

The Pelagos Sanctuary for Mediterranean marine mammals

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ABSTRACT

1. In February 2002, France, Italy and Monaco agreed to establish an international sanctuary for Mediterranean marine mammals. The resulting Pelagos Sanctuary encompasses over 87 500 km² of the north-western Mediterranean Sea, extending between south-eastern France, Monaco, north-western Italy and northern Sardinia, and surrounding Corsica and the Tuscan Archipelago.

2. The Pelagos Sanctuary illustrates how the tenets of Marine Protected Area (MPA) design can be reconciled with the dynamic nature of oceanic systems, because its spatial scale was defined by oceanographic and ecological considerations, specifically the location of the Ligurian permanent frontal system.

3. By expanding protective measures beyond national waters, the Pelagos Sanctuary also sets a precedent for the implementation of pelagic protected areas in the high seas. The Pelagos Sanctuary will contribute to the conservation of the Mediterranean Sea at two scales: (i) locally, by protecting important cetacean foraging and breeding grounds in the Ligurian Sea, and by providing 'umbrella' protection to other marine predators in this area; and (ii) regionally, by empowering other conservation measures, such as the Specially Protected Areas Protocol of the Barcelona Convention and the wider goals of the Agreement on the Conservation of Cetaceans of the Black and Mediterranean Seas (ACCOBAMS).

4. However, because few cetacean species are resident within the Sanctuary, their effective long-term conservation will require large-scale management and coordinated monitoring throughout the Mediterranean basin.

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INTRODUCTION

During the past decades, the concept of Marine Protected Areas (MPAs) has gained considerable favour worldwide as a tool for the conservation of endangered marine species and their habitats (Agardy, 1997, 2001), including upper-trophic predators such as marine mammals (Hooker and Gerber, 2004). Initially, spatially explicit designations for marine mammal conservation were introduced to protect pinniped haul-out sites on land (Reeves, 2000). Eventually, MPAs were established to protect important aquatic habitats, including calving grounds and foraging areas (Hoyt, 2005). The charismatic value of marine mammals in the public arena, combined with the widely diffused perception of their threatened status, eventually led to the establishment of large-scale sanctuaries encompassing the entire territorial waters and exclusive economic zones (EEZs) of individual nations, such as Ireland in 1991 (Berrow and Rogan, 1994) and Mexico in 2002, as declared by officials of the Mexican government at the 54th Meeting of the International Whaling Commission (IWC). Such designations, however, have rarely been driven by explicit conservation goals and have yet to be followed up with articulated management planning.

International cetacean sanctuaries encompassing entire ocean basins, such as the 1979 Indian Ocean Sanctuary and the 1994 Southern Ocean Sanctuary, were established under the auspices of the IWC exclusively to protect large whale populations from commercial harvest by parties to the 1946 International Convention on the Regulation of Whaling. Under this convention, the IWC may adopt regulations with respect to the conservation and utilization of whale resources, fixing *inter alia* 'open and closed waters, including the designation of sanctuary areas' (Birnie, 1985; Maffei, 1996). Reconciling the effective conservation of cetacean populations in the high seas with ongoing 'scientific whaling' and broader ecosystem-level considerations remain major challenges to existing IWC Sanctuaries (Gerber *et al.*, 2005; Zacharias *et al.*, 2006).

Increasingly, MPAs designed for the specific goal of conserving marine mammals and their habitats have developed into more complex regimes, involving the implementation of ecosystem-level management schemes capable of addressing the broader range of threats affecting these populations. A variety of species throughout the globe, including odontocete and mysticete cetaceans, pinnipeds and sirenians, have already benefited from such protective measures (for detailed reviews, see Reeves (2000), Hooker and Gerber (2004) and Hoyt (2005)). Currently, regional plans to establish MPA networks targeting protected species and habitats are moving forward. Yet, it is increasingly apparent that the effective management of marine mammals and other highly mobile species will require approaches extending beyond national EEZs. While establishing networks of reserves on the high seas will be a major challenge under current international law, there is growing hope that the international community will make this vision a reality in the near future (Norse *et al.*, 2005). The recent establishment of an international sanctuary that includes a high seas component for cetaceans in the western Mediterranean provides a valuable illustration of how the current global effort to promote MPA networks in regional seas can be advanced.

In 1991, a grassroots effort originating in Italy stimulated a proposal for the establishment of a large MPA in the north-western Mediterranean Sea to protect cetacean populations within the territorial waters of France, Italy and Monaco, and in the adjacent international waters. This idea eventually led to a tripartite agreement on the creation of the 'International Sanctuary for the Protection of Mediterranean Marine Mammals', also known as the 'Pelagos Sanctuary'. The impetus for the Sanctuary proposal was threefold: (i) recently acquired knowledge of the presence of important populations of cetaceans in the area; (ii) awareness of the existence of serious threats to these populations; and (iii) a lack of legal instruments to protect the Mediterranean high seas beyond the 12 nautical mile (22.3 km) buffer provided by the national territorial seas, where most of the habitats of these cetacean populations lie.

The aim of this paper is to provide a historical perspective of the process and the lessons learned from the establishment of the Pelagos Sanctuary. More specifically, it reviews the ideas and intentions that spawned the Sanctuary, describes the processes that led to its establishment, discusses the management plans for the

Sanctuary, and considers its implications for the development of larger MPA networks in the Mediterranean Sea.

OCEANOGRAPHIC AND ECOLOGICAL FEATURES OF THE WESTERN LIGURIAN SEA

The productivity of the Western Mediterranean is notoriously spatially heterogeneous, and influenced by the effects of currents, the input of freshwater river runoff, and the mixing by localized winds steered by topographic features (Estrada, 1996; Salat, 1996; Agostini and Bakun, 2002; Arnau *et al.*, 2004). While the Mediterranean has long been considered an oligotrophic sea with low-nutrients and ocean productivity (e.g. Margalef, 1984, 1985), satellite-derived Sea-viewing Wide Field-of-view Sensor (SeaWiFS) imagery has revealed the existence of several regions of elevated chlorophyll *a* concentration (Chl *a*), a metric of the abundance of phytoplankton standing stocks in the euphotic zone of the water column (Figure 1). In addition to vast oligotrophic regions (Chl *a* < 0.1 mg m⁻³) in the Eastern Mediterranean basin, waters of intermediate (mesotrophic, Chl *a*: 0.1–0.3 mg m⁻³) and high (eutrophic, Chl *a*: 0.3–1 mg m⁻³) productivity are found in the Aegean Sea, the Adriatic Sea and the north-west Mediterranean off the coasts of Spain and

Summer (June - September) SeaWiFS Composite (1998 -2005)

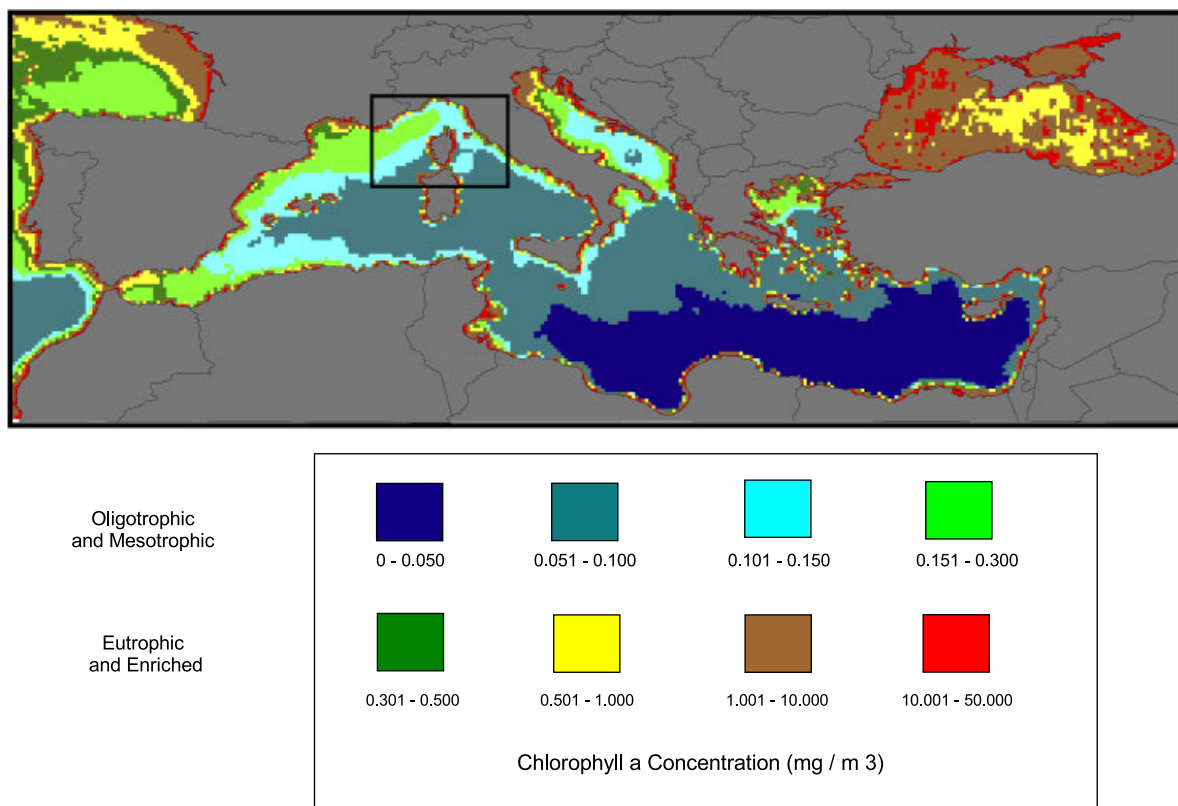


Figure 1. Maximum remotely sensed chlorophyll *a* concentration in the Mediterranean Sea during summer (June–September, 1998–2005) colour-coded to highlight different productivity domains (Kahru and Mitchell, 2000). The box highlights the Corsican–Ligurian–Provençal basin, the site of the Pelagos Sanctuary (Figure 2). The dominant anticlockwise circulation around the Ligurian Sea is evident by the juxtaposition of ‘green’ and ‘blue’ waters across a frontal system. This figure is available in colour online at www.interscience.wiley.com/journal/aqc

France (Figure 1). Enriched coastal waters ($\text{Chl } a > 1 \text{ mg m}^{-3}$) occur along the margin of the entire basin, and eutrophic waters ($1.0 > \text{Chl } a > 0.3 \text{ mg m}^{-3}$) are particularly evident within three enclaves in the western Mediterranean: the Alborán Sea, the Ebro Delta, and the Gulf of Lions (Jacques, 1989; Estrada, 1996; Arnau *et al.*, 2004).

Farther east, the Ligurian Sea (Figure 2) is characterized by high levels of primary productivity, caused by the interplay of climatic, oceanographic and physiographic factors. A dominant cyclonic (counter-clockwise) current, flowing north along Corsica and Tuscany and thence hugging the coast of Liguria and mainland France in a westerly direction, creates a permanent frontal system which separates coastal and offshore waters (Stocchino and Testoni, 1977). Intense biological activity is generated along this water mass boundary by the enhanced productivity and retention associated with this frontal system (Goffart *et al.*, 1995). Such phenomena are intermittently and seasonally reinforced by vertical mixing and coastal upwelling, generated by the prevailing north-westerly wind ('mistral'), which pumps deep nutrients and other organic substances contributed by rivers, most notably the Rhone, into the euphotic zone, where they fertilize growing phytoplankton populations (Gonella *et al.*, 1977; Arnau *et al.*, 2004). Consequent high levels of primary production, with spring-time $\text{Chl } a$ concentrations $> 10 \text{ mg m}^{-3}$ (Jacques, 1989), support a conspicuous biomass of highly diversified zooplankton fauna, including gelatinous macrozooplankton and swarming *Meganyctiphanes norvegica* euphausiid crustaceans (krill) (Sardou *et al.*, 1996). Zooplankton concentrations, in turn, attract to the area various upper-trophic level predators, including krill-eating, fish-eating and squid-eating cetaceans (Forcada *et al.*, 1995, 1996; Gordon *et al.*, 2000).

The Pelagos Sanctuary encompasses over $87\,500 \text{ km}^2$ of the north-western Mediterranean Sea, between south-eastern France, Monaco, north-western Italy and northern Sardinia, and surrounding Corsica and the Tuscan Archipelago (Figure 2). The Sanctuary includes the Ligurian Sea and parts of the Corsican and Tyrrhenian Seas, and is composed of the internal maritime (15% of its extent) and territorial waters (32%) of France, Monaco and Italy, as well as the adjacent high seas (53%). The continental shelf (200-m isobath)

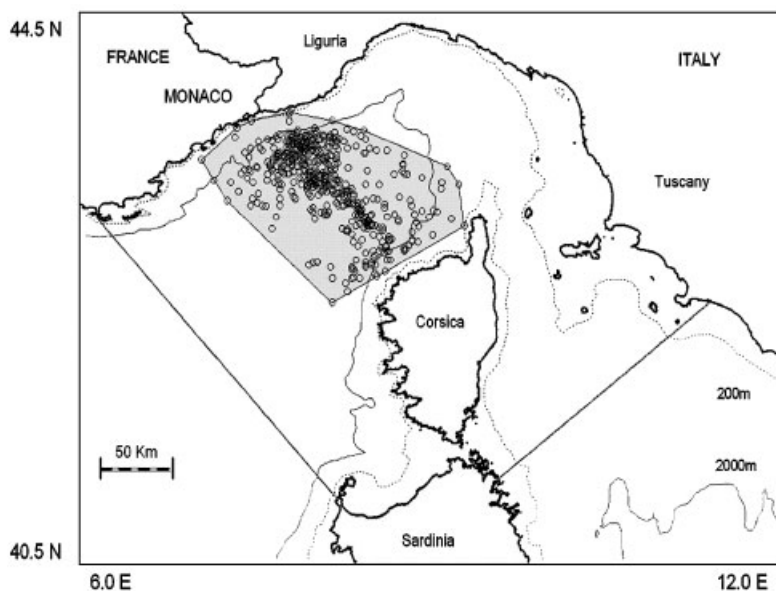


Figure 2. Location of the Pelagos Sanctuary showing the extent of the shelf (200 m depth contour) and the slope (2000 m depth contour). The area of fin whale concentrations (grey shaded area) was defined using a minimum convex polygon around 502 sightings north of Corsica, compiled during summer (2 June–9 October) surveys in 1990–1999 (Panigada *et al.*, 2005).

is wide within the Sanctuary only where it abuts limited coastal plains; it is mostly narrow and dissected by steep, deeply cut submarine canyons. The western offshore portion of the Sanctuary consists of a uniform abyssal plain 2500–2700 m deep, offshore of the continental slope, while east of Corsica the sea floor is shallower (1600–1700 m) and uneven, with a series of islets and a deep-water channel bisecting the continental shelf.

The Pelagos Sanctuary contains deep-water and shelf-slope habitats suitable for the breeding and foraging needs of the entire complement of cetacean species found in the Western Mediterranean Sea (Notarbartolo di Sciara, 1994; Beaubrun, 1995). The two most abundant cetaceans in the Sanctuary, the fin whale *Balaenoptera physalus* and striped dolphin *Stenella coeruleoalba*, account for 20% and 60% of all historical (1986–1989) summer-time cetacean sightings (Notarbartolo di Sciara, 1994). About 3500 fin whales are found in the western Mediterranean, and a considerable proportion of these concentrate in the Corsican–Ligurian–Provençal basin in summer to feed on krill (Forcada *et al.*, 1996), though they can be observed in this area all the year round (Notarbartolo di Sciara *et al.*, 2003). Striped dolphins are the most abundant cetaceans throughout Mediterranean offshore waters (Aguilar, 2000), with an estimated summer population size of 20 000–30 000 within the Sanctuary (Forcada *et al.*, 1995).

Six other species are a regular component of the Sanctuary's diverse cetacean fauna: deep-diving squid-eating odontocetes such as sperm whales *Physeter macrocephalus*, long-finned pilot whales *Globicephala melas* and Risso's dolphins *Grampus griseus*, frequenting both offshore and slope waters (Di-Méglio *et al.*, 1999; Gordon *et al.*, 2000), and Cuvier's beaked whales *Ziphius cavirostris*, favouring specific slope areas overlying submarine canyons (Nani *et al.*, 1999); now rare and endangered short-beaked common dolphins *Delphinus delphis*, found both in coastal and offshore waters particularly in the southern part of the Sanctuary (Bearzi *et al.*, 2003); and predominantly coastal bottlenose dolphins *Tursiops truncatus*, frequenting mostly the shelf areas surrounding Corsica, northern Sardinia, the Tuscan Archipelago and continental France (Nuti *et al.*, 2004; Ripoll *et al.*, 2004).

This faunal diversity coexists with very high levels of human pressure (European Environment Agency, 1999). Most of the coastal areas bordering on the Sanctuary, particularly on the mainland, are heavily populated with large and medium-sized coastal cities, ports of major commercial and military importance and industrial areas. Furthermore, the entire Sanctuary coastal zone contains major tourism destinations, thereby being subject to considerable added human pressure, including whale-watching tours, ferry traffic and coastal runoff, especially during the summer months. As a consequence, diverse human activities pose actual and potential threats to cetacean populations in the Sanctuary (Table 1).

HISTORICAL CONTEXT

As early as 1899 Albert 1st of Monaco, a pioneer of oceanography, commented that he was more likely to sight cetaceans from the windows of his palace than during dedicated cruises to the Arctic seas (Albert of Monaco, 1899). The notion of dense cetacean concentrations in that portion of the Mediterranean, however, was lost in the following century, when mainstream ecological knowledge asserted that the generalized oligotrophy of Mediterranean offshore waters, with no appreciable upwelling and low primary productivity (e.g. Margalef, 1984, 1985), could not support significant resident populations of upper-trophic level marine predators such as whales (Vinciguerra, 1926).

The first research expeditions exclusively devoted to cetacean population ecology in the Mediterranean during the late 1980s (e.g. Notarbartolo di Sciara *et al.*, 1993), revealed the presence of important cetacean habitats and populations within a wide marine area between Corsica and the continental coasts of France and Italy. Dedicated cruises conducted between 1986 and 1989 described the distribution and abundance of cetaceans in the waters surrounding Italy, and highlighted the importance of the western Ligurian and Corsican seas for these species. Sighting rates of all cetaceans in this area were twice the overall average for

Table 1. Threats and impacts on cetaceans in the Pelagos Sanctuary

Threat	Actual/ potential	Types of impact	Metrics to quantify trends	Species affected	Appropriateness of Pelagos Sanctuary to address impacts	References
Vessel noise	A	Short-term habitat degradation causing small-scale redistribution	Distribution	All	High (traffic lanes, prohibition of motor racing and military exercises)	Lusseau, 2003 Bejder <i>et al.</i> , 2006
Vessel collision	A	Direct mortality	Population size, mortality levels	Fin whale, sperm whale	High (traffic lanes and other mitigation measures)	Panigada <i>et al.</i> , 2006
Fisheries	A	Direct mortality through bycatch	Population size	Striped dolphin, sperm whale, long-finned pilot whale, Risso's dolphin, Cuvier's beaked whale, bottlenose dolphin	High	Notarbartolo di Sciara, 1990 Silvani <i>et al.</i> , 1999
	A	Direct mortality from competition with fisheries for demersal prey	Population size	Bottlenose dolphin	High	Bearzi, 2002 Lauriano <i>et al.</i> , 2004
	P	Depletion of food causing medium-scale redistribution	Population size, distribution	Bottlenose dolphin, common dolphin	High	Bearzi <i>et al.</i> , 2006
Whale-watching	P	Short-term habitat degradation causing small-scale redistribution	Distribution	Fin whale	Very high	Notarbartolo di Sciara, 1995 Jahoda <i>et al.</i> , 2003

Pollution	A	Long-term habitat degradation causing mortality, health problems, reproductive disruption	Population size, reproductive parameters	All	Low	Marsili and Focardi, 1996
Coastal development	A	Long-term habitat degradation causing medium-scale redistribution	Distribution	Mostly bottlenose dolphin	Low	Kemp, 1996
Military sonar	A	Direct mortality	Population size	Cuvier's beaked whale, Risso's dolphin, common dolphin	Very high	Jepson <i>et al.</i> , 2003 Fernández <i>et al.</i> , 2004
Seismic exploration	A	Short-term habitat degradation causing redistribution	Distribution	Cuvier's beaked whale, long-finned pilot whale	Very high	Rendell and Gordon, 1999
Global change	P	Short-term habitat degradation causing redistribution	Distribution	All	Very high	Richardson <i>et al.</i> , 1995
		Long-term habitat degradation causing large-scale redistribution	Population size	All	Insignificant	Learmonth <i>et al.</i> , 1996

the Italian seas, and four times the mean for the adjacent Tyrrhenian waters (Notarbartolo di Sciara *et al.*, 1993). Additional line-transect surveys of fin whales and striped dolphins in the western Mediterranean in the summer of 1991 documented important concentrations of both species in the Corsican–Ligurian–Provençal basin (Forcada *et al.*, 1994, 1996). The discovery that Mediterranean fin whales (Bérubé *et al.*, 1998), striped (Gaspari *et al.*, 2004), bottlenose (Natoli *et al.*, 2003), and common dolphins (Natoli *et al.*, 2004) are genetically distinct from their Atlantic conspecifics emphasized the conservation significance of the Ligurian Sea, where large cetacean populations disjunct from those in the Atlantic Ocean concentrate.

In those same years, awareness concerning the extent and intensity of human activities in that area, notably fisheries but also navigation and transportation of hazardous substances, highlighted the serious threats to marine biodiversity. Pelagic driftnet fishing for swordfish, *Xiphias gladius*, had developed rapidly in the Mediterranean. This was particularly true in Italy, where in the late 1980s over 700 vessels were licensed to use driftnets, and scores of such boats from southern Italy, each of them with nets averaging 20 km in length, converged in summer on the rich Ligurian Sea fishing grounds (Notarbartolo di Sciara, 1990). This fishery was known to cause high levels of accidental mortality in at least six cetacean species found in the area (Notarbartolo di Sciara, 1990), which was underscored by the unusually high number of cetacean carcasses, bearing telltale marks of nets, found floating at sea or beached along the coast of western Liguria (Podestà and Magnaghi, 1989). Such circumstances were given very high visibility by the national and international media, partly in response to the global moratorium on large-scale pelagic driftnet fishing on the high seas called for by UN Res. 44/225 of December 1989 (Scovazzi, 1998). Strong pressure was thus exerted on the Italian government to restrain driftnet fishing effort in the area, both at the national (e.g. by NGOs such as ENPA, WWF, Greenpeace, Europe Conservation and Marevivo, and by the Rotary Club; by the judiciary in Liguria, where driftnets were confiscated in 1989 and 1990; and by members of the Italian Parliament) and at the international levels (e.g. by French NGOs such as ‘SOS Grand Bleu’, and by the US government).

The Italian government was eventually spurred into action by rulings in 1998 and 1990 by the higher Italian courts, and established a driftnet-free zone in a portion of the Ligurian Sea in 1990, wherein no Italian vessels, except a small number of local boats, were allowed to fish with this gear. Though the zone failed to include most of the cetacean habitat to be protected, it was legally significant because it discouraged distant vessels from fishing there. It was also significant politically, given that it introduced for the first time in the Mediterranean the notion of closing an area to fishing with the aim of protecting cetaceans. The struggle between driftnet fisheries and environmental concerns continued in the following decades, and is still alive today. However, after years of institutional partiality towards short-term fishing interests, the tide eventually turned in favour of more farsighted environmental concerns, and led to decisions by the European Commission first to limit the maximum net length per boat to 2.5 km in 1992, and later to ban driftnets altogether from European vessels as of 1 January 2002.

In addition to fishing, other major impacts deriving from human activities at sea likely to affect cetaceans had become evident in the late 1980s and early 1990s. Increasing maritime traffic, including offshore motorboat races, high-speed passenger vessels, pleasure craft, naval ships and an expanding commercial whale-watching industry, clearly carried the risk of potential disturbance for cetaceans, and increased the incidence of collisions for the larger species (Panigada *et al.*, 2006). Noise produced by experimental military sonar was noted as a cause of behavioural modifications in long-finned pilot whales in the Sanctuary area (Rendell and Gordon, 1999). In addition, maritime transportation of hazardous substances to and from the coastal industrial hotspots of northern Italy and France posed significant threats to the marine environment, as demonstrated by a major spill off the port of Genoa in 1994, in which 144 000 tonnes of burning oil were discharged into the sea (Relini, 1994).

The reluctance of some Mediterranean riparian states to create EEZs extending a full 200 nautical miles (370 km) from their coasts, a right introduced in 1982 by the United Nations Convention on the Law of the Sea (UNCLOS), has deprived the region of an effective conservation and management tool, because it

means that the high seas in the Mediterranean begin as close as 12 nautical miles (22.3 km) from shore. Unilateral measures, such as the limitations imposed by Italy in 1990 to national driftnet operations in the Ligurian Sea, can be effective to solve localized problems but are inadequate to mitigate wider human impacts in the high seas. There was a widespread public recognition in Italy, Monaco and France during the early 1990s of an urgent need to modify the existing international legal framework in order to allow a responsible development and sustainable management of human activities in the Mediterranean high seas. However, the possibility of adopting multilateral agreements among riparian states to subject the region's high seas to shared management or conservation regimes was not formally considered until 1995, when the establishment of protected areas in the high seas was contemplated by a newly revised version of the SPA Protocol to the Barcelona Convention. ACCOBAMS, which attempts to integrate spatial conservation measures with species-oriented measures in the Mediterranean and Black Seas, came into force in 2001. In 2003 France established an ecological zone beyond the 12 nautical miles limit of the territorial sea (Law n. 346 of 15 April 2003), and in 2006 Italy adopted a legislation (Law n. 61 of 8 February 2006) allowing the establishment of ecological zones having, among others, the purpose of protecting marine mammals and biodiversity.

In 1990, stimulated by the awareness of the importance of the Ligurian Sea for cetaceans and the serious threats to these populations, the Tethys Research Institute proposed to the 'European Association Rotary for the Environment' a project for the establishment of an MPA encompassing the most important habitat for cetaceans in the region (Venturino, 1997). The rationale behind the proposal entitled 'Project Pelagos' included: the ecological richness and representativeness of this area, the presence of critical habitat for diverse fauna of pelagic species including cetaceans, and the opportunities that the area offered to research, education and development. Most importantly, the proposal challenged the mainstream legal notion of the time that establishing a protected area in the high seas was impossible. The proposal envisaged the creation of a Biosphere Reserve in the high seas of the Ligurian–Corsican–Provençal basin, and the establishment of an international authority responsible for the sustainable management and conservation of the basin's natural resources (Notarbartolo di Sciara *et al.*, 1992). Prince Rainier III of Monaco granted the support of the Principality to the proposal and recommended that a sanctuary for cetaceans be created in the Ligurian–Corsican–Provençal basin, through a trilateral agreement among France, Italy and Monaco managed by an international body hosted by Monaco.

The adoption of the Sanctuary Agreement was the outcome of a slow-paced negotiation. The proposal was rapidly endorsed by a number of NGOs, and a Resolution (19.92 on the 'Establishment of a Marine Sanctuary for Large and Small Cetaceans in the Ligurian Sea, Western Mediterranean') was passed by the IUCN General Assembly in Buenos Aires in 1994. Within a year 'Project Pelagos' had also attracted the attention of the environment ministers of Italy and France, who decided to have their respective countries join Monaco in the effort. A number of intergovernmental meetings were organized thereafter, producing a joint Declaration 'concerning the institution of a Mediterranean sanctuary for marine mammals', signed in Brussels on 22 March 1993 by officials of the three countries (Appendix 1). However, this 'declaration of intents' had no binding force (Scovazzi, 2001). Despite the constant intervention of the Monegasque authorities, there was a 5-year lull until the issue was rekindled in 1998 by vigorous lobbying of the NGO community and support from the fishing community in Italy. The Agreement, followed by a declaration, was signed in Rome on 25 November 1999, and deposited with the Principality of Monaco (Appendix 2). It was ratified by Monaco (2000), France (2001) and Italy (2002), and entered into force on 21 February 2002. The protected area was enlarged from the original proposal to encompass the waters between Corsica and Tuscany, and included waters having the legal status of maritime internal waters, territorial seas and high seas (today also ecological zones). In November 2001 the Parties to the Barcelona Convention adopted the decision of inscribing the Sanctuary in the List of the Specially Protected Areas of Mediterranean Importance (SPAMIs).

The content of the Agreement and its main provisions have been extensively described (Scovazzi, 2001). In brief, the parties undertook conservation measures to ensure a favourable status for all marine mammal species, and to protect them and their habitats from negative impacts, both direct and indirect. The adopted

measures prohibit any deliberate taking (defined in broad terms as ‘hunting, catching, killing or harassing of marine mammals, as well as the attempting of such actions’) or disturbance of mammals. Concerning the crucial question of driftnet fishing (Scovazzi, 1998), the parties merely undertook to comply with the relevant international and European Community regimes. This seems to be an implicit reference to European Community Regulation No. 345/92 of 22 January 1992, which prohibits the use of driftnets longer than 2.5 km, as well as to the subsequent European Council Regulation No. 1239/98 of 8 June 1998 which, as from 1 January 2002, prohibits the use or keeping on board of driftnets of any length. The subordination to the European Community regime on driftnets, irrespective of the fact that one of the parties (Monaco) is not a member of this international organization, introduces an element of uncertainty into the Agreement. The parties also agreed to exchange their views with the objective to regulate and, if appropriate, prohibit high-speed offshore races in the sanctuary, and regulate whale-watching activities for purposes of tourism.

Under a broader perspective, the Sanctuary Agreement can be seen as an element of the trend towards a closer cooperation among Mediterranean states in the exercise of a ‘prime responsibility’ for the environmental preservation of their common regional heritage. On a global basis, this pattern is in agreement with Art. 194, para. 5 of UNCLOS, which provides that the measures to protect and preserve the marine environment ‘shall include those necessary to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life’. Other relevant regional components of this cooperative conservation approach include the 1995 SPAMI Protocol, the 1996 ACCOBAMS Agreement, and the General Fisheries Commission for the Mediterranean (GFCM), the region’s fisheries organization.

Despite the wish of the negotiators that the process be expeditious, the Agreement entered into force almost 3 years after its signature. At an extraordinary meeting of the parties in 2005 it was agreed that Italy would host the headquarters (in Genoa), that the executive secretary would be a French national, and that the chairing of the scientific and technical committee would be the responsibility of the Principality of Monaco. Current efforts by the parties focus on gaining recognition for the Sanctuary by the relevant intergovernmental bodies, with a special priority for Particularly Sensitive Sea Areas (PSSAs) designation by the International Maritime Organization (IMO); consideration by the GFCM as the relevant Regional Fishing Organization (RFO); and listing in UNESCO’s World Heritage Convention (WHC).

MANAGEMENT, MONITORING AND CHALLENGES TO THEM BOTH

The Pelagos Sanctuary is a key area for Mediterranean cetaceans because it contains essential habitats for the diverse complement of species regularly sighted in the western Mediterranean, and supports large resident populations of several genetically distinct stocks. In addition to protecting localized summer-time cetacean aggregations, the effective management of the Pelagos Sanctuary will have broader implications for the conservation of the Corsican–Ligurian–Provençal basin and the entire Mediterranean basin. Protecting Ligurian Sea cetaceans will enhance regional conservation efforts by helping to maintain the integrity of a productive and high-value ecosystem of ecological and fisheries importance, and will provide a stimulus and insight into ways of protecting far-ranging species within the entire Mediterranean basin.

However, the effective management of the Sanctuary will require the articulation of clear and quantifiable objectives, and devising a monitoring system to assess whether these objectives are being met.

Management goals

As a first step, three complementary sets of goals, which span a broad array of ecological factors are proposed: (i) protecting threatened species and their habitats within the Sanctuary; (ii) protecting the

ecosystems and food-webs supporting these species and habitats; and (iii) protecting highly migratory species in the wider Mediterranean basin. While outreach, awareness and education efforts are critical aspects of effective MPA management and marine conservation efforts as a way to promote a broader sense of ocean stewardship, in this review the focus is on articulating the ecological objectives of the Pelagos Sanctuary. Nevertheless, it is acknowledged that these scientific goals will only be met if they are supported by broad-based public understanding and support.

As a flagship for future marine conservation approaches beyond territorial waters, the Pelagos Sanctuary sets precedents for how marine conservation actions can be implemented in high-use and heavily industrialized areas such as the Mediterranean Sea, how high-seas MPAs can be achieved through a collective agreement amongst like-minded nations, and how they can be supported by a regional framework. Nevertheless, the Sanctuary implementation represents merely the beginning of a long iterative process, whereby the Sanctuary's objectives will be clearly articulated through a consensus process, with subsequent management continuously monitored and assessed to gauge its failures and successes. The progress towards effective management has started with the compilation of broad goals that are articulated in a management plan. These goals initially targeted the protection of marine mammal populations and their habitats, but have been expanded to include broader ecosystem-level considerations relating to the prey resources supporting local cetacean populations and the physical–biological processes responsible for enhanced productivity in the Ligurian Sea.

Goal no. 1: Protection of Pelagos cetaceans and their habitats

The task of granting protection to cetacean populations from a broad array of threats (Table 1) within such a large and heavily exploited area is formidable indeed. In particular, maintaining a favourable conservation status for the area's marine mammals, along the lines of the EU 'Habitats Directive' (given that they are all listed in the Directive's Annex IV), also considering their wide-ranging habits, is not easy and requires well-designed marine zoning strategies capable of incorporating the natural history (e.g. ontogenetic habitat requirements, seasonal migrations) of these species, as well as the inherent variability in their oceanic environment (e.g. changes in the extent and location of important oceanographic habitats, such as frontal systems and eddies) (Hyrenbach *et al.*, 2000; Hooker and Gerber, 2004; Norse *et al.*, 2005). Even when large MPAs are implemented, they require the careful articulation of clear management objectives, as well as guidelines and timelines for assessing their effectiveness over time (e.g. Gerber *et al.*, 2005; Zacharias *et al.*, 2006). Otherwise, even when guided by well-conceived management plans, the risk exists that MPAs remain little more than 'paper parks' unless the broader ecosystem-level and socio-economic considerations are taken into account at the time of implementation (e.g. Reeves *et al.*, 2003).

Goal no. 2: Protection of cetacean food webs and ecosystems

A broad-based ecosystem-level management plan for the Pelagos Sanctuary will have to include an understanding of the ecology of the local cetacean populations, as well as their life-support systems. Some would refer to this as classic habitat protection, but Harwood's (2002) characterization of protecting functional ecological units is preferred. In particular, when considering fin whales, a broader ecosystem-level approach would entail protecting the mechanisms that allow large euphausiid biomass to subsist. Thus, the Pelagos Sanctuary should be viewed as both a whale and a krill sanctuary, which should be capable of accommodating the inherent dynamics of the marine food-webs and the oceanographic processes supporting the high localized productivity and prey aggregations of importance to highly mobile marine predators. This will involve addressing the need to monitor abundance, distribution and seasonality of *M. norvegica* throughout the frontal system.

Goal no 3: Protection of highly migratory cetaceans in the Mediterranean basin

The cetaceans of the Ligurian Sea are susceptible to different threats and impacts inside and outside the Sanctuary's waters. Therefore, the Pelagos Sanctuary management plan should consider the threats and protections that exist both within and outside its jurisdiction, in tight connection with ACCOBAMS. In addition to addressing cetacean movements and habitats within Sanctuary waters, a monitoring plan will require information on the threats and impacts these species face outside of MPA waters. In particular, a system for recording anthropogenic impacts and mortality (e.g. ship strikes, entanglements in fishing gear, strandings, mortality from military sonar, and fisheries bycatch) both inside and outside of the Sanctuary will be critical to evaluate the effectiveness of the Sanctuary establishment. Together, the information on impacts and habitat use patterns will help Pelagos and ACCOBAMS managers to interpret year-to-year changes in cetacean distribution and abundance, in the face of oceanographic changes (e.g. Forney, 2000; Panigada *et al.*, 2005), and consider such knowledge when proposing the development of larger networks of MPAs for cetaceans in the Mediterranean Sea.

Monitoring and research needs

In addition to the critical information on the threats and distributions of cetaceans required for protecting these species and their critical habitats, a broader ecosystem-level understanding of the physical (e.g. ocean currents, frontal systems) and the biological (e.g. ocean productivity, cetacean prey distributions) processes supporting cetacean aggregations in the Ligurian Sea is needed to devise a longer-term management plan for the Pelagos Sanctuary. While outlining all the potential sources of spatial and temporal variability in the oceanography of the Corsican–Ligurian–Provençal basin is well beyond the scope of this review, an example to illustrate the types of considerations to be addressed within a broader ecosystem-level management plan is presented, focusing on the temporal patterns of ocean productivity, and showcasing some of the management implications of the observed variability.

Because lower-trophic level planktonic organisms are more closely tied to physical processes responsible for ocean productivity and aggregation than upper-trophic level nekton (e.g. squids and fishes), these trophic linkages should be more easy to outline and model for plankton-feeding than for fish/squid-feeding cetaceans (for a review see Hyrenbach *et al.*, 2000). Focusing on the fin whale, the most numerous zooplankton-feeding cetacean in the Ligurian Sea, an assessment was made as to what extent the productivity of their summer-time foraging grounds varies temporally, from month to month and from year to year. Fin whale concentrations within the Sanctuary were mapped using historical sightings (1990–1999) from Panigada *et al.* (2005). While the study area considered by Panigada and co-workers is restricted to the waters north of Corsica, these replicated systematic surveys provide a long-term perspective of fin whale distributions in the region of the Ligurian frontal system (Figure 1). However, larger-scale summer surveys have sighted fin whales within a broader area of the Ligurian Sea, extending from southern France to the south-west of Corsica (Forcada *et al.*, 1995; Notarbartolo di Sciara *et al.*, 2003).

Sightings were mapped using the ArcView 3.2 Geographic Information System (GIS) and the extent of these foraging grounds delineated using the minimum convex polygon, from the Animal Movement extension (<http://www.absc.usgs.gov/glba/gistools/>) (Hooge and Eichenlaub, 1997). The area of fin whale concentrations covered $\sim 23\,000\text{ km}^2$, or 26% of the entire Sanctuary (Figure 2), and spanned depths from 32 to 2823 m. Overall, 80.9%, 18.9% and 0.2% of this area consisted of abyssal plains ($> 2000\text{ m}$), slope (2000–200 m), and shelf ($< 200\text{ m}$) waters respectively, reinforcing the suggestion that fin whales in the area occur off the continental shelf and slope (Panigada *et al.*, 2005).

Having defined the 'climatological' fin whale summer-time foraging grounds, the Chl *a* concentration within this region during four summer months (June–September) was calculated, using time series of monthly (SeaWiFS) imagery (8 years: 1998–2005), with a spatial resolution of 9 km (<http://>

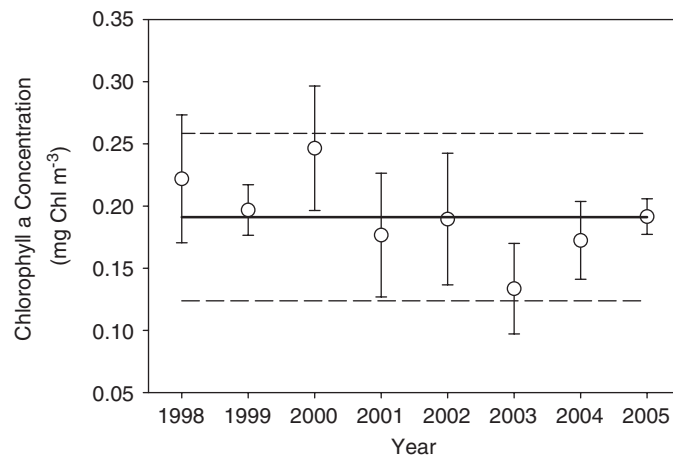


Figure 3. Time series of mean (+SD) monthly SeaWiFS Chlorophyll *a* concentration during summer (June–September), superimposed over the long-term (1998–2005) summer mean (solid line) plus and minus two SD (dashed lines).

seawifs.gsfc.nasa.gov/SEAWIFS.html). Because SeaWiFS estimates between 0.05 and 50 mg m⁻³ are within 35% of global *in-situ* Chl *a* concentrations, those pixel values beyond this range were discarded (Hooker and McClain, 2000). A time series of 32 images (4 months × 8 years) was compiled and a two-way analysis of variance (ANOVA) performed to determine whether there was significant monthly and inter-annual variability in Chl *a* concentrations in this region. While no significant variability across months was detected (F -ratio: 0.317, df: 3, p : 0.813), year-to-year changes (F -ratio: 2.483, df: 7, p : 0.050) were documented. The ANOVA residuals were normally distributed (Kolmogorov–Smirnov one sample test, MaxDiff: 0.093, n : 32, p : 0.944).

These results suggest that the summer-time productivity of the Ligurian Sea, as indicated by the standing stock of Chl *a*, varies inter-annually, but is fairly consistent within any given year (Figure 3). However, a broader regional perspective illustrates the high productivity of this region, within the context of the north-west Mediterranean (Figure 1). The long-term composite of maximum summer-time (June–September) Chl *a* concentrations shows a ‘green’ tongue of mesotrophic waters (0.150–0.300 mg m⁻³) extending eastwards into the Sanctuary. As the resulting dynamic colour front shifts location and intensity from month to month and year to year, the average monthly pigment values for the region of fin whale concentration changes accordingly (Figure 3). However, the extent to which localized primary and secondary productivity and fin whale distributions respond to this variability is unknown.

In particular, the degree to which the observed changes in primary producer abundance may eventually influence the upper-trophic level predators in this system is not understood. Nevertheless, these remote sensing analyses highlight year-to-year changes in ocean productivity and water mass distributions. Thus, a comprehensive Sanctuary management plan should strive to understand how these physical–biological interactions influence ecosystem structure and species distributions, from year to year. For example, two critical issues pertain to the ability of the Pelagos Sanctuary to support resident cetacean populations, and to the connectivity between the Ligurian Sea and other cetacean foraging grounds elsewhere in the Western Mediterranean. These factors will influence the ability of resource managers to interpret trends in population abundance and demographic rates of local populations, and the basin-wide movement patterns of these species (Forney, 2000; Gerber *et al.*, 2005). This understanding will be critical to assessing whether the Pelagos Sanctuary is achieving its conservation goals at regional (Ligurian Sea) and basin-wide (Mediterranean) scales.

Challenges to effective management

Currently, four main issues are challenging the management of the Pelagos Sanctuary for the conservation of cetaceans and their habitats: curbing illegal driftnet practices, ensuring that ongoing military exercises are not harmful to cetaceans, streamlining bureaucratic obstacles to effective management, and identifying clear ecosystem-level objectives.

Perhaps the most serious threat to Ligurian cetaceans is the development by fishermen in France of modified 'thonaille' or 'courantille volante' fishing gear, by adding floating anchors to gill nets as a way to overcome the driftnet ban. Despite this slight modification, this fishing gear is still considered by the European Commission as a driftnet and, as such, is prohibited. In spite of bans imposed by regional regulatory bodies such as the European Commission, the General Fisheries Commission for the Mediterranean and the International Commission for the Conservation of Atlantic Tuna, driftnets are still used in the Sanctuary, and cause significant levels of cetacean mortality (Imbert *et al.*, 2001).

The second challenge is determining the extent to which the use of the Pelagos zone as a test zone for acoustic experiments, mainly by the military and scientists using the NATO Undersea Research Centre (NURC) in La Spezia, constitutes a threat to cetaceans and the ecosystem. The Pelagos parties raised their concern about these activities at their first meeting and started fruitful discussions with NURC. This collaboration is ongoing within the scope of the ACCOBAMS work on the impact of sub-marine noise on cetaceans.

The third obstacle entails streamlining the management of what is inherently a complex multinational entity with overlapping jurisdictions. France, Italy and Monaco all utilize the international tools quoted on the Agreement preamble to protect cetaceans in the Pelagos region. A clear hierarchy between these initiatives must be established to avoid duplication and dispersion of conservation actions. Towards this aim, the Pelagos parties should examine their respective obligations and tools already established by these Agreements. For example, ACCOBAMS and the Barcelona Convention have adopted guidelines for whale-watching, and this management model could be tailored specifically for the Pelagos context.

The fourth challenge to the effective management of the Pelagos Sanctuary entails the need for a framework to guide and assess the effectiveness of broader ecosystem-level objectives, which seek to extend conservation measures from protected species and their habitats to marine food-webs and ecosystem-wide processes. It is essential that an effective ecosystem-level management has a clear rationale and a firm knowledge base.

CONCLUSIONS: THE PELAGOS SANCTUARY AS A POTENTIAL MODEL FOR EFFECTIVE ECOSYSTEM-LEVEL MANAGEMENT IN THE HIGH SEAS

Effective ecosystem-level management of the Pelagos Sanctuary will require a multidisciplinary understanding of the Ligurian Sea and its cetacean populations. In particular, it is critical to gain an understanding of the physical processes that sustain high localized ocean productivity in the Ligurian Sea, and the trophic links supporting the food-webs exploited by cetacean aggregations in this area. For instance, an estimated 1000 fin whales aggregate within the Pelagos Sanctuary in summer (Forcada *et al.*, 1995), each being capable of consuming up to several hundred kilograms of euphausiids daily. Therefore, an understanding of the processes responsible for the formation of critical physical (e.g. the Ligurian front) and biological (e.g. euphausiid concentrations) features, is essential to understanding how the Ligurian Sea can support these upper-trophic marine predators changes inter-annually, and over the long-term. In particular, these dynamics will influence the criteria and the success of any zonation process because the location and extent of these habitat features vary in time and space.

Furthermore, an improved understanding of the ecological significance of the Pelagos Sanctuary for marine mammals will require a detailed knowledge of the trophic interactions supporting these higher-level

predators, including the spatial scales of their foraging, their local trophic requirements, and the dynamics of their prey (Hooker *et al.*, 2002; Cianelli *et al.*, 2004; Hooker and Gerber, 2004). Determining the important prey resources and foraging habitats of these species will require information from dietary studies, strandings, at-sea surveys and individual tracking. In particular, habitat-use analyses will focus on identifying critically important foraging areas and migration routes, which will require more stringent protective measures (e.g. fishery closures, re-routing of shipping lanes to avoid vessel strikes) (Cañadas *et al.*, 2005; Panigada *et al.*, 2005).

Another critical aspect of MPA management entails the continued monitoring of the ecological and anthropogenic conditions within and outside the MPA, including the status of the protected resources, the patterns of human use in time and space, and the status and trends in existing and anticipated threats. Adaptive management will be particularly important in the Pelagos Sanctuary, given the dynamic nature of the frontal region and the highly migratory habits of cetaceans.

The three broad ecosystem-level management goals listed above provide a tangible target for the management of this MPA, which will help steer its implementation plan and the design of a monitoring plan to assess its effectiveness. In addition to the systematic ecological and socio-economic research programme envisioned by the management plan, effective stewardship will require developing measurable and tangible objectives that are much more specific than the general Sanctuary goals listed above. These may include measures of biotic integrity (e.g. standing stocks, productivity), and environmental variability (e.g. oceanography, disturbance regimes), along with appropriate indicators of physical and biological variability at short (inter-annual) and long (climate change) temporal scales (Zacharias *et al.*, 2006).

By linking the broader management goals with a field monitoring programme, these quantitative and measurable objectives will help identify those habitats, processes, and threats 'critical' to achieving the management objectives. At the same time, the work that is necessary if these goals are to be achieved will catalyse research, outreach and education within the Sanctuary and in the broader Mediterranean Sea. On the basis of the Sanctuary management plan, there are three general recommendations for developing a monitoring programme and associated quantitative metrics of success.

First, proceed with developing clear, specific and quantifiable objectives for management. Along with the objectives, a monitoring plan for measuring management success against each objective should be articulated. The lack of clear metrics of success are a dangerous pitfall of MPA implementation, because the inability to gauge the success of these management actions can result in disillusionment, loss of credibility, and community/industry backlash against established and future parks and marine zoning initiatives (Agardy *et al.*, 2003).

Second, develop a broad biogeographic and ecosystem-level analysis of cetacean ecology, including their distributions, abundance, habitats and community structure. This approach should quantify changing conditions within and outside Sanctuary waters, and consider genetic, stock, species, community and ecosystem levels. Potential metrics could include changes in ocean productivity over time, studies of the density and distribution of cetaceans, research on the population and group structure (e.g. age classes) and reproductive rates on cetaceans, and investigations of the abundance and composition of their prey.

Third, establish a programme to map the spatial and temporal distributions of the threats to cetaceans and the oceanographic processes supporting ocean productivity and prey availability within and outside of the Sanctuary. Potential metrics could include changes in bycatch rates and ship strikes, surveys of floating marine debris and derelict fishing gear, studies of pollutants in the food web and in cetacean tissues, studies of anthropogenic noise levels in the area, as well as monitoring of human activities (whale-watching, oil tanker and cargo vessel traffic, fishery distributions) within and outside the Sanctuary.

A wealth of information on oceanographic, ecological and socio-economic aspects will be needed to integrate the Pelagos Sanctuary management plan with other cetacean and ecosystem protections outside of its waters. Nevertheless, the long-term protection of the Ligurian Sea cetaceans will benefit from the following actions: (i) coordination with the objectives of other conservation and management initiatives (most notably, ACCOBAMS and the SPA Protocol to the Barcelona Convention); (ii) integration of other

existing fisheries and coastal zone management concepts within Sanctuary management objectives; and (iii) adherence to the principles of adaptive management and the precautionary principle (Mangel *et al.*, 1996; Dayton, 1998).

The development of a coordinated Sanctuary management plan and a quantitative monitoring programme will be critical to ensure the effective implementation of the Pelagos Sanctuary, and the long-term conservation of Ligurian Sea cetaceans. This dual approach will provide the information foundation required for the long-term management of the Sanctuary, as well as clear guidelines to assess the Sanctuary's effectiveness.

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APPENDIX 1: JOINT DECLARATION CONCERNING THE INSTITUTION OF A MEDITERRANEAN SANCTUARY FOR MARINE MAMMALS¹

by:

- the Environment Minister of the Republic of France
- the State Secretary for the sea of the Republic of France
- the Environment Minister of the Republic of Italy
- the Merchant marine Minister of the Republic of Italy
- the State Minister of the Principality of Monaco

The Minister of the Environment and the State Secretary for the sea of the Republic of France, the Minister of the Environment and the Minister of Merchant marine of the Republic of Italy, the State Minister of the Monaco Principality,

- considering the serious threats impending on Mediterranean marine mammals and in particular on their habitats,
- considering that the Corsican–Ligurian–Provençal Basin is an area of particular importance for such species within their range,

¹Unofficial English translation. Original declaration published in French and Italian.

- taking into account international agreements, resolutions and other pertinent texts related to the protection of marine mammals and their habitats, including among others:
 - the Rio Declaration on environment and development, as well as the pertinent chapter of Agenda 21, in particular as it refers to the precautionary principle;
 - the United Nations Convention on the law of the sea (Montego Bay, 1982);
 - the Convention on biological diversity (Rio de Janeiro, 1992);
 - the Convention on the conservation of migratory species of wild fauna (Bonn, 1979);
 - the Convention on the conservation of European wildlife and natural habitats (Bern, 1979);
 - the Convention on the prevention of marine pollution by dumping of wastes and other matter (London, 1972);
 - the International Convention for the prevention of pollution from ships (MARPOL, London, 1973/78);
 - the International Convention for the regulation of whaling (Washington, 1946);
 - the Convention for the protection of the Mediterranean Sea against pollution, and its relevant protocols (Barcelona, 1976);
 - the Genoa Declaration on the second Mediterranean decade (1985);
 - the Action Plan for the conservation of Mediterranean cetaceans adopted in the framework of UNEP MAP (Cairo, 1991) by the Contracting Parties to the Barcelona Convention;
 - the Agreement on the protection of the Mediterranean coastal waters (RAMOGE, 1976);
 - Resolution no 46/215 of the General Assembly of the United Nations Organisation of 20 December 1991;
 - Recommendation of 26 January 1990 of the International Commission for the Scientific Exploration of the Mediterranean (CIESM) concerning the assessment of the impact of driftnet fishing and related measures;
- have adopted the following Declaration:

Article 1

An international marine sanctuary is established in the Corsican–Ligurian–Provençal seas with the aim of protecting all species of marine mammals.

Article 2

Signatories base their declaration on the following elements:

- conservation status is determined as ‘favourable’ when knowledge on their populations indicate that the marine mammals of the region constitute a viable component of the ecosystems they are part of;
- ‘habitat’ means all or part of the range area of marine mammals which allows them adequate existence conditions;
- ‘taking’ means hunting, capturing or killing of marine mammals as well as attempts to do so.

Article 3

Signatories designate a competent authority for the coordination of management of the sanctuary.

Article 4

The sanctuary covers the marine space included between the Tuscan Archipelago, the Ligurian Sea and the Sea of Provence within the following delimitations:

- To the west: a line connecting Pointe Escampobariou (western tip of the Giens Peninsula: 43° 01' 40'' N, 06° 06' 00'' E) with Capo Falcone (40° 58' 30'' N, 08° 11' 50'' E), located at the western limit of the Gulf of Asinara (northern Sardinia).
- To the east: a line connecting Cap Corse (43° 00' 45'' N, 09° 25' 05'' E) with Punta Bianca (eastern limit of the Gulf of La Spezia: 44° 02' 05'' N, 09° 58' 35'' E).
- To the south: a line connecting Capo Ferro in Sardinia (41° 09' 25'' N, 09° 32' 00'' E) with Punta Chiappa in Corsica (41° 35' 00'' N, 09° 22' 00'' E).

The sanctuary includes the maritime internal waters and the territorial sea of the three States as well as the high seas.

The signatories may proceed to extend the geographical limits indicated above, unless there is an objection by one of them.

Article 5

The signatories commit themselves to undertake all necessary measures mentioned in the following articles, to guarantee a favourable conservation status to marine mammals by protecting them, as well as their habitats, against negative impacts, direct or indirect.

Article 6

The signatories prohibit in the sanctuary:

- all deliberate takes and disturbance. Research work needing takes of marine mammals will be authorised only if it addresses the objectives of the present Declaration. Such works are subject to the approval of the competent authority;
- the use and possession by all ships of the fishing gear denominated drifting gillnet.

In this respect, signatories regulate aboard vessels flying their flag the use of fishing practices which may, based on scientific evaluation, cause the accidental capture of marine mammals and affect their feeding resources, also taking into account the risks posed by fishing gear lost or discarded at sea. The signatories also invite the competent Authorities of other States to endeavour to act in conformity with the present Declaration.

Article 7

The signatories reinforce the surveillance in the sanctuary and intensify the fight against pollution having a direct or indirect impact on the conservation of marine mammals, in consideration of their international commitments.

Article 8

The signatories regulate, and if necessary prohibit, off-shore motorboat competitions in the sanctuary, and regulate whale watching.

Article 9

The signatories encourage and facilitate:

- national, European and international research programmes designed to scientifically assess the scientific effectiveness of measures adopted within the framework of the Declaration; the competent authority designated under article 3 is to ensure the coordination of research activities;
- public awareness campaigns, with a special attention to marine professionals and users.

For all the above actions, the signatories invite the collaboration of competent scientific organisations, of marine professionals and users, and of concerned associations and non-governmental organisations.

Article 10

The signatories ensure control and enforcement in the sanctuary of the provisions of the present Declaration, with the support of the services devoted to marine surveillance. If necessary, the signatories facilitate mutual use of harbours and airports, on the basis of simplified procedures.

Article 11

Ministers invite competent Authorities of other Mediterranean States to act in accordance with the present Declaration, notably in agreement with the Action Plan for the conservation of Mediterranean cetaceans.

Article 12

The present Declaration is brought to the attention of concerned third States, organisations, and international commissions, notably through the intermediary of the Mediterranean Action Plan, the International Maritime Organisation, and the International Commission for the Scientific Exploration of the Mediterranean.

Signed in Bruxelles on 22 March 1993

Environment Minister of the Republic of France

State Secretary for the sea of the Republic of France

Environment Minister of the Republic of Italy

Merchant marine Minister of the Republic of Italy

State Minister of the Principality of Monaco

APPENDIX 2: AGREEMENT ON THE CREATION OF A MEDITERRANEAN SANCTUARY FOR MARINE MAMMALS²

The Parties to the present Agreement:

- Considering the threats encountered by Mediterranean marine mammals and in particular on their habitats,
- Considering that in the Mediterranean Sea there is an area within the distribution range of these animals, that is of particular importance for their conservation,
- Considering that according to the United Nations Convention on the Law of the Sea, the area in question is in part constituted by waters, with respect to which, each of the Contracting Parties exercises its sovereignty or jurisdiction,
- Considering that the European Community, as regards to two of the state parties, exercises complete competence in the field of conservation and management of living aquatic marine resources; that the technical measures of conservation of fishery resources in the Mediterranean are currently established by EC Council Regulation No. 1626/94, of 27.06.94,
- Recognising that as regards to two state parties, the provisions that will be adopted in the application of the present Agreement cannot prejudice the relevant Community principles and provisions, neither that they may put in question their obligation and duties as EC member states,
- Keeping in mind the treaties and the other relevant international instruments, namely,
 - the Conventions on the conservation of migratory species of wild fauna and the relating convention on the conservation of European habitats and wildlife fauna,
 - the International Convention for the Regulation of Whaling and the Agreement for the Conservation of Cetaceans of the Mediterranean and Black Seas and Contiguous Atlantic areas,
 - the Convention for the Protection of the marine environment and the coastal region of the Mediterranean, and its relative Protocols,

wishing to take action for the conservation of Mediterranean marine mammals, have agreed as follows:

Article 1

With respect to the present Agreement:

- a) a conservation status is deemed to be 'favourable' when the knowledge on the populations indicate that the marine mammal species of the region are maintaining themselves as a viable component of their ecosystem.
- b) the term 'habitat' means any part of the range area of marine mammals, temporarily or permanently occupied by them, and utilised in particular for reproductive, birthing, feeding activities as well as a migration route.
- c) the term 'taking' means the hunting, the capturing, the killing and the harassment of marine mammals including the attempt to conduct such activities.

Article 2

1. The parties establish a marine sanctuary within the area of the Mediterranean Sea as defined in article 3, whose biological diversity and richness represent an indispensable attribute for the protection of marine mammals and their habitats.
2. The Parties will protect all species of marine mammals within the Sanctuary.

Article 3

The sanctuary is composed of maritime areas situated within the internal waters and territorial seas of the French Republic, the Italian Republic and the Principality of Monaco, as well as portions of adjacent high seas. The limits of the sanctuary are the following:

- to the west, a line extending from Pointe Escampobariou (western point of the Giens peninsula: 43° 01' 70" N, 06° 05' 90" E) to Capo Falcone, situated on the western coast of the island of Sardinia (40° 58' 00" N, 008° 12' 00" E),
- to the east, a line extending from Capo Ferro, situated on the north-eastern coast of Sardinia (41° 09' 18" N, 009° 31' 18" E) to Fosso Chiarone, situated on the western Italian coast (42° 21' 24" N, 011° 31' 00" E).

Article 4

The Parties undertake to adopt within the sanctuary, the appropriate measures mentioned in the following articles, so as to ensure the favourable conservation status of marine mammals, by protecting both them and their habitat, from any negative direct or indirect impacts resulting from human activities.

²Unofficial English translation. Original agreement published in French and Italian.

Article 5

The Parties shall co-operate with the intent of periodically assessing the marine mammal population status, the causes of mortality, and the threats interfering on their habitat and in particular on their biological functions such as feeding and reproductive activities.

Article 6

1. Taking into account their international obligations, the Parties shall conduct monitoring activities within the Sanctuary and shall intensify the fight against any form of pollution, whether of maritime or land-based origin having or likely to have a direct or indirect impact on the marine mammal conservation status.
2. The Parties will adopt national strategies aimed at phasing out the release of toxic compounds within the sanctuary, giving priority to substances listed in Annex I of the Protocol against Pollution from Land Based Sources and Activities of the Barcelona Convention for the Protection of the Mediterranean Sea against Pollution.

Article 7

Within the Sanctuary the Parties:

- a) will forbid any deliberate take or intentional disturbance of marine mammals; however the non-lethal take of individuals shall be authorised in case of emergency situations or within the scope of scientific activities carried out '*in situ*' and in compliance with the terms of this Agreement,
- b) will comply with the international regulations and those of the European Community, regarding the use and the keeping of fishing equipment known as 'pelagic drift net',
- c) will exchange their view, as deemed necessary, to promote in the appropriate fora and after scientific evaluation, the adoption of regulations relating to the use of new fishing equipment that could result in the indirect capture of marine mammals or that could endanger their sources of prey, while also considering the risk of loss of or deliberate disposal of fishing equipment at sea.

Article 8

In the sanctuary, Parties shall regulate the watching of marine mammals for tourist purposes.

Article 9

The Parties will exchange views with the aim of regulating and if appropriate, forbidding high-speed motorboat competitions within the Sanctuary.

Article 10

The Parties exchange their views in order to harmonise, as far as possible, the regulation measures pursuant to the previous articles.

Article 11

Without prejudice of the relevant provisions of international law and if appropriate of the European Community regulations, nothing of the preceding dispositions will prevent the Parties from enacting stricter national regulation measures.

Article 12

1. The Parties will hold regular meetings for the putting in action and the follow-up of the present Agreement. The Parties establish the organisational aspects required for such meetings taking into account the presence of already existing structures.
2. In this framework they shall favour and encourage:
 - a) national and international research programs geared to establish the scientific aspects of application of the present Agreement;
 - b) awareness-building campaigns geared at professional and other marine users, and non-governmental organisations, with particular emphasis on campaigns regarding the prevention of collision between vessels and marine mammals and the need to communicate the presence of dead or distressed mammals to the competent local authorities.

Article 13

In order to ensure the application of the measures included in the present Agreement the Parties appeal, in particular, to the authorities responsible for maritime patrolling. They agree to exchange all relevant information recorded in this context. To this purpose the Parties will facilitate the mutual use of their air and maritime ports through simplified procedures.

Article 14

1. In the part of the sanctuary located within the waters subject to its sovereignty or jurisdiction, each of the State Parties to the present Agreement is responsible for the application of the relevant provisions.
2. In the other parts of the sanctuary, each of the State Parties is responsible for the application of the provisions of the present Agreement with respect to ships flying its flag as well as, within the limits provided for by the rules of international law, with respect to ships flying the flag of third States.

Article 15

Nothing in the present Agreement will prejudice the sovereign immunity of warships or other ships owned or operated by a State while engaged in government non-commercial service. However, each Contracting Party shall ensure that its vessels and aircraft entitled to sovereign immunity under international law, act in a manner consistent with the present Agreement.

Article 16

As soon as the Protocol concerning specially protected areas and biological diversity in the Mediterranean enters into force for them, the Parties will present a joint proposal for inclusion of the sanctuary in the list of specially protected areas of Mediterranean importance.

Article 17

1. The Parties invite other States, exercising activities within the area defined in Art. 3, to take protection measures similar to those foreseen by the present Agreement, taking into account the Action Plan adopted within the UNEP/MAP framework for the conservation of cetaceans in the Mediterranean and the Agreement on the conservation of cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area, or any other pertinent treaty.
2. The present Agreement is communicated to all international organisations competent at the international or regional level, as well as to the Parties to the Convention for the protection of the marine environment and the coastal region of the Mediterranean.

Article 18

The present Agreement is subject to ratification, acceptance or approval by the signatory parties.

Article 19

1. The instruments of ratification, acceptance or approval will be deposited with the Government designated as depositary of the present Agreement.
2. The present Agreement will enter into force on the thirtieth day following the date of deposit of the instruments of ratification, acceptance or approval of the signatory Parties.

Article 20

1. The Parties may invite any other interested State or international organisation to accede to the present Agreement. Accession will be open after the entry into force of the Agreement.
2. The present Agreement will enter into force, with regard to the acceding Parties, on the thirtieth day following the date of deposit of the instrument of accession, acceptance or approval.

Article 21

1. Any Party may ask for the convening of a conference for the revision of the Agreement. All revisions will require the agreement of the signatory Parties.
2. Any Party may denounce the Agreement. The denunciation will take effect three months after its notification to the depositary. The denunciation by an acceding Party will not cause the termination of the Agreement for the other Parties.

Article 22

1. The present Agreement, written in the French and Italian languages, each version being equally authentic, is deposited with the archives of the Government of the Principality of Monaco.

2. The present agreement will be registered by the depositary in conformity to Art. 102 of the Charter of the United Nations.
Signed in Rome on 25 November 1999
For the Principality of Monaco
For the French Republic
For the Italian Republic

ATTACHED DECLARATION

The representatives of the three signatory Parties express their satisfaction for the happy finalisation of a document on which they have worked for more than six years. Being it understood that, as with all human work, this agreement is perfectible, it represents the first crucial step towards a real and effective protection of mammals in the western Mediterranean.

Without waiting for the ratification procedures, the signatory Parties will as from today endeavour to facilitate the application of the Agreement by establishing the bases for the management of the sanctuary.

The signatory Parties may rely on the work already accomplished by themselves at the state and the territorial entities level. In particular, the experience gained within the RAMOGE agreement will positively contribute to the establishment and management of the sanctuary.

The Parties hope that, besides the rapid fulfilment of the undertakings embodied in the Agreement by the competent authorities of the State and territorial entities, studies on a certain number of points that may complete the substance of the Agreement be conducted, applying the precautionary principle. This refers in particular to the consequences on marine mammals of the use of means for seismic and acoustic prospecting and detection, as well as the possible exploitation of non-living natural resources. Lastly, the question of noise and speed of vessels, already addressed in the Agreement with regard to high-speed motorboat races, will need to be also examined.