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Marine Reserves for the Mediterranean Sea

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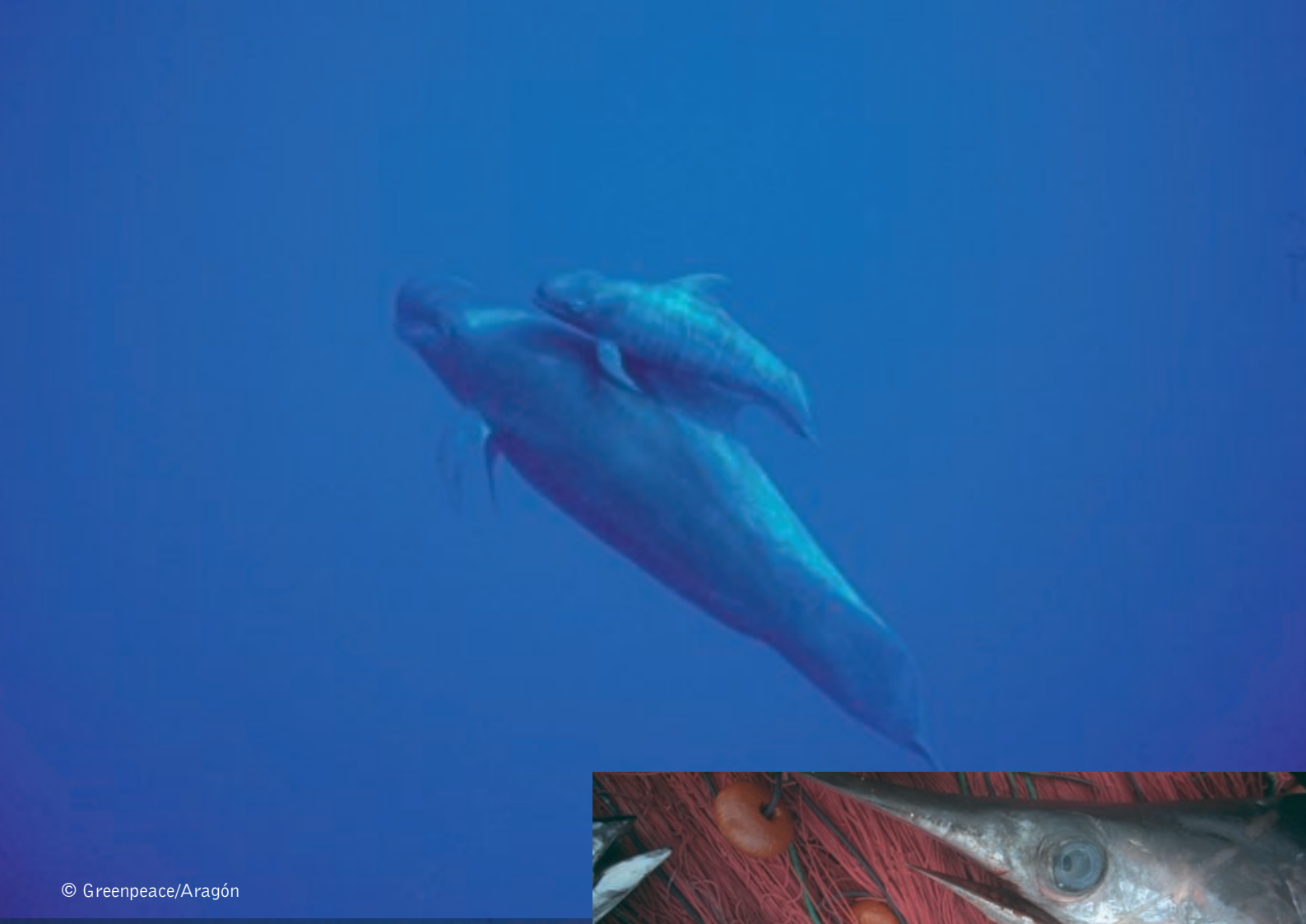
Marine Reserves for the Mediterranean Sea

Defending Our Mediterranean

"Greenpeace is committed to defending the health of the world's oceans and the plants, animals and people that depend upon them."


MARINE
RESERVES!

Content



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Executive summary:

This Greenpeace report sets out the argument for the urgent establishment of a network of marine reserves across the Mediterranean Sea to safeguard its productivity, its marine life and its ecosystems for the many millions of people who rely on it for their health and wellbeing - now and in the future.

The Mediterranean Sea is a rich and diverse environment, home to many unique species and important ecosystems. Being an enclosed sea, and the majority of the Mediterranean being beyond the control of any one country, it truly represents a shared resource - and a shared responsibility - for the region.

The Mediterranean Sea is threatened by many damaging human impacts, including over-fishing, destructive fishing techniques, pollution and climate change. Steadily, these are degrading the shared resource and treasure that the Mediterranean Sea represents.

A network of large scale marine reserves will represent a shift in the balance of human impacts, from damage and harm to protection and conservation. This network must cover a representative range of marine ecosystems, both in coastal waters and on the high seas. Greenpeace believes that in the face of the damage that has been done to the Mediterranean, this network of marine reserves must cover around 40% of the Mediterranean Sea in order to protect it for generations to come.

Because it is virtually enclosed and its habitats inter-connected, the Mediterranean Sea is a prime example of why marine management must take account of whole ecosystems, not single species or areas. A marine reserve network will create a sound basis upon which to build sustainable, precautionary and ecosystem-based management of the Mediterranean's marine resources.

Experience of marine reserves elsewhere in the world has shown an increase in the number, size and diversity of species within the reserves. They therefore represent our most valuable tool in conserving biodiversity and making ecosystems more resilient to change or damage. This, combined with sustainable management, also brings benefits of precaution and insurance to fisheries management for the surrounding seas. Marine reserves also have many other positive benefits for science, education and recreation.

Although agreements and commitments have been made at international, regional and national levels to protect the Mediterranean Sea, progress towards developing a network of marine reserves is still lacking. Agreements and commitments are meaningless without action, and action towards a network of marine reserves requires political will. Mediterranean countries must work together to protect the Mediterranean, our shared resource and treasure.

It's Our Sea - let's protect it.

Introduction:

The Mediterranean Sea - literally, the sea at the middle of the earth - has, unsurprisingly, dominated the culture of the nations that border it. Connecting three continents - Europe, Asia and Africa, The Mediterranean's resources are shared between 21 bordering countries. For thousands of years, it has facilitated trade and the exchange of cultures between the various peoples of the region.

Although it is part of the Atlantic Ocean, the Mediterranean is almost completely separated from the main body of the Atlantic at the Straits of Gibraltar, at the narrowest point by only 13 kilometres of water. About 5.9 million years ago, the precursors to the modern Straits of Gibraltar closed, isolating the Mediterranean, which evaporated to a deep, dry basin some two miles below world ocean levels, containing a series of highly saline lakes. This basin permanently reflooded about 5.4 million years ago as the Straits reopened.

As a result of the separation of the Atlantic and Mediterranean Basins, the Mediterranean Sea contains many species that are found nowhere else - more than one in four species is unique to the Mediterranean. It is warmer, saltier and lower in nutrients than the Atlantic Ocean and as a result it has low primary productivity - particularly in the Eastern basin - making the Mediterranean Sea vulnerable to over-exploitation.

Nevertheless, the Mediterranean Sea has a high level of biological diversity, and the coastal shelf below the 46,000 kilometers of coastline contains some rich and important habitats. The seagrass meadows, rocky intertidal zones and estuaries of the Mediterranean coastal zone are particularly important habitats for many species, providing spawning and nursery areas for some of the main fish species. Although the average depth is around 1,500 meters, the deepest water in the Mediterranean reaches 5,267 meters in the Calypso Deep in the Ionian Sea. These deep water areas are largely unexplored. They contain seamounts, cold seeps (where methane gases seep from the seabed) and submarine trenches - features associated with highly specialized and vulnerable ecosystems.

However the close proximity of the many millions of people who live along or visit the Mediterranean coast across three continents and the consequent heavy use of the Mediterranean Sea has placed huge pressure on the marine environment.
Driftnets are still used in the Mediterranean although banned by both regional and European Union [A] legislation due to the high levels of by-catch (unwanted species caught by fishing gear) that results from their use. Bottom trawling, arguably the most destructive of all fishing methods, has been banned in the Mediterranean at depths below 1000 meters. However trawling, equivalent to the clear-felling of forest, continues in shallower waters.

Added to the damage caused by capture fisheries, aquaculture activities exert a heavy toll on the marine environment. On a local level, the use of chemicals and the location of highly stocked enclosures often cause much damage. More widely, aquaculture creates huge a demand for feed derived from other marine species. Far from being a solution to overfishing stocks, aquaculture can actually encourage overfishing on the species used to manufacture feed.

The Mediterranean Sea is also polluted on a daily basis by sewage and chemical discharges from land. These problems are increasing in magnitude as a result of poorly regulated coastal development. Shipping activities are associated with polluting oil inputs.

In short, the "sea that lies between us" is being damaged by all but protected by none.

Clearly, the Mediterranean Sea must be protected to ensure that its rich biodiversity is maintained and that it continues to be the lifeblood of the many communities that depend on it - now and in the future.

Protection agreements such as the European Union's Natura 2000 network and the Mediterranean region's network of specially protected areas (SPAMI) cover only a relatively small area when compared to the Mediterranean's 2.5 million square kilometer area. Currently, fully protected areas cover less than one percent of the Mediterranean Sea - a far cry from the twenty to fifty percent that scientists have recommended. This is also what Greenpeace is proposing: a network of fully protected, large-scale marine reserves to cover the range of marine ecosystems - the marine equivalent to national parks on land.

There is no time to lose. Immediate action is needed to save the Mediterranean Sea.

This means a comprehensive network of large-scale reserves on the high seas, together with a mosaic of smaller marine reserves in the coastal zone, whilst areas outside these reserves must be well managed according to the principles of sustainability.

[A]Note that in this report we use the term EU, though it is formally the European Community (EC) that adopts legislation and is party to international conventions.


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1. Values of the Mediterranean

Cultural value

The Mediterranean Sea has as many names as the civilizations that thrived and perished along its blue shores. The Mediterranean coastline that extends for 46,000 kilometers has hosted some of the oldest civilizations in the world and is the setting for many of the mythological stories transmitted through religion, faith and traditional storytelling.

Despite the current view of the Mediterranean as a deep rift between its north and south coastlines, it has also provided a centre of trade throughout the region. Carthage, Greece, Sicily, and Rome took turns at attempting to control its trade routes and wealthy shores. The Byzantine Empire and the Arabs followed, and after them Barcelona and the Italian city trading states, such as Venice and Genoa, dominated the Mediterranean. The same pattern of control over Mediterranean islands, coasts, and trade routes took a vital importance during both World Wars, after which the region continues to be of major strategic value.

This same sea, which has been so central to shaping the region's history and culture, is now under serious and imminent threat of irreversible damage. This in turn threatens the livelihoods of the many communities who live by it.

Biodiversity

The Mediterranean Sea supports a wide range of ecosystems, from the rich seagrass meadows and rocky reefs of the coastal zone, to the seamounts, cold seeps and trenches of the seabed. At its deepest, the Mediterranean reaches depths of over five thousand meters. Over ten thousand species have been identified in the Mediterranean Sea, representing 8 - 9% of the world's marine biodiversity [1] despite representing only 0.7% of the marine area [2]. The deep-sea ecology of the Mediterranean has been very much defined by its history, in particular the period when it became isolated from the Atlantic Ocean some 5 million years ago, and largely dried out [3].

Over twenty species of cetaceans (whales, dolphins and porpoises) are found in the Mediterranean Sea, with half of those being resident populations. Eight cetacean species are considered common; fin whale, Balaenoptera physalus; sperm whale, Physeter macrocephalus; striped dolphin, Stenella coeruleoalba; Risso's dolphin, Grampus griseus; long finned pilot whale, Globicephala melas, bottlenose dolphin, Tursiops truncatus; common dolphin Delphinus delphis; and Cuvier's beaked whale, Ziphius cavirostris. Both the fin whale and sperm whale are listed on the IUCN red list of threatened species [4].

One of the most distinctive and threatened species of the Mediterranean is the Mediterranean monk seal, Monachus monachus. The monk seal is the only pinniped (seal or sealion species) found in the Mediterranean Sea. It is now very rare and has been listed as an endangered species by the IUCN since 1966 [5]. Despite protection through all relevant agreements including the Bern Convention, Bonn Convention, Convention on International Trade in Endangered Species, the EU Habitats Directive [6] and the Action Plan for the Management of the Mediterranean Monk Seal [7], its decline has not been halted. In the 2004 IUCN assessment the species was listed as critically endangered, only one level down from extinction [8].

There are three species of marine turtles present in the Mediterranean, two of them resident (the loggerhead turtle Caretta caretta and the green turtle Chelonia mydas) and the third, the leatherback turtle Dermochelys coriacea, a visitor from the Atlantic Ocean proper [9]. The Mediterranean green turtles are considered a separate sub-population, which is listed by the IUCN as critically endangered. Leatherback turtles are also critically endangered, and loggerhead turtles listed as endangered [10]. Marine turtles in the Mediterranean are threatened by past overexploitation, fishing activities, coastal development and tourism, shipping and pollution. [11]

Many of the important habitats of the Mediterranean are also very vulnerable to human activities. Seagrass meadows of Posidonia oceanica provide vital spawning, nursery and feeding areas for a diverse and rich ecosystem. Seagrass meadows are declining in many parts of the Mediterranean, as a result of pollution, coastal development, fishing activities and invasion by the tropical macroalga Caulerpa taxifolia.[12]

Deep-sea habitats of the Mediterranean are both valuable and vulnerable. A recent report providing an overview of the deep-sea habitats of the Mediterranean suggests a two-part recommendation for their protection [13]. The first part, a precautionary ban on bottom trawling in depths below 1,000 meters, was adopted by the General Fisheries Commission for the Mediterranean in 2005. The second, the development of a system of marine protected areas is being further developed in a number of concurrent initiatives, including through the current Greenpeace campaign.

Economic values

The Mediterranean shows a pattern of development highly influenced by the natural environment, and is a region that brings together countries at differing stages of economic and social development but united in a common heritage. Maintaining the ecological health and integrity of coastal areas of the Mediterranean is key to the development of a sustainable future for the region but these areas are currently subject to public policies and social practices in great need of change if natural capital is to be maintained, risk and inequity are to be reduced and development is to take place to achieve long term sustainability.

Currently, the unique combination of climate, beautiful coastline, rich history and diverse culture attract millions of tourists every year to the coastal areas around the Mediterranean. Approximately one third of the world's international tourists choose the Mediterranean coast. [14] Accordingly, tourism is, without exception, an essential economic sector for all Mediterranean countries due to the size of tourist flows and the money that they spend, the number of jobs created (many millions region-wide) and the contribution to GDP that the sector makes and is projected to make in the future [15].

The living resources of the Mediterranean Sea have been exploited for many thousands of years and currently such activities employ around 420,000 people, of whom some 280,000 are fishers, mainly small scale. Though not as economically important as tourism, fishing is considered to be very much part of the Mediterranean identity and is important in relation to local economies since around 85% of the boats in the region operate on a small scale. Sustainable fishing is also crucially dependent upon the preservation and protection of marine ecosystems and hence the current trends of fishery indicators showing increasing degradation of resources are of great concern [16].

2. Threats to the Mediterranean

Overfishing and other fisheries impacts

Worldwide, overfishing is considered to be the biggest environmental threat to the oceans. Many stocks have been overfished and some of them, for example the Canadian cod stocks, have collapsed spectacularly. Even in relatively recent times, such collapses were thought to be all but impossible. Recent studies have shown a strong decline in many fish species all over the world, particularly top predators, when compared with their abundance before industrial fisheries started [17]. The Mediterranean Sea is no exception from this global trend.

A declining catch

Total catches in both the Mediterranean and Black Seas have been around 1,500,000 tonnes in recent years. That's more than double the 700,000 tonnes landed in 1950, but is far below the maximum 2 million tonnes reached between 1982 and 1988. Catches of many species reached peaks between the late 80's and the early 90's, but have decreased since [18].

Commercially important stocks in the Mediterranean include bluefin tuna, albacore, hake, swordfish, marlin, red mullet and sea bream. Food and Agriculture Organization (FAO) data suggests that in the Mediterranean and Black Seas together, around 20% of resources are depleted, 15% are overexploited and 50% are fully exploited [19]. The European Environment Agency (EEA) evaluation paints an even starker picture for the Mediterranean region [20]. For the majority (80%) of commercially exploited stocks in the Mediterranean, no robust assessment of their status exists. Where the status of stocks has been assessed, this indicates that around 60% of commercially important stocks are being fished outside of safe biological limits. Earlier EEA data suggested that between 65% and 79% of stocks were outside safe biological limits, dependent on region [21].

Fisheries management in the region

The situation of many fish stocks in the region is alarming. Although it is not the intention in this document to provide an holistic overview of these stocks, some general trends emerge quite clearly. The quality of the catches, both in terms of species composition and size of fish caught has generally declined. Long-lived and slow-growing species and the larger specimens of targeted fish have largely disappeared from various demersal catches over a number of areas. Catch per unit of fishing effort (the amount of fish caught for a given level of fishing effort) has fallen dramatically when compared to catch rates of some decades ago despite the fact that the power of fishing vessels has increased considerably over the same time period. [22]

Overfishing is resulting in the targeting and landing of increasingly smaller fish, in some cases in spite of the fact that size restrictions exist. The protection of smaller fish in populations targeted by trawling is critical to the sustainable management of such fisheries. Yet restrictions are being openly flouted, as illustrated by a recent Greenpeace investigation of fish marketed in Greece. www.greenpeace.org/mediterranean/size-matters In other fisheries, regulations are non-existent. Swordfish fisheries are not governed by minimum landing size egulations over the whole Mediterranean. As a result, immature individuals comprise the bulk of the catch.[23]

By-catch is another considerable problem. Much of the data has been gathered from studies focusing on deep water trawls targeting shrimp and from pelagic (mid-water) gill netting operations. The FAO discard database for the Mediterranean and Black Seas includes data for less than a quarter of the nominal (reported) landings of 1.5 million tonnes from the region, highlighting a huge gap in the available data. Trawl fisheries discard between 20 and 70% of the catch depending on the depth trawled.[24]

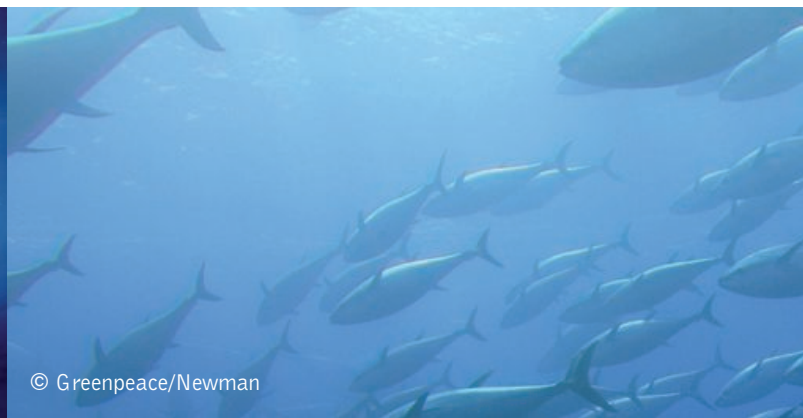
In general, lack of data for fisheries is a major problem throughout the Mediterranean. As noted above, European Environment Agency data indicates that assessments of stock status simply do not exist for around 80% of stocks. In addition, the catches in many fisheries may be under reported. Moreover the scale and extent of illegal fishing is not well known. It is now widely recognised that there is a lack of effective monitoring, control and surveillance data for fisheries in the Mediterranean. In turn, this means that there are no high quality data upon which scientific advice designed to regulate the fisheries can be based. These points are starkly exemplified by the fisheries for large pelagic fish in the region.

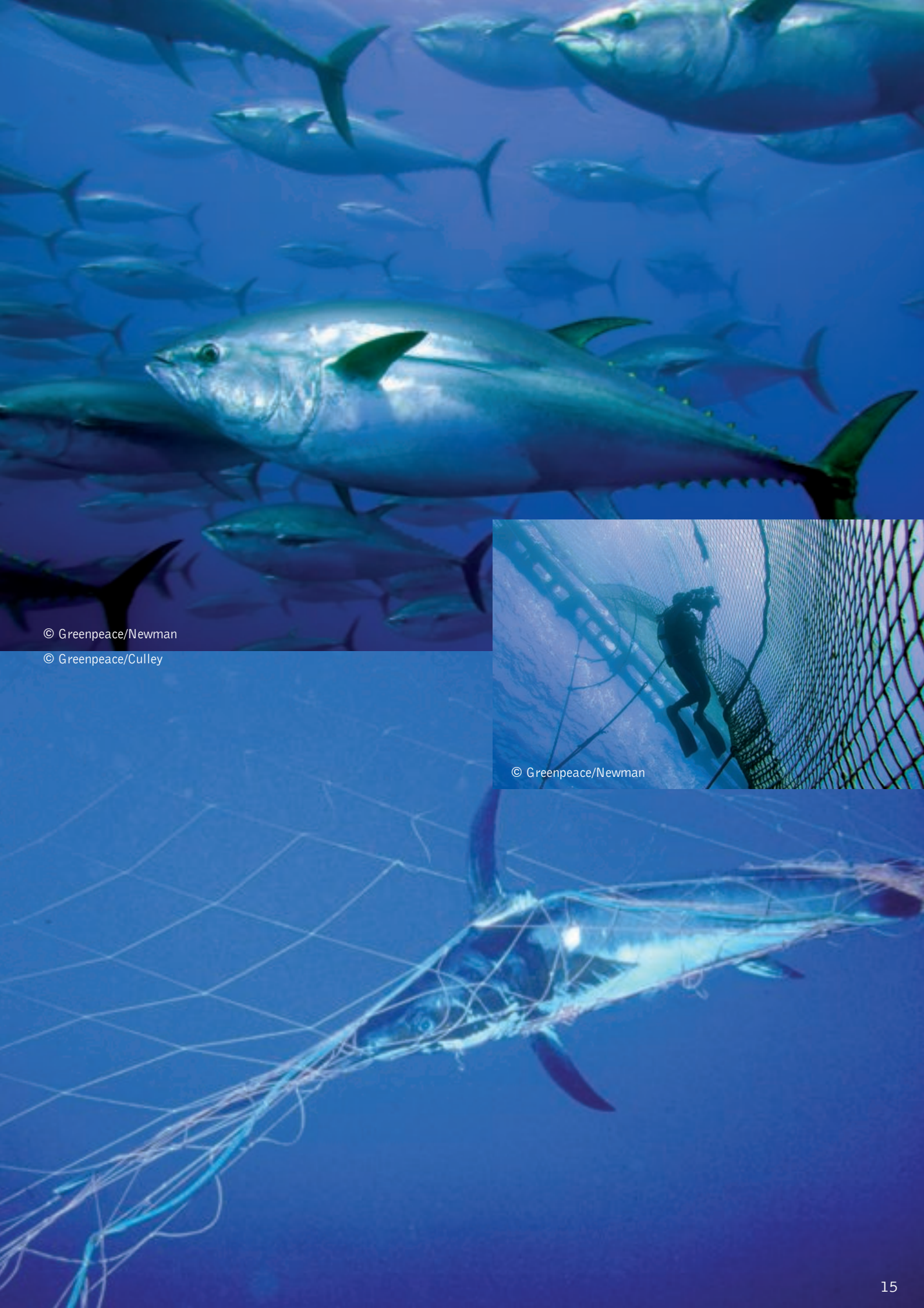
Large migratory species: a common resource under threat

Large migratory fishes such as tuna and swordfish swim throughout the Mediterranean, and have been shared as a common resource by fishing communities in this region for thousands of years.

The case of the bluefin tuna is well known: in May 1999 Greenpeace published a report publicly exposing the depletion of this population in the Mediterranean Sea [25]. The amount of adult bluefin tunas had decreased 80% over the previous 20 years. Huge numbers of juvenile tuna were caught every season, further compromising the ability of the stock to regenerate from these historically low levels. Pirate fishing boats were also depleting the stock. It was abundantly clear at the time of the Greenpeace report that drastic measures were needed to allow the bluefin tuna population to recover. Since then, however, the situation has deteriorated (See page 19, Bluefin tuna ranching: a recipe for disaster).

In the case of swordfish the unknown status of the stock, the likely high exploitation rate, the probable large catch of very small fish, and the warning signs from within the fishing industry itself are all causes for serious concern [26]. According to The International Commission for the Conservation of Atlantic Tunas (ICCAT), the body supposed to be responsible for management of these fisheries, catches of immature fish may account for as much as 50-70% of the total catches [27]. In short, poor quality and simple unavailability of data make it difficult to assess the status of tuna and billfishes species in the region. [28]





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Illegal, Unregulated and Unreported fishing

Worldwide, illegal, unregulated and unreported (IUU) fishing is a major problem, linked to the lack of effective management systems and also to increased commercial pressure on dwindling fisheries resources. The Mediterranean is no exception to this problem. A good example is the extensive use of driftnets, which continues despite their prohibition in the Mediterranean.

The constraints to addressing IUU fishing in a meaningful way are considerable. Financial constraints limiting the frequency and intensity of surveillance operations, for example the use of patrol craft, adequacy of training programs, availability of fisheries monitoring, control and surveillance (MCS) instruments and the lack of an enforceable legal regime on the high seas are all substantial constraining factors. Added to this are the societal costs, such as unemployment in fishing and related industries, that can result (at least in the short term) from enacting and enforcing laws to reduce fishing effort.

Despite these constraints, it is vital that legally binding measures are taken to regulate fishing on the high seas, in order to prevent the plunder of marine resources by IUU fishing vessels. Internationally, these must include the establishment of a central monitoring, control and compliance authority to regulate high seas fishing, and development of a global vessel monitoring system. Cooperation is needed to prepare a list of vessels licensed to fish the high seas, as well as blacklist of vessels and companies that have failed to comply with conservation measures.

Regionally, necessary steps to tackle IUU fishing in the Mediterranean Sea include the development of a regional register of fishing vessels and a review of the General Fisheries Commission for the Mediterranean (GFCM) to ensure that measures such as inspection at sea can be effectively taken and efficiently implemented. Mediterranean countries also need to prepare and implement national plans of action to combat IUU fishing, as mandated in the International Plan of Action of the United Nations FAO. To date, Spain is the only Mediterranean country to have adopted a National Plan of Action to combat the problem of IUU fishing.

Wider impacts on the ecosystem

The General Fisheries Commission for the Mediterranean published a review in 2004 examining the impacts of fishery activities on marine ecosystems [29]. This review noted that all of the problems associated with fishing activity recorded around the globe occurred in the Mediterranean. A combination of factors was considered responsible. The Mediterranean supports intensive fisheries activity using a variety of gear types. A variety of habitats are targeted ranging from shallow waters to deep water environments and these habitats support important biodiversity.

The GFCM report indicates that the impacts extend beyond what might be regarded as simple overfishing whereby only the target species are depleted. There is a massive ecological footprint from fishing evident in the Mediterranean, which is reflected in whole ecosystem changes and changes to the structure of the food web. Commercial catches and by-catch of rays and sharks threaten the existence of some species. Long-line fishing kills or injures substantial numbers of seabirds and turtles, which are increasingly threatened. Every kind of major fishing gear in use in the Mediterranean is reported as impacting on cetacean species, although driftnets are acknowledged as the worst problem in this regard. Artisanal fishing and increased scarcity of food resources caused by overfishing continue to put pressure on highly endangered monk seals. Finally, trawling impacts on seagrass beds are reported as being substantial due to disturbance of the sediment and direct damage to the vegetation, while dynamite fishing continues to be a problem in some areas.

Driftnets: walls of death

In November 2003 The International Commission for the Conservation of Atlantic Tunas (ICCAT) adopted a binding recommendation banning the use of driftnets in fisheries for large pelagic fish such as tuna and swordfish in the Mediterranean. This recommendation followed a series of international agreements, beginning with United Nations Resolutions adopted by the General Assembly in 1989 and 1991 [30]. These recommended a moratorium on all driftnet fishing by the end of June 1992. This was reinforced at a European [31] and Mediterranean [32] level, with subsequent binding regulations completely banning the use of driftnets by European Community vessels [33].

So what has been the impact of these binding agreements and regulations on "wall of death" fishing in the Mediterranean Sea? While some driftnet fleets were restructured during the tortuous political process, others expanded rapidly. The North African countries together with Turkey are cases in point. While domestic legislation was in place theoretically banning drift netting, the fleets continued to grow, buying gear from Greek and Italian owners restructuring their own operations. [34]

Recent information suggests that the Moroccan fleet consists of 177 vessels (although Morocco has admitted to operating over 300 drift netting vessels). Other important fleets include the Italian fleet, numbering 90-100 vessels [B], the Turkish fleet comprising 45-100 vessels and the French fleet of between 45 and 75 boat. Other evidence suggests that Algeria, among other North African countries, may be an important operator although there is no solid evidence to back this up. [35]

The impact of driftnets, often 10-12 kilometers in length, has long been under scrutiny due to the by-catch associated with it. There is no doubt that drift netting continues to exert a huge impact in the Mediterranean. In the Alboran Sea, driftnets threaten the last healthy population of common dolphins in the Mediterranean. Striped dolphin mortality in the region of the Balearic Islands is also a concern. There is a wide consensus about the negative impacts of drift netting on cetaceans as a whole.

The Moroccan driftnet fleet is responsible for large by-catch of rays and sharks in the Alboran Sea and in the areas fished by the Tangiers fleet around the straits of Gibraltar and the Atlantic. Annual by-catch of blue, thresher and shortfin mako has been estimated at around 7-8 thousand for each species in the Alboran Sea, while the Atlantic fleet accounts for up to 27 thousand of each species annually. [36]

Undoubtedly, driftnets are a continuing problem in the Mediterranean. Given the solid legal instruments that exist to address this highly destructive fishing method, the EU, GFCM and ICCAT should prioritise their implementation and enforcement to bring about a long overdue end to drift netting in the Mediterranean.

[B] Greenpeace has reason to believe that the size of the Italian driftnet fleet may be substantially higher than this. In the 1990s, this fleet comprised over 600 vessels. The present number is unknown, however Greenpeace evidence (Greenpeace Italy: Driftnets report 2004) has shown that vessels that have received subsidies to decommission driftnet gear are still using it, fishers not previously engaged in drift netting have started, and possibly that new and larger driftnet vessels have added to the fleet since the 1990s.

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Threats to sea turtles

The first turtles can be traced back to the age of the dinosaurs some 200 million years ago. All seven species of sea turtle are endangered. Three species of turtle are found in the Mediterranean Sea but only two breed there. [37] The loggerhead turtle (Caretta caretta) is the most common species, nesting at a number of sites around the Mediterranean, mostly in the eastern basin. The green sea turtle (Chelonia mydas) is mainly found in the waters of the eastern Mediterranean and has a few nesting sites in South Eastern Turkey and Cyprus. The leatherback turtle (Dermochelys coriacea), has been infrequently reported from the Mediterranean.

Turtles suffer from the impacts of many fishing practices in the Mediterranean, including surface and bottom longlining, drift netting, trawling and set netting. Protection is needed in the vicinity of nesting beaches to prevent turtles being injured or killed. The delay in the elimination of driftnets from the Mediterranean and the growing use of driftnets in key turtle conservation areas off North African and Turkish coasts are matters of particular concern.

Turtles also suffer as a result of the pollution of the Mediterranean Sea by toxic substances and litter. Over twenty percent of loggerhead turtles examined in Malta were contaminated with plastic or metal debris and/or hydrocarbons. [38] Turtles are particularly sensitive to oil pollution and are also vulnerable to industrial and municipal discharges.

In addition to the problems arising from fisheries and pollution, the nesting behaviour of sea turtles can be disrupted by changes to their nesting sites. The changes associated with coastal development may render sites unsuitable for nesting. Light pollution and aircraft noise may act as a strong deterrent to turtles coming ashore.

People and dogs also deter female turtles from coming ashore, while even the placement of beach furniture and other items may change the temperature range in the sand, and thereby change the sex ratio of the offspring. Tyre ruts on beaches can entrap juvenile turtles, preventing them from reaching the sea. Such impacts are likely to increase as a result of increasing development and tourism, unless explicit measures are taken to control them. [39]

Bluefin tuna ranching: A recipe for disaster

More than 2000 years ago, the Greek philosopher Aristotle wrote about migration and reproduction of bluefin tuna in the Mediterranean in his treatise "the history of animals". Already in the Roman Empire tuna fishing was one of the most stable industries [40]. This fishery, one of the most profitable in the world, is now threatened by industrial practices and lack of protection.

In 1999, Greenpeace published a report highlighting the depletion of bluefin tuna population in the Mediterranean Sea [41]. The biomass of adult bluefin tuna - the spawning stock biomass - had decreased 80% over the previous twenty years. Every year, far too many juvenile tuna were being caught, and pirate fleets were depleting the stock. Clearly, drastic measures were needed to restore the bluefin tuna population.

Since then, not only has the overfishing worsened, but a new industrial activity targeting tuna is posing an added threat to the survival of tuna in the Mediterranean. This is the capture, transport and fattening of tuna in cages all along the Mediterranean coast known as "tuna ranching". Industrial purse seiners and tugboats sweep the whole region in search of tuna, assisted by a flotilla of aircraft and helicopters able to find schools of tuna, despite their dwindling numbers.

Tuna ranching is a highly profitable activity directed to the Japanese market. Instead of reducing fishing to help tuna recover in the Mediterranean, fast profits have brought more money into the fishery: this means new and bigger fishing boats, storage plants, and even new airports to export the tuna. Governments have greatly contributed to boost this expansion: European Union subsidies, as high as $34 million since 1997, coupled with big investments from Japan and Australia, have encouraged even greater catches [42].

The practice has resulted in an increase in the catch of juvenile tuna, and exacerbated the management difficulties [43] faced by ICCAT, the multilateral body responsible for managing the tuna populations of the Atlantic and Mediterranean. No one knows the actual amount of bluefin tuna caught in the Mediterranean Sea, but it is widely accepted that it is higher than the total allowable catch (TAC). The current TAC for the East Atlantic and Mediterranean of 32,000 tonnes is itself unsustainable, exceeding scientific recommendations. [44] It is estimated that in 2003 around 21,000 tonnes of wild-caught bluefin tuna were introduced into cages in the Mediterranean.[45]

The huge quantity of fish needed to feed farmed tuna is also a problem. Up to 20 kilograms of feed, made from fish, is used to produce just one kilogram of tuna [46]. An estimated 225,000 tonnes of fish feed is thrown every year into the Mediterranean Sea, most coming from West Africa, the North Atlantic and America [47]. A recent report has highlighted the risk of introducing diseases to local fish species from the fish bait, as has previously occurred in tuna fattening operations in Australia [48]. The spread of disease to important local fish stocks such as anchovy or sardine could be disastrous for local fishermen. From a precautionary point of view, this risk is unacceptable.

The demand for fish feed is also making fishermen harvest species that were not previously fished commercially. This is the case of round sardinella in the Alboran Sea, where increasing fishing for this species may put at risk one of the healthiest common dolphin populations in the Mediterranean.[49]

Tuna ranching in the Mediterranean means that a previously common resource shared by fishing cultures all around the Mediterranean Sea is now controlled by a few investors. Not only is the bluefin tuna being privatised and over-exploited, but other fisheries of the region are also being placed in jeopardy.

An industry report warned that major catches in 2004 took place inside Libyan territorial waters, around Cyprus and inside the Antalya Gulf in Turkish territorial waters, where tuna previously found a safe-haven [50]. Restoring safe breeding and feeding grounds by protecting them from fishing would be an important step towards the recovery of the depleted bluefin tuna stock in the Mediterranean.


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Aquaculture

Aquaculture - the farming of marine animals and plants - is an expanding industry worldwide, and the Mediterranean Sea is no exception. [C] As is the case in many parts of the world, this expansion is often taking place without a proper assessment of its impact in the marine environment and on the sustainability of this industry as a whole.

Aquaculture is presented to the public as a solution to the current crises in fisheries. We are told that in order to lower the pressure on wild fish stocks we should increasingly obtain the seafood we eat from farming activities. The reality is quite different, as many of the species that are being farmed are in fact carnivorous species that consume huge amounts of fish during the farming process.[51]

Mediterranean coastal areas are already subject to extremely high human pressure, and pristine areas are more and more difficult to find. The aquaculture sector is in many cases adding to this pressure in search of areas of high water quality in order to set up their farms. The installation of fish farms close to vulnerable and important habitats such as seagrass meadows is particularly concerning.

Total aquaculture production by the countries of the General Fisheries Commission for the Mediterranean (excluding Japan), showed an overall increase between 1992 and 2002, reaching a peak in 2000. [59] According to the GFCM, Italy is by far the leading producer with146,000 tonnes, followed by Greece, Egypt, France and Turkey. The primary species produced in the region are the Mediterranean mussel (Mytilus galloprovincialis), gilthead seabream (Sparus aurata), Manila clam (Ruditapes philippinarum), European seabass (Dicentrarchus labrax) and flathead grey mullet (Mugil cephalus) [52].

Concerns have been raised about aquaculture production in the Mediterranean, including disease problems, biodiversity concerns due to the introduction of new species in the region, the impact of the farms' effluents on the surrounding environment, competition for good quality coastal areas and competition with other coastal users. In one example from Astakos Gulf in Greece, elevated levels of nutrients and toxic trace metals were found associated with fish farms, as well as an accumulation of surplus food and fish faeces on the seabed. This resulted in damage to seagrass and other seabed communities.[54]

[C] Under the term aquaculture, many different definitions exist. In many cases the emphasis is on the intensive farming of carnivorous species, which has greatly grown around the Mediterranean basin recently. Most of what we discuss in this report is the development of this particular form of aquaculture.

Oil

The Mediterranean Sea is an area in which the oil industry is highly active. Several important producers are located in the region. Offshore oil and gas reserves are located along the Adriatic coast of Italy and in the Greek Aegean, but the most important areas are offshore of Tunisia and Libya. Exploration is taking place off the coasts of Israel, Turkey and Morocco. In the early 1990's there were 116 offshore platforms in operation in the Mediterranean Sea.

Oil refineries are distributed all around the Mediterranean Basin, but with most operating in northern countries. There are more than 40 refineries with a combined capacity (in 2000) of around 458 million tones per annum. There is, therefore, a large seaborne oil trade in the region [55]. The largest exporters of oil are Libya, Algeria, Egypt and Syria, with major imports taking place into France, Italy, Spain and Turkey.

At any one time in the Mediterranean Sea around two thousand vessels are in transit of which approximately 200 to 300 are tankers transporting oil and petroleum products. Around 370 million tonnes of oil is transported through the Mediterranean on an annual basis, representing 20% of global oil shipping [56]. In turn, this creates an increased risk of oil pollution incidents. On average there are around 60 incidents a year, of which 15 involve ships, and 60% occur close to petrochemical facilities.

Between 1987 and 1996 an estimated 22,000 tonnes of oil entered the Mediterranean as a result of accidents [57]. The United Nations Environment Programme (UNEP) estimated in 2002 that over the previous fifteen years some 55,000 tonnes of oil had been accidentally spilled in the Mediterranean with three major accidents accounting for 75% of the total [58].

Sand and Gravel extraction

Growth in construction industry has increased the demand for concrete aggregates in the recent decades. Dredging activities cause long-term environmental impacts, affecting marine life, the fishing activities and any other legitimate users of the sea. The resulting damage appear in the form of economic losses such as loss of natural resources and tourism revenues, and represent irrecoverable ecological losses. Extraction from shallow areas modifies near-shore waves conditions, affects erosion and deposition rates, and alters seabed habitat. [59] Effect of marine sand and gravel extraction on seabed species persist at least 6 years after the cessation of dredging.[60]

In the western Mediterranean, coastal seabed communities are particularly affected. The effect on the seabed community appears to be related to the physical impact on the sea floor. Disturbances created by dredging have prolonged effects, particularly in low dynamic systems such as those present in the Mediterranean. [61] Sand and gravel dredging may lead to changes in the composition of marine life in an area. Some species are clearly reduced after dredging. For instance, in the Catalan Western Mediterranean Sea, the official catch data of bivalves (e.g. mussels, clams and oysters) showed a decreasing yield following dredging.[62]

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Shipping

Some of the world's busiest shipping routes are to be found in the Mediterranean. On an annual basis, it is estimated that 200,000 vessels ply their trade in the Mediterranean, and large numbers of them will visit one or more of the 305 Mediterranean ports (one per 150 kilometers of coastline). It is estimated that the Mediterranean accounts for around one third of the world's total merchant shipping. [63] Many of the goods transported by ships are hazardous and the loss of hazardous cargo can result in severe damage to the marine environment. Even leaving aside the potential for accidents, the discharge of chemical tank washings and oily wastes including oil contaminated ballast and wash waters represent a significant source of marine pollution.

In addition to the impacts of oil spills outlined earlier, the Mediterranean also suffers from intentional pollution from ships. As a defined "Special Sea Area" under the MARPOL 73/78 Convention (Annex 1 Regulation 10) the discharge of oil or oily mixtures into the Mediterranean from ships is entirely prohibited with only minor and well-defined exceptions. The Convention appears to be regularly flouted however, and operational discharges from ships make up a major proportion of the hydrocarbon input to this regional sea.

A study conducted under the auspices of the European Community [64] using remote sensing data identified in excess of 1600 spills in 1999 alone. None of these coincided with any reported spills or accidents. The volume of oil involved in the detected slicks was estimated at around 13,000 tonnes. This is probably a gross underestimate of the true input from ship operations through de-ballasting, tank washing, and engine room and bilge discharges.

Estimates of the true extent of illicit oil discharges from vessels in the Mediterranean vary widely. UNEP (2002) suggest that inputs amount to some 250,000 tonnes per annum, but note that earlier estimates of 500,000 tonnes were regarded as plausible by the International Maritime Organization (IMO). Levels as high as 1.2 million tonnes have been suggested, [65] but current estimates regard the true figure as lying between 100,000 and 150,000 tonnes per annum. [66] What is clear however is that illicit operational discharges from ships are a source of considerable chronic pollution in the Mediterranean, which must be fully evaluated and brought under control. In addition, it has been estimated that there are some 361 wrecked vessels possibly containing up to one million tonnes of oil and petroleum products in the Mediterranean Sea, which have been designated as potentially polluting wrecks. [67]

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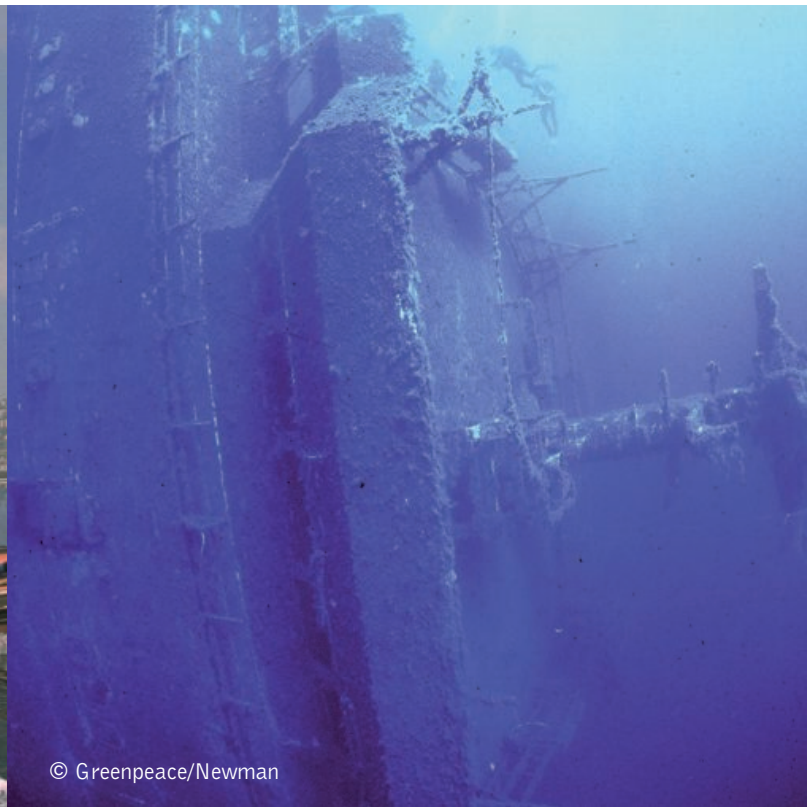

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Threats to whales and dolphins

Eighteen of the whale and dolphin species that have been reported in Mediterranean waters are listed as endangered or threatened species by the Protocol concerning Specially Protected Areas and Biological Biodiversity, [68] and specific measures for their protection are advocated.

A range of human activities threaten the cetacean (whale, dolphin and porpoise) populations in the Mediterranean, with certain fishing methods posing the greatest threat. Non-selective fishing gear means that threatened species regularly become entangled and drown in fishing nets. These victims are termed "by-catch". There is widespread concern about the high level of by-catch in the Mediterranean swordfish fisheries using driftnets,[69] for example it was estimated that 1,682 cetaceans were caught as by-catch by the Italian driftnet fishery in 1991. [70]

Although driftnets are technically banned in the Mediterranean (See page 17, Driftnets: walls of death) significant numbers still operate, including French and Italian vessels that refuse to comply with the legislation in force. Driftnets are a particular threat to sperm whales, a threatened species. In the late 90's Greenpeace recorded up to 30 sperm whales killed by driftnets in a single fishing seaon. The Moroccan driftnet fleet also poses a high threat to the survival of the last remaining healthy population of common dolphin (Delphinus delphis) in the whole Mediterranean. [71] Other types of fishing gear impact upon cetacean populations, but to a lesser extent. [72]

Another issue of concern in the region is that of ship collisions with cetaceans. There are records for six different species of cetaceans having been involved in ship collisions in the Mediterranean. The most susceptible species appear to be the large fin and sperm whales, and fast moving ferries are the major hazard. The relatively small numbers of both these species and the fact that they are genetically distinct from the populations inhabiting the Atlantic Ocean is particularly worrying. The captain of one ferry operating between France and Corsica estimated that they hit whales at least once a year. [73]

Pollution

The Mediterranean suffers from pollution from industry, agriculture and urban centres and these pollution sources are regarded as major environmental problems in a large majority of countries in the region. [74] Limited water exchange makes the Mediterranean very sensitive to the build-up of pollutants. In addition to coastal point sources, other sources are situated inland and the pollutants are carried by the many rivers that drain into the Mediterranean. The multitude of chemicals used to create a vast range of household and industrial products, including plastics, plasticizers, packaging materials, pesticides, fertilisers, solvents, and a vast number of other hazardous products are posing a serious threat to the region. A large number of industries located along the coast regularly pump thousands of tonnes of toxic waste directly into the water. As a result, the Mediterranean basin has now arguably become one of the most polluted semi-enclosed basins in the world.

Generation of sewage effluents from coastal cities, which are then discharged untreated or partially treated into the sea is a major problem along Mediterranean coastlines. Of the 70% of cities with sewage treatment plants, none treat wastewater above secondary treatment plant level. Hence these discharges are significant sources not only of nutrients, but also metals and organic chemicals. The information available concerning the occurrence of persistent organic pollutants (POPs) in the Mediterranean region is inconsistent since monitoring effort is not consistent over all countries, and intensity of monitoring is inconsistent. The recent evaluation by the European Environment Agency (EEA 2005), for example, includes estimate data from just four northern Mediterranean countries for dioxin emissions.

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Data for toxic heavy metals is also patchy. Some "hotspots" such as Haifa Bay and Izmir Bay have been identified. Unlike most people in central and northern Europe, most people in Mediterranean coastal regions have an intake of mercury very close to the US Reference Dose, the precautionary maximum safe dose. In Mediterranean fishing communities, large numbers of people have an intake 10 times the reference dose, and at this level of intake it is known that there are clear neurological impacts.

POPs such as the pesticide lindane, occur at a number of hotspots due to manufacturing wastes, stockpiles and historical usage. Over 200 tonnes of DDT are still stockpiled in various countries, together with other organochlorine pesticides. Polychlorinated biphenyls (PCBs), used in electrical equipment pose a threat due to their continuing use and improper disposal in a number of countries. Stockpiles of hazardous waste have also been documented in many countries around the region, together with large numbers of unregulated and untreated discharges from manufacturing processes.

In short, Marine life in the Mediterranean Sea is potentially polluted from a multitude of sources. This not only threatens marine ecosystems themselves, but also creates a serious health risk in a region where fish is an integral part of the regional diet and many people depend on the sea for a living.

Tourism

Tourism, despite providing economic benefits to the region, has had a major role in the degradation of the coastal and marine environment. Rapid development and the building of associated infrastructure has been encouraged by governments in Mediterranean countries in order to support the large numbers of tourists that visit the region each year. This rapid and uncontained urban development has caused serious erosion problems in many places along the Mediterranean coasts. According to a comprehensive study for the European Commission, Greece has a 4,368 kilometers of coastline affected by erosion, Italy 2,349 km and France 2,803 km of eroded coastline. [75]

The great seasonality of Mediterranean tourism means that the majority of visitors are present during the summer months, producing large amounts of solid waste and wastewater which can not be properly treated due to inadequate infrastructure of small coastal towns and villages, the services of which were originally built to serve only a small permanent population.

Tourism is often concentrated in areas of high natural wealth, causing a serious threat to natural habitats of endangered Mediterranean species such as sea turtles and monk seals. Loggerhead sea turtles in the island of Zakynthos in Greece are one example. Tourism and the construction of tourist facilities have caused irreversible damage to some important nesting grounds. [76] Tourism has also been depriving Mediterranean monk seals of important habitats, which is one of the main threats to the survival of the species.[77]

Climate change

The potential impacts of climate change within the various European regions have been recently assessed. [78] However, the potential changes in marine systems are not well known. One impact of climate change could be to increase both water temperature and salinity over the whole of the Mediterranean Sea, with variations existing between regions. Modeling of the impact of such changes suggests that the deep water circulation processes in the Mediterranean Sea could be disrupted, and the intensity of winter convection decreased. [79]

Impacts of such changes upon biological systems remain highly speculative. It is likely that they will, however, be profound. Because the Mediterranean basin is virtually enclosed, the scope for northward migration of existing marine flora and fauna, and replacement with species with a typically warmer water distribution from the south is also restricted. Based upon analysis of a historical deep water cooling event in the Eastern Mediterranean, it appears that temperature changes of 0.05-0.1 degree Celcius are capable of causing wide ranging changes in components of the deep seabed ecosystem in the region.[80]

In addition to the above, other direct physical impacts can be anticipated. The low tidal range of around 1 meter makes the Mediterranean particularly vulnerable to sea level induced changes. Since the 1960s, the mean level of the Mediterranean relative to the Atlantic has declined by some 2cm due to evaporation and lower freshwater input. This in itself may be a reflection of climate change. Nonetheless, with a projected global rise in sea level of 13-68cm by the 2050s, the Mediterranean is projected to lose large areas of coastal wetlands and lowlands (31-100% by the 2080s). In addition, sea level rise is likely to cause an increase in storm surges and floods. Coastal erosion is likely to increase, while estuaries and coastal groundwater may become more saline. Coastal water tables may rise and drainage of such land areas will be impeded. It has been predicted that the number of people living in Mediterranean coastal areas affected by flooding could rise dramatically by the 2080s. [81]

Alien species

Introduced or "alien" species can have serious impacts in the marine environment, competing with native species for food and for space, and altering the structure of communities and habitats. Alien species may be introduced from one marine area to another either by intentional release or by accident. To date, over 600 exotic species have been recorded from the Mediterranean Sea, with the rate of introduction peaking in the 1970s and 1980s. In the five years to 2005, it has been estimated that an alien species has been introduced to the Mediterranean once every four weeks. [82]

The mode of introduction differs across the Mediterranean. The intensive rate of introductions in the eastern basin is attributable to the Suez Canal. In the western basin, shipping and aquaculture activities are largely responsible. The northern Adriatic and the south of France are considered introduction "hotspots" with a total of 166 known introductions between them, mainly in lagoon ecosystems. [83]

Alien species can have severe impacts on the marine environment such as changing the habitat type, for instance meadows of the seagrass Posidonia, important spawning and nursery for many fish species, can be completely replaced by dense Caulerpa forests. This alga contains a toxin that is thought to inhibit growth of other species.[84] The negative impacts of species on ecosystem function can cause subsequent adverse effects on fisheries, aquaculture, shipping, tourism and human health. [85]

Specific examples have been reported from all parts of the region. The rapid decline in the populations of the sea star Asterina gibbosa, the prawn Melicertus kerathurus and the jellyfish Rhizostoma pulmo in Israeli waters have been paralleled by an increase in populations of exotics. Red mullet (Mullus barbatus) and hake (Merluccius merluccius) have been forced into deeper waters by exotic competitors. The Manila clam (Ruditapes philippinarum) out competes and replaces native species. A population explosion of jellyfish (Rhopilema nomadica) in the eastern Mediterranean has impacted upon tourism and the functioning of ships and power plants. The negative impacts of such exotic introductions are generally not offset by their use as a marketable resource.

Marine reserves would provide a degree of protection for the Mediterranean Sea from the negative impacts of alien species. In a broad sense, degraded habitats are more vulnerable to the establishment of new species than healthy ecosystems. A new species has not only to be physically introduced to an area, it must also survive, reproduce and spread in order to establish, and this can be affected by many factors. [86] High levels of human disturbance have been shown to increase the success of invading species.[87]

3. Marine reserves

Definition

Marine Protected Area (MPA), is a term that is becoming increasingly common in the context of biodiversity conservation, habitat protection and fisheries management. The term covers a wide range of protection measures, with an equally wide variation in the benefits conferred by this status. MPAs can be created for many purposes, ranging from the protection of a species to a whole habitat or ecosystem, to the protection of certain interests, such as small scale or recreational fishing.

Marine reserves are one type of MPA, and in terms of protecting the marine environment, they offer the highest level of protection. Marine reserves are areas of the sea that are fully protected from damaging human activities - much like national parks in the sea. In the 2004 report on Rescuing the North and Baltic Seas, Greenpeace adopted the following definition of marine reserves:

Large-scale marine reserves are areas that are closed to all extractive uses, such as fishing and mining, as well as to disposal activities. Within these areas there may be core zones where no human activities are allowed, for instance areas that act as scientific reference areas or areas where there are particularly sensitive habitats or species. [D]

Some areas within the coastal zone may be opened to small-scale, non-destructive fisheries, provided that they are sustainable, within ecological limits, and have been decided upon with the full participation of affected local communities. [E]

The need to create Marine Protected Areas is being acknowledged at a national and international level, with fora such as the United Nations World Summit on Sustainable Development stating the need for the creation of marine protected areas, and setting targets and timelines for this.[88]

Increasingly, fully protected marine reserves are being recognized as the category of MPA that is necessary to give the level of protection necessary to ensure that the health and productivity of the world's seas and oceans are restored and maintained. In a consensus statement on the benefits of marine reserves, the American Association for the Advancement of Science stated "full protection (which usually requires adequate enforcement and public involvement) is critical to achieve this full range of benefits. Marine protected areas do not provide the same benefits as marine reserves." [89]
The World Parks Congress recommended that a global system of effectively managed, representative networks of marine protected areas be developed by 2012. Strictly protected areas would form the basis of this network, with the Congress recommending that at least 20-30% of the world's seas and oceans should be fully protected.

[D] Within the Mediterranean, these core zones are likely to include Specially Protected Areas of Mediterranean interest under the Barcelona Convention, and within the EU, Natura 2000 sites such as Special Areas of Conservation under the Habitats Directive and Special Protection Areas under the Birds Directive.

[E] In the Mediterranean Sea, this would generally apply to the area within the 12 or 6 nautical mile territorial limit; however in designing marine reserves, biological limits should be used rather than political boundaries - for example a reserve extending to the outer edge of the coastal shelf may encompass a broader range of depths and habitat types than if it ended at 12 nm.

Marine reserves as a tool for conservation

Conservation is about protecting the diversity and abundance of life on earth. This means protecting not just single species, but the full variety of species and their habitats, as well as preserving the complex interactions between species that make up an ecosystem. To do so requires an approach that considers all these aspects. Marine reserves, which protect entire areas from a range of human impacts, do just this, which makes them a unique tool for conservation. In addition, an ecosystem approach should be extended to activities outside of marine reserves; for example by considering not just the direct impacts of fishing on a single target species, but on other species that are caught, the impacts on the habitat, and changes to the balance between species.

Marine reserves are primarily a tool for conservation, and despite the additional benefits they bring for fisheries, recreation and other uses of the marine environment their conservation benefits alone are important enough to warrant the creation of a global network. It is unthinkable that on land, an entire region would be utilised for urban development, industry and agriculture, without making a provision for wild spaces to ensure the survival of natural ecosystems. Likewise, this must be the case for the oceans. However when national parks and wilderness areas were being created on land, this was not thought to be necessary in the oceans - their resources were considered unlimited. Certainly in the past there were many natural refuges for marine species provided by areas that were simply inaccessible. However coastal environments and species were already being threatened, and now with the advent of new technology, even the most remote of these refuges have become accessible to exploitation.

The world's governments have recognised the importance of leaving a healthy and viable world to future generations and maintaining its ecological basis. Under the Convention on Biological Diversity, countries are committed to stemming the loss of biodiversity and to establishing a comprehensive, effectively managed and ecologically representative network of national and regional protected areas, including areas where extractive uses are excluded. In the marine environment, this means a commitment to establish a global network of marine reserves.

The establishment of marine reserves has been shown to result in long-lasting and often rapid increases in the abundance, diversity and productivity of marine organisms. [90] While the benefits of protection are more apparent for species that spend much or all of their time within a marine reserve, reserves can also offer protection to migratory species if they are protected at vulnerable stages, such as spawning and nursery grounds. [91]

In order to protect the whole spectrum of marine biodiversity it is vital that all major habitats should be represented within a regional network. Scientists have developed useful criteria to help identify priority areas of the marine environment that should be protected to achieve the greatest effects [92]. These are:

- Sites that include vulnerable habitats e.g. seamounts
- Sites that contain vulnerable life history stages e.g. fish spawning and nursery grounds
- Sites that are capable of supporting exploited species or rare species
- Sites that provide ecological services

Marine reserves can also restore ecosystem balance lost through human activities. For example fishing target species can upset the balance of predator/prey relationships, and result in habitat change. As these changes can occur over a long period of fishing at unsustainable levels, the altered habitat is sometimes not recognised as un-natural, and not until marine reserve is declared and larger fish return and restore balance. For example a marine reserve created in an area with over fifty percent bare rock grazed by sea urchins was restored to seaweed beds once populations of large fish and crayfish (predators of the sea urchins) recovered [93].

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Marine reserves as a tool for fisheries management

Marine reserves are by definition closed to fisheries but the establishment of a network of marine reserves can benefit fisheries in a number of ways. Marine reserves enable exploited populations to recover and habitats modified by fishing to regenerate. As unexploited areas, marine reserves act as valuable reference areas that can be used to help understand the effects of fishing outside and inform management decisions, so underpinning the ecosystem approach.

In addition, there is a growing body of evidence to suggest that the establishment of a network of marine reserves can lead to enhanced yields in adjacent fishing grounds. This can be the result of either the spillover of adults and juveniles across reserve boundaries or from the export of larvae or eggs from reserves to fished areas.

One of the major problems with fish stocks that have been depleted by overfishing is that there are very few large fish remaining in the population. Large females are essential, because they produce many eggs of better quality. Generally when a female doubles in length, she produces eight times more eggs. [94] These eggs show a higher level of fertilisation and better survival rates. So, a few large mature females may contribute far more to reproduction than a large number of first-time spawning females. In marine reserves some female fish will over time grow large and make very significant contributions to the eggs and larvae that may be exported out of the reserve.

Less has been published on the effects of marine reserves in the Mediterranean. Available data, however, points to a great success of well-managed marine reserves, compared to non protected areas. A clear effect is the increase in size of fish in marine reserves [95], and it is well known that large fish have a larger reproduction rate. In general, fishing is known to modify both the age structure of fish populations (adults become more rare) and the general structure of the fish community (the proportion of carnivorous species, of greater commercial interest, decreases) [96].

A comparison of fish populations within and outside marine reserves in Corsica and Sardinia showes the importance of good management of marine reserves. In the marine reserve in Corsica the average biomass of commercial species was around 2.3 times higher in 4 years, 4 times in 10 years and 6 times higher in about 20 years. For particular species, such as grouper and brown meagre, results are much higher: the brown meagre biomass was 70 times higher after 20 years of protection. In the marine reserve in Sardinia, however, the increase in fish biomass over 10 years was only 0.2 times. The study attributed this to the uncontrolled poaching activity in Sardinia throughout much of that time [97].

Marine reserves can be sited to protect specific areas that are important to key life stages of targeted species such as spawning and nursery grounds, migration routes and feeding grounds.

Marine reserves can help provide a more predictable catch from year to year, hence enhancing fisheries stability. They also serve as a form of insurance against uncertainty and reduce the probability of overfishing and fishery collapse.

Marine reserves - other benefits

Monitoring the biodiversity of marine ecosystems that are protected against extractive activities has great educational value and provides an opportunity for local communities to gain ownership of marine reserves in their area. From schools to universities and research institutions, marine reserves provide a venue for research and discovery. At present, far too few Mediterranean coastal communities have access to such a resource.

Marine Reserves provide an undisturbed habitat that can supply invaluable information for scientific research. Assessing environmental change occurring during the recovery of

damaged ecosystems is necessary in order to obtain a better understanding of the complexities of marine life. Marine Reserves provide a unique source of long-term data, giving researchers the opportunity to monitor species and their habitats - which is essential in order to supply reliable information for future conservation and management policies.

Marine reserves provide a benchmark or baseline, showing what the sea is supposed to be like. This can have scientific benefits - providing the necessary "control" with which to compare the effect of fishing and other activities outside of marine reserves. It can also help to prevent the effect of "shifting baselines" whereby the concept of what is natural gradually changes over years and between generations as the environment is degraded.

Non-extractive uses of the sea can also benefit from marine reserves. Activities such as diving, snorkeling, underwater photography and whale watching all benefit from diverse and abundant marine life. Such activities can provide alternative economic opportunities for coastal communities, and do not come at the expense of the marine environment. The positive impacts of marine reserves could also include appreciable economic benefits, although few systematic studies have been carried out. Increases in fish populations could be a key economic advantage, but further studies are needed. Evaluations to date depend upon the use of models and projections.[98] [99] [100]

In the domain of tourism (and ecotourism) studies have predicted that increased fish numbers and sizes fostered by marine reserves in the Turks and Caicos Islands would increase the economic viability of the reserves. [101] Tourism is the most economically valuable industry in the Great Barrier Reef Marine Park. The park is divided into different zones including a large number of no-take zones. Tourism expenditure in 1999 was AU $4269 million, far exceeding the gross values of recreational fishing (AU $240 million) and commercial fishing (AU $119 million). [102]

A further example comes from Apo Island marine reserve in the Philippines. Here it is estimated that the initial US $75,000 investment in the reserves now yields an annual return somewhere between US $31,900 and $113,000 taking into account increased fish yields outside the marine reserve, and other reserve generated income such as increased local dive tourism. [103]

Size, scaling and connectivity of marine reserves

Modeling studies of marine reserves have shown that whatever their size, their establishment is likely to lead to increases in density, biomass, size of individuals and diversity. [104] In fact most established highly protected marine reserves are small in scale and have been shown to yield positive effects. For example the tiny reserves at Apo Island in the Philippines and Hol Chan in Belize have been remarkably effective. However small marine reserves are unlikely to be self-sustaining and will not be adequate to protect vital ecosystem functions or maintain habitat complexity. Ecological viability increases with size, as does resilience.

In order to protect whole ecosystems it is important to ensure that all habitats are represented within a network of marine reserves and that habitats are replicated within the network. The World Parks Congress in Durban 2003 recommended that "networks should be extensive and include strictly protected areas that amount to at least 20-30% of each habitat." [105] The term 'at least' is important as the World Parks congress clearly recognised that some habitats will need a greater proportion protected than others. For isolated and regionally rare habitats it will be necessary to ensure that a greater proportion of those habitats are given protection, as they will need to be self-sustaining.

Although proportional increases occur at all reserve sizes, [106] absolute increases in numbers and diversity are clearly important. For example, doubling fish numbers in a small reserve from 10 to 20 fish is substantially different from doubling the fish numbers in a large reserve from 1000 to 2000. Equal relative differences in biological measures between small and large reserves nearly always translate into greater absolute differences for larger reserves, and so larger reserves will be necessary to meet conservation goals.

Two leading experts on the science of fully protected marine reserves, Callum Roberts and Julie Hawkins of York University in the UK, have come to the conclusion that 'all arguments converge upon the importance of large-scale protection, with maximum benefits generally falling in the range of 20% to 40% of the sea in reserves'. [107] While most existing marine reserves are small, some countries are beginning to designate bigger areas. In 2004 Australia designated 34% of the Great Barrier Reef Marine Park as highly protected marine reserve.

Studies focusing on the benefits of marine reserves to fisheries suggest that maximum benefits will accrue when large areas are put off limits to fishing. Recent models suggest that more than 35% of the total area needs to be in no-take reserves to prevent recruitment overfishing of sedentary species, such as sea urchins or many reef fishes, but area requirements will differ for species on account of their differing biology. [108] An analysis based on a model for reserve size and placement in the North Sea suggests that the maximum size of a marine protected area necessary to benefit species of concern in the ecosystem is in the range of 25 to 40% of the total North Sea area. [109] The key recommendation of the UK's Royal Commission on Environmental Pollution (RCEP) 2004 report on addressing the impact of fisheries on the marine environment was that 30% of the UK's EEZ be designated as no-take zones. [110]

The total area of sea that needs protecting is likely to increase as the degree of human impact outside of reserves increases. This is because populations in reserves will become more dependent on those in other reserves for their replenishment, while fisheries outside the marine reserves will become more dependent on replenishment by offspring from protected populations. [111]

In order to conserve a representative range of habitats and species a number of marine reserves will need to be established and it is important that these are sited in a network that ensures connectivity. Many marine species have open water dispersal phases and eggs and larvae are often carried long distances away from where they were spawned.

As the marine reserve coverage of an area increases so will connectivity. As the number of reserves in a network increases so will the links, but at a faster rate. [112]

Some experts have stressed the importance of making the reserves in a network of different sizes. [113] Marine reserves should typically increase in size moving from nearshore to offshore. Small reserves will be harder to identify in offshore areas, harder for fishers to comply with, and thus harder to enforce. [114] Also, as a rule of thumb, protected areas will need to be larger in offshore regions because scales of animal movements tend to be larger offshore. [115]

Building a network of smaller marine reserves in the coastal zone will have the advantage of spreading fishery benefits to fishing communities along the coast rather than concentrating them round a few large marine reserves with some communities losing their fishing grounds altogether. [116]

Greenpeace proposal

Greenpeace is campaigning for a global network of marine reserves covering forty percent of the world's oceans, in order to have clean and healthy oceans and seas. In a Mediterranean context, this means establishing a representative network of marine reserves, comprising large-scale reserves on the high seas, and a mosaic of smaller marine reserves in association with well-managed, sustainable fishing areas within the coastal zone. Such a network is essential if we are to stop and reverse the decline in the region's varied biodiversity and there is a growing body of evidence to suggest that it will also yield benefits to fisheries.

As a first step towards establishing a Mediterranean network, Greenpeace has drawn up a map showing a number of key areas appropriate for designation as marine reserves. The proposed network includes examples of the different habitats found in the region, as well as areas known to be important spawning and nursery grounds, which are necessary for proper functioning of the ecosystem. Although a paucity of detailed data was found for some parts of the region (especially the eastern basin) and for some species and habitats, this is not a block to designing a network. One of the beauties of a network of marine reserves as a conservation tool is that as long as the network is of sufficient scale and includes a comprehensive selection of habitats spread through the region it will achieve its goals. Further details of the methodology by which these areas were selected employed is given in the box below.

Greenpeace acknowledges that these proposals must be accompanied by a wider range of measures to ensure the sustainability of activities related to the resources of the Mediterranean Sea. If marine reserves are established without an accompanying strategy for the transition period involving all stakeholders, there may be short term economic consequences for Mediterranean communities. On the other hand, Greenpeace notes that the continuation of present day exploitation rates and methods will have huge economic and social impacts, because of the degradation and loss of valuable natural resources.

Greenpeace believes establishing a network of marine reserves is fundamental to protecting natural resources and providing a sustainable future for many economic activities in the Mediterranean, and to ensure a high quality of life for the people living close to the Mediterranean Sea.

While Greenpeace has made every effort to use the best information available to select the proposed reserves, it recognises the crucial importance of further refinement and the effective engagement of different stakeholders and in particular coastal communities, in this process.

Proposed marine reserve sites

Figure 1. shows a proposed marine reserve network that fits the criteria outlined in this report. The proposed network is based on available information on species and habitats of the Mediterranean Sea. The coastal area also requires protection through a network of marine reserves. As described on page 39.

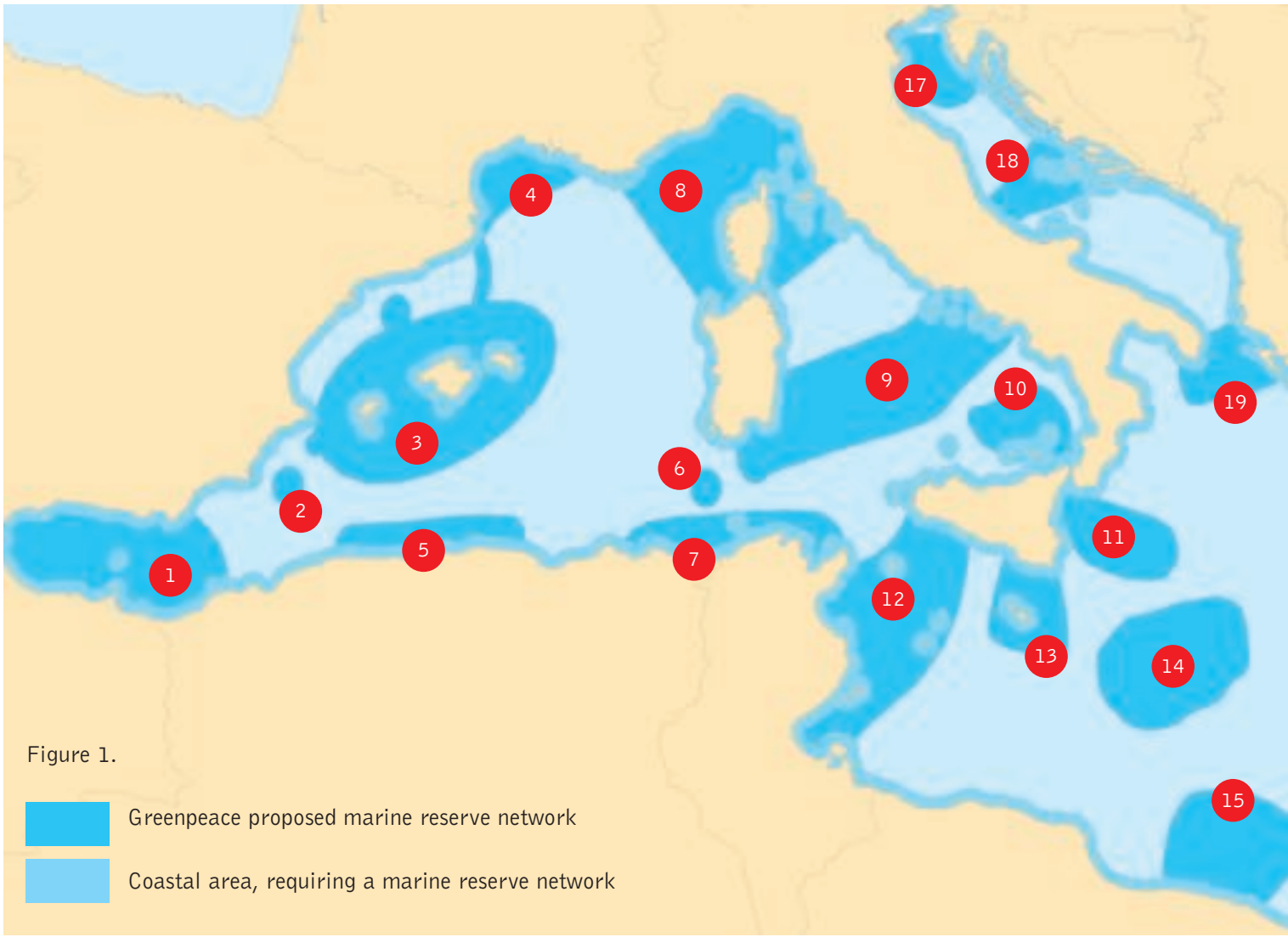

Figure 1.

1. Alboran Sea

The Alboran Sea is the meeting point for the cold waters of the Atlantic Ocean and the warmer waters of the Mediterranean Sea, and a migratory route for many species of fish, whales, dolphins and turtles. The Alboran contains regions of upwelling, where marine life thrives. The area is a spawning area for pilchards and anchovy and an important area for a number of whale and dolphin species, including the striped, common, bottlenose and Risso's dolphins, and the long-finned pilot whale. Vulnerable deep-sea features are found in the Alboran Sea, including seamounts and deep-sea corals.

2. (& 6) Seamounts

These areas represent individual seamounts in the Mediterranean Sea (seamounts are also included in many of the other proposed marine reserve areas). Seamounts are home to many unique and vulnerable species. In addition to the important seabed communities found on seamounts, they also provide important breeding and feeding grounds for species in the waters above.

3. Balearic Islands

The waters surrounding the Balearic Islands are an important spawning area for tuna and swordfish, two over-exploited migratory species, as well as many other species including pilchards, round sardinella and anchovies. The area contains deep-sea corals and cold seeps, and is an important area for sperm whales. The great white shark, a vulnerable species, is recorded in the area.

4. Gulf of Lions

The Gulf of Lions is influenced by the Rhône Delta, which is designated a UNESCO Biosphere Reserve and Ramsar site. This marine area is an important spawning ground for pilchards, anchovy, round sardinella and shrimps. It is also an important sperm whale area, and contains cold seeps and deep-sea corals.

5. Algerian stretch

This area is a spawning ground for anchovy, and an important area for sperm whales. Deep-sea corals are found here.


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Aegean sea
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7. Carthagian stretch

This area is important for sperm whales, and is a spawning ground for anchovy. Pilchards, round sardinella, blue whiting, and blue and red shrimps, and bottlenose dolphins are found here. The coastline is a nesting and migratory route for sea turtles.

8. Ligurian Sea

The Ligurian Sea contains a frontal system, pushing up deep waters rich in nutrients. This makes the area highly productive, with a diversity of species present. It is an important feeding area for whales and dolphins, with around 13 cetacean species found there. The Mediterranean population of fin whales (Balenoptaera physalus) may be becoming a separate "new" species. Seamounts and deep-sea corals are also present in the area. The Ligurian Sea was designated as a sanctuary under the SPAMI system due to its importance for whales and dolphins, however a marine reserve is required to fully protect the diversity of marine life and habitats there.

9. Central Tyrrhenian Sea

The central Tyrrhenian Sea, between Sardinia and mainland Italy, is an important area for cetacean species including fin and sperm whales and common dolphins. The area has been proposed as an MPA for whales and dolphins. The central Tyrrhenian is a spawning ground for anchovy, and an important area for pelagic fish, such as blue whiting and round sardinella. It is a migratory route for tuna, and an important area for seabirds. The area has a significant concentration of seamounts including the Vavilov Seamount.

10/11. Messina Strait (north and south)

This is an important area both for the huge upwelling system present here, and because it is a migratory route for pelagic fish, whales and dolphins. The area contains a large number of seamounts, including the Marsili Seamount - one of the largest volcanic structures in the Mediterranean, rising 3,000 meters from the seabed. The area is important for sperm whales and fin whales, and is a spawning area for tuna and swordfish.

12. Sicilian Channel

The Sicilian channel between Sicily and Tunisia joins the west and east Mediterranean basins, and hosts many species from both areas. It is a highly productive area and represents a biodiversity hotspot within the Mediterranean. The area is important for sperm whales and fin whales, and the great white shark. Seamounts and deep-sea corals are found close to Sicily, and the Tunisian coastline has turtle nesting beaches, seagrass meadows and sponge communities.

13. Maltese slope

This area, extending from the south of Sicily to include the waters surrounding Malta, is an area of high biodiversity within the Mediterranean. It contains an important area for juvenile anchovy. It is important for common dolphins, and was proposed as a marine protected area by ACCOBAMS. The waters around Malta are also thought to be a breeding area for great white sharks.

14. Medina Ridge

This is an important area containing deep-sea habitats as well as the Medina (Malta) Ridge and a number of seamounts, including the Epicharmos and Archimedes Seamounts.

15. Gulf of Sirte

This area is an important feeding ground for the northern bluefin tuna. The adjacent coastline hosts turtle nesting beaches and seagrass meadows.

16. Libyan head

The coastal and marine area of East Libya has been described as one of the "last ten paradises" of the Mediterranean. The coastal area contains seagrass meadows, making it an important fish nursery area. Turtles nest on the adjacent beaches, and further offshore are seamounts, including the Herodotus Seamount, and cold seeps.

17. Upper Adriatic

The upper Adriatic is an important spawning area for pilchards and anchovy. An adjacent Croatian coastal area has been proposed as a bottlenose dolphin reserve by Tethys Research Institute. The area also hosts a high diversity of fish species including tuna, swordfish and sharks, and seagrass meadows are present along the Croatian and Italian coasts.

18. Pomo/Jabuca Trench

This area is an important spawning area for Mediterranean hake, anchovy and other species, and is vital for many Adriatic fish populations. Due to its importance, trawling was banned from part of this area in 1998. There is also a cold seep area found here.

19. Otranto channel

The marine area off the 'heel' of Italy contains an important site of deep-sea corals, including the rare white coral, Lophelia. The area was recommended for protection by WWF and IUCN, and partially protected in 2006 by a GFCM ban on trawling.

20. Hellenic trench

The Hellenic Trench is an important area for sperm whales, as well as Cuvier's beaked whale, and was recommended for protection by Pelagos, a marine NGO. The area south-west of Crete was recommended as a marine protected area for sperm whales by ACCOBAMS. The area contains deep-sea features including the Calypso Deep, the deepest part of the Mediterranean Sea, and important habitats such as cold seeps and seamounts. The adjacent Greek coastline contains turtle nesting beaches, and a number of coastal protected areas.

21. Olimpi

This area south of Crete contains important deep-sea features in the Olimpi mud field. This includes mud volcanoes, cold seeps and brine pools, and hosts microbial communities.

22. Saronikos Gulf

This is an important area for common dolphins, and is part of a larger proposed MPA for common dolphins (recommended by ACCOBAMS). It is a nursery ground for hake (Merluccius merluccius), one of the most commercially important species in the Mediterranean.

23. Sporades Islands

This area is an important area for Mediterranean monk seals, and is designated as an IUCN protected area, and Greek Natura 2000 site. It is part of a larger proposed MPA for common dolphins, recommended by ACCOBAMS.

24. Thrakiko Pelagos

This area is considered an important nursery ground for many species, including hake, prawn and anchovy. The north Aegean is the last remaining area in the Mediterranean where harbour porpoise are still found. Mediterranean monk seals and Common dolphins are also present. The adjacent coastline is included in the Greek Natura 2000 network.

25. Limnos - Gökçeada

The north Aegean is the last remaining area in the Mediterranean where harbour porpoise are still found. The proposed reserve in the north-east Aegean is an important area for common dolphins, and is part of a larger proposed MPA for common dolphins, recommended by ACCOBAMS. Adjacent coastline is included in the Greek Natura 2000 network.

26. Crete to Turkey

This area contains seamounts, and is an important area for common dolphins (part of a proposed MPA for common dolphins recommended by ACCOBAMS). Adjacent coastal areas are included in the Greek Natura 2000 network, and turtles nest along the adjacent Turkish coastline.

27. Central Levantine Sea

An important deep-sea area containing numerous seamounts and cold seeps. This area is a spawning ground for swordfish, a commercially important species in the Mediterranean.

28. Anaximander Mountains

This area south of Turkey contains the Anaximander Mountains, with seamounts, mud volcanoes and methane cold seeps. The adjacent coastline has a number of sea turtle nesting beaches.

29. Cypriot Channel

The waters between Cyprus and southern Turkey are a spawning ground for bluefin tuna (Thunnus thynnus), frigate tuna (Auxis rochei) and Atlantic black skipjack (Euthynnus alleteratus). The adjacent coastlines of Cyprus and Turkey have nesting beaches of the endangered loggerhead turtle (Caretta caretta) and green turtle (Chelonia mydas).

30. Eratosthenes Seamount

The Eratosthenes seamount is located south of Cyprus and north of the Nile delta, and it rises up from the seafloor to 800m below sea-level. Here rare coral species can be found, such as Caryophyllia calveri and Desmophyllum cristagalli. The area is also important for whales and dolphins, including sperm whales, fin whales, striped and bottlenose dolphins. The coastline of Cyprus has a high concentration of turtle nesting beaches.

31. Phoenician coast

This area is an important migratory route for tuna, and breeding area for loggerhead turtles (Caretta caretta), green turtles (Chelonia mydas) and sharks. The threatened sandtiger shark (Carcharias taurus), gulper shark (Centrophorus granulosus) and angelshark (Squatina squatina) are present in the area. Adjacent coastal waters contain hydrothermal vents, and their associated communities.

32. Nile fan

The deep waters of the Nile fan, with their associated submarine canyons and cold seeps, are areas of high biodiversity. Cold seeps emit mud, gas and fluids and support high microbial diversity. These important and vulnerable seabed features have prompted the GFCM to create a protected area where trawling is banned. The area is also an important feeding ground for fish, including tuna.

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Methodology

The Greenpeace proposal for a regional network of marine reserves has been based on extensive data collected over a number of months relating to the biological diversity and physical oceanography of the Mediterranean.

Once collected, the data (mainly spatial, but some quantitative) was digitised and inputted into a Geographical Information System (GIS) database. This mapping software makes it possible to overlay different data sets and by looking at the resulting 'sandwich' it is then possible to determine areas of high ecological importance and select areas that together might constitute a representative regional network, ensuring that at least 40% of each habitat is included.

Data layers used in mapping our network included:

- Distribution of species (including whales, dolphins, seals and fish)
- Important areas for marine species (such as spawning grounds, nursery areas and nesting beaches)
- Important habitats (such as seamounts and seagrass meadows)
- Sites previously identified as priorities for protection (such as SPAMI and Natura 2000 sites)

To further improve the process, expert advice from regionally based scientists was sought. The network proposed by Greenpeace has been based on the best available information. The next stage is for all the regional stakeholders to consider the proposal and refine the maps on the basis of further information and practical considerations.

The coastal zone

The Greenpeace definition of marine reserves relates to large-scale marine reserves, such as we propose here for the open seas of the Mediterranean. In the coastal zone, a network of marine reserves is just as important, however due to the movement of species and the type of fishing, this needs to be designed on a different scale.

The features of the high seas operate on a larger scale - migration of pelagic species; deep-sea ridges and mountains; and variation in ocean conditions. Similarly, the fishing fleets of the high seas are designed to travel long distances. On the other hand, features of the coastal zone, such as rocky reefs, seagrass meadows, estuaries or turtle nesting beaches, are on a smaller scale. The coastal fishing fleet also operates on a scale of kilometres, rather than hundreds of kilometres. In order to account for this, the large scale marine reserves of the open seas cannot simply be extended into the coastal zone. The coastal marine reserve network needs to be established in consultation with local communities. This will ensure that small-scale features are protected, while equitable access to fishing resources is maintained. The benefits that marine reserves bring for education, research, leisure and tourism will also be shared between coastal communities.

Despite the differences in scale, the same ecological principles apply to establishing a marine reserve network in the coastal zone. These are:

- A network that covers an adequate proportion of the marine area. The proportion considered adequate has been discussed earlier.
- Protection for each habitat type; not only rare, unique or pristine sites, but also examples of common habitats - which are often degraded, but are also often critical habitat for marine species.
- Protection of each type of habitat must cover an adequate proportion of that habitat, and include numerous sites.

Properly applied, a coastal marine reserve network will be supported and enforced by the local community, and will bring benefits within the reserves (such as education, research, recreation and tourism opportunities) and can also benefit small-scale fisheries in surrounding areas. This has been demonstrated by the establishment of a network of small-scale coastal marine reserves in St Lucia, in the Caribbean. There, a network of marine reserves was established covering around 35% of the reef [117]. After three years of protection, the biomass of commercial fish species had tripled within the marine reserves, and doubled over the rest of the reef. After five years of protection, catches outside the marine reserves had increased by 46-90%. [118] Closer to home, a series of marine reserves in Egypt's Red Sea were established in 1995, giving an increase of over 60% in the catch per unit effort of a surrounding fishery after only five years of protection. [119]

To ensure that both the benefits of marine reserves and access to fishing areas are distributed equitably around the coastline, the design of a network must consider social as well as biological factors.

Caring for the rest of the sea

Marine reserves have demonstrated clear benefits for conserving the plants, animals and habitats of the sea, and for the sustainability of the fisheries beyond the boundaries of the reserve. However, the benefits of marine reserves are equally dependent upon or enhanced by ecologically sensible management of the surrounding sea.

This proposal recommends the protection of forty percent of the Mediterranean Sea in marine reserves. In addition, to ensure that the majority of the Sea - the sixty percent outside the reserves - is managed in a sustainable and equitable way, some fundamental changes to the way they are managed are needed.

The current oceans governance regime is based on the principle of "freedom of the seas"; the outdated concept that the high seas (which the Mediterranean is largely comprised of) should be open to all nations to freely exploit. This concept originated in the days when the resources of the ocean were considered inexhaustible, yet today it is clear that this is simply not true. Modern oceans governance needs to fundamentally change to recognise that our oceans resources are finite, and that what we need to strive for instead is freedom for the seas.

The concept of freedom for the seas has its origins in the Mediterranean with Maltese statesman Arvid Pardo. Almost four decades ago, Pardo, then the United Nations Ambassador for Malta, developed the concept of the common heritage of humankind in relation to ocean resources. In his 1971 'Draft Oceans Space Treaty', Pardo argued that all ocean space beyond areas of national jurisdiction - through the water column to the seabed - must be managed in such a way as to ensure that its resources are viewed as part of the common heritage of humankind and its benefits sustainably and equitably shared. So freedom for the seas recognises that there are limits on what can be absorbed by and what can be taken from our oceans, and requires the sustainable and equitable management of the high seas for the benefit of all of humankind, for now and for the future.

Freedom for the seas also means that impacts on the entire ecosystem are taken into account before any activity is allowed to take place, and that precaution lies at the core of the management regime - those who wish to use this global commons are responsible for any harm that they may cause and must minimise the risks of their planned activities on the environment. In addition, it means:

Adoption of ecosystem based management

No species exists in isolation, and fisheries management is fundamentally flawed if it does not account for its impacts on the surrounding habitat. The disastrous results of managing fisheries while destroying their critical breeding habitats through bottom trawling, for example, demonstrates the need to manage ecosystems, not single stocks or species.

Practicing the precautionary principle

Precaution means that a lack of knowledge does not excuse decision-makers from taking action, but rather that they err on the side of caution. To do this, the burden of proof must be placed on those who want to undertake activities such as fishing or coastal development to show that they will not harm the marine environment, before they are allowed to do so. This will encourage sustainable development and fisheries, while ending destructive practices.

Elimination of destructive fishing practices

Fishing practices that clearly fail the test of sustainability must be prohibited. An example is the use of driftnets, which have unacceptably high levels of by-catch and as a result have been banned from the Mediterranean. The ban on driftnets must now be enforced. (See page 17, Driftnets: walls of death)

Elimination of pirate fishing

The management of fisheries and the marine environment is only as good as its enforcement. Illegal, unregulated and unreported (IUU) fishing threatens the marine environment and the livelihoods of those who fish legitimately. Loopholes in fisheries management, lax attitudes allowing the proliferation of flags of convenience and poor enforcement of regulations must be addressed.

Reduction of fishing overcapacity

The continued expansion of fishing capacity presents an obstacle to achieving equitable and sustainable use of marine resources. Fishing capacity must be adjusted to a level that the sea can sustain, and subsidies encouraging over-capacity must be eliminated.

End of pollution

The sea is not a waste dump. Unfortunately the Mediterranean Sea, like most other seas and oceans, has been treated as such. There are many agreements and commitments to protect the Mediterranean from pollution, however, what is needed is a fundamental change in attitude. Out of sight does not mean out of mind, and using the sea as a sewer, trash heap or toxic dumping ground is simply not acceptable.

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4. The Mediterranean - a special political seascape

The Mediterranean - centre of the ancient world and cradle of western civilisation - is as much a region of diversity and cultural identity, as it is one of contrast, conflict and divergence. The sea that lies between builds bridges as much as it divides, while its shores bear the legacy - a remarkable variety of tongues, customs, crafts, currencies, traditions, beliefs, peoples and politics.

Politically, the region lies at the crossroads of Western Europe, the Balkans, the Middle East and North Africa - a bridge between the political East and West, the global North and South, the Western and the Arab worlds, between Judaism, Islam and Christianity, between the European Union (EU) and its neighbours.

European integration has been the political reality for almost forty percent of the citizens of Mediterranean coastal countries. European integration has gone hand in hand with the powerful notions of a social Europe and a strengthened European identity, but has also spurred significant economic growth, with unmistakable consequences for resource use in the Mediterranean.

The European Community (EC) is a Contracting Party to the Barcelona Convention, a regional convention for the protection of Mediterranean marine and coastal environments, which entered into force in 1978. The EC countries make a significant contribution to the workings of this Convention, and various EC Council Decisions have been taken to adopt the Convention and some of its related protocols.

In addition to the EC (as an institution), the other Contracting Parties are Albania, Algeria, Bosnia and Herzegovina, Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Lebanon, Libya, Malta, Monaco, Morocco, Serbia and Montenegro, Slovenia, Spain, Syria, Tunisia and Turkey. Hence the Convention covers the full geographical and cultural spectrum that defines the regional character, from the Middle East to North Africa and Southern Europe.

The structure of the Barcelona Convention, following an ambitious revision in 2002 to bring it into line with the principles of the Rio Declaration and the United Nations Convention on the Law of the Sea (UNCLOS) consists of the revised Convention itself in conjunction with Protocols specifically addressing dumping of waste at sea, emergencies at sea, land based sources of pollution, biodiversity, transboundary movement of hazardous waste and the oil exploration and exploitation.

These instruments are supplemented by a broad array of co-operative agreements such as the Euro-Mediterranean Partnership (Euro-Med) which promulgates the Short and Medium Term Environmental Action Programme (SMAP). In addition to the region wide initiatives the EU has concluded bilateral association agreements with many partner countries under the auspices of Euro-Med.

The need to enforce national and international environmental legislation in the region is considered paramount. There is considerable disparity in the way that enforcement is carried out over the region as a whole, reflecting the different socio-economic conditions and geo-political realities. In addition to this, there is an increasingly urgent need to adopt integrated, ecosystem-based management approaches in the region to ensure that the maintenance of healthy, fully functioning ecosystems is the basis for resource management.

The fact that the majority of the Mediterranean Sea falls beyond the jurisdiction of any country means that international cooperation within the Mediterranean region is a necessity for the management and protection of the Sea. Despite the challenges posed by the diversity of political, social, cultural and economic factors within the region, Mediterranean countries must work together in order to protect the Mediterranean Sea, both coastal waters and high seas.

5. Politics of protection

If governments were as dutiful about honouring agreements as the law-abiding citizens of their countries, the Mediterranean Sea would be a healthier, more diverse and more prosperous sea. Many of the commitments that politicians have signed should have long been implemented, but effectively little or no action has been taken.

Learning to swim - from Barcelona to Jakarta and back

Over a quarter-century ago, in 1976, Mediterranean governments formally recognised the economic, social, health and cultural value of the Mediterranean marine environment. Meeting in Barcelona, they pledged to prevent, abate, combat and to the fullest possible extent eliminate pollution of the Mediterranean Sea and to protect and enhance the marine environment (1976 Barcelona Convention). At the time, public concern over the persecution of many charismatic species and signs of dramatic overuse of the ecosystem services was rising.[120]

Three years later, under the auspices of the 1979 pan-European Convention for the conservation of flora and fauna (Bern Convention), the pledge to protect the Mediterranean environment was extended to apply generally to European species and habitats, [121] recognising their aesthetic, scientific, cultural, recreational, economic and intrinsic value. In the same year, but at an international level, the Convention on Migratory Species (Bonn Convention) introduced strict protection requirements for migratory species such as cetaceans and water birds. Most Mediterranean coastal states adopted the Conventions, albeit often with some delay.

Also in 1979, and once more in response to public dismay, the countries of the European Economic Community (now European Community) adopted the first nature conservation legislation at European Community level - the EU Birds Directive, which required the protection of special protection areas for birds.

Almost a decade and a half later and still faced by the growing decline in species and habitats, [142] the international community, including all Mediterranean coastal states, widened its commitment to the protection of biodiversity, pledging to regulate and manage the use of biological resources regardless of where they occur, with a view to ensuring their conservation and sustainable use (1992 United Nations Convention on Biological Diversity). Meeting three years later, this time in Jakarta, Indonesia, the Parties to the Convention adopted a specific programme of action for the protection of the marine environment - the Jakarta Mandate for Marine and Coastal Biodiversity (Decision VII/5).

It had been a long journey from the early commitments made in Barcelona to those signed in Jakarta. Importantly, the Convention for Biological Diversity contained the first international commitment to establish national networks of protected areas, as well as guidelines for their selection, establishment and management of sites. The European Community emulated this important development by laying the legal foundations for the establishment of an EU-wide network of protected areas in the 1992 EU Habitats Directive, known as Natura 2000. Sites have to be designated on land and at sea.

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The list of commitments is long

Over the years the list of commitments has further grown. Mediterranean coastal states, provided they have signed relevant agreements, are now bound by at least the following commitments: [F]

- since 1989, to take steps in accordance with the Bern Convention to designate Areas of Special Conservation Interest (ASCIs) to establish the pan-European network of protected areas known as EMERALD network, and to ensure that the necessary and appropriate conservation measures are taken for each area;

- since 1992, to establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity, in accordance with the Convention on Biological Diversity (CBD);

- since 1995, to protect, preserve and manage in a sustainable and environmentally sound way areas of particular natural or cultural value, notably by the establishment of Specially Protected Areas of Mediterranean Importance (SPAMIs), selecting representative types of coastal and marine ecosystems of adequate size to ensure their long-term viability and to maintain their biological diversity, in accordance with the amended SPA Protocol to the Barcelona Convention;

- since 1996, to co-operate to create and maintain a network of specially protected areas to conserve cetaceans, comprising areas which serve as cetacean habitat and/or areas which provide important food resources for them, in accordance with the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS);

- since 2002 and in accordance with the Plan of Implementation of the World Summit for Sustainable Development (WSSD), to establish marine protected areas consistent with international law and based on scientific information, including representative networks by 2012 and time/area closures for the protection of nursery grounds and periods; and

- since 2004, echoing the WSSD target, to establish a global network of comprehensive, effectively managed, and ecologically representative national and regional systems of protected areas by 2012, collectively contributing to achieving the 2010 target to significantly reduce the current rate of biodiversity loss, in accordance with CBD Decision VII/28.

In addition, Cyprus, France, Greece, Italy, Malta, Slovenia and Spain, are under the obligation to establish the Natura 2000 network - made up of Special Protection Areas for wild birds protected in accordance with the 1979 Birds Directive, and of Special Conservation Areas protected in accordance with the 1992 Habitats Directive.

EU Member States are also bound by the EU's Common Fisheries Policy (CFP), which makes provision for the establishment of 'zones and/or periods in which fishing activities are prohibited or restricted including for the protection of spawning and nursery areas' (Regulation 2371/2002), as well as specific measures to reduce environmental impacts and adopt recovery or management plans for struggling fish stocks. CFP measures apply to EU waters and EU vessels, wherever these may operate. Fishing can thus be controlled or prohibited for conservation purposes in zones or during periods throughout the waters of Member States and in areas falling outside EU waters, ie in areas of the high seas and fishing zones of non-EU countries.

[F] As by convention, the dates provided are those of the adoption rather than the entering into force of the agreement. In the case of ACCOBAMS for instance, the agreement was drawn up in 1996 but did not come into effect until 2001. In accordance with Recommendations 14, 15 and 16 (1989) and Resolution No. 3 (1996) of the Bern Convention

So, are we building paper parks?

Despite the sixteen odd years since the first pledge to protect areas in the marine environment was made, Mediterranean countries have, to date, protected less than 5% of the sea surface. Unfortunately, the majority of this area is afforded very little actual protection - for example the Ligurian Sea Sanctuary, which makes up more than half of the existing protected area within the Mediterranean, was established for the protection of cetaceans, but does not protect them against threats such as fishing.

Perhaps the most thorough assessment of the distribution and state of inshore habitats has been spurred by the obligation to select Natura 2000 sites under the EU Birds and Habitats Directives. While management plans are in preparation for some Natura 2000 sites, their full protection has still not been secured.

Indeed, the EU Member States have utterly failed to complete the network by the legal deadline of 1998 - eight years ago. Unlike international agreements, EU law provides the possibility of litigation against non-compliant Member States. In the face of at least 23 Court judgements on the Birds and Habitats Directives since the beginning of 1999 (CELEX), involving amongst others France, Italy, Spain and Greece, implementation has somewhat improved, but is still a long way from completion.

While most of the judgements deal with cases of insufficient implementation of the Directives in the terrestrial environment, the state of implementation in the marine environment is even further behind schedule. Overall the number of offences is an indication of the ease with which governments shun political agreements. To provide new momentum - and perhaps to try and legitimise the lack of political action - EU Member States have recently been set themselves the new aspirational deadline of completing Natura 2000 in the marine environment by 2008.

Lack of scientific data is frequently given as a reason to explain insufficient progress in identifying areas for protection. It is evident, however, that a lack of political will and recognition of the importance of our seas has allowed this ignorance to persist. What's more, enforcement of site protection is often too lax and a confusion of competencies in the marine environment encourages competent authorities to deflect responsibility and delay action.

Who is responsible?

Ultimately responsible for meeting the commitments for marine protection are the governments of the Mediterranean coastal states. All of them have the competency to protect the waters under their jurisdiction. For the large section of high seas, they can and must take collective responsibility within the context of the General Fisheries Commission for the Mediterranean, the Barcelona Convention and the United Nations Convention on the Law of the Sea (UNCLOS).

Protecting areas in European Community waters from the impacts of fishing, currently seems to require action from the Member States, the European Commission and the EU Council of Fisheries Ministers respectively.

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This is because the European Community has assumed exclusive competence to act in relation to fisheries management. As a consequence, a Member State can only take unilateral measures to prohibit all or certain types of fishing in the 0-12 nautical mile inshore waters, and where this is expressly provided for under the EU's Common Fisheries Policy. Such measures must be compatible with and no less stringent than EU measures.

Where measures are liable to affect vessels of another Member State (i.e. those applying in the 6-12 nm area), the Member State must first notified the measures with the European Commission, other Member States and to Regional Advisory Councils. The Commission can then confirm, cancel or amend the measure.

The management of fishing in the wider area of the Mediterranean Sea is overseen by the General Fisheries Commission for the Mediterranean (GFCM), established in 1949. The GFCM coordinates the assessment and management of shared stocks, and has taken an increasingly active role in:

i) promoting the development, conservation and management of living marine resources more widely;
ii) formulating and recommendation of conservation measures; and
iii) encouraging joint training and research projects.

All Mediterranean coastal states are members of the GFCM and participate in the decision-making of the Commission and its Committees.

A glimmer of hope?

As early as 1975, regional co-operation in protecting the Mediterranean Sea was given a boost when 21 coastal states and the European Community (then European Economic Community) signed the Mediterranean Action Plan drawn up under the auspices of the United Nations Environment Programme (UNEP/MAP). The stated aim was "to meet the challenges of protecting the marine and coastal environment while boosting regional and national plans to achieve sustainable development".

MAP today finds its legal muscle in the Barcelona Convention and relies largely on the Convention's six Protocols for implementation. The Protocols, some of which have yet to enter into force, cover: i) the protection of Specially Protected Areas and biodiversity, ii) the dumping of waste, iii) the prevention of pollution by hazardous substances in cases of emergency, iv) land-based sources of pollution, v) pollution resulting from the exploration and exploitation of the Continental Shelf and the seabed and its subsoil, and vi) the transboundary movement of hazardous wastes and their disposal. MAP was reviewed and updated in 1996, and continues to facilitate and strengthen implementation of the Barcelona Convention by promoting the joint programming and financing of action to protect the marine environment.

Since 1975, MAP has, for instance, facilitated a programme for the assessment and control of pollution in the Mediterranean Region (MED POL), which has gradually shifted its original focus on assessment towards taking action to effectively reduce marine pollution from land-based sources. In future, MAP and related bodies established under the Barcelona Convention may come to facilitate regional implementation of new international and regional legal instruments, including those, if any, adopted by the European Community.

Co-operation and co-ordination in the region - or at least amongst those seven coastal states that belong to the European Union - is also greatly improved by the workings of the European Community. The Community's common fisheries and nature conservation policies promote common standards and joint and cross-boarder enforcement. This, on the whole, has benefits for the enforcement of environmental standards, but in relation to the Common Fisheries Policy has also led to adverse market pressures and competition in the fisheries sector.

In recognising the distinctness of Mediterranean fisheries and the inadequacy of the current fisheries management regime, the European Commission has put forward a new proposal for the sustainable exploitation of fishery resources in the Mediterranean Sea (COM(2003)589). This is an attempt to bring various technical aspects of fishing in line with the Common Fisheries Policy (e.g. gear size), and more importantly to effectively address the specific causes of stock decline in the Mediterranean.

If discussions amongst EU Member States continue along the current path, Member States seem set to adopt provisions that would require the establishment of fisheries protection areas, specifically for the protection of areas important for fish such as their nursery grounds. This would be an important but seemingly isolated step in the right direction, as most of the rest of the Commission's safeguards for the protection of the Mediterranean Sea contained in the original proposal for the Mediterranean Regulation have been eroded away by the Mediterranean Fisheries Ministers. For those who follow the negotiations, the question begs: what is our Ministers' understanding of 'sustainable exploitation of fishery resources'? Unless there is a sea change in attitudes away from national protectionism and political collusion with the fishing sector - there will be no glimmer of hope for the Mediterranean.

In a separate initiative, the European Commission has adopted a European Strategy and related proposal for a new EU law for the protection of the marine environment. This new marine directive holds the promise of strengthening the legal protection of the Mediterranean Sea. However, if it is to meet its ambition - to create for the first time a

single EU mechanism to control the impacts of all maritime industries - it needs to be considerably strengthened by the European Parliament and Council of Ministers, which have the responsibility and opportunity to change and improve the European Commission's draft.

In other words, the governments of the EU Mediterranean coastal states, together with their northern counterparts, must prove their commitment to regional marine protection by making use of this opportunity to negotiate strong EU legislation for the protection of the Mediterranean and other European seas. In building on the current proposal, Mediterranean leaders have a real chance to go beyond existing provisions for protected areas and create provisions for a network of fully protected marine reserves.

The directive, once it is adopted, will be implemented at a regional level, identifying a number of ecological management sub-regions within the Mediterranean basin and possibly involving existing bodies, such as those established under the Barcelona Convention, in the co-ordination and implementation of conservation measures.

In addition to MAP and activities initiated by the European Community, a further political process has created a platform for improved co-operation in the region, including on environmental issues. The Euro-Mediterranean Partnership was established in 1995, between EU Member States and countries from the southern and eastern Mediterranean. Although the agreement is principally aimed at the establishment of a free trade zone by 2010, it contains an aspect of environmental sustainability. To this end countries have agreed to a Short and Medium-term Priority Environmental Action Programme (SMAP), which provides for action and funding in the areas of integrated water management, waste management, the identification and protection of hot spots of pollution and threatened biodiversity, Integrated Coastal Zone Management (ICZM), and the combating of desertification. Celebrating its tenth year of existence in 2005, the Euro-Med Partnership is currently reviewing its priorities for the future.

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6. Conclusions

There is no shortage of international and regional commitments and agreements and scientific advice declaring the need for a network of marine reserves. What is lacking is the political will to make this a reality. This must change, and Greenpeace believes that the people of the Mediterranean will play a crucial role in bringing this about.

Imagine a Mediterranean abundant with life; clean, healthy and productive. Marine reserves where your children and your children's children can see the Sea in it's full beauty and abundance - the way it is supposed to be. No longer should we accept that the Mediterranean is over-exploited and treated as a waste dump. It is not too late to act - and there is no excuse for a failure to act.

We need to tell our politicians - local, regional and international - that this is Our Sea, and we must protect it. We need the laws to make it possible for large-scale marine reserves to be created on the high seas of the Mediterranean. And we need a network of marine reserves to be created - starting not tomorrow, but starting today.

All the countries of the Mediterranean are parties to the Convention on Biological Diversity (CBD), with the aim of halting the loss of biodiversity on land and in the seas and oceans. Greenpeace believes that the best pathway to honour the CBD commitment to protect marine biodiversity is to create an implementing system under the United Nations Convention on the Law of the Sea, UNCLOS. The laws created must allow for full protection from damaging activities, and provide enforcement mechanisms.

Promising steps towards a network of marine reserves have already been taken in the Mediterranean; the Barcelona Convention creates a regional agreement under which marine protected areas can be created within and beyond national jurisdiction. The European Union, which includes seven of the Mediterranean countries as its members and has regional partnerships with non-member countries, has made progress towards creating a network of marine protected areas.

However the steps taken to date fall far short of what is needed. The Ligurian Sea Sanctuary, the first High Seas "specially Protected Area of Mediterranean Interest" created under the Barcelona convention covers just over 3% of the waters of the Mediterranean, but is designed to protect only whales and dolphins, and does not restrict fisheries beyond pre-existing measures such as a ban on driftnets. The Natura 2000 network, being created within European Union countries, covers less than 1% of the waters of the Mediterranean.

Internationally, the European Union has taken a leading role in discussions on creating a network of marine protected areas on the high seas. At a recent meeting under the CBD process, the EU called for an interim goal of creating 5-10 high seas marine protected areas by 2008. Such calls are meaningless unless there is the political will to begin this process in their own seas - the Mediterranean Sea is a perfect place to start.

Mediterranean countries must work together to protect the Mediterranean, our shared resource and treasure.

It's Our Sea - let's protect it.

List of abbreviations

ACCOBAMS	Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area www.accobams.org
ASCI	Areas of Special Conservation Interest, under the Bern Convention on Conservation of European Wildlife and Natural Habitats.
CBD	Convention on Biological Diversity www.biodiv.org
CFP	Common Fisheries Policy of the European Union
EC	European Community
EEA	European Environment Agency www.eea.eu.int
EU	European Union www.europa.eu.int
Euro-Med	Euro-Mediterranean Partnership (Barcelona Process), between the EU and other Mediterranean countries. http://europa.eu.int/comm/external_relations/euromed
FAO	Food And Agriculture Organization Of The United Nations www.fao.org
GFCM	General Fisheries Commission for the Mediterranean www.fao.org/fi/body/rfb/GFCM/gfcm_home.htm
IMO	International Maritime Organization www.imo.org
ICCAT	International Commission for the Conservation of Atlantic Tunas www.iccat.es
IPCC	Intergovernmental Panel on Climate Change www.ipcc.ch
IUCN	The World Conservation Union www.iucn.org
IUU	illegal, unregulated and unreported fishing
MAP	(or UNEP/MAP) Mediterranean Action Plan, developed under the United Nations Environmen Programme www.unepmap.org
MARPOL	the International Convention for the Prevention of Marine Pollution from Ships
MCS	monitoring, control and surveillance
MED POL	The Programme for the Assessment and Control of Pollution in the Mediterranean region
MPA	Marine Protected Area
PCB	Polychlorinated biphenyl
POP	persistent organic pollutant
RCEP	Royal Commission on Environmental Pollution (UK) www.rcep.org.uk
SMAP	Short and Medium Term Environmental Action Programme (of Euro-Med)
SPA	Specially Protected areas, under the Barcelona Convention "Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean"
SPAMI	Specially Protected Areas of Mediterranean Importance, listed under the above protocol of the Barcelona Convention
TAC	total allowable catch
UK	United Kingdom
UN	The United Nations www.un.org
UNCLOS	United Nations Convention on the Law of the Sea www.un.org/depts/los
UNEP	United Nations Environment Programme www.unep.org
US	United States
WSSD	World Summit on Sustainable Development www.johannesburgsummit.org
WTO	World Trade Organisation www.wto.org
WWF	World Wide Fund for Nature, formerly known as the World Wildlife Fund www.panda.org

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122 In accordance with Recommendations 14, 15 and 16 (1989) and Resolution No. 3 (1996) of the Bern Convention

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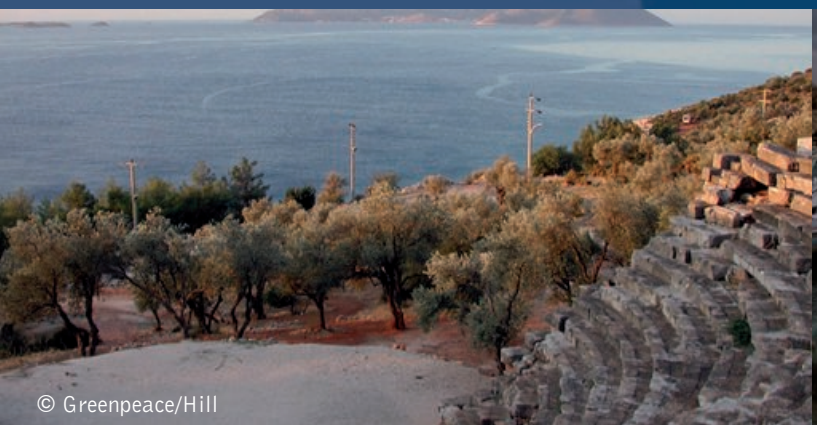

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