



UNEP



# CETACEAN MANUAL

FOR MPA MANAGERS



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# **CETACEAN MANUAL**

FOR MPA MANAGERS

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## FOREWORD

Based on a recent report by MedPAN, there are today 161 marine protected areas (MPAs) declared in the Mediterranean by the region's coastal nations, protecting 19,000 km<sup>2</sup> of coastal marine waters, and many more are present also in the Black Sea and the Contiguous Atlantic. In principle, these could be safe havens for many cetacean species from the ACCOBAMS region, at least for the smaller coastal odontocetes such as common bottlenose dolphins, harbour porpoises, and short-beaked common dolphins.

However, very few of these MPAs were initially created having the conservation of cetaceans in mind. As a consequence, cetaceans are hardly mentioned as part of the biodiversity that most of these MPAs' management plans set out to protect. This is a terrible waste of opportunities, which hopefully this carefully compiled manual will help redressing.

The opportunities deriving from the cetacean/MPA binomial fall into two categories, because benefits from the binomial go in both senses. Not only it is true that MPAs can support cetacean conservation; cetaceans can be greatly taken advantage of by MPAs to increase their own visibility and effectiveness. This is because charismatic dolphins and porpoises are powerful flagship species, and by consequence, by exerting irresistible fascination on people, are capable of catalysing the interest on MPAs of the public at large, and of propagating the idea that conserving the marine environment is a fascinating endeavour. This is why discovering that an MPA is harbouring even a small portion of cetacean habitat should be considered a blessing, albeit sometimes unintended and unhoped-for, by any MPA manager with a minimum of vision.

There are many ways of taking full advantage of the presence of cetaceans within an MPA boundary, as this manual illustrates.

Before thinking about advantages, of course, the mammals' presence in the area must be secured through careful monitoring and conservation actions. Monitoring can be done in several ways, depending on goals, human resources and budget, by following a set of simple survey methods. Furthermore MPAs, which dispose of trained personnel and infrastructure, are ideal centres to support stranding and rescue networks, at the local or even at the national scale. Similarly, straight-forward measures to address the main threats to the animals' conservation status and wellbeing can be included in the MPA planning process.

On the other hand, the presence of cetaceans in a specific area can help the MPA to increase its visibility and to attract visitors, for example by offering dolphin or whale watching excursions, and by hosting information, interpretation, and education facilities and programmes. If responsibly managed, dolphin or whale watching will increase public awareness and fascination for the marine environment and its inhabitants, while being at the same time a potentially relevant source of income for the local communities and for the MPAs themselves. By offering to the marine mammal enthusiasts the exhilarating opportunity of admiring a pod of dolphins riding a vessel's bow wave, MPAs can create the only acceptable alternative to the observation of dolphins confined for life in captivity, sadly withering away in their rank pools of chlorinated water.

Whale watching, eco-volunteering programmes and other forms of involvement of non-specialists can help transforming MPAs into condensation nuclei for widespread passion and concern for the marine environment, and contribute to anchor MPAs into the hearts and minds of the public at large.

Giuseppe Notarbartolo di Sciarra  
President, Tethys Research Institute  
Co-Chair, IUCN Joint WCPA/SSC Task Force on Marine Mammal Protected Areas

## 1. WHAT ARE THE MAIN CETACEAN SPECIES REGULARLY PRESENT IN THE ACCOBAMS AREA?

Carlo Franzosini, Miramara Marine Protected Area (Trieste, Italy)

In this section a short description of each of the main species of cetaceans considered regularly present in the Mediterranean, the Contiguous Atlantic area and the Black Sea is provided.

For each species the principal identification keys and a synopsis of their biology and behaviour is given.

The Cetacean species found in the ACCOBAMS area by regular populations are listed in the following tables: Table 1 lists the 11 species that are represented by populations which are regularly present in the Mediterranean Sea and Contiguous Atlantic area. Table 2 lists three cetacean species regular in the Black Sea.

Visitor, vagrant and alien species are not considered here, as they are of less concern for MPA managers.

Cetacean species represented in the ACCOBAMS area by regular populations (Tables 1 & 2) are also listed in a variety of international and regional conservation legal texts. These are:

- Washington Convention (1973)<sup>1</sup>, App. I & App. II.
- Bern Convention (1979)<sup>2</sup>, App I & App. II.
- Bonn Convention (1979)<sup>3</sup>, App. I & App. II.
- EU Habitats Directive (1992)<sup>4</sup>, Annex II & IV.
- SPA/BD Protocol, Barcelona Convention (1995)<sup>5</sup>, Annex II.
- ACCOBAMS - Agreement on the Conservation of Cetaceans in the Black Sea Mediterranean Sea and Contiguous Atlantic Area (1996)<sup>6</sup>.
- Provisional list of Species of Importance in the Black Sea, annexed to the Biodiversity and Landscape Conservation Protocol to the Bucharest Convention (1992)<sup>7</sup>.

The information and images presented in this chapter are merged from the following three sources, which are also available on the internet:

Notarbartolo di Sciarra G., Birkun A., Jr. 2010. Conserving whales, dolphins and porpoises in the Mediterranean and Black Seas: an ACCOBAMS status report, 2010. ACCOBAMS, Monaco. 212 p.

[http://www.disciara.net/documents/NotarbartolodiSciarra\\_Birkun\\_2010.pdf](http://www.disciara.net/documents/NotarbartolodiSciarra_Birkun_2010.pdf)

Tethys Research Institute: the "Ionian Dolphin Project"  
Cetacean Species Commonly Occurring in the Greek Seas

<http://ioniandolphinproject.org/species-guide/>

IUCN (2012). Marine Mammals and Sea Turtles of the Mediterranean and Black Seas. Gland, Switzerland and Malaga, Spain: IUCN. 32 pages.

[https://cmsdata.iucn.org/downloads/iucn\\_med\\_2012\\_marine\\_mammals\\_\\_sea\\_turtles\\_def.pdf](https://cmsdata.iucn.org/downloads/iucn_med_2012_marine_mammals__sea_turtles_def.pdf)

<sup>1</sup> <http://www.cites.org>

<sup>2</sup> [http://www.coe.int/t/dg4/cultureheritage/nature/Bern/default\\_en.asp](http://www.coe.int/t/dg4/cultureheritage/nature/Bern/default_en.asp)

<sup>3</sup> [http://europa.eu/legislation\\_summaries/environment/nature\\_and\\_biodiversity/l28051\\_en.htm](http://europa.eu/legislation_summaries/environment/nature_and_biodiversity/l28051_en.htm)

<sup>4</sup> [http://europa.eu/legislation\\_summaries/environment/nature\\_and\\_biodiversity/l28076\\_en.htm](http://europa.eu/legislation_summaries/environment/nature_and_biodiversity/l28076_en.htm)


<sup>5</sup> [http://195.97.36.231/dbases/webdocs/BCP/ProtocolSPA96annexes\\_eng.pdf](http://195.97.36.231/dbases/webdocs/BCP/ProtocolSPA96annexes_eng.pdf)


<sup>6</sup> <http://www.accobams.org>



<sup>7</sup> [http://www.blacksea-commission.org/\\_convention-protocols-biodiversity.asp#ANNEX2](http://www.blacksea-commission.org/_convention-protocols-biodiversity.asp#ANNEX2)



Table 1 - CETACEAN SPECIES REPRESENTED BY POPULATIONS REGULARLY PRESENT IN THE MEDITERRANEAN SEA AND CONTIGUOUS ATLANTIC AREA



Illustrations from Massimo Demma / ISPRA and from Artescienza


Species	Identification Keys	Synopsis of their biology and behaviour
1 - Fin whale <i>Balaenoptera physalus</i> 	The maximum total length of Mediterranean fin whales is above 20 m; probably somewhere between 21 and 23 m. It has a streamlined body and the head represents about a quarter of the total body length. Unique among cetaceans, the fin whale's lower jaw is black on the left side and white on the right side, and is an important identification cue. The curved dorsal fin is set two-thirds of the way along the back, and is visible shortly after the blow upon surfacing; the blow is tall and columnar. Colouration is generally dark grey on the top surface, with white throat pleats, a white belly and white underside to the tail. There is a characteristic pale grey 'blaze' on the right side of the head and subtle chevron patterns along the back behind the blowholes. Tail flukes are broad with a distinct median notch and slightly concave trailing edge, and are rarely raised out of the water when diving.	The fin whale is the world's second largest cetacean species after the blue whale, and the largest species in the Mediterranean. The life span of a fin whale may be 85 to 90 years. In the western Mediterranean ship strikes constitute the main known source of anthropogenic mortality for fin whales. Shipping noise and vessel disturbance, particularly from the unregulated whale watching, is another source of concern. Mostly found throughout the Mediterranean and the contiguous Atlantic Area. Conservation status: IUCN (global): Endangered IUCN (Mediterranean): Vulnerable.

Species	Identification Keys	Synopsis of their biology and behaviour
<p>2 - Sperm whale <i>Physeter macrocephalus</i></p> 	<p>The maximum total length recorded for Mediterranean female and male sperm whales is approximately 10.5 m and 17.3 m, respectively. The large, square shaped head represents about one-third of the total body length and contains the spermaceti organ; this organ is filled with a waxy liquid called spermaceti, which is involved in sound production and echolocation. The lower jaw is narrow and contains 20 to 26 pairs of conical teeth, which fit into sockets in the top jaw; there are no teeth in the top jaw. On top of the head, the S-shaped blowhole is positioned to the left and angled forward, which produces a distinct, 'diagonal', bushy shaped blow. Sperm whales do not have a true dorsal fin but there is a small triangular hump, behind which a row of bumps extend along the back toward the tail. The tail fluke often has nicks and notches that can be used to identify individual animals. Skin is wrinkled and dark grey or brown in colour, with white patches on the belly. There may also be circular scars on the body caused by squid suckers.</p>	<p>The sperm whale is the largest of the toothed whales, life expectancy is estimated to be at least 70 years. The most serious threat to sperm whales in the Mediterranean is high-seas swordfish and tuna driftnets, which have caused a likely unsustainable mortality since the mid-1980s. In addition, disturbance from intense marine traffic and collisions with large vessels might also pose a significant threat. Mostly found throughout the Mediterranean and the contiguous Atlantic Area. Conservation status: IUCN (global): Vulnerable IUCN (Mediterranean): Endangered.</p>

<p>3 - Cuvier's beaked whale <i>Ziphius cavirostris</i></p> 	<p>The animal is up to 7 m long. It has a slightly bulbous melon, a goose-like non prominent beak and a small curved dorsal fin. In adult males, two forward-pointing teeth can protrude from the tip of the lower jaw, visible when the mouth is closed. Otherwise, toothless. There is a slight depression in the body beneath each pectoral fin, known as the 'flipper pocket'. Colouration is predominantly dark grey, but with a pale grey melon, light coloured lower jaw and pale patch from the melon to the dorsal fin. There is a pale grey chevron marking under the chin. Oval scars caused by parasites or predators are common in older animals as well as double-lined marks due to intraspecific fighting between males.</p>	<p>The Cuvier's beaked whale is a rather robust animal, but it tends to have a quite elusive behaviour, so that most of what is known comes from strandings data. The most important threat for this species is likely anthropogenic noise, responsible for significant mortality in Greece and the Mediterranean Sea in general. Mostly found throughout the Mediterranean and the contiguous Atlantic Area. Conservation status: IUCN (global): Least Concern IUCN (Mediterranean): Data Deficient.</p>
<p>4 - Killer whale <i>Orcinus orca</i></p> 	<p>The general body shape of a killer whale is roughly cylindrical but tapering at both ends. Killer whale sizes vary significantly between different geographical areas. Adult male are larger than adult females. Killer whales coloration is solid black and white, with a gray patch called a "saddle" or a "cape" on the back, just behind the dorsal fin.</p>	<p>In the Mediterranean Sea, the killer whale is considered seasonally resident in the Strait of Gibraltar and its adjacent Atlantic waters; it is a visitor to the western Mediterranean and is occasionally recorded as a vagrant in the eastern basin. Killer whales are seen as competitors by fisheries, attacking tuna caught on longlines. Direct killing by fishermen, a decrease in their food supply (especially bluefin tuna) and disturbance and habitat degradation (underwater noise from ferries and sonar equipment, pollutants, oil spills, etc.) are the biggest threats to their survival in the region. Conservation status: IUCN (global): Data Deficient IUCN (Mediterranean): Not assessed.</p>

Species	Identification Keys	Synopsis of their biology and behaviour
<p>5 - Long-finned pilot whale <i>Globicephala melas</i></p> 	<p>Long-finned pilot whales have globose head, long flippers and white anchor-shaped patch on the chest that make them easily identifiable. Average adult length: 5–7 m.</p>	<p>Long-finned pilot whales are among the largest members of the dolphin family (Delphinidae), and are commonly seen in tight, sociable groups of 9–23 individuals. They feed offshore on deep-sea squid, other cephalopods and small pelagic fish using echolocation to help them find food. Common in the Western Mediterranean, especially in the Alboran and Ligurian Sea. Long-finned pilot whales are threatened by maritime traffic disturbance, fishing activities, pollution and high-intensity underwater noise from naval sonar and seismic exploration. Conservation status: IUCN (global): Data Deficient IUCN (Mediterranean): Data Deficient.</p>
<p>6 - Risso's dolphin <i>Grampus griseus</i></p> 	<p>This dolphin has a robust, stocky body and a tall, curved dorsal fin. The melon is blunt and bulbous with a unique V-shaped crease running from the upper lip to the blowhole. This species has no prominent beak and just two to seven pairs of teeth in the lower jaw. Adult Risso's dolphins can measure up to 3.8 metres in length, their body mass can reach 500 Kg and can live for more than 30 years. The colour pattern varies greatly between individuals, and with age. Calves are born grey, but turn darker grey to dark brown as they become juveniles. As they age, the skin tone lightens to silvery-grey in some cases and the body is increasingly covered with scratches and scars inflicted by other Risso's dolphins and prey species such as squid.</p>	<p>Risso's dolphins are observed mainly in the slope habitat, but also close to the coast and over the plateau. The main known threat to Risso's dolphins in the Mediterranean is entanglement in high-seas driftnets and longlines, followed by disturbance and ingestion of plastic debris. Mostly found throughout the Mediterranean and the contiguous Atlantic Area. Conservation status: IUCN (global): Least Concern IUCN (Mediterranean): Data Deficient.</p>

<p>7 - Rough-toothed dolphin <i>Steno bredanensis</i></p> 	<p>The species derives its common name from the vertical ridges in the teeth, which give them a roughened appearance. <i>S. bredanensis</i> is the only long-beaked dolphin with a smoothly sloping melon (forehead) that gently blends into the upper beak. The body is not very slender and the anterior portion may be stocky. The large pectoral fins are set farther back on the body than in most other delphinids. The dorsal fin is tall and only slightly recurved. Some large males may have a hump posterior to the anus resembling a keel. Rough-toothed dolphins are countershaded with white bellies and black to dark grey backs. The sides are medium grey and separated from the cape on the back. Size reaches 2.6 m in females and 2.8 m in males, and body mass may reach 155 kg.</p>	<p>Formerly considered a visitor of the Mediterranean Sea, it is now tentatively considered regular in the eastern Mediterranean due to recently documented sightings, mainly in the spring and summer.. They swim in groups ranging from several to tens of individuals, typically in a very tight formation. Considered an open water species, they do venture close to shore, where they are susceptible to gill-net entrapment. Mostly found in the Levantine Sea and possibly in the contiguous Atlantic Area. Conservation status: IUCN (global): Least Concern IUCN (Mediterranean): Not assessed.</p>
<p>8 - Common bottlenose dolphin <i>Tursiops truncatus</i></p> 	<p>The common bottlenose dolphin is presumably the most familiar of the small cetaceans because of its coastal occurrence. Their colour pattern is typically a dark grey back with light grey sides and a near-white belly. Adult animals often have scars inflicted by other animals, including rake marks caused by other dolphins' teeth. These are robust animals measuring up to 3.4 metres long and weighing around 300 kg when fully grown, which is somewhat shorter than their counterparts in oceanic populations.</p>	<p>The common bottlenose dolphin is the most coastal cetacean species in the Mediterranean Sea. Mostly found throughout the Mediterranean and contiguous Atlantic Area. Conservation status: IUCN (global): Least Concern IUCN (Mediterranean): Vulnerable.</p>

Species	Identification Keys	Synopsis of their biology and behaviour
<p>9 - Striped dolphin <i>Stenella coeruleoalba</i></p> 	<p>The striped dolphin is a streamlined oceanic dolphin, similar in shape and size to the common dolphin and measuring up to 2.3 metres in length. It has a long beak, a large curved dorsal fin and short tapered pectoral fins.</p> <p>Striped dolphins have a distinct colour pattern: the beak, melon, back, dorsal and pectoral fins are dark grey whilst the throat and belly are very pale; there are usually three dark grey stripes running from the eye to the anus, one to the pectoral fin and a third short stripe between the other two; the eyes are normally outlined by a dark patch; starting above the eye, a blaze of pale grey sweeps along each flank.</p>	<p>The striped dolphin is an oceanic species which often travels in large groups, preferring highly productive open waters beyond the continental shelf that are rich in food. It can also be found close to shore where the waters are relatively deep. It feeds on a wide variety of small fish, especially lanternfish, and squid, which it can catch by diving down to 200 m.</p> <p>Striped dolphins are the most abundant and one of the best known cetaceans in the Mediterranean, in both the western and the eastern basins. The species is particularly common in the Ligurian Sea, Gulf of Lion, the Alboran Sea and the waters between the Balearic Islands and the Iberian Peninsula.</p> <p>Conservation status: IUCN (global): Least Concern IUCN (Mediterranean): Vulnerable.</p>






<p>10- Short beaked common dolphin <i>Delphinus delphis</i></p> 	<p>The short-beaked common dolphin has a distinctive creamy yellow hourglass pattern along the sides, with a dark grey back, tail and flippers and a cream coloured belly. The beak is relatively long and slender. Adult short-beaked common dolphins measure between 1.8 to 2.3 metres long and weigh about 100 kg.</p>	<p>Once one of the most abundant cetacean species in the Mediterranean Sea, common dolphins have declined throughout the region since the 1960s. The causes of their generalised decline include prey depletion by overfishing, incidental mortality in fishing gear and intentional killings. Lifespan is about 20 to 30 years.</p> <p>At present, two species are recognized unanimously; the short-beaked common dolphin <i>D. delphis</i> and the long-beaked common dolphin <i>D. capensis</i>. Only short-beaked common dolphins inhabit the Mediterranean Sea, and therefore in a Mediterranean context most of the time their name is shortened and they are referred to as 'common dolphins'. Mostly found throughout the Mediterranean and contiguous Atlantic Area.</p> <p>Conservation status: IUCN (global): Least Concern IUCN (Mediterranean): Endangered.</p>
<p>11 - Harbour porpoise <i>Phocoena phocoena</i></p> 	<p>This is the smallest cetacean found in the Mediterranean. The body is fairly stocky resulting in a rotund shape and lacks a prominent beak. A triangular dorsal fin is positioned mid-body and is visible when the animal surfaces. Colouration is typically dark grey on the back and pectoral (side) fins, with lighter grey sides and a pale belly. There is a dark stripe from the mouth to the pectoral fins. A swimming pattern of several short, rapid surfacings followed by an extended dive of several minutes is characteristic for this species.</p> <p>Adult animals measure 1.4 to 1.7 metres in length and weigh around 60-70 kg.</p>	<p>Lifespan is about 10 to 20 years. Until the mid 1990s the harbour porpoise was considered absent or extinct in the Mediterranean Sea. Its presence is now definitely confirmed by a number of strandings and sightings and it is limited to the northern part of the Aegean Sea.</p> <p>Conservation status: IUCN (global): Least Concern IUCN (Mediterranean): the Black Sea subpopulation (thought to also include Aegean Sea animals) is listed as Endangered.</p>



Table 2 - Cetacean species represented by populations regularly present in the Black Sea

Species	Identification Keys	Synopsis of their biology and behaviour
<p>1 - Common bottlenose dolphin (Black Sea subspecies) <i>Tursiops truncatus ponticus</i></p> 	<p>The dolphins that live in the Black Sea are genetically and morphologically distinct from other bottlenose dolphin populations in the eastern and western Mediterranean and north-eastern Atlantic; hence they are recognized as an endemic subspecies found nowhere else. They are smaller than those in the North Atlantic and possess a uniquely shaped skull, while those in the Mediterranean are intermediate in size.</p>	<p>The total population size is unknown but is likely to be less than 1,000. Different groups of bottlenose dolphins migrate and gather every autumn in the waters south of Crimea (Cape Fiolent–Cape Sarych) and in other areas off the Russian, Georgian and Turkish coasts. Nowadays accidental mortality is mainly due to fishing gear. Other causes, such as depleted stocks of their prey species and exotic diseases due to increasing sewage pollution, have been identified as the main threats to the survival of this endangered subspecies.</p> <p>The species occurs throughout the Black Sea area, including the Kerch Strait, the Sea of Azov and the Turkish Straits.</p> <p>Conservation status: IUCN (global): Least Concern IUCN (Black Sea): Endangered.</p>

<p>2 - Short-beaked common dolphin (Black Sea subspecies) <i>Delphinus delphis ponticus</i></p> 	<p>Evidence suggests the Black Sea population is a distinct subspecies. These dolphins do not look physically different from the common dolphins in the Mediterranean.</p>	<p>Bulgarian and Russian fishermen used to catch large numbers of these dolphins in the Black Sea for meat and oil; the fishery ended by the mid-1960s. There has been some recovery since, and although the present population size is unknown, it may consist of tens of thousands of individuals. Current threats to these dolphins in the Black Sea are overfishing of their main prey species (anchovies and sprats) and increasing water eutrophication, as well as disease. The subspecies occurs almost throughout the Black Sea, except for the Kerch Strait and the Sea of Azov.</p> <p>Conservation status: IUCN (global): Least Concern IUCN (Black Sea): Vulnerable.</p>
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Species	Identification Keys	Synopsis of their biology and behaviour
<p>3 - Harbour porpoise (Black Sea subspecies) <i>Phocoena phocoena relicta</i></p> 	<p>External distinctions: blunt, short-beaked head; slightly falcate, wide-based, short dorsal fin; small, spatulate, blunt teeth<sup>8</sup>.</p> <p>Coastal, relatively shallow waters along the perimeter of the Black Sea represent the typical circumlittoral zone of the harbour porpoise distribution. Animals do not avoid waters with low salinity and transparency; sometimes they can be observed in semifresh bays, lagoons, estuaries and even in big rivers (e.g., Danube and Don).</p>	<p>The primary wintering areas are in the south-eastern Black Sea, where most of the Black Sea porpoise population congregates every year. These winter feeding grounds coincide with those of the anchovy. Until 1983, unregulated hunting was the primary threat to the species and led to a dramatic reduction in numbers. The decline continues, caused by entanglement in fishing gear, ship strikes, habitat degradation and depletion of their food source. Moreover, four mass mortality events in the past 20 years killed several thousand individuals. Survey results suggest that the current population numbers at least several thousand and possibly a few tens of thousands.</p> <p>This subspecies of harbour porpoise inhabits mainly shallow waters over the continental shelf around the entire Black Sea coast, but sometimes it can also be found far offshore in deep waters. Some individuals make annual migrations, leaving the Sea of Azov and north-western Black Sea before winter and returning in spring.</p> <p>Conservation status: IUCN (global): Least Concern IUCN (Black Sea): Endangered.</p>



Some of the cetacean species present in the Mediterranean and Black Seas  
Photos: Tilen Genov, Morigenas

<sup>8</sup> <http://www.grid.unep.ch/bsein/redbook/txt/phocoena.htm?%20MAMMALIA>

## 2. HOW TO CARRY OUT MONITORING OF CETACEAN POPULATIONS IN MPAS

*Tilen Genov, Morigenos - Slovenian Marine Mammal Society (Piran - Slovenia)*

*The different monitoring protocols, listed from simple to less simple, are described in this chapter. For each of the methods an indication of the expected results, necessary efforts, useful tools and instruments is provided. General guidelines and selected references are also indicated at the end of the section.*



*Monitoring of common bottlenose dolphins. Photos: Tilen Genov, Morigenos*

### 2.1 INTRODUCTION

Monitoring of cetaceans within and around an MPA can be done in several ways. The choice of most appropriate monitoring methods and protocols will largely depend on things like the size of the MPA, the topographical properties of the area, the resources available and the species present in the area. The choice of monitoring methods will also depend on the goal we are trying to achieve. For example, we might be interested in knowing the absolute abundance of cetaceans using the MPA, or living within it, in order to follow trends and ensure the viability of the population. Monitoring trends in abundance, distribution and habitat use is especially important if we want to assess the effectiveness of an MPA (for example when new MPAs are being set or when changes in management measures take place) and determine whether its conservation objectives are being met. This is especially true when MPAs are set specifically for the conservation of cetaceans. On the other hand, we might simply be interested in knowing how often cetaceans occur in the area, what species we are likely to encounter, and so forth.

### 2.2 METHODS: FROM SIMPLE TO LESS SIMPLE

Methods for monitoring cetaceans are quite diverse. Some methods are suitable for answering particular types of questions, while others may be more appropriate for different types of questions. All methods have their strengths and limitations. Some commonly used methods for monitoring cetacean populations are listed below.

#### *Incidental sightings and strandings*

As a first step, the collection of incidental sightings and strandings information can enable initial insights and construction of a species list. This may often be a preliminary way of collecting information and to plan more rigorous data collection later on. Sightings of cetaceans by MPA personnel, volunteers, visitors, fishermen or other members of the public can provide an inexpensive way of gathering information. MPA managers can (and probably should) actively promote the reporting of sightings by visitors and other MPA users. Basic data such as date, time and location of the sighting are very straightforward to record by anyone. Group size and species identification are slightly more complicated, but represent additional useful data that can often be collected. Photographs or video footage can corroborate the reported data. This type of information can provide a rough measure of which species are most common, and potentially detect gross seasonal differences (or long-term trends) in occurrence. This type of information is often the only available information for rare species. However, caution is needed in interpreting results from such records, because the information provided by non-experts may not always be reliable, and seasonal peaks in sightings may reflect seasonal peaks in the number of visitors to the area. This method of monitoring provides no quantitative measure for assessing population change.



*Incidental sightings by fishermen or tourists can provide useful information. Photos: Tilen Genov & Ana Hace, Morigenos*

#### *Land-based monitoring*

Some cetaceans permanently live close to land, or they frequently occur alongshore. Some make repeated nearshore migrations each year. These can readily be observed from the coast, using high vantage points and binoculars. This makes surveying for cetaceans relatively easy and inexpensive. Theodolite tracking can provide additional information on the movements of the animals. If sufficient survey effort is maintained, such monitoring can provide an assessment of the frequency of occurrence and the associated interseasonal or interannual variation, and even some level of habitat use. Moreover, this method often allows interactions between boats and cetaceans to be studied and monitored. If MPA is located on a path of a nearshore seasonal migration corridor, land-based watches can be used for counts of migrating animals, which can in turn provide information on abundance. However, the drawback is that land-based surveying provides limited area coverage and in most cases does not provide accurate information on abundance or trends.



Land-based surveying. Photos: Tilen Genov, Morigenos

### Platforms of opportunity

Platforms of opportunity such as ferries, whale-watching or sightseeing boats, fishing boats, oceanographic research vessels, etc. are often used to survey areas at low cost. (See chapter 6 on how to develop and manage sustainable whale-watching activities.) These often allow repeated observations over time, but with little or no control over where the vessel goes. This again limits the area coverage and is usually not appropriate for abundance estimation. However, it can provide a year-round monitoring opportunity, and if coupled with photo-identification (see below), it can provide a range of other useful information.

### Boat surveys

Surveys using a dedicated boat allow a wider area coverage and a wider range of information to be collected. The choice of a boat will depend on resources available, the size of the MPA to be monitored and the types of questions that need to be answered. Boats can be used for photo-identification surveys (see below) or line transect surveys (see below). They can also be used to conduct acoustic surveys (see below). Photo-identification of coastal cetaceans can often be done with relatively small boats (5–6 m), powered by outboard engines. Rigid inflatable boats are commonly used. Line transect surveys require a higher platform (at least 5 m, ideally much more) and therefore, especially if we want to cover larger areas, a much larger ship. One vital piece of equipment in any boat survey is the GPS (Global Positioning System), which allows us to pinpoint sighting locations as well as record where the survey took place. Small hand-held GPS devices are inexpensive and can be used for that. In most cases, some quantification of survey effort is desirable, either in hours spent surveying or even better, the distance travelled on effort.

### Acoustic monitoring

Static passive acoustic monitoring utilizes hydrophones (underwater microphones) that can record cetacean vocalizations. Acoustic devices can be deployed at sea and retrieved at a later stage. For example, C-POD loggers are commonly used for acoustic monitoring of porpoises and dolphins, but there are also other types of devices that can be used. Being autonomous, they can collect data when visual surveys are not possible, i.e. at night, during bad weather, etc. They can provide information on long-term trends in patterns of habitat use and frequency of occurrence. Such methods require the animals to vocalize in order to detect them, which may not always be the case. The choice of acoustic equipment will depend on the target species (cetaceans have very diverse vocalization repertoires) and the research questions. Furthermore, in areas with several species, some might be difficult to tell apart acoustically. Static passive acoustic monitoring does not currently enable estimation of abundance, but there

has been a lot of research progress in that field lately, which is likely to change that. Acoustic surveys can also be carried out 'on the go', by towing a hydrophone array behind the ship. This is used in acoustic line transect sampling (see below) and for some species such as sperm whales and porpoises, it can provide estimates of abundance.

### Photo-identification

Photo-identification (or photo-ID) is a very common method of monitoring cetacean populations and is often the most suitable and simple way to monitor coastal cetaceans. In several species, individual animals can readily be recognised by natural markings, such as scars and notches on the dorsal fins or tail flukes, pigmentation patterns, body scarring, callosity patterns, etc. Animals are photographed to facilitate mark recognition. This method is non-invasive and can provide information on a range of aspects of cetacean biology and ecology. It provides information on site fidelity, i.e. how often individual animals use a given area. Because individual animals can be identified, this also provides information on how many animals use the MPA. Photo-ID data can be applied to mark-recapture techniques in order to estimate absolute abundance and survival, to assess reproduction rates and to monitor trends. A free computer program MARK (<http://warnercnr.colostate.edu/~gwhite/mark/mark.htm>) can be used for this task. Photo-ID requires a fast, high resolution camera (Canon EOS 60D is a good example of that, but numerous other cameras of the same and other brands are equally appropriate) with a telephoto or zoom lens (usually 70-200 or 300 mm). Nowadays the market provides numerous options that satisfy such needs at fairly low cost. However, not all species of cetaceans carry sufficient amount of markings to enable photo-ID. It is vital that good (sharp, big enough, right angle) photographs of as many animals in the group as possible are obtained. This means we need to get fairly close to the animals (the exact range will depend on the species and the photographic lens used) and take photographs perpendicularly to the identifying feature, e.g. a dorsal fin. For example, when photographing common bottlenose dolphins with a 200 mm lens, the boat should ideally be completely parallel to the animal at about 10-20 m distance. An attempt should be made to photograph all animals in the group, regardless of their level of marking. Obviously, the welfare of the animals should be a priority and every care should be taken to prevent undue disturbance.



Natural marks on dorsal fins of these common bottlenose dolphins from northern Adriatic enable photographic identification of individuals. Photos: Tilen Genov, Morigenos

### Line transect surveys

Line transect surveys are aimed at covering (usually large) representative areas with the purpose of estimating abundance. They require a range of assumptions and can be logistically and technically quite demanding, as well as usually quite costly. However, line transect surveys are one of the few methods that can provide reliable estimates of abundance for cetaceans. There are three ways line transect surveys for cetaceans can be carried out: through ship-based surveys, aerial surveys (using airplanes) and acoustic surveys. Ship-based visual surveys require a fairly large ship that can stay out at sea for days or weeks. Aerial surveys require so-called bubble windows, which enable the researcher to see directly below the aircraft. Acoustic surveys can be done using fairly small boats, for instance sailing boats, and a towed hydrophone array. A free computer program DISTANCE (<http://www.ruwpa.st-and.ac.uk/distance/>) is a great tool for designing line transect surveys and to analyse the collected data.

### Spatial modelling

Spatial modelling of habitat use is increasingly being used in the study and conservation of cetaceans. This approach uses environmental data to help explain animal distribution and predict important areas. Such models can be used to inform conservation and management decisions. Model predictions can inform MPA design and information on negative anthropogenic effects on cetaceans. This approach is analytically complex and requires rigorous data collection schemes.

### Biopsy sampling

Tissue samples (skin and blubber) of free-ranging cetaceans can be obtained using biopsy sampling. Such samples can provide information on toxicology (i.e. pollutant levels), stable isotopes (feeding habits and trophic levels) and genetics (kinship and genetic population structure). It can even provide information on pregnancy. Biopsy samples can be obtained with a biopsy pole (to sample bowriding animals) or via remote sampling using crossbows or rifles. These methods are semi-invasive, so every care needs to be taken to minimise stress and potential risk to the animals. This means proper training is needed before undertaking biopsy sampling.

## 2.3 GENERAL CONSIDERATIONS

Whatever the method used, some issues are important to consider. The first one is what the purpose of the monitoring is, like noted above. Secondly, training and data quality control should be incorporated into any monitoring strategy, to ensure the data collection is consistent and that inferences can be drawn from it.

Regardless of the type of data being collected, it is important to store it in a dedicated database (whatever its structure), so that the data are readily available and comparable over long-term.

Ideally, clear objectives of monitoring and envisaged type of analysis should be set prior to any data collection. If the study design is poor, little can be done in the analysis stage later on.

It is difficult to cover all the monitoring methods at length in a limited space. Therefore, the interested readers and MPA managers are encouraged to consult more detailed literature on these topics. Some useful references are suggested below.

## 2.4 GENERAL GUIDELINES

- Collecting incidental information from MPA users is almost always a useful thing. It requires little effort, but can provide potentially useful information. Similarly, platforms of opportunity are a useful and low-cost source of information.

- If the MPA is coastal (and cetaceans frequently occur alongshore), land-based monitoring using binoculars and high vantage points may be the most efficient and cost-effective way of monitoring. This will not provide information on absolute abundance, but can provide information on relative abundance, potential trends in habitat use and interaction with human activities.
- If the MPA is coastal and a small and manoeuvrable boat is available, photo-ID can provide a number of demographic parameters of the population under study. It can also provide information on abundance, provided that mark-recapture assumptions are met. Photo-ID can also sometimes be applied from platforms of opportunity (e.g. whale-watching boats).
- Coastal areas frequented by cetaceans that come there to feed, can be monitored using static passive acoustic devices. This will not provide information on abundance, but it does provide some index of area usage.
- For very large and offshore MPAs, ship-based (visual and acoustic) or aerial surveys are probably the only option to monitor cetacean populations. However, this is rather expensive. Still, it can be done periodically (e.g. every 5 years) to monitor long-term trends.
- Consult the experts involved in monitoring of cetaceans before undertaking any monitoring strategy. There is no substitute for a carefully planned monitoring strategy.

## 2.5 SELECTED REFERENCES

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### 3. WHAT ARE THE EXISTING REGIONAL OR SUB-REGIONAL DATA FEEDBACK MECHANISMS? WHAT NETWORKS OF EXPERTS ON CETACEANS ARE ACTIVE, AT THE REGIONAL, SUB-REGIONAL AND NATIONAL LEVELS? WHAT ARE THE KEY ORGANIZATIONS THAT MANAGERS CAN CONTACT?

Carlo Franzosini, *Miramare Marine Protected Area (Trieste - Italy)*

*General guidelines for a data-feedback mechanisms in case of strandings of alive or dead cetaceans are listed in this section followed by a short description of the MEDACES tool, the regional database on cetacean strandings. A scheme reporting some of the principal national authorities, organizations, research centres and rescue centres active in the field of study and conservation of cetaceans in the ACCOBAMS area is also present with the indication of useful contacts.*

#### 3.1 GENERAL GUIDELINES FOR A DATA-FEEDBACK MECHANISMS <sup>9</sup>

The wider community should be made able to report strandings in a efficient and rapid way, thus warranting a timely and opportune response. Gathering appropriate information either from live stranding and from carcass incidents would maximise the number of recordings, allowing better identification of causes of mortality, strandings and lesions.

An accurate reporting of strandings and mortalities, made available to all relevant parties, would enable long-term scientific studies which provide information to improve their conservation, management and biological knowledge. By including the public among these parties, we would increase awareness of cetaceans.

An ideal stranding network requires an organised systematic response, including early detection, and reporting followed by rapid and effective action. This should include:

- A mechanism for allowing quick reporting of live stranded, ill, injured or dead animals (a "24 hours" telephone service).
- An emergency response team to attend the reports of stranded animals.
- Organised and standardised data collection and reporting procedures.
- Logistic support and equipment for retrieval and transport of animals (when required).
- A facility for medical treatment and rehabilitation in the case of live animals.
- A facility for the effective necropsy of dead animals by trained personnel.

The general objectives of a stranding network should be:

- To allow the wider community to report strandings in a efficient and rapid way.
- To warrant that an opportune response is made to all notified cetacean strandings.
- To maximise the number of strandings recorded, in order to identify the causes of mortality, strandings and lesions.
- To secure timely reporting of strandings and mortalities to all relevant parties, including the public.
- To enable long-term scientific studies which provide information to improve their conservation, management and biological knowledge.
- To increase public awareness of cetaceans.

<sup>9</sup> From ACCOBAMS, 2004. "Guidelines for the Development of National Networks of Cetacean Strandings Monitoring" <http://www.accobams.org/images/stories/Guidelines/NEW/guidelines%20for%20the%20development%20of%20national%20networks%20of%20cetacean%20strandings%20monitoring.pdf>

#### 3.2 MEDACES, THE REGIONAL DATABASE ON CETACEAN STRANDINGS

The Mediterranean database on cetacean strandings (MEDACES) was established in Valencia, Spain, after a decision taken in 2001 by the Contracting Parties to the Barcelona Convention. The Regional Activity Centre for Specially Protected Areas (RAC/SPA) is the depositary for the database, whose management is entrusted to the University of Valencia's Cavanilles Biodiversity Institute (ICBIBE), with the financial support of the Spanish Ministry of Environment (MMA). This database strictly adheres to a deontological code of ethics<sup>10</sup>.

##### Data input

The MEDACES web-page provides information about the project and the collaborating institutions. It is designed to allow direct input of data, as it gives users the direct access to the input forms.

Stranding data are sent to MEDACES by national stranding networks, national authorities, research and conservations institutions as well as RAC-SPA and ACCOBAMS.

MEDACES provide three different options to facilitate the gathering of stranding data:

Protected Database Extract: this option allows submission of extracts of large data sets. This is especially relevant for institutions with an extended experience and large amount of records.

- The "Excel" form: this option allows data to be filled in and stored in an Excel file format.
- The "paper" form: stranding data can also be filled into a paper copy of a PDF document.

##### Data output

MEDACES is a relational database, i.e., the information of every stranding record is stored in different, related tables. For instance, data regarding the institution sending the stranding information, cetacean measurements as well as samples taken for life history studies will be stored in three different tables. The main advantage of using a relational database is that it facilitate the search of complex information within the database that otherwise would be difficult.

MEDACES is managed as a geodatabase, and is made using the Microsoft Access software. The geodatabase is able to represent geographical data of the strandings, being able to get the location of any event in a map. It is also possible to get the information of this stranding through the interface of the map.

The MEDACES web-page has two specific tools that are accessible for users: a search function for information related to the strandings, and a graphic visualization of strandings using basic cartography. The search tool contains searching criteria by species, sex, date, country, province and locality. The output is a printable list of records fulfilling the searching criteria.

Until 2008 MEDACES provided regularly its biennial report to RAC/SPA and ACCOBAMS. Unfortunately, budget cuts in the Spanish Ministry of Environment had led to a suspension of its activity, despite the financial support provided by RAC/SPA in 2010. By the end of 2013, RAC /SPA and the Spanish Ministry of Environment agreed to support the re-functioning of MEDACES during the biennium 2014-2015.

<sup>10</sup> [http://www.rac-spa.org/sites/default/files/meetings/nfp9/wg\\_331\\_inf10\\_eng.pdf](http://www.rac-spa.org/sites/default/files/meetings/nfp9/wg_331_inf10_eng.pdf)

### 3.3 NATIONAL AUTHORITIES, ORGANIZATIONS, RESEARCH CENTRES AND RESCUE CENTRES ACTIVE IN THE FIELD OF STUDY AND CONSERVATION OF CETACEANS

The document “Cetacean Stranding Coordinators in the ACCOBAMS Area”, available at the web page <http://www.accobams.org/images/stories/PDF/cetacean%20stranding%20coordinators%20in%20the%20accobams%20area.pdf>

provides the reference names and contact details of the “Cetacean Stranding Coordinators”, the reference persons to get in touch with in each country.

The following tables list the information made available by:

- The National Reports submitted for the Meetings of the ACCOBAMS Contracting Parties<sup>11</sup>.
- CIESM Guide of Marine Institutes<sup>12</sup>.
- European Cetacean Society<sup>13</sup>.
- The Mediterranean Environmental NGOs Database<sup>14</sup>.
- NETCET project - Network for the Conservation of Cetaceans and Sea Turtles in the Adriatic<sup>15</sup>.
- Dolphin Biology & Conservation Organisation<sup>16</sup>.



Photo: Saul Ciriaco, Miramare MPA



Photo: Tilen Genov, Morigenos



Photo: Tilen Genov, Morigenos

11 [http://www.accobams.org/index.php?option=com\\_content&view=article&id=1056&Itemid=86](http://www.accobams.org/index.php?option=com_content&view=article&id=1056&Itemid=86)

12 <http://www.ciesm.org/online/institutes/IndexInstituts.htm>

13 <http://www.europeancetaceansociety.eu/>

14 <http://www.mio-ecsde.org/ngos/>

15 <http://www.netcet.eu/>

16 <http://www.dolphinbiology.org/>

	National authorities	Rescue centres & Stranding network reference points	Institutional Organisations	Non Governmental Organisations (NGOs)
<b>Albania</b>	Ministry of Environment, Forests and Water Administration		Museum of Natural Sciences, under the Faculty of Natural Sciences (Tirana University)	Association for the Protection of Aquatic Wildlife in Albania (APAWA)
<b>Algeria</b>	Ministère de la Pêche et des Ressources Halieutiques	Institut des Sciences de la Nature Laboratoire de Biologie et Pollution Marines, University of Oran Es-Senia 31000 Oran Tel.: +213 6 337048 Fax: +213 6 410078 Contact Person: Zitouni Boutiba	Centre National de Recherche et de Développement de la Pêche et l'Aquaculture (TIPAZA) Laboratoire de Recherche Réseau de Surveillance Environnementale, Département de Biologie Marine de l'Université d'Oran (Oran) Ecole Nationale Supérieure des Sciences de la Mer et de l'Aménagement du Littoral (Alger)	
<b>Bulgaria</b>	Ministry of Environment and Water	Rescue Centres for Cetaceans  Institute of Fish Resources – Varna Festa Dolphinarium – Varna	Institute of Fishing Resources Agricultural Academy Varna Tel : + 359 52 257 876 Mail : ifr@abcis.bg Institute of Oceanology Bulgarian Academy of Sciences Varna Tel : + 359 52 370 486 Mail : office@io-bas.bg www.io-bas.bg	
<b>Croatia</b>	Ministry of Culture State Institute for Nature Protection Ministry of Environmental Protection, Physical Planning and Construction Ministry of Agriculture, Fisheries and Rural Development Ministry of the Sea, Transport and Infrastructure	Stranding network reference point  Croatian Natural History Museum Demetravo 1 10000 Zagreb @Tel.: +385 1 4851 700 E-mail: Drasko.Holcer@hpm.hr	Croatian Natural History Museum in Zagreb  Faculty of Veterinary Medicine in Zagreb	Blue World Institute of Marine Research and Conservation
<b>Cyprus</b>	Ministry of Agriculture, Natural Resources and Environment : Department of Fisheries and Marine Research	Stranding network reference points  Department of Fisheries and Marine Research 101 Vithleem str. 1416 Nicosia Ms Marina Argyrou, Fisheries and Marine Research Senior Officer Tel: (357)22.807852 / Fax: (357)22.775955 Mail: margyrou@dfmr.moa.gov.cy	Department of Fisheries and Marine Research (DFMR) Tel 22807868 Mail: director@dfmr.moa.gov.cy	Cyprus Wildlife Society, Nicosia



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<p><b>France</b></p>	<p>Ministère de l'écologie, de l'énergie, du développement durable et de la mer</p>	<p>Stranding network reference point Réseau National Echouages (RNE) - Observatoire PELAGIS - UMS 3462 Université de La Rochelle - CNRS Pôle Analytique - 5 allées de l'Océan 17 000 La Rochelle France Tel : + 33 546 449 910 Fax : +33 546 449 945 Email : crmm@univ-lr.fr Coordinateur régional pour la Méditerranée Dr. Frank DHERMAIN, 04-91-26-72-25 Pyrénées-orientales, l'Hérault et l'Aude : Laurent DUPONT (ONCFS), 04-68-53-01-81 / 06-27-02-58-66 Gard : Skander BOUDERBALA, 04-66-51-57-37 / 06-77-00-68-89 Bouches-du-Rhône : Dr. Frank DHERMAIN, 04-91-26-72-25 Var : Dr. Franck DUPRAZ, 04-98-05-90-91 / 06-14-70-43-19 Alpes-Maritimes : Dr. Véronique VIENET, 06-10-79-66-48 Corse: Catherine CESARINI, 06-09-38-81-03</p>	<p>Observatoire PELAGIS - UMS 3462 - Université de La Rochelle / CNRS Pôle Analytique 5 allée de l'Océan F-17000 La Rochelle FRANCE Tél. 05.46.44.99.10.</p>	<p>GIS-3M (Group of Scientific Interest on Marine Mammals of the Mediterranean Sea)  GREC : Groupe de Recherche sur les Cétacés</p>
<p><b>Georgia</b></p>	<p>Ministry of Environment Protection and natural Resources</p>	<p>Rescue Centres for Cetaceans  "Black Sea Flora and Fauna Educational Scientific Research Centre", Batumi Municipality</p>	<p>Iliia State University Tbilisi Ecology Institute Zoology Institute <a href="http://www.iliauni.edu.ge/index.php?lang_id=ENG&amp;sec_id=1">http://www.iliauni.edu.ge/index.php?lang_id=ENG&amp;sec_id=1</a></p>	<p>Association 'Flora and Fauna'  Green Movement of Georgia</p>

	National Authorities	Rescue Centres & Stranding Network Reference Points	Institutional Organisations	Non Governmental Organisations (NGOs)
Greece	<p>Ministry of Environment, Energy and Climate Change, Directorate general for the environment Trikalon 36, GR-11526, Athens Contact person : Eleni Tryfon Tel : +302106918202 E-mail : e.tryfon@prv.ypeka.gr</p> <p>Ministry of Maritime Affairs and Aegean, Hellenic Coast Guard Headquarters Fisheries Control Directorate, GR-185 10 Gate E1-E2, Port of Piraeus Tel: 2131374380 Fax:2104285720 e-mail : delal@hcg.gr</p> <p>Ministry of Rural Development and Food, Directorate for Animal Health, Axapvwv 2, GR-101 76, ABMVA Contact person: Sokratis Perdikaris Tel : +30 210 2125789 e-mail : ka6u043@minagric.gr</p>	<p>Stranding Network reference Point :</p> <p>Ministry of Mercantile Marine and Aegean, Directorate of Port Police, Local Port Police Authorities</p> <p>Aristotle University of Thessaloniki, School of Veterinary Medicine, Faculty of Health Sciences St. Voutyra 11, GR-546-27, Thessaloniki Contact person : Dr. Anastasia Komnenou, Assoc. Prof of Surgery-Exotic and Wildlife Medicine, Phone: +30 2310 99 4443 Mobile: +306945 531850 Fax: 302310 994449 e-mail : natakomn@vet.auth.gr</p> <p>Hellenic Centre for Marine Research -46.7 km Athens – Sounion, PO Box 712, GR-190 13 Anavyssos, atiki Contact person: Dr. K. Kapiris Tel: 210 9856712, Fax: 210 9811713 e-mail: kkapir@hcmr.gr</p> <p>Pelagos Cetacean Research Institute Terpsichoris 21, GR-16671, Vouliagmeni Contact person: Dr. A. Frantzis Tel/Fax: +30 210 8960108 e-mail: pelages.info@otenet.gr http://www.pelagosinstitute.gr</p> <p>ARION – Cetacean Rescue and Rehabilitation Research Centre M.Botsari 110, GR-54453 Thessaloniki Contact person : Dr Aimilia Drougas Tel/fax: +30 213 0067257-8 Mobile: +30 6945 644994, +30 6945 531850 e-mail : arion@arion.org.gr</p>	<p>Hellenic Centre for Marine Research -46.7 km Athens – Sounion, PO Box 712, GR-190 13 Anavyssos, atiki Contact person: Dr. K. Kapiris Tel: 210 9856712, Fax: 210 9811713 e-mail: kkapir@hcmr.gr</p> <p>Fisheries Research Institute Nea Peramos, GR-64 007, Kavala Contact Person: Dr. E.Koutrakis Tel: 25940 22691,2,3 Fax: 25940 22222 e-mail : manosk@inale.gr</p>	<p>Pelagos Cetacean Research Institute Terpsichoris 21, GR-16671, Vouliagmeni Contact person: Dr. A Frantzis Tel/Fax: +30 210 8950106 E-mail: pelages.info@otenet.gr www.pelagosinstitute.gr</p> <p>ARION – Cetacean and Rehabilitation Research Centre M.Botsari 110, GR-5454453 Thessaloniki Contact person: Dr Aimilia Drougas Tel/Fax : +30 213 0067257-8 Mobile : +30 6945 644994 +30 6945 531850 e-mail: arion@arion.org.gr</p> <p>Archipelagos, Institute of Marine Conservation P.O Box 42, GR-83 102, Pythagorio, Samos Contact person: A.Miliou Tel: 22730 61191 e-mail: a.miliou@archipelago.gr</p> <p>Tethys Research Intitue Vonitsa field base: Makariou Kiprou 22, GR-30002, Vonitsa Aetoloakarnania Contact person : Dr Joan Gonzalvo Tel: 6979428717 (May – September) e-mail : joan.gonzalvo@gmail.com</p>

<p><b>Israel</b></p>	<p>Israel Nature &amp; Parks Authority, Ministry of Environmental Protection</p>	<p>Stranding network reference point  IMMRAC The Recanati Institute for Maritime Studies The Charney School of Marine Sciences University of Haifa Mount Carmel Haifa 31905 Tel: + 972-50-6241663 Mail: goffman@research.haifa.ac.il Contact Person: Oz Goffman</p>	<p>Israel Oceanographic and Limnological Research Institute Haifa Tel : + 972 4 851 52 02 Mail : lea@ocean.org.il www.ocean.org.il</p>	<p>Israel Marine Mammal Research &amp; Assistance Center Tel: + 972-50-6241663 Mail: immrac@gmail.com www.immrac.org</p>
<p><b>Italy</b></p>	<p>Ministry of the Environment, Land and Sea General Board for Nature and Sea Protection</p>	<p>National stranding network  Coordinated by the national coastguard: (telephone 1530) National Stranding Bank (BDS, Pavia University) <a href="http://mammiferimarini.unipv.it">http://mammiferimarini.unipv.it</a> Cetaceans stranding Emergency Response Team (Padua University) Mediterranean Marine Mammals Tissue Bank (Padua University) Tel. 049.8272600-2601 segreteria.bca@unipd.it</p>	<p>Biology Department, University of Genoa  Centro Interdisciplinare di Bioacustica e Ricerche Ambientali (CIBRA), Università di Pavia  Museo civico di storia Naturale (Milano)</p>	<p>Cetacea Foundation : Tethys Research Institute</p>
<p><b>Lebanon</b></p>			<p>NCSR - CNRS Batroun Liban Nord Lebanon Fax : + 961 6 741 584 Mail : bihar@cnrs.edu.lb www.cnrs.edu.lb</p>	
<p><b>Libya</b></p>			<p>Marine Biology Research Centre Tripoli-Tajura Tel : + 218 21 369 00 01/3 Mail : drawatig@yahoo.com</p>	
<p><b>Malta</b></p>	<p>Malta Environment and Planning Authority Environment Protection Directorate</p>	<p>Conservation Biology Research Group Department of Biology University of Malta, Msida, MALTA Tel. no: +356 23402790 mob.no. +356 99429592 email: adriana.vella@um.edu.mt Contact Person: Dr. Adriana Vella</p>	<p>University Marine Laboratory Msida Tel : + 356 2340 2272 Mail : victor.axiak@um.edu.mt <a href="http://home.um.edu.mt/biology/">http://home.um.edu.mt/biology/</a></p>	

	National authorities	Rescue centres & Stranding network reference points	Institutional Organisations	Non Governmental Organisations (NGOs)
<b>Montenegro</b>	Ministry of Spatial Planning and Environmental Protection Institute for Nature Protection		Institute of Marine Biology, Kotor Tel : + 382 32 334 569 Mail : ibmk@ibmk.org Web Site : www.ibmk.org	
<b>Morocco</b>	Ministère de l'Agriculture et de la Pêche Maritime Département de la Pêche Maritime Rabat	Réseaux d'échouage et banque de tissus géré par le Centre régional de l'Institut national de recherche halieutique (INRH) à Nador	Institut National de Recherche Halieutique 2, Rue de Tiznit Casablanca Tel.: +22.22.02.49 Fax: +22.26.88.57 E-mail : mesfioui@inrh.org.ma Contact Person: Amina Moumni Institut Scientifique Département de Zoologie et Ecologie Animale Avenue Ibn Battota B.P. 703, Agdal 10106 Rabat Tel.: +212.7.774548	
<b>Portugal</b>	Ministry of the Environment Instituto de Conservação da Natureza e da Biodiversidade (ICNB)	ABRIGOS - Live stranding network Tel. 96 88 49 101 24 h /day ; 7 days / week Rescue Centres for Cetaceans Sociedade Portuguesa de Vida Selvagem Zoomarine Cram Quiaios	Escola de Mar Sociedade Portuguesa de Vida Selvagem CIRCE - Conservation Information and Study on Cetaceans Projecto Delfim - Centro Portugues de Estudos dos Mamiferos Marinheiros	Sociedade Portuguesa de Vida Selvagem Associação para as Ciências do Mar
<b>Romania</b>	Ministry of Environment and Forests		Romanian Marine Research Institute Nat. Inst. for Marine Research & Development "Grigore Antipa" Constanta Tel : + 40 241 543 288/540 870 Mail : rmri@alpha.rmri.ro www.rmri.ro	MARE NOSTRUM Bvd. 1 Decembrie 1918 No. 3 900711 Constanta Tel: + 40 421 612422 Mail: office@marenosttrum.ro Contact persons: Mihaela CANDEA, Executive Director, e-mail: mihaela_candea@marenosttrum.ro Marian PAIU, e-mail: marian_paiu@marenosttrum.ro
<b>Slovenia</b>	Ministry of Agriculture and Environment Environmental Agency of the Republic of Slovenia The Institute of the Republic of Slovenia for Nature Conservation	Stranding network reference point Morigenos - Slovenian Marine Mammal Society Kidričevo nabrežje 4 6330 Piran Tel: +38631771077 e-mail: morigenos@morigenos.org, tilen.genov@gmail.com Contact person: Tilen Genov	National Institute of Biology, Marine Biology Station, Piran	Morigenos – Slovenian Marine Mammal Society Phone: + 38631771077 mail: morigenos@morigenos.org web: www.morigenos.org

	National authorities	Rescue centres & Stranding network reference points	Institutional Organisations	Non Governmental Organisations (NGOs)
Spain	<p>Regional Governments(Environment and Fisheries authorities)</p> <p>Directorate General of Sustainability of Coast and Sea (Ministry of the Environment Rural and Marine Affairs)</p> <p>Directorate General of Fisheries Resources and Aquaculture (Ministry of the Environment, and Rural and Marine Affairs)</p>	<p>There are:                      a national stranding network which provides regular information and constitutes the national warning system that enables the country to proceed properly in case of unusual events like mass stranding                      a national advisory panel for rescue activities to contribute to a coordinated cetacean stranding response                      Rescue Centres for Cetaceans                      ANDALUCIA CEGMA del Estrecho (Centro de Gestion del Medio Marino Andaluz)                      ANDALUCIA: Consejeria de Medio Ambiente, Junta de Andalucia                      CATALUA CRAM (Centro de Recuperaci n de Animales Marinos de Cataluna)                      BALEARIC ISLANDS Fundaci n Marineland Palmitos                      MURCIA Centro de Recuperacion de Fauna Salvaje "El Valle"                      VALENCIA - Rehabilitation Centres of Valencia, Castellon and Alicante (Environmental Department of the Valencian Government)                      VALENCIA - ARCA del Mar, Oceanografic (Ciudad de las Artes y las Ciencias)                      Stranding network reference point                      Universidad de Valencia                      Departamento de Zoología                      Facultad de Biología                      Dr. Moliner 50.                      46100 Burjasot, Valencia                      Tel.: +34.963864375                      Fax: +34. 963864372                      E-mail: toni.raga@uv.es                      Contact Person: Juan Antonio Raga</p>	<p>CSIC - Spanish National Research Council - (Ministry of Science and Innovation)</p> <p>IEO - Spanish Institute of Oceanography (Ministry of Science and Innovation)</p> <p>University of Valencia. Cavanilles Institute of Biodiversity and Evolutionary Biology</p> <p>University of Barcelona. Department of Biology</p> <p>Autonomous University of Madrid</p> <p>University of Cadiz</p> <p>University of Balearic Islands</p> <p>University of Seville</p> <p>University Complutense of Madrid. Group for the Study of Animal and Human Behaviour (GECAH)</p>	<p>Alnitak. Marine Environment Research and Education Centre                      Spanish Cetacean Society (SEC)                      Greenpeace – Spain                      WWF – Spain / ADENA                      Foundation for the Conservation and Recovery of Marine Animals (CRAM)                      Aula del Mar (Malaga)                      Oceana – Regional Office for Europe                      Museo del Mar de Ceuta (Ceuta)                      Oceanic cetacean society (Cadiz)                      Andalusian society for the study of cetaceans (ESPARTE)                      Asociaci n de Naturalistas del Sureste (ANSE, Murcia)                      Ecologistas en Accion                      Association for study, conservation and research – Balaena                      Conservation, information and research on cetaceans (CIRCE)                      La Isla de los delfines (Comunidad Valenciana)</p>
Syria	<p>Ministry of State for Environment Affairs                      General Directorate of Ports</p>		<p>High Institute Of Marine Research                      Tishreen University Lattakia                      Tel : + 963 41 428 690/428 658                      Mail : tu-himr@scs-net.org                      Laboratory of Marine Sciences and Aquatic Environment                      Tishreen University Lattakia                      Tel : + 963 41 412 657                      Mail : adibsaad@scs-net.org</p>	

	National authorities	Rescue centres & Stranding network reference points	Institutional Organisations	Non Governmental Organisations (NGOs)
<b>Tunisia</b>	<p>Ministère de l'Agriculture, des Ressources hydrauliques et de la Pêche : Direction Générale de la Pêche et de l'Aquaculture</p>	<p>Stranding network reference point Institut National des Sciences et Technologies de la Mer 28, rue de 2 Mars 1994 2025 Salambo Tel.: +216 71 730 420 Fax: +216 71 732 622 Contact Person: Mohamed Nejmedine Bradai Mail: mednejmeddine.bradai@instm.rnrt.tn</p>	<p>INSTM - Institut National des Sciences et Technologies de la Mer Salamambo Tel : + 216 71 730 548 Mail : ridha.mrabet@instm.rnrt.tn www.instm.rnrt.tn/</p>	
<b>Turkey</b>		<p>Istanbul University Faculty of Fisheries Istanbul Tel: + 90 212 4555700/16404-16434 E-mail: ozturkb@istanbul.edu.tr Contact Person: Bayram Öztürk</p> <p>Turkish Marine Research Foundation (TUDAV) Istanbul Tel: + 90 216 4240772 Mail: tudav@tudav.org Contact Person: Bayram Öztürk</p> <p>Underwater Research Society Yenisehir 06444 Ankara Tel.: +90 312 231 6501 Mail : sadafag@yahoo.com</p> <p>Recep Tayyip Erdoğan University Faculty of Fisheries Zihni Derin Campus 53100 Rize Tel.: +90464 223 33 85 Mail: suurunleri@erdogan.edu.tr</p>	<p>Institute of Marine Sciences Middle East Technical University Erdemli - Mersin Tel : + 90 324 521 2406/2150 Mail : sukruעים.metu.edu.tr www.ims.metu.edu.tr</p> <p>Institute of Marine Sciences and Management University of Istanbul Tel : + 90 212 528 2539 Mail : cemga@istanbul.edu.tr www.istanbul.edu.tr/enstituler/denizbilimleri/denizbilimleri.htm</p> <p>TUDAV Institute Turkish Marine Research Foundation Istanbul Tel : + 90 216 424 0772 Mail : tudav@superonline.com www.tudav.org</p> <p>Institute of Marine Sciences and Technology Izmir Tel : + 90 232 278 65 25/65 15 Mail : imstdirector@deu.edu.tr www.deu.edu.tr</p> <p>Istanbul University Fisheries Lab Laleli - Istanbul Tel : + 90 212 514 03 88 www.istanbul.edu.tr</p>	

			<p>Marine Ecology Research Centre  Karadeniz Technical University  Trabzon  Tel : + 90 462 752 28 05  Mail : seyhan@jbsd.ktu.edu.tr  www.ktu.edu.tr</p>	
<p><b>Ukraine</b></p>	<p>Ministry of Environmental Protection  of Ukraine Department of Natural  Ecosystems</p> <p>Biosafety Fauna Conservation</p>	<p>Rescue Centres for Cetaceans  Evpatoria Marine Mammal Rescue Centre  Sevastopol Marine Mammal Rescue Centre  Feodosia Marine Mammal Rescue Centre</p>	<p>Institute of Biology of the Southern Seas  National Academy of Sciences of Ukraine  Sevastopol  Tel : + 380 692 544 110  Mail : ibss@ibss.iuf.net  www.ibss.iuf.net</p> <p>Marine Hydrophysical Institute  National Academy of Sciences of Ukraine  Sevastopol  Tel : + 380 692 54 04 52  Mail : ocean@alpha.mhi.iuf.net  www.mhi.iuf.net</p>	<p>Black Sea Council for Marine Mammals (BSCMM)</p>

## 4. HOW TO DEAL WITH STRANDING OF DEAD AND LIVE ANIMALS (ADMINISTRATIVE AND SCIENTIFIC LEVEL)?

Carlo Franzosini, *Miramare Marine Protected Area (Trieste - Italy)*

*This section considers the response to an event of a stranding of a marine mammal, giving information on how and when to intervene, how to create a multitasking response team, texts and links to useful handbooks regarding the issue, etc. The second part of the chapter is dedicated to the collection of data and samples of a stranded animal, should the MPA team be directly asked to take samples and/or to perform a necropsy of a stranded animal, in the absence of veterinarians or public health officials during the stranding event. Indications on carcass disposal are given at the end of the chapter.*

### 4.1 DESCRIPTION AND RATIONALE

A “strand” is a beach, or land bordering a body of water, and “stranded” is defined as having run aground. The latter term also describes any creature having been left in a helpless position, such as a marine mammal that falters ashore ill, weak, or simply lost.

Marine strandings occur for a number of reasons, including sickness, disorientation, natural mortality, extreme weather conditions or injury. Recently bycatch - the accidental capture of animals in fishing nets - has also been identified as one of the main causes of death.

Quoting Geraci and Lounsbury (see below), the animals that strand most commonly are generally those that are most abundant, and for that reason, “rehabilitating” a common species for eventual release will not likely benefit its population in any way. In fact, releasing one carrying infectious organisms is apt to be harmful. The rescue of an endangered species, such a monk seal, is another matter: every addition will have a measurable effect on the very small population. The average person today would not respond to a stranding merely because the animal has some scientific value. More often, we are moved by the humane need to help an animal in distress. Beyond that, marine mammals have a role that is reflected in the way we view them and how we react when any one of them comes ashore.

The advice addressed to MPA managers, is to establish formal contacts - possibly a written agreement - between the Marine Protected Area, local veterinarians and the sanitary authorities, as human and animal safety are the top priority. This agreement is aimed at paving the way to the operative response that should be given to any stranding event next to come. In a further stage of the agreement, the MPA manager could seek the support of local administration, NGOs and volunteers to ensure public awareness, spreading of information and – mainly - a substantial basis for the setting up of a response team. In any case, as Cetacean species are included in the Annexes to the Washington convention, taking in charge, transporting, possessing and delivering marine mammals should happen in compliance with CITES procedures (refer i.e. to art. III paragraph 5<sup>17</sup> and art. IV paragraph 6<sup>18</sup> of text of the Convention).

A basic point to be developed in the agreement is the release of written Protocols for the “Dead Animal Response”, the “Live Animal Response: First Response”, and the “Live Animal Response: Rehabilitation and Final Disposition”. Such Protocols have to ensure the health, welfare and safety of both the animals and the human responders; they are asked to balance the need for standardized procedures while allowing flexibility to address specific needs of different situations for diverse species and habitats, as well as unforeseen circumstances.

Protocols for cetaceans (whales, dolphins and porpoises) can be different than the ones for pinnipeds (seals) since their biology is significantly different. Each event is different and requires consideration of the following factors:

- What are the species and group composition involved in the event?
- Is the situation caused by human activities or a natural event?
- Are resources available to ensure the safety and welfare of both the animals and the responders?

For assessing the state of stranded animals, and for an overview of treatment and care options, veterinarians could refer to the 1996 report edited by the Whale and Dolphin Conservation Society, entitled “A review of live strandings of Cetaceans: implications for their Veterinary Care, Rescue and Rehabilitation in the UK”, presently available on-line : [http://www.wdcs.org/submissions\\_bin/strandingsreview.pdf](http://www.wdcs.org/submissions_bin/strandingsreview.pdf).

A comprehensive and updated tool, developed for the area covered by Sardinia, Corsica, Liguria and Tuscany, is one of the outputs of the GIONHA project, presently available only in Italian at:

<http://www.gionha.it/risorse/pubblicazioni/report/linee-guida-per-il-recupero-soccorso-cetacei-e-tartarughe-marine.zip/view>.

Should an MPA manager seek practical training on this issue, the “Observatoire PELAGIS” based in La Rochelle (France) is regularly providing qualified courses, ranging from the collection of information gathered on the field, up to the dissection of animals and the standardized sample collection. The members of this institution are coordinating the whole national stranding network.

The point illustrating “Collection and Storage of Samples” (in paragraph 5) and the following paragraph 6 (“Basic field equipment”) are inserted here in the case that the MPA team should be directly asked to collect some samples and/or to perform a necropsy of a stranded animal, in the absence of veterinarians or public health officials during the stranding event. Paragraph 8 provides:

- The MEDACES data collection form.
- The advice provided by the British Divers Marine Life Rescue, on behalf of the UK Marine Conservation Society, for the very first operations to start on site.
- A poster, commonly displayed in Scotland, which could serve as an example on how to sensitize local population on reporting information of a stranding event.

Marine Mammals Ashore: A Field Guide for Strandings<sup>19</sup> is a comprehensive manual for understanding and dealing with stranded Cetaceans, indicated for students, scientists and marine resource managers. It describes rescue operations, how to organize a response team, and how to deal with the media and the public.

<sup>19</sup> J.R. Geraci and V.J. Lounsbury, 2005. *Marine Mammals Ashore: A Field Guide for Strandings (2<sup>nd</sup> edition)*. Baltimore National Aquarium, 371 pp. ISBN : 0977460908, 9780977460908

<sup>17</sup> <http://cites.org/eng/disc/text.php#III5>

<sup>18</sup> <http://cites.org/eng/disc/text.php#IV6>



Internet provides also helpful resources and information, such as these made available by:

- MEDACES - The Mediterranean Database of Cetacean Strandings  
<http://www.rac-spa.org/medaces>.
- ACCOBAMS' "Guidelines for the Development of National Networks of Cetacean Strandings Monitoring", "Guidelines for a coordinated cetacean stranding response", and "Guidelines concerning best practice and procedure for addressing cetacean mortality events related to chemical, acoustic and biological pollution"  
[http://www.accobams.org/index.php?option=com\\_content&view=article&id=1134&Itemid=165](http://www.accobams.org/index.php?option=com_content&view=article&id=1134&Itemid=165).
- RAC/SPA for the Caribbean region  
[http://www.car-spaw-rac.org/IMG/pdf/MARINE\\_MAMMALS-\\_STRANDINGS-3.pdf](http://www.car-spaw-rac.org/IMG/pdf/MARINE_MAMMALS-_STRANDINGS-3.pdf).
- UK Marine Conservation Society  
<http://www.marine-conservation.org.uk/ukstrandings.html>.
- NOAA/NMFS' Marine Mammal Health and Stranding Response Program  
<http://www.nmfs.noaa.gov/pr/health/>.
- Marine Mammal Stranding Network Participants  
<http://www.nmfs.noaa.gov/pr/health/networks.htm>.

The following text is partially trait and modified from the above mentioned manual and web resources. It is not a comprehensive review nor should it be considered as Guidelines: its goal is to provide an overview of practices for responding to strandings.

## 4.2 DEFINITIONS AND DECISIONS ON WHEN TO INTERVENE

- **Stranding:** occurrence of a marine mammal (either dead, ill or alive) immobilized ashore.
- **Mass Stranding:** stranding of two (except mother with calf) or more animals near in time and space.
- **Mass die-off:** mortality on a large scale (without inference on the cause of death or species involved).

An unusual mortality event is determined after the occurrence of certain criteria. These are:

- A marked increase in the magnitude or a marked change in the nature of morbidity, mortality or strandings when compared with prior records.
- A temporal change in morbidity, mortality or strandings is occurring.
- A spatial change in morbidity, mortality or strandings is occurring.
- The species, age, or sex composition of the affected animals is different than that of animals that are normally affected.
- Affected animals exhibit similar or unusual pathologic findings, behavior patterns, clinical signs, or general physical condition (e.g., blubber thickness).
- Potentially significant morbidity, mortality or stranding is observed in species, stocks or populations that are particularly vulnerable (e.g., listed as depleted, threatened or endangered or declining). For example, stranding of three or four right whales may be cause for great concern whereas stranding of a similar number of fin whales may not.
- Morbidity is observed concurrent with or as part of an unexplained continual decline of a marine mammal population, stock, or species.

**Stranding Network:** human and institutional coordination for the monitoring of cetacean strandings. Its objective include:

- Provide welfare of live stranded animals.
- Allow the wider community to report strandings in a efficient and rapid way.
- Minimize risk to public health and safety.
- Support scientific research and assist in determining causes of mortality.
- Advance awareness and education on marine mammals.

**When to intervene:** deciding what course to take requires an understanding of the animal's natural history, social organization, and species specific considerations, and should bear in mind that a rescue effort generates interest from the public.

**Criteria** for deciding when to intervene include consideration of the following questions:

- How many animals are involved? Attempting to give equal attention to more animals than resources allow may compromise adequate care for any one.
- Is logistical support available?
- Are local weather and sea conditions favorable?
- Can animal condition be accessed?
- What is the time elapsed since stranding?
- Can it be easily handled?
- Are care facilities available?

## 4.3 THE RESPONSE TEAM

**Institutional mandate:** a stranding network must function within the legal framework established by various relevant authorities and organizations at local, national and regional levels to ensure effective coordination, avoid duplication of efforts and actions, and achieve action its long-term goals.

**Elements of a network** shall include :

- A mechanism for allowing quick reporting of live stranded, ill, injured or dead animals (a "24 hours" hotline telephone service).
- An emergency response team, with a veterinary component to attend the reports of strandings, particularly live animals.
- Organised and standardised data collection and reporting procedures.
- Logistic support and equipment for retrieval and transport of animals (when required).
- A facility for medical treatment and rehabilitation in the case of live animals.
- A facility for the effective necropsy of dead animals by trained personnel.

To be of real value data have to be collected in a consistent manner, from the largest possible number of animals and over a long time period.

NGO's can play an important role in stranding networks by mobilising volunteers to cover as much of the national coastline as possible, increasing public awareness on cetacean conservation, and seeking the co-operation of local fishermen.

The regional stranding network, established under UNEP umbrella, is MEDACES :

<http://www.rac-spa.org/medaces>.

The composition of a response team depends on the type and frequency of animals coming ashore. Common to all situations, however, is the basic need for the team to :

- Respond rapidly.
- Contact local authorities upon arrival.
- Evaluate the situation.
- Provide emergency care.
- Arrange to take action (release, transport, necropsy, specimen and data collection, and photographic documentation).
- Enlist local assistance.
- Provide information to the public and media.
- Protect public health and ensure safety.
- Maintain communications with stakeholders.

#### 4.4 RESCUE AND RELEASE

Immediate release, returning the animal to sea would require consideration of the following :

- The animal is manageable and logistic support adequate.
- Beach and environmental conditions are favorable.
- The animal is healthy and able to function normally.
- Maternal care for young can be met.
- The area of release is within natural or suitable habitat. Logistical capabilities and support are determining to decide whether or not to release an animal.

#### 4.5 REHABILITATION

Rehabilitation would require consideration of the following:

- There is a good chance the animal can be restored to health.
- Facilities are available and equipped for the species and number of animals involved.
- Arrangements can be made for safe and expeditious transport.
- The animal is manageable and poses no major risk to others or to facility staff.
- There are sufficient funds and staff to provide care for a reasonable period.

The purpose of rehabilitation would be to provide humane care for stranded marine mammals and to optimize the success of releasing into the wild. Care facilities should meet design and operational criteria so as to optimize rehabilitation success rate.

A detailed evaluation process is required to determine if, following rehabilitation, an animal is suitable for release. Refer to ACCOBAMS' "Guidelines for the release of captive cetaceans into the wild"<sup>20</sup>.

#### 4.6 GENERAL PROCEDURES, DATA AND SAMPLE COLLECTION

Stranding responses will differ according to each case and characteristics of a region and country. Apart from local differences, more detailed operational indications are given in two ACCOBAMS' documents:

- Guidelines for a coordinated cetacean stranding response during mortality events caused by infectious agents and harmful algal blooms<sup>21</sup>.
- Guidelines concerning best practice and procedure for addressing cetacean mortality events related to chemical, acoustic and biological pollution<sup>22</sup>.

Mass stranding will also need additional human resources, although not necessarily skilled or trained at the same level of expertise. Tasks and actions should be clearly defined, communicated and supervised, and can generally be summarized as follows:

- To have all the equipment ready for use before a stranding occurs.
- To react quickly. It is important to respond to those notifying a stranding and to inform persons at the stranding site that operations are already under way.
- To evaluate the situation. Once on the beach it is necessary to obtain all possible information about the stranding and surrounding conditions to take appropriate decisions.

<sup>20</sup> [http://www.accobams.org/index.php?option=com\\_content&view=article&id=1134&Itemid=165](http://www.accobams.org/index.php?option=com_content&view=article&id=1134&Itemid=165)

<sup>21</sup> <http://www.accobams.org/images/stories/Guidelines/NEW/guidelines%20for%20a%20coordinated%20cetacean%20stranding%20response.pdf>

<sup>22</sup> <http://www.accobams.org/images/stories/Guidelines/NEW/guidelines%20for%20addressing%20cetacean%20mortality%20events%20.pdf>

- To contact the relevant authorities. It is important to consider the local, regional or national organizations involved and that can assist to both control the public and the animal.
- To coordinate the action of authorities and volunteers. Those involved either officially or as volunteers require the assistance of a person experienced in strandings. Experts must give them instructions and remember to eventually acknowledge the help received.
- To care for public health and safety. Potential public health problems and distress to the animal, persons involved and the public in general, as well as eventual risks to the security of people or animals should be considered.
- To provide information to the public and the media. This information must be clear and appropriate explaining the action taken.
- To take relevant scientific decisions. This aspect depends on the scientific competence of the official in charge and has to do with decisions concerning animal transportation, euthanasia (if required), necropsy, and data and photography collection.

#### Data Collection

Scientific data collection requires a detailed, carefully planned protocol implemented by qualified personnel, following the indications provided either by a stranding network (i.e. MEDACES or the national network). Given that the level of response and capacities to respond to strandings differ among most countries and situations, there is a tendency to collect data at two levels: basic information pertaining to the stranding and more complex data which may vary as a function of the logistic and technical possibilities of each country.

A summary of basic information required for each stranding include:

- Details of both the informant and the scientific reporter: name and address (institution).
- Field number.
- Number of animals including this one.
- Date (dd/mm/yyyy), time of first discovery.
- Location: latitude and longitude (to 0.1 minute, if possible), locality, region, country.
- Species identification (by qualified personnel).
- Sex of animal (by qualified personnel).
- Total body length.
- Weight (if possible).
- Animal condition : a) alive; b) dead [b1) freshly dead; b2) decomposed but organs basically intact; b3) advanced decomposition (organs not recognizable); b4) mummified or skeletal remains only].
- Report marks or external wounds.
- Pictures should always be taken, including: Whole body, head, jaws, dorsal fin, tail, genital area, and old cars.

Supplementary on-site information include:

- Weather and tide conditions.
- Human/predator interaction.
- Presence of prey species.
- Behaviour.
- Samples collected for life history (e.g. teeth, ear plugs, reproductive tracts, stomach contents) and for blood studies, toxicology, microbiology, histopathology, parasites collected.

While documenting signs of human interaction (which are useful for conservation and management measures) such as entanglement, lacerations, debris or gear ingestion, a reference handbook available on-line is the "Marine Mammal Human Interaction Handbook", by Barco and Touhey (2006) :

[http://www.bahamaswhales.org/strandings/Barco\\_06.pdf](http://www.bahamaswhales.org/strandings/Barco_06.pdf)

**Collection and Storage of Samples**

The collection of biological specimen operated in a MPA should be framed within a specific protocol made available either by a biological repository (i.e. a Natural History Museum), or by local sanitary authorities and veterinarians.

A biorepository is a biological materials repository that collects, processes, stores, and distributes biospecimens to support scientific investigation. It assures the quality, and manages the accessibility and distribution/disposition of the biospecimens in its collection. The four main operations of a biorepository are; (i) collection (ii) processing, (iii) storage or inventory, and (iv) distribution of biological specimens. An updated registry of these institutions is available at:

<http://www.biorepositories.org/>

Great care should be exercised labelling the samples. Two labels, one inside and another outside the container, should accompany each sample. This is because external labels are easily detached at high humidity or at freezing temperatures. Each label should include the following data:

- Reference no. designating the individual animal.
- Type of tissue.
- Purpose of the sample (histopathology, virology, etc.).

Labels should be written legibly in permanent ink, using adequate terminology and preferably in English.

**Life History Studies\***

STUDY	ANIMAL CONDITION
Histopathology	a) & b1)
Microbiology	a) & b1)
Parasitology	a) to b2)
Toxicology	a) to b2)
Reproduction	a) to b2)
Genetics	a) to b4)
Other life history studies (age, prey)	a) to b4)

Age determination : in Odontocetes, take 4-5 teeth from the middle of the lower jaw. Choose teeth that appear intact and little curved. If the jaw does not need to be preserved for preparation of the skeleton, it can be sawed to collect the teeth more easily. Teeth can be frozen at -20°C or kept in 70 % ethanol. They should not be kept at room temperature as they may crack hampering age determination. In Mysticetes, age determination techniques include counting growth layers both in the ear plug from the auditory meatus and in the baleen plates, and counting the number of corpora (lutea and albicantia) in the uteri of females. Of these techniques, ear plugs, and to a lesser extent corpora, have proven to be most accurate<sup>23</sup>. Diversely, preserving whale's tympanic bullae is useful for the radiometric age determination method based on the activity ratio of Radium-226 and Lead-210.

\*refer to the description of " animal conditions" provided in page 49

23 Hamilton P. K., Knowlton A. R., Marx M. K., Kraus S. D. (1998). Age structure and longevity in North Atlantic right whales *Eubalaena glacialis* and their relation to reproduction. *Mar Ecol Prog Ser*, Vol. 171: 285-292, 1998

Digestive contents : the contents of each stomach compartment should be collected separately and kept frozen at -20°C. Alternatively, 70 % ethanol can be used to preserve the stomach contents, but formaldehyde solutions should be avoided as they can dissolve small fish bones.

Genetic studies : a piece of skin (2 x 2 cm) should be collected and kept frozen (-20°C) or fixed in either 70 % ethanol or 20% dimethyl sulfoxide (DMSO) solution saturated with NaCl.

Reproductive status. Collection: In females both ovaries must be collected and weighted making the distinction between the left and right ovary. Ovarian scars should also be noted, and to which side they correspond. In males only one testis needs to be collected and weighted. Fixation and storage: part of the gonads must be fixed in a buffered solution of 10% formaldehyde.

Skeleton. It is necessary to know beforehand whether the skeleton is to be kept intact for collection purposes. In this case the necropsy is more complex as the integrity of the bones should be sought. The skull is crucial for the confirmation of species identification and every effort should be made to collect and save it. Particular attention must also be paid to preserve the pelvic bones, as well as the tympanic bullae and hyoid bones.

**Health Studies**

*Toxicology*

Collection: Although 10 g are enough to perform the analyses, large tissue samples (± 250 g) should be collected. For the analyses of persistent organic pollutants (POPs), samples of blubber, dorsal muscle, liver, kidney and brain should be wrapped in aluminum foil and then stored in a plastic bag. A sample comprising the whole depth of the blubber (free of skin and muscle) should be collected at the posterior level of the fin. For heavy-metal analyses, samples of blubber, dorsal muscle, bone (5th rib), liver, kidney and brain should be cut when possible with plastic knives (since contact with any metal should be avoided) and stored in new plastic bags; and if not, the fact must be reported. The liver and kidney should be weighed before any sample is taken.

In lactating females, collect milk samples in glass vials. Foetuses should be surveyed in the same fashion as adults. Fixation and storage: samples should be preserved at -20°C if analyses are not carried out immediately. Ideally samples should be weighed before freezing, its weight being reported on the label, because of liquid losses associated to freezing.

*Microbiology*

Samples from lesions that are suspected to have an infectious origin must be taken in an aseptic fashion with a sterile scalpel blade. The surface of the sample must be disinfected in 70 % ethanol. Then the sample (2 x 2 x 2 cm for virology or 6 x 6 x 6 cm for bacteriology, approx.) should be placed in a suitable container. Commercial kits for the collection and storage of such samples are available.

*Virology*

Collection: Sampling of parenchyma and lesions of potential infectious origin should be taken in an aseptic fashion. Fixation and storage: samples should be placed as soon as possible at 4°C. If they cannot be transported to a specialised laboratory within 24 h, they should be frozen (ideally at -80°C).

*Bacteriology*

Collection: the collection of liquids (blood, pus, urine, etc.) should be done with a syringe or a sterile Pasteur pipette after disinfection (alcohol, cauterisation) of the organ surface (heart, bladder, etc.). An intestinal loop, with adjacent mesenteric ganglion, must be collected after ligation of its two ends.

*Parasitology*

Collection: parasites should be collected and fixed in a solution of 70 % ethanol with 5 % glycerine. If such a solution is not available, they can be stored in a 10 % formaldehyde solution. If all individuals are not collected, the whole number should be estimated. When surveying for parasites, special attention should be paid to the ear sinuses,

the air passages and pulmonary blood vessels, liver and hepatic ducts, pancreas, the different stomach compartments and the intestine. If the skull is to be kept intact, caution should be exercised when dissecting the ear sinuses to avoid damage to the tympanic bulla. If lesions associated to parasites are detected, fix the ensemble in 10 % formaldehyde.

Fixation and storage: fixed specimens can be stored at room temperature. Fresh tissues or organs for parasite examination should be refrigerated at 4°C. Freeze (-20°C) if they cannot be examined within 24 h.

#### *Histopathology*

Collection: samples should be collected to include a zone of juxtaposition of normal tissue and the lesion. Avoid manipulating the sample excessively to avoid damaging its microstructure. For large organs, it is preferable to collect several small samples rather than a large one.

Fixation and storage: The best fixative is a buffered solution of 10 % formaldehyde. A nonbuffered solution can be used instead and has the advantage that can be readily prepared on the field, but this will preclude ulterior immunohistochemical analyses.

Since the penetration of the fixative is slow, it is advisable to:

- Make small slices thinner than 1 cm thick.
- Slice large samples at regular intervals.
- Inject fixative in hollow organs (bladder, eye, etc.) and lesions (e.g. cysts).

The ratio between the volume of fixative and that of the tissue should be around 10:1 and even 20:1 for brain samples. Since tissues tend to stiffen in formaldehyde, it is advisable using vials with large openings. Do not freeze samples for histopathology either before or after fixation.

#### *Immunohistochemistry*

Fix all samples with a buffered solution of 10 % formaldehyde. Fixation should be as short as Possible. Ideally analyses should be carried out within 24 h.

#### *Electron Microscopy*

Samples should be collected as fast as possible, cut in small cubes (1 mm<sup>3</sup>), fixed in glutaraldehyde and stored in glass vials.

#### *Molecular Biology (PCR)*

Samples for molecular studies (2 x 2 x 2 cm) must be frozen quickly and stored at -20°C.

### 4.7 BASIC FIELD EQUIPMENT

The minimum material necessary to perform a necropsy of a stranded animal would include :

- Latex gloves (not plastic).
- Data sheets.
- Waterproof markers.
- Measuring equipment.
- Knives, scissors, scalpel, string, plastic knives.
- Sample containers, vials and labels.
- Aluminum foil and new plastic bags and sacs.
- kitchen paper rolls.
- Scales or dinamometres.
- Cooler with ice packs.
- Preservatives (70% ethanol, 10% formalin, others).
- First-aid kit.
- Photographic camera.

### 4.8 CARCASS DISPOSAL

One of the more relevant actions from both the media and public health perspective is to develop a protocol for the disposal of stranded cetaceans after death and data collection. Carcass disposal shall be handled in a manner consistent with local regulations; the decisions are constrained by the size and condition of the animal, stranding location characteristics and logistic factors.

Whereas a small cetacean, such a dolphin, is easy to handle and transport, large animals (whales) are difficult to deal with. Likewise, there are differences depending on whether the body is fresh or in advanced state of decomposition or on the geographical characteristics of the coast, e.g. sandy beaches vs. inaccessible, abrupt and steep shorelines.

Finally, the support of human resources, both officials and volunteers, and the availability of equipment, such as vehicles, excavators, boats, etc., is also important. For that reason, it is recommended that a brief report containing basic findings and acknowledgment to local support be prepared and displayed, as appropriate, at local facilities (city hall, port police office, etc).

Incineration is the best method to dispose of the carcass of a cetacean. Logistics allowing, large animals should be cut in manageable pieces. If cremation is not possible, the body should be buried in an authorized dump. Incineration on the beach or disposal at sea should be avoided because of the risks posed to public health and navigation.

In E.U. countries, only in the case where it is proved that the animal did not suffer of communicable diseases, the carcass may be disposed through burial, and possibly sinking, following the indications of responsible authorities (derogation to EC Regulation 1774, art. 24).

Site cleanup: every reasonable effort has to be made in the clean up of beach areas where the activities that may have contributed to soiling of the site took place (e.g., necropsy or specimen collection).

### 4.9 LINKS TO USEFUL HANDBOOKS

*9 a) MEDACES Data-collection form: [http://medaces.uv.es/home\\_eng.htm](http://medaces.uv.es/home_eng.htm)*

*9 b) Advice provided by the British Divers Marine Life Rescue in the event of a stranding<sup>24</sup>*

Anyone finding a stranded dolphin, whale or porpoise should report it immediately, taking great care when approaching stranded animals because of possible injury or disease transmission.

Important things you can do to help are:

- Support the animal in an upright position and dig trenches under the pectoral fins.
- Cover the animal with wet sheets or towels (even seaweed) and keep it moist by spraying or dousing with water, sea water if possible.
- Do NOT cover, or let any water pass down the blowhole (nostril), located on top of the animal's head. This will cause the animal great distress and could even kill it. Do NOT cover the dorsal fin, tail fluke or pectoral fins, as these are important for thermoregulation.
- Every movement around a stranded animal should be quiet, calm and gentle. Excessive noise and disturbance will only stress it further. Keep people with dogs away.
- Estimate the length of the animal and look for any distinguishing feature that may give clues as to the species you are dealing with.

<sup>24</sup> <http://www.marine-conservation.org.uk/ukstrandings.html>

- Look for any signs of injury and count the number of breaths (opening of the blowhole) that occur over a minute - this can give important clues as to how stressed the animal is.
- Take great care when handling a dolphin, porpoise or whale; keep away from the tail or mouth, as it can inflict serious injuries - this is particularly the case with whales and it is advisable to avoid handling larger whales until experienced help has arrived. Avoid the animal's breath, as it may carry some potentially dangerous bacteria.
- Provide information: give an exact location for the animal. If you have a mobile, give the number to the authorities.
- Give an accurate description of the animal, including its breathing rate, and whether it is in the surf, on rocks or sand, in the shade or in the full glare of the sun.
- Information on weather conditions and sea state also can be helpful.
- Keep all contact, noise and disturbance to a minimum.
- Under no circumstances release the animal into the sea before the rescue team has arrived. It is fine to support a smaller dolphin or porpoise in the water, as long as the blowhole is kept above the water at all times, and as long as it is carried to the water carefully, e.g. in a tarpaulin. Do NOT drag or lift the animal by its fins or tail. These are delicate and can be easily injured. Releasing the animal before it has received an assessment and first aid from experienced personnel can do more harm than good.

9 c) A poster from the "Scottish marine animal stranding hotline", aimed at collecting and reporting relevant information<sup>25</sup>



Photos: Archive of the Municipality of Trieste, Science Museums Service

<sup>25</sup> <http://www.strandings.org/images/strandingsposter.pdf>

## 5. HOW TO CLEAN STRANDED ANIMAL CARCASSES (FOR INTERPRETATION CENTRES/EXHIBITS)?

Carlo Franzosini, *Miramare Marine Protected Area (Trieste - Italy)*  
in collaboration with: dr. Luca Lapini, *Museo Friulano di Storia Naturale (Udine - Italy)*

*At first, sanitary institutions have to give their green light to move and manipulate the carcass. If the body is intact and in good conditions, a solution could be its preservation, intended either as taxidermic preparation or a reproduction (fine replica), the second allowing to recover the skeleton of the animal. Both solutions require the intervention of skilled specialists, thus a budget has to be provided. Cleaning the carcass is less demanding and expensive. The burial, in an appropriate place selected in accordance with local authorities, requires up to a couple of years to bring back the complete skeleton.*

Operating on a dead cetacean requires the authorization of the local representatives of the sanitary institutions, which i.e. have to assess that the salm is not spreading communicable diseases. Successively, all the operations finalized to collect, store and preserve cetacean samples must be agreed by the local CITES (Convention of International Trade of Endangered Species) Management Authorities.

In view of this eventuality it is recommended that the MPA manager gets in touch and takes preliminary agreements with the closest Museum of Natural History, as these institutions are the most experienced and technically prepared in this field. Most of them also manage databases and store tissue and DNA samples of stranded animals for scientific purposes (biological repositories).

Nevertheless, the preservation (taxidermic preparation) of cetaceans requires time, technicians, materials and laboratories: this is to say that not all the museums can be adequately equipped or are willing to offer their availability to meet this commitment for free. Alternatively, one can turn to professional taxidermists. The taxidermic preparation of a medium-sized dolphin (150-200 kg) could cost, on the European market, around 4.000 €.

Moreover, a service company which holds authorizations for handling expired meat is needed, as it could intervene in transporting and eventually freezing and storing animal's carcass before its preparation (refer to local slaughterhouses and veterinary services).

The preparation of a fine replica of a fresh and intact carcass is an interesting alternative to its taxidermic preparation. The dead specimen should be put in the correct posture and frozen before proceeding. A thin layer of silicone is rolled out on the entire body, then the whole gets fully wrapped with a fiberglass coating. Once the fiberglass has solidified, the body will be pulled out in pieces through cuts and openings in the fiberglass mantle; the resulting negative body print is then recomposed and filled with fluid polyurethane, to obtain a positive replica of the cetacean. After its hardening, the polyurethane positive replica is finished by plastering, polishing and painting.

At the end of this operation, the skeleton could be recovered too, thus permitting to exhibit both the entire animal and its skeleton. The cost of a fine replica of a stranded cetacean is similar to its taxidermic preparation, but the result is more stable and less delicate along time.

Cleaning a carcass is a less demanding and expensive operation. This can be carried out by burying the dead specimen in the ground or in sand, in an appropriate place, at least one meter underground, and keeping it there undisturbed for a couple of years. In order to avoid the loss of smaller parts and the dislocation of bones, the carcass has to be fitted in a wooden coffin, made able to allow natural decomposition. Local authorities have to be consulted in order to select the most suitable site for this operation.

Alternatively, a taxidermist could intervene and speed up the process: the carcass, cut into parts, is boiled and/or macerated before cleaning by hand the skeleton.

## 6. HOW TO DEVELOP AND MANAGE SUSTAINABLE ‘WHALE’-WATCHING ACTIVITIES?

*Milena Tempesta, Miramare Marine Protected Area (Trieste, Italy)*

*The development of whale-watching activities in a sustainable way is treated in this chapter with an in-depth view of the opportunity to create a label for commercial operators that voluntarily agree to follow a correct code of conduct during sightings. An analysis of the pros and cons of the development of whale watching is also given.*

### 6.1 DESCRIPTION AND RATIONALE

“Whale”- or better “cetacean”-watching is the activity of observing cetaceans (whales, dolphins, porpoises, etc.) in the wild, both from the coastline (i.e. observation points on a cliff) and at sea (by private boats or cruise ships for example) or from the air (by airplane). The activity can take the form of a commercial operation for ecotourists or of a research activity to collect data with non-lethal methods on live animals or can be both at the same time. It can also be a simply opportunistic activity conducted by amateurs without any commercial aspects on an ad hoc (modified from<sup>27</sup> and <sup>28</sup>).

In recent years whale watching in the Mediterranean region has become of major importance to the tourism industry, despite the activity being seasonal and simply praise to the abundance of cetaceans in certain areas and to the easy access from the coast<sup>29</sup>. A positive growing trend has been recorded world-wide with important socio-economic implications<sup>30</sup> including in many riparian Countries such as Italy, France, Spain, Greece and Croatia, where commercial whale and dolphin watching has been flourishing for more than ten years. For example a recent report (2009) which updates a 2005 socio-economic study<sup>31</sup> on the presence of whale watching operators along the French and Monaco Mediterranean coasts, showed an increase in the number of operators involved in commercial whale watching, exceeding 30, ten more than in 2005. Some of them offer the opportunity to swim with dolphins and use air means to detect cetaceans. Following ACCOBAMS-RAC/SPA guidelines<sup>27</sup>, commercial operations that involve entering the water with the animals should be forbidden due to the risks both to cetaceans and humans.

The ACCOBAMS Scientific Committee at their 8th meeting held in November 2012, recognised the many potential benefits of whale watching from a wide-range of perspectives, including economic, public awareness and education. From a scientific perspective, however, it was noted that the further development of whale watching activities within the agreement area should be carefully managed in order to minimise potential adverse impacts on cetacean individuals and populations.<sup>32</sup>

27 IFAW, Tethys Research Institute & Europe Conservation, 1995. Report of the Workshop on the Scientific Aspects of Managing Whale Watching. Montecastello di Vibio, Italy, 30th March –4th April 1995. 40 p.

[www.helsinki.fi/~lauhakan/whale/education/ifaw/vibio/content.html](http://www.helsinki.fi/~lauhakan/whale/education/ifaw/vibio/content.html)

28 UNEP MAP RAC/SPA, 2003. A worldwide review of regulations, guidelines and codes of conduct for whale watching as a reference for the Mediterranean Sea. Ed. RAC/SPA, Tunis.

29 ACCOBAMS Resolution 4.7, 2010: Guidelines for Commercial Cetacean-Watching in the ACCOBAMS Area [http://www.accobams.org/images/stories/MOP/MOP4/Resolutions/res%204.7\\_commercial%20cetacean%20watching%20activities%20in%20the%20accobams%20area.pdf](http://www.accobams.org/images/stories/MOP/MOP4/Resolutions/res%204.7_commercial%20cetacean%20watching%20activities%20in%20the%20accobams%20area.pdf)

30 O’CONNOR S., CAMPBELL R., CORTEZ H. & KNOWLES T., 2009. Whale Watching Worldwide: tourism numbers, expenditures and expanding economic benefits, a special report from the International Fund for Animal Welfare, Yarmouth MA, USA, prepared by Economists at Large.

31 MAYOL P. & BEAUBRUN P., 2005. Le whale-watching en Méditerranée Française : état des lieux et perspectives. Recensement des Opérateurs, diagnostic socio-économique et écologique de l’activité, propositions préliminaires de gestion. Rapport réalisé pour le compte du Rapport réalisé pour le compte du Ministère de l’Ecologie et du Développement Durable dans le cadre du Sanctuaire PELAGOS pour les mammifères marins en Méditerranée. 104 p.

32 ACCOBAMS Annex 10 recommendation 8.5: Recommendation on whale watching. Report of the 8th meeting of the Scientific Committee, Monaco, 13-15 November 2012.

### 6.2 LABEL FOR COMMERCIAL WHALE WATCHING OPERATORS

Whale watching should not interfere with the conservation, management or protection of cetaceans and should not have any discernible adverse effect on the behavioural patterns of cetaceans<sup>33</sup>. Following this recommendation, MPA managers whose area is interested by whale watching operations should consider to take agreements with these commercial operators. Such agreements should minimise the risks of adverse impacts on cetaceans, establishing specific rules whose aim is to guarantee the compliance of commercial activity with the principles enunciated by ACCOBAMS. The final result should be some kind of “label” provided by the MPA Authority to the commercial operators who respect the agreed rules of conduct. To deserve the label, whale watching operators have to undertake the initiative on a voluntary basis, and agree upon yearly controls to assess its effectiveness. A study on the French whale watching operators in the area of the Pelagos Sanctuary shows that the most common infringement is an intruding behaviour, as 70% of the operators can not recognise the signs of disturbance on cetaceans and are not sufficiently trained to be attentive to them<sup>34</sup>. For this reason, education and training are of the utmost importance and need to be taken into consideration by MPA managers. The technical and administrative steps necessary for creating and adopting a label are listed in the ACCOBAMS and Pelagos guidelines for implementing commercial whale watching activities<sup>35</sup>. In the case of setting up an agreement with commercial operators, MPA managers could refer to this document.

### 6.3 CODE OF CONDUCT

Detailed guidelines for commercial cetacean-watching activities in the Mediterranean region are described in the ACCOBAMS and RAC/SPA document<sup>27</sup> (2004) but the key principles can also be taken from the International Whaling Commission (IWC)<sup>36</sup> as agreed by its Scientific Committee in 1996:

- (1) Manage the development of whale watching to minimise the risk of adverse impacts;
- (2) Design, maintain and operate platforms to minimise the risk of adverse effects on cetaceans, including disturbance from noise;
- (3) Allow the cetaceans to control the nature and duration of ‘interactions’.

If even one of these aspects is not complied with and the animals start showing signs of stress, the activity should be suspended.

33 ACCOBAMS, 2005 . Guidelines for Commercial Cetacean-Watching Activities in the Black Sea, the Mediterranean Sea and Contiguous Atlantic Area

[http://rac-spa.org/sites/default/files/doc\\_cetacean/watching.pdf](http://rac-spa.org/sites/default/files/doc_cetacean/watching.pdf)

34 MAYOL P., BEAUBRUN P., DHERMAIN F. & RICHEL G., 2007. Commercial whale watching off the French Mediterranean Coast. Whale watching in the Mediterranean. Questions of sustainable development. ICW/59/10.

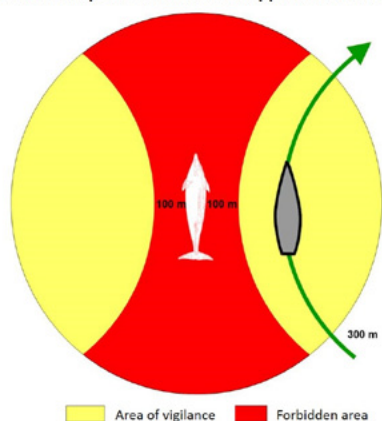
35 ACCOBAMS & PELAGOS SANCTUARY. Guidelines for implementing a Pelagos/ACCOBAMS Label for commercial whale watching activities.

<http://www.accobams.org/images/stories/Guidelines/NEW/guidelines%20for%20implementing%20a%20pelagos%20accobams%20label.pdf>

36 <http://iwc.int/wwwguidelines>

A diagram of the code of good conduct for whale watching in the Mediterranean can be found in the ACCOBAMS - Pelagos guidelines 31 and follow the scheme below:

Distances to be respected and areas of approach to a cetacean



In short:

- Slow pace and calm, constant advance the moment the cetaceans are spotted, especially within the 300 m area
- No approach closer than 100 m
- Length of observation limited to 30 minutes, 15 minutes if other boats are waiting
- Only one boat within the 300 m area
- Never try to touch, feed or swim with a cetacean.

## 6.4 THREATS AND POSITIVE ASPECTS

Whale watching can be a source of serious disturbance if poorly conducted<sup>37</sup>. A specific whale watching working group has been created by IWC and in 2011 has produced a five year whale watching strategy that has been adopted by the Commission, and is developing a web-based handbook for cetacean watching. At the same time the IWC Scientific Committee is studying the potential impact of repeated whale watching on individual whales, their populations and their habitats. This complex task requires examining both short- and long-term impacts. Factors to be considered include changes in behaviour and habitat use that may potentially affect feeding, reproductive success and even mortality rates. For this reason a monitoring of the presence, abundance, behaviour of the cetaceans in the area interested by the MPA should be foreseen with a special focus on the interaction with the whale watching activities and its possible negative impacts. Refer to chapter 2 for monitoring programmes.

On the contrary, whale watching can be seen as an “opportunistic” activity to raise awareness and sensitisation on tourists on the issue of cetaceans conservation and more in general on marine environment and to collect scientific data on cetaceans. The educational value should be of primary importance and MPA managers should perform training courses for whale watching operators and be sure of the presence aboard of a biologist/naturalist to provide correct information to participants. Educational tools (like leaflets and posters for example) can be distributed to whale-watchers during the activity. At the same time operators during their frequent boat trips with tourists can combine the “watching” activity with a collection of data useful for scientific purposes. Data, collected with scientific criteria, can be gathered both by the operators and the tourists in a sort of citizen-science campaign.

## 6.5 SUMMARY POINTS FOR MANAGERS

Following the indications above described, here it is possible to summarise the main steps to develop and managing cetacean-watching activities in an MPA in a sustainable manner.

Activity should not conflict with the conservation, management, or protection of the cetaceans and should not have any discernable adverse effect on the behavioural patterns of the cetaceans.

- Share agreements with the whale watching companies/operators (licences, labels).
- Train whale watching operators on good practices / code of conduct of approach to cetaceans in order to avoid disturbance, on cetaceans conservation and principal characteristic of the MPA (rules, habitats, important species) and on the marine environment.

- Monitor the presence, abundance, behaviour of the cetaceans in the area interested by the MPA focusing on the interaction with the whale watching activities and its possible negative impacts in an optic of adaptive management of the activity.
- Monitor the level of education/sensitisation programmes provided by the whale-watching operators to tourists in an optic of ameliorate the given information.
- Involve and train whale watching operators in a collection of scientific data on cetaceans useful for a better knowledge of the cetacean population in the MPA and contiguous areas.
- Develop education campaigns on cetaceans conservation for tourists and local people.

Activity should be suspended if:

- Whale watching operators involved in the MPAs do not respect the agreed code of conduct;
- Cetacean populations start showing signs of negative impact on their presence, distribution, behavioural patterns, etc.

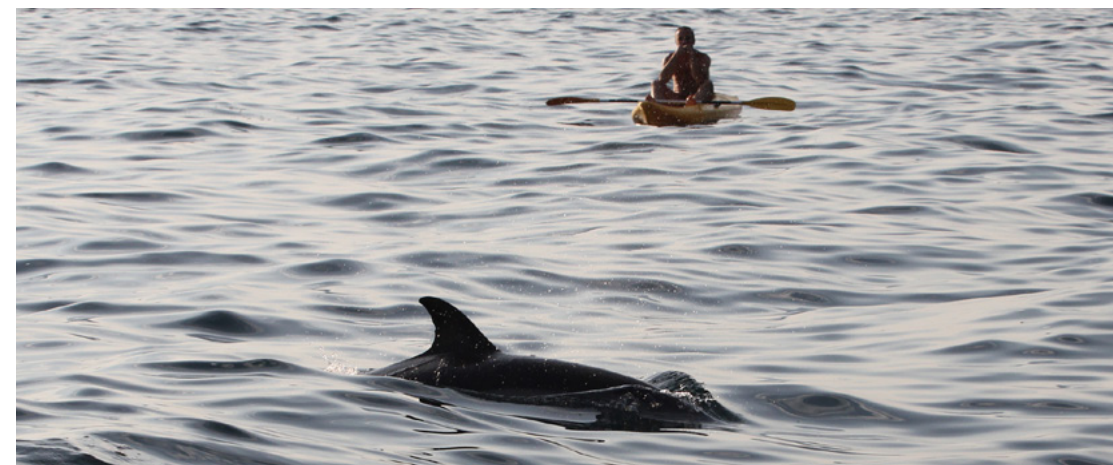


Photo: Tilen Genov, Morigenos



Photo: Saul Ciriaco, Miramare MPA

<sup>37</sup> International Whaling Commission, 2011. Five year strategic plan for whalewatching 2011-2016. [http://iwc.int/cache/downloads/61pp7v1qdn4sss40ow88kgso4/AC-002s3%20IWC%20Whale%20Booklet\\_HR.pdf](http://iwc.int/cache/downloads/61pp7v1qdn4sss40ow88kgso4/AC-002s3%20IWC%20Whale%20Booklet_HR.pdf)

## 7. HOW TO SET UP AND MANAGE SUSTAINABLE ECO-VOLUNTEERING ACTIVITIES?

*Tilen Genov, Morigenos - Slovenian Marine Mammal Society (Piran - Slovenia)*

*An overview on the involvement of eco-volunteers in cetacean research and conservation is presented here. All the main things to take in mind when starting with eco-volunteering activities are listed and commented with a summary of general guidelines at the end of the section.*

### 7.1 INTRODUCTION

Eco-volunteering activities are becoming increasingly popular worldwide. They bring revenue to local economies, support (both financially and hands-on assistance) important research, conservation and humanitarian work, enable interested individuals to take part in such work, and have an educative and awareness role for those involved. For a large part, such activities promote nature conservation, cultural conservation, sustainable development and human rights issues.

Cetacean research and conservation often involves some type of eco-volunteering activities. Several projects worldwide offer 'eco-volunteers' to take part in their research and/or conservation work. For several projects in many countries, this is the only way to carry out their work.

### 7.2 BENEFITS OF ECO-VOLUNTEERING

Eco-volunteering activities provide benefits for both parties involved: those organising such activities and those taking part. Ultimately, this should also benefit the species, habitats and local communities that we are targeting. Cetacean eco-volunteers provide benefits to cetacean projects in several ways. Firstly, such activities often involve a financial contribution, which is often the only thing that enables the work to be carried out in the first place. Secondly, eco-volunteers provide practical help in the field or in the lab, thus providing labour power, whether it's an extra pair of eyes on the survey ship, manual help with setting up acoustic equipment, talking to the public or help with data entry. This of course is not a benefit just for the project, but for some greater good that the project is trying to achieve. There are benefits for the eco-volunteer, too. They acquire knowledge and experience that would probably not be possible otherwise. They get practical, hands-on insights into how the work is carried out and what it's like to be a cetacean researcher, a conservation biologist or an environmental educator. Such activities provide education and awareness, and most importantly, they give a sense of involvement, which (in many cases) ultimately leads to greater care and long-term commitment to nature conservation. This is the part where eco-volunteering activities start to benefit conservation overall.



*Eco-volunteers helping collect information on cetacean behaviour. Photos: Tilen Genov, Morigenos*

### 7.3 THINGS TO CONSIDER WHEN SETTING UP ECO-VOLUNTEERING ACTIVITIES RELATED TO CETACEANS

#### *Clear objectives*

The first thing that needs to be considered in any eco-volunteering setting is rather obvious, but often overlooked: clear objectives of the project and its activities. What are we trying to achieve and why?

#### *Type of involvement*

Once the objectives are clear, we can consider how we wish to achieve this and how eco-volunteers could help. All activities should be in line with those objectives. In some situations, we may need actual help from eco-volunteers, for example as observers on a research ship, a ferry, or a land-observation post. Additionally, we may require paying eco-volunteers that will financially support activities we wish to carry out. In both cases, it needs to be ensured that volunteers not only provide practical or financial help, but they also 'get something back'. 'Something' can be a range of things, such as new skills and knowledge, unique and unforgettable experience, joy of observing animals in their natural environment, etc. Very often, eco-volunteers need to feel they are being useful and that they are making a difference. Most eco-volunteers wish to be a part of the team, not tourists on a sightseeing tour. In all cases, it is important to inform the volunteers of what they can expect and what is expected of them.

#### *Priorities*

In many cases, eco-volunteers need to understand that they are not participating in an entertainment programme or 'whale safari', but instead taking part in a research or conservation project with specific objectives. It is important to demonstrate that the collection of scientific data and welfare of the animals under study has priority over getting very close to the animals or taking pretty pictures. Also, they should not feel disappointed if the animals are not seen. The purpose of a research or monitoring programme is to get an accurate overview of the situation and population status (which may well include the absence of the animals), not seeing animals as often as possible.

#### *Training and quality control*

Next thing to consider is to make sure the work done by eco-volunteers or data collected by them will actually be meaningful and useful. This can be achieved by preliminary training and by proper supervision and tutoring. There are situations where eco-volunteers can do the job on their own after a brief training period, but more often they will need an experienced tutor to coordinate and supervise the work. It is important for the eco-volunteers to understand the objectives of the work, the rationale behind it, the methods used and so forth. Lectures, presentations, videos and practical training can all be used to convey as much information as possible to the volunteers, as well as ensure the quality of data collected. This also means that coordinators of any eco-volunteering programme must be qualified to run it.

#### *Fees, accommodation and food*

Eco-volunteering can take a variety of forms. Volunteers may come from the local area, on a daily basis (without on-site accommodation) or they may come from further away. In the latter case, accommodation may or may not be a part of the provided service. Volunteers might have food and accommodation included as part of their agreement with the hosting organisation, or they might need to organise it themselves. Additionally, as outlined above, we may require paying eco-volunteers that will financially support activities we wish to carry out. There should be some trade-off in the price for participation. While one of the goals of payable eco-volunteer programmes is the financial support of the research and conservation work, it is important to realise that very expensive programmes limit the number of people who can afford them. Because promoting cetacean and marine conservation should be one of the objectives of any eco-volunteering programme, it may be useful not to over-limit the participation.



*Safety, age, fitness and ability to swim*

Cetacean research often involves the need for some moderate level of physical fitness (being able to tolerate sun and heat, being able to walk uphill to the land-observation post, etc.) and the ability to swim (in case of boat-based work). This ensures that the work can be done safely and that volunteers know what to expect. If a person is unable to swim, it may be better that they do not participate in boat-based work for safety reasons. Likewise, land-based work that requires volunteers to climb a steep hill every day may not be suited to people with injuries or mobility problems. It may be important to make clear from the beginning that these are the requirements for participating in the programme. On the other hand, the organiser may wish to accommodate such cases, either by mandatory use of life jackets on the boat or providing transport to the land-based observation site. Some type of activities may be unsuitable for children or elderly people, while others may well include these age groups. Whatever the case, safety of people involved should come as a first priority.

*Sustainable and environmentally responsible*

As with all conservation-oriented projects (like MPA projects should be), it is important for all activities to be conducted in as environmentally friendly and sustainable way as possible. Even though cetaceans are the target of cetacean-oriented projects, environmentally responsible attitudes and practices should be adopted on as many levels as possible. This goes from things like sorting and recycling rubbish, to limiting the use of resources or products such as water, electricity, fuel, cleaning agents, plastic, etc. There is little point in running a cetacean research and conservation project if all our other actions are unsustainable or harmful to the environment. While the use of fuel in boat-based surveys is currently unavoidable, much can be done to make the research activities as low-impact as possible. Furthermore, research activities in the field should ensure that animal safety and well-being are kept as a high priority. This includes a code of conduct for approaching cetaceans at sea, in order to keep potential disturbance to a minimum. It is important that MPA managers and their projects give an example of responsible attitude and good practice to their visitors and eco-volunteers.

**7.4 GENERAL GUIDELINES**

- Set clear science or conservation objectives.
- Evaluate whether the main gain from eco-volunteers is help in the field or lab, financial support, or both. This will determine the type of activities and whether volunteers need to contribute financially.
- Consider how eco-volunteers would be involved in the programme and what they would get out of it. Make sure they know what to expect and what is expected of them.
- Make sure the priorities are clear for both the coordinators and the eco-volunteers.
- Prepare training material and provide proper training before and during any activities. Make sure the volunteers have leadership and support from programme coordinators. Coordinators need to be qualified for the work they do.
- Define the type of service (accommodation, food, etc.) provided.
- Consider the conditions for participation and ensure that safety is always a priority.
- Consider what can be done to minimise the impact of eco-volunteering activities on nature and cetaceans, and attempt to be an example of good practice.

**7.5 EXAMPLES AND FURTHER INFORMATION**

A number of ACCOBAMS Partner organisations such as Alnitak, Blue World, CIRCE, Morigenos, OceanCare, Pelagos and Tethys (see [www.accobams.org](http://www.accobams.org) - Partners), organise eco-volunteering activities as part of their research and conservation programmes. See their respective websites for further information and examples on eco-volunteering activities.

## 8. HOW TO DEVELOP AWARENESS OF TOURISTS AND SOCIO-ECONOMIC ACTORS ON CETACEANS' CONSERVATION ISSUES?

*Milena Tempesta, Miramare Marine Protected Area (Trieste, Italy)*

*This chapter is dedicated to the description of the different type of actions and tools to develop in order to raise awareness on cetaceans' conservation among stakeholders. Some ideas on how to start an education/sensitisation process are given; its targets, messages, time needed and degree of difficulties are analysed and commented.*

### 8.1 DESCRIPTION AND RATIONALE

“Educating” the public is a large, complex concept that needs to comply with specific standards that can be adapted and finalised in the long term. In particular Education for Sustainable Development allows every human being to acquire the knowledge, skills, attitudes and values necessary to shape a sustainable future: this is a major challenge for this century<sup>38</sup>.

With the resolution 2.23 “Education strategy and programs”, ACCOBAMS recognise the fundamental role of education both for involved civil society in cetacean conservation and as a tool to a better acceptance of compulsory measures, increasing the knowledge on cetacean role in the ecosystem<sup>39</sup>. Following IUCN, developing a comprehensive outreach and education strategy to promote responsible viewing of wild mammals by tourist and commercial operators are among the most important conservation measures<sup>40</sup>, as legislation enforcement and conservation areas establishment.

According to some authors<sup>41</sup>, few can be done in cetacean conservation without popular support and awareness, so education campaigns should be addressed to modify wrong attitudes and re-calibrate activities that actually contribute to the demise of marine mammals and marine ecosystem they live in<sup>42</sup>.

Usually interpretive programmes cover the biology, ecology, and behaviour of marine species, best practice guidelines and human threats to marine areas. Following the review of the education and conservation benefits of 18 marine wildlife experiences with dolphins, whales and marine turtles, author<sup>43</sup> showed that visitor learning and emotional empathy during mediated encounters with marine wildlife contributed to on-site behaviour changes and some longer term intentions to engage in marine conservation actions.

### 8.2 HOW TO START: TARGETS AND TOOLS

Education efforts to be effective need to be continuous over time and professionally conducted. Education, interpretation and awareness aim to translate the scientific results in a language accessible and comprehensive for the general public and contribute to the better understanding of the rules and measures necessary for marine mammal's conservation.

Targets and tools vary based on the message we want to give: target audience can be general public, tourists, schools, teachers, trainers and operators, media, enforcement communities, fishermen, consumers. At the same time tools need to be different both based on the target and on the contents of the message. It is possible to identify a gradient from “easier to do-short term” to “more complicated-long term needed” activities as reported in the table below:

38 UNESCO, 2005. *Education for Sustainable Development. United Nations Decade 2005-2014.* <http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/education-for-sustainable-development/>

39 ACCOBAMS res 2.23 (MOP2/Doc 39) 2nd meeting of the Parties, Palma de Mallorca (Spain), 9-14 November 2004.

40 IUCN 2012. *Marine Mammals and Sea Turtles of the Mediterranean and Black Seas.* Gland, Switzerland and Malaga, Spain: IUCN. 32 pp.

41 NOTARBARTOLO di SCIARA G. & BIRKUN A. Jr., 2010. *Conserving whales, dolphins and porpoises in the Mediterranean and Black Seas: an ACCOBAMS status report.* ACCOBAMS, Monaco. 212 pp.

42 REYNOLDS J.E., MARSH H., RAGEN T.J., 2009. *Marine mammal conservation. Endangered Species Research 7: 23-28.*

43 ZEPPEL H., 2008. *Education and conservation benefits of marine wildlife tours: developing free-choice learning experiences.* *Journal of Environmental Education, Vol 39, 3: 3-18.*

**TABLE 3: DIFFERENT TYPES, TARGETS AND TOOLS OF EDUCATION AND AWARENESS ACTIVITIES THAT CAN BE SET UP ON MARINE MAMMALS. AN INDICATION OF THE DIFFICULTIES IN IMPLEMENTATION AND TIME NEEDED IS PRESENT**

Type	Difficulty gradient	Time needed	Target	Message	Tool
Quick Communication	Easy	Short period	All	Information on marine mammal species inhabiting the area. Rules and code of conduct in case of sightings	Short text, beautiful pictures for bookmarks, leaflets, posters, T-shirts
Web-based communication	Easy	Short period	All	Information on cetaceans and real-time updates on their presence in the area Message-based information on interesting results from cetacean presence monitoring Promotion of activities (public events, whale watching tours, eco-volunteering camps, etc.)	Short text, journal-style entries and editorials, beautiful pictures for websites, blogs, social networks
Public events	Easy	Short period	All	Information on cetaceans presence in the area. Interesting results obtained during the monitoring activities Games on marine mammal species and drawings contests for children	Easy lectures, ppt presentations, videos
Training programmes	Medium	Short/medium period	Teachers, university students, tourist guides, whale watching operators, fishermen	Information on cetaceans in the area Scientific results obtained by the monitoring Specific information on species/marine environment Threats and positive results on cetaceans conservation How to transfer information to public	Lectures by experts, ppt presentations, videos, simulation of a monitoring activity, simulation of activities with groups (tourists, schools, etc.)

Interpretive programmes	Medium	Short/medium period	General public, tourists, schools, teachers	Provoke curiosity, attention and touch emotional sphere of visitors on marine mammal and marine environment conservation	Interpretive tools like games, artefacts, objects, whale watching tours, visitor centres expositions. Experiences last from 2 hours to half a day
Educative programmes	Medium	medium/long period	Teachers, schools	Provoke curiosity, attention and touch emotional sphere of students and teachers on marine mammal and marine environment conservation, try to change attitudes on cetaceans in a long term view	Yearly or multi-yearly educational programmes tailored for different class ages

*Quick communication*

Information and brief data on the presence and characteristics of the marine mammals can be easily communicated with the use of simple tools like booklets and posters. The cost of these tools is limited as is the message they can contain. Generally speaking these tools are indicated when wishing to raise public awareness of particular problems/threats or to catch its attention on cetaceans and means of conservation. For example, T-shirts with pictograms explaining what to do in case of dolphin entanglement can be used as a gift to fishermen during a specific awareness campaign tailored to these socio-economic actors.

*Web-based communication*

Online resources as websites, blogs, social networks can be easily used as tools to communicate to general public information on the different species commonly present in the area, to promote activities for public such as public events organised by the MPA on the topic or the opportunity to participate as volunteers to monitoring activities for example. Website is a more static tool and is an online resource for giving more in-depth information while social networks (Facebook, Twitter, etc.) are more message-based and for this reason are indicated to give real-time updates, messaging, networking and sharing quick information. Blogs function like online journals, and can feature real-time updates, journal-style entries and editorials. Descriptions of some results of the monitoring activities conducted on cetaceans, of particular characteristics of some species, occasional presence of one species in the area, can be arguments to feed the blog. Costs for this tools are moderate but, as social networks request real-time updating, dedicated personnel is necessary to insert messages, answer to followers, post pictures, etc.

*Public events*

The organisation of a public event can vary from photo or video contests open to the public or projections of documentaries followed by debates with experts to a multifaceted “open days”. For example, concerning cetaceans, many NGOs propose events such as the “Dolphin Day” with an intense programme comprising of lectures, workshops, games, projections, exhibitions, sport competitions and concerts. Costs, staff involved and budget to allocate, depend namely on the complexity of the event, the venue for projections and the number of participants expected. The message to be delivered in this particular case is obviously securing a positive attitude from the public regarding cetaceans and the marine environment in general. Most importantly it is fundamental to involve children and their parents, inviting them to discover marine mammals and efforts under way for their conservation.

### *Training programmes*

A specific programme to train operators such as MPA guides, volunteers, whale watching and tourist operators, but also university students and school teachers can be a good starting point to “train the trainers” and obtain a multiplier effect of communication. Seminars and lectures but also simulation of on-site (on-boat) activities are the most common tools involving experts case by case. Specific information on marine mammals, their distribution, ecology and biology, last results of the scientific monitoring but also indications on how to manage groups (tourists, schools, etc.) and how to pass them the correct information should be given.

A particular attention should be given to the awareness and training of fishermen that can be at the same time a threat for cetaceans but also a resource for managers if they are positively involved. Meetings with fishermen, workshop and short training activities on how to deal with marine mammals in case of sightings, entanglements in the nets, strandings, collection of simple data, etc. are of utmost importance.

### *Interpretive programmes*

A visitor centre, an information point are both interpretation tools, aiming at touching the sensitivity of the public, provoking its curiosity and capturing its interest. In a MPA, interpretive tools can be totally or partially dedicated to marine mammals, displaying their biology, ecology, threats and conservation measures through interactive exhibits, games, videos, etc. If a visitor centre is not present within the MPA premises, interpretive paths and/or guided tours can be organised. For instance, a path heading to a viewing point along the coastline can be enhanced by informative panels displaying information on how to recognise the different cetaceans species. The same information can be provided by MPA operators during a whale-watching tour, either on board of the boat or previously to it, in a sort of briefing. Data on sightings obtained by visitors should be reported to the MPA staff both directly or via web site or social networks. This, on one hand, is linking people in a participative way to MPA's activities, while on the other it gives managers the opportunity to have a feedback on the tools they prepare and the messages which are communicated.

Interpretive programmes have to be developed by a dedicated and well trained staff, which works in collaboration with researchers. This is the way to translate the scientific results on cetacean monitoring into a language comprehended by the broad public. Communication tools and message's content must have the same importance, this is a rule to be kept in mind by the “interpreters” and by the managers: a mistake to avoid is letting the tool become more important than the message to be spread. An example can be the use of games: these are very useful to involve children, but the ultimate goal is not just letting the children play, rather to use a certain game to teach a specific thing.

### *Educative programmes*

Educative programmes are intended as conceiving and developing lectures, workshops and on-the-field activities, expressly tailored for school-groups of different ages. By using interpretive techniques and/or more formal and informal teaching techniques, education activities can reach their long-term goal, which is to modify the behaviour and to instil positive attitudes. Similarly as for interpretation activities, also for the educative ones a dedicated and trained staff is needed. It is called to work in collaboration with the MPA manager and the researchers, but also with teachers and schools representatives in order to satisfy the two converging needs: provide communication on marine mammal conservation, and respond to school programmes.

Educative programmes can touch each aspect of marine mammal and marine environment conservation, with the opportunity to prepare multi-year programmes: the classes will return several times over a longer period. Activities should necessarily be tailored over the different age and the different themes touched by school programmes.

## 8.3 THE 4 STEPS: PLANNING, IMPLEMENTATION, FEEDBACK, MAINTENANCE

Building awareness campaigns is something which has to be planned in terms of financial support and human resources (people involved and time dedicated), targets, messages and communication channels. During the preparation phase, managers are called to decide the most suitable time to start the planned activity, its duration, the preparation and availability of the materials and tools needed for the campaign. Once the activity has started, it is important to monitor the results obtained in terms of changes in people's attitudes and beliefs, and progress in the common knowledge about cetacean's conservation. This in an optic of better adapting similar actions in future times.

Following the scheme displayed in the above Table 3, “time needed”, “target” and “message” are part of the planning process, while “type” and “tool” are part of the implementation phase. Feedback can be different for each type of awareness activity put in place. Their maintenance should be consequent to the information obtained by feedback. For instance, a good indicator of the success of an interpretive panel asking people to report sightings, is how many reports are arriving. For public events, the number of participants can be used as indicator of success, while information on the effectiveness of training programmes is how the operators work during a whale watching guided tour. In the case of educational activities, questionnaires to be filled in by teachers and students are easy to place, providing effective evaluation.

## 8.4 SUMMARY POINTS FOR MANAGERS

Following the above indications, the main steps in awareness/education activities focusing cetaceans' conservation issues can be summarised in that way:

- Education and sensitisation need time and, to be effective, efforts must be continuous over the years, run in a professional way, adequately funded and sustained.
- Plan the awareness activities and define target audience, tools and messages.
- Ensure a continuous link and exchange of information between scientific staff and education staff.
- Maintain contacts with NGOs, volunteers, associations that already work on education and awareness to join the efforts.
- Monitor the results of the awareness efforts, in terms of effectiveness of the message reaching the target audience.
- In order to be effective, ensure the continuity of the awareness actions.

## 9. HOW TO MANAGE INTERACTIONS BETWEEN MARITIME ACTIVITIES AND CETACEANS?

*Tilen Genov, Morigenos - Slovenian Marine Mammal Society (Piran - Slovenia)*

*The principal human activities that can negatively interact with cetacean conservation are discussed in this section, giving also suggestions to managers on potential solutions. As cases can vary greatly, some references are given in order to investigate the issue more in depth.*

### 9.1 INTRODUCTION

Interactions between cetaceans and maritime activities of humans are numerous and diverse. The same is true within MPAs, in which a range of human activities are often permitted. Managing such interactions is probably the most difficult tasks in cetacean conservation, but also the most important part of it. This is the part that all other activities lead to.

Every area is different and interactions between humans and cetaceans vary greatly, both in type and extent of such interactions. It is therefore difficult to provide some general guidelines that would be a panacea to all human-cetacean problems. Still, the following paragraphs provide some very general guidelines on potential solutions. MPA managers are encouraged to seek further information in more specific literature, based on the type of problems they are facing.

### 9.2 MOST COMMON MARITIME ACTIVITIES IMPACTING CETACEANS

As noted above, interactions between cetaceans and maritime activities of humans are numerous and diverse. The type and extent of these interactions will depend on a number of factors such as the size and natural characteristics of the MPA, the regulations within it, level of control and compliance, the types of human activities present, species of cetaceans present, and so forth. In most Mediterranean and Black Sea MPAs however, the activities likely to affect cetaceans are fishing, commercial shipping, recreational boating and tourism, while urbanisation, agriculture and industry are also likely to have an impact.

Probably the most acute impacts are intentional killing, incidental mortality in fishing gear and disturbance (or boat strikes) by boat traffic. These usually have a direct and immediate effect on cetaceans, such as injury, death, stress or displacement. These are the types of human impact that can probably be managed on an MPA level, because we can, at least in theory, adopt management measures that can reduce or eliminate these threats within MPAs. Noise and chemical pollution, as well as prey depletion, are likely to be cause chronic effects and may impact populations over longer term. While it is becoming increasingly evident that these are a serious threat to cetaceans, their population level impacts are difficult to evaluate. These are the types of human impact that are probably not possible to address solely within MPA management, but require a more general, holistic and international approach to ecosystem-based management.

### 9.3 A BRIEF NOTE ON ANTHROPOGENIC MORTALITY, CONSERVATION AND ANIMAL WELFARE

When we wish to evaluate the extent of human impacts on populations, especially those related to direct mortality, we typically need to know at least two things: a) how many animals are being killed and b) how many are there in the population? These two things can tell us how serious the problem is. For example, if 2 dolphins are being killed in fishing nets each year, and the population numbers a total of 20 animals, then this is a serious conservation problem for that population. However, if 2 animals are being killed per year, and the population numbers 200,000 animals, then this may not be a conservation concern. Note that animal conservation and animal welfare are not the same thing, even though both are important issues in their own right. Mortality of 2 animals out of 200,000 likely does not threaten the population, and is thus not a conservation problem. However, it may well be a welfare

problem. While we could argue that from a conservation point of view, 2 animals are 'acceptable', we may also argue that no animal mortality is ethically acceptable, if it can be prevented.

### 9.4 WORKING TOWARDS SOLUTIONS

One thing that is nowadays quite clear is that talking and collaborating are an integral part of any successful conservation. While there are situations when MPA managers can make management decisions on their own, more often they need to involve other stakeholders (fishermen, divers, local community, boat operators, etc.) in the decision-making process. Involving MPA users in the problem solving is likely to increase the chances of success. Stakeholders will also have insights and ideas that are likely to make management measures more efficient. While it is impossible to always keep all the stakeholders satisfied, it is important to make them understand what the problems are and why certain decisions are being taken.

### 9.5 POTENTIAL MEASURES TO MANAGE INTERACTIONS BETWEEN CETACEANS AND MARITIME ACTIVITIES

#### *Intentional killing*

While rarer than in the past, intentional killing of cetaceans still occurs in the Mediterranean and Black Sea. As cetaceans are protected in most Mediterranean and Black Sea countries, killing them is illegal. Proper enforcement should therefore be carried out in MPAs to prevent it. Incidental mortality in fishing gear (bycatch)

As a first step, it is vital to assess the problem. Ideally, we should know how many animals are being killed over a given time frame, how big the population is, what is the population's natural growth rate over the same time frame, and which type of fishing gear appears to be the most hazardous for cetaceans. Next we need to assess what can be done to mitigate the problem. This will depend on a number of factors, for example type of fishing gear. Solutions might take the form of gear modification. Examples of that would be using different types of net filament, which make it less likely for the animal to become entangled, or excluding devices through which the animals can escape if they get caught in trawlers. A solution might also be temporary fishing closure or even year-round no-take zones. A radical (but sometimes necessary) solution is also to completely close the fishery that is causing unsustainable mortality, for example drift nets.

Acoustic deterrent devices and pingers have been used extensively in some areas, both to avoid cetacean bycatch and to prevent depredation (see below). While there is some indication that they work (in some areas and with some species), there is growing evidence indicating they do not. Often, after a brief period of avoidance, cetaceans become habituated to the sounds, which may eventually even attract them to fishing nets, having a so-called 'dinner bell effect'. Last but not least, with our seas already full of noise (see below), caution should be exercised before introducing additional noise into them.



*Left: Interactions between cetaceans and fisheries. Right: Commercial shipping in cetacean habitat. Photos: Tilen Genov, Morigenos*

### Depredation and fishing gear damage

Depredation and fishing gear damage are the other side of the coin in cetacean-fishery conflict. Some species of cetaceans (i.e. common bottlenose dolphins) in some areas occasionally take fish from the nets, causing catch loss or gear damage. In areas where fishing is allowed, this may or may not be a problem. It is important to evaluate the extent of the problem, to determine whether the extent of interactions perceived and reported by fishermen is consistent with the actual situation. Solutions to depredation include gear modifications, time shifts in fishing and acoustic deterrent devices (see above). Where depredation is evidently high enough to cause economic losses, compensation schemes may also be put into place. Cetaceans also interact with aquaculture, but evidence suggests that little or no damage is caused. Instead, cetaceans appear to be attracted to aquaculture structures, which likely concentrate prey around them. On the other hand, nets aimed at keeping cetaceans away from aquaculture have been known to cause cetacean mortality.

### Boat strikes and disturbance

Sometimes the best option to prevent deleterious effects of boat traffic on cetaceans is to enforce 'no boat' zones. These zones should be designated in areas that are known to be important for cetacean feeding, resting or socialising. One potential scenario would be to only allow kayaks and similar small vessels that are not fast or powered by engines. This does not only benefit cetaceans, but other marine fauna as well (fish, for example, are known to respond to sound, while sea turtles are often killed by fast boats).

However, this is not always possible. Another option is to enforce speed restrictions in areas known to be frequented by cetaceans. This makes boats more predictable to the cetaceans, causes less stress and reduces the chances of collisions between cetaceans and boats. Finally, mandatory code of conduct for observing cetaceans should be formulated and widely circulated among boaters. It is important that monitoring of compliance and enforcement of the code are put in place. On top of that, education and awareness on proper conduct and responsible behaviour in the vicinity of cetaceans is of great importance. General guidelines include slowing down or stopping the boat in the vicinity of cetaceans, avoiding the pursuit of cetaceans, keeping a distance, avoiding sudden changes of speed or direction, not attempting to feed or swim with cetaceans, etc. If whale-watching is allowed to take place within the MPA, whale-watching operators should acquire proper training and certification, and comply with the code of conduct. See Chapter 6 on how to develop and manage sustainable whale-watching activities. A few simple rules of proper conduct can dramatically reduce negative impacts of boats on cetaceans.



Left: Boat disturbance can pose a serious threat to cetacean populations.  
Right: Responsible behaviour can dramatically reduce negative impacts of boats on cetaceans.  
Photos: Polona Kotnjek, Morigenos

### Commercial shipping

In some areas, commercial shipping can represent a significant threat to cetaceans. Slow moving species such as fin whales and sperm whales are frequently hit by fast ferries, tankers or cargo ships. For some populations, this represents the main threat to their survival. These collisions can be prevented with a number of measures. Speed reduction in cetacean hot spots can drastically reduce the number of fatal ship strikes, while on-board observers and real-time reporting systems (such as REPCET) provide additional means for preventing such events. In some cases, shipping lanes and traffic separation schemes can even be moved, in order to avoid important cetacean habitat and/or migration routes (this was successfully implemented in Spanish Mediterranean waters).

### Prey depletion

In some areas, it has been demonstrated that overfishing or destructive fishing can have devastating consequences on marine ecosystems, including cetaceans. No-take MPAs (or no-take zones within MPAs) can be very beneficial for the fish biomass, the entire ecosystem and consequently for cetaceans. The value of no-take zones is covered widely in MPA literature and will not be dealt with here. The bottom line is that such zones can be very important for cetaceans, by providing sustainable food resources and ensuring healthy ecosystems.

### Habitat degradation

General habitat degradation, resulting from mechanical and chemical pollution, dredging, anchoring, trawling, urbanisation and so on, ultimately affects cetaceans as well. Poorer habitat quality decreases the value of that habitat for cetaceans. Therefore, all habitat degradation should be avoided. Chemical pollution

The effects of chemical pollution are a problem not only for cetaceans, but for the entire marine environment. However, being long-lived top predators, cetaceans accumulate high concentrations of toxic substances in their tissues, making them vulnerable to hormonal disruption, immune suppression, reproductive inability, etc. This is usually not something that can be managed on the MPA level, but all measures should be taken to reduce and prevent any additional pollution within MPAs. This includes proper waste water treatment, reduced use of pesticides in agriculture, proper maintenance of boat engines, the use of biodegradable cleaning agents, etc.

### Noise pollution

Noise pollution can be the result of boat and ship traffic (see above), military activities, seismic exploration, construction, etc. Apart from disturbance (see above), noise can cause masking of biologically important sounds or even cause injury and death. Underwater noise is probably one of the most serious threats to cetaceans worldwide, but also one of the most difficult ones to properly address. With respect to MPAs, noise pollution can best be managed through managing the number and/or speed of boats or ships, preventing new construction works, and prohibiting seismic or military sonar activities within MPAs. If any noise-producing activities are to take place, proper Environmental Impact Assessments should be made and mitigation activities enforced.

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## APPENDIX: ANALYSIS ON QUESTIONNAIRE ANSWERS

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*The following section contains the results of a questionnaire sent to the MPA managers in order to investigate on the direct involvement of MPAs in cetacean conservation and related activities.*

Several MPAs already running cetacean conservation activities have been asked to answer a printed form. Ten short questions were intended to measure their level of involvement. Only few MPAs answered to the questionnaire but some general indications can be extrapolated.

Although not involved officially in the management of cetaceans, respondents assure that cetacean conservation is present in their management plan both specifically or under the definition of monitoring and research on endangered species. At the same time the creation and distribution of info materials on cetaceans and on rules of conduct is foreseen. Taking in charge injured and dead cetaceans is also an activity within the management plan.

Some MPAs have budget allocated and dedicated personnel, while others collaborate with external experts from NGOs and/or scientific institutions to develop the activities on cetaceans indicated in the management plan. In this case 1 or 2 MPA staff persons join the external research group.

Budget allocated varies annually from around 1.000 euros to 3-4.000 euros. Some MPAs have a provisional budget for the next 10 years, specifically allocated for management activities on cetaceans including monitoring, awareness, standings, etc. For the others there is a medium term commitment for cetacean conservation but the budget is allocated year by year.

All MPAs have at least partially an idea of the species present in their area. Data on frequency, population size, abundance and distribution are not always available, particularly for the MPAs established more recently. The collaboration with external experts seems to assure more consistent results on scientific monitoring with the use of photo identification methods and boat transects for recognise individuals and estimate absolute abundance and survival. In some case passive acoustic monitoring with hydrophones to record cetacean vocalizations is used.

As far as networks is concerned, the MPAs are normally in contact with local and national organisations for monitoring data but also in case of stranding and / or carcass disposal following national foreseen procedures. Less present is the contact with international organisations that operate in these fields.

Among the MPAs which provided their answers, none is involved in whale watching activities, neither is running eco-volunteering activities on cetaceans. In the majority of the MPAs, awareness activities appear to be at the early stage, although they plan to develop them in the future. Only in a single case public events, training courses and interpretive programmes on cetaceans are organised.



Photos: Saul Ciriaco, Miramare MPA

