

Blue lines indicate the area meeting the ISRA Criteria; dashed lines indicate the suggested buffer for use in the development of appropriate place-based conservation measures

STRAIT OF MESSINA ISRA

Mediterranean and Black Seas Region

SUMMARY

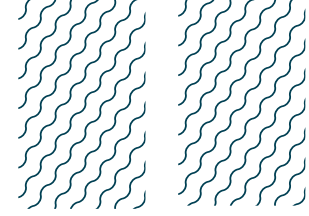
Strait of Messina separates Sicily Island from the Italian peninsula and connects the Tyrrhenian Sea with the Ionian Sea. Its articulated benthic topography and the presence of strong tidal currents, cause upwellings of the deep Ionian cold and nutrient-rich waters. The Scilla Valley, in the northern part of the area, has a well-developed coralligenous habitat. Within this area there are: **threatened species** (e.g., Spinetail Devil Ray *Mobula mobular*); **reproductive areas** (*Common Stingray* *Dasyatis pastinaca*); areas important for **movement** (Spinetail Devil Ray); and **distinctive attributes** (Bluntnose Sixgill Shark *Hexanchus griseus*).

CRITERIA

Criterion A - Vulnerability; Sub-criterion C1 - Reproductive Areas; Sub-criterion C4 - Movement; Sub-criterion D1 - Distinctiveness

—	—
ITALY	—
—	—
0-500 metres	—
—	—
622.46 km²	—
—	—





DESCRIPTION OF HABITAT

Strait of Messina is in the central Mediterranean Sea, between the Ionian and Tyrrhenian basins of Italy. Scilla Valley is the northern limit and the Messina Canyon the southern limit. The strong and turbulent hydrodynamics of the area are driven by colder, saltier, and nutrient-rich deep Ionian waters that mix with shallow Tyrrhenian flows (Vercelli & Picotti 1926; Mosetti 1988). Lunar phases influence horizontal and vertical fluxes and create tidal currents with opposing directions (south-north and north-south) every six hours. During the horizontal southern-tide, Tyrrhenian waters flow into the Ionian basin from the surface to 30 m depth, forming strong shallow currents that can reach up to 50 cm/s. During the horizontal north-tide, Ionian water masses move through the area to the Tyrrhenian Sea sinking below its waters, providing a periodic input of nutrients and sustaining high levels of primary production (Spanò & De Domenico 2017).

The connection between the two water flows and the irregular morphology of the bottom also causes vertical currents (eddies) in the narrowest area of connection between Calabria (Scilla) and Sicily (Capo Peloro) (De Domenico 1987). Benthic habitats host peculiar habitats previously considered exclusive to the Atlantic Ocean. Kelp forests (*Laminaria* sp.) form a particular habitat in the area and probably represent a relict biodiversity of the Tethys Sea. Scilla Valley hosts a rich coralligenous habitat mostly formed by the Mediterranean Sea endemic and Vulnerable Red Gorgonian *Paramuricea clavata* (Coelho et al. 2023) and the largest population of the Black Coral *Antipathella subpinnata* in this body of water (Bo et al. 2009).

This Important Shark and Ray Area is benthopelagic and is delineated from inshore and surface waters (0 m) to 500 m based on the bathymetry of the area and upwelling current limits.

ISRA CRITERIA

CRITERION A - VULNERABILITY

Two Qualifying Species considered threatened with extinction according to the IUCN Red List of Threatened Species™ regularly occur in the area. These are the Vulnerable Common Stingray (Jabado et al. 2021) and the Endangered Spinetail Devil Ray (Marshall et al. 2022).

SUB-CRITERION C1 - REPRODUCTIVE AREAS

Strait of Messina is an important reproductive area for one ray species.

Combining citizen science videos collected during the last three years by recreational scuba divers and sightings along linear 50 m transects conducted in June 2023, a reproductive area of the Common Stingray was identified in shallow waters of northern coast of the area (Grancagnolo et al. unpubl. data 2023). Twenty-two gravid Common Stingrays, all showing marked posterior-dorsal swellings (i.e., suggesting advanced pregnancy) were sighted resting in groups on sandy bottoms and within Neptune Grass *Posidonia oceanica* meadows, at 8–12 m depth. Up to 15 pregnant females were counted on a single 50 m linear transect. In the same area, the presence of a mature male, with claspers longer than pelvic fins, and a large-sized female with fresh mating scars in the posterior half of the disc, were also recorded. This suggests that in addition to an aggregation of pregnant females, mating events occur in the area (Grancagnolo et al. unpubl. data 2023). Females mating within minutes or hours after pupping has previously been documented for the congeneric Southern Stingray *Dasyatis americana* (Chapman et al. 2003).

SUB-CRITERION C4 - MOVEMENT AREAS

Strait of Messina is an important movement area for one ray species.

A satellite tagging campaign conducted in June 2019 tagged eight Spinetail Devil Rays in the Strait of Messina (Notarbartolo di Sciara unpubl. data 2023). Animals were tagged with Wildlife Computers MiniPAT and all individuals appeared to be full-sized adults; however, they were not captured before being tagged and therefore neither measured nor sexed. Tags were implanted with poles by fishers from traditional harpoon fishing vessels named 'passerelle' or 'feluche. All tagged rays moved east into the Ionian Sea, with three of them venturing further north in the southern Adriatic Sea, and three of them moving back west again across the Strait of Messina into the Tyrrhenian Sea, using the strait as a migration pathway (Notarbartolo di Sciara unpubl. data 2023). A conclusion that can be drawn from the above is that the Strait of Messina is a transit area for the movements of this species between the eastern and the western Mediterranean sub-basins.

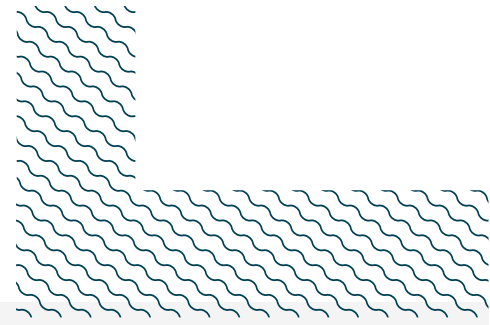
SUB-CRITERION D1 - DISTINCTIVENESS

One shark species shows unique behaviour in the Strait of Messina.

The Bluntnose Sixgill Shark is demersal and mainly occurs on the shelf edge and slope, and occasionally inshore (Finucci et al. 2020). In waters of Hawai'i, it was recorded to undergo a distinct diel vertical migration descending to depths below 700 m during the day and ascending to 200-350 m during the night, with a recorded depth range of 189-816 m (Coffey et al. 2020).

In the Strait of Messina, Bluntnose Sixgill Shark individuals recurrently and predictably arise in shallow waters (15-30 m) at a specific site in the area and only under specific environmental conditions (during moonlight nights when horizontal north-tide occurs; Spanò & De Domenico 2017). The predictability of this behaviour has attracted shark-diving tourism in the area (Potoschi et al. 2010).

Bluntnose Sixgill Sharks are both accidentally captured and directly targeted by commercial fishers in the Strait of Messina. For example, a study recorded 37 captures from 40-250 m depth (67.65% of catches were below 90 m) between 2000 and 2003 (Celona et al. 2005). The presence of animals in shallower waters of the area has been related to the unique condition of the upwelling currents of the area which facilitate vertical migration for feeding purposes (Potoschi et al. 2010). Coastal, shallow water fish including White Seabream *Diplodus sargus* and Salema Porgy *Sarpa salpa* were recorded in the stomachs of 23 individuals captured in the area (Celona et al. 2005).



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QUALIFYING SPECIES

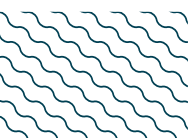
Scientific Name	Common Name	IUCN Red List Category	Global Depth Range (m)	ISRA Criteria/Sub-criteria Met (mark with an 'X')							
				A	B	C1	C2	C3	C4	C5	D1
SHARKS											
<i>Hexanchus griseus</i>	Bluntnose Sixgill Shark	NT	0-2,490								X
RAYs											
<i>Dasyatis pastinaca</i>	Common Stingray	VU	0-200	X		X					
<i>Mobula mobular</i>	Spinetail Devil Ray	EN	0-1,112	X					X		

SUPPORTING SPECIES

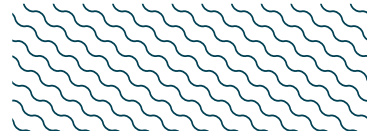
Scientific Name	Common Name	IUCN Red List Category
SHARKS		
<i>Alopias superciliosus</i>	Bigeye Thresher	VU
<i>Alopias vulpinus</i>	Common Thresher	VU
<i>Carcharodon carcharias</i>	White Shark	VU
<i>Centrophorus uyato</i>	Little Gulper Shark	EN
<i>Cetorhinus maximus</i>	Basking Shark	EN
<i>Dalatias licha</i>	Kitefin Shark	VU
<i>Etmopterus spinax</i>	Velvet Belly Lanternshark	VU
<i>Galeus melastomus</i>	Blackmouth Catshark	LC
<i>Heptranchias perlo</i>	Sharpnose Sevengill Shark	NT
<i>Isurus oxyrinchus</i>	Shortfin Mako	VU
<i>Mustelus mustelus</i>	Common Smoothhound	EN
<i>Odontaspis ferox</i>	Smalltooth Sand Tiger	VU
<i>Oxynotus centrina</i>	Angular Roughshark	EN
<i>Prionace glauca</i>	Blue Shark	CR*
<i>Scyliorhinus canicula</i>	Smallspotted Catshark	LC
<i>Scyliorhinus stellaris</i>	Nursehound	VU
RAYS		
<i>Aetomylaeus bovinus</i>	Duckbill Eagle Ray	CR
<i>Dasyatis pastinaca</i>	Common Stingray	VU
<i>Myliobatis aquila</i>	Common Eagle Ray	CR
<i>Pteroplatytrygon violacea</i>	Pelagic Stingray	LC
<i>Raja asterias</i>	Starry Skate	NT
<i>Raja brachyura</i>	Blonde Skate	NT
<i>Torpedo marmorata</i>	Marbled Torpedo Ray	VU
<i>Torpedo torpedo</i>	Ocellate Torpedo	VU

*Assessed as CR in a Mediterranean Sea regional assessment but considered NT globally.

IUCN Red List of Threatened Species Categories are available by searching species names at www.iucnredlist.org. Abbreviations refer to: CR, Critically Endangered; EN, Endangered; VU, Vulnerable; NT, Near Threatened; LC, Least Concern; DD, Data Deficient.



SUPPORTING INFORMATION



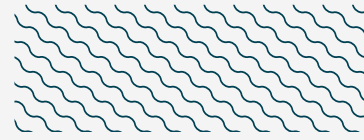
There are additional indications that Strait of Messina is an important feeding area for three shark species.

The area is a narrow swim way with a peculiar hydrodynamic regime characterised by tidal and upwelling currents, which increases the presence of important food resources in the area, including small to large pelagic fish (Malara et al. 2021). This key area, unique in the Mediterranean Sea, constitutes an important area for the feeding of top predators, that benefit from the area to capture their prey (Malara et al. 2021).

Repeated direct observations of White Shark and Shortfin Mako occurrence have been made in the area (Leonetti et al. 2020; Malara et al. 2021; Bargnesi et al. 2022). In several instances, these observations were associated with feeding events (Sperone et al. 2012; Malara et al. 2021). For example, seven cases of shark attacks to harpooned adult swordfish have been directly documented in the area between 2014 and 2020 (Malara et al. 2021) and although the exact species could not be identified on each occasion, adult Shortfin Mako and White Shark were directly observed by harpoon fishers in the area, not more than 3 days before each event (Malara et al. 2021).

Further, a direct observation of an adult Shortfin Mako feeding on a Spinetail Devil Ray has been made by the authors. In addition, White Shark attacks on Common Bottlenose Dolphin and Striped Dolphin have been reported twice in the area (Sperone et al. 2012). This area has also been delineated as a candidate Important Marine Mammal Area (IMMA), the East Sicily and Strait of Messina (<https://www.marinemammalhabitat.org/imma-eatlas/>), due to it for several marine mammal species.





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