ACTION PLAN

FOR THE CONSERVATION OF CETACEANS

IN LIBYA

prepared by Giovanni Bearzi

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THE REGIONAL ACTIVITY CENTRE FOR SPECIALLY PROTECTED AREAS (RAC/SPA)[1]

RAC/SPA is one of the regional activity centres of the Mediterranean Action Plan (UNEP) hosted by Tunisia.

RAC/SPA was established by the contracting Parties to the Barcelona convention and its protocols with the aim of assisting Mediterranean countries with the implementation of the Protocol concerning specially protected areas in the Mediterranean. The Parties accepted Tunisia's offer to house the RAC/SPA and Tunisia, which is host country to the centre since 1985, provides it with direct support.

The missions of RAC/SPA such as they figure in the new Protocol consist in:
a) assisting the Parties, in cooperation with the competent international ,intergovernmental and nongovernmental organisations, in: establishing and managing specially protected areas; conducting programmes of scientific and technical research in conformity with article 20 of the present Protocol; conducting the exchange of scientific and technical information between the Parties in conformity with article 20 of the Protocol; preparing management plans for protected areas and species; developing cooperation programmes in conformity with article 21 of the Protocol; preparing educational materials designed for various groups;
b) convening and organising meetings of National Focal points and providing them with secretariat services;
c) formulating recommendations concerning the guidelines and common criteria pursuant to article 16 of the Protocol;
d) creating and updating databases on specially protected areas, protected species and on other matters relevant to the Protocol ;
e) preparing reports and technical studies that may be required for the implementation of the Protocol;
f) elaborating and implementing the training programmes mentioned in article 22, paragraph 2 of the Protocol;
g) cooperating with regional and international governmental and non governmental organisations concerned with the protection of areas and species, provided that the specificity of each organization and the need to avoid duplication of activities is respected;
h) carrying out the functions assigned to it in the action plans adopted within the framework of the Protocol;
i) carrying out any other function assigned to it by the Parties.

In each state Party to the Convention, the RAC/SPA has a focal point appointed by the authorities of the country. The national focal point works in liaison with the RAC/SPA on the technical and scientific aspects concerning the implementation of the Protocol. The national focal points for the SPA meet every two years.

In carrying out its activities the RAC/SPA maintains relations of cooperation and consultation with several inter-governmental and non-governmental organizations. The aim of this cooperation is to avoid duplication and to promote consultation and exchange of information.

ABOUT THE AUTHOR

Giovanni Bearzi has carried out research on Mediterranean dolphins since 1986. He founded and directed for a decade a dolphin research and conservation programme in Croatia, that was awarded the "Henry Ford European Conservation Award" as best European project overall. He then created a research and information centre in Venice, Italy, for the management of dolphin projects conducted by the Tethys Research Institute. He has trained dozens of research assistants and has supervised a number of students working on Mediterranean cetaceans. In 2003 he earned a Ph.D. in zoology at the University of Basel, Switzerland, with a thesis on Mediterranean common dolphins and bottlenose dolphins. Since 1990 he has been a Board member of the Tethys Research Institute and in 2001 he became the President of Tethys. He is also a member of the IUCN Cetacean Specialist Group. Giovanni co-ordinates dolphin research projects in the Ionian Sea and in the Adriatic Sea and collaborates with ACCOBAMS on a regular basis to design and promote cetacean conservation actions. Between 2002-2006 he taught Cetacean conservation as contract professor at the Faculty of Environmental Sciences, University of Venice, Italy. In 2001 he was awarded a Pew Marine Conservation Fellowship.

[1] From http://www.rac-spa.org

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1. CONTEXT

A mission to Libya (11-16 December 2004) was organised and funded by the Regional Activity Centre for Specially Protected Areas (RAC/SPA) and the Environment General Authority (EGA) to collect information for the preparation of an Action Plan for the conservation of cetaceans.

The Marine Biology Research Centre (MBRC) at Tajura acted as guest institution and offered generous hospitality and ideal settings for the gathering of the necessary information.

A number of researchers and experts from MBRC, EGA and the Al-Fateh University participated in the meetings and provided valuable information. A list of Libyan experts attending the meetings and interviewed individually is attached to this report (Annex 2). The body of information gathered in four days of meetings was considerable, and represented an ideal background for the preparation of this Plan.

In addition to the meetings, the mission to Libya shed light on the present level of local expertise and on the available equipment and facilities. Facilities by MBRC include boats that can be used for dolphin research, meeting and conference rooms, an aquarium and museum with local marine species, pools for experimental fish farming and several wet and dry labs.

The mission included visits to local fish markets to survey the variety of fish fauna, average fish size, and market value of fish. Interviews with fishermen at fish markets complemented the information gathered through interviews.

A draft Action Plan for the conservation of cetaceans in Libya was submitted in March 2005. A revision of the draft was completed in November 2006, based on which this final document was produced.

2. BACKGROUND INFORMATION

THE PRESENT STATUS OF CETACEANS IN LIBYA

Twenty one species of cetaceans occur in various degrees of abundace in the Mediterranean Sea, of which eight are regarded as regular (fin whale *Balaenoptera physalus*, sperm whale *Physeter macrocephalus*, Cuvier's beaked whale *Ziphius cavirostris*, long-finned pilot whale *Globicephala melas*, Risso's dolphin *Grampus griseus*, common bottlenose dolphin *Tursiops truncatus*, short-beaked common dolphin *Delphinus delphis* and striped dolphin *Stenella coeruleoalba*), and all others as occasional (Notarbartolo di Sciara 2002). Surprisingly, almost nothing is known about the species composition and distribution of cetaceans in Libyan waters, although species such as the common bottlenose dolphin and the Risso's dolphin have been recorded.

Dolphins are claimed to have increased in Libyan coastal waters over the past 10 years and are said by fishermen to be abundant. Although there is no scientific evidence to confirm this trend, it is possible that changes in marine food webs and distribution shifts occurred in recent times. Dolphin groups in the waters around Tripoli are said to average 50-70 individuals. Although species identification cannot be confirmed, these dolphins would appear to be mostly bottlenose dolphins.

The reported relatively large numbers of dolphins in some areas - if confirmed - should not necessarily be taken as evidence of healthy ecosystems. Bottlenose dolphins, for instance, are known to survive even in highly degraded environments and can strive in areas that are heavily impacted by human activities (Shane *et al.* 1986), sometimes outliving species that are more sensible to habitat degradation (Bearzi *et al.* 2004). In other words, an opportunistic cetacean species might be increasing as a consequence of ecosystem changes including the decline of other high-order predators. Groupers, swordfish, large tuna and amberjacks actually seem to have declined dramatically in Libyan waters in recent years.

A large and voracious predator that seems to be increasing - possibly providing further evidence of ecosystem change - is a lessepsian species previously not found in the area: the narrow-barred Spanish mackerel *Scomberomorus commerson*. A large fish that weighs up to 25 Kg, the Spanish mackerel has become common in recent years and today is one of the most economically important fish in Libya.

The apparent changes in ecosystem structure cannot be understood based on the available information. However, they are suggestive of shifts occurring in the Libyan marine ecosystems, possibly as a result of overfishing and other causes. A comprehensive assessment of the present status of marine ecosystems and of the changes that have occurred over the last decades is urgently needed. This should include the regular monitoring of cetaceans populations, and science-based assessments of cetacean abundance and trends.

PROBLEMS AFFECTING THE LIBYAN COASTAL AND MARINE ENVIRONMENTS

Since the discovery of oil in the early 1960s, major social and economic changes have occurred in Libya. These resulted in increased individual income, fast population growth, increased work opportunities in urban areas resulting in crowding within limited coastal areas, abandonment of lands and desertification. The population growth in coastal areas is particularly worrying, as it causes accumulation in the nearby waters of large amounts of untreated solid and liquid wastes.

Dumping from building activities is another problem caused by urban development and by the current lack of coastal management. Debris and sewage discharged at sea cause significant habitat degradation in coastal waters.

Detergents and other chemicals have very cheap market prices and are used in large quantities in Libya. These end up in coastal waters mixed with sewage, together with all sort of other toxic substances.

According to Howege & Hamza (2002) the current population - concentrated mainly along the coastline - is likely to double in the next three decades, thus imposing increasing threats to the coastal marine ecosystems, including habitat loss, overfishing and pollution from land-based activities.

Economic growth prompted government subsidies to fishermen in recent times. These caused a quick increase in fishing effort, further triggered by an ever-increasing market demand, particularly since the end of the economic embargo.

Oil exploitation causes significant threats to the Libyan marine environment. Crude oil spills, either resulting from offshore explorations (e.g. in the west of Libya), oil harbours, refineries, or from discharged ballast water from tankers, are frequently seen washed ashore in some areas (Howege & Hamza 2002). Accidents from oil tankers and leaks from exploration platforms and refineries have become frequent in recent years. For instance, the amount of waste oil dumped into the sea from the El-Bouri oil field off Zwara (150 km west of Tripoli) was estimated at 2,770 m^3 during a 25-month period (Howege & Hamza 2002).

FACTORS THREATENING MARINE ECOSYSTEMS AND CETACEAN POPULATIONS

Virtually no quantitative information is available on the current threats affecting cetaceans in Libyan waters. A precise assessment of the present impact of human activities is therefore difficult.

Operational interactions between coastal dolphins and fisheries are known to give rise to conflict in some Mediterranean areas, where depredation of catch and/or fishing gear damage can lead to retaliation from fishermen, including dolphin killings (Reeves *et al*., 2001; Bearzi, 2002; Notarbartolo di Sciara & Bearzi, 2002). However, intentional killings of cetaceans in Libyan waters, if occurring, appear to be rather limited in numbers, and are unlikely to threaten the local populations. The interviewed people consistently claimed that dolphins are never killed or harmed, even if they cause damage to fishing gear or they reduce the catch. This behaviour of not harming cetaceans appears to be deeply rooted in the Libyan cultural heritage.

Fishery bycatch is a major threat to many cetacean populations in the Mediterranean basin (Di Natale & Notarbartolo di Sciara 1994; IWC 1994; Silvani *et al.* 1999; Bearzi 2002; Tudela *et al.* 2005). However, based on the limited information available, cetacean bycatch in fishing gear appears to be a relatively infrequent

occurrence in Libyan waters, reportedly limited to a low number of dolphins caught in trammel nets and purse seines. Caution should be used in interpreting this information as lack of impact as long as a scientific assessment of cetacean bycatch is unavailable.

Collisions with ships have not been documented and are unlikely to represent a significant threat.

Therefore, as far as the mitigation of direct threats such as killings, bycatch and collisions is concerned, by comparison with other Mediterranean areas there appears to be little immediate concern. At present, the main source of concern for the conservation of cetacean populations in Libya relates to the preservation of healthy marine ecosystems, rather than to the direct killing and harming of cetaceans.

Of all factors having the potential for disrupting marine ecosystems and threatening cetacean populations in Libya, excessive fishing in certain areas is by far the most alarming. There is evidence that overfishing has already caused major changes in the Libyan marine ecosystems, especially in the western region. Continued overexploitation will disrupt ecological balance and have negative impacts on both the local cetacean fauna and the local fisheries. Illegal fishing methods including undersize mesh size, illegal gear, and use of explosives and chemicals are reported to occur in some sites in Libya. Legislation to ensure sustainable fishing exists, but enforcement is low. Furthermore, the current fishing effort - being clearly unsustainable in some areas - is expected to grow in the future under ever-increasing local and international market demand.

Xenobiotic contamination of cetaceans tissues through food-web magnification (e.g. from organochlorines and hydrocarbons) represents a threat for cetaceans (e.g. see O'Shea *et al.* 1999). In Libya, sewage and other pollutants in most cases are discarded untreated directly to the sea, particularly around industrialised areas and near the large coastal cities, therefore causing significant levels of water pollution near human settlements. Levels of man-made contaminants in cetacean tissues stranded along the Libyan coasts should be monitored to allow for a preliminary assessment of toxicological risk.

Oil spills, in addition to ecosystem damage, may cause problems to cetaceans due to accidental ingestion and inhalation (Smultea & Würsig 1995). However, no data are available to evaluate the direct and indirect impacts of oil spills on cetaceans in Libyan waters.

Finally, noise pollution may represent another serious threat (Richardson *et al.* 1995; Jasny, 1999). For instance, evidence is growing that impulsive sounds have serious lethal and sublethal effects on cetaceans (e.g. Gisiner, 1998; Jepson *et al.*, 2003). Seismic exploration related to oil exploitation is likely to occur frequently in Libyan waters, and this activity is known to produce high-intensity sounds that may cause behavioural disruption, habitat loss and/or physical impairment and death among cetaceans. The impact of noise pollution needs to be carefully evaluated.

ILLEGAL FISHING IN LIBYAN WATERS

Illegal fishing by local and foreign fleets is consistently reported, and difficult to control. Some Libyan researchers suggest that up to about a half of all fishing in Libya may be illegal. These figures rest on perceptions rather than scientific assessment, and perceptions may vary among researchers. Still, it is reasonable to assume that illegal fishing represents a high percentage of the total, owing to lack of implementation of the existing laws. If the existing laws were enforced effectively, the pressure on the marine environment would likely decrease.

For instance, excellent laws exist which regulate the minimum mesh size in fishing gear, but controls by the Authorities are insufficient to ensure that these laws are followed.

Apart from the use of illegal fishing gear and mesh size, destructive fishing methods are widespread. Dynamite fishing - used extensively in some areas in the recent past - is still relatively popular (Reynolds *et al.* 1994).

The use of bleach and insecticides is also reported to occur in some areas. However, the areas where these methods are used have limited extension.

EVIDENCE OF OVERFISHING IN LIBYAN WATERS

This section summarises the information collected during the meetings at MBRC with regard to the past and present impact of fishing in Libya.

The first evidence of overfishing in Libyan waters dates back to about 10 years ago. Until the early 1990s, fishing was relatively undeveloped and the overall fishing effort was low. Libyan food normally contains a limited amount of fish. Groupers (*Epinephelus* sp.), for instance, were given away for free until recent times, due to low marked demand. Large groupers were very common and used to be found in waters only 2 m deep, but this does not happen anymore. The current fishing pressure on demersal fish, and groupers in particular, is very high. Until 10 years ago groupers weighing up to 40 Kg were common – today they are extremely rare.

Although no quantitative data exist on landing trends in Libyan waters, it has been estimated that a ten-fold increase in fishing effort has occurred since 1990. The mean size of fish caught in Libyan waters is getting smaller, and some fishermen are moving away from portions of the Libyan coast as a result of prey depletion caused by overfishing.

Large swordfish *Xiphias gladius*, red mullets *Mullus barbatus* and common pandora *Pagellus erythrinus* have decreased in both catch quantities and mean size. Tuna and mackerel are reportedly also declining. In the past there used to be 12 tuna traps (tunnaras) in Libya. Today, only three are in operation, and their production has decreased. Back in the early 1980s, bluefin tuna *Thunnus thynnus* as large as 600 Kg could be observed. Today, their maximum size is about 250 Kg.

Fish export for human consumption is the main driving force of Libyan fisheries. Demand for fishmeal is showing a steady increase in response to continuing pressure to expand production in animal feed plants[2].

To meet a market demand that is constantly increasing, the Secretariat of Marine Wealth aims to enlarge the Libyan fishing fleet. This policy, however, may carry serious risks of overexploitation. As long as fishing is not managed based on comprehensive stock assessments and on a thorough understanding of ecosystem and food web structure and dynamics, it is likely that it will result in irreversible damage to marine ecosystems (Browman & Stergiou 2004).

Fishing licences tend to be issued to foreign fleets to exploit the stocks that the Libyan fisheries leave unexploited. In the context of this policy, foreign fleets have been granted licenses to fish in Libyan waters. These fleets use purse seines and longlines to catch tuna and shark (for fins). The EU is also currently negotiating the granting of permits to fish in Libyan waters. The combined impact of local and foreign fishing is likely to cause tremendous additional pressure on the Libyan fish stocks. Fishing boats from neighbouring countries also contribute to the total fishing pressure.

Libyan fishermen reportedly tend to leave their jobs to non Libyans, and the sons of local fishermen are rarely interested in their fathers' job, so that cultural heritage is no longer transmitted from one generation to another. During the meeting it was suggested that at present the majority of fishermen working in Libyan waters are not Libyans[3]. Foreign fishermen are paid for what they catch, and this can represent an incentive to overfish. It was suggested that foreign fishermen don't care about preserving the local fish stocks because they work on a short-term basis and they are not motivated to preserve the marine resources for the benefit of future generations.

One of the relatively "pristine" areas in Libya where fishing is prohibited is Ras Lanuf, an oil exploitation area in the centre of the Gulf of Sirte. Areas used for oil exploitation may enjoy some level of protection from fishing, although a few boats are licensed to fish even there.

[2] http://www.fao.org/fi/fcp/en/LBY/profile.htm

[3] A high percentage of non-Libyan fishermen - mostly from Egypt, Tunisia, Morocco, Syria and Palestina - in Libyan fishing boats was reported by Reynolds *et al.* (1994).

CETACEAN BYCATCH IN FISHING GEAR AND DOLPHIN-FISHERIES OPERATIONAL INTERACTIONS

This section reports the information gathered during the meetings at MBRC, and is intended to complement the data published by FAO in the context of Project LIBFISH (several technical publications in1994, following surveys conducted in 1993) and Project COPEMED (Lamboeuf *et al*. 2000), with regard to information that is relevant to cetacean bycatch and operational interactions between dolphins and fisheries[4].

Driftnets about 2 Km long are used by the Libyan fleet, having a mesh size of 5 cm. Fishing takes place overnight to target small tuna. These driftnets are mostly used around Misratah, where there may be ten boats operating this gear. Based on the available information, this kind of driftnets does not seem cause significant levels of cetacean bycatch.

Boats operating purse seines at night and using lamps to attract fish ("lampara") are used in the west of Libya, from Tunisia to Misratah. In the east this kind of fishing is infrequent (people in the east of Libya are comparatively less used to eat fish and market demand is consequently lower). Large numbers of dolphins reportedly join the lampara boats. Dolphins are said to get very close to fishing boats, especially if one taps on the boat to "call" them. Fishermen sometimes use small explosives such as petards to scare the dolphins away. Sometimes the dolphins follow the boats up into the port. The occurrence of cetacean bycatch in lampara purse seines seems to be low.

Purse seines operating during the day, as well as longlines, are used by foreign fleets (e.g. from Japan and Korea) operating in Libyan waters. The occurrence of cetacean bycatch during these fishing operations is unknown, however MBRC researchers occasionally join foreign ships to report yield and bycatch.

There is no midwater trawling in Libya, although this gear is sometimes used for experimental purposes. Only bottom trawlers exist, operating nets with low openings. Cetacean bycatch in trawling nets is suggested to be insignificant. Dolphins are said to follow trawlers on a regular basis, but they don't cause damage to the fishing gear. Dolphins follow the nets while operating and perform long dives in their proximity. When the nets are lifted they approach the boats and wait until the fishermen get rid of the bycatch, then the dolphins feed on the discarded fish.

Overall, cetacean bycatch would appear to be a rare occurrence in Libyan waters, and the predominant fishing methods - bottom trawling, gillnetting and longlining – are unlikely to cause significant cetacean mortality. As a wild guess, the meeting participants suggested that only about one dolphin per month might get caught in fishing gear in Libya[5]. However, dolphins may occasionally get caught in trammel nets and purse seines, and a comprehensive scientific assessment of the impact of bycatch is needed.

Some fishermen in Libya claim that killing dolphins is illegal, although there seems to be no specific legislation that protects cetaceans. The intentional killing of dolphins was suggested by many to be either infrequent or non-existing in the country. Dolphins are regarded as "holy" and special animals and sayings exist like "if you kill a dolphin you don't catch fish anymore".

Gear depredation by the dolphins mostly involves trammel nets and lampara purse seines. Trammel nets are said to get damaged by the dolphins every night, and purse seines are also heavily affected. Fishing boats operating purse seines at night often try to pass the dolphins on to other boats, by intentionally approaching a boat and lifting the nets so that the animals may move on to the next boat.

Dolphins reportedly eat hooked fish caught in longlines. This behaviour seems to have been learned in recent years as the dolphins didn't do that until about five years ago.

Dolphins are said to eat a number of fish species. Although in the past they used to be highly selective (favourite prey included demersal fish such as the red mullet, common dentex and common pandora), today the dolphins eat all sort of fish, including moray eel and black scorfan.

[4] A review of fishing activities in Libya was prepared by FAO in 1996 and can be found at http://www.fao.org/fi/fcp/en/LBY/profile.htm.

[5] In the area of Tripoli, fishermen normally call MBRC if they catch a cetacean, but the occurrence of such events is low.

These reported changes in dolphin behaviour may represent further evidence of ecosystem shifts including changes in prey availability and/or increased abundance of opportunistic species such as the bottlenose dolphin (a cetacean that notoriously displays the behaviours described above).

To get rid of the dolphins and avoid depredation, fishermen may throw small petards in the water or feed the animals with low-quality fish. An experimental dolphin scaring device has been developed by the Tunisian National Institute of Marine Technology. It consists of a 2 m long steel pipe with closed extremities, having a diameter of one inch. The pipe is filled with some material (either unreported or kept secret). By tapping on one side of the pipe the dolphins are said to get scared and move away. Although this rudimental acoustic device was claimed to be working well, its success and actual application in Libyan fisheries needs to be assessed.

CONCLUSIONS

Following a past when fish consumption was limited to small portions of the local population and fishing was poorly developed (e.g. as a result of long-lasting economic sanctions and exclusion from sectors of the international trade, which restricted the marked demand for fish) the marine ecosystems in Libya have been spared the destruction that has occurred elsewhere.

The Libyan marine ecosystems could still be called "pristine" until about 10 years ago, at a time when most other marine areas around the world were being depleted (Dayton *et al.* 1995, 2003; Pauly *et al.* 1998, 2002; Jackson *et al.* 2001; Myers & Worm 2003). The present diversity and richness of the Libyan marine ecosystems is still amazing by comparison with most other Mediterranean areas. However, alarming signs of change in the Libyan marine ecosystems were recorded in the past decade, likely as a consequence of the combined impact of overfishing, illegal fishing and water pollution. These signs need to be carefully evaluated.

Rather than following in the path of nations that after a few decades of mismanagement have brought several commercial fish stocks near the point of collapse, and now must fall back on fish farming and Governmental subsidies, Libya should appreciate the national treasure that still can be saved. Together with oil, the present richness of marine ecosystems should be regarded as one of Libya's main resources. However, contrary to oil, consumptive exploitation is not the only way to benefit from marine resources.

A wise management of fisheries will preserve healthy and abundant fish stocks for the benefit of the Libyan economy and future generations of fishermen. In addition, well-preserved marine ecosystems - in the context of a spoiled Mediterranean scenario (particularly in the northern basin) - will provide Libya with an extraordinary potential and appeal for the development of tourism. Dilapidating this extraordinary natural heritage in the name of short-term economic benefit would be a fatal mistake.

The impact of overfishing on Mediterranean ecosystems and the resulting food web changes (CIESM 2000; Tudela 2000) are likely to represent one of the most important threats to cetaceans (Bearzi 2002). Urgent measures should be promoted to manage the current fishing effort and reduce overfishing in Libya. This will contribute to the preservation of balanced and diverse ecosystems, therefore preventing irreversible damage to the Libyan marine food webs, of which cetaceans are an important component.

A reduction and careful management of the current fishing effort will ensure that the marine environment is maintained in a status that makes it attractive for a sustainable tourism industry, allowing for the development of a number of profitable activities. For instance, responsible scuba diving, snorkelling, whale watching and/or dolphin watching may be promoted in some areas as economically-sound and non-destructive alternatives to fishing. The creation of MPAs would also contribute to marine conservation and to raising the touristic profile of coastal areas.

In conclusion, this Plan advocates action to promote an increased understanding of ecosystem functioning and a careful assessment of the present impact of fishing. Rather than protecting cetaceans exclusively, which at present appear to be relatively unaffected by direct threats, conservation action should favour an ecosystem-based management approach to preserve the integrity and diversity of marine ecosystems. Conservation measures will need to be adaptive, constantly reviewed and sensitive to signals from the wider environment and the flagship species that are their focus. Where knowledge is lacking, the precautionary principle should be invoked.

Figure 1. Map of the Socialist People's Libyan Arab Jamahiriya (Libya).

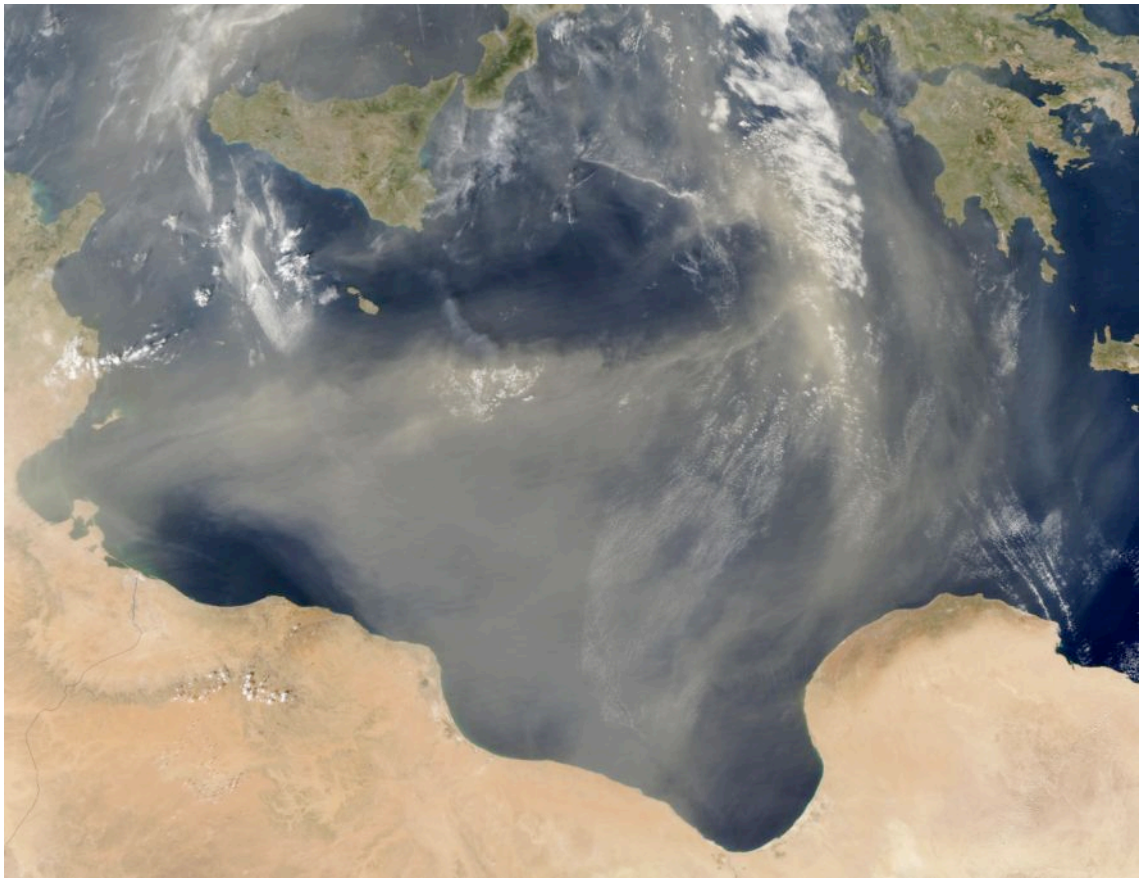


Figure 2. A satellite image of the Libyan coast.

3. PRIORITY ACTIONS (2007-2009)

The actions listed here were selected based on their level of priority and feasibility. These actions should be implemented immediately and completed within three years. An assessment of the implementation status of this Plan will be necessary at the end of the year 2009 (see Section 4), to identify future steps and define priorities based on the results obtained through this first set of actions.

Most of the proposed actions are deliberately simple and several of them have relatively modest budgets. Once appropriate actors have been identified and empowered, it should be possible to get the process started within a short time, even if only limited funding is available.

The MBRC was selected as one of the main actors and targets of this Plan. The Centre has personnel, facilities, commitment to the cause and an institutional mandate to conduct and promote cetacean research and conservation actions in Libya. Whilst MBRC currently represents the Libyan institute that can guarantee most chances of success in the implementation of the initial actions, this does not mean that action will remain confined there. The aim of this Plan is to ensure that MBRC will pioneer cetacean research and conservation actions in Libya with the aim of promoting this new field and diffusing awareness and expertise throughout the country in the near future.

The survey of artisanal fisheries in Libya, co-ordinated by Michel Lamboeuf and conducted by MBRC in the context of the FAO COPEMED Project, stands as an example that excellent work can be done in a short period of time (e.g. two months of field work in the case of the COPEMED survey) and published timely by taking advantage of local experts, good supervision and appropriate funding.

Initial funding for this Action Plan may come at least in part from sources such as the RAC-SPA and ACCOBAMS, with no immediate need for funding by the Libyan Government. However, it is expected that Libya will provide contributions in kind, logistic support, infrastructure and co-ordination to make possible all the actions listed here. Contributions in kind may include housing, ship time, salary for local personnel, translations etc.

Although a precise identification of all actors goes beyond the purposes of this Plan, some of the potential experts and organisations have been listed in Annex 1, with the aim of facilitating and speeding up the implementation of the Plan.

As pointed out in the Libyan National Report on the Strategic Action Plan for the Conservation of Marine and Coastal Biological Diversity in the Mediterranean (SAP-BIO) "the country is in need mainly of technical support; the specialists in the fields of marine science are few and there is a need for reorientation of the studies (postgraduate) into this field and that of environment and biodiversity in general" (Howege & Hamza 2002).

Indeed, there is an urgent need to build capacity among Libyan researchers and students, to facilitate the development of state-of-the-art investigation methods that will shed light on the status and conservation problems of cetaceans in national waters. The present lack of expertise on cetacean research methods, combined with lack of access to the relevant literature and information, prevent to design and carry out meaningful research programmes. However, there is a favourable ground on which cetacean science may develop soon, particularly within institutes such as MBRC and EGA, if Libyan researchers and students are provided with training opportunities and support.

Specific capacity building actions should be developed to encourage the collection of data at sea, and to promote the creation of a co-ordinated national stranding network. Theoretical courses can be organised in Libya to allow for a wide participation, in addition to intensive short-term courses held abroad. Opportunities for long-term training should be created for the most deserving students and researchers. To be effective, all courses should include practical activities and follow-up.

Concurrently, public awareness must be raised by building on the existing traditional respect towards cetaceans, as well as on the existing legislative tools.

Cetaceans in Libya are commonly regarded as "special" animals. As such, they are generally respected by fishermen and other people. Dolphins are rarely killed, even when they cause damage to fishing gear or when they reduce the catches. Preserving such an extraordinary attitude towards animals seen as highly evolved creatures (as a result of the Libyan ancient cultural heritage) would be extremely important.

However, the means to promote awareness and educate the public on the conservation needs of whales and dolphins are presently lacking. The actions outlined here aim to provide the relevant institutions with the necessary tools to design and carry out effective awareness campaigns in Libya.

Encouragement and consistent supervision by international experts represent important aspects to ensure the long-term success and continuation of public awareness and education campaigns.

Much translation work will be needed, as all the materials produced in the context of public awareness and other actions should be in Arabic. Once materials have been produced in Arabic and appropriately diffused (e.g. through library exchange, internet etc.), this may also facilitate the development of cetacean research and conservation campaigns in Arabic-speaking countries other than Libya.

Co-ordination is an important aspect of the process. Some of the actions may be combined and take advantage of a joint effort. A co-ordinator should be in charge of ensuring that duplication of effort is avoided and that all actions are undertaken timely, based on appropriate expertise and collaboration among the involved parties.

Some of the actions listed in this Plan may benefit from collaboration with groups working on turtles, monk seals and marine birds. In some cases, a joint action will have a much stronger impact. Therefore, it is important to promote communication and exchange of information with other marine biologists working in Libya, and let them know about this Plan and the related conservation strategy.

A NOTE ON INTERNET ACCESS IN LIBYA

Access to the internet is normally slow and discontinuous in Libya, although the situation is likely to improve in the future. The current difficulty in accessing internet resources must be taken into account when organising actions that involve sharing information with Libyan researchers, posting information online, or using the internet as a primary way of creating awareness. For the time being, this is unlikely to work well.

Slow internet connections hinder access to literature and other information posted online[6], that can be easily and routinely used in other countries. For instance, as far as the development of a specialised cetacean library is concerned, this implies that publications must be provided as hard copies or as printable pdf files, rather than being posted online or sent through e-mail.

[6] For instance, about 2 hours are currently needed to download a 350 Kb file.

3.1. Education and awareness[7]

ACTION 3.1.1.
PROVISION OF MISCELLANEOUS MATERIAL FOR PUBLIC AWARENESS AND EDUCATION PURPOSES

Provide MBRC and – through it - other Libyan research and conservation centres with public awareness materials to be used during seminars, training courses, public events and institutional meetings to help raising awareness on the need to protect cetaceans in national waters.

The current lack of materials to be used for educational purposes prevents the dissemination of information and makes it difficult to design similar educational materials in Arabic. Materials that may serve to support public awareness actions include videos, photos of Mediterranean cetaceans, posters, brochures, 3D models, tapes with cetacean sounds and other materials for public display. Such materials can be shipped to MBRC at a relatively low cost, and disseminated by MBRC to the relevant centres concerned with education and awareness in Libya. Subsequently, the institutions concerned with marine conservation can produce similar materials in Arabic, specifically suited to the Libyan public.

Possible actors: WDCS, OceanCare, Tethys Research Institute.

Target: MBRC, EGA, Universities and marine research institutes, education and public awareness centres, NGOs.

ACTION 3.1.2.
LEAFLET IN ARABIC TO ENCOURAGE THE REPORTING OF CETACEAN STRANDING EVENTS

Leaflets should be produced to let the relevant people know what to do in case they find a stranded cetacean, and to increase the chances that a stranding event is reported.

This leaflet should be designed to be attached to notice boards and walls, and look attractive enough to stay there for a long time.

The leaflet, in Arabic, should be produced in large quantities to encourage people in coastal settlements to call a centralised phone number (ideally available 24 hours/day, year-round) whenever a cetacean is found stranded along the Libyan coasts.

The leaflet may also include information on how the stranding event can be documented, how to conduct a basic intervention, what data should be recorded, and to whom the event should be notified, especially in areas where expert personnel to carry out a complete necropsy is unavailable.

This service may also serve to collect information on other species of interest (marine turtles, monk seals, elasmobranchs etc.)

Possible actors: MBRC with supervision and assistance from organisations concerned with the management of stranding networks.

Target: *DISSEMINATION* - Libyan Authorities (e.g. Coast Guard), EGA, MBRC, marine research institutes, education and public awareness centres, NGOs.

END USERS - Coast Guard officers, fishermen, people living near the coast.

[7] The education and awareness actions listed in this section are largely consistent with those advocated by the Education Programme developed by ACCOBAMS. It is therefore recommended that actions are conducted in the context of a collaborative effort between the concerned actors and ACCOBAMS.

ACTION 3.1.3.
LEAFLET IN ARABIC EXPLAINING WHY CETACEANS MUST BE PROTECTED

A simple leaflet should be produced in large quantities to educate the relevant public on the need to protect cetaceans, and on practical ways to contribute to marine conservation. The leaflet should state in simple words why it is important to protect whales and dolphins as well as the marine biodiversity at large, and list a series of practical, simple actions that everybody can do to contribute to this process.

This basic and relatively inexpensive action can help promoting awareness, while stressing that cetaceans represent a resource worth caring for. A mention to the traditionally positive attitude of the Libyans towards these animals would be appropriate.

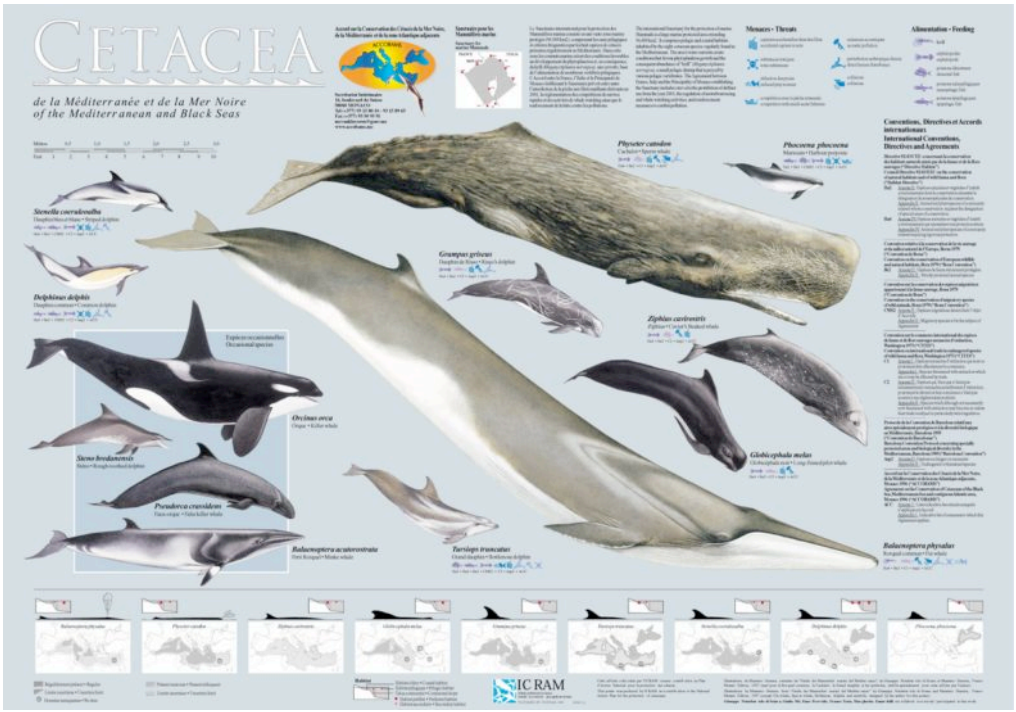
Possible actors: MBRC and EGA with assistance from organisations such as WDCS and OceanCare.

Target: *DISSEMINATION* - Libyan Authorities (e.g. Coast Guard), MBRC, EGA, marine research institutes, education and public awareness centres, NGOs.

END USERS - fishermen, people living in coastal areas, students and school children.

ACTION 3.1.4.
POSTER ON CETACEANS IN ARABIC

Produce a large, attractive poster on cetaceans in Arabic, including all the species that can be found in Mediterranean waters together with information on their ecology and distribution. This poster may be similar to the one drawn by cetacean artist Massimo Demma, that was produced by ICRAM in Italy (shown below).



The poster should emphasise that several cetacean species live in Libyan waters and that they represent an important part of the Libyan natural heritage, as well as a resource that deserves to be known and preserved for future generations.

Drawings giving a "Libyan cut" to the poster should be added (e.g. representing the Libyan coast and aspects of the Libyan cultural heritage).

Possible actors: MBRC and EGA with assistance from ICRAM and artist Massimo Demma (copyright holders of the ICRAM poster).

Target: Libyan Authorities (e.g. Coast Guard), MBRC, EGA, marine research institutes, education and public awareness centres, NGOs, fishermen co-operatives, schools.

ACTION 3.1.5.
DESIGN AND CONDUCT AWARENESS ACTIONS TARGETING THE FISHERIES SECTOR

Involving fishermen and making them aware of the importance of preserving healthy ecosystems, while allowing them to play an active role in the sustainable management of marine resources, is an important component of the conservation process. Fishermen may have little motivation to respect the laws as long as they don't know why these laws exist. Marine conservation should be presented as a strategy to guarantee that healthy fish stocks will be preserved for the present and the next generations of fishermen. Cetaceans should be shown as highly evolved mammals, and marine biodiversity as a national treasure.

To accomplish this, appropriate communication channels should be developed through the direct involvement of experienced personnel favouring a "field" approach. This may include presentations at fisheries cooperatives, participation in fishing activities, much communication on a personal level, and the building of a sense of trust and respect between the fishermen and the person engaged in awareness actions.

Better results may be obtained through the direct involvement and recruiting of fishermen or ex-fishermen in the awareness actions.

Showing documented examples from areas where a few decades of overfishing have destroyed the local environment and prompted the collapse of commercial fish stocks may be particularly effective.

Empowering committed persons that are both capable and willing to engage in awareness actions targeting the fisheries sector represents one of the best strategies. These qualified persons should be co-ordinated and provided with appropriate awareness materials to be translated in Arabic.

Possible actors: MBRC in coordination with EGA, with assistance from the WWF Mediterranean Programme. Abdallah Ben Abdallah, fish scientist and ex-fishermen, may act as local co-ordinator for this action.

Target: Artisanal and commercial fishermen, fishing co-operatives and organisations.

ACTION 3.1.6.
PROVIDE SUPPORT TO PRODUCE A LIBYAN DOCUMENTARY ON CETACEANS

Although many excellent documentary films on cetaceans exist on the market, videos to be used for local awareness purposes would be much more effective if they feature Libyan personnel and have a "Libyan cut".

In 2004, the MBRC initiated the production of a documentary on cetaceans. Footage of appropriate quality was obtained *inter alia* during the *International Meeting on Cetacean Conservation in the Mediterranean and Black Sea Regions* (Tajura, Libya, 30 May - 1 June 2004). This material may be used in combination with other footage to produce an independent documentary which would contribute to the promotion of cetacean research and conservation actions in the country.

Possible actors: MBRC with assistance from a professional broadcasting company or expert video editors. Organisations capable of providing professional footage on Mediterranean cetaceans (e.g. Alnitak, Delphis, Pelagos Cetacean Research Institute, Tethys Research Institute).

Target: National TV, Libyan Authorities (e.g. Coast Guard), EGA, marine research institutes, education and public awareness centres, NGOs, fishermen co-operatives, Universities and schools.

ACTION 3.1.7.
PROVISION OF INFORMATION ON ASPECTS RELATED TO THE KEEPING OF CETACEANS IN CAPTIVITY

Plans are underway to build a dolphinarium in Tripoli, for which the MBRC has issued licenses to take a limited number of dolphins from the wild. Due to the insufficient awareness of the pros and cons of taking dolphins from the wild, keeping them in captivity, and all the related animal welfare and public awareness aspects, it would be appropriate to provide the MBRC and other institutes in Libya with extensive documentation on all the relevant issues. This would ensure that decisions are taken based on appropriate information, *inter alia* with regard to the obligations deriving from the ratification of international treaties.

Possible actors: WDCS, OceanCare, ACCOBAMS.

Target: MBRC, EGA.

ACTION 3.1.8.
CREATE OPPORTUNITIES TO RAISE INSTITUTIONAL AWARENESS ON THE NEED TO MANAGE MARINE RESOURCES IN A SUSTAINABLE WAY, AND ON THE IMPORTANCE OF PROTECTING CETACEANS

The level of institutional awareness in Libya is relatively high, as shown *inter alia* by the Legislative Act #15 of 2003 concerning the Protection of the Environment, by the Law #14 of 1989 concerning the Exploitation of Marine Resources, and by the General People's Committee Resolution #912 of 1992 for the creation of Protected Areas and National Parks. The Libyan Government has established several national parks and protected areas, and Libya was one of the earliest countries that joined the Barcelona Convention and a number of other relevant conservation conventions (for a comprehensive list see Howege & Hamza 2002).

As far as cetaceans are concerned, Libya was one of the first States that signed the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS) back in 1996. Libya subsequently ratified the Agreement in 2002.

However, institutional awareness should be raised further in Libya in view of the alarming and fast-growing threats to the marine environment. Succeeding in the task of making politicians, policy makers and administrators aware of the need to protect marine ecosystems would ultimately result in support for the local institutions promoting cetacean conservation, funding for cetacean research programmes, and improved legislation and/or full implementation of the existing laws aimed at the protection of marine resources.

The organisation of international meetings, training courses and workshops - such as the course on cetaceans organised in Tajura in 2004 - represent excellent ways of promoting institutional awareness. This action aims to ensure that meetings and courses on cetacean research and conservation are regularly organised in Libya, and that these events are used as opportunities to involve the Libyan authorities and make them aware of the international efforts to protect whales and dolphins in the Mediterranean.

Organisations such as the RAC-SPA and ACCOBAMS should consider the added benefit of holding their institutional meetings in Libya, and promoting initiatives in the country that involve the relevant national authorities.

Possible actors: MBRC, EGA, RAC-SPA, ACCOBAMS.

Target: Libyan decision makers, policy makers, politicians, administrators.

ACTION 3.1.9.
TRANSLATION OF THIS ACTION PLAN INTO ARABIC

With regard to Action 3.1.8., a way of diffusing institutional awareness would be translating this Action Plan into Arabic and making it widely and promptly available. The relevant authorities should be informed of the ongoing attempts to protect whales and dolphins in Libya, and made aware of the international appreciation and support towards cetacean conservation actions.

Once translated in Arabic, the Plan may also be adopted in full or in part by other Arabic-speaking countries, or used as a first step towards the development of own conservation plans.

The Arabic and English versions of this Action Plan should be made widely available online, e.g. on the web sites of MBRC, RAC-SPA, ACCOBAMS and other relevant organisations.

Possible actors: EGA.

Target: Libyan decision makers, policy makers, politicians, administrators. Cetacean research and conservation community.

3.2. Capacity building

A NOTE ON SOME OF THE PRACTICAL ASPECTS OF CAPACITY BUILDING ACTIONS

Language
At present, there appears to be much interest in cetaceans among Libyan students and researchers. However, the language is often a problem because only an estimated 25-30% of the Libyan young students understand English - a language that is most commonly spoken by older people. This represents a significant problem when it comes to training, as the selection will often need to include as a pre-requisite a basic knowledge of English. In some cases, it will be necessary to target the training activities on supervisors, and leave to them the task of involving the younger generation.

Travel
Travelling abroad is relatively easy for Libyan researchers. This should facilitate their involvement in training programmes organised abroad. In order to attend training programmes in a foreign country, the Libyan trainees will need an official invitation. It normally takes up to 15 days to get a Visa. A personal insurance that costs about 40 LD/week (about 25 Euro) is also needed. The Visa lasts a minimum of three months and costs 35 Euro.

Selection process
All the conditions for participation in the training and the selection criteria to be met by the trainees involved in the capacity building activities outlined in this section of the Plan should be clearly defined, to ensure that only those who will actually make use of whatever is learned during the training will be involved.

ACTION 3.2.1.
PROVIDE ACCESS TO SPECIALISED LITERATURE ON CETACEANS

One of the greatest hindrances to the development of cetacean research and conservation in the country is the diffused current unavailability of specialised literature. Gaining access to cetacean literature is exceedingly difficult in Libya. Lack of access to appropriate documentation hinders learning, prevents the building of capacity on cetacean research and makes publication of scientific information extremely difficult.

Access to cetacean literature should be facilitated by providing specialised libraries with the necessary support to operate as a source of continuously updated information for local scientists and interested students.

As a first step towards the diffusion of information in Libya, this Action aims to create a basic library on cetaceans and marine conservation at MBRC and to allow for its continuous growth and updating. MBRC manages a relatively large and well-equipped library on marine ecology[8], but specialised literature on cetaceans and marine conservation is lacking. Complementing the existing library with a comprehensive and updated section on cetaceans would help turning the MBRC into a national reference point for cetacean studies, and facilitate the development of cetacean science and conservation in the country.

It must be noted that access to specialised literature through the World Wide Web is currently very difficult in Libya, as internet connections are extremely slow and often not working. For the time being, provision of scientific articles as hard copies or printable pdf files would work better than posting electronic files online. Scientific papers can be photocopied or printed *in situ,* but books should be provided in multiple copies for distribution to centres other than MBRC.

[8] According to the CIESM online database (http://www.ciesm.org; last update July 1999), the MBRC library holds a total of 2,532 books, journals and manuscripts, and 199 periodical subscriptions.

Possible actors: Tethys Research Institute[9].

Target: MBRC, EGA.

ACTION 3.2.2.
BUILD CAPACITY FOR THE MANAGEMENT OF A CETACEAN STRANDING NETWORK

This action envisages the provision of expert supervision for the development of a cetacean stranding network in Libya, and a series of initiatives to build capacity with regard to the collection, storage and preservation of cetacean tissue samples. This could be done through specific training courses, held both *in situ* and abroad, and through the direct involvement of experts supervising the work done in Libya.

Possible actors: *ORGANISATION* - RAC-SPA, ACCOBAMS

TRAINING AND SUPERVISION - International experts skilled in the management of effective cetacean stranding networks and in the collection, storage and preservation of cetacean tissue samples. The University of Padua, Italy, may offer valuable expertise.

Target: MBRC, EGA, NGOs, other Libyan marine research centres.

ACTION 3.2.3.
ORGANISE THEORETICAL TRAINING COURSES ON CETACEANS

This action aims to address in part the need for capacity building outlined elsewhere in this Plan, with regard to field research, laboratory techniques, dealing with the collection, preservation and storage of cetacean tissues etc.

An excellent general training course was organised in 2004 at the MBRC headquarters in Tajura. However, this course had a broad scope and was too short to offer opportunities for practical training. In the future, more specific and practical courses should be organised to allow the local scientists to develop technical skills and deepen their understanding of cetacean research techniques and conservation strategies.

In some cases, it will be particularly effective to organise training courses abroad for selected teams of promising Libyan scientists. Training courses in professional laboratories or well-managed research stations abroad will provide the Libyan researchers with opportunities to experience how the work is done under ideal circumstances. This would allow to bypass all logistical constraints that may occur in Libya, where infrastructure and opportunities for training may be lacking or troublesome in some cases.

For instance, field research on dolphins would be best practiced in places where the animals can be reliably and readily found, weather and sea conditions are optimal, and the application and practicing of research methods is made easy by extensive previous experience by the training team. This would allow to save time and concentrate on training aspects and practice of research methods.

Similarly, ideal opportunities for training in laboratory techniques can be offered by professional laboratories with extensive experience in the handling and analysis of cetacean biological materials.

As noted elsewhere, the selection of appropriate trainees is fundamental. The total cost for individual participation in a training course abroad may be considerable, and it represents a significant investment. It must

[9] The Tethys Research Institute manages one of the largest collections of scientific literature on cetaceans in Europe, currently including about 15,000 entries. Besides thousands of publications on aquatic mammals, it includes papers relating to the conservation of the marine environment and to sustainable resource management. The collection has its focus on Mediterranean cetaceans and their conservation, and it includes most of the available literature – both historical and recent - on cetacean species living in the basin.

be ensured that an appropriate selection process is in place to guarantee that whatever is learned is put to good and timely use.

Considering the lack of specific expertise on cetacean research methods among senior researchers in Libya, and the language issue that has been described previously, the training courses should include both juniors (e.g. promising students) and seniors (e.g. professional researchers with expertise in other disciplines). The latter may not be directly in charge of data collection but can serve as supervisors once they know how the work should be done.

Possible actors: See 3.2.3.1. and 3.2.3.2.

Target: Selected Libyan researchers and students determined to work on cetaceans.

ACTION 3.2.3.1.
BUILD CAPACITY IN LABORATORY TECHNIQUES

Expertise in the treatment of cetacean tissue samples and specific analyses that can be performed on these tissues is largely lacking in Libya. Capacity in laboratory techniques including genetics, molecular biology, toxicology, histology, pathology, parasitology etc. should be built by allowing selected Libyan researchers to spend appropriate periods of time in laboratories abroad, that use state-of-the-art research techniques.

Expertise in standard genetic techniques (e.g. PCR), toxicological analyses (e.g. determination of organochlorine loads), histopathology, parasitology etc. would prove extremely valuable for Libyan scientists, not only in the context of cetacean research but also for investigations on the state of the marine environment in general.

Once the Libyan researchers have been trained, a follow up should ensure that whatever has been learned is actually used, and that the Libyan laboratories are appropriately equipped to perform the relevant analyses.

Possible actors: *ORGANISATION* - RAC-SPA, ACCOBAMS

TRAINING, SUPERVISION AND FOLLOW UP - Laboratories and researchers with extensive experience in the analysis of cetacean tissue samples and biological materials (e.g. University of Barcelona, Spain, University of Valencia, Spain, University of Padua, Italy, University of Siena, Italy, University of Durham, U.K., University of Liege, Belgium).

Target: Selected Libyan researchers and students determined to work on cetaceans.

ACTION 3.2.3.2.
BUILD CAPACITY IN CETACEAN FIELD RESEARCH METHODS

No expertise is currently available in cetacean field research methods in Libya. However, opportunities to conduct research on cetaceans at sea do exist, as well as infrastructure and basic equipment. To facilitate the prompt launching of research projects on cetaceans, it would be appropriate to involve selected Libyan researchers and students in training courses held abroad under ideal circumstances.

Training should include lectures and practical activities on topics such as species identification, survey techniques, individual photo-identification, collection of behavioural data, data handling, database management, co-ordination of project personnel and management of all the logistical aspects related to a field research programme.

The collection of field data in Libya should initiate soon after the training, and expert researchers should provide follow up to assist in the development of area-specific research protocols and methods

for data collection and analysis. Further expert supervision should be offered to facilitate data analysis and ensure a timely publishing of the new information.

Possible actors: *ORGANISATION* - RAC-SPA, ACCOBAMS.

FIELD TRAINING - Organisations with relevant expertise and documented training skills (e.g. Tethys Research Institute, Pelagos Cetacean Research Institute, Alnitak).

FOLLOW UP AND EXPERT SUPERVISION - international experts on cetaceans research.

Target: Selected Libyan researchers and students determined to work on cetaceans.

ACTION 3.2.4.
PROVIDE SELECTED LIBYAN RESEARCHERS AND STUDENTS WITH OPPORTUNITIES FOR LONG-TERM TRAINING

Supporting skilled, enthusiastic researchers and students determined to engage in marine conservation may represent one of the most valuable investments in the medium and long term. Opportunities for long-term training should be offered to allow Libyan researchers and students to attend specialisation courses in top Universities and laboratories abroad.

Long-term training may include enrolment in Master's courses, and whenever possible the continuation of the studies in the context of Ph.D. or Post Doc research programmes, relying on support and advisorship from international Universities and experts.

The most appropriate way to develop this action is by creating a selection mechanism based on merit, that offers appropriate financial support for higher studies with a focus on the status and conservation of cetaceans in Libya. The awarding of such a grant should be linked to the development of a specific project in Libya.

It must be noted that research grants may also be obtained by Libyan students through the Libyan Government. These grants are for broad subjects (e.g. "biology") and it is up to the student to specialise in a given research field. However, national grants are not intended to support studies abroad.

Possible actors: Universities offering Master's with a focus on cetaceans and the study and conservation of the marine environment (e.g. University of St. Andrews, University of Aberdeen, University of Bangor, University of Edinburgh etc.)

Target: Selected Libyan researchers and students.

3.3. Research

A NOTE ON THE DISSEMINATION OF SCIENTIFIC DATA

Information obtained through the actions outlined in this section of the Plan should be made promptly available to the scientific community. Appropriate dissemination means include verbal and poster presentations at scientific conferences and symposia (on fisheries, cetaceans, marine conservation etc.), publication in scientific journals, progress reports disseminated through web sites (e.g. those of EGA, MBRC, RAC-SPA, ACCCOBAMS), and publication in newsletters such as *Fins* (the newsletter of ACCOBAMS).

Support should be provided to ensure that data dissemination takes place timely, and that the information is made available in both English and Arabic.

Libyan researchers should be given editorial support and scientific supervision whenever necessary.

ACTION 3.3.1.

STIMULATE RESEARCH ON LIBYAN FISHERY TRENDS AND MARINE ECOSYSTEM STATUS WITH REGARD TO OVERFISHING

As summarised in Section 2, over the past decade the Libyan marine ecosystems have been exposed to largely unregulated fishing effort that, under increasing pressure from European and eastern markets, is depleting the local marine resources at an alarming rate. Dramatic changes have occurred over the past decade as a result of overfishing, and the constantly growing fishing effort can be expected to produce irreversible damage to the marine fauna and - consequently - to the fisheries themselves.

Circumstantial evidence of overfishing can be found by talking with the local fishermen, by looking at the high occurrence of undersize fish (e.g. groupers) in the local fish markets, or by observing the intensity of the current fishing methods and effort, and the widespread use of illegal and destructive fishing methods and gear. Unfortunately, the impact of overfishing in Libya remains undocumented in the scientific arena, and there is little public and institutional awareness of the destructive potential of the present fishing effort.

Urgent action is needed to raise awareness on the medium and long-term consequences of overfishing and to promote efforts to regulate fishing before it's too late.

A review of the impact of overfishing in Libya and a documentation of the changes already occurred in the local marine fauna would be needed, e.g. with regard to changes in fishing effort and gear, catch per unit effort, species composition and average fish size occurred over the past 10-20 years.

Failing to document and disseminate information on fishery and ecosystem trends will result in the phenomenon described as "shifting baselines" (Pauly 1995), i.e. a continuous drift in reference points resulting in a perception that nothing changes, whilst dramatic shifts bring the marine ecosystems ever closer to collapse, and/or cause a continuous decrease in mean trophic levels (Pauly *et al.* 1998).

A review of the available information done in collaboration with Libyan fishery experts may greatly enhance our capability to understand the present status and trends of the Libyan marine ecosystems, assess the impact of fishing and develop appropriate and timely mitigation strategies.

Possible actors: MBRC and EGA; Fisheries Centre, University of British Columbia; WWF Mediterranean Programme; Tethys Research Institute.

ACTION 3.3.2.
CONDUCT RESEARCH ON CETACEANS FROM TUNA BOATS AND THE FORMER MBRC RESEARCH VESSEL

MBRC does regular fishery research from tuna boats, during campaigns that are generally conducted in May-June every year. During these campaigns, two MBRC researchers are embarked on tuna boats for 70 consecutive days to record fishery data. This opportunity could be used to collect data on cetacean distribution, species composition, group size, interactions with fishing operations, associations with tuna schools, and on the possible occurrence of cetacean bycatch in fishing gear.

In the past, MBRC used to operate a 49 m long dedicated research ship, "Nour". This boat currently serves as fishing trawler but it can be employed occasionally for fishery research campaigns lasting about 12 days, during which cetacean data can be collected.

As pointed out in Section 3.2., training will be needed to enable MBRC personnel to record appropriate cetacean data during these cruises. In addition, some funding should be allocated to motivate the trained researchers to engage in cetacean data collection (also considering that they already have fishery research to do).

It should be noted that even a monetary compensation may not guarantee that data are collected appropriately, e.g. if the work entails long observation sessions under demanding circumstances, when attention/concentration and consistency of effort are key pre-requisites. A long-term grant to support research conducted in the context of a Ph.D. or a Master's degree (Action 3.2.4) may increase the chances of a high and consistent commitment throughout the study. Although it is unlikely that long-term support can be offered to more than one student (due to financial constraints), the student may act as co-ordinator for this project and ensure high data collection standards.

It must be stressed that fishing boats do not represent independent observation platforms. Therefore, they do not allow to record unbiased data, e.g. with regard to cetacean/fisheries interactions (see Action 3.3.5). Still, these platforms of opportunity will allow to collect valuable preliminary information.

Basic equipment (e.g. digital camera with zoom lens, laptop computer, binocular, GPS) should be provided whenever appropriate to selected personnel embarked on board fishing boats, to allow them to enter their data into dedicated databases and download the photos taken during the research campaigns on a daily basis.

Possible actors: Selected Libyan researchers and students. Expert co-ordinator to overview data collection methods and subsequent data analysis and publishing.

ACTION 3.3.3.
CONDUCT RESEARCH ON CETACEANS FROM THE MBRC OWN INFLATABLE CRAFT

MBRC owns an inflatable boat about 7 m long in relatively good conditions, equipped with 45 and 25 HP outboard engines. This boat would be appropriate for conducting preliminary photo-identification surveys on coastal dolphins, as well as observations on their distribution, habitat use and behaviour including interactions with fisheries in the area.

Once a team of researchers has been trained (see relevant actions in Section 3.2.), they could initiate a series of surveys in the coastal waters off Tripoli to collect systematic information on the local cetacean fauna. The surveys should be conducted at regular intervals and cover the four seasons. Given the kind of boat and the nature of the work at sea, surveys should only take place under ideal sea and weather conditions (flat sea, good visibility etc.).

MBRC researchers should be provided with project-specific training, supervision and assistance to analyse and publish their data. In addition to training, funding should cover the provision of appropriate research equipment (e.g. digital camera with zoom lens, GPS) and raw costs for the surveys at sea (e.g. engine and boat upkeep, fuel).

Possible actors: Selected, trained MBRC researchers. Expert supervisor.

ACTION 3.3.4.
INVESTIGATE THE OCCURRENCE OF CETACEAN BYCATCH IN FISHING GEAR

In Libyan waters the occurrence of cetacean bycatch in fishing gear is poorly documented. Bycatch is said to occur infrequently, possibly because dangerous fishing techniques such as purse seining, pelagic driftnetting and midwater trawling are not widespread.

However, purse seines are reportedly used by the Japanese and Korean fleets licensed to fish in Libyan waters, as well as by local fisheries in the west of Libya. Midwater trawling sometimes occurs in the context of experimental fisheries research, and may develop in the future. Driftnets about 2 km long (mesh size about 5 cm) are used by the Libyan fleet, and deployed at night to target small tuna. Driftnets are mostly used in Misratah, where there may be about 10 boats using this gear. This suggests that some level of cetacean bycatch may occur, which remains unreported or undocumented.

Conducting research on the occurrence of cetacean bycatch in collaboration with the fisheries sector would also bring information on the cetacean species living in Libyan waters and insight on their distribution, as well as providing opportunities to recover dead animals that may be used for a number of laboratory analyses (e.g. stomach content and stable isotope analyses, toxicological and genetic analyses, parasite loads, etc.).

In this first phase of implementation of the Plan, evidence on the occurrence of cetacean bycatch in fishing gear can be obtained through a survey similar to the one conducted in the context of the FAO COPEMED Project (see Section 3). Involvement in the project of Libyan personnel with specific expertise on fisheries and fishing methods would be essential. Expert supervision and co-ordination should be provided to ensure that interviews and subsequent data analysis are bias-free and performed based on state-of-the-art investigation methods.

In addition, information should be collected through other means to investigate the fishing effort, kind of gear and occurrence of cetacean bycatch in foreign fishing fleets operating in Libyan waters. In this case, it can be expected that data will be more difficult to obtain and an effort should be made to identify the most appropriate investigation methods.

Efforts should be aimed at identifying areas and fisheries that are immediate problems in terms of depleting cetacean populations, as compared with areas/fisheries where the incidence of entanglement is known/likely to be low. Bycatch rates and dynamics should be assessed as precisely as possible in problem areas, in order to develop area-specific mitigation strategies.

Possible actors: MBRC, one consultant with specific expertise on cetacean bycatch survey methods and collection of unbiased information through interviews. WWF Mediterranean Programme.

DATA SOURCE - Libyan fishermen, foreign fleets operating in Libyan waters.

ACTION 3.3.5.
INVESTIGATE THE OCCURRENCE OF OPERATIONAL INTERACTIONS WITH FISHERIES

Data on operational interactions collected by means of fishermen interviews should be designed in a way that allows biased perceptions and/or harsh feelings to be taken into account (Bearzi 2002). In this kind of investigations it should be considered that a "commensal" relationship between the biologist and the fishermen can represent an important bias. For instance, it has been suggested that direct observations of depredation by marine mammals should not be conducted from fishing platforms, but only from independent platforms (Smith 1995). Research focusing on the animals should be conducted parallel to research focusing on the fisheries. Moreover, research should not only focus on the immediate area and season of harvesting, as this represents an especially constraining practice when considering the food web interactions with cetaceans, with their frequently large annual movements and behavioural flexibility. Finally, ecosystem components other that the

abundance of commercially important prey should be considered, as improving our understanding of the dynamics of food web interactions is far more important than investigating consumption rates (Smith 1995).

Although this action may be conducted in parallel with Action 3.3.4, and be partly based on interviews, the investigation method should include the collection of field data from independent observation platforms, to obtain an independent assessment of the reliability and frequency of occurrence of the interactions in all seasons. As long as independent assessments are unavailable, the information obtained through interviews should be regarded as temporary and likely to be affected by various kinds of biases (particularly with regard to the extent and frequency of the interactions).

Possible actors: MBRC, one consultant with specific expertise on cetacean/fisheries interactions and collection of unbiased information through interviews and direct observations. ICRAM (Italy) and the University of Barcelona (Spain) can offer valuable expertise.

DATA SOURCE - Libyan fishermen, investigations from independent platforms.

ACTION 3.3.6.
SURVEY OF CETACEAN SPECIMENS IN MUSEUM COLLECTIONS

Sparse cetacean skeletons and/or skeletal parts are included in Libyan museum collections[10]. These collections have never been comprehensively surveyed. It would be important to evaluate the information on cetaceans available in museum and university collections, and classify all the existing materials in the context of a comprehensive survey of osteological collections in Libya.

Cetacean bones and skeletal parts should be identified, photographed (the digital format would be particularly appropriate) and classified together with the available information (date and site of stranding or recovery, stranding circumstances, cause of death, body size, gender, etc.). Bone and/or teeth samples should be collected whenever possible to allow for genetic analyses aimed to reveal population structure, following an agreement with the relevant experts in this kind of analyses.

This survey may be conducted by an international expert supported by one or more local researchers, in the context of a single well-planned visit to all the Libyan collections. The results of this investigation should be made promptly available to the international scientific community. If the final data are not appropriate for publication in peer-review journals, information can be diffused through newsletters (e.g. *Fins*), internet, e-mail lists, and/or presented at scientific conferences.

Possible actors: MBRC. University of Alfateh Museum. Luigi Cagnolaro (Italy) and Alexandros Frantzis (Pelagos Cetacean Research Institute, Greece) can offer valuable expertise.

ACTION 3.3.7.
PROMOTE THE ANALYSIS AND EXCHANGE OF TISSUE SAMPLES FROM STRANDED CETACEANS

The present effort for the monitoring of cetacean strandings should be increased through the actions outlined elsewhere in this Plan[11]. Once appropriate capacity has been built (see Action 3.2.3.1), complete necropsies should be performed for each stranding event. Tissue samples should be sent in part to existing cetacean tissue banks[12] (e.g., those in Padua, Italy and Barcelona, Spain) and in part preserved for future analyses to be conducted *in situ*, as soon as local expertise becomes available.

[10] For instance, two skulls of the rare harbour porpoise *Phocoena phocoena* were said to be included in the collections of the University Museum and of the National Museum, both in Tripoli.
[11] A scientific collaboration with scientists working on turtles and/or monk seals can be envisaged to increase the effectiveness of patrolling along the Libyan coast, and increase the overall reporting rates.
[12] Issues related to export permits for biological materials must be taken into account.

In the context of this Action, a scientific collaboration should be developed between MBRC and laboratories/experts abroad, to ensure the proper analysis of cetacean tissue samples and organs, exchange of information and timely publishing of data.

Possible actors: MBRC
University of Durham, U.K. (genetics)
University of Padua, Italy (anatomy and pathology)
University of Siena, Italy (toxicology)
University of Barcelona, Spain (toxicology)
University of Valencia, Spain (parasitology).

3.4. Management

ACTION 3.4.1.
PROMOTE MEASURES TO REDUCE OVERFISHING

As highlighted in Section 2, adopting new regulations and enforcing the existing laws and agreements with regard to sustainable fishing is one of the highest priorities in Libya. The issuing of new fishing licences should be strictly regulated and the current licensing system should be reviewed and made more strict.

A generally poor respect of the laws, particularly by fishermen who are largely non-Libyans, together with the present lack of enforcement and inappropriate means to patrol the long Libyan coast, represent a major problem. A continuous monitoring system should be developed to control fishing boats and gear, both on land and at sea. Illegal fishing (e.g. with regard to illegal gear, mesh size, use of explosives or chemicals etc.) must be stopped immediately through methods including education campaigns and appropriate penalties.

The issuing of fishing permits to non-national fleets using intensive and often destructive fishing methods may result in the collapse of the commercial fish stocks being exploited and permanent damage to marine ecosystems, thus preventing the development of a sustainable and long-lived fishing industry managed by the Libyans.

Much co-ordination effort will be needed among the relevant institutions in Libya to promote environment-friendly fishing methods, and regulate the fishing effort so that the marine resources can be preserved for the benefit of both the present and the future generations.

Possible actors: EGA, MBRC. RAC-SPA and ACCOBAMS can provide consultancy.

ACTION 3.4.2.
CREATE A CENTRALISED BODY FOR THE CREATION AND MANAGEMENT OF A NETWORK OF MARINE PROTECTED AREAS TO PROTECT KEY CETACEAN HABITAT AND PRESERVE HEALTHY FISH STOCKS

Marine Protected Areas (MPAs) represent effective means of protecting the integrity of marine ecosystems and mitigating some of the threats affecting cetaceans. Success depends on factors including appropriate management and the capacity to match critical habitat preferences by cetaceans with the boundaries of the MPA.

MPAs restore ecosystem functioning and benefit marine food webs by providing shelter to threatened marine species, thus contributing to the recovery of depleted cetacean prey (Agardy 1997; Bianchi & Morri 2000; Roberts *et al.* 2001). MPAs are also amenable to the promotion of respectful cetacean-watching, which may allow ex-fishermen or part-time fishermen to increase their income with cetaceans instead of fishing, and most importantly begin to involve them in the conservation process.

Protection to critical cetacean habitats should be ensured by means of a network of MPAs designed to increase or safeguard habitat quality, reduce the chances of unintentional harm (e.g. bycatch), provide shelter and better habitat conditions for cetacean prey, reduce noise levels and direct disturbance, etc.

In many areas critical habitat will need to be considered as a network of areas, with well managed buffer zones, rather than isolated reserves. These goals are only possible with comprehensive planning and co-ordination.

The management body should be in charge of collecting and processing all the relevant information, while co-ordinating research and public awareness actions targeted to the identification and creation of new MPAs. The management body should also promote capacity building in this field and involve international experts in the design of MPA networks.

Possible actors: EGA, MBRC and other relevant authorities.
RAC-SPA and ACCOBAMS can provide consultancy.

ACTION 3.4.3.

CREATE AND EMPOWER A CENTRALISED BODY FOR THE MANAGEMENT OF A CETACEAN STRANDING NETWORK

At present, there is no regular, systematic monitoring of cetacean strandings in Libya. However, a favourable background exists for the development of an effective stranding network, as cetacean strandings are usually regarded by the locals as interesting events that are worth reporting.

Currently, strandings are reported occasionally either to a local Authority (e.g. Coast Guard) or to MBRC. Although the reporting system is said to work relatively well, reports are currently rare, possibly due to a low occurrence of stranding events. It must be noted, however, that a low occurrence of cetacean strandings would be inconsistent with the reportedly high and "increasing" abundance of dolphins in coastal waters. Therefore, the hypothesis of low reports simply resulting from low rates of reporting at least along some portions of the Libyan coast should be considered.

Information on cetacean stranding events should be collected and managed by a centralised body, that should be also managing a network of regional contact persons in charge of co-ordinating the inspection and/or recovery of cetaceans carcasses, the collection of tissue samples, and the necropsy of the animals whenever feasible.

Such a role of centralised body could be formally covered by MBRC, which should be provided with appropriate training and information on how to proceed, based on experience accumulated elsewhere in the Mediterranean basin.

Possible actors: MBRC.
RAC-SPA and ACCOBAMS can provide consultancy.

ACTION 3.4.4.

ENSURE THAT CETACEANS ARE SPECIFICALLY INCLUDED AS PROTECTED SPECIES IN THE LIBYAN LEGISLATION

At present, cetaceans are not specifically protected by the Libyan legislation. Although laws exist to protect the marine environment in general - such as Law #14 for marine conservation and Law #15 for the protection and improvement of environment - there is a clear need to adopt a specific law dedicated to the protection of all living marine mammals (cetaceans as well as the Mediterranean monk seal), including from killing, harming, capture, handling, harassment and other forms of disturbance.

It must be stressed that the ratification by Libya of ACCOBAMS and other international treaties (e.g. the SPA Protocol of the Barcelona Convention and its Annex 2, the CMS Convention, and the Convention on Biological Diversity) implies observation of the relevant provisions relative to the protection of cetaceans.

It is recommended that the Libyan legislation is harmonised with the international agreements that have been ratified so far. The laws for marine mammal protection enforced by other Mediterranean countries may be taken as a model.

Possible actors: EGA, MBRC.
RAC-SPA and ACCOBAMS can provide consultancy.

ACTION 3.4.5.
ENSURE THAT ENVIRONMENTAL IMPACT ASSESSMENTS GIVE SPECIAL CONSIDERATION TO CETACEANS AND THEIR HABITAT

Ensure that the existing impact assessment procedures to regulate human activities give special attention to potential threats to the marine ecosystems, in order to prevent damage to cetacean populations. Impact on cetaceans should be carefully assessed by taking advantage of local as well as international expertise. The role of different experts and stakeholders should be harmonized to ensure that human activities are sustainable and compatible with the mandate to preserve natural resources including cetaceans.

Possible actors: EGA, MBRC.

ACTION 3.4.6.
ENCOURAGE THE CREATION AND DEVELOPMENT OF NGOS CONCERNED WITH THE CONSERVATION OF THE MARINE ENVIRONMENT

NGOs dealing with nature protection exist in Libya, but they are small and often poorly organised. According to Howege & Hamza (2002), there are 47 NGOs around the country, but only a half of them are science-oriented and few are interested in ecological problems.

The current policy of EGA is to encourage the establishment of new NGOs concerned with the conservation of nature (Howege & Hamza 2002). This policy should be further promoted and organisations willing to work on marine conservation should be supported and provided with appropriate training and - when appropriate - funding.

Although at present institutional organisations such as MBRC and EGA represent the most appropriate candidates to promote cetacean research and conservation in Libya, the NGOs may significantly contribute to this process in the near future, as soon as they are provided with opportunities for development and professional growth.

Possible actors: EGA.
RAC-SPA and ACCOBAMS can provide support.

ACTION 3.4.7.
SUPPORT THE INTERNATIONAL EFFORTS TO ASSESS CETACEAN ABUNDANCE

ACCOBAMS is promoting a comprehensive effort to survey the whole Mediterranean basin and assess cetacean numbers and distribution through state-of-the-art research methods. This needs to be done in the context of a co-ordinated effort supported by States that are Parties to the Agreement.

Although a "basin-wide" survey project is still in its planning phase, and funding needs to be allocated, it would be important to ensure that Libya will contribute in the future by providing trained personnel and issuing permits for entering its national waters during the survey.

As the process for obtaining the necessary permits is likely to be long, it would be important to start informing EGA and the other relevant bodies about the purposes and level of implementation of the basin-wide cetacean survey.

Possible actors: ACCOBAMS, EGA, MBRC.
The International Fund for Animal Welfare can offer relevant expertise to conduct a cetacean survey in Libyan waters.

4. INDICATIVE BUDGETS

Indicative budgets for actions related to Education and awareness, Capacity building and Research are provided below. It must be stressed that these figures may vary greatly according to the way the actions are conducted (comprehensiveness, effort, level of expertise of consultants and personnel involved etc.), and they may be re-budgeted to account for the available expertise, facilities and local support. The sums indicated here are intended to represent minimum figures.

The budget for Management actions cannot be estimated as this depends largely on institutional commitment and political circumstances.

Indicative budget for education and awareness actions

Action		Budget items	Indicative / minimum cost (Euro)
3.1.1	PROVISION OF MISCELLANEOUS MATERIAL FOR PUBLIC AWARENESS AND EDUCATION PURPOSES	Copying, communication, packaging, shipping, administrative costs.	5,000
3.1.2	LEAFLET IN ARABIC TO ENCOURAGE THE REPORTING OF CETACEAN STRANDING EVENTS	Design, text, drawings, co-ordination, translations, printing, shipping, communication, administrative costs.	6,000
3.1.3	LEAFLET IN ARABIC EXPLAINING WHY CETACEANS MUST BE PROTECTED	Design, text, drawings and/or photos, co-ordination, translations, printing, shipping, communication, administrative costs.	6,000
3.1.4	POSTER ON CETACEANS IN ARABIC	Design, additional drawings, co-ordination, copyright costs, text, translations, printing, shipping, communication, administrative costs.	6,000
3.1.5	DESIGN AND CONDUCT AWARENESS ACTIONS TARGETING THE FISHERIES SECTOR	Expert consultancy, field work, travel, communication, awareness material, administrative costs.	50,000
3.1.6	PROVIDE SUPPORT TO PRODUCE A LIBYAN DOCUMENTARY ON CETACEANS	Expert consultancy, footage, production, packaging.	25,000
3.1.7	PROVISION OF INFORMATION ON ASPECTS RELATED TO THE KEEPING OF CETACEANS IN CAPTIVITY	Involvement of actors on a volunteer or institutional basis.	0
3.1.8	CREATE OPPORTUNITIES TO RAISE INSTITUTIONAL AWARENESS ON THE NEED TO MANAGE MARINE RESOURCES IN A SUSTAINABLE WAY, AND ON THE IMPORTANCE OF PROTECTING CETACEANS	Involvement of actors on a volunteer or institutional basis.	0
3.1.9	TRANSLATION OF THIS ACTION PLAN INTO ARABIC	Translation, document formatting.	2,000

Indicative budget for capacity building actions

Action		Budget items	Indicative / minimum cost (Euro)
3.2.1	PROVIDE ACCESS TO SPECIALISED LITERATURE ON CETACEANS	Expert consultancy (selection of articles and books), preparation of materials, library database, books (selection of books), photocopying, stationary, packaging, shipping, administrative costs.	8,000
3.2.2	BUILD CAPACITY FOR THE MANAGEMENT OF A CETACEAN STRANDING NETWORK	Expert supervision, travel, training course in Libya (one trainer), visit abroad of a selected Libyan researcher.	15,000
3.2.3	ORGANISE THEORETICAL TRAINING COURSES ON CETACEANS	See 3.2.3.1 and 3.2.3.2.	
3.2.3.1	BUILD CAPACITY IN LABORATORY TECHNIQUES	Three 15-day courses (one per year), one trainee: organisation, training, travel, room & board, follow up. Follow up (4 days): expert consultancy, travel, final report.	Training: 20,000 Follow up: 4,000
3.2.3.2	BUILD CAPACITY IN CETACEAN FIELD RESEARCH METHODS	Three 7-day courses abroad, four selected trainees/course: organisation, training, travel, room & board. Equipment for the trainees: digital camera with zoom lens, laptop, software, accessories. Follow up (7 days): expert consultancy, travel, final report.	Training (per course): 15,000 Equipment (per kit): 6,000 Follow up: 6,000
3.2.4	PROVIDE SELECTED LIBYAN RESEARCHERS AND STUDENTS WITH OPPORTUNITIES FOR LONG-TERM TRAINING	Individual 3-year grants for higher studies abroad.	Undefined

Indicative budget for research actions

Action		Budget items	Indicative / minimum cost (Euro)
3.3.1	STIMULATE RESEARCH ON LIBYAN FISHERY TRENDS AND MARINE ECOSYSTEM STATUS WITH REGARD TO OVERFISHING	Expert consultancies, one 7-day trip to Libya, communication, final report.	12,000
3.3.2	CONDUCT RESEARCH ON CETACEANS FROM TUNA BOATS AND THE FORMER MBRC RESEARCH VESSEL	Monetary compensation for field work (30 Euro/day), 70 days, two observers, three years. Equipment for the trainees: GPS, digital camera with zoom lens, laptop, software, accessories. Local co-ordinator (three years). Final report.	Field work: 12,600 Equipment (per kit): 7,000 Co-ordinator (salary and report): 12,000
3.3.3	CONDUCT RESEARCH ON CETACEANS FROM THE MBRC OWN INFLATABLE CRAFT	Field costs for 5 surveys/month, 10 months/year, two years: boat setup, boat and engine upkeep, gasoline, miscellaneous. Equipment for the field work: GPS, digital camera with zoom lens, laptop, software, accessories. Local co-ordinator (two years). Final report.	Field work: 15,000 Equipment: 7,000 Co-ordinator (salary and report): 12,000
3.3.4	INVESTIGATE THE OCCURRENCE OF CETACEAN BYCATCH IN FISHING GEAR	Expert consultancy, travel, communication, final report.	30,000
3.3.5	INVESTIGATE THE OCCURRENCE OF OPERATIONAL INTERACTIONS WITH FISHERIES		
3.3.6	SURVEY OF CETACEAN SPECIMENS IN MUSEUM COLLECTIONS	Expert supervision, local personnel, travel, room & board, communication, final report.	8,000
3.3.7	PROMOTE THE ANALYSIS AND EXCHANGE OF TISSUE SAMPLES FROM STRANDED CETACEANS	Co-ordination, communication, permits, shipping, materials.	6,000

5. FUTURE STEPS

At the end of 2009 an assessment will be necessary of the level of implementation and success of this Action Plan. Based on the lessons learned during the first three years and on increased understanding of cetacean presence, distribution and conservation needs, a second phase of the Plan will need to be planned.

It is expected that the second phase will entail quantitative assessments of cetacean populations and population monitoring in Libyan waters. Conversely, slightly less emphasis may be posed on capacity building.

The adoption of sustainable fishing practices should be strongly encouraged, with the ultimate goal of preserving marine biodiversity and ecosystem balance. In addition, measures will need to be taken to mitigate conflict between cetaceans and fisheries.

Marine areas in immediate need of protection should be identified, and critical cetacean habitat should be protected by creating networks of MPAs.

Finally, sustainable nature tourism should be promoted as the most effective way of harmonising economic interest and long-term management of healthy marine resources.

As stressed elsewhere in this Plan, conservation measures will need to be adaptive, and change according to 1) new evidence provided by research actions and 2) management needs resulting from increased/decreased impact of human activities.

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Annex I

POSSIBLE ACTORS

An arbitrary and incomplete list of organisations and individuals possessing relevant expertise, who may contribute to the implementation of this Action Plan:

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Annex 2

LIBYAN EXPERTS ATTENDING THE PREPARATORY MEETINGS AND/OR INTERVIEWED INDIVIDUALLY

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Annex 3 - Photo album

The Marine Biology Research Centre (MBRC) at Tajura.

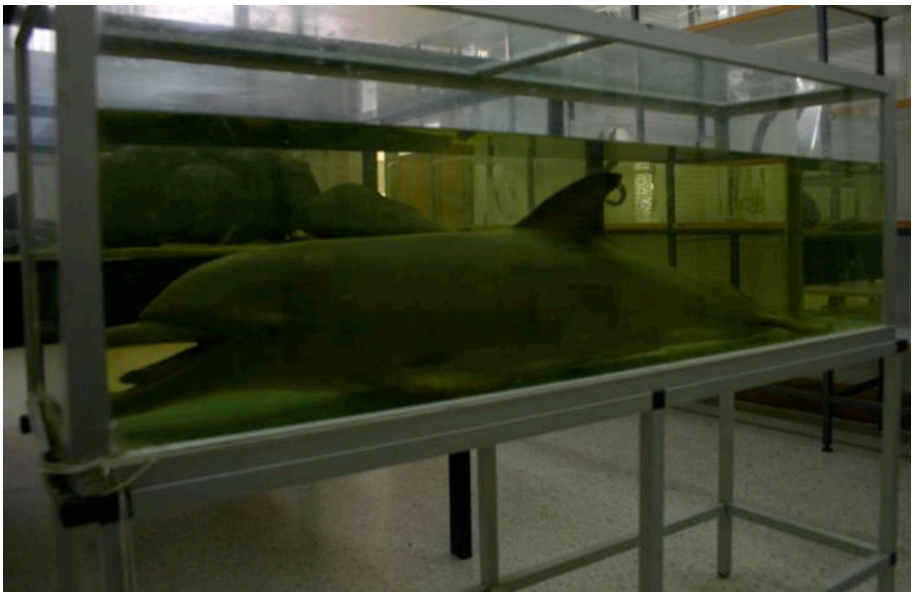
MBRC: an educational painting outlining the Libyan marine food web.

Some of the Libyan experts who participated in the preparatory meetings, and the consultant. Left to right: Alkekli, Tayeb, Bearzi, Abuissa, Al Gumezi, El Shrif.

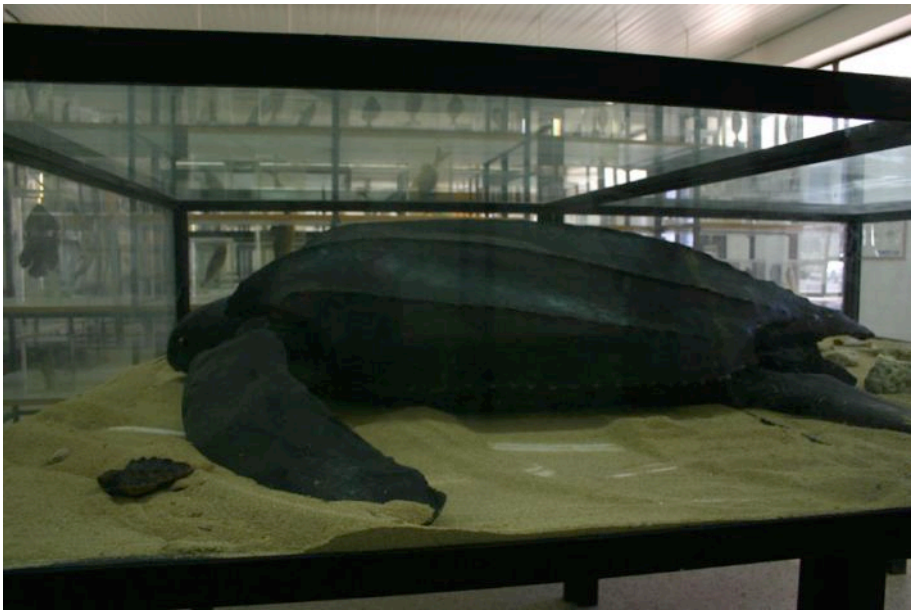
Some of the Libyan experts who participated in the preparatory meetings, Lobna Ben Nakhla from RAC-SPA and the consultant. Left to right: Alkekli, Ben Abdallah, Ben Nakhla, Abuissa, Bearzi, El Shrif, Al Gumezi, Tayeb.

MBRC: the museum.

MBRC: a Risso's dolphin *Grampus griseus* skeleton on display at the museum.



MBRC: a juvenile common bottlenose dolphin *Tursiops truncatus* on display at the museum.



MBRC: a leatherback turtle *Dermochelys coriacea* on display at the museum.

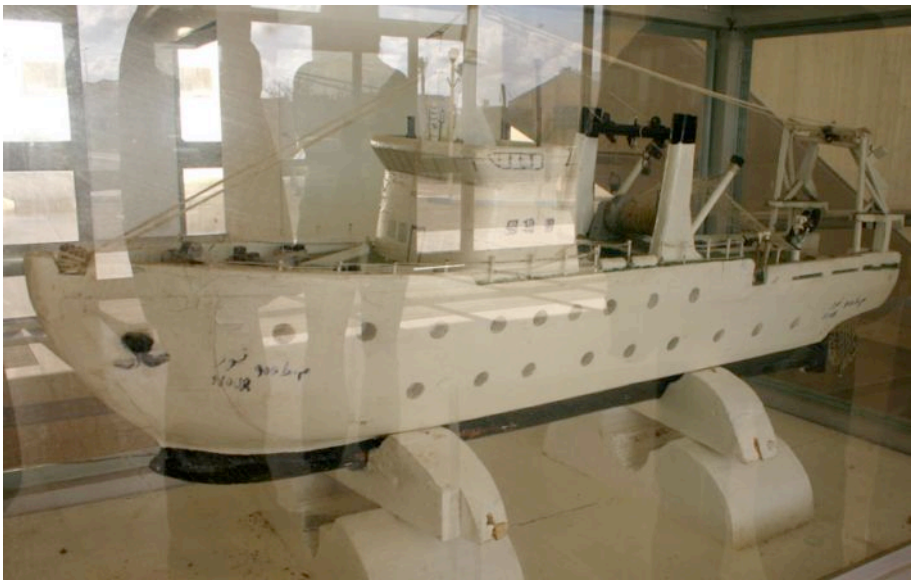
MBRC: caudal fin of a basking shark *Cetorhinus maximus* on display at the museum.

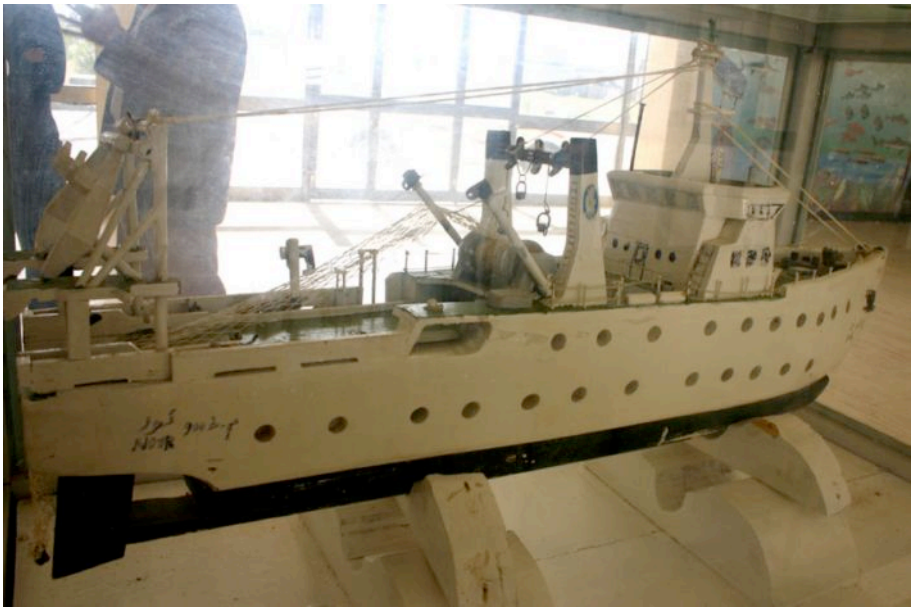
MBRC: the narrow-barred Spanish mackerel *Scomberomorus commerson* (right) on display at the museum: a lessepsian species that has become common in recent years and is now one of the most economically important fish in Libya.

MBRC: the library.

MBRC's 7 m inflatable craft that can be used for dolphin surveys in the area of Tripoli.

The MBRC Director of directorate of Studies and Consultations, Abdul Baset A. Abuissa shows the 7 m inflatable craft that can be used for dolphin surveys in the area of Tripoli.





A model of MBRC's former research ship, *Nour*.