UNITED
NATIONS

EP

UNEP/MED WG.608/Inf.14

UNITED NATIONS
ENVIRONMENT PROGRAMME
MEDITERRANEAN ACTION PLAN

10 May 2025
Original: English

Seventeenth Meeting of SPA/BD Focal Points

Istanbul, Türkiye, 20-22 May 2025

Agenda Item 5: Conservation of Species and Habitats

5.2. Updating of the Action Plan for the conservation of cartilaginous fishes (Chondrichthyans) in the Mediterranean Sea

Overview of the status of elasmobranchs in the Adriatic region

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Note by the Secretariat

1. The present document has been prepared within the framework of the bilateral Cooperation Agreement signed between UNEP/MAP and the Italian Ministry of Environment and Energy Security (MASE) to support the implementation of the MAP Programme of Work (PoW 2024-2025) and to Improve national monitoring, management and capacity-building for conservation of endangered elasmobranchs in the Adriatic areas. It is submitted to the 17th meeting of the SPA/BD Focal Points for Information.

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1. Introduction to the overview on the status of elasmobranch in the Adriatic region

1. Elasmobranchs (sharks and rays) are a key group of marine predators, mediating trophic cascades as top or meso- predatory species (Myers et al., 2007; Heithaus et al., 2012) and thus maintaining the structure and functioning of food webs (Libralato et al., 2006; Baum and Worm, 2009). These species exhibit density-dependent recruitment and K-strategy life history traits (Compagno, 1990; Frisk et al., 2001) expressed in greater longevity, slower maturation, and lower fecundity compared to several marine species. This makes them considerably more vulnerable to exploitation pressure than teleost counterparts. In recent years, these species have attracted increasing concern due to the large declines in their population abundances (Baum and Myers, 2004; Ferretti et al., 2010) and a greater understanding of their ecological importance (Heupel et al., 2014) and high vulnerability to extinction risk (García et al., 2008; Dulvy et al., 2014). The main direct threat to elasmobranch species is fisheries exploitation, leading in some cases to extirpation and shifts in local species assemblages (Ward and Myers, 2005; Sguotti et al., 2016). Elasmobranch species are often weakly regulated by fisheries management since they often represent the bycatch of more valuable target resources (Stevens et al., 2000; Dulvy et al., 2008; Techera and Klein, 2011).

2. The Mediterranean basin is a hotspot of biodiversity for chondrichthyan species hosting over 80 species (Mancusi et al., 2020), but it is also one of the world's regions facing the highest risk of extinction: more than half of the evaluated species are under threat, with almost a third of them fished close to the level of extinction (Figure 1).

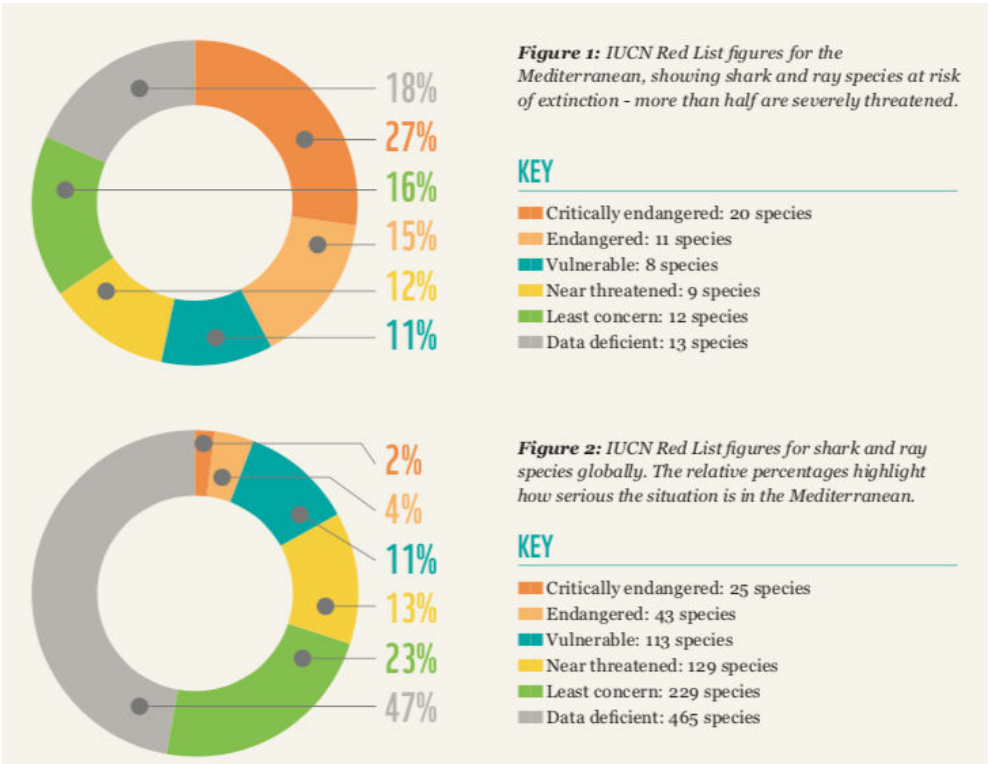

Figure 1. IUCN (International Union for the Conservation of Nature) Red List figures for shark and ray species globally (top) and for the Mediterranean Sea (bottom) (source WWF Report 2019 "Sharks in Crisis: A call to Action for the Mediterranean").

3. Between 1980 and 2015, the percentage of shark and ray species listed as threatened increased by 18% in the Mediterranean Sea (Walls and Dulvy, 2021).

4. One of the most relevant basins of the Mediterranean for the presence of elasmobranchs is the Adriatic Sea. In the Adriatic Sea, elasmobranchs have undergone a drastic decline in recent decades (Jukic-Peladic et al., 2001; Lotze et al., 2010; Ferretti et al., 2013), so much so that around 70% of species are considered threatened at the regional level (https://www.iucnredlist.org/, last access 22nd November 2024). The Adriatic Sea is recognized as one of the most heavily impacted regions by trawl fishing worldwide (Amoroso et al., 2018; Pitcher et al., 2022), which significantly affects the bycatch of elasmobranchs (Carpentieri et al., 2021). However, the assessment of these organisms' stocks is hindered by a lack of available data (Cashion et al., 2019).

5. The Adriatic Sea (Figure 2) encompasses the territorial waters of Italy (Friuli-Venezia Giulia, Veneto, Emilia-Romagna, Marche, Abruzzo, Molise, and Apulia Regions jurisdictions), Slovenia (Obalno-kraška statistical Region's jurisdiction), Croatia (Istarska, Primorsko-goranska, Ličko-senjska, Zadarska, Šibensko-kninska, Splitsko-dalmatinska, Dubrovačko-neretvanska Regions' jurisdictions), Montenegro (Herceg Novi, Tivat, Kotor, Budva, Municipalities' jurisdictions), and Albania (Shkodër, Lezhë, Durrës, Tirana, Fier, Vlorë, Counties' jurisdictions). Furthermore, part of the area falls in extra-territorial waters included into the declared EEZs of Croatia.

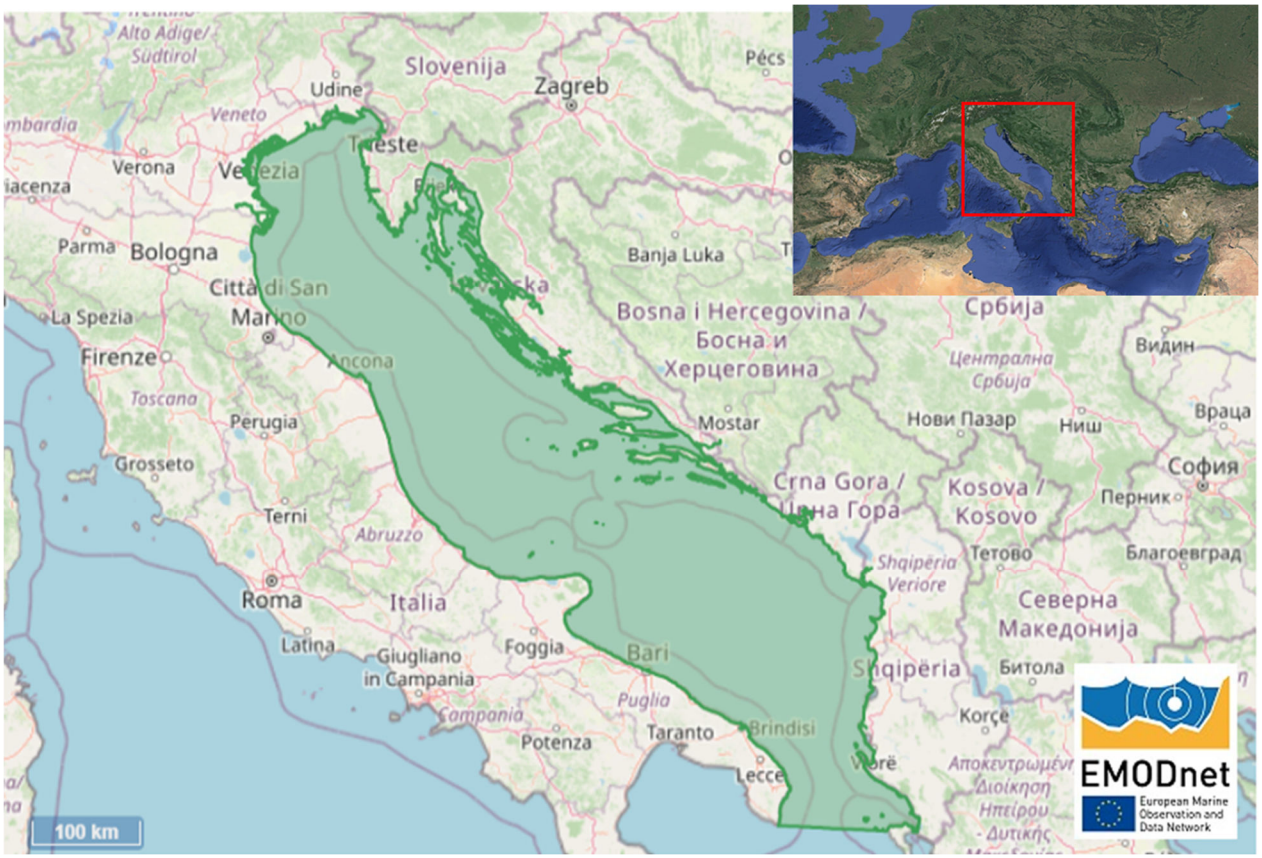

Figure 2. Map of the Mediterranean Sea (inset) with a focus (in red) of the Adriatic Sea (filled in green in the main map).

6. The Adriatic is a warm temperate sea, with surface temperatures ranging from 6 ºC in winter to 29 ºC in summer. Temperatures of the deepest layers are, for the most part, above 10 ºC.

7. This area includes mobile sandy bottoms, seagrass beds (Guidetti et al., 2002), hard-bottom associations (Freiwald et al., 2009; Ingrosso et al., 2018), and unique rocky outcrops called ‘trezze’ and ‘tegnue’ (Tonin and Lucaroni, 2017; Ingrosso et al., 2018). The area hosts a strong diversity of benthic and pelagic habitats due to an important gradient of environmental factors from its western portion to its eastern coasts and it is also one of the most productive areas in the Mediterranean Sea (UNEP/MAP-RAC/SP, 2015).

8. The Adriatic Sea is usually divided into three sub-basins: the northern, the central and the southern Adriatic Sea (Trincardi et al., 1996). The northern sub-basin has an average depth of 35 m with a maximum depth of 75–100 m, approximately between Pescara and Sibenik, where a slope gently leads to the central basin at depths of 140–150 m (van Straaten, 1970). The northern part of the basin is, by convention, bounded to the south by the transect approximately at 43.5°N.

9. The central Adriatic has an average depth of 130–150 m and is characterised by the presence of the deep Jabuka/Pomo Pit that reaches 273 m depth (van Straaten, 1970). The Adriatic Sea provides ~30% of Mediterranean freshwaters (~30% of which come from Po River), creating a positive water balance of 90–150 km³ exported to the Mediterranean (Artegiani et al., 1996). The strong influence of the Po River plumes results in variable salinity, low water temperature, and high productivity, especially in the northern and central areas (Grilli et al., 2020).

10. The Southern Adriatic, located south of the central basin, represents the deepest part of the Adriatic Sea, with depths reaching up to 1,200 meters in the South Adriatic Pit (Miserocchi et al., 2023). This sub-basin is characterized by more stable water conditions, with less variation in temperature and salinity compared to the northern areas. It plays a crucial role in the overall water circulation of the Adriatic, as currents flowing through the Strait of Otranto connect the Adriatic Sea to the Ionian Sea and the Eastern Mediterranean, influencing water exchange and nutrient distribution (Artegiani et al., 1996).

2. Assessment of Current Monitoring Programmes

11. The monitoring of elasmobranchs in the Adriatic is conducted using a variety of approaches, integrating both scientific data and traditional knowledge. The main scientific surveys that are currently carried out include:

- MEDITS, the Mediterranean International Trawl Survey, conducted in the GSA 17 (Northern and Central Adriatic Sea) and GSA 18 (Southern Adriatic Sea);
- EU MSFD (Marine Strategy Framework Directive, EC 56/2008), Monitoring programs of Italy and Croatia;
- BYCATCH (GFCM) monitoring projects: conducted since 2006 in Italian waters, including the Adriatic basin. From the campaign of 2024-2025, Croatia is participating in GFCM Bycatch strengthening data collection and testing mitigation measures for elasmobranchs caught with passive gears.

MEDITS project

12. The MEDITS (International bottom trawl survey in the Mediterranean) monitoring project began in 1994 to assess demersal resources. The general orientations of this action have been defined in 1993 by an ad-hoc working group managed by the European Commission (Directorate of Fisheries) and opened to scientists from all the Community countries (Anonymous, 1993).

13. At the beginning the programme was managed by four main partners: the Spanish Institute of Oceanography (IEO, Spain), the French Research Institute for the Exploitation of the Sea (IFREMER, France), the Italian Society of Marine Biology (SIBM, Italy) and the National Center of Marine research (NCMR, Greece). Since 1996, the activity of the programme has been enlarged in the Adriatic through the participation of three newcomer countries: Albania, Croatia and Slovenia. For the time being, about twenty institutes and laboratories from the Northern Mediterranean contribute to the programme. At present, the programme has no formal link with other international bodies, but some of the partners are mainly involved in different other groups or organizations (GFCM - General Fisheries Commission for the Mediterranean, ICES - International Council for the Exploration of the Sea, etc.) and other international research programmes. One survey has been carried out each year with the same rules since 1994.

14. The main features of the yearly survey are (Anonymous, 2017):

- A standard design of sampling bottom trawl gear (GOC 73) is used (codend mesh size of 20 mm stretched mesh).
- The survey uses a depth-stratified random sampling scheme, with strata defined by depth and geographical zone.
- Hauls are distributed proportionally to the surface area of depth strata, which limits are: 10-50m, 51-100m, 101-200m, 201-500m, and 501-800m.
- Haul duration is determined by depth: 30 minutes on the continental shelf (10-200m) and 60 minutes on the slope (201-800m).
- The surveys are scheduled between late spring and summer (May to July) and conducted during daytime.
- All species larger than 1 cm are identified, with total weight and number of individuals recorded. Sex and gonad maturation stage are identified on a set of target species.
- A length-stratified random sampling is applied to collect biological data, such as otoliths of bony fish and individual weight.
- If a live specimen of a rare species or a species subject to conservation measures is caught, efforts should be made to obtain length, weight and sex data and return the specimen back to the sea unharmed, giving it a chance for survival. The specimens should be returned at sea preferably within 4-5 minutes.

15. The MEDITS protocol also defines common formats for data exchange, including 5 different standards:

- TA: hauls details and specifications;
- TB: aggregated data on species' total number and weight;
- TC: length frequency distributions by length, sex, and maturity stage;
- TE: individual data of length, weight, age and sex;
- TL: marine macro-litter data

16. All the hauls are carried out using the same sampling gear. To increase the catch of demersal species, the gear has a vertical opening slightly superior to the most common professional gears used in the area.

17. The MEDITS survey has been carried out in GSA 17 since 1994. **GSA 17**, located in the Northern-Central Adriatic Sea, extends on an area of 92261 km². The survey was extended to the eastern side in 1996. It was conducted primarily during spring. The sampling intensity accounts for 120 hauls per year on the western side and 60 hauls per year on the eastern side (Figure 3). On average, 141 hauls per year were done in the whole time series. The survey was not carried out in 2022 due to bureaucratic delays connected to the COVID-19 pandemic.

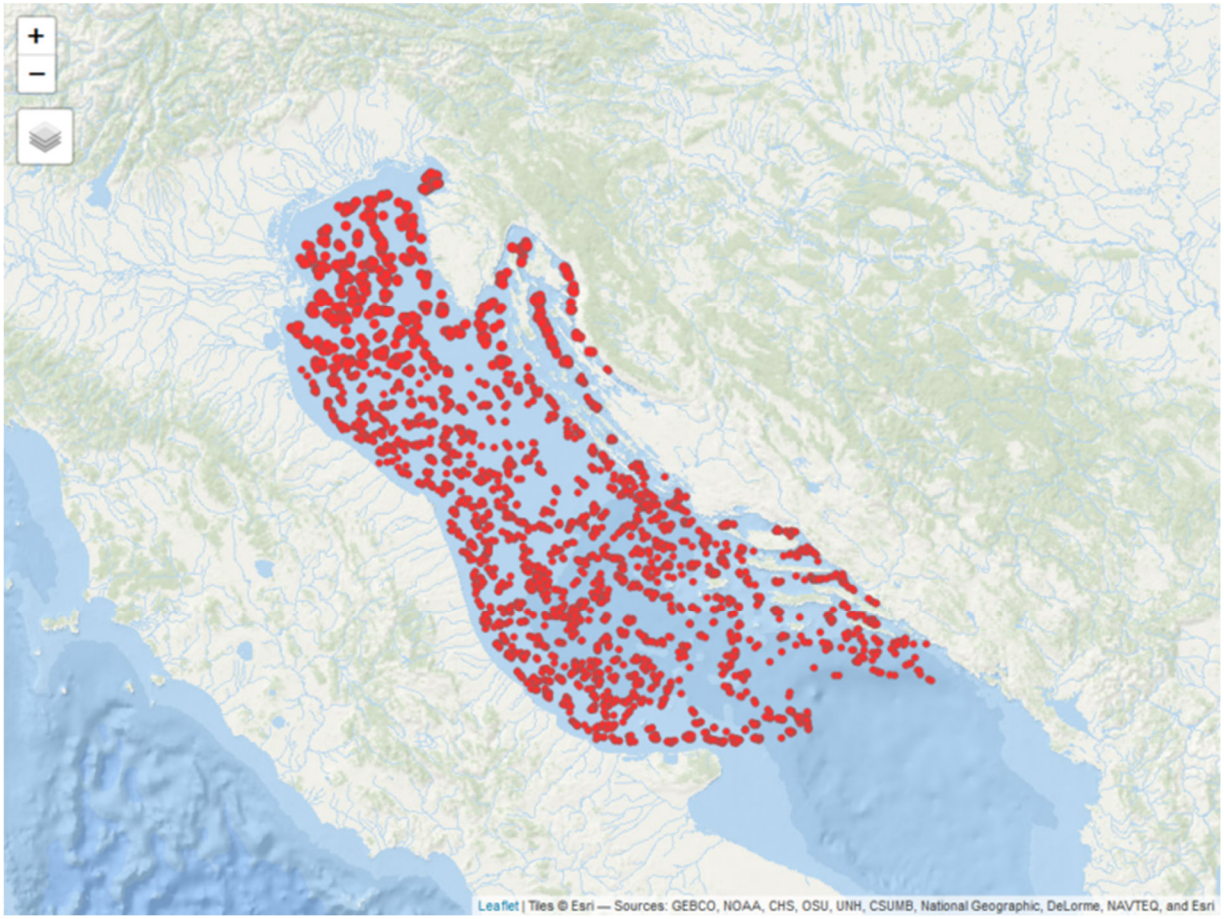

Figure 3. Map of the sampling stations of the MEDITS in GSA17, North-central Adriatic basin. Credits: https://rdbfis.eu/?page_id=3059

18. **GSA 18**, located in the southern part of the Adriatic Sea, extends on an area of 29008 km². The MEDITS survey has been carried out in GSA 18 since 1994 in the western side of the area, while on the eastern side the survey started in in 1996 along the Albanian coasts and in 2008 in the Montenegrin area. It was conducted primarily during spring, with a sampling intensity of about 90 hauls per year (Figure 4). On years 2020 and 2021 the survey was not conducted on the eastern waters, where the survey is carried out under the GFCM umbrella. The survey was not carried out in 2022 in the whole GSA due to bureaucratic delays connected to the COVID-19 pandemic

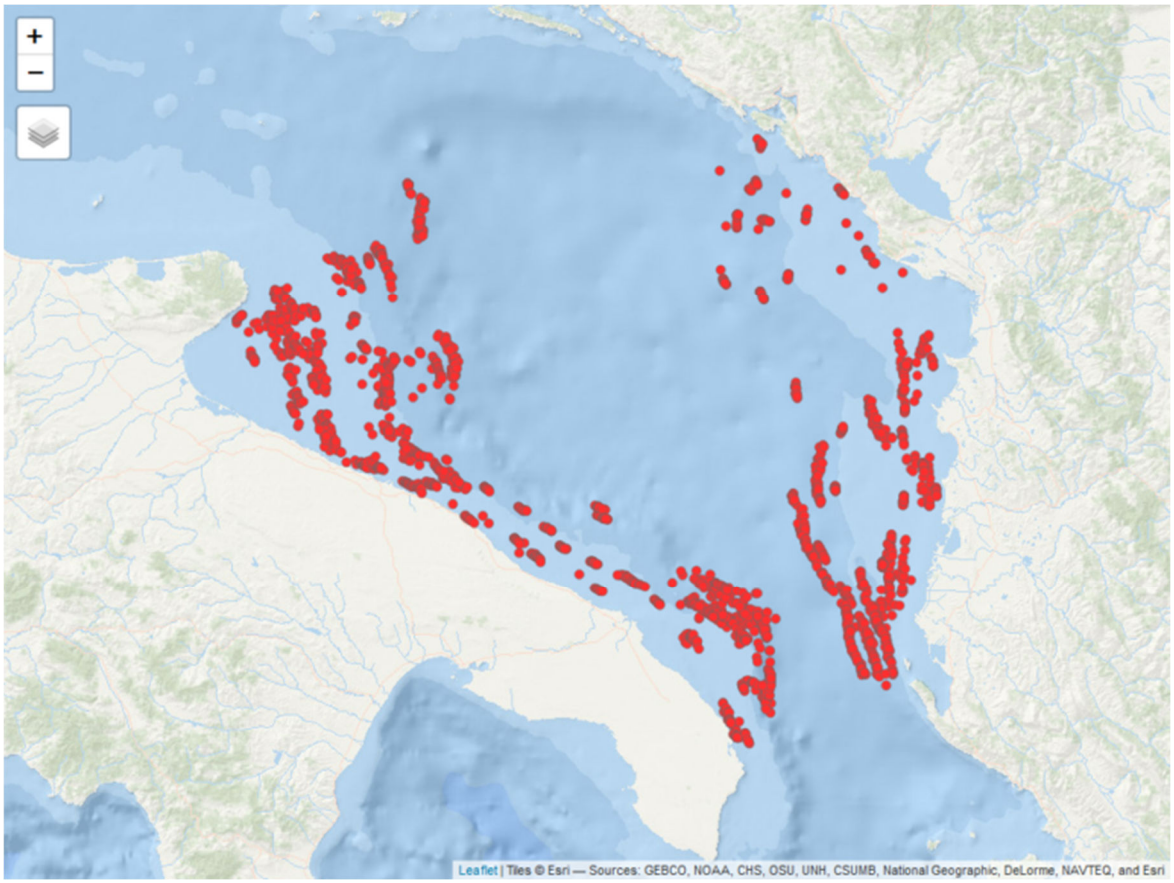

Figure 4. Map of the sampling stations of the MEDITS in GSA18, Southern Adriatic basin. Credits: https://rdbfis.eu/?page_id=3060

19. Since 2012, the MEDITS reference list of target species includes 82 species, of which 32 are Elasmobranchs (see Table 1). For all the monitored taxa, the total number of individuals, the total weight and the individual length should be collected.

20. This list has been further split in two groups:

- MEDITS G1 includes 41 species with 9 demersal taxa (3 fish, 4 crustaceans and 2 cephalopods) and 32 Selachians. For these species, the total number of individuals, the total weight, the individual length (Figure 5) and also biological parameters including sex, maturity, individual weight, and age should be collected.

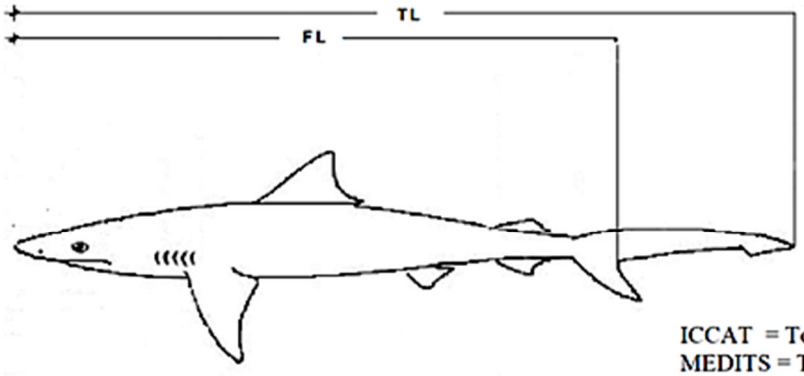

Figure 5. Total length measurement for elasmobranch captured in the MEDITS surveys (source MEDITS Handbook - Instruction Manual - Version 9).

- MEDITS G2 includes 43 species for which only total number of individuals, total weight and individual length should be collected.

21. All elasmobranchs targeted by MEDITS are included in G1 (Table 1).

Table 1. List of reference elasmobranch species (Tot. No=total number of individuals in the haul; Tot. W= total weight of the individuals in the haul; the number 1 in the column MEDITS G1 indicates that the species has been selected for some measurements; the column date indicates when the species has been introduced in the list of target species, the symbol > followed by the year indicates that the species was excluded by the list in that year) targeted in MEDITS survey (source MEDITS Handbook - Instruction Manual - Version 9).

No	Medit LIST proposal 2011	Species group DCF	MEDITS G1	MEDITS G2	Group	Old MEDITS list	Tot. No	Tot. W	Ind. Length	Sex	Mat. stage	Age	Ind. weight	Date	CODE	English common name
	Elasmobranches															
39	*Centrophorus granulosus*	G1	1		Elasmob.		x	x	x	x	x		x	2012	CENT GRA	Gulper shark
40	*Dalatias licha*	G1	1		Elasmob		x	x	x	x	x		x	2012	SCYM LIC	Kitefin shark
41	*Dipturus batis*	G1	1		Elasmob		x	x	x	x	x		x	2012	RAJA BAT	Skate
42	*Dipturus oxyrinchus*	G1	1		Elasmob		x	x	x	x	x		x	2012	RAJA OXY	Longnosed skate
43	*Etmopterus spinax*	G1	1		Elasmob		x	x	x	x	x		x	2012	ETMO SPI	Velvet belly
44	*Galeorhinus galeus*	G1	1		Elasmob		x	x	x	x	x		x	2012	GALE GAL	Tope shark
45	*Galeus melastomus*	G1	1		Elasmob	1	x	x	x	x	x		x	1999	GALU MEL	Blackmouth catshark
46	*Heptranchias perlo*	G1	1		Elasmob		x	x	x	x	x		x	2012	HEPT PER	Sharpnose sevengill shark
47	*Hexanchus griseus*	G1	1		Elasmob		x	x	x	x	x		x	2012	HEXA GRI	Bluntnose sixgill shark
48	*Leucoraja circularis*	G1	1		Elasmob		x	x	x	x	x		x	2012	RAJA CIR	Sandy ray
49	*Leucoraja melitensis*	G1	1		Elasmob		x	x	x	x	x		x	2012	RAJA MEL	Maltese ray
50	*Mustelus asterias*	G1	1		Elasmob		x	x	x	x	x		x	2012	MUST AST	Starry smoothhound
51	*Mustelus mustelus*	G1	1		Elasmob		x	x	x	x	x		x	2012	MUST MUS	Smoothhound
52	*Mustelus punctulatus*	G1	1		Elasmob		x	x	x	x	x		x	2012	MUST MED	Blackspotted smoothhound
53	*Myliobatis aquila*	G1	1		Elasmob		x	x	x	x	x		x	2012	MYLI AQU	Common eagle ray
54	*Oxynotus centrina*	G1	1		Elasmob		x	x	x	x	x		x	2012	OXYN CEN	Angular rough shark
55	*Raja asterias*	G1	1		Elasmob		x	x	x	x	x		x	2012	RAJA AST	Starry ray
56	*Raja clavata*	G1	1		Elasmob	1	x	x	x	x	x		x	1999	RAJA CLA	Thornback ray
57	*Raja miraletus*	G1	1		Elasmob		x	x	x	x	x		x	2012	RAJA MIR	Brown ray
58	*Raja polistigma*	G1	1		Elasmob		x	x	x	x	x		x	2012	RAJA POL	Speckled ray
59	*Raja undulata*	G1	1		Elasmob		x	x	x	x	x		x	2012	RAJA UND	Undulate ray
60	*Rhinobatos cemiculus*	G1	1		Elasmob		x	x	x	x	x		x	2012	RHIN CEM	Blackchin guitarfish
61	*Rhinobatos rhinobatos*	G1	1		Elasmob		x	x	x	x	x		x	2012	RHIN RHI	Common guitarfish
62	*Rostroraja alba*	G1	1		Elasmob		x	x	x	x	x		x	2012	RAJA ALB	White skate
63	*Scyliorhinus canicula*	G1	1		Elasmob	1	x	x	x	x	x		x	1999	SCYO CAN	Smallspotted
64	*Scyliorhinus stellaris*	G1	1		Elasmob		x	x	x	x	x		x	2012	SCYO STE	Nursehound
65	*Squalus acanthias*	G1	1		Elasmob		x	x	x	x	x		x	2012	SQUA ACA	Piked dogfish
66	*Squalus blainvillei*	G1	1		Elasmob		x	x	x	x	x		x	2012	SQUA BLA	Longnose spurdog
67	*Squatina aculeata*	G1	1		Elasmob		x	x	x	x	x		x	2012	SQUT ACU	Sawback angelshark
68	*Squatina oculata*	G1	1		Elasmob		x	x	x	x	x		x	2012	SQUT OCL	Smoothback angelshark
69	*Squatina squatina*	G1	1		Elasmob		x	x	x	x	x		x	2012	SQUT SQU	Angelshark
70	*Torpedo marmorata*	G1	1		Elasmob		x	x	x	x	x		x	2012	TORP MAR	Marbled electric ray

22. Concerning elasmobranch maturity stage, the MEDITS refers only to oviparous species (Rajidae and Scyliorhinidae). However, the majority of elasmobranchs are viviparous or ovoviviparous which have a great diversity in ovarian cycles and gestation periods. The examination of male maturity does not present particular problems, considering that they are classified according to the relative sizes and development of claspers and internal spermiducts (Anonymous, 2017). For females it is necessary to apply the dissection of the individual to observe the presence of oocytes and the formation of egg-cases in mature oviparous individuals. For this reason, it is better to use a specific scale for the viviparous and ovoviviparous species usually fished in the Mediterranean Sea as *Squalus acanthias*, *S. blainville, Etmopterus spinax*, *Torpedo* spp., *Dasyatis* spp. for which the reproductive biology is less investigated in several Mediterranean areas (Anonymous, 2017). For these reasons, in the MEDITS surveys the maturity scale for viviparous elasmobranchs is like the one adopted at WKMSEL 2010 (ICES, 2010)

MSFD-Italy: Monitoring Programs

23. Within the monitoring program 3 (fishery), ISPRA[1] has activated the sub-program 3.2 Fishery dependent database. The monitoring activity is based on the study and monitoring of pelagic elasmobranchs, also including the monitoring and biological sampling of commercial elasmobranchs and minor fisheries. They have been included in the scope of this single activity because the homogeneity of the detection systems and the diffusion of the detection network throughout the national territory can guarantee both standardization and reproducibility of the methodologies, and facilitated access to sources of information (e.g. the boats of the professional fishing already subject to survey using on-board observers, landing observation and self-sampling approaches, in the DCF programmes). The parameters to be monitored concern the abundance of catches (landing and discard), effort, demographics of catches of the target species (for the list of species, refer to the National Data Collection Plan within the DCF, see UE Decision DECISIONE DELEGATA UE 2019/910, https://eur-lex.europa.eu/legal-content/IT/TXT/PDF/?uri=CELEX:32019D0910, it includes all species listed in MEDITS G1) estimate of the indicators at the stock level. The parameters' collection by commercial fishing follows internationally validated standard approaches. Data is acquired on a monthly/quarterly basis throughout the whole year integrating information coming from different *métiers* (Small-scale fisheries, pelagic fishing, recreational bluefin tuna fishing) and analyzing DCF data to verify the feasibility of a Minimum Conservation Size of Elasmobranchs (action spread over two years). Data is used to assess indicators within Descriptor 3 of MSFD (Commercial fish and shellfish), at an annual scale.

24. Further after a thorough revision and a public consultation, a new program of measures was launched and published in the Italian Decree of 10 October 2017. Thus, regarding elasmobranchs, the programs of monitoring set within the MSFD for the Adriatic sub-region are:

- MADIT-M023: EC and International measures to protect elasmobranchs;
- MADIT-M033-NEW4: Implementation of measures for training and awareness to reduce elasmobranchs' mortality due to by-catch.

MSFD-Croatia: Monitoring Programs

25. Monitoring and Observation System for the Continuous Assessment of the State of the Adriatic Sea (JADMON) 2021-2026. – Work Area 1 RC-MORE : Pursuant to the Decree on the Preparation and Implementation of Documents of the Marine Strategy Framework Directive – MSFD (Official Gazette 112/14, 39/17 and 112/18) (hereinafter: the Decree) and the Decision on the Adoption of the Action Program for the Strategy for the Management of the Marine Environment and Coastal Area: The Monitoring and Observation System for the Permanent Assessment of the State of the Adriatic Sea (2021 – 2026) (Official Gazette 28/2021) (hereinafter: the Decision). The Ministry of environmental protectiona and green transition (MEPGT) is the coordinator for the implementation of the Monitoring and Observation System for the Permanent Assessment of the State of the Adriatic Sea (hereinafter: the Monitoring System).

[1] ISPRA is the Italian Institute for Environmental Protection and Research (Istituto Superiore per la Protezione e la Ricerca Ambientale, ISPRA). ISPRA acts under the auspices and policy guidance of the Ministry of Environment and Energy Security (Ministero dell'Ambiente e della Sicurezza Energetica, MASE) offering the technical and scientific support in the implementation of several institutional mandates, including planning and conducting the European Marine Strategy Framework Directive (MSFD) activities.

26. Regarding the assessment of the criteria D1C1, sporadic data on bycatch is collected through the National Stranding Network (Protocol for Alerting and Monitoring of dead, sick or injured strictly protected marine species (marine mammals, sea turtles and cartilaginous fish). The Programme of Measures pursuant to Article 13 of the Marine Strategy Framework Directive includes several activities which address this issue. Implementation of monitoring and assessment of the extent of incidental catches by using observers on fishing vessels and by targeted data collection is planned within the measure 3.8.1 Analyze the risks of incidental catch of turtles, marine mammals, sharks, rays and seabirds by different fishing gear. From 2019 fishing sector has the obligation to record and to report bycatch of endangered species, including all species of sea turtles, marine mammals, elasmobranchs, sea birds[2] through Croatian national data collection programme conducted by the Ministry of Agriculture. Moreover, further research is needed to assess the impact of pressures on the populations of sea turtles.

BYCATCH VII

27. The Italian ISPRA began in 2006 a monitoring program called BYCATCH funded by the Italian Ministry of Agriculture, Food and Forestry focused on the evaluation of bycatch of protected species in pelagic trawling. Initially, the project was focused on cetaceans, but then birds, turtles and elasmobranchs were included in the lists of monitored species.

28. BYCATCH VII was an extensive monitoring programme conducted by CNR-IRBIM[3] Ancona, on midwater pair trawlers, which records incidental catches of elasmobranchs, cetaceans and sea turtles in the Adriatic Sea from 2016 to 2019, under permit issued by the Italian Ministry of Agriculture, Food and Forestry (Fishery and Aquaculture directorate), in compliance with the Italian obligations to the Council Regulation (EC) 812/2004 and the EU Data Collection Framework (Bonanomi et al., 2018; Fortuna et al., 2010). The monitoring programme covers about the 3%–5% of midwater pair trawlers' annual activity in the Adriatic Sea. To achieve this type of coverage, trained observers take part on several fishing trips aboard commercial fishing vessels on a monthly basis. The gear commonly used in this type of fishing is a pelagic (or midwater) pair trawl known as "*Volante*", which targets small pelagic fish such as anchovy and sardine. According to Council Regulation (1967/2006) (Mediterranean Regulation, MR), the mesh size used in this fishing technique should have a minimum opening ≥20 mm, provided that 80% of the catch, after sorting, is of sardines (*Sardina pilchardus*) and anchovies (*Engraulis encrasicolus*)

[2]https://ribarstvo.mps.hr/UserDocsImages/popis%20osjetljivih%20vrsta%20za%20web_20.12.2023%20za%20web%20final.pdf.

[3] CNR-IRBIM is the Institute of Marine Biological Resources and Biotechnologies of the National Research Council of Italy. IRBIM research is focused on marine biology and ecology, population structure, connectivity and spatial distribution of the main fisheries resources, technologies for sustainable fisheries and aquaculture, integrated management of coastal zones for the sustainable management of bioresources, and biodiversity conservation. Within the BYCATCH program, IRBIM contributes to the assessment of the status of sharks and rays.

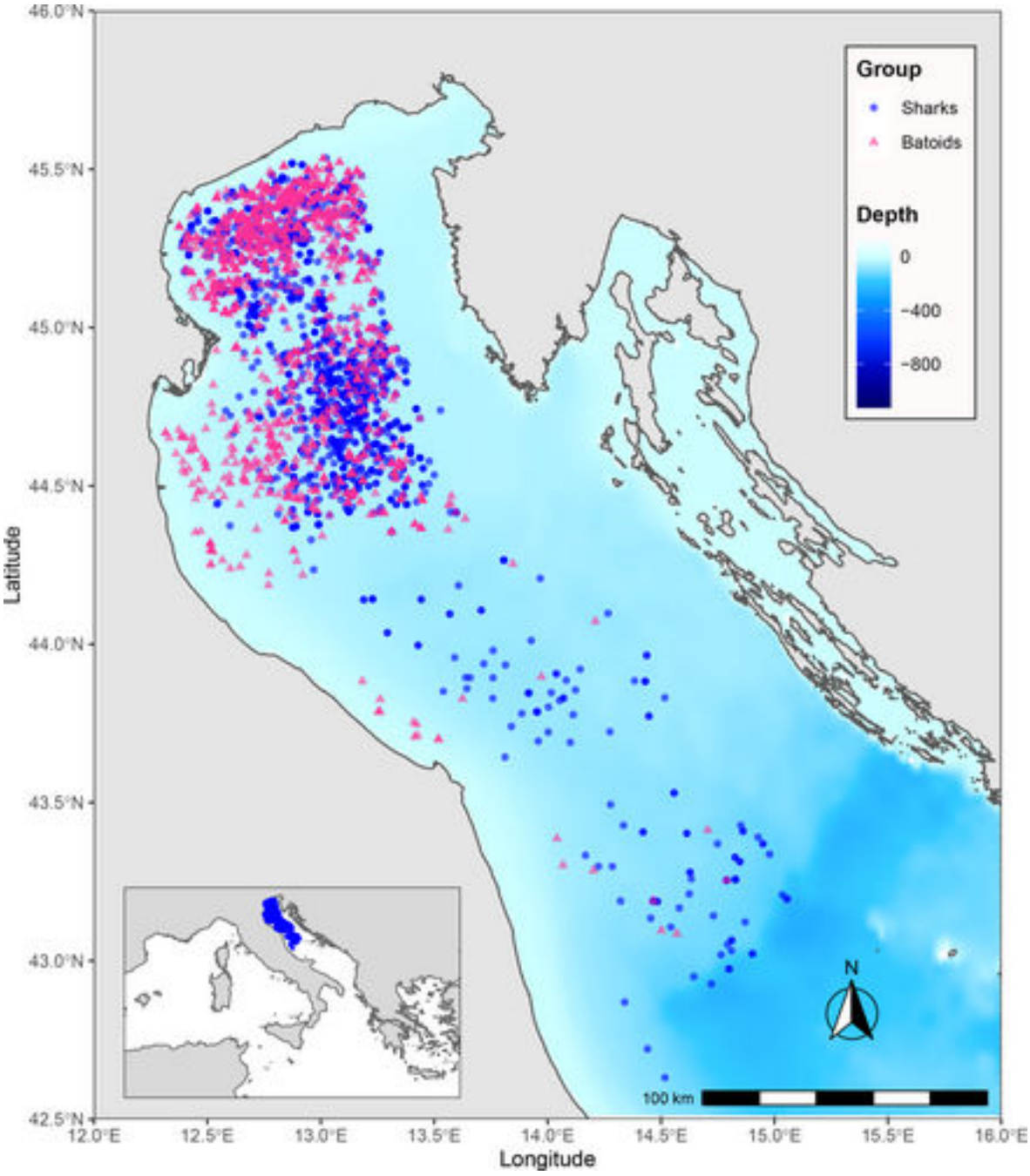

Figure 6. Spatial distribution of the specimens caught during the BYCATCH program from 2006 to 2019, categorized by taxonomic group. The recorded captures derive from monthly observations on board of pelagic pair trawlers involved in anchovy and sardine fishing (from Colombelli and Bonanomi, 2022).

29. Further projects, without a specific recurrence, are conducted with the use of two methodologies that are below described.

ICCAT Shark research and Data collection program

30. The program is active since and it is based on funding provided by the Commission through the regular budget (Science budget) and voluntary contribution from ICCAT CPCs. The Shark Research and Data Collection Program (SRDCP) represents a further step to align with ICCAT Res. 11-17 on

Best Available Science, to fill knowledge gaps on fisheries and biology issues by improving data collection, cooperation and capacity building. In order to achieve these goals, the SRDCP aims to provide guidance to the Standing Committee for Research and Statistics (SCRS) researchers, by prioritizing those issues related to data collection and research lines on species biology/ecology, fisheries and mitigation measures. The implementation of the SRDCP falls within the general framework of the SCRS strategic plan which will provide the overall framework for the required coordination and for the development of the programme. The ICCAT Sharks Species Group recommends that a small group of SCRS scientists should be in charge of elaborating the biological sampling design (which has been initiated in 2014). With regards to collaboration with other organisations, it is important for ICCAT to continue to interact with other RFMOs that conduct scientific studies and provide management for shark species of interest in this research plan (e.g., tRFMOs, GFCM, NAFO and ICES)

Use of LEK (Local Ecological Knowledge) Data for Reconstructing Historical and Recent Elasmobranch Catches

31. Local Ecological Knowledge (LEK) refers to the knowledge held and transmitted by local communities or indigenous populations regarding the natural environment and the biodiversity that surrounds them (Aswani et al., 2018). LEK-based surveys are typically conducted ad-hoc by scientists, depending on the availability of local fishers willing to participate.

32. LEK is based on knowledge accumulated by local communities (typically, in marine environments, fishermen) over a certain period, through observations, direct interaction with ecosystems, and the use of natural resources for their subsistence (Gaspare et al., 2015). Communities that depend closely on the natural environment for their survival, such as fishing communities or indigenous populations, often develop a deep and detailed understanding of the local ecosystem, including the dynamics of species populations, sustainable fishing strategies, and resource management practices (Silvano and Valbo-Jørgensen, 2008). When comparing the responses of interviewees, it was found that LEK and CSK coincide 50% of the time, while they differ completely in only 8% of cases (Huntington, 2000). This indicates that the two types of research can be used complementarily, integrating traditional knowledge with modern science to provide a more complete and accurate view of the environment and species that need to be conserved.

33. Studies using a multidisciplinary approach that combines data from local ecological knowledge (LEK), citizen science (CS) initiatives, and historical data (from archival documents, including catch records, scientific surveys, and museum samples) (Giovos et al., 2021) have allowed the reconstruction of the distribution and abundance of species considered critically endangered or locally extinct in the Mediterranean. For example, LEK data provided valuable insights into the historical presence of the angel shark in specific regions of the Mediterranean, helping identify potential hotspots for further investigation. Different species of the genus *Squatina* were particularly abundant in the Adriatic Sea until about 50 years ago. Citizen science initiatives have allowed data to be collected on their presence, providing real-time information on the current distribution of these species. Long-term historical data have enabled comparisons over time, highlighting potential changes in their populations. This study is an example of how the integration of different research methods offers a powerful tool for the conservation of endangered species. This approach provides a comprehensive understanding of the distribution, abundance, and ecological dynamics of species, enabling targeted conservation efforts. Additionally, it facilitates the involvement of local communities and citizens in conservation initiatives, promoting a sense of belonging and responsibility for the marine environment.

34. LEK has been used also to obtain information on the presence, abundance, distribution, and behaviour of elasmobranchs in 12 geographical sub-areas (GSA), defined by the General Fisheries Commission for the Mediterranean (FAO-GFCM) to subdivide the Mediterranean Sea (Barbato et al., 2021). Through comparison with scientific literature, Barbato et al. (2021) demonstrated the reliability of LEK data for five species (*Mustelus spp.*, *S. acanthias*, *Raja* spp., *M. aquila*, and *S. stellaris*) in the Adriatic Sea and for seven species (*Mustelus* spp., *Raja* spp., *P. glauca*, *S. canicula*, *Torpedo* spp., *P. violacea*, and *I. oxyrinchus*) in the other Mediterranean GSAs. Furthermore, LEK provided new information for a comprehensive representation of species aggregations (*Mustelus* spp., *S. acanthias*, *M. aquila*, and *S. canicula*) in the sampled GSAs and revealed the first descriptions of size, individual number, and sex composition (Barbato et al., 2021).

Use of FDD (Fishery Dependent Data) for Analyzing Elasmobranch Landing Data

35. Information on catch production is collected annually by the national competent authorities for fishing statistics, using the GFCM-STATLANT 37A form (https://www.fao.org/gfcm/data/en/). The data on nominal catch of some major groups are generally reviewed in collaboration with the relevant regional agency, which for the Mediterranean is the GFCM (General Fisheries Commission for the Mediterranean and the Black Sea) (https://www.fao.org/gfcm/data/en/). The GFCM database contains annual statistics on catches in the Mediterranean and the Black Sea (https://www.fao.org/gfcm/data/en/).

36. Before 2017, states reported landing statistics for elasmobranchs without distinguishing species, and FAO data only reported official landings, excluding bycatch that was discarded at sea (Bradai et al., 2012). Since 2017, the European Union has introduced the Landing Obligation (LO): a landing requirement under which all catches of regulated species must be landed and counted against the quotas of each EU member state (Catchpole et al., 2017). The Landing Obligation aims to reduce accidental catches in fishing, encouraging better selectivity to restore fish stocks and to allow the long-term maintenance of Maximum Sustainable Yield (MSY) without harming biodiversity (Guillen et al., 2018). FDD is updated annually, while the Landing Obligation (LO) regulation introduced in 2017 aims to improve data quality by mandating the reporting of all catches.

37. Italy is one of the main countries involved in elasmobranch fishing in the Mediterranean (Bradai et al., 2012). A more specific analysis focusing on the tons of elasmobranchs caught in Italy reveals a decrease in quantity from 1,003.1 tons in 2005 to 484.69 tons in 2021 (Figure 7).

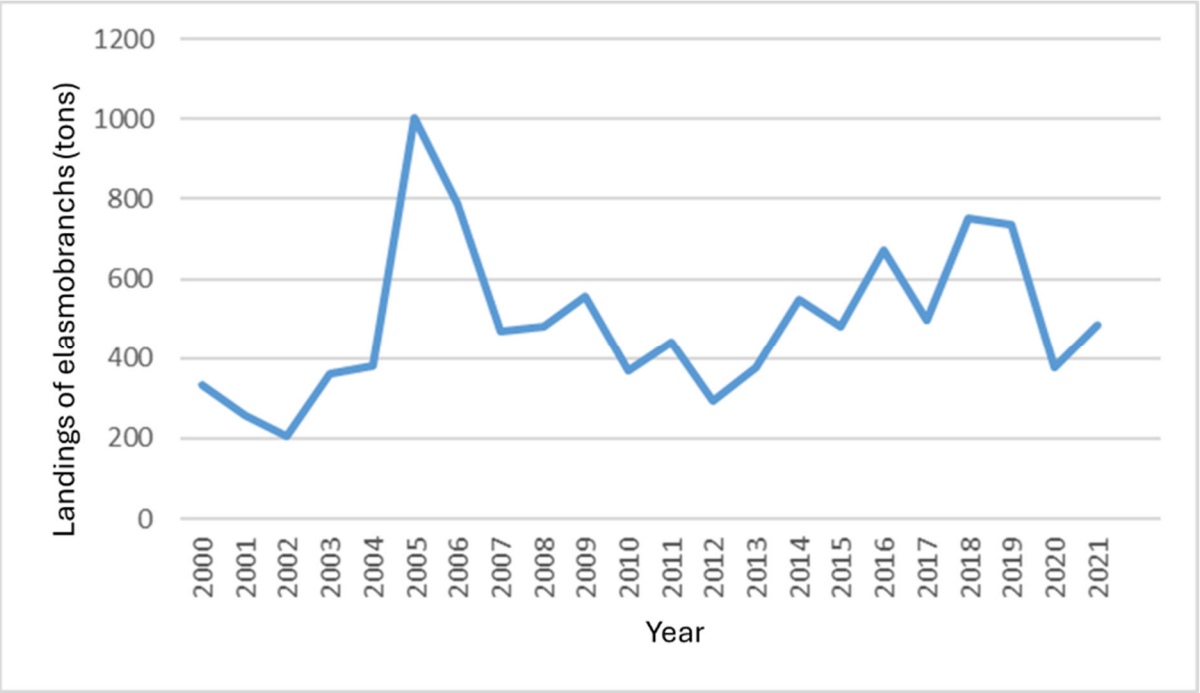

Figure 7. Catch trends of elasmobranchs in the last 21 years by the Italian fleet in the Adriatic Sea (FishStat – FAO). (Credits: Ettorre, 2023).

38. Although there has been fluctuating abundance over the last sixteen years, it is evident that elasmobranch catches have declined, as the maximum peaks have never reached levels comparable to those observed in the early 2000s. However, estimating the abundance of captured elasmobranchs has limitations (Bradai et al., 2012).

3. Evaluation of Research and Evaluation Efforts

39. The Adriatic Sea hosts a rich diversity of elasmobranch species due to its productive ecosystems and varied habitats. Serving as a migratory corridor, the southern Adriatic, and in particular the Strait of Otranto, represents a key transition area for elasmobranch's migratory routes; connecting the Adriatic to the Ionian Sea and the Eastern Mediterranean, ensures the exchange of individuals between populations, maintaining the genetic diversity and the resilience of species across the Mediterranean region. Soldo & Lipej's checklist (2022) includes 60 species of sharks and rays, represented by 27 families, encompassing those that permanently inhabit the Adriatic Sea, those that occasionally enter, and those that were previously recorded but are now considered regionally extinct. For instance, species like *Squatina oculata*, *Pristis pectinata*, and *Rhinobatos rhinobatos* are now regarded as regionally extinct (Soldo and Lipej, 2022).

40. The Adriatic basin represents a crucial nursery area for several elasmobranch species due to the high diversity of shallow coastal habitats, providing shelter from predators and abundant food supplies to juvenile individuals of sharks and rays. These habitats are essential for the population sustainability of slow growth species with low reproductive rates such as Common Smooth-hound (*Mustelus mustelus*) and the Spiny Dogfish (*Squalus acanthias*).

41. While a high level of biodiversity can be observed, it is important to emphasize that the overexploitation of marine resources has caused a drastic decline in the abundance of organisms, particularly those of larger size and belonging to higher trophic levels. Since the mid-20th century, the advent of industrial fishing has had a significant impact on various populations of elasmobranchs in the Adriatic, where some species may even be considered functionally extinct (Ferretti et al., 2008).

42. The trend of declining elasmobranchs is not uniform across the region: there is a greater than 60% reduction in the number of sharks and rays along the Italian coasts, which are more impacted and subjected to fishing compared to the Croatian coasts (Ferretti et al., 2008).

43. The list includes 33 species of sharks, 26 species of skates and ray and 1 chimaera. In the present report, we focused on species listed in Table 2. Images of these elasmobranchs are included in Annex 1. The status of conservation of the Mediterranean and Adriatic populations of most of these species is defined as vulnerable (VU), endangered (EN) or critically endangered (CR) by the IUCN. Note that, in some cases, such as for *S. canicula*, *H. griseus* or *Torpedo* spp., the status of conservation changes between the two basins considered.

Table 2. List of shark and ray species present in the Adriatic Sea and conservation status according to IUCN Mediterranean assessment and to the Soldo and Lipej (2022) updated assessment of the conservation status at the level of the Adriatic region (CR=critically endangered, EN=endangered, VU=vulnerable, NT= near threatened, LC=least concern, DD=data deficient, EX=extinct). For more information visit https://www.iucnredlist.org/. The last column refers to the occurrence of the species in the Adriatic Sea as assessed in Soldo and Lipej (2022).

Scientific Name	Common Name	Mediterranean Depth Range (m)	IUCN Red List (Mediterranean Sea)	Adriatic assessment	Occurrence in the Adriatic Sea
Aetomylaeus bovinus	Duckbill Eagle Ray	0-30	CR	CR	Rare
Alopias superciliosus	Bigeye Thresher	0-723	EN	DD	Rare
Alopias vulpinus	Common Thresher	0-366	EN	EN	Common
Bathytoshia lata	Brown Stingray	0-800	VU	VU	Rare
Carcharhinus plumbeus	Sandbar Shark	0-280	EN	EN	Occasional
Carcharias taurus	Sand Tiger Shark	0-200	CR	CR	Rare
Carcharodon carcharias	White Shark	0-250	CR	CR	Rare
Centrophorus uyato	Little Gulper Shark	210- 1,400	EN	CR	Rare
Cetorhinus maximus	Basking Shark	0–1,264	EN	CR	Occasional
Chimaera monstrosa	Rabbitfish	100-1,663	NT	VU	Rare
Dalatias licha	Kitefin Shark	37-1,800	VU	VU	Rare
Dasyatis pastinaca	Common Stingray	0-200	VU	VU	Occasional
Dipturus batis	Common Blue Skate	10-600	CR	CR	Rare

Dipturus nidarosiensis	**Norwegian Skate**	**125-1,573**	**EN**	**CR**	**Rare**
Dipturus oxyrinchus	Longnosed Skate	90-900	NT	CR	Rare
Echinorhinus brucus	Bramble Shark	18-1,214	EN	CR	Rare
Etmopterus spinax	Velvet Belly Lanternshark	300-2,490	NT	LC	Rare
Galeorhinus galeus	Tope	0-400	VU	EN	Occasional
Galeus atlanticus	Atlantic Sawtail Catshark	330-710	NT	DD	Rare
Galeus melastomus	Blackmouth Catshark	55-2,000	LC	LC	Common
Gymnura altavela	Spiny Butterfly Ray	10-100	CR	CR	Rare
Heptranchias perio	Sharpnose Sevengill Shark	300-1,000	DD	DD	Rare
Hexanchus griseus	Bluntnose Sixgill Shark	0-2,490	NT	LC	Common
Hexanchus nakamurai	Bigeyed Sixgill Shark	90-621	DD	DD	Rare
Isurus oxyrinchus	Shortfin Mako	0-500	CR	CR	Rare
Lamna nasus	Porbeagle	0-1,360	CR	CR	Occasional
Leucoraja circularis	Sandy Skate	50-800	CR	CR	Rare
Leucoraja fullonica	Shagreen Skate	30-800	CR	CR	Rare
Mobula mobular	Spinetail Devil Ray	0-700	EN	CR	Rare
Mustelus asterias	Starry Smoothhound	0-200	VU	VU	Common

Mustelus mustelus	**Common Smoothhound**	**5-350**	**VU**	**VU**	**Abundant**
Mustelus punctulatus	Blackspotted Smoothhound	0-300	VU	VU	Common
Myliobatis aquila	Common Eagle Ray	0–537	VU	VU	Common
Odontaspis ferox	Smalltooth Sandtiger	10-850	CR	CR	Rare
Oxynotus centrina	Angular Roughshark	60-600	CR	CR	Occasional
Prionace glauca	Blue Shark	0-1,160	CR	CR	Common
Pristis pectinata	Smalltooth Sawfish	0-88	CR	EX	Rare
Pteroplatytrygon violacea	Pelagic Stingray	0-238	LC	LC	Common
Raja asterias	Starry Skate	0-150	NT	NT	Common
Raja clavata	Thornback Skate	10-300	NT	EN	Common
Raja miraletus	Brown Skate	10-530	LC	LC	Abundant
Raja montagui	Spotted Skate	0-600	LC	LC	Common
Raja polystigma	Speckled Skate	10-800	LC	NT	Rare
Raja radula	Rough Skate	0-350	EN	EN	Rare
Raja undulata	Undulate Skate	0–200	NT	VU	Rare
Rhinobatos rhinobaos	Common Guitarfish	0-180	CR	EX	Rare
Rhinoptera marginata	Lusitanian Cownose	0-100	DD	CR	Rare
Rhizoprionodon acutus	Milk Shark	1-200	VU	CR	Rare
Rostroraja alba	White Skate	40-500	EN	EN	Rare
Scyliorhinus canicula	Smallspotted Catshark	0-800	LC	NT	Abundant

Scyliorhinus stellaris	**Nursehound**	**0-409**	**NT**	**NT**	**Abundant**
Somniosus rostratus	Little Sleeper Shark	102-2,220	DD	DD	Rare
Sphyrna zygaena	Smooth Hammerhead	0-200	CR	CR	Rare
Squalus acanthias	Spiny Dogfish	0-1,446	EN	EN	Common
Squalus blainville	Longnose Spurdog	16-677	DD	EN	Common
Squatina oculata	Smoothback Angelshark	20-500	CR	EX	Rare
Squatina squatina	Angelshark	0-150	CR	CR	Occasional
Tetronarce nobiliana	Great Torpedo Ray	0-925	LC	VU	Rare
Torpedo marmorata	Marbled Torpedo Ray	10-100	LC	NT	Common
Torpedo torpedo	Ocellate torpedo	0-300	LC	NT	Occasional

44. The northern part of the Adriatic Sea is considered as a reproductive site for several elasmobranch species, in particular the sandbar shark (Costantini and Affronte, 2003; Barbato et al., 2021), the spiny dogfish and the common and darkspotted smoothhounds (Bonanomi et al., 2018), the smallspotted catshark (Serena and Relini, 2006), the angelshark (WWF, 2020), the blue shark (Soldo, 2006; Urso, 2015), the duckbill eagle ray (Dulčić et al., 2008), the common stingray (Šantić et al., 2011), the common eagle ray and the starry ray (Šantić et al., 2011; Sviben et al., 2019). Aggregations sites of the common eagle ray, the common smoothhound and the blackspotted smoothhound have been reported in the the same area (Barbato et al., 2021) as they are largely well-known by fishermen of the Adriatic Sea, especially those from the fishing fleets of Fano and Civitanova Marche – San Benedetto del Tronto (preliminary and unpublished data by Fanelli E. & Da Ros Z.; Corriere Adriatico, 18 February 2021).

45. Smallspotted catshark (*Scyliorhinus canicula*) individuals are frequentely caught as by-catch through the use of bottom trawlers (Barausse et al., 2014), especially in the northern part of the Adriatic, often presenting specimens with mature reproductive traits (Finotto et al., 2015).

46. Many authors highlight the importance of the northern basin as breeding (Soldo and Lipej, 2022) and nursery area of several ray species, enhanced by the catch of mature females of duckbill eagle ray (*Aetomylaeus bovinus*) bearing near term embryos (Dulčić et al., 2008), and juveniles of common stingray (*Dasyatis pastinaca*) (Šantić et al., 2011), common eagle ray (*Myliobatis aquila*) (Horvat et al., 2014; Soldo and Lipej, 2022) and the starry skate (*Raja asterias*)(Sviben et al., 2019), a resident range-resticted species that occurs year-round in the area and is regularly encountered and caught in local fisheries (Soldo and Lipej, 2022; Fanelli et al., 2023).

47. The spatial pattern of incidental catches in late summer-early autumn indicated that the most important area of Common Eagle Ray aggregation was located in the northern Adriatic Sea, mainly between 44.5°N and 45.5°N and between 12.5°E and 13.5°E, while an area of smaller aggregation was observed in the southeastern-most part of the investigated area (between 43.0°N and 43.5°N and between 14.5°E and 15.0°E))(La Mesa et al., 2016). Other aggregations of important species, such as the Basking Shark (*Cetorhinus maximus*) (Soldo et al., 2008) and the Spinetail Devil Ray (*Mobula mobular*)(Scacco et al. 2009; Fortuna et al., 2014), have been reported in the Northern Adtiatic and the Jabuka/Pomo Pit.

48. A recent sighting reported the presence of a pregnant female of blue shark *Prionace glauca* on the beach of Lido di Classe in the Emilia-Romagna Region (Italy) (see Ravenna Today 2023).

49. Seasonal aggregations of the spinetail devil ray are well known especially near Croatian coasts (Bello et al., 2012), in the central and southern Adriatic Sea, possibly related to the localized availability of high densities of prey (e.g., epipelagic fish) (Holcer et al., 2012).

50. In 2023, the IUCN Species Survival Commission Shark Specialist Group established, with the support of different scientists, the Northwest Adriatic Important Shark and Ray Area (ISRA)(IUCN SSC Shark Specialist Group, 2023a). This expert-driven innovative approach ensures that discrete portions of habitats, critical to shark species (ISRAs) are delineated and used in various place-based conservation and management initiatives across global waters, providing decision makers and other relevant stakeholders with actionable knowledge encessary for the implementation of adequate sistematic place-based conservation. The Northwest Adriatic ISRA is under the strong influence of Po River plume which results, as alredy mentioned, in high marine productivity (Marini et al., 2008) (Figure 8). This area hosts a population of the threatened *Squalus acanthias* that reproduces here between July and September (Bonanomi et al., 2018) and it is also a reproductive area for *Mustelus mustelus*, which pregnant females and juveniles were reported between April and June -(IUCN SSC Shark Specialist Group, 2023a).

51. Furthermore, mature males of the spiny dogfish (*Squalus acanthias*) were caught from mid February to mid July , while mature females with nearly full-term embryos were recorded in spring and early summer(Bargione et al., 2019).

52. A large number of juveniles and immature individuals of the common and blackspotted smoothhounds (*Mustelus mustelus* and *M. punctulatus*) are usually landed as bycatch of pelagic/midwater and bottom trawlers (Bonanomi et al., 2018), and sold at Chioggia and Ancona harbours, which host the largest fishing fleets of the northern and central Adriatic Sea, together with Fano harbour (Bonanomi et al., 2018)(Fanelli et al., *in prep*.). For more information, please visit Northwest Adriatic ISRA Factsheet.

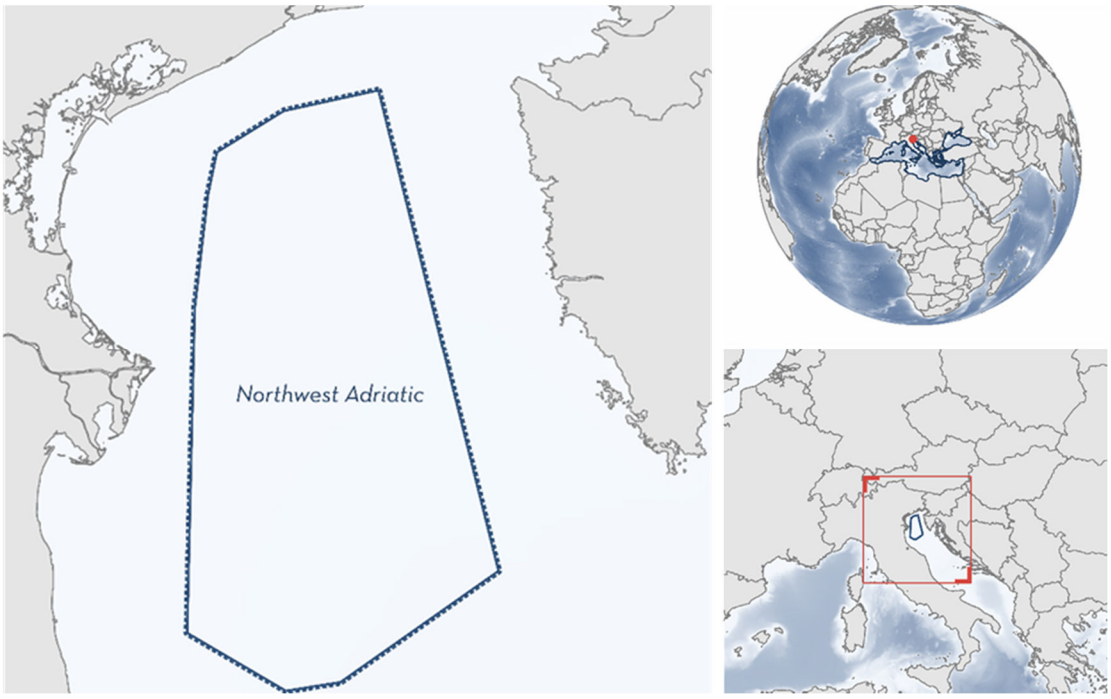

Figure 8. Map of the Northwest Adriatic Sea ISRA. Credits (IUCN SSC Shark Specialist Group, 2023a).

53. In the case of the Sandbar Shark (*Carcharhinus plumbeus*), in 2023 IUCN approved the creation of another ISRA in the Northern Adriatic Sea (Figure 9). The scientists involved in the proposal of this area as ISRA demonstrated this area is a parturition site for the species, as in summer (the main pupping season for the species season), a high density of neonates occurs. In fact, the small-scale fishery surveys conducted between 2019 and 2021, in the area in front of the cities of Cervia and Marina di Ravenna, reported the presence of hundreds of neonates and young-of-the-years (YOY)(as evidenced vy the presence of a fresh open umbilical or partially open umbilical scar), as bycatch in gillnets (Barbato, 2022). The observed size range of captured YOY were between 47 and 67 cm total length (TL), within the reported size-at-birth range of the species (56–75 cm TL; Ebert & Dando, 2021). For more information, please visit [Cervia-Marina di Ravenna Factsheet.]

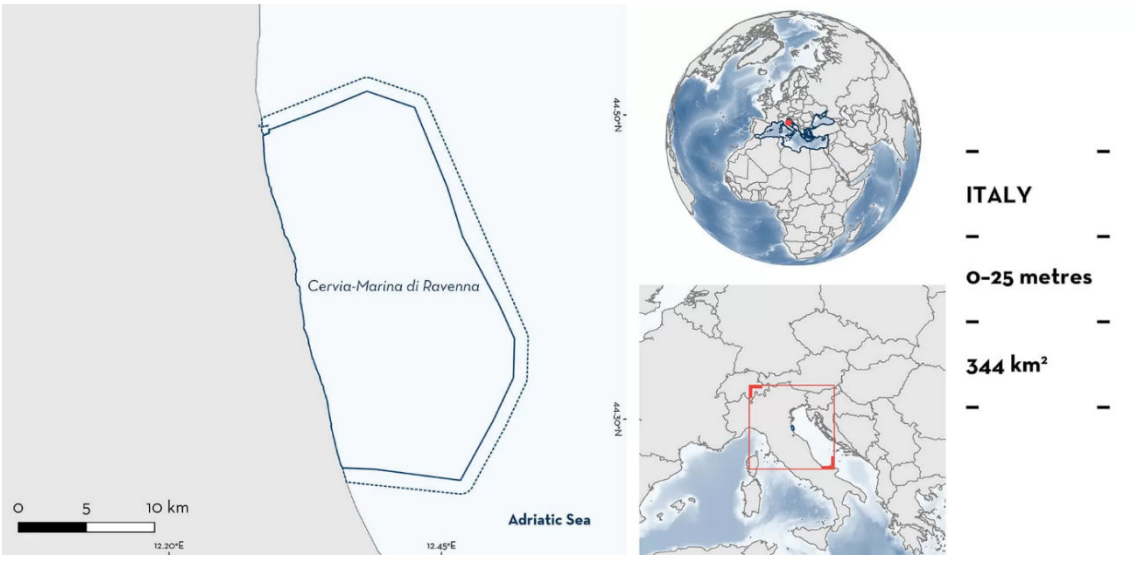

Figure 9. Map of the Cervia-Marina di Ravenna ISRA. Credits (IUCN SSC Shark Specialist Group, 2023b)

54. Croatian coasts also host nursery sites of the Angelshark (*Squatina squatina*), especially inshore areas of the northern Adriatic Sea (Holcer and Lazar, 2017; WWF, 2020; Gajić, 2022) where juveniles are frequently observed in the central eastern Adriatic Sea, off the coast of Vis island and Tisno as reported by (Soldo, 2006). In 2023, IUCN established here the Western Virsko More ISRA (Figure 10) that includes parts of the coastline of 11 large islands, and 48 smaller islets and rocks, with Olib and Molat Islands being the largest islands in the area. The area comprises both sandy and rocky coastal areas and deeper muddy-sandy areas (to 85 m depth). This ISRA, that includes 16 Natura 2000 Special Areas of Conservation (SAC), hosts a reproductive area for *Squatina squatina* (IUCN SSC Shark Specialist Group, 2023c). The species is now rare in other areas of the Adriatic Sea, but recent catch records and surveys have confirmed that the area is a hotspot for the species that here seems to reproduce during spring (Ugarković et al., 2020). Moreover, the presence of *Mustelus mustelus, M. punctulatus, Scyliorhinus canicula, S. stellaris, Dasyatis pastinaca, Myliobatis aquila, Raja miraletus* and *Torpedo marmorata* is here reported (IUCN SSC Shark Specialist Group, 2023c). For more information, please visit Western Virsko More ISRA Factsheet.

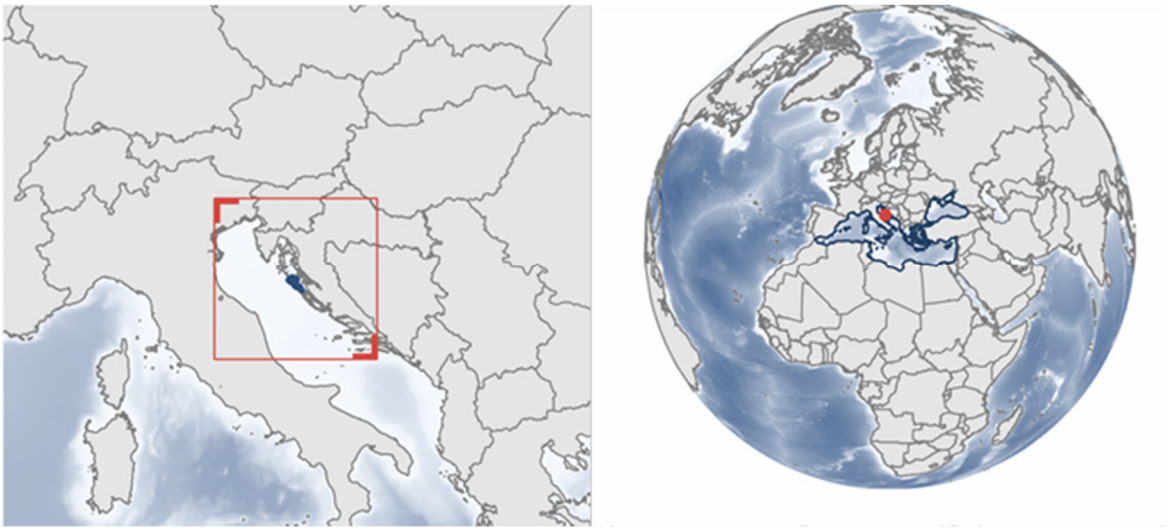

Figure 10. Map of the Western Virsko More ISRA. Credits (IUCN SSC Shark Specialist Group, 2023c)

55. The southern Albania area, comprised by the Albanian territorial waters on the boundary of the Adriatic and Ionian Seas, includes part of two marine protected areas: Marine National Park of Karaburun – Sazan and the Nature Park of Porto Palermo. The area includes a variety of coastal, continental shelf, and deepwater habitats, and extends towards the deep Southern Adriatic Pit. Given its location at the entrance of the Adriatic Sea, the area is considered an important biological corridor and site of oceanographic exchange. Several shark species occur in the area, but baseline data are sparse due to a lack of dedicated research and monitoring activities.

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56. In 2023, the IUCN SSG established the River Bojana/Buna Delta ISRA located in the southeast Adriatic Sea (Figure 11). The River Bojana is the second largest tributary of the Adriatic Sea and creates a distinctive habitat rich in nutrients and fine sediments that cover the inshore areas along the coasts of Albania and Montenegro. The area overlaps with three existing marine protected areas in Montenegrin territorial waters and five Key Biodiversity Areas arerecognised within the area, including sites covering lagoons and freshwater inflows. Here is recorded the presence of populations of the common thresher *Alopias vulpinus*, for which the presence YOY size individuals across several recent years was recorded, and of the starry skate *Raja asterias*, and a reproductive area for *Prionace glauca*, plus undefined aggregations of *M. punctulatus* (IUCN SSC Shark Specialist Group, 2023d). *Prionace glauca* is usually observed between April and July, with a peak in May which is linked to reproductive activity. The area is caractherized also by the presence of *Carcharhinus plumbeus*, *M. asterias , S. canicula, S. blainville* and several rays. For more information, please visit River Bojana/Buna Delta Factsheet.

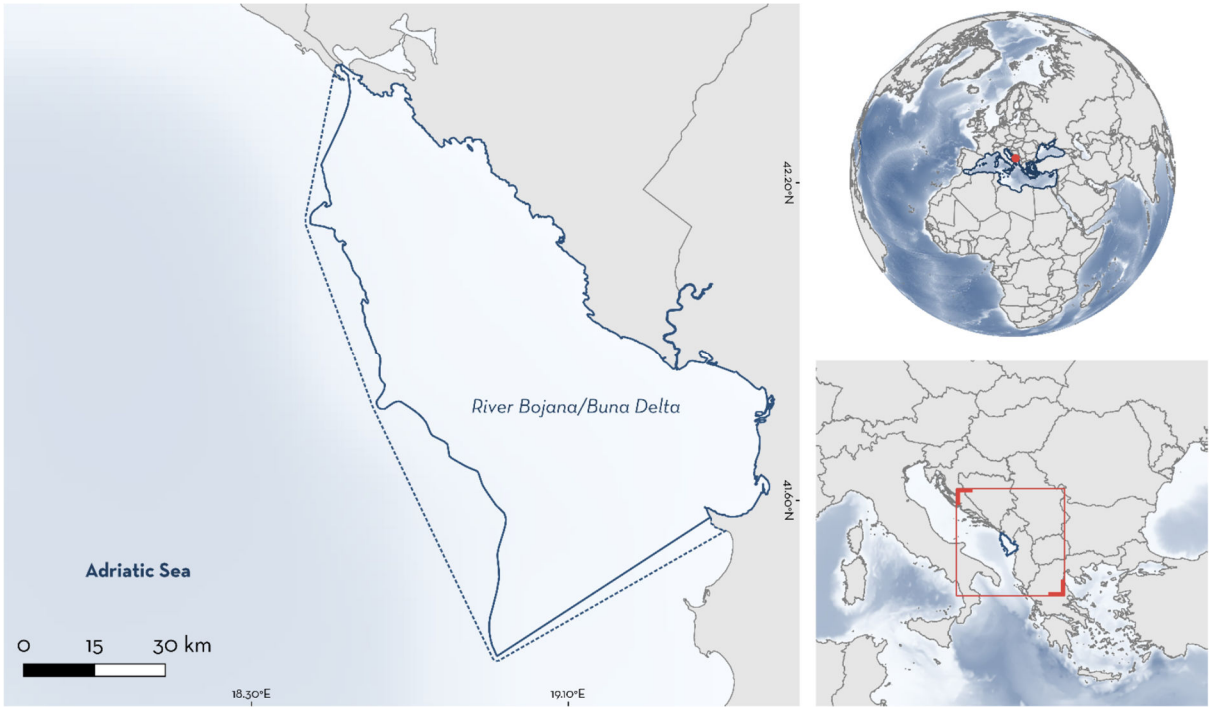


Figure 11. Map of the River Bojana/Buna Delta ISRA. Credits (IUCN SSC Shark Specialist Group, 2023d)

57. The Southern Adriatic encompasses GSA18 and hosts a wide variety of habitats, including deep rocky reefs and muddy seabeds, providing shelter and breeding grounds for a wide range of fish, crustaceans, and cephalopods.

58. The southern Adriatic region serves as one of the last strongholds for rare or endangered elasmobranch species such as the thresher shark (*Alopias vulpinus*), the common smoothhound (*Mustelus mustelus*), angelshark (*S. squatina*); potential reproductive areas (e.g., sandbar shark *Carcharhinus plumbeus*); and potential areas important for movement (e.g., the shortfin mako *Isurus oxyrinchus*). Further information are required to understand the regularity of vital life history functions occurring in the area, and the importance of the area for sharks.

59. Moreover, the Southern Adriatic Pit hosts a population of the blue shark *Prionace glauca* that lives in this sub basin that hosts epipelagic and mesopelagic zones of the water column from the surface to a depth of 800 m. Due to the importance of this pit for this threatened species, in 2023 the IUCN SSG approved the establishment of the Southern Adriatic Pit ISRA (IUCN SSC Shark Specialist Group, 2023e) (Figure 12).

60. Blue sharks have here a regular and predictable seasonal presence in the area, based on tracking data and captures in fisheries where it represents the most frequently captured pelagic shark in the southern Adriatic Sea (Ćetković et al., 2022; Carbonara et al., 2023). The species here reproduces during September and October (Coispa unpublished data).

61. Moreover, sightings of *Alopias superciliosus, A. vulpinus, Carcharodon carcharias*, *Cetorhinus maximus*, *Hexanchus griseus, Isurus oxyrinchus, Mobula mobular,* and *Pteroplatytrygon violacea* supported the institutioin of this ISRA. For more information, see Southern Adriatic Pit ISRA Factsheet.

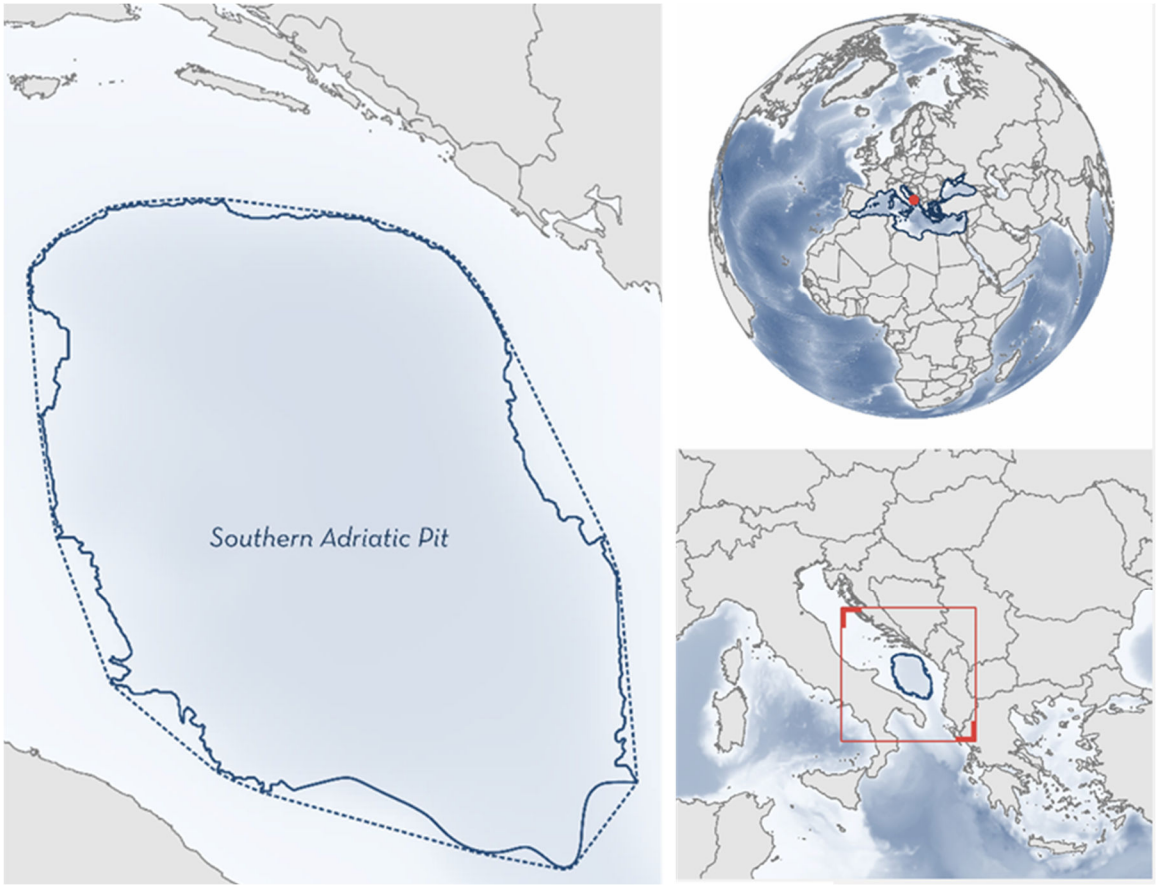


Figure 12. Map of the Southern Adriatic Pit ISRA. Credits (IUCN SSC Shark Specialist Group, 2023e)

62. Going southern along the Adriatic Sea, the Otranto Channel constitutes another ISRA established in 2023 due to the presence of reproductive sites for *Galeus melastomus* (IUCN SSC Shark Specialist Group, 2023f) (Figure 13).

63. The area is caractherized by the presence of Vulnerable Marine Ecosystems such as beds of the bamboo coral *Isidella elongata*, sea pens, deep-water sponges, deep-water corals, and other colonial and solitary coral species. It overlaps with the boundary of the South Adriatic Ionian Straight Ecologically or Biologically Significant Marine Area. Reproductive areas for the Blackmouth Catshark were identified in the area through the MEDISEH project using MEDITS data from 1994 to 2010 (Giannoulaki et al., 2013). The identification of 'nurseries' and 'spawning areas' was based on the use of density measures to identify 'density hot spots' of 'recruits' (juveniles; <27 cm total length [TL]) and 'spawners' (adults; >45 cm TL) (i.e., areas where the density of these groups was significantly higher than other areas). To evaluate the importance that each annual density hotspot played for the population, measures of temporal persistence were used (Giannoulaki et al., 2013). The stability of a density hotspot for recruits or spawners can be assumed to be an indirect measure of the importance of that area for the recruitment/spawning success of the population. Across GSA 18, the reproduction of this species occurs during spring and summer, and the recruit and spawner aggregations are generally localised along the slope parts of Otranto Channel (Giannoulaki et al., 2013). For more information see Otranto Channel ISRA Factsheet.

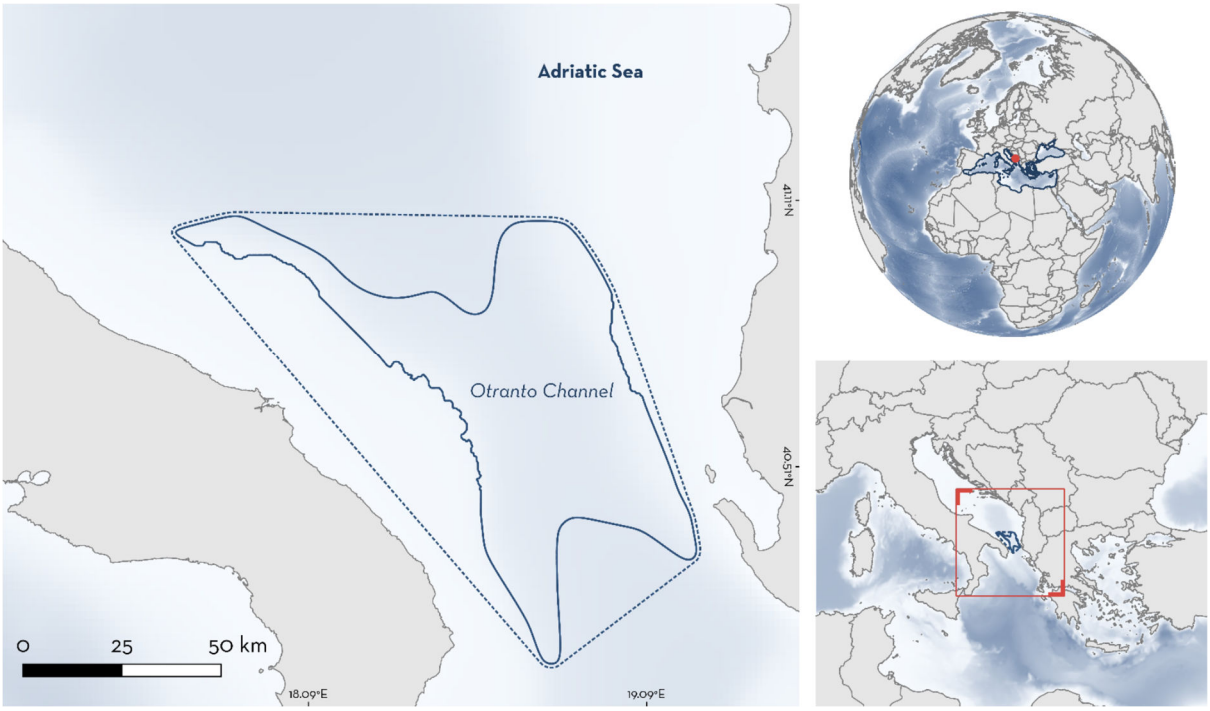


Figure 13. Map of the Otranto Channel ISRA. Credits (IUCN SSC Shark Specialist Group, 2023f)

64. Fishing pressures, both targeted and through bycatch, has caused a significant decline in shark and ray populations in the Adriatic Sea, together with the increasing coastal development and habitat degradation. Several eleasmobranch such as blackmouth catshark (*Galeus melastomus*), blue shark (*Prionace glauca*), tresher shark (*Alopias vulpinus*), small-spotted catshark (*Scyliorhinus canicula*), torpedo ray (*Torpedo marmorata*), angelshark (*Squatina squatina*) and starry skate (*Raja asterias*), are facing a species decline due to those drivers (Fortibuoni et al., 2016; Maioli et al., 2024). The blackmouth catshark is rarely involved in by-catch due to its habitat at depths, with most caught juveniles being discarded (D'Iglio et al., 2021).

65. *Prionace glauca* and *A. vulpinus* are strongly impacted by pelagic longline by-catch (Carbonara et al., 2023), with juveniles mainly captured in fixed gillnets (Ćetković et al., 2019), resulting in a 90% population decline caused by overfishing (Ferretti et al., 2008; Ćetković et al., 2019). Since the 1980s, *S. acanthias* has shown a constant decline. Classified as "Endangered" by the IUCN in 1994, no signs of recovery have been observed in the Adriatic (Ferretti et al., 2013). The torpedo ray is in decline mainly in the western Adriatic, being more pronounced in Italian waters (Ferretti et al., 2008; Maioli et al., 2024), while it persists in the eastern region (Lipej et al., 2011). Studies conducted between 2020 and 2021 indicate that *T. marmorata* is one of the most caught species in the Istrian Peninsula (Iveša et al., 2021), with a high abundance in the northern Adriatic.

66. Since 1970, it is reported that there is a decrease in the abundances of *S. canicula* (Maioli et al., 2023). Previous analyses had revealed a 90% decrease of the presence of this species in the Adriatic area between the late 1940s and early 2000s (Jukic-Peladic et al., 2001). In contrast, data obtained from the STECF in the framework of a master thesis study conducted by a student at the Polytechnic University of Marche in 2023 showed a slight increase in landings of the species. However, the trend in landings is erratic, with bursts evident every two to three years, as also reported by previous analyses (Barausse et al., 2014).

67. The Angel shark *S. squatina* has suffered a more than 90% population decline since the 1970s (Fortibuoni et al., 2016) and is now only rarely sighted in the northern Adriatic (Ferretti et al., 2016). Nowadays, it is considered locally extinct in several areas of the Adriatic basin (Holcer and Lazar, 2017), even if recently the existence of some reproductive sites of this species is reported along Croatian and Albanian coasts (Ugarković et al., 2020; Gajić, 2022; IUCN SSC Shark Specialist Group, 2023c).

68. The starry ray *R. asterias* is considered of moderate commercial interest at regional and subregional level, and it is also one of the species most affected by bycatch from trawl fisheries and artisanal fishing, reflecting in an increasing fishing pressure, which leads to a continual depletion of the population in the Adriatic (Fanelli et al., 2023).

4. Analysis of Management and Conservation Strategies

69. The analysis of management and conservation strategies is organized according to Mediterranean, EU and regional actions.

Mediterranean management and conservation strategies

70. The Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention) was adopted on 10 June 1995, in Barcelona, and the Annexes, including Annex II and III which reports the “List of endangered species or threatened species” and the “List of species whose exploitation is regulated”, in Annex II and III, respectively, were adopted on 24 November 1996, in Monaco, and subsequently amended several times, with the last update reported as Decision IG.26/4 and entry into force on 24 July 2024. The species of elasmobranchs, occurring in the Adriatic basin and reported in Annex II are:

Bathytoshia lata (Garman, 1880)
Carcharias taurus (Rafinesque, 1810)
Carcharodon carcharias (Linnaeus, 1758)
Cetorhinus maximus (Gunnerus, 1765)
Dasyatis pastinaca (Linnaeus, 1758)
Dipturus batis (Linnaeus, 1758)

Galeorhinus galeus (Linnaeus, 1758)
Gymnura altavela (Linnaeus, 1758)
Isurus oxyrinchus (Rafinesque, 1810)
Lamna nasus (Bonnaterre, 1788)
Leucoraja circularis (Couch, 1838)
Mobula mobular (Bonnaterre, 1788)
Myliobatis aquila (Linnaeus, 1758)
Odontaspis ferox (Risso, 1810)
Oxynotus centrina (Linnaeus, 1758)
Rhinobatos rhinobatos (Linnaeus, 1758)
Rhinoptera marginata (Geoffroy St. Hilaire, 1817)
Rostroraja alba (Lacépède, 1803)
Sphyrna zygaena (Linnaeus, 1758)
Squatina oculata (Bonaparte, 1840)
Squatina squatina (Linnaeus, 1758)
The species of elasmobranchs, occurring in the Adriatic basin and reported in Annex III are:
Alopias vulpinus (Bonnaterre, 1788)
Carcharhinus plumbeus (Nardo, 1827)
*Centrophorus granulosus** (Bloch & Schneider,1801)
Heptranchias perlo (Bonnaterre, 1788)
Hexanchus griseus (Bonnaterre,1788)
Mustelus mustelus (Linnaeus, 1758)
Mustelus punctulatus (Risso, 1826)
Pteroplatytrygon violacea (Bonaparte, 1832)
Prionace glauca (Linnaeus, 1758)
Squalus acanthias (Linnaeus, 1758)
* *Centrophorus granulosus* is considered absent from the Mediterranean Sea, as this gulper shark attains at least 1.7 m length, while the records from the Mediterranean have been revised and refers to *C. uyato* (Rafinesque, 1810) (White et al., 2022, DOI: 10.11646/zootaxa.5155.1.1).

71. Recommendation GFCM/36/2012/3 on fisheries management measures for conservation of sharks and rays in the GFCM area of application, later amended by GFCM/42/2018/2 on fisheries management measures for the conservation of sharks and rays in the GFCM area of application (GFCM, 2021) refer to the annexes of the Barcelona Convention Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol). They are accomplished by granting full protection to the Mediterranean elasmobranch species included in Annex II of the SPA/BD Protocol (List of endangered or threatened species, see above) and by requesting detailed reports on any catch of species included in Annex III of the SPA/BD Protocol (List of species whose exploitation is regulated, see above). Moreover, these recommendations establish that Contracting parties and cooperating non-contracting parties (CPCs) need to ensure that tope shark (Galeorhinus galeus) specimens caught with bottom-set gillnets, longlines and tuna traps be promptly released unharmed and alive, to the extent possible. The GFCM recommendations also ban finning practices within the GFCM area of application.

72. Recommendation GFCM/44/2021/16 on additional mitigation measures for the conservation of elasmobranchs in the Mediterranean Sea. The general objective of this recommendation is to push CPCs to develop further actions to improve the conservation status of elasmobranchs and measures to mitigate or eliminate, where possible, the risk of incidental catch in fishing operations and/or the associated mortality in the GFCM area of application. The recommendation applies to all elasmobranch species of the Mediterranean Sea listed in Annex II and III of the SPA/BD Protocol and includes the adoption of species-specific actions that are listed in the annex to the recommendation.

73. Among species occurring int eh Adriatic basin, species-specific actions are set for smooth-hound sharks (*Mustelus mustelus*, *M. punctulatus*), common thresher (*Alopias vulpinus*), sandbar shark (*Carcharhinus plumbeus*), gulper shark (*Centrophorus granulosus**), sharpnose sevengill shark (*Heptranchias perlo*), piked dogfish (*Squalus acanthias*) and blue shark (*Prionace glauca*) (see species-specific actions at https://faolex.fao.org/docs/pdf/mul217151.pdf). Different conservation measures for elasmobranchs are proposed focusing on mitigating incidental mortality, improving bycatch management, and advancing data collection and research. These measures are organized in four axes: i. Implementation by CPCs of strategies to reduce incidental elasmobranch mortality (such as incentive systems for vessel captains, technical training and certification for vessel operators, research on gear modifications to improve post-release survival rates); ii. Implementation by CPCs of strategies to minimize bycatch in fisheries identified as high-risk by the Scientific Advisory Committee -SAC (such as gear modifications, spatial and temporal fishing restrictions or closures, maximum bycatch thresholds and use of magnetic deterrents, where cost-effective); iii. Creation of an incentive-based management that rewards low-impact fishers and promotes sustainable practices, and iv. Promotion of bycatch Limits, i.e. fishing vessels must limit shark bycatch listed in Annex III of the SPA/BD Protocol, setting species-specific catch limits. The recommendation also provides clear indication for data collection, monitoring, and research. The Recommendation asks CPCs to improve data collection on elasmobranch bycatch following established methodologies (e.g., FAO technical manuals and DCRF frameworks). It encourages research to be focused on critical habitats and the impacts of fishing gear, promoting legislative changes if needed and promotes pilot projects, initiated by the GFCM, upon CPCs' requests, to monitor species listed in Annex II and III, ensuring compliance with conservation measures. The Recommendation also stated that the SAC is invited to assess the socio-economic impacts of elasmobranch depredation and recommend compensation mechanisms. Further, by 2025, the SAC is asked to compile and assess actions undertaken, advising on new conservation measures (such as species-specific catch limits, restrictions on recreational fishing and landing sizes, new guidelines to enhance post-release survival rates). Finally, according to the Recommendation the SAC is requested to identify knowledge gaps and provide population estimates and conservation targets, ensuring robust frameworks for sustainable elasmobranch management.

74. Recommendation GFCM/45/2022/12 on the establishment of a set of minimum rules for sustainable recreational fisheries in the Mediterranean Sea. In Part II of this recommendation, different conservation measures (prohibitions) are set regarding the prohibition to retain any specimen pertaining to the species listed in Annex 1, that concerning elasmobranchs occurring in the Adriatic basin, refers to A) species listed in Appendices I and II under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), i.e. all Carcharhinidae (requiem shark) species, *C. maximus*, *M. mobular*, *C. carcharias*, *S. zygaena*, *Isurus oxyrinchus*, *L. nasus, A. vulpinus* and *A. superciliosus*; B) species listed in Appendices I and II under the Convention on the Conservation of Migratory Species of Wild Animals (CMS), i.e. *C. taurus*, *C. maximus*, *C. carcharias*, *S. squatina*, *R. rhinobatos*, *A. bovinus* and *R. marginata* (Mediterranean Sea population), and C) species listed in Annex II under the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol) of the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention) (see list of species provided above).

EU management and conservation strategies

75. At the European level, different regulations have been adopted for the management and conservation of elasmobranchs, which are:

i. Regulation (EU) 2019/1241 of the European Parliament and of the Council of 20 June 2019 on the conservation of fisheries resources and the protection of marine ecosystems through technical measures (.....) (http://data.europa.eu/eli/reg/2019/1241/oj). Annex I lists prohibited species, that are species for which there is a prohibition to fish for, retain on board, transship, land, store, sell, display or offer for sale. Concerning species which occur in the Adriatic basin (see Table 2), the prohibited ones sensu Reg. 2019/1241 are:

- basking shark (*Cetorhinus maximus*) and white shark (*Carcharodon carcharias*);
- devil fish (*Mobula mobular*);
- white skate (*Rostroraja alba*);
- angel shark (*Squatina squatina*);

ii. Regulation (EU) 2023/2124 of the European Parliament and of the Council of 4 October 2023 on certain provisions for fishing in the General Fisheries Commission for the Mediterranean (GFCM) Agreement area (recast) (http://data.europa.eu/eli/reg/2023/2124/oj). TITLE III - Common provisions. CHAPTER I Technical and conservation measures. Section I - Reduction of the impact of fishing activities on certain marine species. Subsection 1 - Sharks, skates and rays. Article 98 – Protected elasmobranch species. 1. Member States shall ensure high protection from fishing activities for elasmobranch species listed in Annex II to the Protocol concerning specially protected areas and biological diversity in the Mediterranean (species occurring in the Adriatic basin, according to Table 2, and included in this Annex II are, based on the last updates at 24/07/2024: *Carcharias taurus, Carcharodon carcharias, Cetorhinus maximus*, *Dasyatis pastinaca*, *Dipturus batis, Galeorhinus galeus, Gymnura altavela, Leucoraja circularis, Mobula mobular, Myliobatis aquila, Odontaspis ferox, Oxynotus centrina, Pristis pectinata, Rhinoptera marginata, Rhinobatos rhinobatos, Rostroraja alba, Sphyrna zygaena, Squatina oculate, Squatina squatina*). 2. Elasmobranch species which are included in Annex II to the Protocol concerning specially protected areas and biological diversity in the Mediterranean shall not be retained on board, transshipped, landed, transferred, stored, sold or displayed or offered for sale. 3. To the extent possible, fishing vessels that have incidentally caught elasmobranch species included in Annex II to the Protocol concerning specially protected areas and biological diversity in the Mediterranean shall promptly release them unharmed and alive.

iii. Regulation (EU) 2017/2107 of the European Parliament and of the Council of 15 November 2017 laying down management, conservation and control measures applicable in the Convention area of the International Commission for the Conservation of Atlantic Tunas (ICCAT), (...). (http://data.europa.eu/eli/reg/2017/2107/2024-04-08). CHAPTER V “Sharks”. This chapter provides in Article 30 the general provisions for the release of live sharks that are caught incidentally and are not used for food or subsistence in fisheries that are not targeting sharks and recommend Member States to carry out research on shark species caught in the ICCAT Convention area in order to improve the selectivity of fishing gear, to identify potential nursery areas and consider time and area closure and other measures, as appropriate. According to this general provision, this research shall provide information on key biological and ecological parameters, life-history and behavioural traits, as well as on the identification of potential mating, pupping and nursery grounds.

In the following articles of this chapter (namely 31, 32, 33 and 35, related to species occurring in the Adriatic waters) there is the explicit prohibition of retaining on board, transhipping or landing any part or whole carcass of *Lamna nasus* (art. 31), *Alopias superciliosus* (art. 32), *Isurus oxyrinchus* (art. 33) and Sphyrnidae (art. 35) caught in association with ICCAT fisheries. Further in all these articles, Union catching vessels are forced to promptly release unharmed sharks, accidentally caught in association with ICCAT fisheries when brought alongside the vessel. Additionally, art. 36a encourages Member States to implement data collection programmes that ensure the accurate reporting of sharks catch, effort, size and discard data to ICCAT. Finally, art. 37 provides indications for sampling of shark species by scientific observers and other authorized individuals.

iv. Council Regulation (EU) 2024/257 of 10 January 2024 fixing for 2024, 2025 and 2026 the fishing opportunities for certain fish stocks, applicable in Union waters and, for Union fishing vessels, in certain non-Union waters, and amending Regulation (EU) 2023/194 (http://data.europa.eu/eli/reg/2024/257/oj): Article 20 "Prohibited species"- Union fishing vessels shall not fish for, retain on board, tranship or land the following species:(j) porbeagle (*Lamna nasus*) in all waters; (n) common guitarfish (*Rhinobatos rhinobatos*) in the Mediterranean. 2. When accidentally caught, specimens of the species referred to in paragraph 1 shall not be harmed and shall be promptly released.

v. Regulation (EU) 2019/1241 of the European Parliament and of the Council of 20 June 2019 on the conservation of fisheries resources and the protection of marine ecosystems through technical measures, (...). (http://data.europa.eu/eli/reg/2019/1241/oj). Article 9, 4(c) referring to highly migratory species of sharks, and (5) by way of derogation from paragraph 4, incidental catches in the Mediterranean Sea of no more than three specimens of the shark species referred to in that paragraph may be retained on board or landed provided that they are not protected species under Union law.

vi. Council Regulation (EC) No 1967/2006 of 21 December 2006 concerning management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea (...) (http://data.europa.eu/eli/reg/2006/1967/2019-08-14) CHAPTER VI "NON-COMMERCIAL FISHING" Article 17 (1) The use of longlines for highly migratory species shall also be prohibited for leisure fisheries.

vii. Regulation (EU) 2023/2124 of the European Parliament and of the Council of 4 October 2023 on certain provisions for fishing in the General Fisheries Commission for the Mediterranean (GFCM) Agreement area (recast) (ELI: http://data.europa.eu/eli/reg/2023/2124/oj). TITLE III COMMON PROVISIONS. CHAPTER I Technical and conservation measure Section I - Reduction of the impact of fishing activities on certain marine species - Subsection 1 "Sharks, skates and rays" - Article 106 "Recording of incidental catches of certain marine species" - 1) (...) masters of fishing vessels shall record in the fishing logbook referred to in Article 14 of that Regulation the following information:(e) any event of incidental catch and, where required, release of sharks and rays of the species listed in Annex II or Annex III to the Protocol concerning specially protected areas and biological diversity in the Mediterranean. Article 99 of this regulation “Identification of sharks” also establishes that the beheading and skinning of sharks on board and before landing is prohibited. Beheaded and skinned sharks shall not be marketed at the first sale markets after landing and Member States shall ensure that sharks are kept on board, transhipped, landed and marketed at first sale in such a way that species are recognisable and identifiable, and that the catch, incidental catch and, whenever appropriate, release of those species can be monitored and recorded.

This article applies to guarantee the correct identification of sharks, skates and rays at the landing site before the commercialization.

viii. Commission Regulation (EU) 2023/966 of 15 May 2023 amending Council Regulation (EC) No 338/97 to reflect the amendments adopted at the 19th meeting of the Conference of the Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (ELI: http://data.europa.eu/eli/reg/2023/966/oj).

ix. EU DECISIONS: 98th Meeting of the scientific review group on trade in wild fauna and flora (19 September 2023) (https://speciesplus.net/api/v1/documents/16334): Negative opinion for import of specimens of *Prionace glauca* [Mediterranean stock (W=Wild, X=Specimens taken in the marine environment not under the jurisdiction of any State). Moreover, a "zero export quotas" has been established for *Prionace glauca* from the Mediterranean stock for the year 2024. This decision implies that captures of blue sharks from Italian fishers in Mediterranean high seas (Areas Beyond National Jurisdiction) cannot be landed in Italy. In this case, the catches would be subject of issues of "Non detriment findings (NDF)" certificate from the CITES management authority following the procedure of "Introduction from the Sea": vessels of Country A fishing in high seas and landing in Country A, where country A is considered to be the importer country. However, due to the negative opinion of the EU Scientific Review Group, this certificate cannot be issued, and the blue shark cannot be landed. Moreover "quota zero" implies that Italy cannot export any blue shark caught in territorial waters being Mediterranean waters].

x. Commission Delegated Decision (EU) 2021/1167 of 27 April 2021 establishing the multiannual Union programme for the collection and management of biological, environmental, technical and socioeconomic data in the fisheries and aquaculture sectors from 2022 (http://data.europa.eu/eli/dec_del/2021/1167/oj), Table 4 "Species for which data are to be collected for recreational fisheries": Mediterranean Sea - elasmobranchs, highly migratory ICCAT species.

xi. EU Regulation 2015/2102 amends Regulation (EU) No 1343/2011 on certain provisions for fishing in the GFCM (General Fisheries Commission for the Mediterranean) Agreement area. This regulation, in the Article 16j, refers to protected shark and ray species which are included in Annex II to the Protocol concerning specially protected areas and biological diversity in the Mediterranean ("Protocol to the Barcelona Convention", see list above) that cannot be retained on board, transhipped, landed, transferred, stored, sold or displayed or offered for sale. It also establishes that, to the extent possible, fishing vessels that have incidentally caught sharks and rays of the species included in Annex II to the Protocol to the Barcelona Convention shall promptly release them unharmed and alive. The regulations, in article 16k, also stated that the beheading and skinning of sharks on board and before landing is prohibited and that beheaded and skinned sharks may not be marketed at the first sale markets after landing.

xii. Regulation (EU) No 605/2013 of the European Parliament and of the Council of 12 June 2013 amending Council Regulation (EC) No 1185/2003 on the removal of fins of sharks on board vessels (ELI: http://data.europa.eu/eli/reg/2003/1185/2013-07-06. This regulation establishes a general prohibition of the practice of 'shark finning', whereby a shark's fins are removed, and the remainder of the shark is discarded at sea. This Regulation shall apply to the removal of shark fins, retention on board, transshipment and landing of sharks or shark fins.

For the purposes of this Regulation, the following definitions shall apply: 1. ‘shark fins’ means any fins of sharks including caudal fins, but excluding the pectoral fins of rays, which are a constituent part of raywings; 2. ‘shark’ means any fish of the taxon Elasmobranchii. Article 3 "Prohibitions" 1. It shall be prohibited to remove shark fins on board vessels, and to retain on board, tranship or land shark fins; 1a. Without prejudice to paragraph 1, in order to facilitate on-board storage, shark fins may be partially sliced through and folded against the carcass but shall not be removed from the carcass before landing. 2. It shall be prohibited to purchase, offer for sale or sell shark fins which have been removed on board, retained on board, transshipped or landed in contravention of this Regulation. Note: after landing, the shark's fins and meat may be traded separately. The presence on the market and in ethnic restaurants of shark fins (e.g. fin soup) or other products derived from sharks (e.g. fillets) does not imply a violation of Regulation (EU) 605/2013, as the trade in fins and other shark products is currently permitted. The control aims at the identification and origin of the product, for the need of CITES certification in the case of species in the lists in Appendix II (note 8 in the tables), whether or not they are imported products. The control of the species identification is also valid during controls on frozen products such as fillets (for example mako, porbeagle, and blue shark fillets).

xiii. Nature Restoration Regulation (EU) 2024/1991, proscribe new obligation to restore habitats of certain cartilaginous fishes included in Annex III . Within the process of preparation of national restoration plan, preparatory monitoring and research will be needed to identify the restoration measures taking into account the latest scientific evidence. National restoration plan, which is planned to be adopted in 2026, will include restoration measures for the marine habitats of chondrichthyan species necessary to improve the quality and quantity of those habitats, including by re-establishing them, and to enhance connectivity, until sufficient quality and quantity of those habitats is achieved.

Regional Strategies

76. *Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans):* Established under the Barcelona Convention in 2003, it aims to reduce bycatch, protect critical habitats, and enforce sustainable fishing practices. The Action Plan for the Conservation of Chondrichthyan Fishes in the Mediterranean Sea is in line with:

- the Barcelona Convention adopted by the Mediterranean countries and the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean;
- the International Plan of Action for the Conservation and Management of Sharks (IPOA Sharks) proposed by FAO and adopted by the UN member states in 1999;
- the UN Fish Stocks Agreement (UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks) in effect since 11th December 2001;
- paragraph 31 of the Implementation Plan of the Resolution of the World Summit for Sustainable Development adopted in Johannesburg in September 2002.

77. The Mediterranean Action Plan for the Conservation of Chondrichthyan Fishes constitutes a proposal for regional strategies, pointing out priorities and actions to be undertaken at national and regional level.

78. *EU Shark Plan (Community Action Plan for Sharks):* In 2009, the Commission has adopted the action plan for the conservation and management of sharks (EU-POA Sharks) that was endorsed by the EU Council. This plan was inspired by the International Action plan for the Conservation and Management of Sharks (IPOA SHARKS) adopted by the United Nations Food and Agriculture Organization (FAO) in 1999.

79. *EU Finning Ban (2013):* Prohibits the removal of shark fins onboard fishing vessels, reducing the incentive for illegal finning activities and ensuring that sharks are landed with fins attached.

80. *Single Species Action Plan (SSAP) for the Angelshark (*Squatina squatina*) in the Mediterranean Sea*: the Convention on the Conservation of Migratory Species of Wild Animals (CMS) has adopted, during the 44th session of the GFCM, held in November 2021, the SSAP for the Angelshark in the Mediterranean Sea to guide coordinated conservation efforts. This is is a strategic document developed to guide the conservation and recovery of *Squatina squatina*, a critically endangered species (see Table 2) which population collapse was primarily caused by unsustainable fishing practices, habitat degradation, and bycatch. The main purpose of the SSAP is to provide a coherent framework for coordinated action among Mediterranean countries, stakeholders, and conservation bodies to halt the decline of the Angelshark and promote its long-term survival in the region addressing the main threats through an ecosystem-based, precautionary, and participatory approach. A core action of the plan is the identification and protection of critical habitats, such as shallow coastal areas and soft-bottom seabeds that are essential for feeding, breeding, and act as nurseries. The plan promotes the establishment and enforcement of spatial conservation measures, including marine protected areas and fishing restrictions in key habitats. Another fundamental objective is the reduction of bycatch through technical adaptations, gear modifications, and improved fishing practices. Moreover, the SSAP emphasizes the need for robust scientific research and monitoring programs to fill existing knowledge gaps on Angelshark distribution, ecology, and population trends. It encourages cross-border collaboration and data-sharing mechanisms to build a comprehensive understanding of the species across its fragmented Mediterranean range. Public awareness and education are also central to the plan, aiming to foster support among coastal communities, policymakers, and the general public. Ultimately, the SSAP for the Angelshark seeks not only to prevent extinction but to facilitate the species' recovery through coordinated, science-based, and inclusive conservation efforts.

Spatial-based conservation measures

Marine Protected Areas (MPAs)

76. Several Protected areas that include marine habitats are present in the Adriatic Sea and, with the ban of fishery, their existence could contribute to the conservation of some shark and ray species.

Slovenia
The main MPAs are:
Krajinski park Debeli Rtič
Krajinski park Strunjan
Naravni rezervat Strunjan
Sečoveljske soline
Žusterna - rastišče pozejdonke
Rt Madona v Piranu
Ankaran - Sv. Nikolaj

77. The complete MPAs list is reported in a report of the SUPREME project (Figure 14).

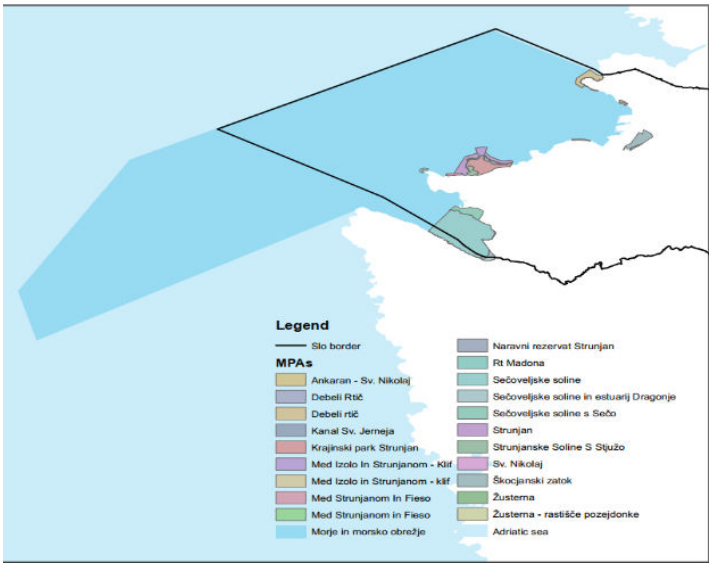


Figure 14: Map of Slovenian coastal and marine protected areas (Institute for Water of the Republic of Slovenia, 2019).

Italy
Miramare (Friuli-Venezia Giulia) MPA
Tremiti Islands (Apulia) MPA
Torre Guaceto (Apulia) MPA

Croatia
Brijuni National Park
Kornati Islands National Park (Including protected waters of the archipelago)
Mljet National Park (Marine section of the park)
Lastovo Nature Park (Lastovo Archipelago)
Telašćica Marine Reserve (Part of Dugi Otok Island)

Montenegro
Platamuni MPA
Katič MPA
Stari Ulcinj MPA

Albania
Prespa National Park
Karaburun-Sazan Marine National Park
Butrint National Park

Fishery restricted areas (FRAs)

78. The Jabuka/Pomo Pit, situated in the Middle Adriatic Sea, is a sensitive and critical spawning and nursery zone for important Adriatic demersal resources, especially European Hake (*Merluccius merluccius*) and the Norway Lobster (*Nephrops norvegicus*) (Elahi et al., 2018). The Jabuka/Pomo Pit was protected as a Fisheries Restricted Area – FRA – since 2017 (Recommendation GFCM/41/2017/3) and it is one of the most significant MPAs in the Adriatic. Restrictions on fishing activities grant the protection to species like smooth-hound sharks and rays. For more information, see https://maritime-spatial-planning.ec.europa.eu/story-1-italycroatiaslovenia-fisheries-and-conservation (Figure 15).

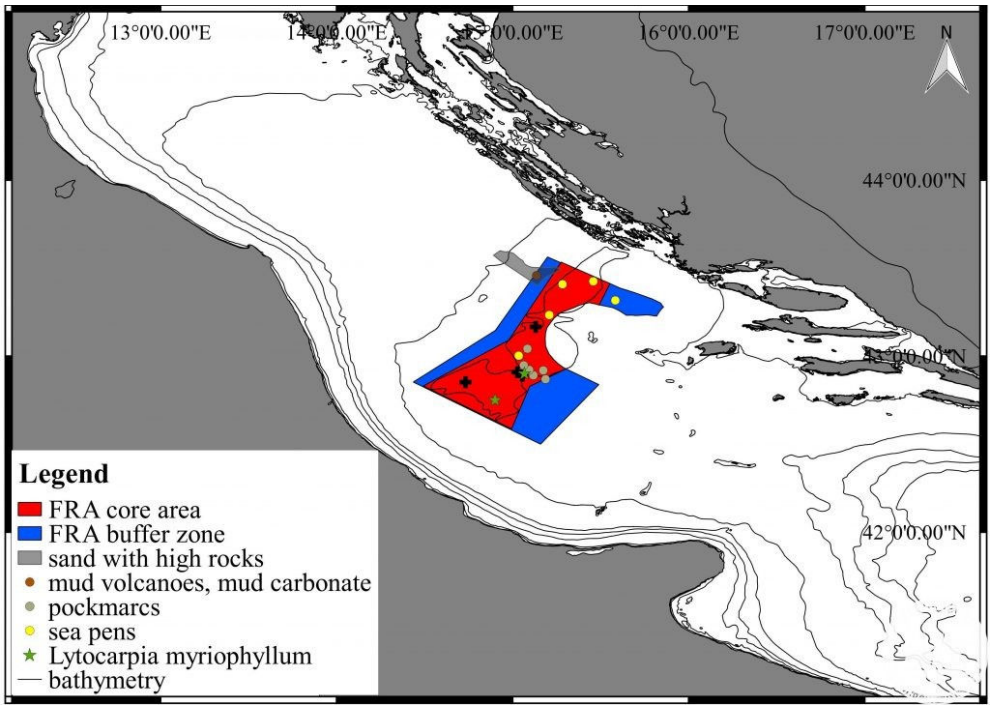
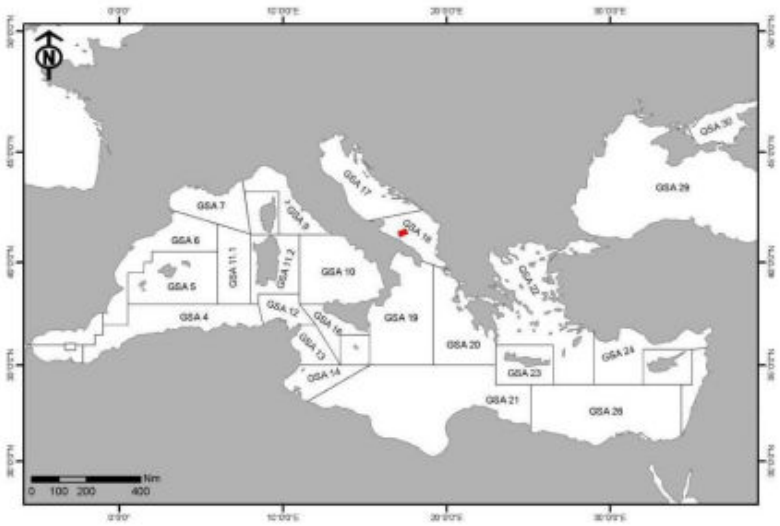


Figure 15: Map of the Fisheries Restricted Area (FRA) in the Jabuka/Pomo Pit in the central Adriatic Sea (GSA 17).

79. The Bari Canyon was also included in a recently established FRA (Recommendation GFCM/44/2021/3) where any professional or recreational fishing activity is prohibited in Zone A, the core area (Figure 16), while fishing activities with towed nets, bottom set nets and recreational fishing are prohibited in Zone B (identified as “buffer zone”). IN zone B some fishing activities with set longlines and traps may be allowed provided that the vessel and/or its master are in possession of a specific and that historical fishing activities in the buffer zone are demonstrated. In the area, the occurrence of different deep-sea threatened (or data deficient) elasmobranchs, such as *Centrophorus uyato*, *Dalatias licha*, *Hexanchus griseus*, is reported (Sion et al., 2019; Angeletti et al., 2021).



Map of the Mediterranean Sea and location of the fisheries restricted area in the Bari Canyon (geographical subarea 18)

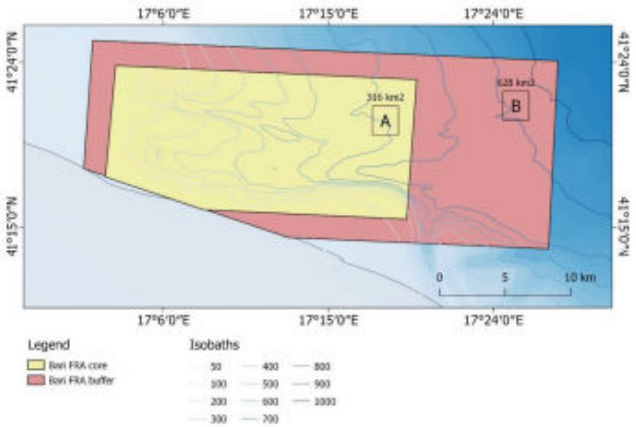


Figure 16: Map of the Fisheries Restricted Area (FRA) in the Bari Canyon in the southern Adriatic Sea (GSA 18).

80. Recently, on November 2024, after a long negotiation process, the proposal of the institution of a FRA in the Otranto Channel between Apulian and Albanian coasts, advanced by MedReact and the Adriatic Recovery project in 2018, has been finally accepted thanks to the work of the European Union, Albania and the Adriatic experts of the GFCM (Recommendation GFCM/47/2024/6). This is the largest marine protected area of the Adriatic Sea, where bottom fishery was banned from a core area of more than 1,900 km^2, and regulated in a buffer area of ca. 700 km^2 (Figure 17). This measure will also contribute to the conservation of several population of elasmobranchs that live in that area, including *Mobula mobular*.

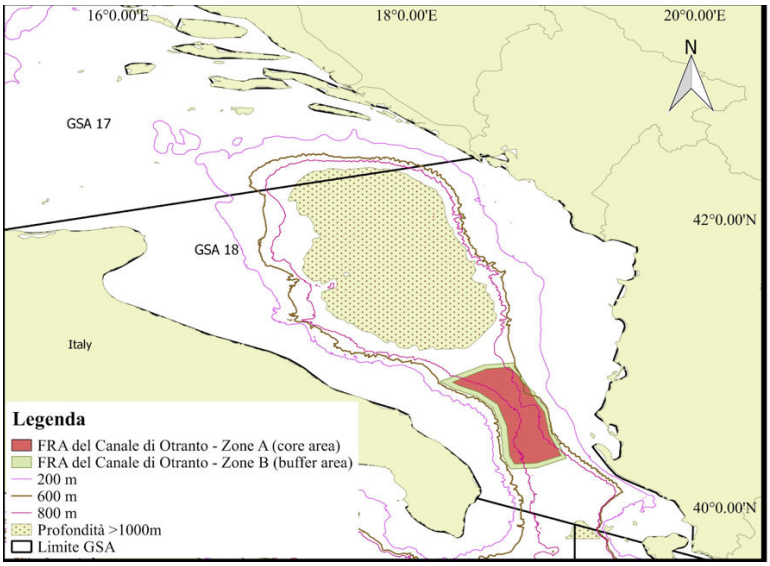


Figure 17: Map of the Fisheries Restricted Area (FRA) of the Otranto Channel in the southern Adriatic Sea (GSA 18).

81. Overall, the three FRAs strictly protect 3,608 km^2 (core areas) from fishery (Figure 18).

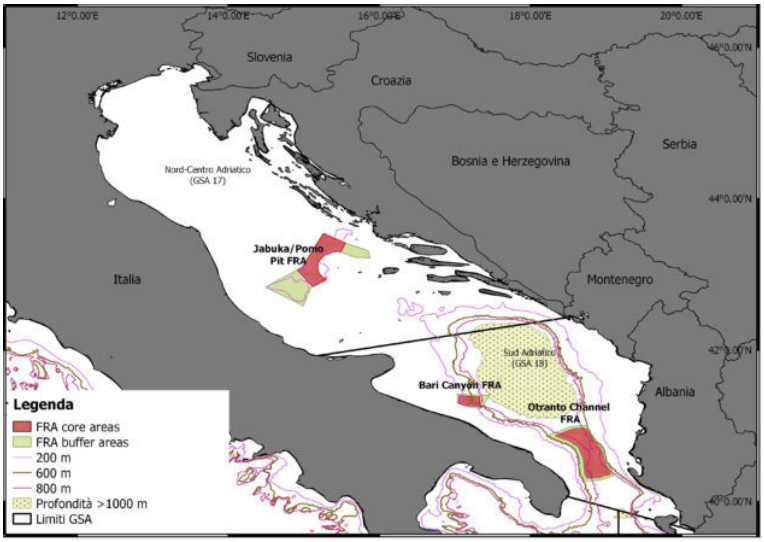


Figure 18: Map of the three Fisheries Restricted Areas (FRA) of the Jabuka-Pomo Pit in the central Adriatic (GSA 17), and of Bari Canyon and Otranto Channel in the southern Adriatic Sea (GSA 18).

Other spatial-based conservation measures

82. The Adriatic Sea encompasses three Ecologically or Biologically Significant Marine Areas – EBSAs: the Northern Adriatic, the Jabuka/Pomo Pit, and the South Adriatic Ionian Straight. Moreover, in the Adriatic Sea, more than 150 marine areas exist, under the Birds or Habitats Directives (for more information https://natura2000.eea.europa.eu/).

83. The area includes several Key Biodiversity Areas – KBAs –, although they mostly cover wetlands and only a small part of them extends into marine areas (Grado e Marano lagoon, Caorle lagoon, Venezia lagoon, Comacchio and Bonifica del Mezzano, Delta Po e Goro, Sentina, Middle Adriatic, several archipelagos along the Eastern coast, Gargano promontory, Figure 19). KBAs can be identified by a KBA National Coordination Group (KBA NCG) if this has been established in a country or by an individual or small group of proposers. For more information, see https://www.keybiodiversityareas.org/ .

Figure 19. KBAs in the Adriatic Sea. Credits: https://www.keybiodiversityareas.org/.

84. In 2006 the Italian Ministry of Agricultural, Food and Forestry Policies instituted seven *Zone di Tutela Biologica* or ZTB (namely "Zones for Biological Conservation") in the Adriatic Sea with the objective of allowing, with a comprehensive strategic perspective, the regulation of professional and sport fishing activities and the related monitoring and control of all biological protection areas.

5. Conservation Initiatives

MedBycatch project

85. The joint project "Understanding Mediterranean multi-taxa 'bycatch' of vulnerable species and testing mitigation – a collaborative approach" (the MedBycatch project) is a partnership between the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS), the General Fisheries Commission for the Mediterranean (GFCM) of the Food and Agriculture Organization of the United Nations (FAO), the Specially Protected Areas Regional Activity Center (SPA/RAC) of the United Nations Environment Programme/Mediterranean Action Plan (UN Environment/MAP), the International Union for Conservation of Nature – Centre for Mediterranean Cooperation (IUCN-Med), BirdLife Europe and Central Asia (BL ECA) and the Mediterranean Association to Save the Sea Turtles (MEDASSET).

86. The project was funded by the MAVA Foundation over a three-year period (2017–2022) and focuses on Croatia, Italy, Morocco, Tunisia, Türkiye. It aims to build on complementarities of the partners' respective mandates promoting synergies and join resources and expertise. The main objectives of this project are:

- addressing knowledge gaps regarding the bycatch of vulnerable species occurring during fishing operations in the Mediterranean through a more systematic and standardized approach to data collection (both FDD and fishery-independent data) and capacity-building;
- identifying and supporting the testing of mitigation measures to reduce incidental catches and/or mortality of vulnerable species;
- raising awareness on the issue of bycatch and provide an informed basis for the formulation of national/regional strategies to reduce incidental catches, preserve vulnerable species and support the sustainability of fisheries

87. In the final report, the MedBycatch highlighted that in the Adriatic Sea specimens of *Squalus acanthias* dominate the bycatch records, representing 72% of the reported conservation-priority elasmobranch species in the Adriatic Sea. *Mustelus mustelus* accounts for 24% of the recorded bycatch events. Other notable species include *Alopias vulpinus*, *Pteroplatytrygon violacea*, and *Myliobatis aquila*. Pelagic trawlers are responsible for most incidental captures in the Adriatic Sea. The results of the MedBycatch project confirmed that the northern Adriatic Sea features nursery areas of *M. mustelus* and *S. acanthias* which juveniles significantly contribute to the bycatch of the species. Set gillnets occasionally captured rare species, such as *Lamna nasus* and *Hexanchus griseus*, underlining the role of small-scale fisheries in elasmobranch bycatch (Carpentieri et al., 2021).

CIESM SHARKLEK initiative presented at the last CIESM congress

88. The CIESM Scientific Program "Highly Migratory Species," co-funded by The Prince Albert II of Monaco Foundation, has been ongoing since 2021 and is set to continue beyond the funding period, which ends in 2024. The program focuses on two main areas: seabirds and elasmobranchs. A specific roundtable elaborated the new Guide to Shark Identification and presented of the SharkLEK protocol used for gathering info on elasmobranchs to understand shark migration, the program is leveraging fishermen's knowledge to identify shark presence and habitat hotspots with LEK, together with preliminary results from the test phase of questionnaires in Egypt and Türkiye. The SharkLEK protocol will be modified and used by LIFE EU SHARKS, LIFE PROMETHEUS projects with the support of IUCN experts to interview also fishers from coastal Countries of the Adriatic Sea. For more information look at the video “CIESM field mission on Elasmobranch (Türkiye June 2024)” (not projected due to time constraints on-site) *CIESM Channel* https://www.youtube.com/watch?v=GqtxzVjLEvM .

89. **MEDLEM (Mediterranean Large Elasmobranchs Monitoring)** is a monitoring programme that aims at building a database focused on large shark and batoid species: the database hosts data referred only to species of sharks with more than 100 cm in maximum size (TL) and batoids with more than 150 cm in disc width (DW). MEDLEM was established in 1985, becoming completely operational in 2000, collecting records of Mediterranean elasmobranchs (catches, sightings, strandings, and historical records) within a single database. The objectives of the MEDLEM programme are:

- collecting information on bycatch, sightings, and stranding events throughout the Mediterranean
- establishing a common protocol for the data collection
- recording spatial occurrence of events through the years
- archiving scientific papers related to elasmobranchs in the Mediterranean, sea as well as any reliable information from newspapers and social media.

90. The MEDLEM programme directly implements the FAO IPOA-Sharks. In Malaga, during the meeting of the GFCM of 2004, a common protocol for collecting field data was proposed and, in that occasion, many Mediterranean countries accepted to cooperate with this scientific programme and to adopt a standardised data collection framework. Since then, the MEDLEM programme has also been presented at the European Elasmobranch Association annual conference, the IUCN, Sharks International and RAC-SPA (UNEP, 2009) meetings (Mancusi et al., 2020).

91. **LIFE23-NAT-IT-LIFE-PROMETHEUS/101148295 project (2024–2029):** Funded by the EU, this project aims to improve elasmobranch conservation by reducing bycatch, promoting alternative sustainable fisheries, and encouraging ecotourism activities. For more information visit LIFE PROMETHEUS. Within the different areas targeted by the project, two are located in the Adriatic basin, i.e. the parturition area for sandbark sharks, *C. plumbeus*, off Cervia (Emilia Romagna, northern Adriatic Sea), and the fishing grounds off Monopoli (Apulia, Southern Adriatic), where the longliners fleet operating for swordfish fishery, annually record high bycatch of blue sharks, *P. glauca*.

92. **LIFE18-NAT-IT-LIFE-ELIFE project (2018-2025):** This initiative focuses on promoting best conservation practices within EU professional fishing sectors in the Mediterranean, conducting pilot actions in various Italian harbors. LIFE ELIFE Project: This EU-funded initiative aims to improve the conservation of Mediterranean elasmobranchs by promoting low-impact fishing practices. Efforts include testing new fishing gear such as circle hooks and shark excluder devices, which help reduce bycatch. For more information visit LIFE ELIFE. Within the areas targeted by the project, one is located in the Adriatic basin, i.e. the fishing grounds off Ancona, here researchers from CNR-IRBIM has performed some trials with trawl nets equipped with exclusion grids.

93. **LIFE22-GIE-IT-LIFE-EU-SHARKS/101114031 project (2023-2027):** This project seeks to ensure the conservation and sustainable use of Mediterranean elasmobranchs by encouraging joint responsibility and promoting behavioral changes to reverse their decline. An example of activities carried out by this project is “How to unhook and release sharks and rays” (Life EU Shark / CIESM) narrated by Eleonora de Sabata (MedSharks), see the video at https://www.youtube.com/watch?v=AsD01aOZ1rc. For more information visit LIFE EU SHARKS.

Specific Conservation initiatives

Albania

94. The Fishery Institute of Durrës (also known as the Laboratory of Aquaculture and Fisheries) is part of Department of Aquaculture and Fisheries in the Agricultural University of Tirana and has conducted shark and ray research in the past, focusing primarily on taxonomy, in collaboration with non-governmental organisations (NGOs), for example the Albanian Center for Environmental Protection and Sustainable Development (ACEPSD) or associated researchers. ACEPSD conducts at-sea fisheries investigations and maintains citizen science networks established among coastal fishers, who report geo-referenced and photo-verified shark and ray catches and landing site data.

Bosnia and Herzegovina

95. No biodiversity monitoring system is in place to provide quality data on the status of biodiversity in the country. The country does not have an institution tasked to monitor the state of biodiversity, while governing entities lack capacities to establish their own monitoring systems stipulated in their laws on nature protection (FAO, 2022).

Croatia

96. Croatia has developed specific national legislation related to sharks, rays, and chimaeras and a ‘Strictly protected’ species status is given to 23 species of sharks and rays (Table 3). This is the highest level of protection in Croatia and any harm toward listed species is regulated by the Criminal Code of Croatia and offenders may be prosecuted (Soldo and Lipej, 2022).

Table 3: List of shark and ray species granted by strictly protected status in Croatian waters (UNEP-MAP-RAC/SPA. 2015).

Carcharhinus plumbeus	*Odontaspis ferox*
Prionace glauca	*Dasyatis pastinaca*
Sphyrna zygaena	*Gymnura altavela*
Galeorhinus galeus	*Mobula mobular*
Heptranchias perlo	*Pristis pectinata*
Hexanchus griseus	*Dipturus batis*
Alopias vulpinus	*Dipturus oxyrinchus*
Cetorhinus maximus	*Rhinobatos rhinobatos*
Carcharodon carcharias	*Oxynotus centrina*
Isurus oxyrinchus	*Squatina oculata*
Lamna nasus	*Squatina squatina*
Carcharias taurus	

Slovenia

97. The only institutions involved in shark and ray research are the Marine Biology Station of the National Institute of Biology, Piran and the Fisheries Research Institute of Slovenia, Ljubljana. General fisheries data are recorded into the BIOS database (the biological database of the Fisheries Research Institute of Slovenia, for more information visit https://www.zzrs.si/en/page/bios/). Currently there are no regulations to protect sharks and rays, but data on shark landings are recorded into the BIOS database (Table 4 and Figure 20).

Table 4: species-specific landing (in kg) of different shark and ray species in Slovenia in the period from 2000-2022, source Slovenian BIOS database.

COMMON NAME	SPECIES NAME	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Common Thresher	*Alopias vulpinus*	0	0	0	0	0	6	0	0	0	100	12	9	12	9	19	52	13	12	138	12	9	12	138
Sandbar Shark	*Carcharhinus plumbeus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spiny Dogfish	*Squalus acanthias*	0	0	0	0	0	3	0	0	0	3	16	34	8	17	8	17	6	4	1	4	5	1	1
Porbeagle	*Lamna nasus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common Smoothhound	*Mustelus mustelus*	2517	5288	3806	6281	4708	1707	1679	1337	2158	1848	1054	1751	1589	1554	1488	2906	2584	2307	1785	3000	2284	3137	1690
Blackspotted Smoothhound	*Mustelus punctulatus*	0	419	559	9	0	0	3	229	0	10	3	229	0	0	0	3	0	0	0	3	0	0	0
Smallspotted Catshark	*Scyliorhinus canicula*	16	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nursehound	*Scyliorhinus stellaris*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Common Eagle Ray	*Myliobatis aquila*	204	141	44	130	232	238	124	101	127	335	89	106	150	238	327	124	101	127	127	123	109	127	31
Marbled Torpedo Ray	*Torpedo marmorata*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Starry Skate	*Raja asterias*	35	45	107	87	71	48	60	59	26	83	61	47	61	61	85	83	59	26	26	75	26	60	179
Thornback Skate	*Raja clavata*	61	143	197	25	48	307	336	356	265	178	151	101	121	102	307	356	235	173	99	234	173	99	90
Brown Skate	*Raja miraletus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		2624	5537	4376	6480	5059	2309	2132	2352	2397	2597	1645	2068	2147	2402	2807	4336	3560	2420	3154	2914	3482	4184	2343

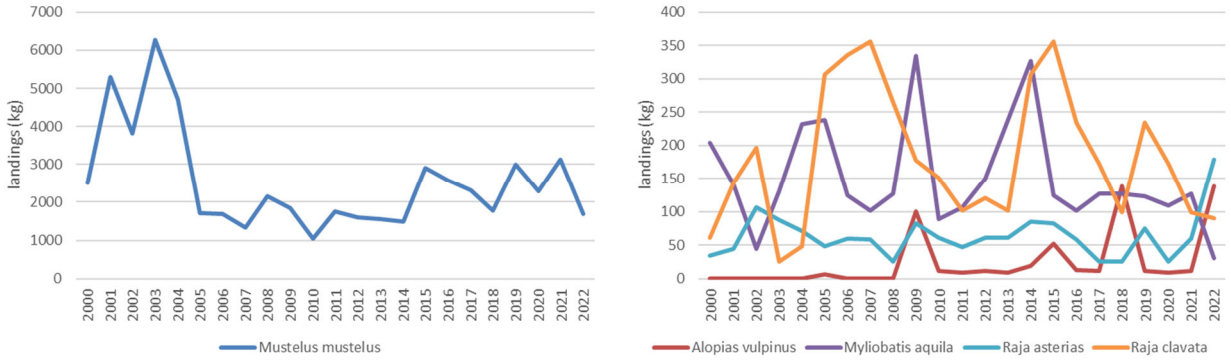


Figure 20. Trends of the main elasmobranch species landed in Slovenia from BIOS database

Montenegro

98. Shark and ray related research is carried out by staff at the Institute of Marine Biology (IBM) in Kotor, Montenegro, with contributions from the local non-governmental sector in the past. Research is focused on collecting records of all species and through two main sources 1) Data Collection Reference Framework (DCRF); and 2) Maintaining citizen science initiatives. The laboratory for ichthyology and marine fisheries of IBM keeps all available data on species encounters in the country's territorial waters, including catches, strandings, and documented records of live animals.

99. Policy development and updating, proclamation of fishing bans and all other actions related to fisheries management are the responsibility of the Directorate for Fisheries in the Ministry of Agriculture, Forestry and Water Management. These regulations are enforced with fishery inspections that are currently undertaken by the Directorate for Fisheries.

100. The institute report that fishers often clean individuals before landing to prevent meat spoiling, which creates problems for identifying the species at landing points. Monitoring of shark and ray catches and sightings is conducted by the IBM through regular fisheries monitoring programs and on the voluntary basis of fishers, citizens, and the Institute's scientific staff.

Non-governmental organisations (NGOs), private research institutes and associations engaged in conservation and management activities

101. Several Italian non-governmental organisations (NGOs), private research institutes, and associations are engaged in conservation and management activities, disseminating knowledge, increasing awareness and collaborating with international fisheries management organisations such as COISPA Foundation (https://www.coispa.it/it/fondazione-coispa-ets.html). The COISPA Foundation, recently established, is involved in several national and EU research programs and integrated development projects, promoting eco-innovation, sustainable management of aquatic living resources and conservation measures. COISPA takes part to the EU Data Collection Framework in Italy for the GSA 18 South Adriatic, GSA19 Western Ionian and GSA 10 Central-Southern Tyrrhenian. Among all their projects (https://www.coispa.it/it/progetti/), the COISPA Foundation participated to the project Safe Sharks (M5 – 17158; https://www.wwf.it/area-stampa/il-wwf-insieme-ai-pescatori-per-salvare-gli-squali-nel-mediterraneo/) supported by WWF-Italy- MAVA Fondation, aimed at satellite tagging *Prionace glauca* to evaluate its survival after shark by-catch (2018-2020). Moreover, COISPA participated in the MedBycatch (2019-2022).

102. Recently, relevant activities have been conducted at national and regional levels by the World Wildlife Fund (WWF) Mediterranean, WWF Adria and WWF Italy, under several projects focusing on sharks and rays.

103. MedReact ONLUS (https://medreact.org/en/), as mentioned before, works for the promotion of the protection of the Adriatic Sea from destructive fishing. With its efforts, in 2016 this association launched the Adriatic Recovery Project through which a closure to fishery of the Jabuka/Pomo Pit was obtained in 2017. In 2024, MedReact actions allowed to obtain a closure of the Otranto Channel. Recently, this ONLUS received the fundings for the project Protecting Sharks in the Northwest Adriatic of the Shark Conservation Fund (https://www.sharkconservationfund.org/project/protecting-sharks-in-the-northwest-adriatic/).

104. Sharklab Adria (https://sharklab-adria.org/), based in Albania, plays a significant role in the conservation of elasmobranchs in the Adriatic Sea. As an NGO, it focuses on several key conservation efforts, particularly in research and awareness-building. Sharklab Adria conducts fieldwork focused on elasmobranch populations. Their research includes monitoring shark and ray species' health, ecology, and behavior, with a specific emphasis on the impacts of pollution and habitat degradation. They also investigate diseases in these species, which is crucial for understanding the broader health of marine ecosystems. For example, they conduct post-capture health assessments to study survival and recovery rates of species, as well as monitoring fisheries to track landing data, especially regarding shark species like the spiny butterfly ray and rough shark (https://sharklab-adria.org/projects/). One of Sharklab Adria's major initiatives is the rehabilitation and re-release of captured sharks and rays, contributing to the restoration of marine biodiversity. This includes projects aimed at reviving critically endangered species like the angel shark *Squatina squatina*, which has seen a small resurgence in the Adriatic. They also focus on the revival of species like the *Gymnura altavela* (spiny butterfly ray).

6. Identification of Gaps and Needs and elaboration of Recommendations

105. The Adriatic Sea, a semi-enclosed basin in the Central Mediterranean Sea, plays a critical role in the biodiversity of Europe's marine ecosystems. However, the Region faces significant challenges, including overfishing, habitat degradation, increase of invasive alien species and climate change, which have exacerbated pressures on vulnerable species like sharks, rays, and other marine organisms. This section of the present document outlines the key gaps, recommendations, and future needs for six Countries overlooking the Adriatic Sea: **Italy, Slovenia, Croatia, Bosnia and Herzegovina, Montenegro, and Albania.**

106. The main gaps in conservation of elasmobranch populations inhabiting the Adriatic Sea are related to the following aspects:

a) **lack of data and systematic monitoring systems**: especially in Bosnia and Herzegovina, there is a notable absence of a biodiversity monitoring system for assessing marine life. Similarly, Croatia and Albania struggle with incomplete data on the catch and bycatch of sharks and rays, which hampers science-based policy decisions (Soldo and Lipej, 2022). In Slovenia, limited research on the reproductive biology and feeding habits of these species further complicates effective management;

b) **institutional and policy deficiencies**: Bosnia and Herzegovina lacks harmonized legal and institutional frameworks for environmental and fisheries management across its entities. Furthermore, the absence of marine protected areas (MPAs) in Bosnia and Herzegovina exacerbates biodiversity loss in its waters;

c) **weak enforcement of regulations**: in Albania, despite existing regulations, enforcement remains weak, particularly in terms of bycatch monitoring and community involvement in conservation activities;

d) **inadequate coverage of protected areas or enforcement of already existing ones**: while MPAs exist in some parts of the Adriatic, their representativity and management are insufficient, particularly in Slovenia. Offshore and deeper habitats remain largely unprotected, which leaves critical breeding and nursery areas for sharks and rays at risk. In recent years, through strategic projects in Croatia, several activities were conducted relating to establishment of Natura 2000 management framework (98 management plans which covers more than 40% of marine Natura 2000 areas), monitoring and mapping of for habitats and species, and management of strictly protected species.

Also, to contribute to the EU goal of protecting at least 30% of the EU's seas and global target of protecting 30% target in marine environment (GBF target 3) Croatia is finalizing process of defining new areas for spatial protection particularly for turtles, dolphins, seabirds, seagrass meadows have been identified and are planned to be designated as marine Natura 2000 sites in Adriatic Sea.

107. In order to address the identified gaps, some recommendations for improving conservation actions have been identified.

108. First, strengthening data collection and research is an essential step towards sustainable management. Particularly, increasing the knowledge of species distribution, migration patterns and the presence of critical habitats such as nurseries and breeding or feeding grounds is an essential and challenging aspect to be addressed. To do so, a higher level of cooperation is needed among researchers (both public and private institutions and organizations, NGOs and academia) to identify and propose the institution of more ISRA and KBAs that could be taken into consideration when adopting conservation measures. As an example, the Gulf of Trieste is known to potentially host a nursery area of *S. acanthias* and *M. mustelus,* but no recent scientific knowledge is available. In the Central Adriatic basin, nurseries of smoothounds are known to be present, but tagging adult and mature animals could be useful to localize those areas and elect

109. Giving the transboundary nature of Adriatic marine ecosystems, the conservation of sharks together to establish a joint-monitoring program and harmonize legal frameworks.

110. Probably, for both these points, the constitution of a focus group working on elasmobranchs in the Subregional Committee for the Adriatic Sea, based on the GFCM Working Group on Vulnerable Species (WGVUL), led and nominated by GFCM and including relevant experts from all Adriatic Countries could facilitate the sharing of expertise and improve capacity to undertake data collection, stock assessment, but also bycatch mitigation measures. This Committee could also promote the input to the MEDLEM database under the appropriate protocol, to ensure shared access to information on chondrichthyan fishes across the Adriatic Sea. GFCM could invite this group of experts to participate in the interactive regional platform on bycatch vulnerable species which creation was proposed last 16th of April (https://www.fao.org/gfcm/technical-meetings/detail/en/c/1682921/, report: https://gfcm.sharepoint.com/EG/Report%20v2/Forms/AllItems.aspx?id=%2FEG%2FReport%20v2%2F2024%2FWGVUL%2FGFCM%5FWGVulnerable%20species%5F2024%5FReport%2Epdf&parent=%2FEG%2FReport%20v2%2F2024%2FWGVUL&p=true&ga=1).

111. The establishment of the three Adriatic FRAs (Jabuka/Pit Pomo, Bari canyon and Otranto Channel) is an effective measure that could help protecting elasmobranchs in the Adriatic Sea, even if more knowledge on the species inhabiting these waters is needed, considering that the three FRAs mostly encompassed deep waters, and thus may affect mainly deep-sea species. Moreover, the creation of new Natura 2000 sites, based on the ISRAs established by IUCN-SSG, could be useful to address this challenge. Another recommendation to regional authorities of Countries that have competence in the management of coastal waters should refer to the enlargement and enforcement of MPAs network, that could positively contribute to improving the connectivity among these protected sites.

112. International authorities such as RAC/SPA are strongly invited to support and fund capacity-building initiatives especially in non-EU countries such as Bosnia and Herzegovina, and Albania. These initiatives could involve and train local authorities, enhance stakeholder engagement, and foster community participation in conservation efforts. As an example, the RAC/SPA Call for Consultancy 09/24 (Call for consultancy to organize a sub-regional training workshop on monitoring and identification of cartilaginous fishes) promoted the organization of a sub-regional training workshop for stakeholders from the Adriatic Region. Other funds could be destinated to the organization of workshops for sharking best practices for the safe release of elasmobranch caught by fishers or the application of mitigating measures to reduce the bycatch.

113. Moreover, the ICCAT Shark Research and Data Collection Programme has funded different projects aimed at improving knowledge on the biology and ecology of large pelagic sharks, commonly caught during fishing operations (i.e. shortfin mako, porbeagle, blue shark, etc.), exclusively focused on Atlantic population. Such effort could be extended also to the Mediterranean, and specifically to the southern Adriatic, where high by-catch of blue sharks are recorded.

114. To ensure the long-term sustainability of marine biodiversity in the Adriatic, conservation programs in the Adriatic region require sustainable, long-term funding. EU Countries should leverage existing EU funds, such as the European Maritime, Fisheries and Aquaculture Fund (EMFAF), and explore new financial mechanisms, including public-private partnerships.

115. Establishing well-coordinated governance structures is critical to the success of conservation initiatives. Bosnia and Herzegovina, for instance, must strengthen institutional frameworks to define responsibilities across various government levels. Serbia, Albania, and Montenegro need to align their fisheries policies with EU standards to enhance compliance with conservation objectives.

116. Mitigation measures like gear modifications, deterrent applications, fishing restrictions during sensitive seasons, and awareness campaigns to minimize bycatch are recommended for sustainable management.

Conclusions

117. The Adriatic Sea, with its rich but vulnerable biodiversity, presents a unique challenge for conservation not only at Mediterranean level, but also at global level, being one of the most impacted seas of the world (Micheli et al., 2013). In this context, fishery exploitation results as the main driver of the striking, long-term elasmobranch decline in the whole basin, calling for urgent management actions to improve their conservation status. While significant gaps exist in data, governance, and enforcement, there is also a clear opportunity for these countries to collaborate more effectively. By improving knowledge, enhancing protection, and fostering cooperation, the Adriatic region can serve as a model for sustainable marine biodiversity management. Immediate action, supported by international frameworks, robust legislation, transborder cooperation and community engagement, will be critical to ensure elasmobranch conservation.

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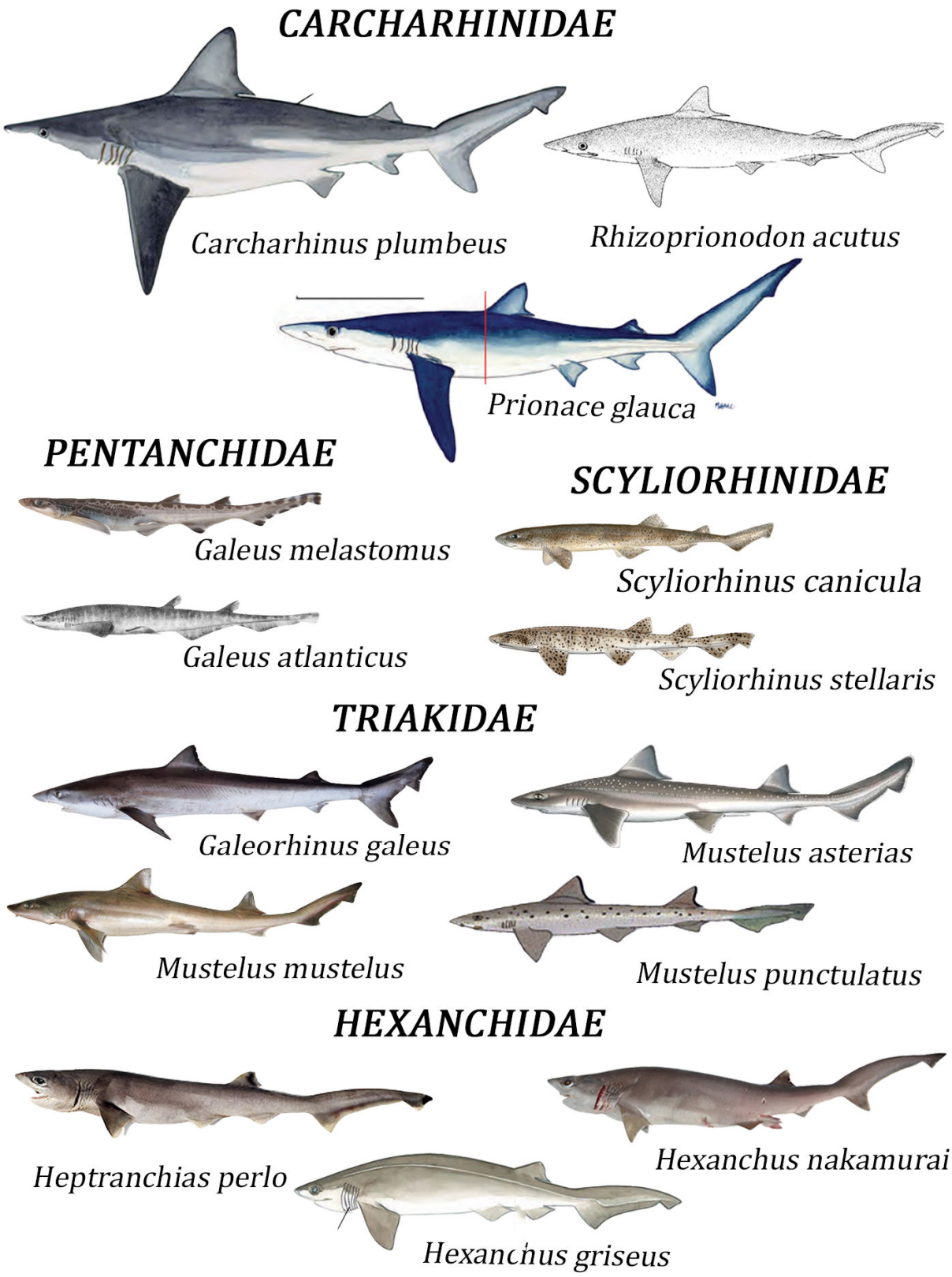
ANNEX 1


CARCHARHINIDAE
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Prionace glauca
PENTANCHIDAE
Galeus melastomus
Galeus atlanticus
SCYLIORHINIDAE
Scyliorhinus canicula
Scyliorhinus stellaris
TRIAKIDAE
Galeorhinus galeus
Mustelus asterias
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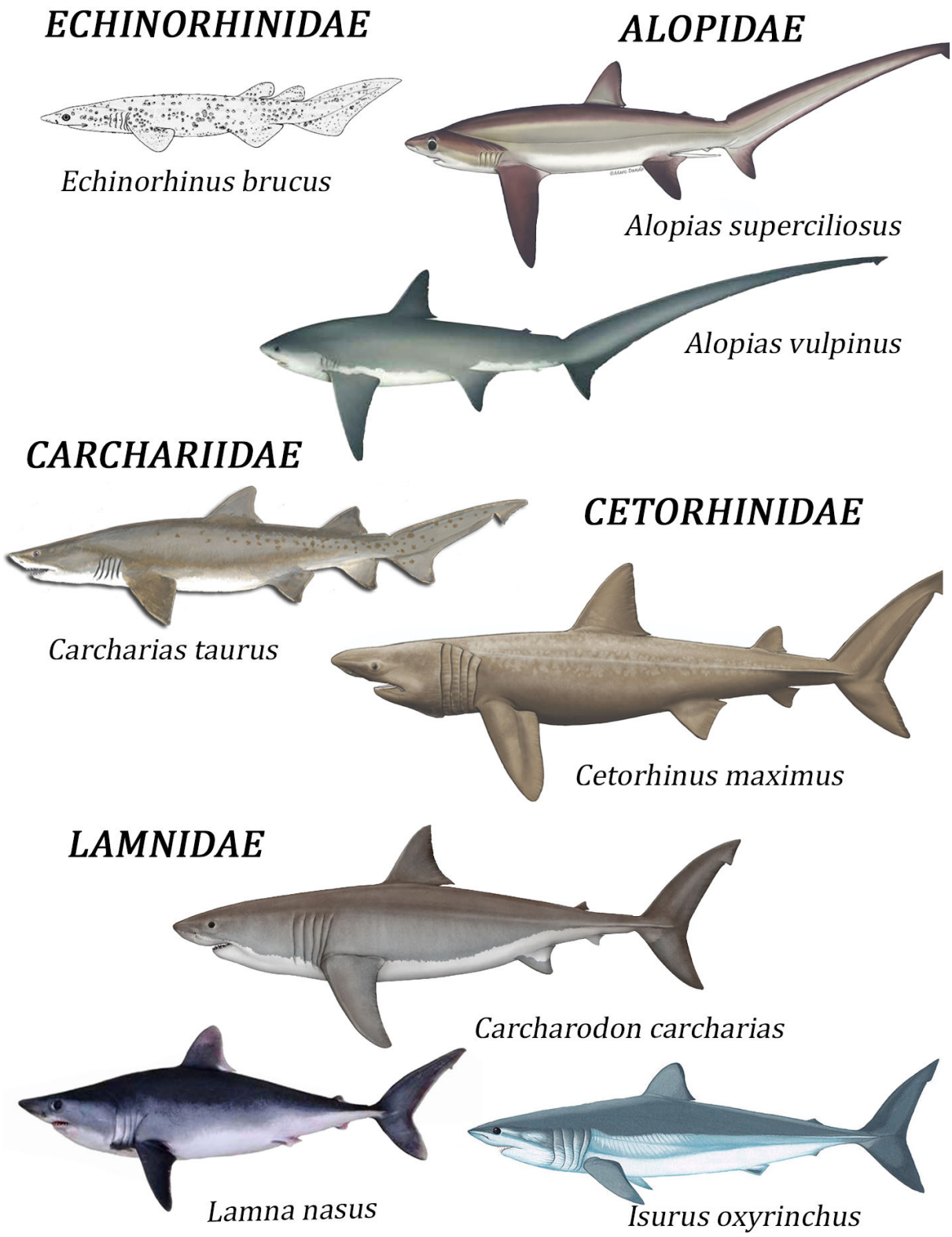
Mustelus punctulatus
HEXANCHIDAE
Heptranchias perlo
Hexanchus nakamurai
Hexanchus griseus


ECHINORHINIDAE
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Alopias vulpinus
CARCHARIIDAE
Carcharias taurus
CETORHINIDAE
Cetorhinus maximus
LAMNIDAE
Carcharodon carcharias
Lamna nasus
Isurus oxyrinchus

ODONTASPIDIDAE

Odontaspis ferox

CENTROPHOTIDAE

Centrophorus uyato

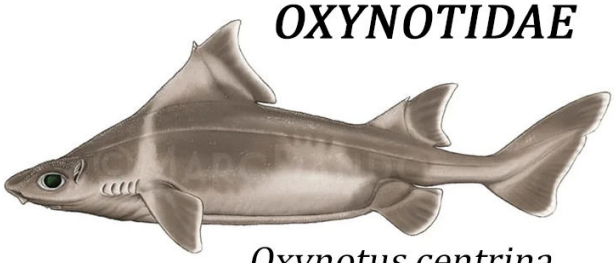
DALATIIDAE

Dalatias licha

ETMOPTERIDAE

Etmopterus spinax

OXYNOTIDAE

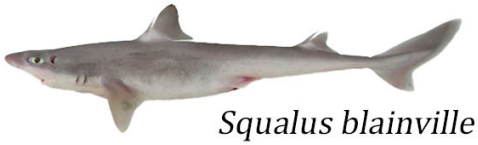


Oxynotus centrina

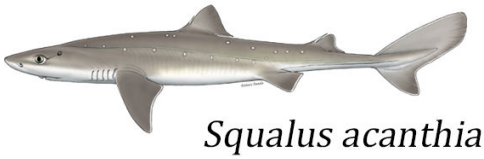
SOMNIOSIDAE

Somniosus rostratus

SQUALIDAE

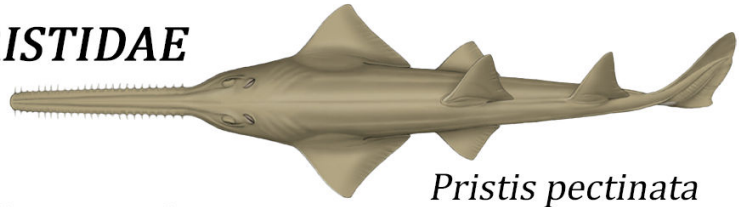


Squalus blainville



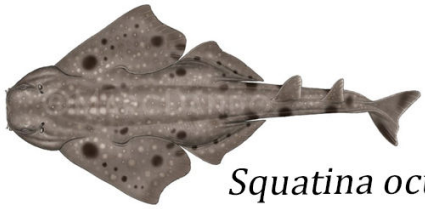
Squalus acanthias

PRISTIDAE



Pristis pectinata

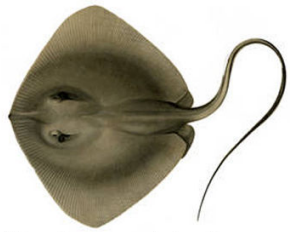
SQUATINIDAE



Squatina oculata

Squatina squatina

DASYATIDAE



Bathytoshia lata

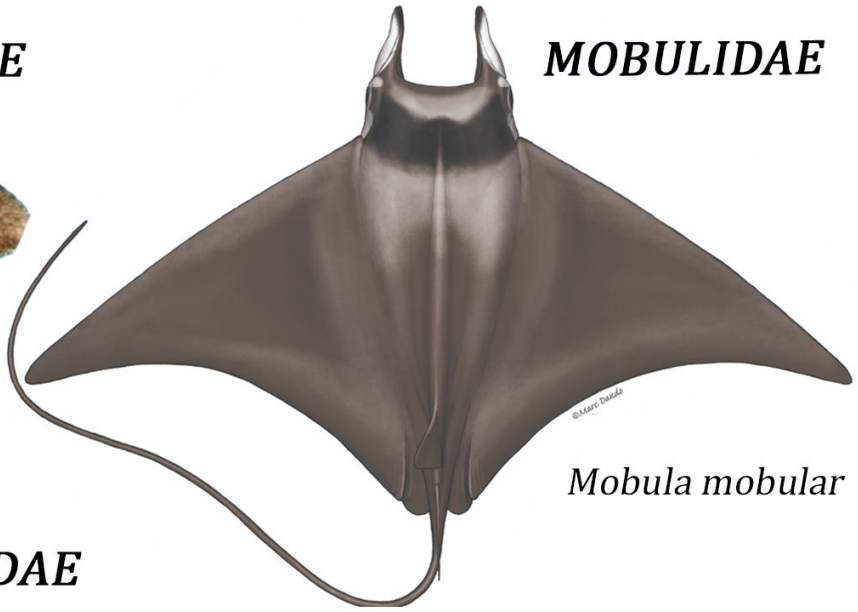
Dasyatis pastinaca

Pteroplatytrygon violacea

GYMNURIDAE

Gymnura altavela

MOBULIDAE



Mobula mobular

MYLIOBATIDAE

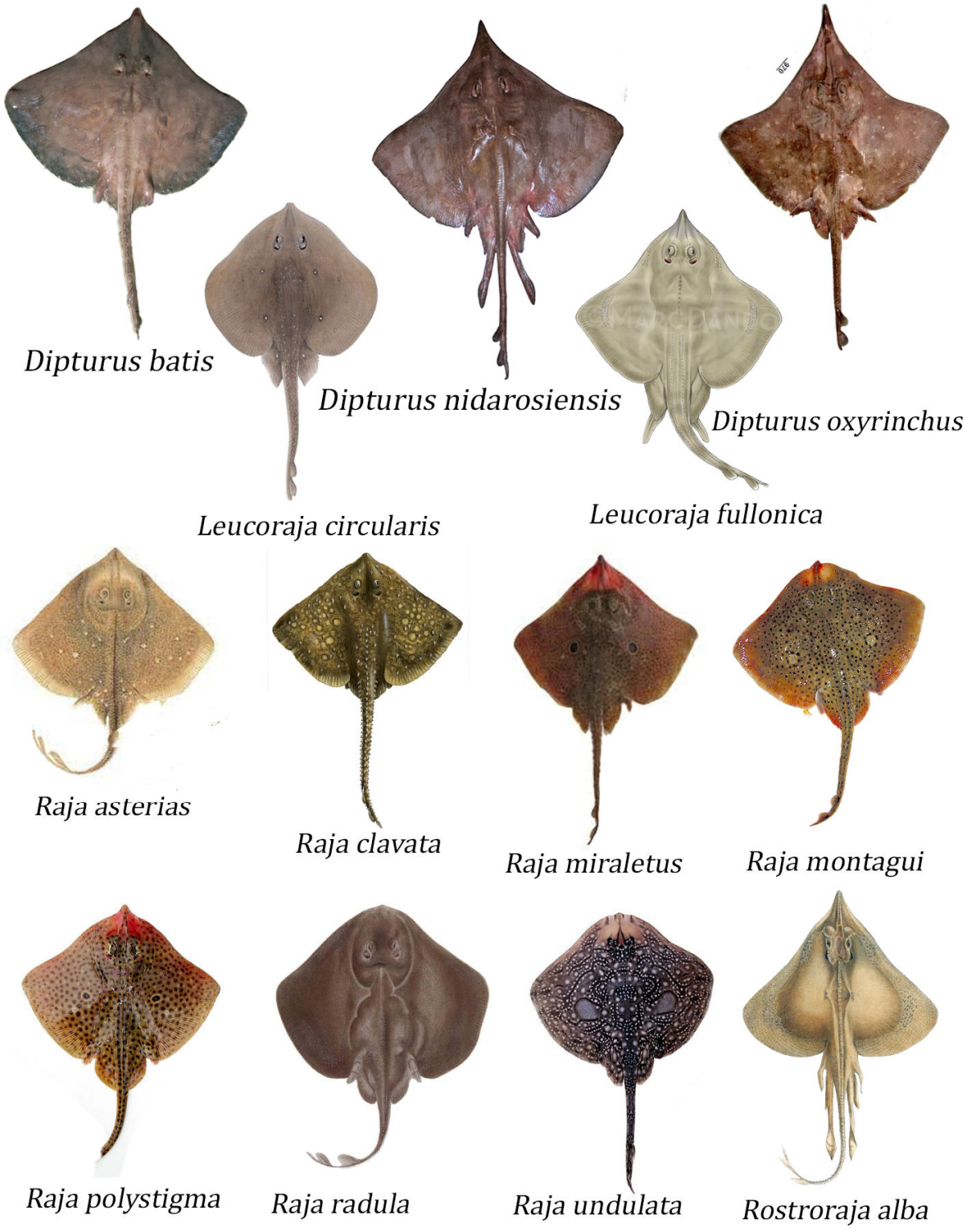
Aetomylaeus bovinus

Myliobatis aquila

RHINOPTERIDAE

Rhinoptera marginata

RAJIDAE


Dipturus batis
Dipturus nidarosiensis
Dipturus oxyrinchus
Leucoraja circularis
Leucoraja fullonica
Raja asterias
Raja clavata
Raja miraletus
Raja montagui
Raja polystigma
Raja radula
Raja undulata
Rostroraja alba

RHINOBATIDAE

Rhinobatos rhinobatos

TORPEDINIDAE

Tetronarce nobiliana

Torpedo marmorata

Torpedo torpedo

CLASS: CHONDRICHTHYES

ORDER: CARCHARHINIFORMES
FAMILY: CARCHARHINIDAE

1- *Carcharhinus plumbeus* (Nardo, 1827), Sandbar shark
2- *Prionace glauca* (Linnaeus, 1758), Blue shark
3- *Rhizoprionodon acutus* (Rüppell, 1837), Milk shark

FAMILY: PENTANCHIDAE

4- *Galeus melastomus* (Rafinesque, 1810), Blackmouth catshark
5- *Galeus atlanticus* (Vaillant, 1888), Atlantic sawtail catshark

FAMILY: SCYLIORHINIDAE

6- *Scyliorhinus canicula* (Linnaeus, 1758), Lesser spotted dogfish
7- *Scyliorhinus stellaris* (Linnaeus, 1758), Nursehound

FAMILY: TRIAKIDAE

8- *Galeorhinus galeus* (Linnaeus, 1758), Tope shark
9- *Mustelus asterias* (Cloquet, 1819), Starry smooth-hound
10- *Mustelus mustelus* (Linnaeus, 1758), Smooth-hound
11- *Mustelus punctulatus* (Risso, 1827), Blackspotted smooth-hound

ORDER: ECHINORHINIFORMES
FAMILY: ECHINORHINIDAE

12- *Echinorhinus brucus* (Bonnaterre, 1788), Bramble shark

ORDER: HEXANCHIFORMES
FAMILY: HEXANCHIDAE

13- *Heptranchias perlo* (Bonnaterre, 1788), Sharpnose sevengill shark
14- *Hexanchus griseus* (Bonnaterre, 1788), Bluntnose sixgill shark
15- *Hexanchus nakamurai* (Teng, 1962), Bigeyed sixgill shark

ORDER: LAMNIFORMES
FAMILY: ALOPIDAE

16- *Alopias superciliosus* Lowe, 1841, Bigeye thresher
17- *Alopias vulpinus* (Bonnaterre, 1788), Common Thresher

FAMILY: CARCHARIIDAE

18- *Carcharias taurus* (Rafinesque, 1810), Sand tiger shark

FAMILY: CETORHINIDAE

19- *Cetorhinus maximus* (Gunnerus, 1765), Basking shark

FAMILY: LAMNIDAE

20- *Carcharodon carcharias* (Linnaeus, 1758), Great white shark
21- *Isurus oxyrinchus* (Rafinesque, 1810), Shortfin mako
22- *Lamna nasus* (Bonnaterre, 1788), Porbeagle

FAMILY: ODONTASPIDIDAE

23- *Odontaspis ferox* (Risso, 1810), Smalltooth sand tiger

ORDER: SQUALIFORMES
FAMILY: CENTROPHOTIDAE

24- *Centrophorus uyato* (Rafinesque, 1810), Little gulper shark

FAMILY: DALATIIDAE

25- *Dalatias licha* (Bonnaterre, 1788), Kitefin shark

FAMILY: ETMOPTERIDAE

26- *Etmopterus spinax* (Linnaeus, 1758), Velvet belly

FAMILY: OXYNOTIDAE

27- *Oxynotus centrina* (Linnaeus, 1758), Angular roughshark

FAMILY: SOMNIOSIDAE

28- *Somniosus rostratus* (Risso, 1827), Little sleeper shark (https://kids.britannica.com/students/article/little-sleeper-shark/312209)

FAMILY: SQUALIDAE

29- *Squalus acanthias* (Linnaeus, 1758), Picked dogfish (https://www.cms.int/en/species/squalus-acanthias)
30- *Squalus blainville* (Risso, 1827), Longnose spurdog (https://www.colapisci.it/pescitalia/pisces/elasmobranchi/Squaliformes/Squalidi/spinarolobruno.htm)

ORDER: RHINOPRISTIFORMES
FAMILY: PRISTIDAE

31- *Pristis pectinata* (Latham, 1794), Smalltooth sawfish (https://www.cms.int/cami/fr/node/7513)

ORDER: SQUATINIFORMES
FAMAILY: SQUATINIDAE

32- *Squatina oculata* (Bonaparte, 1840), Smoothback angelshark (https://isea.com.gr/squatina-oculata-sut-%CE%BC%CE%B1%CF%84%CE%BF%CF%81%CE%AF%CE%BD%CE%B1/)
33- *Squatina squatina* (Linnaeus, 1758), Angelshark (https://shark-references.com/species/view/Squatina-squatina)

ORDER: MYLIOBATIFORMES
FAMILY: DASYATIDAE

34- *Bathytoshia lata* (Garman, 1880), Brown stingray (https://www.marinespecies.org/aphia.php?p=taxdetails&id=1018707)
35- *Dasyatis pastinaca* (Linnaeus, 1758), Common stingray (https://shark-references.com/species/view/Dasyatis-pastinaca)
36- *Pteroplatytrygon violacea* (Bonaparte, 1832), Pelagic stingray *(https://www.biodiversityexplorer.info/chondrichthyes/elasmobranchii/batoidei/pteroplatytrygon_violacea.htm)*

FAMILY: GYMNURIDAE

37- *Gymnura altavela* (Linnaeus, 1758), Spiny butterfly ray (https://www.fishbase.se/summary/Gymnura-altavela)

FAMILY: MOBULIDAE

38- *Mobula mobular* (Bonnaterre, 1788), Devil fish

FAMILY: MYLIOBATIDAE

39- *Aetomylaeus bovinus* (Geoffroy Saint-Hilaire, 1817), Bull ray
40- *Myliobatis aquila* (Linnaeus, 1758), Common eagle ray

FAMILY: RHINOPTERIDAE

41- *Rhinoptera marginata* (Geoffroy Saint-Hilaire, 1817), Lusitanian cownose ray

ORDER: RAJIFORMES
FAMILY: RAJIDAE

42- *Dipturus batis* (Linnaeus, 1758), Blue skate
43- *Dipturus nidarosiensis* (Storm, 1881), Norwegian skate
44- *Dipturus oxyrinchus* (Linnaeus, 1758), Longnosed skate
45- *Leucoraja circularis* (Couch, 1838), Sandy ray
46- *Leucoraja fullonica* (Linnaeus, 1758), Shagreen ray
47- *Raja asterias Delaroche,* 1809), Mediterranean starry ray
48- *Raja clavata* (Linnaeus, 1758), Thornback ray
49- *Raja miraletus* (Linnaeus, 1758), Brown ray
50- *Raja montagui* (Fowler, 1910), Spotted ray
51- *Raja polystigma* (Regan, 1923), Speckled ray
52- *Raja radula* (Delaroche, 1809), Rough ray
53- *Raja undulata* (Lacepède, 1802), Undulate ray
54- *Rostroraja alba* (Lacepède, 1803), White skate

ORDER: TORPEDINIFORMES
FAMILY: RHINOBATIDAE

55- *Rhinobatos rhinobatos* (Linnaeus, 1758), Common guitarfish

FAMILY: TORPEDINIDAE

56- *Tetronarce nobiliana* (Bonaparte, 1835), Electric ray
57- *Torpedo marmorata* (Risso, 1810), Marbled electric ray
58- *Torpedo torpedo* (Linnaeus, 1758), Common torpedo

CLASS: HOLOCEPHALI
ORDER: CHIMAERIFORMES
FAMILY: CHIMAERIDAE

59- *Chimaera monstrosa* (Linnaeus, 1758), Rabbit fish