemiculus* and *G. altavela* in İskenderun Bay can be summarized as above in light of the available information.

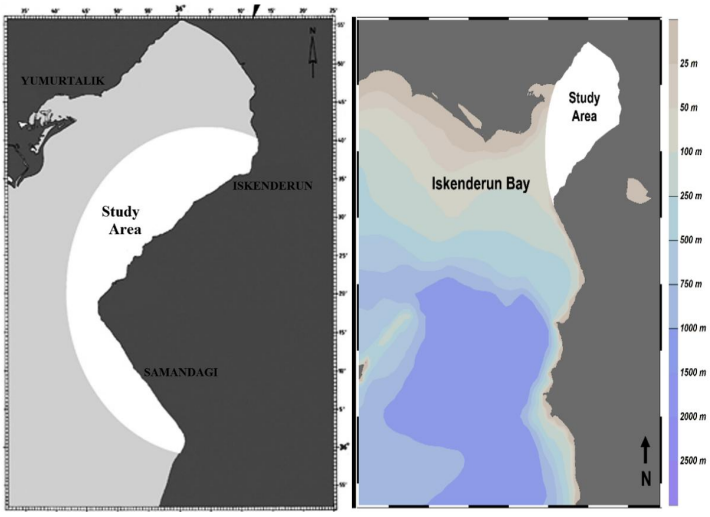

Figure 7. Comparison of the study areas of Yemişken et al. (2014) (A) and Dalyan (2020) (B) (Maps used in the studies have been revised).

6. Regional Projects and Initiatives in GSA 24

Although not focused on *Glaucostegus cemiculus* and *Gymnura altavela*, several important projects that have been initiated in geographical subregion 24, where information on these two species is also collected, are as follows (Fakıoğlu et al., 2021):

6.1. Understanding and attempting to reduce bycatch of several sensitive species in the Mediterranean – a collaborative approach

- The project is under the coordination of BirdLife International.
- Direct partners: SPA/RAC, GFCM, ACCOBAMS, MEDASSET, IUCN-Med, WWF MMI. Indirect partners: GREPOM, AAO/BirdLife Tunisia, DEKAMER, Doğa Derneği/BirdLife Turkey, WWF-Turkey, TUDAV, WWF North Africa, LIPU and WWF Italy).
- Objective: This project focuses on bycatch and aims to identify and test measures to reduce the impact of fishing activities on marine mammals, seabirds, sea turtles and cartilaginous fish.

6.2. Support mechanism for data production on sensitive species (marine mammals, seabirds, sea turtles and chondrichthyans) affected by fishing activities in priority areas in the Mediterranean

- MAVA is implemented by WWF-Türkiye with the support of SPA/RAC within the scope of the Species Information Programme.
- Objective: This project aims to reveal the interactions between cartilaginous fish and small-scale fishermen in the most intensive fishing areas of the North East Mediterranean. Data collection activity focuses on three main objectives:
  - i) to estimate the proportion of vulnerable species incidentally caught by small-scale fishermen using on-board observations;
  - ii) to understand and describe the movement-related behavior of cartilaginous fish using the PSAT tagging method;
  - iii) to map areas where fishing activities and monitored species overlap using portable GPS devices and printed maps.

7. Practices in Action for Species Management

The legal instrument that includes the protection, exploitation, and control of aquatic products in Turkey's seas and inland waters is the Fisheries Law No. 1380, which was adopted in 1971. According to this law, the Communiqué No. 5/1 on the Regulation of Commercial Fisheries (Communiqué No: 2020/20) Section 4, Article 16 prohibits the fishing, collection, possession on ships, landing, transportation, and sale of *Glaucostegus cemiculus* (listed as Rhinobatos cemiculus in the communiqué) in all Turkish waters (Official Gazette 2020). However, in the 2022 amendment to the table of protected species in

Article 16 of the same communiqué, only the great white shark (Carcharodon carcharias) was added (Official Gazette 2022). Therefore, *Gymnura altavela* is not protected in all Turkish waters.

In the first half of 2023, the Shark Specialist Group (SSG) of the International Union for Conservation of Nature and Natural Resources (IUCN) organized a workshop to identify important areas for sharks and rays in the Mediterranean and Black Seas. During this workshop, the Mersin and İskenderun bays were declared as Important Shark and Ray Areas (ISRA) (Jabado et al., 2023). Although the designation of ISRA areas in the Mediterranean does not grant any enforcement authority over the sovereign rights of the relevant countries, the delineation of these areas provides a framework that serves the purpose of "protecting the habitat" as one of the future steps to protect species (Jabado et al., 2023; p. 10). The reasons for the declaration of the ISRA in Mersin and İskenderun bays, covering a marine area of 7,860.9 km² extending from 0 to 200 meters in depth, can be summarized as follows:

(1) The region is characterized by sandy and muddy bottom structure and receives a large amount of freshwater input consisting of nutrient-rich waters, which results in the formation of brackish waters along the coast;
(2) The region overlaps with Ecologically or Biologically Important Marine Areas, nine Key Biodiversity Areas and two Ramsar sites in the northeastern Mediterranean.
(3) The critical species identified in the region are: threatened species (*G. cemiculus*); breeding areas (Rhinobatos rhinobatos); and feeding areas (Dasyatis pastinaca).

The declaration of the Mersin and İskenderun Bays as an ISRA is undoubtedly an important step towards identifying and protecting the habitats of flat sharks in the region. However, a notable shortcoming is that the ISRA in İskenderun Bay ends at Akıncı Cape and does not extend south along the Samandağ coast. It is known that along the coastline between Akıncı Cape and Şahlankaya, adult individuals of the *G. cemiculus* species regularly visit the area up to the wave-breaking zone for reasons that are not yet understood (personal observations by Cem Dalyan and Emin Yoğurtçuoğlu; Figure 8).

Figure 8. *G. cemiculus* individual wandering around the coastal area (Photo: Emin Yoğurtçuoğlu).

In addition, Alkusairy et al. (2014) conducted a study in the northeastern Mediterranean between Raas Albassit and Tartous (Syria, between latitudes 35°55′N and 34°55′N) in the past years, and concluded that *G. altavela* uses the area for breeding purposes and that a sustainable population exists in this area. In light of the available information, the 1,192.6 km2 sea area between Latakia and Banyas in Syria has also recently been declared an ISRA, and the justifications for the declaration of the Latakia-Banyas ISRA can be summarized as follows (Jabado et al., 2023):

(1) The seabed in this region includes very shallow and flat areas, mixed gravel and coarse sand, short rocky shorelines and a steep continental slope extending to deeper waters.

(2) The region is located within the northeastern Mediterranean Ecologically or Biologically Important Marine Area. The critical species identified in the region are: threatened species (*G. cemiculus*) and breeding areas (*G. altavela*).

Changing the trawling ban, which is currently applied as 1 mile in the area between Akıncı Burnu and Şahlankaya (Figure 9), where *G. cemiculus* and *G. altavela* populations are dense, to 1.5 miles will be an important step to reduce the pressure caused by fishing activities on these species whose populations are on the decline. Since this area can serve as a reserve for the species, it is also recommended to declare it a fully protected area (No-Take Zone) and close it to human activities. In addition, as an important step in the actions regarding the protection and management of *G. cemiculus* and *G. altavela* populations in the region, the expansion of the Mersin and İskenderun Gulf ISRA border southward to include the Akıncı Burnu-Şahlankaya coastal and marine areas will also ensure the formation of an integrated ISRA adjacent to the Latakia-Banyas ISRA in the northeastern Mediterranean (Figure 9). The Red List assessments of the species in the Mediterranean are Endangered (EN) for *G. cemiculus* and Critically Endangered (CR) for *G. altavela* (Otero et al., 2019). According to Serena et al. (2020), the Mediterranean populations of *G. cemiculus* and *G. altavela* are in decline. This area expansion is considered as an action approach that strengthens the sustainable management of these threatened species.

Figure 9. Projected boundaries of the new ISRA area expected to be formed in case of possible southward extension of the Mersin and Iskenderun Gulf ISRA.

8. Action and Area Management Plan for *Glaucostegus cemiculus* and *Gymnura altavela* Species

8.1 Threat Categories

The threats outlined above in Section 5 for cartilaginous fishes are shown in the table in this section as grouped threat categories for *G. cemiculus* and *G. altavela*, taking into account the conditions of the Akıncı Burnu-Şahlankaya coastline and the sea area (Table 1).

THREAT CATEGORIES						
1. Agriculture and Aquaculture	**2. Biological Resource Use**	**3.Climate Change and Extreme Weather Events**	**4. Human Interventions and Human Disturbance**	**5. Pollution**	**6. Coastal Development and Commercial Facilities**	**7. Transportation and Service Corridors**
1.1. The possibility of foreign substances (hormones, drugs, etc.) from rearing cages entering the sea and contamination of species with these substances; as well as the possibility of dense aggregation of individuals around the facility attracted by easy food opportunities (discarded feed, dead fish, etc.) and disruption of natural aggregation patterns.	**2.1.** Illegal, unregulated and unrecorded fishing. **2.2.**Bycatch of species in large-scale industrial fisheries and small-scale fisheries and difficulties in species identification, resulting in unfavorable onboard storage conditions, delayed or impossible release. **2.3.** Livelihood and food security. **2.4.** Amateur fishing and hobby fishing (e.g. shore-based cane fishing, spear fishing, etc.). **2.5.** Ghost nets.	**3.1.** Changing water temperature.	**4.1.** Habitat loss. **4.2.** Disturbance of seabed form and structure. **4.3.** Damage to habitats from boat anchors. **4.4.** Recreational water sports (e.g. disturbance from divers through snorkeling or scuba diving). **4.5.** Impact on natal and development areas due to increased numbers of tourists and beach users.	**5.1.** Oil spills. **5.2.** Micro and macro plastics. **5.3.** Waste water discharges.	**6.1.** Increase in coastal development and infrastructure.	**7.1.** Physical damage or noise disturbance caused by maritime transportation.

8.2. Action Plan

8.2.1. GOAL 1: TO MINIMIZE FISHING-CAUSED MORTALITY OF *Glaucostegus cemiculus* AND *Gymnura altavela* IN THE AKINCI CAPE-ŞAHLANKAYA COASTLINE

According to Çiloğlu (2017), the number of vessels actively fishing in the Gulf of İskenderun is 662. Although this number, which belongs to 2016, does not reflect the current situation, it is thought that this figure is largely valid today. In 2019, the Turkish fishing fleet operating under GFCM GSA 24 consisted of 1,705 vessels using both fixed and mobile fishing gear (gillnets, trammel nets, purse seines, bottom trawls, longlines, and trawling nets) (Gordon et al., 2020). In a narrow area where hundreds of vessels operate, bycatch of *G. cemiculus* and *G. altavela* is an inevitable situation. Although this situation cannot be completely prevented, it can be minimized with various measures.

8.2.1.1. Target 1 - Monitoring and reporting of *G. cemiculus* and *G. altavela* by-catch amounts in all fishing activities along the Akıncı Burnu-Şahlankaya coastline, including amateur fishing, and minimizing by-catch pressure for both species.

Action 1 - To improve reporting focused on *G. cemiculus* and *G. altavela* species, NGOs should provide professional and amateur fishermen, diving schools and divers with materials that will allow for better identification of both species and their easy distinction from similar species in the region (e.g. lizards or sea eagles).

Action 2 - Preparation of guidebooks / brochures for consistent data collection and provision of these to professional and amateur fishermen, diving schools, divers by NGOs, researchers or relevant official institutions.

Action 3 - To encourage amateur anglers, spearfishing free divers and recreational scuba divers to report their *G. cemiculus* and *G. altavela* observations, prepare a digital map application accessible from the internet and announce it to a wide audience via social media.

Action 4 - To prevent harm to *G. cemiculus* species fiddleheads that periodically beach in the wave-soaked zone on the Akıncı Burnu-Şahlankaya coastline and *G. altavela* species spiketails that do not exhibit beaching behavior but can enter shallow waters, raise awareness among the local people, amateur and professional fishermen, spearfishing free divers and scuba divers through NGOs and researchers using the training materials suggested in Action 1.

8.2.1.2. Target 2 - To reduce the retention of *G. cemiculus* and *G. altavela* individuals caught on boats and to increase their survival rates after they are released into the sea through information and training for fishermen.

Action 1 - Developing and implementing training programs by NGOs or relevant official institutions to inform fishermen about the conservation status of *G. cemiculus* and *G. altavela* species, their fishing

ban status, and what good practices should be followed in case of incidental catch.

Action 2 - Preparation of a survey to determine the reasons for keeping *G. cemiculus* and *G. altavela* species on deck in order to increase the survival rates of captured individuals, and implementation by NGOs or researchers from relevant official institutions.

Action 3 - Development and implementation by NGOs or relevant government agencies of a best practice guide specific to the species *G. cemiculus* and *G. altavela* for commercial and recreational fishermen, diving schools, spearfishermen, free divers and scuba divers.

8.2.1.3. Target 3 - To determine and minimize the extent of interaction between amateur fishing activities and recreational diving activities carried out at sea and the *G. cemiculus* and *G. altavela* species.

Action 1 - Preparation of a survey to determine how often amateur fishermen and recreational divers encounter *G. cemiculus* and *G. altavela* species, and implementation by NGOs or researchers from relevant official institutions.

Action 2 - Good practice guides/brochures for *G. cemiculus* and *G. altavela* species will be prepared by NGOs or relevant official institutions and distributed in amateur angling and sport diving clubs and/or stores to be determined around Iskenderun Bay by NGOs or relevant official institutions.

8.2.2. GOAL 2: BETTER IDENTIFICATION OF THE HABITAT OF *Glaucostegus cemiculus* AND *Gymnura altavela* ON THE COASTAL BAND BETWEEN AKINCI CAPE AND ŞAHLANKAYA

It is known that İskenderun Bay is generally characterized by its sandy and muddy bottom structure, and that a large amount of freshwater, especially nutrient-rich waters, enters the bay through the Asi and Ceyhan rivers, and that bitter waters form along the coast due to this input (Ergüden et al., 2022). However, more detailed research needs to be conducted in this region to understand the purposes for which the coastal strip between Akıncı Burnu and Şahlankaya is used by *G. cemiculus* and *G. altavela* species.

8.2.2.1. Target 1 - A better understanding of the distribution of *G. cemiculus* and *G. altavela* species in the coastal strip between Akıncı Burnu and Şahlankaya, the critical areas of importance for both species, and the seasonal aggregation and coastal approach behavior of both species. **(What is a Critical Area? A specific geographical area containing the essential features required for the conservation of *G. cemiculus* and *G. altavela* species. This may also be an area that is required for the revival or conservation of the species but is not currently used by the species, such as nesting, mating, aggregation, and feeding areas.)**

Action 1 - Raising awareness of both species by NGOs and/or relevant official institutions to encourage the

public to report their observations of *G. cemiculus* and *G. altavela* species to complement fisheries data and to increase citizen scientist contribution.

Action 2 - Cooperation with diving clubs operating in the coastal strip between Akıncı Cape and Şahlankaya and NGOs and/or relevant official institutions to increase awareness of the existence of *G. cemiculus* and *G. altavela*.

Action 3 - Identification of popular beaches and diving sites along the coastline between Akıncı Burnu and Şahlankaya by NGOs and/or relevant official institutions and comparison with observation data.

Action 4 - Cooperation with fishermen's cooperatives, diving clubs, NGOs and/or relevant official institutions in the region to organize awareness and justification seminars focusing on the fishermen and divers in the region regarding the necessity of declaring a seasonal no-fishing zone in the region(s) where *G. cemiculus* and *G. altavela* individuals most likely aggregate for breeding purposes in the coastal strip between Akıncı Cape and Şahlankaya. Although the seasonal dynamics of breeding aggregations of both species on the Samandağ coast have not been investigated, studies in the southeastern Aegean Sea (Bilgili and Kabasakal, 2023) and southeastern Mediterranean Sea (Chaikin et al., 2020) have shown that aggregations of both species peak in the summer months. Therefore, restricting fishing during the summer between Akıncı Cape and Şahlankaya and including the restriction also on small-scale fisheries would be an important step for the protection of G. cemiculus and *G. altavela* populations in the region.

8.2.2.2. Target 2 - To reflect the habitats of *G. cemiculus* and *G. altavela* in spatial planning and coastal development projects related to the seas.

Action 1 - Researchers should determine whether areas with high levels of pollution (plastic, agriculture, oil transfer lines, etc.) overlap with areas important for *G. cemiculus* and *G. altavela*.

Action 2 - Researchers should determine the general characteristics of potential critical habitats based on habitats where *G. cemiculus* and *G. altavela* species have been previously seen.

Action 3 - Ensuring cooperation between NGOs, relevant official institutions and the government in the Environmental Impact Assessment process prior to construction projects near critical habitats located on the coastal strip between Akıncı Burnu and Şahlankaya.

Action 4 - Sustainable management of critical habitats, ensuring that impacts on *G. cemiculus* and *G. altavela* are kept at acceptable levels by protecting, maintaining or re-establishing important habitat features, and ensuring cooperation between NGOs, relevant official institutions and governments to include critical habitats in Marine Protected Area

processes and environmental impact assessments.

Action 5 - "İskenderun Gulf Coastal Areas Holistic Planning and Management Project" aims to: (1) Effectively protect original and non-renewable resources in İskenderun Gulf and surrounding coastal areas, and (2) Prepare a Management Model and Strategic Plan with a well-established Protection-Use balance (Sönmez and Balaban, 2009). From this perspective, *G. cemiculus* and *G. altavela* are two natural resources that are original and cannot be renewed (or will likely take a very long time) if they are destroyed, as they are threatened species. Since the 7B (Arsuz Region) and 8A (Samandağ Region) coded coastlines of this project, which was prepared many years ago, overlap with the Akıncı Burnu-Şahlankaya coastline, the evaluation of what kind of gains were achieved in this region by NGOs, researchers and relevant official institutions, and adaptation of the said coastline and related sea area to today's conditions for good management.

Action 6 - 6 February 2023 After the Kahramanmaraş Earthquakes, the dumping of excavation residues on the Samandağ coast should either be stopped completely or the said activity should be reduced to a level that will not cause permanent damage to this fragile habitat in the long term and can be buffered by natural processes, especially in order to prevent damage to the areas where kemane fish (*G. cemiculus*) come out to the wave zone on the beach and to prevent silting in the coastal zone in the future.

References

Akşıray, F. (1987): Türkiye Deniz Balıkları Ve Tayin Anahtarı (Istanbul University Publications, Istanbul.

Alkusairy, H., Malek, A., Saad, A., Reynaud, C., Capapé, C. (2014): Maturity, reproductive cycle, and fecundity of spiny butterfly ray, *Gymnura altavela* (Elasmobranchii: Rajiformes: Gymnuridae), from the coast of Syria (eastern Mediterranean). Acta Ichthyologia et Piscatoria 44, 229-240.

Azov, Y. (1991): Eastern Mediterranean - a marine desert? Marine Pollution Bulletin, 23, 225 232.

Başusta, N., Erdem, Ü., Çevik, C. (1998): İskenderum Körfezi kıkırdaklı balıkları üzerine taksonomik bir çalışma. Celal Bayar Üniversitesi Fen-Edebiyat Fakültesi Dergisi, Fen Bilimleri Serisi 1, 63-69.

Bauchot, M.L. (1987): Raies at autres batoidés. In: M. Fisher, M. Schneider and M.-L. Bauchot (eds), Fiches FAO d'Identification des Espècs pour les Besoins de la Peche. Méditerranée et Mer Noire. Zone de Peche 37. Revision 1. II, pp. 847-885. FAO, Rome.

Bengil, E. G. T., Başusta, N. (2018): Chondrichthyan species as by-catch: a review on species inhabiting Turkish waters. J. Black Sea/Mediterranean Environment 24, 288-305.

Bianchi, C. N., Morri, C. (2003): Global sea warming and "tropicalization" of the Mediterranean Sea: biogeographic and ecological aspects. Biogeographia 24, 319-327.

Bilecenoğlu, M., Kaya, M. Cihangir, B., Çiçek, E. (2014): An updated checklist of the marine fihes of Turkey. Tr. J. Zool., 38, 901-929. doi:10.3906/zoo-1405-60.

Bilgili, A., Kabasakal, H. (2023): Encounters with threatened batoids from the perspective of a spearfisherman suggesting an aggregation site in southeastern Aegean Sea, Turkey. Regional Studies in Marine Science 61. https://doi.org/10.1016/j.rsma.2023.102894.

Carpentieri, P., Nastasi, A., Sessa, M., Srour, A. (editörler) (2021): Incidental catch of vulnerable species in Mediterranean and Black Sea fisheries – A review. Studies and Reviews No. 101 (General Fisheries Commission for the Mediterranean). Rome, FAO. https://doi.org/10.4060/cb5405en.

Carus, J. V. (1889-1893): Prodromus Faunae Mediterraneae. Vol. II. Brachiostomata, Mollusca, Tunicata, Vertebrata. E. Schweizerbart'sche Verlagshandlung, Stuttgart.

Chaikin, S., Belmaker, J., Barash, A. (2020): Coastal breeding aggregations of threatened stingrays and guitarfish in the Levant. Aquatic Conservation: Marine and Freshwater Ecosystems, 30, 1160-1171. DOI: 10.1002/aqc.3305.

Çiloğlu, E. (2017): İskenderun Körfezi balıkçı gemilerinin yakıt (OTV'siz) ve avcılık miktarlarının diğer balıkçı gemileri ile karşılaştırılması. Süleyman Demirel Üniversitesi Eğirdir Su Ürünleri Fakültesi Dergisi 14, 138-147.

Dalyan, C. (2020): The commercial and discard catch rates of the trawl fishery in the İskenderun Bay (northeastern Levantine Sea). Trakya University Journal of Natural Sciences, 21, 123-129, DOI: 10.23902/trkjnat.773435.

Deveciyan, K. (1926): Pêche et Pécheries en Turquie. Imprimerie de l'Administration de la Dette Publique Ottomane, Istanbul, 480 sayfa.

Dulvy, N.K., Fowler, S.L., Musick, J.A., Cavanagh, R.D., Kyne, P.M., Harrison, L.R., Carlson, J.K., Davidson, L.N.K., Fordham, S.V., Francis, M.P., Pollock, C.M., Simpfendorfer, C.A., Burgess, G.H., Carpenter, K.E., Compagno, L.J.V., Ebert, D.A., Gibson, C., Heupel, M.R., Livingstone., S.R., Sanciangco, J.C., Stevens, J.D., Valenti, S., White, W.T. (2014): Extinction risk and conservation of the world's sharks and rays. eLIFE 3:e00590. DOI: 10.7554/eLife.00590.

Dulvy, N.K., Pacoureau, N., Rigby, C.L., Pollom, R.A., Jabado, R.W., Ebert, D.A., Finucci, B., Pollock, C.M., Cheok, J., Derrick, D.H., Herman, K.B., Sherman, C.S., VanderWright, W.J., Lawson, J.M., Wallsi R.H.L., Carlson, J.K., Charvet, P., Bineesh, K.K., Fernando, D., Ralph, G.M., Matsushiba,

J.H., Hilton-Taylor, C., Fordham, S.V., Simpfendorfer, C.A. (2021): Overfishing drives over one-third of all sharks and rays toward a global extinction crisis. Current Biology 31, 1–15. https://doi.org/10.1016/j.cub.2021.08.062.

Ebert, D.A., Stehmann, M.F.W. (2013): Sharks, batoids, and chimaeras of the North Atlantic. FAO Species Catalogue for Fishery Purposes. No. 7. Rome, FAO.

Erguden, D., Kabasakal, H., Ayas, D. (2022): Fisheries bycatch and conservation priorities of young sharks (Chondrichthyes: Elasmobranchii) in the Eastern
Mediterranean, Zoology in the Middle East 68, 135-144, DOI:10.1080/09397140.2022.2051916.

Fakıoğlu, E., Gillham, R.L., Hood, A.R., Kabasakal, H., Oruç, A., Öztürk, A.A., Ulman, A. (2021): Akdeniz Kelerleri: Alt Bölgesel Eylem Planı (SubRAP) CAB 24 (Kuzey Doğu Akdeniz).

Fanelli, E., Da Ros, Z., Martino, I., Azzurro, E., Bargione, G., Donato, F., Lucchetti, A. (2023): Crowding in the middle of marine food webs: A focus on Raja asterias and other mediterranean batoids. Marine Environmental Research 183. https://doi.org/10.1016/j.marenvres.2022.105830.

Favaro, B., Côte, I.M. (2013): Do by-catch reduction devices in longline fisheries reduce capture of sharks and rays? A global meta-analysis. Fish and Fisheries 16, 300-309. DOI: 10.1111/faf.12055.

Filiz, H., Yapıcı, S., Bilge, G. (2018): Chondrichthyan fishes in catch composition of the bottom trawl fishery on the coast of Didim, Turkey. J. Black Sea/Mediterranean Environment 24, 28-37.

Fowler, S.L., Cavanagh, R.D., Camhi, M., Burgess, G.H., Cailliet, G.M., Fordham, S.V., Simpfendorfer, C.A., Musick, J.A. (comp. and ed.). 2005. Sharks, Rays and Chimaeras: The Status of the Chondrichthyan Fishes. Status Survey. IUCN/SSC Shark Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK. x + 461 sayfa.

Heithaus, M.R., Frid, A., Vaudo, J.J., Worm, B., Wirsing, A.J. (2010): Unraveling the Ecological Importance of Elasmobranchs. In: Sharks and Their Relatives II: Biodiversity, Adaptive Physiology, and Conservation II, 611–637. doi:10.1201/9781420080483-c16.

İnan, A. (2011): İskenderun Körfezi'nde petrol kirliliğinin modellenmesi. Gazi Üniv. Müh. Mim. Fak. Der. 26, 471-478.

Jabado, R.W., García-Rodríguez, E., Kyne, P.M., Charles, R., Armstrong, A.H., Bortoluzzi, J., Mouton, T.L., GonzalezPestana, A., Battle-Morera, A., Rohner, C., Notarbartolo di Sciara, G. (2023): Mediterranean and Black Seas: A
regional compendium of Important Shark and Ray Areas. Dubai: IUCN SSC Shark Specialist Group.

Kabasakal, H. (2021): A review of shark biodiversity in Turkish waters: updated inventory, new arrivals, questionable species and conservation issues. ANNALES - Ser. hist. nat., 31, 181-194.

Karadurmuş, U., SARI, M. (2022): Marine mucilage in the Sea of Marmara and its effects on the marine ecosystem: mass deaths. Turkish Journal of Zoology 46, 93-102. https://doi.org/10.3906/zoo-2108-14.

Legras, G., Loiseau, N., Gaertner, J.-C. (2018): Functional richness: Overview of indices and underlying concepts. Acta Oecologica 87, 34–44. https://doi.org/10.1016/j.actao.2018.02.007.

McEachran, J.D., Capapé, C. (1984a): Rhinobatidae. In: Fishes of the north-eastern Atlantic and the Mediterranean (Whitehead, P.J.P., Bauchot, M.-L., Hureau, J.-C., Nielsen, J., Tortonese, E., editörler). Vol. 1, UNESCO, Paris, 156-158.

McEachran, J.D., Capapé, C. (1984b): Gymnuridae. In: Fishes of the north-eastern Atlantic and the Mediterranean (Whitehead, P.J.P., Bauchot, M.-L., Hureau, J.-C., Nielsen, J., Tortonese, E., editörler). Vol. 1, UNESCO, Paris, 203-204.

Ninni, E. (1923): Primo contributo allo studio dei pesci e della pesca nelle acque dell'impero Ottomano. Missione Italiana Per l'Esplorazione dei Mari di Levante, Venezia, 187 sayfa.

Otero, M., Serena F., Gerovasileiou, V.,Barone, M., Bo, M., Arcos, J.M., Vulcano A., Xavier, J. (2019): Identification guide of vulnerable species incidentally caught in Mediterranean fisheries. IUCN, Malaga, Spain, 204 sayfa.

Özdilek, H. G., Yalçin-Özdilek, S., Ozaner, F. S., & Sönmez, B. (2006). Impact of accumulated beach litter on Chelonia mydas L. 1758(Green turtle) Hatchlings of the Samandag Coast, Hatay, Turkey. Fresenius Environmental Bulletin, 15(2), 95-103.

Özgür Özbek, E., Çardak, M., Kebapçıoğlu, T. (2016): Spatio-temporal patterns of abundance, biomass and length-weight relationships of *Gymnura altavela* (Linnaeus, 1758) (Pisces: Gymnuridae) in the Gulf of Antalya, Turkey (Levantine Sea). J. Black Sea/Mediterranean Environment 22, 16-34.

Pimiento, C., Leprieur, F., Silvestro, D., Lefcheck, J.S., Albouy, C., Rasher, D.B., Davis, M., Svenning, J.-C., Griffin, J.N. (2020): Functional diversity of marine megafauna in the Anthropocene. Science Advances 6 : eaay7650. DOI: 10.1126/sciadv.aay7650.

Ravi, V., Venkatesh, B. (2018): The divergent genomes of teleosts. Annual Review of Animal Biosciences 6, 47-68. https://doi.org/10.1146/annurev-animal-030117-014821.

Resmi Gazete (2020): 5/1 Numaralı Ticari Amaçlı Su Ürünleri Avcılığının Düzenlenmesi Hakkında Tebliğ (Tebliğ No: 2020/20). Resmi Gazete Sayı: 31221, sayfa 18.

Resmi Gazete (2022): 5/1 Numaralı Ticari Amaçlı Su Ürünleri Avcılığının Düzenlenmesi Hakkında Tebliğ (Tebliğ No: 2020/20)'de Değişiklik Yapılmasına Dair Tebliğ (Teblig No: 2022/19). Resmi Gazete Sayı: 31949, sayfa 42.

Serena, F. Abella, A.J., Bargnesi, F., Barone, M., Colloca, F., Ferretti, F., Fiorentino, F., Jenrette, J., Moro, S. (2020): Species diversity, taxonomy and distribution of Chondrichthyes in the Mediterranean and Black Sea, The European Zoological Journal, 87, 497-536, DOI:10.1080/24750263.2020.1805518.

Sönmez, B. (2018). Sixteen year (2002-2017) record of sea turtle strandings on Samandağ Beach, the eastern Mediterranean coast of Turkey. Zoological Studies, 57.

Sönmez, M.R., Balaban, O. (2009): İskenderun Körfezi Kıyı Alanları Bütünsel Planlama ve Yönetim Projesi. Planlama Dergisi 2009/1, 25-51.

Turan, C., Gürlek, M., Ergüden, D., Kabasakal, H. (2021): A new record for the shark fauna of the Mediterranean Sea: Whale shark, *Rhincodon typus* (Orectolobiformes: Rhincodontidae). Annales - Ser. hist. nat. 31, 167-172. DOI:10.19233/ASHN.2021.20.

Türkmen, A., Aras, S. (2011): İskenderun Körfezi'nde Deniz Suyu ve Sedimentte Oluşan Ağır Metal Birikiminin İncelenmesi. Karadeniz Fen Bilimleri Dergisi 1, 1-23.

Yağlıoğlu, D., Deniz, T., Gürlek, M., Ergüden, D., Turan, C. (2015): Elasmobranch bycatch in a bottom trawl fishery in the Iskenderun Bay, northeastern Mediterranean. Cah. Biol. Mar. 56, 237-243

Yeldan, H. (2018): Estimating some population parameters and stock assesment of spiny butterfly ray, *Gymnura altavela* (Linnaeus, 1758) the Levant Basin coast (Northeastern Mediterranean). Indian Journal of Animal Research 52, 1790-1796. DOI:10.18805/ijar.B-917.

Yemişken, E., Dalyan, C., Eryılmaz, L. (2014): Catch and discardfish species of trawl fisheries in the Iskenderun Bay (Northeastern Mediterranean) with emphasis on lessepsian and chondricthyan species. Mediterranean Marine Science, 15, 380–389. https://doi.org/10.12681/mms.538.