Template for Submission of Scientific Information to Describe Areas Meeting Scientific Criteria for Ecologically or Biologically Significant Marine Areas

Title/Name of the area: Sicilian Channel

Presented by
Greenpeace International as a submission to the Mediterranean Regional Workshop to Facilitate the Description of Ecologically or Biologically Significant Marine Areas (EBSAs), 7 to 11 April 2014, Málaga, Spain.
Contact person: Sofia Tsenikli, Senior Political Advisor, Email: sofia.tsenikli@greenpeace.org; tel: +30 6979443306

Information in this submission has been presented at the CBD Expert Workshop on Scientific and Technical Guidance on the use of Biogeographic Classification Systems and Identification of Marine Areas beyond national jurisdiction in need of protection, 29 September - 2 October 2009, in Ottawa, Canada, and is included in the official report of the workshop which can be accessed here.

Abstract

The Sicilian Chanel joins the west and east Mediterranean basins and hosts many species from both areas. It is highly productive and considered a biodiversity hotspot within the Mediterranean. Seamounts and deep-sea corals are found close to Sicily, including mounds of white corals known locally as "cannelleri", which are vulnerable species in their own right and provide valuable habitat for many more. The complex oceanographic conditions in this area lead to high productivity and result in good conditions for fish spawning – the Sicilian Channel is an important spawning ground for a number of commercially important fish species, including Bluefin tuna, swordfish and anchovy, as well as a number of demersal species. This is also thought to be an important nursery area for the endangered white shark. The Sicilian Channel is thought to be the last important habitat for the critically endangered Maltese Skate.

Introduction

In 2006 Greenpeace published a proposal for a regional network of large-scale marine reserves with the aim of protecting the full spectrum of life in the Mediterranean (see **Error! Reference source not found.**) (Greenpeace 2006). The network of candidate sites is made up of 32 different areas stretching from the Alboran Sea in the west to the Phoenician coast in the east. The Sicilian Channel was identified as one of the areas to be protected within the network which was drawn up with the help of experts and used a variety of data sets including distribution of species, areas important for key life stages e.g. spawning grounds, important habitats such as seamounts and sites previously identified as priority sites for protection such as SPAMIs. The key principles of marine reserve networking were applied to the network design, ensuring that it is representative of the full range of habitats found in the Mediterranean Sea, has different habitat types replicated through the network, has sufficient levels of connectivity and is made up of sites that are sufficiently large to be viable. The total coverage of the network amounts to 40% of the Mediterranean.

The Sicilian Channel is the strait of the Sea located between the island of Sicily and Tunisia where Pantelleria (Italy), Pelagie Islands and Lampedusa (Italy), and Malta, Gozo and Comino Islands (Malta) are located. It plays an important role by dividing the Mediterranean Sea into two principal sub-basins, the eastern and the western Mediterranean. The complex topography and circulation scheme makes the Sicilian Channel a highly productive area and a biodiversity hotspot within the Mediterranean. Its location means that it hosts many species from both basins.

The Sicilian Channel has complex bottom morphology comprising two sill systems separated by an internal deep basin (Figure 2). The eastern sill system is divided between the Malta plateau and Medina Bank and it has maximum depth of about 540m and connects the Sicilian Channel with the Ionian Basin. The western sill is divided between the large Adventure Bank and the Nameless Bank (Gasparini et al., 2005). These large sill systems are separated by the narrow shelf in the central part. The shape of slope is extremely irregular, incised by many canyons, trenches and steep slopes (Fiorentino et al., 2006).

According to Civile et al. (2008), neogene rifting caused the development of three major depressions, the Pantelleria (1317-m depth), Linosa (1529-m depth), and Malta (1731-m depth), located in the central basin of the channel. The Pantelleria Trough, southeast of Pantelleria Island, is one of three narrow, steep-walled, elongate NW–SE troughs in the Channel. Pantelleria Trough has almost straight, fault-bounded slopes, over 100 km long and 28 km wide, with depths reaching 1314 m. The western end of Pantelleria Trough is cut by two fault valleys running parallel to the southwest and northeast coasts of Pantelleria Island.

The sea bottoms of the littoral zone of the northern Tunisian coast are mainly rocky, while those of the eastern (Hammamet Gulf) and southern (Gabès Gulf) coasts are sandy to sandy-muddy (Ben Mustapha et al. 2002b). The rocky bottoms of the northern coast offer the best substratum for colonization by very rich coralligenous assemblages (Ben Mustapha et al.2002a), while in "la petite Syrte" i.e the Gulf of Gabès *sensu lato*, and in several parts of the Hammamet Gulf, the Posidonia meadows show their maximum geographical distribution (e.g. Ben Mustapha et al. 1999).

The Sicilian Channel is a high-energy site with a dynamic current system that exchanges the waters between western and eastern basins (Figure 3). Dynamically, the circulation in the Sicilian channel can be described as a two-layer exchange, the upper layer (about 200m thick) of Atlantic Water (AW) which flows eastward and the deep layer of Eastern Mediterranean Outflow Water (EOW) mainly composed of Levantine Intermediate Water (LIW hereafter) that flows in the opposite direction The AW splits into two branches at the entrance to the Sicilian Channel, one flowing to the Tyrrhenian Sea, the other into the Sicilian Channel. The second branch is composed by two streams, the Atlantic Ionian Stream (AIS) and the Atlantic Tunisian Current (ATC). In winter, the ATC is more pronounced. In summer, the AIS is associated with a number of well-known semi-permanent features including the intermittent northward extension of the AIS (NAIS) at the Ionian shelf break, which seems to be driven by the surface density contrast between waters of the Sicilian and the Ionian basins. (Beranger et al.,2004).

In the subsurface layers the topography plays an important role. The LIW has a higher velocity due to the Bernoulli effect: LIW has a narrow area in which to flow in comparison with the wide area available to AW. As consequence, it enables the upper layer of the Eastern Mediterranean Deep Water (EMDW) in the Ionian sea to reach the western basin (Gasparini et al.,2005).

Upwelling along the eastern and southern costs of Sicily is a permanent feature. As explained by Beranger et al., (2004), upwelling is governed by the south-eastward winds and by the inertia of the isopycnal domes of the AIS meanders and cyclonic vortices that can extend its influence far offshore due to the configuration of the circulation.

Many eddies of variable strength, shape and size (cyclonic and anticyclonic) are noticed in the Tunisian–Sicily region. According to Savini et al (2009) between Adventure Bank and the Malta plateau, LIW forms a pair of subsurface eddies (one cyclonic, one anticyclonic) along the western flank of the Malta plateau and AIS forms a cyclonic vortex off Cape Passero.

Seamounts are considered as highly productive and biodiversity hotspots, since they produce retention areas for phytoplankton and create the conditions that support a diversity of important habitat types. In the extension of the Sicilian continental shelf toward the Pantelleria Rift (Adventure Bank and Graham Bank plateaus), five volcanic seamounts have been recognized (Tetide, Anfitrite, Galatea, Cimotoe and Graham), three of which have been sampled. Two other much larger seamounts, Bannock and Nameless Bank (Banco Senza Nome), are located between the Malta and Pantelleria basins and close to the eastern border of the Nameless Bank respectively (Calanchi et al.,1989).

Past volcanic activity in the Sicilian Channel has formed the islands of Pantelleria and Linosa. There is also volcanic activity underwater in the Graham Bank in the northwestern part of the channel. In the recent past, an eruption created the ephemeral Ferdinandea Island, with a diameter of about 600 m, constituted by a scoria cone that was rapidly eroded away. However, the underwater volcano, now known as a Graham Seamount or Empedocles Seamount is in fact part of a 3-km-long and 2-km-wide submerged edifice that rises from the sea-floor for about 180 m. Accordingly with Civile et al.(2008), at the base of the western slope, a 3-km-large and 1-km-long lava flow are recognizable and several fumaroles have been observed along the north eastern flank at depths ranging from −160 m to −50 m, following a roughly N–S direction. They are characterized by huge emissions that form well defined columns of bubble eruptions that can also be seen at the sea surface.

In research reported by Savini et al. (2009) detailed acoustic mapping discovered more than 100 small-scale domes and peculiar ridges were a few miles offshore between 140 and 170 m water depth. Data collected suggest that both the domes and ridges are influenced by active slow-flux seeps. Mapped domes were found from 50 to

200 m wide and no more than 5 m high occurring on the seafloor, isolated or arranged in clusters. Ridges consisted of large tabular sub-elongated structures, elevated from 5 to 10 m from the surrounding seafloor, and had flat tops on which numerous close-set, small cones occurred, appearing in video observation as carbonate structures heavily colonized by gorgonians. There is evidence of past mud extrusion at the domes that is no longer evident and at the present time active degassing is the main process that controls the morphological and sedimentological expression of both the domes and ridges.

Sea floor pockmarks are formed by gas discharge. They are features biologically relevant due the possible existence of unique chemosynthesis-based communities in the cold seep that are frequently found on them. According to Minisini et al.,(2007) structures that are interpreted as pockmarks have been found in the Sicilian Channel, at the West of the Gela Basin (the basin between Adventure Bank and the Malta Plateau).

The Sicilian Channel has been the subject of systematic research over a period of decades at both a national and international level. ICRAM (Central Institute for Technical and Scientific Marine Research) is the main Italian research body. Several Conservation Action Plans are being implemented involving National and Regional government as well as local, regional and national organizations. At the international level, CISEM (the Mediterranean Science Commission) is a relevant research body with more than 2000 marine scientists from 23 countries participating. In addition, both areas have been subject of research under various EU and Global Programmes.

Location

The location of the area described in this paper is shown in Figure 1.

Feature description of the proposed area

1. Habitats

a) Deep coral communities

In the Sicilian Channel, there is a substantive variety of deep coral communities. The sessile benthos in the Sicilian Channel is dominated by the octocorals *Isidella elongata* and tall sea pen (*Funiculina quadrangularis*) as well as red coral (*Corallium rubrum*) (Freiwald et al., 2009).

Areas that are difficult or impossible for sample trawling have been studied by Ragonese et al.(2003). According to this research, those hard bottoms are characterized by huge white coral assemblages produced by madrepores (*Madrepora oculata*, *Lophelia prolifera*) and barnacles (Balanus sp.). Another yellow coral, *Dendrophyllia cornigera* lives at higher depths (i.e. >500m), colonizing rocky substrates exposed to hydrodynamism.

Records of living colonies of white coral assemblage dominated by colonies of the scleractinian *Lophelia pertusa*, *Madrepora oculata* and *Dendrophyllia cornigera* were recently identified in the Linosa trough and in the nameless bank using ROV techniques as part of the recent research conducted under the HERMES project (Freiwald et al., in press). The most intense growth of *C. rubrum* was documented in the Linosa sample site, among the white coral habitats surveyed in the Sicilian Channel.

Ninety-six different species, including fours species of black corals (*Antipathes dicotoma, Antipathes subpinnata, Parantipathes larix, Leiopathes glaberrima*) were recorded during a research expedition conducted by Greenpeace Italy in collaboration with Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA) in the Sicilian Channel in 2012 (Greenpeace Italy, 2012).

b) Cold seep communities

Cold seep communities are the home of unique chemosynthesis-based communities (not relying on photosynthetic production) dominated by bacterial mats and particular species of bivalves and tubeworms, that are associated with endosymbiotic (chemo-autotrophic) bacteria. The existence of pockmarks in the area points to the existence of these cold-seep type communities (Cartes et al., 2004). The recent discovery of pockmarks (Minisini et al.,2007) might point to the existence of these cold-seep type communities in the area. However, they have not been discovered yet and further research should be carried out to confirm the existence of these unique environments in this part of the Mediterranean deep sea.

c) Pelagic

Patti et Al (2004) show how the surface circulation of the two-way exchange flow through the Sicilian Channel and its complex topography makes the Sicilian Channel a high productivity and retention area. AIS enters the channel by its west side to describe a large cyclonic meander, which embraces the Adventure Bank and then approaches the shore by the middle of the southern coast of Sicily and separates again when it encounters the shelf of Malta and then encircles a second cyclonic vortex, off Cape Passero. This circulation favours the existence of "permanent" upwelling to the left of the Stream. Coastal upwelling is believed to be the main source of nutrient pumping in the area (characterized by very low levels of river discharge).

This favours spawning activity and recruitment success processes, turning this area in a recognized spawning and nursery area for species of high commercial relevance such as bluefin tuna, swordfish, hake and greater fork beard. (e.g. Garcia Lafuente et al.,2002, Garofalo et al.,2004). The area also includes spawning grounds of red mullet (*Mullus barbatus*) (Garofalo et al., 2004) and a relatively high abundance of rays, different from the remaining region (Garofalo et al.,2003). According to Fiorentino et al.,2003 the existence of a frontal zone precisely in the middle of the area, in fact, may offer an ideal situation for small predatory organisms such as squid paralarvae, due to the richness of food particles concentrating at the convergence front.

Levi et al. (2003) investigated the stock-recruitment relationship for red mullet in the Sicilian Channel, including environmental information in terms of sea surface temperature (SST) anomaly as a proxy for oceanographic processes affecting recruitment. Results showed that, for a given level of spawning stock, higher levels of recruitment corresponded to SST, being warmer than average during the early life stages.

2. Species

a) Endemic species

The Maltese skate (*Leucoraja melitensis*) is a Mediterranean endemic species. Its main range now appears to be restricted to the Sicilian Channel, where it is found at depthssubject to heavy trawling activity (Cavanagh and Gibson, 2006). It is extremely rare - in broadscale surveys of the north Mediterranean coastline from 1995–1999, it was recorded in only 20 out of 6,336 hauls. It is also now rare off Malta and rare or absent off Tunisia, where it was previously considered moderately common. Although population data is lacking, given the small range of the remaining population the potential detrimental impact of trawl fisheries is likely to be significant. Further research is also needed on the exploitation, distribution, biology and ecology of this species, as well as trends in abundance.

The Mediterranean endemic scleractinian coral *Cladopsammia rolandi* is also present in the Sicilian Channel (Zibrowius 1980).

b) Bluefin tuna

The Sicilian waters are one of the most important spawning sites for threatened Bluefin tuna in the Mediterranean, as confirmed by Piccinetti et al., (1996a, b) which showed that BFT larvae are mainly concentrated all around Sicily (the Sicilian Channel, southern Tyrrhenian and northern Ionian Seas). It is important to notice that the Sicilian Channel, similar to the Balearics, is the site of formation of important frontal systems, which may favour the feeding requirements of larval tuna.

Oray et al.,(2005) showed the results of a 2003 and 2004 fish egg and larval survey which encompasses the BFT spawning grounds off the southern Sicilian coasts. They reported high larvae catches in 2003 and relatively low catch in 2004. The area's importance as a spawning ground is also confirmed by previous research reported by the same author has shown the area can be considered a rather important spawning ground for the species from the tuna fishery. However, recent larval surveys carried out off the Tunisian part of the Sicilian Channel within the TUNIS II project reported no BFT larvae catches. As for the Balearics, data showing the position of vessels targeting bluefin tuna in the Mediterranean made available by the ICCAT Scientific Committee supports the importance of this area as a spawning ground for the species (ICCAT Secretariat Report on Statistics and Coordination of Research, 2011).

c) Swordfish spawning and nursery ground

Swordfish (*Xiphias gladius*) is the second most important large pelagic species in the Mediterranean Sea. The ICCAT considers the existence of a single Mediterranean Stock. The Sicilian Channel seems to be one of the most important spawning grounds for the species along with others sites including the Balearic Isles & central Mediterranean (Di Natale, 2006).

The spawning activity of the Mediterranean swordfish appears more strictly related to climate and oceanographic features than for other pelagic species. Observations at sea confirm that a surface layer at a temperature of about 22°C or more is sometimes enough to induce spawning even for a short period and the hypothesis that swordfish spawn on multiple occasions during a single season is to be seriously taken into account (Di Natale 2006).

Although juvenile individuals are reported everywhere in the surface longline fishery, (Di Natale 2006), the major concentrations are linked to the availability of a plentiful supply of food either close to the coast or off-shore, and can change their geographical distribution substantially from one year to the other, according to oceanographic features. Juvenile swordfish are usually present along the entire Sicilian coast including small isles, the area around Malta as well as the Balearic Isles among others.

d) Anchovy (Engraulis encrasicolus)

Anchovy is a short-lived pelagic species, distributed all over the Mediterranean and one of the most important resources in this region. It ranks second in abundance to the sardine (*Sardina pilchardus*), but first in terms of economic importance. However, its distribution is not regular or wide-spread and rather comprises a set of independent populations. Such could be the case of the Sicilian Channel anchovy.

The dynamics of the biomass of the anchovy population in the Sicilian Channel were addressed by two European projects (Med 96-052 and Med 98-070). Results indicated that the NW region of the southern Sicilian coast (i.e. the area off Sciacca, on the Adventure Bank) gathers the most favourable conditions for the anchovy spawning grounds (Cuttita et al.,2003). According to García Lafuente et al., (2002), distribution of anchovy early stages is highly dependent on surface water dynamics. Such study shows that the highest larval concentration is located off Cape Passero, (200 km downstream of the main spawning ground). The estimated averaged age of this population, based on the length of the larvae, is 8 to 10 days, which matches the time it takes larvae that has hatched from an egg spawned off Sciacca to get Cape Passero. The cyclonic circulation of water masses provides enrichment mechanisms for larvae growth and feeding, acting as main nursery ground.

e) Demersal species

Recently the diversity of demersal fish communities (Osteichthyes and Chondrichthyes) has been studied using trawl surveys under the international MEDITS program. The greatest diversity within these communities was found at the offshore bank on the western part of the south Sicilian shelf (Adventure Bank) with a high biomass of commercially important species such as hake and red mullet present. Detailed analysis of the catches from this area shows that 58 different fish species were present i.e. about 34% of the total number of fish species collected over the entire study area. The entire area delineated was inside the 100m isobath (Garofalo et al., 2007). The eastern sector of the Adventure Bank was found to be far less diverse as was the central sector of the Sicilian Channel. However these areas also showed high variability.

Interestingly, the areas showing the greatest inter-annual variability of diversity are located mainly along the shelf edge, where topographically induced upwelling may occur (Lermusiaux and Robinson, 2001), and particularly along the average trajectory of the AIS (Robinson et al.,1991). The area where the AIS approaches the Sicilian coast is known to be a permanent upwelling area (Lermusiaux and Robinson, 2001) and was identified in the MEDITS study as an area persistently characterized by low diversity values (Garofalo et al.,2007).

Hake (*Merluccius merluccius*) is one of the most studied demersal species because of its great importance in Mediterranean fisheries although many aspects related to the spatial scale of its biology remain little known. Fiorentino and colleagues (2006) recently found that hake occurs at all life stages in two distinct geographic areas, the Adventure and Malta Banks, well separated by a wide area where hake abundance is very scarce. The two nursery areas were identified at the eastern side of the Adventure Bank and Malta Bank, and in both nurseries grounds extended from about 100 m to the upper slope (approx. 200m). Moreover, juveniles inhabit preferentially the eastern side of the Banks and show seasonal differences with the highest concentration of juveniles located along the eastern boundary of Malta Bank in autumn, and in Adventure Bank during spring. Spawning aggregations were also found in the south-western break of both Adventure Bank and Malta Bank in autumn.

Red mullet (*Mullus barbatus*) is another of the most important Mediterranean demersal species, mainly caught by bottom trawling on continental shelves. On the Italian side of the Sicilian Channel, this species is mainly found at depth less than 200 m and spawns in spring, and the 0-group recruits in late summer (Levi et al., 2003). A space-time analysis performed by Garofalo and colleagues (2004), indicated two clearly separate spawning grounds in the area, over two banks off the Adventure Bank and the Malta both at around 100 m depth. On the Adventure Bank the distribution is characterized by several patches, some of them being in coastal waters. In

contrast, a large spawning area was identified close to the Maltese territorial waters. Although the recruits were rather widely distributed throughout Sicilian coastal waters, four areas of high concentrations were identified, between 20 m and 50 m depth, which were quite stable in location.

The greater fork beard (*Phycis blennoides*) is one of the most commercially important gadoids in the Mediterranean. Little is known of the spawning period. Reproduction occurs from late summer to early winter (Massutí et al.,1996; Belcari and Biagi, 1999). Two extended areas of recruit concentration (i.e. stable nursery areas)were identified on the western and eastern side of the Adventure Bank, located between 200 and 400m deeper; other nurseries were found in the easternmost part of the Sicilian Channel. Different from hake, there is large interannual variability as to the nursery areas (Fiorentino et al., 2003). Hydrology does not appear to play a role in explaining the position of the spawning fish and juveniles.

f) Cetaceans

Fin whales are known to congregate in late February and early March in the coastal waters of the island of Lampedusa (Italy), Sicilian Channel, to feed on the euphausiid *Nyctiphanes couchii*. Nevertheless, there is limited information on the presence and habitat use for this species They favour upwelling and frontal zones with high zooplankton concentrations (Canese et al, 2006; Hoyt, 2005).

Bottlenose dolphins have been recorded in waters around the Pelagie Islands. Local subpopulations appear to be habitat dependent, as biogeographic and hydrographic features influence their distribution and movement pattern Four possible ecological boundaries have been proposed for the species as follows: the Gibraltar strait, the Almerìa-Oran front, the Sicilian Channel and the Turkish Straits system. Nevertheless, information on the presence and habitat use for this species in the area is limited (Reeves and Notarbartolo di Sciara, 2006; Natoli et al, 2005; Hoyt, 2005).

g) White shark

The fact that the white shark reproduces in the central Mediterranean seems to be widely accepted. The Sicilian Channel apparently represents a nursery ground for this species. There is evidence of declines and likely fishery pressures placed upon the apparent reproductive and nursery grounds in the Sicilian Channel. Very little is known about seasonal movements or key elements of this species' population biology. Fergusson suggests that efforts should focus upon the Sicilian Channel and its environment in order to implement a scheme of protective management in 'critical habitats', selected by interpreting biogeographical data (Fergusson et al, In prep; Morey et al, 2003; Soldo and Ducic, 2005; Fergusson, 2005).

h) Loggerhead turtle

Lampedusa and Linosa (two Natura 2000 sites) are among the last known nesting sites of Loggerhead turtle (*Caretta caretta*) in this part of the Mediterranean (IUCN, 2013). In the last four years, a total of 11 nests have been found on the island of Linosa and between one and five nests on the island of Lampedusa.

From 1995, Rescue Centre activity has tagged and released more than 600 sea turtles. During this period, it has been observed that one female turtle which was captured and marked in 1996 was observed nesting again in Linosa eight years later (EC, 2000).

Management activity in the Pelagie Islands is focused on loggerhead conservation but also includes observations to evaluate the impact of fisheries, in particular longline fishing, on loggerhead populations in the area. In this respect, an enduring collaboration was set with a number of fishermen that come from Sicily to the Pelagie Islands during the summer season for longline fishing (targeting swordfish).

Feature condition and future outlook of the proposed area

1. Overfishing and impact of fishing activities

a) Fishing activity

The Sicilian Channel is one of the most important fishing areas of the Mediterranean Sea, where significant fleets operate with high fish production. In the Pelagie Islands alone the local fishery fleets consists of 164 fishing licenses (95 lines, 30 gillnets, 29 trawl net and 10 fish trap), In addition, the boats from the Sicilian and North African fleet are usually fishing in the Archipelago using trawl nets or purse seiners (Celoni et al., 2006). Both pelagic and demersal species are targeted.

b) Use of destructive fishing techniques – bottom trawling

The Sicilian Channel is one of the most important demersal fishing grounds in the Mediterranean Sea and is commonly exploited by trawlers. In particular, the Mazara del Vallo trawl fishery (south-western Sicilian coast), is one of the most important in the Mediterranean Sea (about 180 trawl vessels). 21% of the trawl fleet operates in the Sicilian coastal waters with short fishing trips (1–2 days); the remaining 79% of the trawl fleet is characterised by boats that carry out deep-sea fishing and go out for long trips (21–25 days) in the Sicilian Channel (Gristina et al.,2006). Some of main target species include hake (*Merluccius merluccius*), greater fork beard (*Phycis blennoides*), red mullet (*Mullus barbatus*) and anchovy (*Engraulis encrasicolus*) which have been heavily exploited inthis area, causing their slow decline (Levi et al.,1998, Garcia Lafuente et al.,2002, Fiorentino et al., 2003).

Trawling is known to have extremely marked direct impacts on the sea-bottom (Tudela 2004). Among the effects of intensive bottom-trawling is the reduction of the complexity of benthic habitats, affecting the epiflora and epifauna and reducing the availability of suitable habitats for predators and prey.

Ragonese et al., (2007) presented for the first time a map of the untrawlable bottoms, drawn on the basis of the not-valid hauls recorded over almost 20 years of scientific trawl surveying in the Sicilian Channel. Results showed that grasping events are concentrated in shallower areas, i.e. on the western banks, on the eastern platform and near the coast; on the contrary, net tearing and gear damages often occurred in deeper grounds, where the "white coral assemblages" are present.

c) Use of destructive fishing techniques – illegal drift-netting

In the past, Italy had the largest driftnet fleet (in excess of 700 vessels during the 1990s) operating throughout a significant portion of the central Mediterranean (Scovazzi 1998).Despite the fact that drift-netting is now prohibited, illegal drift-netting still occurs (Greenpeace 2008; WWF 2005).

Chondrichthyans most vulnerable and frequently caught with driftnets include blue shark *Prionace glauca*, common thresher *Alopias vulpinus*, shortfin mako *Isurus oxyrinchus*, porbeagle *Lamna nasus*, basking shark *Cetorhinus maximus*, giant devil ray *Mobula mobular*, pelagic stingray *Pteroplatytrygon violacea*, requiem sharks Carcharhinus spp. and hammerheads Sphyrna spp. (Tudela 2004; Walker et al. 2005).

Moreover, the entanglement in high seas swordfish driftnets has caused considerable mortality of the Mediterranean sperm whale subpopulation since the mid-1980s (Notarbartolo di Sciara 1990; International Whaling Commission 1994). It is worth noting that during the 1990s Italy had the largest driftnet fleet (in excess of 700 vessels) operating throughout a significant portion of the central Mediterranean (Scovazzi 1998).

The large majority of the strandings in Italy and Mediterranean Spain were caused by entanglement in driftnets, as evident from the reported presence of net fragments or characteristic marks on the whales' bodies(see Reeves and Notarbartolo, 2006 and references herein). Cagnolaro & Notarbartolo diSciara (1992) reported that for 83% of 347 cetaceans stranded in Italy from 1986 to 1990 (inclusive), which included 56 sperm whales, the likely cause of death was related to entanglement. Despite international and national regulations banning driftnets from the Mediterranean, illegal or quasi-legal drift-netting continues in sperm whale habitat, in (e.g., in France, Italy, and Morocco).

d) Stocks in decline

There is evidence of overexplotation of single target stocks (Levi et al., 1998), but the impact of fishing on demersal fish communities in this area has hardly been investigated.

In the Sicilian Channel, demersal fishing ground overlaps with important spawning and nursery grounds and areas occupied by larvae and juveniles of some of the most commercial fish species (e.g. hake, red mullet, anchovy and great fork beard) (Fiorentino et al.,2003, Garofalo et al.,2004). For example, nursery areas are situated mainly between depths of 100 and 200 m for the hake and those for the greater fork beard were found at depths greater than 200 m (Fiorentino et al.,2003).

e) Bluefin tuna and swordfish under threat

An important fishery in the area is the longline fishery targeting swordfish and tuna species and which has increased in effort over the past three decades (Di Natale, 2006; SCRS 2008).

f) Bycatch

Longline fisheries in the area pose a great threat to many species including large turtles (e.g. loggerhead (*Caretta caretta*) (Baez et al. 2007). Data of fishing interaction between marine turtles and fishing activities were recorded during 12 years of activity (1994 to 2005) and results showed drifting longline as the fishing gear with the highest local impact on sea turtles (95.7%). Its peak activity is in summer period, when fishers mostly work with drifting longlines targeting swordfish and loggerhead adult females come to the pocket beach "Pozzolana di Ponente" to lay their eggs. The artisanal fleet operating in the area is mainly composed of vessels employing drifting longlines. This kind of gear results in a high number of interactions, with a mean of 40 loggerheads being hooked per year and a total of 336 specimens found with one or more hooks embedded in their flesh (see Giacoma and Solinas, 2001, Piovano et al.,2001, Nannarelli et al.,2007). In addition, chondrichthyans are also being taken as bycatch in the longline fishery (Cavanagh and Gibson 2007).

Within the framework Life project DelTa (NAT/IT/000163) a dolphin-fishery interaction study was conducted in the Archipelago of Pelagie Islands (south Sicily). Gillnets were identified as the gear for which fishermen complained most frequently of negative dolphins interaction - in 83% of the cases recorded. Results showed frequent interaction was complained of by 72% of long liners and 100% of trawlers (Celoni et al., 2006). Moreover, the study highlights the existence of what was called "operational competitive interaction" (Bearzi 2002) between bottlenose dolphin and fishermen. In fact, results showed a significant reduction of fishing catches for *Mullus surmuletus* when dolphins were present (Celoni et al.,2006).

2. Pollution

a) Oil spills

There is evidence that the area between Sicily and Malta is a pollution hotspot regarding oil spills in the Mediterranean Sea (UNEP/EEA 1999, EC Joint Research Centre/IPSC 2006).

b) Heavy metals and persistent organic pollutants

Pollution by persistent organic pollutants (POPs e.g. PCBs and DDTs) and heavy metals has spread all over the world as evidenced by their detection both in humans and wildlife although their impact on offshore ecosystems has been poorly investigated. Large fish such sharks, tuna and swordfish as well as marine mammals, sea turtles and seabirds, as species occupying the higher trophic levels in the pelagic food chain, may exhibit a high potential for the accumulation of pollutants (e.g. Stefanelli et al.,2002,2004; Storelli et al., 2003; Storelli and Marcotrigiano, 2006)

3. Alien species

Non-native species invasions are currently of major global concern, they are considered to be the second largest threat to biodiversity, after habitat destruction. The invasion and survival of alien species in the Mediterranean is correlated with the general sea surface temperature increase, resulting in the replacement of local fauna with new species. Such changes affect not only local ecosystems, but also the activities of the international fishing fleet when commercial species are affected (European Science Foundation/Marine Board, 2007). Accidentally introduced into the Mediterranean Sea in 1984, the tropical alga *Caulerpa taxifolia* has spread since then, reaching the Tunisian coast. Another variety of *Caulerpa racemosa* (*Caulerpa racemosa var occidentalis*) was discovered in Tunisia and qualified as invasive (Langar et al., 2003).

4. Tourism

The growing number of tourists presents a significant threat to many coastal habitats. In fact one of the main threats to the Pelagian Island turtle population is tourist activities in the nesting sites (Giacoma and Solinas, 2001).

5. Marine traffic

Collisions of marine turtles with boats crossing the waters of the Sicilian Channel (between Sicily mainland and Pelagie Islands) have been recorded (Life NAT/IT/000163). In addition, the Mediterranean sperm whale subpopulation may be affected by disturbance from intense maritime traffic (development of 'highways of the sea') and collisions with vessels, including high-speed ferries. More than 6% (7) of 111 sperm whales stranded in Italy (1986-1999) had died after being struck by a vessel, and 6% of 51 photo-identified individuals (22 in Italy) bore wounds or scars that were clearly caused by a collision (Pesante et al. 2002).

Assessment of the area against CBD EBSA Criteria

CBD EBSA Criteria (Annex I to decision IX/20)	**Description** (Annex I to decision IX/20)	**Ranking of criterion relevance** (please mark one column with an X)			
		No information	**Low**	**Medium**	**High**
Uniqueness or rarity	Habitats/species/geomorphological features present that could be considered rare, dependent on the scale of observations, include: areas of submarine volcanic activity (Civile et al, 2008); mud volcanoes (Holland et al, 2003); the scleractinian coal *Cladopsammia rolandi*, which is endemic to the Mediterranean (Zibrowius, 1980); white coral mounds (known locally as 'canelleri'), composed of *Lophelia pertusa*, *Madrepora oculata* and Balanus spp. barnacles, which occur at 250 – 500m depth (Ragonese et al, 2007); other habitat-building species, recorded in the Sicilian Channel by ROV survey, include the yellow tree coral *Dendrophyllia cornigera*, the octocoral *Isidella elongata*, red coral *Corallium rubrum* and *Funiculina quadrangularis* (cnidarian) communities(Freiwald et al, 2009). Four species of black corals (*Antipathes dicotoma, Antipathes subpinnata, Parantipathes larix, Leiopathes glaberrima*) where observed in the Sicilian Channel during an expedition of Greenpeace Italy and ISPRA (Greenpeace Italy (2012). The potential presence of cold seep communities is indicated by pockmarks (Minisini et al, 2007). Maltese skate *Leucoraja melitensis* is now confined largely to the Sicilian Channel. The species was previously common throughout ¼ of the Mediterranean (Cavanagh and Gibson, 2007). A colony of an undescribed species of large (>20cm), deepwater oyster (Neopycnodonte sp.) has been recorded living on fossilised coral mounds in the Linosa Trough (Wisshak et al, 2009).			X	
Explanation for ranking The Sicilian Channel hosts rare habitats, species and geomorphological features, including mud volcanoes, rare and endangered corals mounds, including of endemic coral species. The Sicilian Channel is considered to be the last important habitat for the critically endangered Maltese Skate. Finally, the existence of pockmarks points to the existence of these cold-seep type communities in the area.					
Special importance for life-history stages of species	Reproductive and nursery grounds of the great white shark *Carcharadon carcharias*(Cavanagh and Gibson, 2007). Spawning aggregations and nursery grounds of hake *Merluccius merluccius* at 100 – 200m on the Adventure and Malta Banks (Fiorentino et al, 2006). Nursery grounds of the greater fork beard *Phycis blennoides* at 200 – 400m on Adventure Bank and in the eastern Strait (Fiorentino et al, 2003). Spawning and nursery grounds of the red mullet *Mullus barbatus* to 100m on Adventure and Malta Banks (Garofalo et al, 2004). Interactions of strong currents with island topography create suitable spawning conditions for a number of pelagic fish species, including: anchovy *Engraulis encrasicolus* (possible Sicilian Channel subpopulation) (García la Fuente et al, 2002); bluefin tuna *Thunnus thynnus* (Piccinetti et al, 1996a/b)*;* small tuna species, including Atlantic bonito *Sarda sarda*, Auxis spp. and				X

	little tunny *Euthynnus alletteratus* (Alemany, pers. comm.); and swordfish *Xiphias gladius* (Di Natale, 2006). Nesting colonies of loggerhead turtle *Caretta caretta* on the islands of Lampedusa and Linosa in the Pelagie Archipelago – these are amongst the few remaining nesting sites for this species in this part of the Mediterranean (EC, 2000). Fin whale *Balaenoptera physalus* feeding area – fin whales congregate off the coastline of Lampedusa during February and early March to feed on *Nyctiphanes couchii* euphausids (Canese et al, 2006). Breeding colonies of Cory's shearwater *Calonectris diomedea* on islands and rocky coastline of the Sicilian Channel (Randi et al, 1989).				
Explanation for ranking Interactions of strong currents with island topography create suitable spawning conditions for a number of pelagic fish species, including anchovy, bluefin tuna and other tuna species and sharks. Nesting sites for loggerhead turtles on the islands in the area are among the few remaining ones in the Mediterranean. The area is also a feeding ground for Fin whales and breeding grounds for Cory's shearwater.					
Importance for threatened, endangered or declining species and/or habitats	Bottlenose dolphins *Tursiops truncatus* (VU) inhabit inshore waters around the Pelagie Archipelago (Pulcini et al, 2004); striped dolphin *Stenella coeruleoalba* (VU)*;* fin whales (VU) (Reeves and Notarbartolo di Sciara, 2006). Loggerhead turtles (EN); leatherback *Dermochelys coriacea* (VU) and green turtles *Chelonia mydas* (EN – was listed as CR in the Mediterranean but has been delisted as Mediterranean is no longer considered to contain a distinct subpopulation (Mrosovsky, 2006)) are observed occasionally (Russo et al, 2003). Maltese skate (CR); great white shark (VU but study found status is EN in the Mediterranean); porbeagle *Lamna nasus* (CR); shortfin mako *Isurus oxyrinchus* (VU but study found status is CR in the Mediterranean); sandbar shark *Carcharhinus plumbeus* (VU but study found status is EN in the Mediterranean); giant devil ray *Mobula mobular* (EN); and blue shark *Prionace glauca* (NT but study found status is VU in the Mediterranean) (Cavanagh and Gibson, 2007). Atlantic Bluefin tuna (EN).				X
Explanation for ranking A number of threatened and endangered species are found in the Sicilian Channel, including dolphins and whales, skates and rays. The importance of the area as spawning and feeding ground for threatened and endangered species such as bluefin tuna and fin whales, as well as nesting grounds for loggerhead turtles are discussed under the "Importance for threatened, endangered or declining species and/or habitats" criterion. The importance of the Sicilian Channel to threatened species of corals and the life circle of critically endangered Maltese skate is discussed under "Uniqueness or rarity" criterion.					
Vulnerability, fragility, sensitivity, or slow recovery	Vulnerable and fragile benthic habitats and species include: white coral mounds composed of *Lophelia pertusa*, *Madrepora oculata* and Balanus spp. Barnacles (Ragonese et al, 2007); the scleractinian coral *Cladopsammia rolandi* (Zibrowius, 1980); the yellow tree coral; the octocoral *Isidella elongata*; red coral; and *Funiculina quadrangularis* (cnidarian)				X

	communities (Freiwald et al, 2009). Species with vulnerable life histories include: fin whales; numerous species of elasmobranchs; loggerhead turtles; and the occasional presence of leatherback and green turtles.				
Explanation for ranking There are vulnerable and fragile benthic habitats and species found in the Sicilian channel. All of these habitats and species are characterized by slow recovery.					
Biological productivity	Areas of high primary productivity and zooplankton concentration are created by oceanographic features that result from the interaction of strong currents and complex topography. Current patterns are likely to retain productivity and fish larvae in the Sicilian Channel (Bakun, 2006). Upwelling is driven by wind and the meandering of the Atlantic-Ionian Stream (Robinson et al, 1991). Total biomass of demersal fish species is particularly high on the Adventure Bank, to depths of 100m. This includes commercially important species, such as hake and red mullet (Garofalo et al, 2007). Productive benthic habitats include: white coral mounds composed of *Lophelia pertusa*, *Madrepora oculata* and Balanus spp. Barnacles (Ragonese et al, 2007); deepwater coral and octocoral assemblages; cold seeps (Minisini et al, 2007); *Funiculina quadrangularis* (cnidarian) communities (Freiwald et al, 2009).				X
Explanation for ranking The area is of high primary productivity and zooplankton concentration due to special oceanographic features.					
Biological diversity	Persistent area of high demersal fish species diversity (58 species recorded) on the Adventure Bank, to depths of 100m (Garofalo et al, 2007). High demersal fish species diversity also recorded at 400 – 600m in the northwest of the Sicilian Channel and on the eastern edge of the Maltese Exclusive Fishing Zone (Garofalo et al, 2007). Potential presence of shallow-water species on the summit of the submerged volcanic island of Ferdinandea. Benthic habitats with high associated levels of species diversity include: white coral mounds composed of *Lophelia pertusa*, *Madrepora oculata* and Balanus spp. Barnacles (Ragonese et al, 2007); deepwater coral and octocoral assemblages; *Funiculina quadrangularis* (cnidarian) communities (Freiwald et al, 2009). "Ninety-six different species were recorded in the Sicilian Channel during a research expedition conducted by Greenpeace Italy in collaboration with Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA) in 2012 (Greenpeace Italy, 2012)."			X	
Explanation for ranking The area is characterized by high biological diversity of demersal fish species as well benthic habitats with high species diversity such as white coral mounds, deepwater corals and octocoral assemblages.					
Naturalness	Shipwrecks create artificial refuges from trawling		X		

	pressure on parts of the Adventure Bank (Ragonese et al, 2007).				
Explanation for ranking The Sicilian channel is an area characterized of high levels of human exploitation.					

References

Báez, J.C., Real, R.and Camiñas, J.A. (2007). Differential distribution within longline transects of loggerhead turtles and swordfish captured by the Spanish Mediterranean surface longline fishery. Journal of the Marine Biological Association of the United Kingdom(2007), 87:3:801-803

Bakun, A. (2006) Fronts and eddies as key structures in the habitat of marine fish larvae: opportunity, adaptive response and competitive advantage. Scientia Marina, 70(suppl. 2), 105-122.
Bearzi G. (2002). Interactions between cetacean and fisheries in the Mediterranean sea. In: G. Notarbartolo di Sciara (Eds.), Cetaceans of the Mediterranean and Black Seas: state of knowledge and conservation strategies.A report to the CCOBAMS Secretariat, Monaco, February 2002. Section9: 20 pp.

Bearzi, G. et al, 2003. Ecology, status and conservation of short-beaked common dolphins (*Delphinus delphis*) in the Mediterranean Sea. *Mammal Review*, 33, pp.225-253.

Belcari, P. and Biagi, F. (1999). Phycis blennoides. In Relini G., J. A. Bertrand & A. Zamboni (eds), Synthesis of Knowledge on Bottom Fishery Resources in Central Mediterranean (Italy and Corsica). Biol. Mar. Medit. 6: 189–196.

Ben Mustapha, K., Hattour, A., Mhetli, M., El Abed,A. & Tritar. B. (1999). Bionomie des étages infra et circalittoral du golfe de Gabès. Bull. Inst. Natl. Sci. Tech. Mer (Tunisie), 26: 5-48.

Béranger, K., Mortier,L., Gasparini, G.P., Gervasio, L., Astraldi, M., & Crépon, M. 2004. The dynamics of the Sicily Strait: a comprehensive study from observations and models. DeepSea Research II 51: 411–440.

Cagnolaro L., & Notarbartolo di Sciara G. (1992).Research activities and conservation status of cetaceans in Italy. Boll. Mus. Ist. Biol. Genova, 56-57:53-85.

Calanchi, N., Colantoni, P., Rossi, P.L., Saitta, M., Serri, G., (1989). The Strait of Sicily continental rift system: physiography and petrochemistry of the submarine volcanic centers. Mar. Geol. 87, 55–83.

Canese, S., Cardinali, A., Fortuna, C.M, Giusti, M., Lauriano, G., Salvati, E. & Greco, S. (2006). The first known winter feeding ground of fin whales (Balaenoptera physalus) in the Mediterranean Sea. Journal of the Marine Biological Association of the United Kingdom, 86/4, pp. 903 – 907.

Cartes, J., Maynou, F., Moranta, J., Massutí, M., Lloris, D., and B. Morales-Nin. (2004). Patterns of bathymetric distribution among deep-sea fauna at local spatial scale: comparison of mainland vs.insular areas. Progress in Oceanography, 60, pp. 29-45.

Cavanagh, R. D., and C. Gibson. (2007). Overview of the Conservation Status of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea. IUCN, Gland, Switzerland and Malaga, Spain.

Celoni, F., Azzolin, M., Galante, I., Comparetto, G. & Giacoma, C. (2006). Fisheries catch and bottlenose dolphin absence/presence around Lampedusa island (Sicily – Italy). Poster presentation European Cetacean Society 2006.

Civile, D., Lodolo, E., Tortorici, L. Lanzafame, G.& Brancolini, G. (2008). Relationships between magmatism and tectonics in a continental rift: The Pantelleria Island region (Sicily Channel, Italy). Marine Geology 251:32–46.

Cuttita, A., Carini, V., Patti, B., Bonanno, A., Basilone, G., Mazzola, S., Garcia Lafuente, J., Garcia, A., Buscaino, G., Aguzzi, L., Rollandi, L., Morizzo, G. & Cavalcante, C. (2003). Anchovy egg and larval distribution in relation to biological and physical oceanography in the Strait of Sicily. Hydrobiologia, 503: 117-120

Di Natale A. (2006). Sensitive and Essential areas for large pelagic species in the Mediterranean Sea. Report "Sensitive and Essential Fish Habitat" Scientific Technical and Economic Committee for Fisheries (STECF), pp. 165-181.

EC (2000). Life NAT/IT/006271 "Urgent conservation measures of Caretta caretta in the Pelagian Islands" http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.createPage&s_ref=LIFE99%20NAT%2FIT%2F006271&area=1&yr=1999&n_proj_id=361&cfid=16586&cftoken=2e4adf8baa61f2ac-360A2F1D-DAE5-7FE0-A7720CC7129F3210&mode=print&menu

EC Joint Research Centre/IPSC. (2006). Oil spills statistics in the Mediterranean. http://www.cedre.fr/fr/publication/colloque/obs/3_med.pdf

European Science foundation/Marine Board (2007). Impacts of climate change on the European Marine and Coastal Environment. Position paper March 2007.

Fergusson, I.K., Soldo, A.S., Bonfil, R. and G. Morey. (in preparation). White shark Carcharodon carcharias Mediterranean Regional IUCN Red List assessment.

Fergusson, I.K., Compagno, L.J.V., and M.A. Marks. (2005). Great White Shark Carcharodon Carcharias. In:Fowler, S.L., Cavanagh, R.D., Camhi, M., Burgess, G.H., Cailliet, G.M., Fordham, S.V., Simpfendorfer, C.A. and Musick, C.A. (eds.) Sharks, Rays and Chimaeras: The Status of Chondrichthyan Fishes. IUCN/SSC Shark Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK.

Fiorentino F., G. Garofalo, T. Fortibuoni, T. Bahrib, M. Camilleri, A. Drago, M. Gristina & F. Massa . (2006). Delineating Habitats used by different life phases of Hake in the Strait of Sicily. Report of the SGMERD-06-01 Sensitive and Essential Fish Habitats in the Mediterranean, pp 203-234.

Fiorentino, F., Garofalo, G., De Santi, A., Bono, G., Giusto, G.B. & Norrito, G. (2003). SpatioTemporal Distribution of Recruits (0 group) ofMerluccius merluccius and Phycis blennoides (Pisces; Gadiformes) in the Straitof Sicily (Central Mediterranean). Hydrobiologia503: 223-236

Freiwald, A ., Beuck, L., Rüggeberg, A., Taviani, M. & Hebbe, D (2009). The white coral community in the central Mediterranean Sea revealed by ROV surveys. Oceanography, Volume 22, Number 1, 58 – 74.

García Lafuente, J., García, A., Mazzola, S., Quintanilla, L., Delgado, J., Cuttitta, A. & Patti, B. (2002). Hydrographic phenomena influencing early life stages of the Sicilian Channel anchovy. Fisheries Oceanography11 (1): 31-44.

Garofalo, G., F. Fiorentino, M. Gristina, S. Cusumano, G. Sinacori. (2007) Stability of spatial pattern of fish species diversity in the Strait of Sicily (central Mediterranean). Developments in Hydrobiology, 193, pp. 117 – 124.

Garofalo, G., Fiorentino, F., Bono, G., Gancitano,S. & Norrito, G. (2004). Identifying spawning and nursery areas of Red mullet (Mullus barbatus, L., 1758) in the Strait of Sicily. In: Nishida T., Kailola P.J., Hollingworth C.E. (eds), GIS/Spatial Analyses in Fishery and Aquatic Sciences, (Vol. 2). Fishery-aquatic GIS Research Group, Saitama, Japan, pp.101-110.

Garofalo, G., M. Gristina, F. Fiorentino, F. Cigala Fulgosi, G. Norrito., and G. Sinacori. (2003). Distribution pattern of rays in the Strait of Sicily in relation to fishing pressure. Hydrobiologia 503: 245–250.

Gasparini, G.P., Ortona, A., Budillon, G., Astrali, M. & Sansone, E. (2005). The effects of the Eastern Mediterranean Transient on the hydrographic characteristics in the Strait of Sicily and in Tyrrhenian Sea, Deep-Sea Res.52: 915–935.

Giacoma C. & Solinas, M. (2001). Urgent measures for the conservation of Caretta carettain the Pelagian Islands. In Proceedings of the international workshop Promoting cooperation of LifeNature beneficiaries and other projects for the protection of sea turtles, Rome 2001, 22-28pp.

Greenpeace (2006). Marine Reserves for the Mediterranean Sea
http://www.greenpeace.org/international/press/reports/marine-reserves-for-the-medite

Greenpeace (2008). Fishing out the Pirates. News story 7th May 2008
http://www.greenpeace.org/international/news/fishing-out-the-pirates

Greenpeace Italy (2012).I tesori sommersi del canale di sicilia
http://www.greenpeace.org/italy/it/ufficiostampa/rapporti/I-tesori-sommersi-del-Canale-di-Sicilia-/

Gristina, M., Bahri, T., Fiorentino, F. & Garofalo, G. (2006). Comparison of demersal fish assemblages in three areas of the Strait of Sicily under different trawling pressure. Fish Res, 81: 60–71

Holland, C. et al, 2003. Mud volcanoes discovered offshore Sicily. *Marine Geology*, 199, pp.1–6.

Hoyt, E. 2005. Marine Protected Area for whales, dolphins and porpoises: a world handbook for cetacean habitat conservation. Earthscan, London, VA (www.earthscan.co.uk).

ICCAT (2011) Secretariat Report on Statistics and Coordination of Research, 2011.

International Whaling Commission. (1994). Report of the workshop on mortality of cetaceans in passive fishing nets and traps. Rep. Int. Whal. Commn.(Spec. Iss.) 15:1-72.

Langar, H., Djellouli, A. S., Sellem, F. & El Abed, A. (2003). Dynamic of growth of Caulerpa Taxifolia (Vahl) C. Agarth in the conditions of the roadstead of Sousse (Tunisia). Congresso della Societa Italiana di Biologia Marina Onlus,34e congresso , Port El Kantaoui, 31 may-6 june 2003. Book of abstracts, 31p.

Lermusiaux, P.F.J., and A.R. Robinson. (2001). Features of dominant mesoscale variability, circulation patterns and dynamics in the Strait of Sicily. Deep-Sea Research I Oceanographic Research Paper 48 (9), 1953–1997

Levi, D., Andreoli, M.G., Bonanno, A., Fiorentino, F., Garofalo, G., Mazzola, S., Norrito, G., Patti, B., Pernice, G., Ragonese, S., Giusto, G.B. & Rizzo P. (2003). Embedding sea surface temperature anomalies into the stock recruitment relationship of red mullet (Mullus barbatus L. 1758) in the Strait of Sicily. Scientia Marina, 67 (1) : 259-268

Levi, D., Ragonese, S., Andreoli, M.G., Norrito,G., Rizzo, P., Giusto, G.B., Gancitano, S., Sinacori, G., Bono, G., Garofano, G., & Cannizzaro, L. (1998). Sintesi delle ricerche sulle risorse demersali dello Stretto di Sicilia (Mediterraneo Centrale) negli anni 1985–1997 svolte nell'ambito della legge 41/82. Biologia. Marina. Mediterranea. 5 (3): 130–139.

Massutí, E., Morales-Nin, B. & Lloris, D. (1996). Bathymetric distribution and recruitment patterns of Phycis blennoides (Pisces:Gadidae) from the slope of the north-western Mediterranean. Scientia Marina, 60: 481–488.

Minisini, D., Trincardi, F., Asioli, A., Canuz, M. & Fogli, F. (2007). Morphologic variability of exposed mass-transport deposits on the eastern slope of Gela Basin (Sicily channel). In Basin Research 19: 217–240, doi: 10.1111/j.1365-2117.2007.00324.x

Morey, G. et al, 2003. The occurrence of white sharks, *Carcharadon carcharias*, around the Balearic Islands (western Mediterranean Sea). *Environmental Biology of Fishes*, 68(4), pp.425 – 432.

Mrosovsky, N., 2006. Does the Mediterranean green turtle exist? *Marine Turtle Newsletter*, 111, pp.1 – 2.

Nannarelli, S., Dominici, A., Pozzi, L., Arena, P., Valentini, A., De lucia, A., Piovano,S., and Giacoma, C. (2007). Estimating Caretta caretta fishing bycatch from Linosa Rescue Center (Italy). Poster presentated in the International Seaturtles Symposium, USA.
http://www.tartanet.it/downloads/07-International%20Sea%20Turtle%20Symposium%202007-USA%20Nannarelli.pdf

Natoli A., Birkun A., Aguilar A., Lopez A., and A.R.Hoelzel. (2005). Habitat structure and the dispersal of male and female bottlenose dolphins (Tursiops truncatus). Proc. R. Soc. B (published online, doi:10.1098/ rspb.2005.3076).

Notarbartolo di Sciara G. (1990). A note on the cetacean incidental catch in the Italian driftnet swordfish fishery, 1986-1988. Rep. Int. Whal. Commn. 40: 459-460.

Oray, S. Karakulak, A. Garcia, C. Piccinetti, L.Rollandi and J.M. de la Serna. (2005). Report on the Mediterranean BYP tuna larval meeting. SCRS/2004/189 Col. Vol. Sci. Pap. ICCAT, 58(4): 1429-1435 (2005).

Patti, B., Bonanno, A., Basilone, G., Goncharov, S., Mazzola, S., Buscaino, G., Cuttita, A., Garcia Lafuente, J., Garcia, A., Palumbo, B. Y. & Cosimi, G. (2004). Interannual fluctuations in acoustic biomass estimates and in landings of small pelagic fish populations in relation to hydrology in the Strait of Sicily. Chemistry and Ecology, 20 (5): 365-37.

Pesante G., Collet A., Dhermain F., Frantzis A., Panigada S., Podestà M. & Zanardelli M. (2002). Review of collisions in the Mediterranean Sea. pp. 5-12 in: G. Pesante, S. Panigada and M. Zanardelli (Eds.), Proceedings of the Workshop "Collisions between cetaceans and vessels: can we find solutions?

Piccinetti C., Piccineti-Manfrin G. & S. Soro (1996a). Larve di tunnidi in Mediterraneo. Biologia Marina Mediterranea, 3(1), pp 303-309.

Piccinetti C., Piccineti-Manfrin G., & S.Soro (1996b). Résultats d'une campagne de recherche sur les larves de thonidés en Mediterranée. SCRS, 57.

Piovano S., Affronte M., Balletto E., Barone B., Dell'Anna L., Di Marco S., Dominici A., Gamba M., Giacoma C., Mari F., Miglietta F., Nannarelli S., Nicolini G. & Solinas M. (2001). Valutazione e riduzione degli effetti di catture accidentali di Caretta caretta nelle Isole Pelagie. Riassunti 5° Convegno Nazionale sui Cetacei e sulle Tartarughe Marine MonteArgentario, 2001), CSC online publications n. 79.

Ragonese, S. Giusto, G.B., Bianchini, M.L. and Morizzo, G. (2003). Mapping natural and man induced untrawlable grounds (no-take zones, NTZs) in view of managing the fisheries of the Strait of Sicily.

Ragonese S., Giusto, G. B., Bianchini, M. L. & Morizzo, G. (2007). Mapping natural and man induced untrawlable grounds (no-take zones, NTZs) in view of managing the fisheries of the Strait of Sicily. In MedSudMed 2007. Report of the MedSudMed Expert Consultation on Marine Protected Areas and Fisheries Management. GCP/RER/010/ITA/MSM-TD-03. MedSudMed Technical Documents, 3: 100 pp.

Randi, E. et al, 1989. Genetic variability in Cory's shearwater (*Calonectris diomedea*). *Auk*, 106, pp.411- 417.

Reeves R., and Notarbartolo di Sciara G. (2006). The status and distribution of cetaceans in the Black Sea and Mediterranean Sea. IUCN Centre for Mediterranean Cooperation, Malaga, Spain. 137 pp.

Robinson, A.R., M. Golnaraghi, W.G. Leslie, A. Artegiani, A. Hecht, E. Lazzoni, A. Michelato, E. Sansone,A. Theocharis & U. Unluata, (1991). The Eastern Mediterranean General Circulation: Features, Structure and Variability. Dynamics of Atmospheres and Oceans15 (3-5): 215-240.

Russo G., Di Bella C., Loria G. R., Insacco G., Palazzo P., Violani C., Zava B (2003). Notes on the influence of human activities on sea chelonians in Sicilian waters. In J. Mt. Ecol., 7 (Suppl.): 37 – 41.

Savini, A., Malinverno, E., Etiope,G., Tessarolo, C., and C. Corselli. (2009). Shallow seep-related seafloor features along the Malta plateau (Sicily channel – Mediterranean Sea): Morphologies and geo-environmental control of their distribution. Marine and Petroleum Geology, 26/9, 1831 – 1848.

Scovazzi T. (1998). The enforcement in the Mediterranean of United Nations resolutions on large-scale driftnet fishing. pp. 365-385 in: J.A. Frowein and R. Wolfrum (Eds.), Max Planck Yearbook of United Nations Law, vol. 2. Max-Planck-Institut fur ausländisches und öffentiches Recht und Völkenrecht.

SCRS (2008). Atlantic Bluefin tuna. Executive summary. In Report of the Standing Committee on Research and Statistics (SCRS), 71-90.

Soldo, A. and Dulcic, J. (2005). New record of a great white shark, Carcharodon carcharias (Lamnidae) from the eastern Adriatic Sea. Cybium 1 (29): 89–90.

Stefanelli, P., Ausili, A., Ciuffa, G., Colasanti, A., Di Muccio, S., & Morlino, R. (2002). Investigation of polychlorobiphenyls and organochlorine pesticides in tissues of tuna (Thunnus thunnus thynnus) from the Mediterranean Sea in 1999. Bulletin of Environmental Contamination and Toxicology 69: 800–807.

Stefanelli, P., Ausili, A., Di Muccio, A., Fossi, C., Di Muccio, S., Rossi, S. & Colasanti, A. (2004). Organochlorine compounds in tissues of swordfish (Xiphias gladius) from Mediterranean Sea and Azores islands. Marine Pollution Bulletin, 49: 938–950.

Storelli, M. M. & Marcotrigiano, G. O. (2006). Occurrence and accumulation of organochlorine contaminants in swordfish from Mediterranean Sea: a case study. Chemosphere, 62: 375-380.

Storelli, M.M., Ceci, E., Storelli, A. & Marcotrigiano, G.O. (2003). Polychlorinated biphenyl, heavy metal and methylmercury residues in hammerhead sharks: contaminant status and assessment. Marine Pollution Bulletin46: 1035–1039.

Tudela, S. (2004). Ecosystem effects of fishing in the Mediterranean: an analysis of the major threats of fishing gear and practices to biodiversity and marine habitats. Studies and Reviews. General Fisheries Commission for the Mediterranean. No. 74. Rome, FAO. 44pp.

UNEP/European Environment Agency (1999). State and pressures of the marine and coastal Mediterranean environment. ISBN: 92-9167-187-8

Walker, P., Cavanagh, R.D., Ducrocq, M. and Fowler, S.L. (2005). Chapter 7 – Regional Overviews: Northeast Atlantic (including Mediterranean and Black Sea). P86. In: Fowler, S.L., Cavanagh, R.D., Camhi, M., Burgess, G.H., Cailliet, G.M., Fordham, S.V., Simpfendorfer, C.A. and Musick, J.A. (comp. and ed.). (2005). Sharks, Rays and Chimaeras: The Status of the Chondrichthyan Fishes.IUCN SSC Shark Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK.

Wisshak, M. et al, (2009). Shell architecture, element composition, and stable isotope signature of the giant deep-sea oyster *Neopycnodonte zibrowii* sp.n. from the NE Atlantic. *Deep-Sea Research Part I.*

WWF (2005) Morocco cracks down on illegal driftnets. News story http://www.panda.org.za/article.php?id=573

Zibrowius, H., 1980. Les Scléractiniaires de la Méditerranée et de l'Atlantique nord-oriental. *Mem. Inst. Oceanog*., 11, pp.1 – 284.

Maps and Figures

Figure 1: Proposed marine reserves in the Mediterranean – B: Sicilian Channel

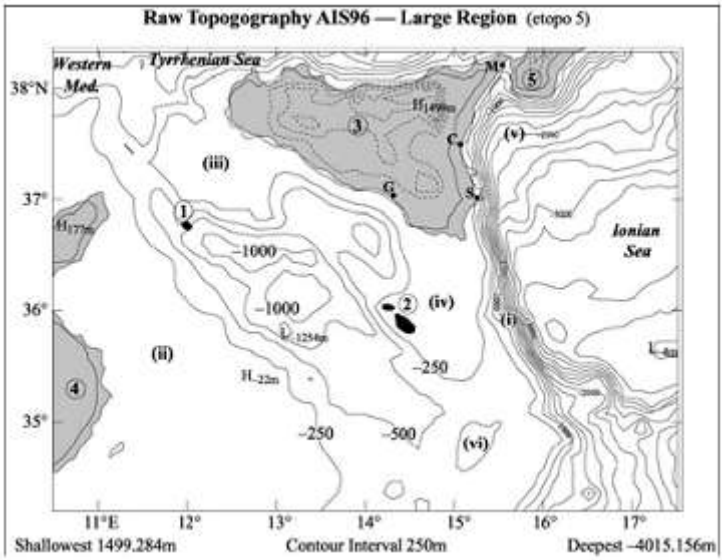

Figure 2: Topography and geography of the Sicilian Channel (Source: Lermusiaux, P.F.J., and A.R. Robinson. 2001. Features of dominant mesoscale variability, circulation patterns and dynamics in the Strait of Sicily. *Deep-Sea Research I Oceanographic Research Paper* 48/9, 1953–1997). Note: The numbers indicate Pantelleria Island (1), Malta Island (2), Sicily (3), Tunisia (4) and Calabria (5). The (i)'s indicate topographic features (De Agostini, 1998): the Ionian slope (i), Tunisian shelf (ii), Adventure Bank (iii), Maltese plateau (iv), Messina Rise (v) and Medina Bank (vi). The letters indicate cities mentioned in the text: G for Gela, S for Siracusa, C for Catania and M for Messina.

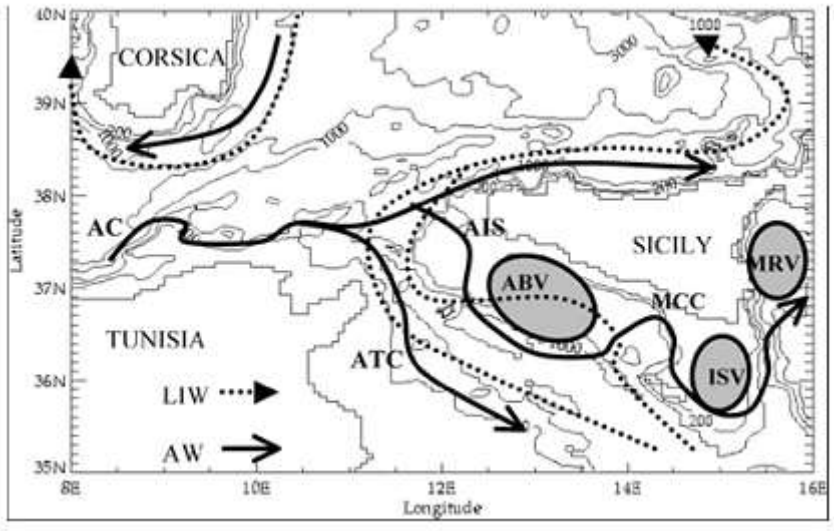

Figure 3: Circulation of sea masses on the Sicilian Channel (Source: Béranger, K., Mortier,L., Gasparini, G.P., Gervasio, L., Astraldi, M., & Crépon, M. 2004. The dynamics of the Sicily Strait: a comprehensive study from observations and models. DeepSea Research II 51: 411–440). Note: AC = Algerian Current; AW = Atlantic Water; LIW = Levantine Intermediate Water; AIS = Atlantic Ionian Stream; ATC = Atlantic Tunisian Current.

Rights and permissions

Figures 2 – 3 have been reproduced from third party publications and should only be used and disseminated with full credit to the sources given.