Cetaceans of the Mediterranean and Black Seas: State of Knowledge and Conservation Strategies

SECTION 18

Conservation Needs and Strategies

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GENERAL CONSIDERATIONS

This section of the report is conceived to provide baseline information needed by managers and decision makers in the process of devising and implementing policies and strategies to ensure cetacean conservation and, wherever necessary, recovery in the Mediterranean and Black Seas.

Policies should be developed to form a basis for the management of human activities affecting, or likely to affect, cetaceans in the Agreement area. Such policies will:

- provide the appropriate framework for the development of remedial measures, guidelines and codes of conduct to regulate or manage human activities impacting on cetaceans;
- give priority to conserving those species or populations identified as having the least favourable conservation status;
- stimulate the undertaking of research in areas or for species for which there is a dearth of data;
- indicate the need for impact assessments to provide a basis for either allowing or prohibiting the continuation or the future development of activities that may affect cetaceans or their habitat in the Agreement area, including fisheries, vessel traffic, military operations, offshore exploration and exploitation, nautical sports, tourism and whale watching;
- establish the conditions under which such activities may be conducted.

In implementing these policies it will be particularly important to take into account and act synergistically with other bodies playing a role in cetacean conservation. These include: (a) national governments that are already actively endeavouring in cetacean conservation policies and measures, (b) non-governmental organisations that are active in the field of marine protection, and (c) international agreements and conventions. Of these, the following are particularly relevant to the issue of cetacean conservation: the parent convention to ACCOBAMS, the Convention on Migratory Species (CMS, the Bonn Convention); the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); the Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention); the Barcelona Convention (which includes, among others, a Protocol concerning Specially Protected Areas of Mediterranean Importance and Biological Diversity containing precise obligations for the Contracting Parties); the Convention on the Protection of the Black Sea against Pollution (Bucharest Convention); the Convention on Biological Diversity (CBD); the World Heritage Convention; and the Convention on the Regulation of Whaling. In particular, as far as the Black Sea is concerned, all governments of the riparian countries have adopted a "Strategic Action Plan for the Rehabilitation and Protection of the Black Sea" (Istanbul, 1996) which promotes concerted policy actions aimed to the reduction of pollution, the management of living resources, and the sustainable human development in the subregion. The box below contains a quotation from that document (Section "Biological diversity protection", Paragraph 62) devoted to special measures for Black Sea marine mammals conservation.

A number of different strategies aimed at the achievement and maintenance of the favourable conservation status of cetaceans in the Agreement area are discussed in the following sections, as outlined in the Conservation Plan (Annex 2 of the Agreement). These include:

1. managing human activities (including fisheries, vessel traffic, whale watching, and activities that cause cetacean habitat degradation and loss) to mitigate negative impacts on cetaceans;
2. granting special protection to areas containing critical cetacean habitats;
3. undertaking targeted research and monitoring programmes;
4. providing for timely responses to emergency situations;
5. promotion of training, education and awareness programmes;
6. finally, with a special consideration for the complex and different weight of the various factors impacting on the different species present in the Agreement area (Table 17.1, Section 17), a number of actions are proposed as having priority importance in the coming years.

Strategic Action Plan for the Rehabilitation and Protection of the Black Sea
(Adopted by the Ministers of Environment on behalf of Bulgaria, Georgia, Romania, Russia, Turkey and Ukraine, Istanbul, 31 October 1996)

Paragraph 62. With the aim of restoring populations of marine mammals, the following measures shall be taken:

a) A ban on the hunting of marine mammals will be enforced by all Black Sea states with immediate effect;

b) Regular population assessments of marine mammals shall be conducted and the first assessment will be completed in 1998. It is advised that these assessments be coordinated by the Istanbul Commission, through its Advisory Group on the Conservation of Biological Diversity;

c) The Centre for the Conservation of Biological Diversity in Butumi, Georgia, shall be provided with the necessary equipment in order to function as a regional rehabilitation centre for captive marine mammals;

d) National centres and sanctuaries for the rehabilitation of marine mammals shall be strengthened;

e) Consideration shall be given to modify fishing practices in order to avoid catching marine mammals, as by-catch, during normal operations. It is recommended that the Istanbul Commission, through its Advisory Group~~s~~ on the Conservation of Biodiversity and its Interim Advisory Group on Fisheries, develop a strategy for the reduction of by-catches of marine mammals.

MANAGING HUMAN ACTIVITIES TO MINIMISE AND MITIGATE NEGATIVE IMPACTS ON CETACEANS

Article 2 of the Conservation Plan (Annex 2) of the Agreement states: "*Parties shall, in co-operation with relevant international organizations, collect and analyse data on direct and indirect interactions between humans and cetaceans in relation to inter alia fishing, industrial and touristic activities, and land-based and maritime pollution. When necessary, Parties shall take appropriate remedial measures and shall develop guidelines and/or codes of conduct to regulate or manage such activities*." The following sections address in detail such recommendation.

A. Mitigation of the negative effects of interactions with fisheries

At the present moment, a system of fisheries policy which is common to the entire region does not exist. Rather, there is one policy common to the four EU member states, and separate policies for the remaining nations. Adopting a common policy on a basin-wide, or region-wide scale would be highly desirable under many aspects, not least as far as cetacean conservation is concerned. Other policy aspects that would significantly benefit marine (and therefore cetacean) conservation in the Agreement area include the adoption, wherever possible, of a community-based system of resource use, and of an ecosystem-based management approach. Furthermore, the current lack of reliable, detailed and regularly updated information on fishery activities in the Agreement area (including, among many other things, cetacean bycatch levels) is a major hindrance to effective management (Caddy 1998). This would involve, among other things, the promotion of co-ordinated, multidisciplinary research and monitoring to provide baseline biological information and to shed light onto ecosystem functioning.

Fishery activities, being particularly intense in the Agreement area (see Section 4.4), may negatively affect cetacean survival in three main ways: (a) by causing mortality or damage through accidental entanglement in active or discarded fishing gear, (b) by subtracting prey through overfishing, and (c) by causing direct mortality or damage through intentional kills deriving from competitive interactions (the use of cetacean meat as fishing bait or as food being probably irrelevant in the area). These three main factors

possess different modalities and dynamics and must be treated separately.

Bycatch - One of the main problems in this field is lack of reliable information. Data on cetacean bycatch is not collected on a regular basis in any fishery in the Agreement area, and too often relevant knowledge is intentionally and carefully concealed by fishermen. Even if they were available, however, bycatch levels data cannot be evaluated in terms of impact on the populations since population size data are almost totally absent in the region. Bycatch levels and fisheries effects have thus been based often on guess-based extrapolations, in some cases to the detriment of the fishermen themselves.

Pelagic driftnets for swordfish and albacore are responsible for the greatest numbers of by-caught cetaceans in the Mediterranean, while bottom gillnets for turbot, sturgeon and dogfish are the most harmful in the Black Sea subregion. The ban on driftnets from European Union fleets (effective 1 Jan. 2002) does not solve the problem on a regional basis, since many non-EU nations have meanwhile apparently been increasing their driftnet effort. However, we could not find reliable information on this subject. A high priority in this field is thus to gather detailed information on effort and bycatch wherever fishing with driftnets and bottom gillnets still occurs, and assess the levels of bycatch in function of the size of the by-caught populations in the different areas.

Other fishing methods known to cause accidental capture of cetaceans in the area include purse seines (mostly for tuna), trawling, longlines, trammel and trap nets, including traditional coastal tuna traps ("tonnare"). Again, the obvious priority here is to acquire detailed knowledge on cetacean bycatch in the different gears, and compare each with bycatch in the driftnets and bottom gillnets and with total bycatch.

Once bycatch levels are known for single populations for which sizes are also known, it will be possible to assess for each population the limits within which removal through bycatch is safe (e.g., potential biological removal, PBR; see Wade 1998).

In those cases in which bycatch levels will exceed such limits, reduction measures are needed. These may include:

Setting bycatch limits above which the fishery is closed.

Adoption of time/area fishing closures. The success of such strategy depends on a detailed knowledge of dynamics of the fishery and of the biology and behaviour of the cetacean species involved (Reeves *et al*., in prep.). Time/area closures are likely to be successful particularly when the bycatch problem is highly localised and predictable in time and space (Murray *et al*. 2000).

Encouraging alternative ways of fishing. This may involve technological changes and gear improvement to enhance selectivity, and training of fishermen on the use of devices or procedures to reduce bycatch. Recently, the deployment of acoustic warning devices ("pingers")[1] to prevent cetacean entanglement in gillnets has been effective in reducing bycatch rates in some fisheries and for certain cetacean species. However, it must be clear that although alarms may have an important conservation role, their use in a particular area and fishery should be conditional on: (a) demonstration of long-term effectiveness through controlled scientific experiments, (b) completion of field trials to address practical issues related to implementation, and (c) establishment of a long-term scientific monitoring programme, preferably involving independent on-board observers (Reeves *et al.* 2001). Moreover, acoustic warning devices should not be regarded as a panacea for solving all by-catch problems. Their use by fishermen can create new problems or exacerbate old ones. Perhaps most importantly, it can lead people to believe that continued fishing is "safe" in an area where an endangered cetacean population is at risk (Reeves *et al.* 2001).

Promotion of eco-compatible mariculture (fish farming) as an alternative source of competitive fish products for fish markets in the Agreement area. In particular, this long-range strategy should be directed to the gradual substitution of active fisheries with modern fish cultivation technologies presenting far lesser threats to cetaceans, as well as reducing competition levels between dolphins and fisheries and preventing of prey depletion through overfishing.

Identifying the environmental, biological and technological reasons why bycatches occur is another important direction of action (Hall 1995).

[1] It is quite important to understand that acoustic devices used to address the various problems of cetacean-fisheries interactions fall into two very distinct functional classes. "Pingers" are **low-level** devices that are used to **warn** cetaceans about the presence of a net in the area, so that the animal increases its attention level and hopefully avoids becoming entangled. **Acoustic deterrents devices (ADD)** and **acoustic harassment devices (AHD)** are high-level instruments originally developed to actively displace pinnipeds from aquaculture installations by producing a noxious sound; ADDs and AHDs are increasingly considered as possible ways to keep dolphins away from coastal fishery operations in the Mediterranean.

Regulations should be introduced and implemented to prevent fishing gear from being discarded or left adrift at sea.

Incidental mortality can also be reduced through rescue and release efforts. It is thus important, in such cases, to require the immediate release of cetaceans caught incidentally in fishing gear in conditions that assure their survival. Efforts to rescue cetaceans bycaught in fishing nets may be difficult and risky for both the entrapped cetaceans and their rescuers, but they are often successful. Such attempts may not only address the welfare of the individual animal entangled, but also represent a significant contribution to the conservation of a threatened species, and provide benefits in terms of public awareness and education. However, rescue efforts of all kinds are not equally justified and it is important to weigh the potential conservation, animal welfare, and scientific benefits against the possible negative outcomes (Reeves *et al*., in prep.).

Finally, education programmes benefiting fishermen and well-designed public awareness campaigns are also an essential component of any mitigating strategy.

Competition between dolphins and fisheries - The problem of small-scale coastal fisheries being damaged by depredation from dolphins, a condition apparently on the increase in many Mediterranean and Black Sea locations, certainly needs a close attention. In this case, unlike in the bycatch problem, it is the fishermen who are affected and damaged in the first place, however in the end cetaceans also lose as fishermen embark on various retaliatory actions that often result in dolphin mortality or damage. The dynamics of such depredatory activities by dolphins are far from being understood: within the Mediterranean there are areas in which dolphins and fishermen coexist peacefully, while in other, often adjacent areas interactions are quite problematic.

Government agencies and international bodies should begin developing and articulating management goals for mitigation of fishery-dolphin conflicts so that it will be possible to make meaningful evaluations of the effectiveness of any adopted measure.

The first aspect to address in this case clearly involves the elucidation of interaction mechanisms through targeted research and monitoring programmes. Very little quantitative information exists on the nature and extent of interactions between dolphins and small-scale commercial fisheries in the Mediterranean, the costs of such interactions to the fisheries, or the effects of such interactions on dolphin populations. Such quantitative data are entire lacking in the Black Sea subregion. A complete inventory of the sites where interaction problems exist should be compiled, and site-specific studies should be carried out focussing on the characteristics of particular fisheries and on the ecology and behaviour of 'local' dolphin population(s). More information is needed on the characteristics of the depredating dolphins, particularly on their identity, age and sex; this should be achieved through photo-identification studies and the monitoring of dolphin distribution, abundance and mortality in the interaction areas.

Acoustic devices (AHDs), designed to deter dolphins from approaching and depredating nets, have been regarded as a possible solution to the problem, and may be useful in some cases. However, they have the potential to damage the hearing of dolphins and other animals and to cause other impacts, such as habitat exclusion. Furthermore, the effects of acoustic exposure are highly species-specific and depend on each species' frequency sensitivity, and on the received level of the sound. To address this issue and discuss possible solutions and implications of the use of AHDs in Mediterranean coastal fisheries, an international Workshop was convened by ICRAM in Rome in May 2001 (Reeves *et al.* 2001). Available data suggest that ultrasonic, low-intensity devices are most likely to be effective for deterring odontocetes while having the least probability of causing harm to other species. The Rome Workshop concluded that, given (a) what is currently known about the physiology and behaviour of Mediterranean coastal dolphins, (b) the potential for excluding dolphins from habitat (and consequent implications for the health of local dolphin populations) and (c) the potential for negative effects on monk seals and other endangered marine fauna, high-intensity acoustic devices such as those currently marketed as AHDs and used to deter pinnipeds from aquaculture operations are inappropriate for use in alleviating conflict between dolphins and fisheries (or aquaculture operations) in the Mediterranean. This conclusion applies irrespective of the potentially high, or even prohibitive, costs of deploying these devices in the Mediterranean context. Furthermore, use of AHDs in the Mediterranean may contravene current national and international regulations.

The Workshop also noted that non-acoustic means of reducing conflicts between dolphins

and fisheries hold considerable promise and deserve detailed evaluation. These include, among others, the experimentation of non-acoustic aversion techniques, the devising of fishing techniques that are less liable to attract dolphins, the development of dolphin watching activities to complement revenues from fishing and convert the presence of dolphins from damaging to value, and the adoption of compensation schemes.

Prey depletion through overfishing - Given the generalised state of depletion of fishery resources in the Mediterranean and Black Seas, a likely consequence in many areas is that ichthyophagous and teuthophagous cetacean populations are affected (see Sections 9 and 10)

Clearly, fisheries management in the Mediterranean and Black Seas is a far-reaching issue that raises major social, economic and environmental concerns involving relevant portions of three continents, and goes well beyond the limited scope of a report concerned with the conservation of a single taxon of marine endangered species. The problem of inadequate fisheries management in the Mediterranean and Black Seas should be addressed and solved on other tables, and all we can remark here is discouragement in noting what little, if any, progress is being made in this field at the present time.

One essential component of such management involves the collection and dissemination of reliable data, and this should include an adequate effort to understand predator-prey interactions and ecosystem functioning. Such data, applied to ecosystem modelling, would certainly help to elucidate the complex ecological interactions between cetaceans, fisheries and other ecosystem components.

B. Mitigation of disturbance

Disturbance from vessel traffic and collisions. Vessel traffic is most intense in the Agreement area, as a reflection of the large volume of its coastal and marine economic activities and the high levels of its human coastal populations. It is obviously unlikely that significant traffic reduction will occur specifically to decrease danger to cetaceans and other marine life. However, mitigating measures can be envisaged to reduce such danger. These include:

Monitoring, research and risk assessment. Accurate data on the seasonal and geographic distribution of traffic, and its volumes, routes, typologies, and possible evolution trends in the Agreement area are, to the best of our knowledge, unavailable at the moment in an organised, usable format. Such information, coupled with information on cetacean distribution and habitat use, would allow a first evaluation of a cause-effect relationship between marine traffic and cetaceans in terms of intensity of exposure. Furthermore, research on the possible long-term effects of traffic disturbance on cetacean populations survival, through behavioural and physiological change, loss of energy intake, and area displacement, should be undertaken to elucidate this still quite poorly understood aspect.

Where impacts from traffic are known or suspected, recommendations (and possibly, in critical habitat, regulations) can be envisaged and provided to shipping operators in terms of minimum approach distances, speed limits when near cetaceans, and the following of pre-determined routes. Areas containing known cetacean critical habitats may be subjected to limited access.

Recommendation and regulation should be accompanied by appropriate awareness and education campaigns, to inform user groups of the potential impact of traffic on cetaceans and to provide codes of conduct to minimise disturbance.

Collisions between vessels and cetaceans are an extreme consequence of the impact of vessel traffic on cetaceans, and very often result in physical damage to both the cetacean and the vessel involved, and thus a source of cetacean mortality. Given the perceived increasing importance that this threat is acquiring in the Agreement area, the theme of collisions should receive special attention. The case of the North Atlantic right whale provides a relevant illustration on how the problem of collisions between vessels and individuals from the world's most endangered whale species has been addressed elsewhere (Marine Mammal Commission 1999). Off the east coast of the U.S. the movements of individual whales are being monitored and communicated to ships in their vicinity; underwater listening stations have been set up to identify areas of concentration; the species' distribution has been correlated with oceanographic features to produce GIS-based distributional predictive models; and, finally, a variety of active acoustic devices to detect animals in front of the ships are being developed and tested.

All measures listed above, aimed at mitigating the negative effects of vessel traffic on cetaceans, will also contribute to address the collision issue.

Of particular importance are of course actions involving the collection of detailed and complete information on collision events and on their modalities and dynamics, and accurate awareness and involvement activities targeting ship captains and crew.

In addition, the following actions can also be envisaged where collision problems are known to be substantive:

Solutions aimed at a general decrease of risk in special areas. Zones containing critical habitat of cetaceans susceptible to be impacted by colliding vessels should be identified (also on the basis of mathematical models designed to predict risk levels) and delimited, and speed and/or tracks controlled within those limits, in the hypothesis (to be tested) that whales may become used to localised presence of traffic and pay more attention in the appropriate locations.

Solutions aimed at increasing the potential by the vessels of detecting and avoiding the whales. These include the creation of an information network among vessels to inform operators about the position of whale concentrations, based on both sighting and passive acoustic data provided by research teams; the establishment of permanent watches on the bridge during daylight, and the development of tools to enhance visual detection during the night and rough weather; the development of active acoustic devices (e.g., subsurface sonar) enabling the detection of whales in vicinity of the track line, at a useful distance. However, we must remark that active sonar devices have been regarded as technical fixes to solve collision problems on high-speed ferries in many parts of the world. Many problems exist in this respect (e.g., the tendency of sound to bend downwards in thermally stratified waters, thus reducing detection range to unworkable conditions; the small acoustic reflectivity of a whale body; concern about further ensonification of the whales' environment).

Solutions aimed at increasing the potential by the whales of detecting and avoiding vessels. This seems a most promising approach, since whales are certainly the most interested parties in avoiding a collision, and appear to excel in the art of naturally avoiding contact with vessels whenever they are aware of their presence. A better understanding of the vessel detection capabilities by the whales and of the exact reasons for their failure to do so effectively, ultimately leading to a collision, is a fundamental steppingstone in this direction. The problem very likely resides in the characteristics of the sound produced by the vessel and perceived underwater by the whales, which may be inadequate to convey the necessary information on distance, bearing, and speed of approach of the vessel itself. Once such knowledge is gained, conceivably the sound produced by the vessel could be modified or enhanced to provide more meaningful spatial information to the whales, improve their detection capabilities and allow their safe manoeuvring and avoidance.

Disturbance from whale watching activities - Whale watching (here intended as encompassing all types of cetacean watching, thereby including dolphin watching) is an activity which is gaining increasing popularity in many parts of the world, Mediterranean included, and likely to develop in the future also in the Black Sea. We believe that it is an activity which should be encouraged, given the substantial educational and economic assets that can be derived from it, which will ultimately benefit cetacean conservation; however, whale watching must be carefully managed to avoid distress and damage to the targeted cetacean populations.

From the management standpoint, whale watching can be divided into two broad categories: commercial whale watching, usually conducted aboard larger passenger vessels, and amateur whale watching, taking place mostly from private pleasure craft. Commercial whale watching is easier to manage and control than amateur whale watching. Managers and decision makers should be particularly concerned about the correct and rational management of whale watching in areas where this activity is new or in its early stage of development, and where the cetacean populations involved are naïve, such as in most of the suitable whale watching locations in the Agreement area.

Whale watching management regimes are being developed in many parts of the world; a useful review is provided by Carlson (1996). Common management measures include minimum approach distances, maximum speed and the prohibition of chasing whales, altering the whales' behaviour or separating a whale from its group, limits to noise production in air and in water, and a limitation to the number of vessels around a whale or group of whales at any time. In the following box a series of basic principles related to the management of whale watching was proposed by the Scientific Committee of the International Whaling Commission in 1996. We suggest that these principles should be adopted as a starting point for the preparation of both guidelines,

codes of conduct and regulations of whale watching in the Agreement area.

A critical aspect of managing whale watching is the determination of the 'carrying capacity', or the amount of whale watching that is sustainable by the population involved over the long term. Carrying capacity is tightly related to a number of factors, including the behavioural and ecological characteristics of the whale population, the operational characteristics of the whale watching industry, and to the environmental variables of a specific area. The following management steps are advised before whale watching activities become firmly established, with the implementation of major capital investment and commercial scale promotions.

First, basic knowledge of the biology and ecology of the species involved (e.g., population parameters, behaviour, seasonal changes, and frequency of occurrence) , as well as the local ecological conditions (e.g., local currents, weather, and distance from shore), should be made available before the start of operations. These preliminary data will be necessary for an initial, rough evaluation of the potential impact of whale watching activities, and should be later followed by the acquisition of more detailed knowledge on the differential susceptibility of cetaceans to disturbance depending on their age, sex and individual variability. The ultimate goal of this research is to gain information on possible impacts of whale watching at the population level.

Second, guidelines and voluntary codes of conduct based on common sense and existing scientific knowledge should be made available to both commercial operations and pleasure boaters likely to engage in amateur whale watching. Operators should be encouraged to adopt such guidelines, and should explicitly inform their customers about this by both making available printed versions of the code of conduct they have adopted on board their vessels and demonstrating with their behaviour that this code is being followed. This would help to expose incorrect conduct in presence of whales to public judgment, comment by the media, and peer pressure, while the same factors would serve to reward respectful behaviour. Unlike commercial operators, amateur whale watchers are controllable to a much lesser degree.

Third, binding laws and regulations should be promulgated by national authorities wherever whale watching becomes an established practice. Regulations should always be accompanied by monitoring of the activities, enforcement, and the possibility for law enforcing agents to provide sanctions to the offenders. In addition to traditional top-down enforcement through respect of the law, bottom-up mechanisms should be encouraged to place on the consumers a large part of the burden of control. In this respect the adoption of "ecolabels" and the establishment of operators' associations clearly committed to optimal standards may have substantial influence on the overall conduct and sustainability of operations in a given area.

Fourth, an accurate inventory of activities and operators should be kept from the outset of commercial operations in any given area. This should include the establishment of databases on categories of whale watching operations, and data on effort, areas, times, numbers of passengers, income, animals encountered, *etc*. An accurate monitoring of operations, coupled with analyses of economic and social performance, should be performed in conjunction with scientific monitoring. It is in fact quite important that commercial whale watching will provide opportunities for both research and education, as this will at the same time contribute to minimise the impact and optimise results. To achieve this, the presence of trained research and education personnel on board should be highly encouraged on small operations, and made compulsory on larger enterprises.

The box below contains three general principles for whale watching developed in 1996 by the Scientific Committee of the International Whaling Commission. The first principle is directed primarily at managers, the second and third mainly at operators.

General Principles for whale watching determined by the Scientific Committee of the IWC

1) Manage the development of whale watching to minimise the risk of adverse impacts:

(a) implement as appropriate measures to regulate platform numbers and size, activity, frequency and length of exposure in encounters with individuals and groups of whales; management measures may include closed seasons or areas where required to provide additional protection; ideally, undertake an early assessment of the numbers, distribution and other characteristics of the target population/s in an area;
(b) monitor the effectiveness of management provisions and modify them as required to accommodate new information;
(c) where new whale watching operations are evolving, start cautiously, moderating activity until sufficient information is available on which to base any further development;
(d) implement scientific research and population monitoring and collection of information on operations, target cetaceans and possible impacts, including those on the acoustic environment, as an early and integral component of management;
(e) develop training programs for operators and crew on the biology and behaviour of target species, whale watching operations, and the management provisions in effect;
(f) encourage the provision of accurate and informative material to whale watchers, to:
- develop an informed and supportive public;
- encourage development of realistic expectations of encounters and avoid disappointment and pressure for increasingly risky behaviour.

2) Design, maintain and operate platforms to minimise the risk of adverse effects on cetaceans, including disturbance from noise:.

(a) vessels, engines and other equipment should be designed, maintained, and operated during whale watching, to reduce as far as practicable adverse impacts on the target species and their environment;
(b) cetacean species may respond differently to low and high frequency sounds, relative sound intensity or rapid changes in sound;
(c) vessel operators should be aware of the acoustic characteristics of the target species and of their vessel under operating conditions; particularly of the need to reduce as far as possible production of potentially disturbing sound;
(d) vessel design and operation should minimise the risk of injury to cetaceans should contact occur; for example, shrouding of propellers can reduce both noise and risk of injury;
(e) operators should be able to keep track of whales during an encounter.

*

3) Allow the cetaceans to control the nature and duration of 'interactions':.

(a) operators should have a sound understanding of the behaviour of the cetaceans and be aware of behavioural changes which may indicate disturbance;
(b) in approaching or accompanying cetaceans, maximum platform speed should be determined relative to that of the cetacean, and should not exceed it once on station;
(c) use appropriate angles and distances of approach; species may react differently, and most existing guidelines preclude head-on approaches;
(d) friendly whale behaviour should be welcomed, but not cultivated; do not instigate direct contact with a platform;
(e) avoid sudden changes in speed, direction or noise;
(f) do not alter platform speed or direction to counteract avoidance behaviour by cetaceans;
(g) do not pursue, head off, or encircle cetaceans or cause groups to separate;
(h) approaches to mother/calf pairs and solitary calves and juveniles should be undertaken with special care; there may be an increased risk of disturbance to these animals, or risk of injury if vessels are approached by calves;
(i) cetaceans should be able to detect a platform at all times; while quiet operations are desirable, attempts to eliminate all noise may result in cetaceans being startled by a platform which has approached undetected; rough seas may elevate background noise to levels at which vessels are less detectable.

Disturbance from research and documentation activities - Even modern, benign research, which refrains from lethal methods, can be invasive at times, and may lead to serious disturbance to the animals through harassment and direct damage. Potential harassing activities include, among others, close approaches for photo-identification, tagging & tracking, biopsy sampling, and experimenting with active acoustic techniques. Although a line must be drawn between non-lethal, yet clearly invasive research, such as that which involves the live capture of animals or the remote implant of large telemetry devices, and much less invasive techniques like photo-identification, it is important to invoke the greatest caution whenever animals need to be approached and affected by human presence.

It is important to note that research programmes involving the above listed methods are badly needed, in particular from the conservation standpoint. A large part of the scant knowledge on Mediterranean cetaceans was collected by such methods, thereby providing essential elements of strength to current conservation efforts. However, even the collection of minuscule skin and blubber biopsies performed by professional researchers can have unwanted, negative effects on the animals (e.g., Bearzi 2000). Therefore, all guarantees should be provided that: (a) research projects involving even mildly invasive techniques provide data clearly needed to address conservation issues, and (b) researchers undertaking such projects are knowledgeable, competent professionals, fully aware of the disruptive potential of their activities, and committed to appropriate dissemination of the results of their efforts through widely available scientific and technical media.

Similarly, photographers and film-makers engaging in documentary efforts on cetaceans and cetacean issues in the Agreement area can provide products that are quite useful to the cause of cetacean conservation through popularisation of scientific issues and awareness campaigns. Also in this case, however, it is important to ensure that: (a) the documentary material adequately conveys the conservation message, and (b) photographers and film crews are well-prepared, environment-concerned professionals, able to guarantee that their products are of high quality and have a reasonable expectation of wide diffusion.

In order to fulfil such requirements, it is important that an authority for issuing research and filming permits be provided for within the Agreement's purview. According to the Article II, Paragraph 2 of ACCOBAMS, the deliberate taking of cetaceans may take place only in emergency situations or, "after having obtained the advice of the Scientific Committee, for the purpose of non-lethal *in situ* research aimed at maintaining a favourable conservation status for cetaceans". The issuing of such permits should certainly be subjected to an assessment based on science and ethics.

It should be noted, however, that an objective evaluation of the impact of such activities should be considered within the general context of the overall impact of human activities on any given cetacean population. Activities from other groups of users of the sea, politically stronger than researchers or photographers, may carry a much heavier impact on cetaceans; it is thus important that regulatory attention be tuned according to the level of damage any activity may cause, rather than according to considerations of political opportunity.

Noise disturbance - According to the Barcelona and Bucharest Conventions, marine pollution includes energy alongside with substances introduced by humans into the marine environment. The conventions thus provide a legal basis for the regulation of underwater noise emissions in the Mediterranean and Black Seas.

Underwater noise is produced in the Agreement area by a variety of human activities which are largely at the basis of the region's economy. It is thus clearly unrealistic to expect that noise levels in the Mediterranean and Black Seas can be easily brought back to natural conditions. However, a number of options exist, and should be addressed, to strive for the reduction to tolerable levels of underwater noise and deriving disturbance to marine life. Strategies should be followed in terms of: (a) monitoring and research, (b) awareness, and (c) specific mitigation measures.

<u>Monitoring and research.</u> Very little, if anything, is known concerning the characteristics of underwater noise (e.g., spatial and temporal distribution, levels, frequencies, etc.) in the Agreement area. Monitoring of noise characteristics should be performed diffusely, and "hotspots of noisiness" should be mapped and checked against the presence of cetacean critical habitats. Activities that introduce high-level sound (e.g., explosions, oil & gas prospecting and drilling, military sonar) in areas that are inhabited by cetaceans should be monitored, inventoried, and assessed for their impact. A particular attention should be

given to areas and seasons that are of special importance to cetaceans. Studies can then be conducted to assess possible impacts of noise on communication, behaviour, and physiology of the concerned populations.

Awareness. Getting decision makers and the public at large to realise that underwater noise is an important issue in marine conservation, and particularly as far as cetaceans are concerned, is another essential step towards the proper addressing of the problem and the implementation of effective mitigation measures. It is thus important that scientific findings in this field be appropriately and correctly disseminated to reach the wider audience.

Mitigation measures. Shipping noise is largely due to the movement through water and cavitation of the ships' propellers. Regular maintenance of blades can reduce noise and cavitation as well as fuel consumption and travel efficiency, and should be highly encouraged. Effects of activities that involve the underwater use of explosives and of high-level impulsive sound (e.g., airgun, military sonar, coastal constructions, drilling) can often be mitigated if special precautions or technological innovations are used. For example, disposal through explosion of World War II ordnance located on the sea bed in Italy has been experimentally performed within curtains of air bubbles, thereby significantly reducing pressure wave propagation in the surroundings (Nascetti 1996). Other promising experiments involving the use of air bubble curtains also took place in Hong Kong, to reduce near-field noise levels in the vicinity of Indo-Pacific hump-backed dolphins (Würsig *et al*. 2000). Mitigation procedures, rules and policies were developed by NATO concerning the use of loud sonar devices after a mass stranding of Cuvier's beaked whales in Greece; such stranding, which was synchronous with nearby military exercises and experiments, suggested a very likely cause-effect relationship between the two events (D'Amico 1998). These high level sounds are liable to temporarily displace animals from an area or even cause hearing damage to the animals, so an assessment of the importance of that area for cetaceans is needed before operations start. Even if the area doesn't contain critical habitats for cetaceans, progressively scaling up the level of noise will warn cetaceans eventually present within range and allow them to distance themselves from the source before harmful levels will reach them. Finally, with sufficient knowledge of the ecology and habits of the involved cetaceans populations, military, industrial and prospecting activities can be seasonally timed to minimise impact.

C. Improvement of the quality of the marine environment

In a heavily populated region such as the Agreement area, where perspectives exist for further substantial increases in human population size and exploitation, addressing the problem of the quality of the marine environment, for cetaceans as well as for humans or any other living being, seems more a question of mitigating damage than one of solving the problem. There is increasing, compelling evidence that pollutants seriously affect both the health and survival of a wide range of living organisms, including ourselves. Too often still, particularly in the Agreement area, short-term economic considerations are made to prevail on basic human rights, environmental needs, and even economic convenience in the long-term. To address this problem and steer towards a condition of improvement, both management actions and research efforts can be proposed.

Management actions. A large number of international agreements and conventions exist which aim at the reduction and halt of the dispersion in the environment of noxious substances. Among these, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, and various International Maritime Organisation (IMO) Conventions in the field of marine safety and prevention of marine pollution, are of primary importance. As far as the Mediterranean and Black Seas are concerned, of particular relevance are, respectively, the Barcelona Convention and the Bucharest Convention, with related Protocols. Protocols to the Barcelona Convention which are particularly relevant to the quality of the marine environment include the so called "Dumping Protocol", the "Oil pollution Protocol", the "Land-based sources Protocol", and the "Transboundary waste Protocol". Similarly, the Bucharest Convention include the following Protocols: the "Protocol on protection of the Black Sea marine environment against pollution from land based sources", the "Protocol on cooperation in combating pollution of the Black Sea marine environment by oil and other harmful substances in emergency situations", and the "Protocol on the protection of the

Black Sea marine environment against pollution by dumping". All these legal instruments (some of which still need to enter into force), once appropriately incorporated into the national legal systems of the Agreement's riparian States and into practice, will pave the way for significant improvement. Coastal habitats are obviously far more at risk than pelagic habitats, although contamination through bioaccumulation of POPs (persistent organic pollutants) in the food web is ubiquitous and pervasive. Therefore, integrated coastal zone management will hopefully promote a more rational use of coastal space and resources, bringing about an improvement of the environmental conditions.

Research. We now know a lot more than just a few years ago about the nature, composition and scale of marine pollution, and thus on what cetaceans are exposed to. However we still know very little about what the real effects of such pollution are on the survival of cetacean populations, on what is the relationship between exposure, individual health, and population survival, and on how synergies may develop between environmental stressors that will cause rapid negative reactions and effects. Quite a bit of research effort still needs to be undertaken through biomarker studies and new investigation technologies to shed light on mechanisms connecting toxicological, physiological and pathological issues in cetacean populations. Finally, critical habitats for cetacean populations, particularly as far as coastal species are concerned, need to be identified, to enable to devote special attention to these populations' basic needs in terms of food quality and quantity, environmental health, and levels of disturbance.

ESTABLISHMENT OF MARINE PROTECTED AREAS

Marine protected areas (MPAs) are increasingly recognised as a primary tool for the conservation of marine habitats and biodiversity (Agardy 1997). Whether MPAs can also effectively protect large, wide-ranging species, such as cetaceans, has been the subject of debate (Reeves 2001, Evans and Urquiola Pascual 2001). Clearly, it is rare that an MPA can be established to encompass a marine surface wide enough to contain the entire range of even the most sedentary of cetacean populations, and the implementation of problem-targeted management actions, more than area protection, obviously seems, in the case of cetaceans, a more effective conservation strategy. However, cases exist in which area protection can be an effective cetacean conservation tool, particularly when a combination of strategies, inclusive of problem-oriented actions, are implemented.

As far as protection of cetaceans is concerned, MPAs can either: (a) be established with the primary objective of conserving cetacean populations, or (b) they may have a more general set of objectives, including, among others, the conservation of cetacean populations, or finally, (c) they may contain cetacean habitat within their boundaries, and could thus serve the function of cetacean conservation if specific management objectives are set. Many coastal MPAs in the Mediterranean and Black Seas subregions fall into this last category. For instance, over 60 protected areas and sites are already established along the coastline of the Black and Azov Seas (Fig. 18.1), and an additional 40 areas are proposed for future protection (Fig. 18.2). The list of Mediterranean coastal MPAs is also very impressive. It is thus necessary to ensure that sufficient awareness exists among MPA managers and practitioners in the Agreement area concerning the presence of cetacean critical habitat within their premises, so that cetacean conservation measures are implemented, with the appropriate science-based support. Furthermore, it is important to create and maintain an overall inventory of the existent coastal MPAs, to help assess and enhance their real and potential effectiveness as far as cetacean conservation is concerned. Such regional network of MPAs, cooperating on a concerted basis in accordance with a common cetacean monitoring and conservation protocol, should be a second, important step to be undertaken.

Specially protected areas to protect cetaceans, where specific threats can be best controlled, can be created in the Agreement area once critical habitats of the various cetacean populations have been identified, and the effects of threats known. This could be best achieved through zoning mechanisms, providing that the ecology and behaviour of the population to be protected is known in sufficient detail. Such specially protected areas can be established within the framework of the Protocol for Specially Protected Areas and Biological Diversity (also known as the

"SPA" Protocol) of the Barcelona Convention, or of other appropriate instruments. As a less drastic measure, time/area fishing closures could be envisaged where bycatch is the greatest concern, and where the problem is highly localised and predictable in time and space. In this case, however, control and enforcement becomes more problematic.

At present the only MPA in the Agreement Area which was specifically created to protect cetaceans is the "International Sanctuary for Mediterranean Marine Mammals", also known as "Ligurian Sea sanctuary" (Notarbartolo di Sciara 2001), created by France, Italy and Monaco in 1999 and recently established as a SPAMI within the framework of the Barcelona Convention (Fig. 18.3). The Ligurian Sea sanctuary is special because it is the first worldwide example of an international MPA specifically designed to protect cetaceans, and also because, unlike any other protected area in it seeks to address the problem of protecting offshore waters. This problem presents unusual MPA design and management challenges, given that in pelagic ecosystems the desirable habitat conditions and the concentrations of key prey resources for cetaceans are known to shift in space and time (Hyrenbach *et al*. 2000).

We must caution that MPAs should not be considered a panacea, as their effectiveness must rest on concurrent measures to be fully realised. In many cases activities known to be harmful to cetaceans are permitted within MPAs: for example, pelagic driftnets in the Ligurian Sea sanctuary and the use of AHDs in the Egadi Islands MPA (western Sicily). MPAs may thus run the risk of giving a false impression of having granted protection to cetaceans, while the animals remain at risk in the absence of vigorous education, monitoring, and enforcement. It is thus of paramount importance that MPAs are established with a firm conservation commitment, and ensuring the involvement of different user groups (e.g., nature tourism operators and fishermen) who may ultimately benefit from the MPA itself.

SUPPORT TO CONSERVATION THROUGH RESEARCH ACTIVITIES

In the Conservation Plan of the Agreement the need is clearly acknowledged for the organisation of co-ordinated, concerted research on cetaceans and promotion of the development of new techniques to enhance their conservation. Research should include the monitoring of the status and trends of species covered by the Agreement, especially those in poorly known areas, or species for which little data are available, in order to facilitate the elaboration of conservation measures.

Although we must note that lack of sufficient information cannot serve as an excuse to delay action, it is clear that lack of solid scientific knowledge on cetacean ecology, biology and threats in the Agreement area is one of the greatest crippling factors in the way of effective conservation efforts (see the "Species/Impact" Table in Section 17, Table 17.1, and related discussion).

The overarching goal of research is therefore to provide the science-based information needed to inform appropriate and timely conservation and management measures. For best results, research strategies must be co-ordinated at the regional level with clear priorities provided, and national research should be comprehended as much as possible within such co-ordination design. Finally, the multidisciplinary and ecosystem-based aspects of research must be privileged.

Research efforts should aim in three different directions: (a) to know the "capital" that we wish to protect, (b) to know the factors that are eroding such capital, and (c) to develop conservation procedures and techniques.

Knowledge of cetacean populations - Initially, easy and cheap studies of the distribution and relative abundance of the different species in the region should be undertaken in "virgin" areas. Unfortunately, even this basic knowledge is lacking from most of the Agreement area.

After that initial step, solid population data must be secured:

- Describe the eventual subdivision of each species present in the area into discrete populations; map the geographic distribution of each population; assess degrees of gene flow across populations.
- Assess population sizes and trends.
- Determine demographic parameters.
- Describe population ecology and habits.
- Critical habitats for each population must be detected and mapped, and location of habitat, size, and characteristics provided.

Knowledge of threats to cetaceans - Mortality factors (e.g., direct killings, bycatch in fisheries, collisions, intoxications, epizootics) must be known, and mortality events monitored, to esti-

mate the contribution of each factor to total mortality of the population.

Habitat degradation factors, mostly deriving from the contamination of the marine environment with anthropogenic substances (e.g., POPs, hydrocarbons, nutrients, solid debris, *etc*.), as well as from land-based infectious agents, must be assessed. These are particularly difficult to evaluate because of the importance of synergistic action among factors, and because what really matters is the long-term population effects of such action, rather than the exposure levels.

Depletion of food resources through overfishing and illegal fishing must be assessed, and compared to the feeding requirements of the population. Updated, reliable fishery data on catch and effort should be readily available to evaluate what is being removed, at what rate, with what means, when and where. Data should be fed into ecosystem models to predict trends and replacement rates.

Noise and overall disturbance levels (including vessel traffic, offshore mineral resource exploration and exploitation, military exercises, whale watching and invasive research) within the population range must be known. Updated information on the space and time distribution of maritime traffic (commercial, military, pleasure, research and prospecting, *etc*.), and of whale watching operations, must be collected. The final objective is the evaluation of the long-term effects of these factors on the population.

Mechanisms at the base of conflicting interactions between coastal cetaceans and small scale, artisanal fisheries must be fully understood.

Climate and ecosystem change signals should be detected and described, and the possible effects of such change on the population should be monitored.

Development of countermeasures and support - Impact assessments must be performed whenever new activities likely to impact on cetaceans are planned, to provide a basis for decisions and a source of indications for management.

Technological innovation (e.g., to enhance fishing gear selectivity and cetacean avoidance, to enhance vessel collision avoidance, to decrease vessel noise and whale watching vessel impact, *etc*.) must be stimulated.

Science-based proposals must be brought forth for the establishment of special MPAs, and MPA management must be science-based as well.

Science-based training, education and awareness activities must be promoted.

Research methods - A very large body of literature and excellent texts (for a recent example see Mann *et al.* 2000) exist that review research methods useful to cetacean conservation efforts. What follows is only a brief, schematised and non-exhaustive summary.

Sighting surveys. These can range from basic cruises designed to describe relative abundance (sighting frequencies) and distribution, to long-term, effort-intensive longitudinal studies of single populations or sub-populations based on photo-identification techniques, and finally to dedicated, line-transect surveys to generate density data and to derive absolute population estimates.

Radio and acoustic tagging and tracking of a sample of individuals within a population, using archival and/or transponder tags, to extract information on identity, position (and therefore on horizontal movements, migration patterns, home range and extent of movements within such range), depth, speed and movement patterns, oceanographic data, visual and acoustic environment, and physiology of the tagged individuals. Short-term, passive tracking of individual cetaceans in the vicinity of a research platform has also been performed using laser range-finders linked to a Global Positioning System (GPS).

Acoustics. Monitoring presence, absence and seasonal variation thereof of vocalising cetaceans, within a portion or entirety of their population range, can be performed through passive acoustics by means of listening devices located on moving ships, buoys or bottom-mounted. The same systems can be used to monitor sound and noise levels in the marine environment.

Remote collection of skin and blubber biopsies from free ranging individuals can be used to evaluate contaminant loads, detoxifying capabilities (through biomarker studies), genetic properties, and trophic level (through stable isotope analysis). A promising research avenue consists in the culturing of cells secured through biopsies, to apply biomarker techniques to tissues grown in the lab.

Stranding networks are needed to monitor levels and composition of strandings and bycatch along the Agreement's coastal area. A systematic programme of necropsies should be implemented to increase knowledge on current pathologies, predict and control epizootics, assess mortality causes, and store and disseminate tissue

and organ samples for pathological, contaminant and genetic studies.

RESPONSE TO EMERGENCY SITUATIONS

During the past few decades major cetacean mortality events have occurred with an apparent increasing frequency in various parts of the world, which have attracted the attention of the scientific community. Mass mortalities over a wide geographic range, such as the Mediterranean striped dolphin and the Black Sea short-beaked common dolphin epizootics, have also occurred within the Agreement area. Given the poor environmental state of the region, similar catastrophic events, as well as emergency situations involving major pollution incidents affecting cetacean critical habitat, are quite likely to occur. It is thus of fundamental importance that an emergency task force be established under the Agreement purview, formed by international experts, to assist in the development and implementation of emergency measures for cetaceans covered by the Agreement when exceptionally unfavourable or endangering conditions occur.

In particular, as stated in the Conservation Plan (Art. 5 and 6), the Task Force should facilitate: (a) the preparation of emergency plans to be implemented in case of threats to cetaceans in the Agreement area, such as major pollution events, important strandings or epizootics; (b) the evaluation of capacities necessary for rescue operations for wounded or sick cetaceans; (c) the compilation of a synthesis of veterinary recommendations for the rescue, rehabilitation and release of cetaceans; (d) the development and implementation of training programmes on responses to emergency situations, transport and first aid techniques, and release of rehabilitated animals; and (e) the preparation of guidelines and of a code of conduct governing the function of centres or laboratories involved in this work, also considering the risks to natural populations when decisions are made to return cetaceans to the wild.

Whenever necessary and if requested by the ACCOBAMS Secretariat, the Task Force should convene and send a team of experts on site to asses the situation and provide advice and assistance to national groups. To help this process, an inventory should be made of the facilities existing in the Agreement area, having experience the capability of maintaining marine mammals.

CAPACITY BUILDING AND EDUCATION

This Section refers to two different aspects of knowledge, which are both essential to the enhancement of the conservation process: capacity building (*i.e.*, the creation of specialist abilities) and education and awareness programmes targeting the wider public.

Capacity building. The essence of capacity building consists in the enhancement of professional capabilities by combining targeted educational programmes with infrastructural improvement (Reeves *et al.*, in press). This is an aspect presenting huge heterogeneity in the region, with large gaps in the levels of training and facilities among different portions of the Agreement area. Since it is essential that expertise for cetacean conservation efforts be provided by local scientists in their own regions, capacity building remains one of the highest priorities of ACCOBAMS. It is highly recommended that:

- Simple lectures by foreign experts may only serve as an initial step for a broad exposure to problem-solving approaches, use of available technology, data collecting and analysis techniques, and to discuss possible applications of such procedures in "virgin" areas. The main value provided by effort of this type is that it may provide the stimulus to embark on more focussed activities.
- Longer-term training through scholarship programmes to study and acquire experience abroad can be quite effective, providing that the recipients of these programmes will have the possibility, once they return at their home country, to apply their knowledge in well-designed, officially recognised and sufficiently funded research or conservation activities. Unfortunately, this is rarely the case; too often trainees return home only to face unemployment or the obligate choice of a different profession, while on the other hand substantial funding, provided with the best of intentions by international donor organisations, dissipates "through the cracks" without providing the expected results due to lack of the necessary local competences. It is thus of funda-

mental importance that (a) training programmes abroad, (b) funding of major conservation programmes by international donors and (c) a long-term commitment by local decision makers and administrations be made to work together in a co-ordinated effort, clearly targeted to the implantation of stable, long-lived research and management structures and abilities.

Training efforts should be incorporated into the production of real-life results of actual research projects or management plans. Collaborative research programmes conducted in the Agreement area present an ideal terrain in which to promote and experiment with training and technology transfer. Thus, bilateral and multilateral projects, involving teams having different levels of expertise from different portions of the Agreement area, should have higher priority. Workshops to address conservation issues peculiar to subsets of the Agreement area will reinforce and upgrade local capacities, strengthen working relationships, help with the identification and agreement on priorities, coordinate research activities, standardise methodology, and enhance the analytical skills of participants (Reeves *et al*., in press). The participation to such workshops by government representatives would provide a much needed link with the local management authorities.

A major problem faced by scientists in areas where a tradition of cetacean research is in the process of being developed is access to all the needed literature and scientific documentation. In such areas it often happens that scientific libraries are unavailable, or insufficiently equipped with specialised, updated literature, or their access may be problematic. By taking advantage from the recent, remarkable progress being made in remote access to bibliographic material stored electronically, efforts should be made to create in each Agreement riparian country at least one specialised information and documentation centre where text and reprints can be accessed. Furthermore, support should be given to existing libraries containing significant bibliographic collections on cetacean science, in order to ensure continued updating and expansion, facilitate access to information to the local scientific community, and provide a framework for capacity building that will encourage documented cetacean research in the Agreement area. Library databases should be managed in the context of a network that facilitates cross-library research and exchange of materials.

A series of *ad hoc* documentation tools should be prepared, and made widely available to the scientific community throughout the Agreement area. These should include, among others: (a) lists of national authorities, research and rescue centres, scientists and non-governmental organisations concerned with cetacean conservation; (b) a directory of existing protected or managed areas for the conservation of cetaceans; and (c) a directory of national and international legislation concerning cetaceans.

Education. Education and awareness campaigns are critical elements of effective management, and need to be prepared and implemented at the highest professional level. The greater public needs to be constantly informed about the status of cetaceans in their region of residence, the possible effects of human activities on their well-being, and ways to improve their chances of survival. Awareness on the very existence of cetaceans, on their possible and real threats, and on actions that can be taken to ensure their survival is still very low in the Agreement area, and very inhomogeneous in its distribution. Education and awareness can be achieved both by ensuring that the media operators are trained and updated on cetacean conservation matters, and that educational material and programmes are constantly developed and appropriately disseminated. Such activities are particularly suited to a number of Non-Governmental Organisations concerned with cetacean conservation, and best results can be achieved through a co-operative effort between institutions and NGOs.

CONCLUSIONS AND RECOMMENDATIONS

While all the conservation strategies previously listed and described in this Section are worthy of being undertaken, and all cetacean species living in the Agreement area deserve to be protected as well, priorities must be defined in order to provide timely responses to address problems that are known or considered to be most urgent.

Priority species. Based on the available knowledge, populations belonging to the follow-

ing species (listed in alphabetical order) are known or presumed to be at greater risk of declining and disappearing from the Agreement area:

Delphinus delphis, short-beaked common dolphin in the Mediterranean Sea;

Phocoena phocoena, harbour porpoise;

Physeter macrocephalus, sperm whale;

Tursiops truncatus, common bottlenose dolphin.

It is therefore highly recommended that urgent measures be undertaken to address the conservation status of such populations.

Priority actions. During the CIESM Meeting in Monte Carlo, on 27 September 2001, a workshop was organised to discuss priorities for cetacean conservation in the Mediterranean and Black Seas. An initial list of priorities, agreed upon in that occasion, is presented in Appendix 2. The following list represents a further elaboration of the Monte Carlo proposal, and its adaptation to a narrow (2002-2006) time frame (please note: items in this list are not presented in order of importance).

- Development of criteria and provision of *ad hoc* support for the harmonisation of commercial whale watching regulations with science-based knowledge on the protection needs of the involved cetacean populations.
- Investigation of competitive interactions between coastal dolphins and artisanal fisheries.
- Creation of a cetacean bycatch database (first phase).
- Development and implementation of pilot conservation and management actions in well-defined key areas containing critical habitat for populations belonging to priority species.
- Workshop on methods for the evaluation of habitat degradation and its effect on cetacean populations.
- Conservation plan for cetaceans in the Black Sea.
- Conservation plan for short-beaked common dolphins (*Delphinus delphis*) in the Mediterranean Sea.
- Conservation plan for common bottlenose dolphins (*Tursiops truncatus*) in the Mediterranean Sea.
- Basin-wide Mediterranean sperm whale (*Physeter macrocephalus*) survey.
- Identification of Mediterranean sites of conservation importance for fin whales (*Balaenoptera physalus*) in addition to the Ligurian-Corsican-Provençal Basin, and assess the functional relationships of such sites to the LCP Basin with respect to the species' habitat needs.
- Development of photo-identification databases and programmes encompassing the entire ACCOBAMS area.
- Establishment and implementation of a long-term training programme on cetacean research, monitoring and conservation/management techniques and procedures.
- Development of an educational tool for the organisation of research projects and basic technical studies.
- Creation of a sub-regional directory of national authorities, research and rescue centres, scientists and governmental and non-governmental organisations concerned with the Agreement's objectives.
- Support to the implementation of national stranding networks, and their co-ordination into a wider regional network.
- Development of a network of specialised bibliographic collections and databases.
- Establishment of a system of tissue banks.
- Establishment of a Task Force for special mortality events.

A brief description of each item, including an indication of the types of activity, of the time-frame and of the expense involved, will be provided to the First Meeting of the ACCOBAMS Parties in a separate document. Detailed project proposals will be successively required, once their implementation will be decided and funding assured.

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Fig. 18.1 – Coastal protected areas already established in the Black Sea subregion:

1 Ropotamo River nature reserve
2 Lake Atanasovsko nature reserve
3 Kamchia biosphere reserve
4 Cape Kaliakra nature reserve
5 Lake Shabla protection area
6 Lake Durankulak protection area
7 Danube Delta biosphere reserve
8 Dunaiskie Plavni biosphere reserve
9 Tiligulskiy landscape park
10 Kinburn Spit landscape park
11 Chernomorskiy biosphere reserve
12 Dzharylgach reservation
13 Karkinitskiy ornithological reservation
14 Lebyazhyi Ostrova branch of the Krymskiy nature Reserve
15 Bakal Spit local reservation
16 Dzhangul landscape and aquatic reservation
17 Atlesh landscape and aquatic reservation
18 Lake Donuzlav local reservation
19 Nikolayevka Coast protection site
20 Cape Lukull inshore aquatic reservation
21 Kazachya Bay reservation
22 Cape Fiolent landscape and aquatic reservation
23 Cape Aia reservation
24 Cape Sarych inshore aquatic reservation
25 Yalta mountain and forest nature reserve
26 Ifigenia Rock protection site
27 Diva and Koshka inshore aquatic reservation
28 Cape Ai-Todor landscape and aquatic reservation
29 Cape Martyan nature reserve
30 Adalary Isles protection site
31 Ayudag landscape and aquatic reservation
32 Cape Plaka landscape and aquatic reservation
33 Kuchuk-Lambat local reservation
34 Landscape and aquatic reservation between Solnechnogorskoye and Malorechenskoye
35 Kanaka reservation
36 Karaul-Oba landscape and aquatic reservation
37 Novy Svet botanic reservation
38 Inshore aquatic reservation between Novy Svet and Sudak
39 Cape Alchak local reservation
40 Karadag nature reserve
41 Cape Chauda landscape and aquatic reservation
42 Opuk nature reserve
43 Cape Khroni inshore aquatic reservation
44 Karalarskiy local reservation
45 Kazantip nature reserve
46 Arabat landscape and aquatic reservation
47 Azovo-Sivashskiy national nature park
48 Stepanovskaya Spit hydrologic reservation
49 Obitochnaya Spit reservation
50 Berdyanskaya Spit reservation
51 Meotida landscape park
52 Don Delta protection area
53 Cape Utrish reservation
54 Lake Abrau reservation
55 Sochi national nature park
56 Pitsunda–Mussera biosphere reserve
57 Kolkheti nature reserve
58 Çamburnu protection area
59 Simenlik (Yeşilirmak Delta) reserve
60 Haci Osman Ormani protection area
61 Kizilirmak Delta nature reserve
62 Sarikum protection area
63 Mert Lake reserve (Iğneada Saka Longozu)

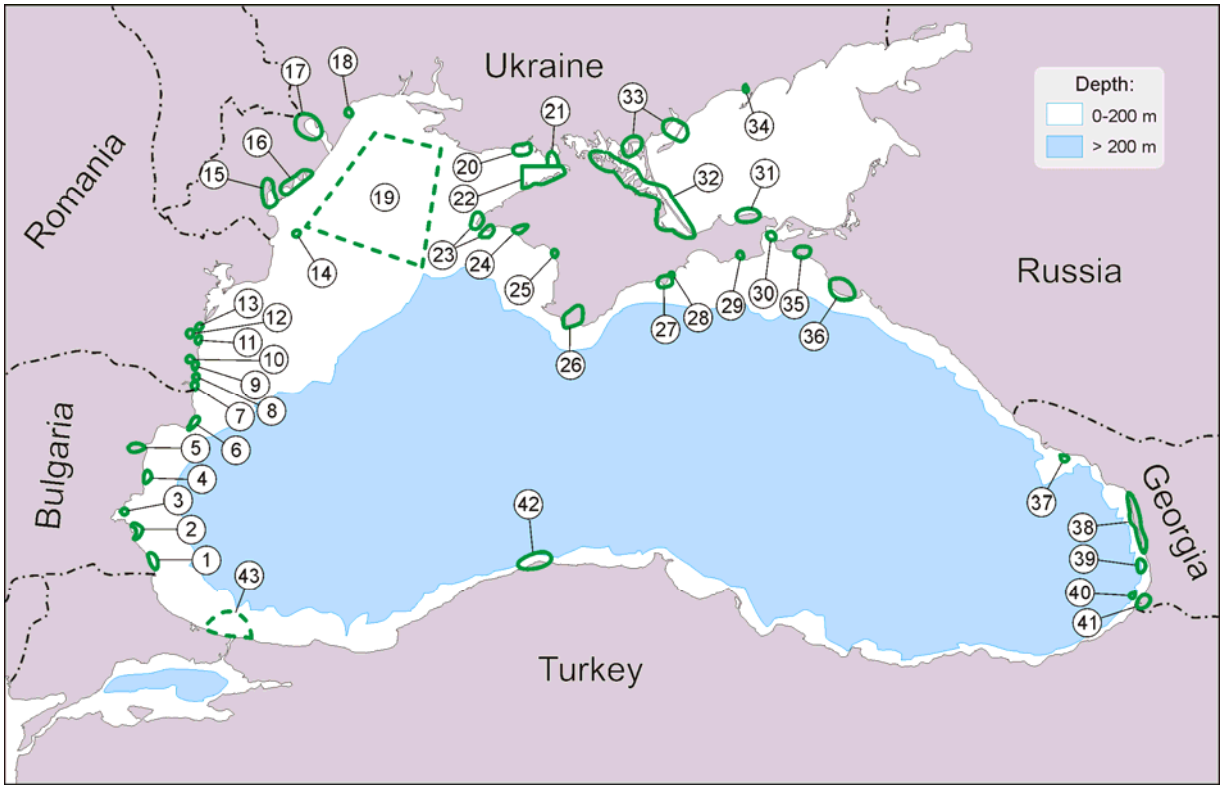

Fig. 18.2 – Proposed Black Sea coastal and marine protected areas which are not established yet:

1 Marine protection area from Ahtopol to the Rezovo river's mouth
2 Marine protection area from Primorsko to Ropotamo river
3 Cocketrice Bank marine protection area
4 Marine protection area from Byala to Shkorpilovtsi
5 Varna Bay and Varna Lake protection area
6 Marine protection area from cape Kaliakra to Kamen Bryag
7 Marine protection area from Vama Veche to 2 Mai
8 Marine protection area from Costinesti to Olimp
9 Cape Tuzla nature reserve
10 Lake Tekirghiol nature reserve
11 Mamaia Bay marine protection area
12 Lake Siutghiol nature reserve
13 Cape Midia nature reserve
14 Zmeiny Island nature reserve
15 Lake Sasyk protection area
16 Tuzly Liman protection area
17 Dniester Estuary national nature park
18 Cape Bolshoy Fontan reservate
19 Zernov's *Phillophora* Field marine protection area
20 Dzharylgach national nature park
21 Karkinitskiy Bay marine reserve
22 Lebyazhyi Ostrova biosphere reserve
23 Tarkhankut nature reserve
24 Donuzlav protection area
25 Lake Kyzyl-Yar protection area
26 Sevastopol national nature park
27 Cape Meganom protection area
28 Tikhaya (Lisya) Bay reservation
29 Uzunlarskoye Lake protection area
30 Tuzla Island protection area
31 Karalarskiy nature reserve
32 Sivashskiy national nature park
33 Priazovskiy national nature park
34 Obitochnaya Estuary protection area
35 Kiziltashskiy Lagoon protection area
36 Abrau Peninsula national park
37 Gudauta Bank protection area
38 Kolkheti national park
39 Supsa marine protection area
40 Batumi Bank marine protection area
41 Adjara national park
42 Doğanyurt–Cide marine reserve
43 Prebosphoric marine reserve

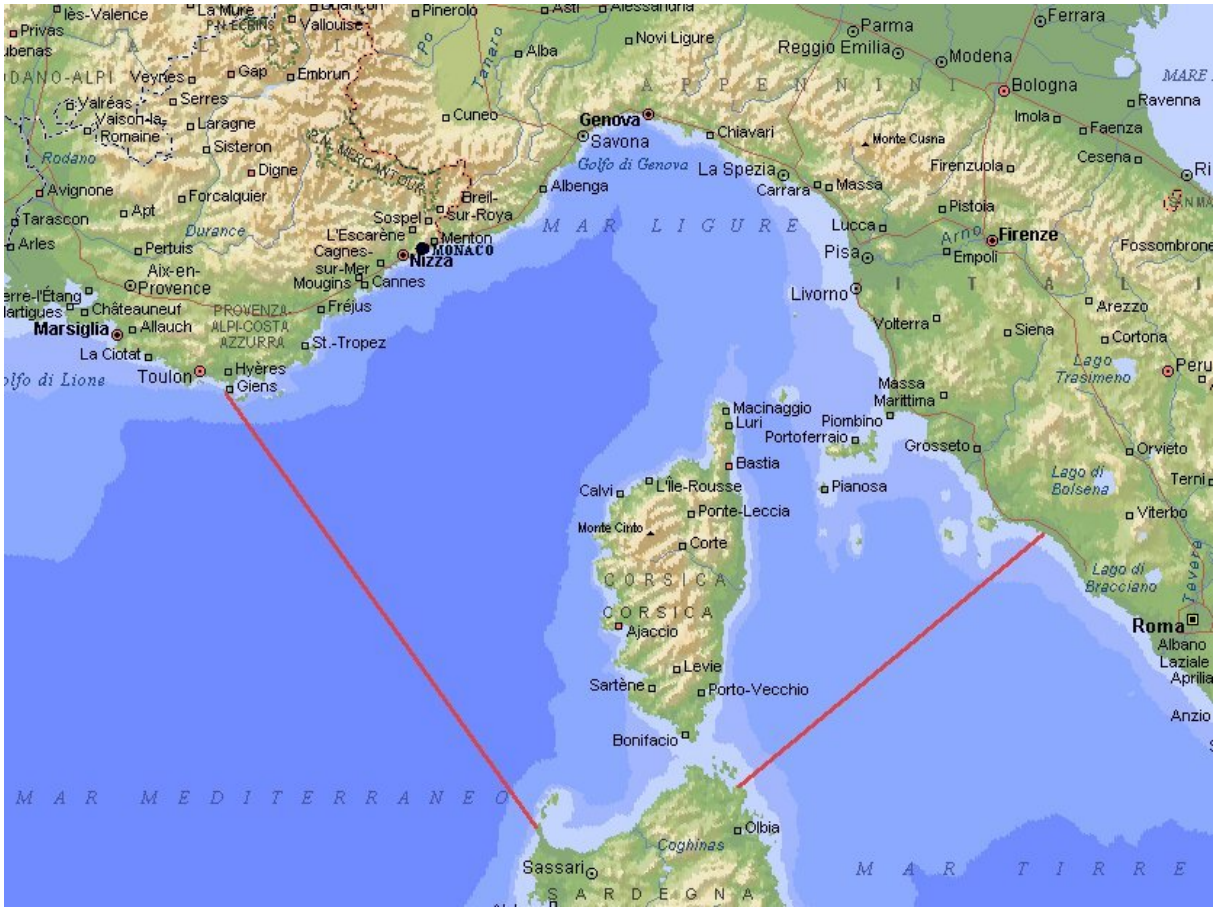

Fig. 18.3 – The “Ligurian Sea sanctuary”