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**ACTION PLAN FOR THE  
CONSERVATION AND MANAGEMENT OF WHALES AND THEIR HABITATS  
IN THE SOUTH ATLANTIC REGION**

*(Submitted by the Government of Brazil)*

Summary:

This document, submitted by the government of Brazil\* is related to UNEP/CMS/COP12/Doc.24.2.6.

It contains a complete version of the Action Plan for the conservation and management of Whales and their habitats in the South Atlantic Region.

This version includes literature cited and an annex containing details of each of the Cetacean species of the South Atlantic Area

For reasons of economy these have not been translated and presented in the above COP document.

\*The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CMS Secretariat (or the United Nations Environment Programme) concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. The responsibility for the contents of the document rests exclusively with its author.

## **ACTION PLAN FOR THE PROTECTION AND CONSERVATION OF SOUTH ATLANTIC WHALES**

### **Introduction**

The present Action Plan for the Protection and Conservation of South Atlantic Whales aims at reasserting conservation interests in the light of the growing and highly qualified regional contribution towards research, in addition to the undeniable economic interest of many developing countries in the reinforcement of sustainable non-lethal and non-extractive uses of whales.

Most species of baleen whales have suffered from modern whaling in the 20<sup>th</sup> century when approximately 3,000,000 whales around the world have been killed, among which approximately 71 per cent were hunted in the southern hemisphere. All large whale species were exploited by commercial whaling in the South Atlantic Ocean. Each species suffered different degrees of exploitation and some were severely depleted. Although protected by an international moratorium on whaling, most of the species that inhabit the South Atlantic Ocean remain endangered or vulnerable.

While species are protected by national laws and enforcement measures in the South Atlantic Range States, as well as at their feeding ground in the Southern Ocean Sanctuary, they remain highly vulnerable during their migration through waters beyond national jurisdiction.

The implementation of the Action Plan for the Protection and Conservation of South Atlantic Whales under the auspices of CMS will address the protection during vulnerable phases of the whales' life cycles and of important habitats to improve the conservation status of the whale baleen species to achieve and maintain a favourable conservation status for all whales and their habitats occurring in the region.

This Action Plan aims to be socially, economically and scientifically useful for the peoples of the South Atlantic coastal States, and to contemplate the widest possible array of regional interests.

The purpose of this Action Plan is twofold: 1) to inform CMS members about its goals and actions for the next ten years, and 2) to propose strategies toward the achievement of its goals using the best means available and point out clear performance measures for each proposed action.

This Action Plan is a living document, which will require, for its adequate implementation, to take on board contributions from coastal States experiences, as well as from CMS, its bodies, and other relevant international instruments and organizations. The Plan will also adapt to range States' respective constitutional and legal requirements and management strategies, including through wide consultation with stakeholders, validation and approval by national decision-making processes, taking into account that this Action Plan is not intended to replace or supersede national efforts for cetacean conservation.

The implementation of this Action Plan under the auspices of CMS will provide a global platform for the conservation and sustainable use of whales and their habitats. CMS will bring together Range States and provide the basis for internationally coordinated conservation measures throughout the migratory range.

All the actions presented in this Action Plan will take place in the South Atlantic Ocean enclosed by the following line: starting from the Equator, then generally south following the

eastern coastline of South America and, starting from a point situated at Lat 55°07,3'S Long 066°25,0'W; thence to the point Lat 55°11,0'S Long 066°04,7'W; thence to the point Lat 55°22,9'S Long 065°43,6'W; thence due South to Parallel 56°22,8'S; thence to the point Lat 56°22,8'S Long 067°16,0'W; thence due South, along the Cape Horn Meridian, to 60°S to the point at 40°S; until it reaches the coast of South Africa; thence it follows the coastline of Africa to the west and north until it reaches the Equator; thence due west to the coast of Brazil, closing the perimeter at the starting point.

## Species and stocks assessment

This Action Plan focuses on all great whale species (all baleen whales, including the Pygmy Right Whale, plus the Sperm Whale) that occur in the South Atlantic area. Table 1 presents a list of the covered species with the current available data on their stock distribution, abundance, trends estimates and main known threats.

**Table 1.** List of recorded whale species and stocks, their abundance (with coefficient of variation (CV) or confidence interval (CI)), trends and known threats.

Species	Stock	Abundance (year)	Abundance CV or 95% CI	Trends	Threats
<i>Eubalaena australis</i>	South Western Atlantic	4,030 <sup>1</sup>	Unknown	6.2% year <sup>1</sup>	Vessel collision, fishery entanglement, coastal development, die-offs.
<i>Eubalaena australis</i>	South Central Atlantic	80 <sup>1</sup>	Unknown	Unknown	Unknown
<i>Eubalaena australis</i>	Southern Africa	4,410 <sup>1</sup>	Unknown	6.8% year <sup>1</sup>	Vessel collision, fishery entanglement, coastal development, chemical and noise pollution, oil and gas exploration
<i>Megaptera novaeangliae</i>	Breeding Stock A	6,400 (2005) <sup>2</sup>	0.11 <sup>2</sup>	7.4% year <sup>3</sup>	Vessel collision, fishery entanglement, coastal development, chemical and noise pollution, oil and gas exploration
<i>Megaptera novaeangliae</i>	Breeding Stock B1	6,800 <sup>4</sup>	95% CI: 4,350-10,500 <sup>4</sup>	Unknown	Vessel collision, fishery entanglement, coastal development, chemical and noise pollution, oil and gas exploration
<i>Megaptera novaeangliae</i>	Breeding Stock B2	510 <sup>4</sup>	95% CI: 230-790 <sup>4</sup>	Unknown	Vessel collision, fishery entanglement
<i>Balaenoptera acutorostrata</i>	South Atlantic	Unknown	---	---	Vessel collision, fishery entanglement, coastal development, chemical and noise pollution, oil and gas exploration
<i>Balaenoptera bonaerensis</i>	Areas II and III <sup>1</sup>	Unknown	---	---	Vessel collision, fishery entanglement
<i>Balaenoptera musculus</i>	Areas II and III <sup>1</sup>	Unknown	---	---	Unknown
<i>Balaenoptera physalus</i>	Areas II and III <sup>1</sup>	Unknown	---	---	Unknown

Species	Stock	Abundance (year)	Abundance CV or 95% CI	Trends	Threats
<i>Balaenoptera edeni</i>	South Atlantic	Unknown	---	---	Vessel collision, fishery entanglement
<i>Balaenoptera borealis</i>	Areas II and III <sup>1</sup>	Unknown	---	---	Unknown
<i>Caperea marginata</i>		Unknown	---	---	Unknown
<i>Physeter macrocephalus</i>	Divisions 1 and 2 <sup>5</sup>	Unknown	---	---	Vessel collision, fishery entanglement

<sup>1</sup> IWC - International Whaling Commission (2014). <sup>2</sup> Andriolo et al. (2010). <sup>3</sup> Ward et al. (2011). <sup>4</sup> Barendse et al. (2011). <sup>5</sup> Revision of these regions is recommended as more data becomes available

## **Governance**

### **Coordination of the Action Plan**

Key stakeholders that may be involved in the development, implementation and review of this Action Plan include, but are not limited to, governmental and non-governmental agencies and organizations, in particular those involved with environmental, marine, scientific and regulatory activities.

### **Duration of the Action Plan**

This Action Plan should be reviewed and refined every ten years to account for ecological, oceanographic and other possible changes.

### **ACTION PROGRAMS**

Two Action Programs comprising 11 actions are proposed: *Research and Monitoring Action Plan* and *Education and Outreach Action Plan*.

#### **Outline of the Action Programmes:**

**Goals.** Goals address what is the desired future situation concerning the conservation and management of whale species, with ambitious long-term envisaged outcomes.

**Objectives.** Objectives focus on measurable outcomes for evaluating progress and success in moving towards future desired conditions.

**Strategies.** The strategies section explains how to achieve the objectives. Activities are developed and implemented to achieve the proposed goals and objectives.

**Performance measure.** The performance measure is a direct index of the success or failure of each action. One of the possible next steps would be the development of performance indicators with the support of the Scientific Committee, taking into account, as appropriate, national indicators where they exist.

#### **Implementation of the Action Plan for the Protection and Conservation of South Atlantic Whales**

This Plan is designed to guide the management of threats faced by whales in the South Atlantic Ocean and monitor their recovery for the next ten years. The implementation of this Action Plan will require cooperation and coordination among federal government agencies, as well as private organizations and individuals. Information exchange, sharing facilities and human resources, and the coordination of policies and procedures within an ecosystem context are also features of this Action Plan.

#### **Limitations**

The success of the actions proposed by this Action Plan is closely linked to the availability of budget and logistic/research staff.

### **PERFORMANCE OF THE ACTION PLAN AND PRIORITIZATION OF ACTIONS**

A fundamental aspect of this Action Plan is the requirement of continuous performance evaluations regarding its implementation and development. The progress of this Action Plan should be evaluated in order to assess which aspects need to be improved or given more attention/effort. The assessment of the effectiveness of performance measures for each Action is key to reaching a proper evaluation.

A Performance Evaluation Committee should be created, and performance results will be

presented to the Scientific Council and to the Conference of Parties of the Convention on Conservation on Migratory Species of Wild Animals at regular intervals to be defined. This is important as a means of keeping informed the general public, researchers, and other interested parties on this Action Plan's effectiveness; helping identify resource gaps; improving communication among research sites, stakeholders and the general public; and providing basis for managers to comprehensively evaluate their outcomes in both the short and long term. The measures proposed to evaluate the performance of this Action Plan are linked to field monitoring, and are presented in the table of goals that specifies the actions needed to assess threats and monitor population abundance and trends.

A list of priority actions was defined and is presented in the table of this Action Plan's goals.

## Research and Monitoring Action Plan

The Research and Monitoring Action Plan (REAP) is key to achieve the main goals of this Action Plan concerning (1) assessing and addressing of threats and (2) monitoring of the recovery of whale populations.

### Goal 1. Assess the distribution, status and trends of whale populations.

Action	Species/Stock	Objective	Strategy	Indicator				Priority	Time scale <sup>1</sup>
				Successful	Moderately Successful	Moderately Unsuccessful	Unsuccessful		
A1	All species	Define and refine whale stock identity.	Develop multi-methodological approaches, increase sampling effort and area coverage for stock identity.	Whale stocks identified for all species, with great increase on sampling effort and area coverage.	Whale stocks identified for most of species, with moderate increase on sampling effort and area coverage.	Whale stocks identified for some species, with some increase on sampling effort and area coverage.	Whale stocks identified for few species, with poor sampling effort and area coverage.	High	Long term
A2	All species/stocks	Determine habitat use patterns and critical areas.	Develop multi-methodological approaches, increase sampling effort and area coverage for habitat use and critical areas identification.	Critical areas and habitat use identified for all species, with great increase on sampling effort and area coverage.	Critical areas and habitat use identified for most of species, with moderate increase on sampling effort and area coverage.	Critical areas and habitat use identified for some species, with some increase on sampling effort and area coverage.	Critical areas and habitat use identified for few species, with poor increase on sampling effort and area coverage.	Low	Medium term

Action	Species/Stock	Objective	Strategy	Indicator				Priority	Time scale <sup>1</sup>
				Successful	Moderately Successful	Moderately Unsuccessful	Unsuccessful		
A3	All species/stocks	Produce abundance estimates and trend estimates	<p>Conduct comprehensive field surveys for abundance estimation.</p> <p>Conduct long-term studies to detect temporal trends of whale populations.</p>	<p>Abundance estimates for all species/stocks</p> <p>Trends estimated for all species/stocks</p>	<p>Abundance estimates for most of species/stocks</p> <p>Trends estimated for most of species/stocks</p>	<p>Abundance estimates for some species/stocks</p> <p>Trends estimated for some species/stocks</p>	<p>Abundance estimates for few species/stocks</p> <p>Trends estimated for few species/stocks</p>	High	Long term

<sup>1</sup>Time scale (short term = 2 years, medium term = 5 years, long term = 10 years)

**Goal 2. Maintain or increase current whale populations**

Action	Species/Stock	Objective	Strategy	Indicator				Priority	Time scale <sup>1</sup>
				Successful	Moderately Successful	Moderately Unsuccessful	Unsuccessful		
A4	All species/stocks	Zero deliberate whale catches	<p>a) Maintain the existing international legal protection and measures for whales.</p> <p>b) Report on infractions to zero whale catches.</p>	No deliberate whale catch reported, international legal protection and management measures maintained or increased.	Few deliberate whale catch reported, international legal protection and management measures maintained.	Some deliberate whale catch reported, international legal protection and management measures maintained or decreased.	High deliberate whale catch reported, international legal protection and management measures decreased.	High	Medium term
A5	All species/stocks	Reduce mortality due to entanglements in fishing gear.	<p>a) Evaluate the degree of overlapping between fisheries and distribution of whale populations.</p> <p>b) Promote cooperation with fishermen, the fishing industry and other stakeholders in order to minimize entanglements.</p> <p>c) Develop or implement National Action Plans to mitigate entanglements.</p> <p>d) Promote capacity building.</p>	Pronounced negative trend rates of whales reported dead due to entanglements.	Moderately Negative trend rates of whales reported dead due to entanglements.	Moderately positive trend rates of whales reported dead due to entanglements.	Pronounced positive trend rates of whales reported dead due to entanglements.	High	Medium term

A6	All species/stocks	<p>Reduce whale-vessel collision rates in breeding grounds.</p> <p>abundance estimates and trend estimates.</p>	<p>a) Initiate a broad and long-term program to evaluate the degree of overlapping between vessel routes and distribution of whales populations.</p> <p>b) Estimate rates of whale-vessel strikes and identify areas of higher risk.</p> <p>c) Incorporate information about areas of risk on international nautical charts.</p> <p>d) Evaluate and propose mitigation actions (e.g. lower vessel speed, changing, vessel routes) if appropriate.</p> <p>e) Contribute data to the IWC (International Whaling Commission) vessel-strike database.</p>	Pronounced negative trend in estimated rates of whale-vessel strikes.	Moderately Negative trend in estimated rates of whale-vessel strikes.	Moderately positive trend in estimated rates of whale-vessel strikes.	Pronounced positive trend in estimated rates of whale-vessel strikes.	Low	Medium term
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<sup>1</sup>Time scale (short-term = 2 years, medium-term = 5 years, long-term = 10 years)

**Goal 3. Foster coordinated research in the region.**

Action	Species/Stock	Objective	Strategy	Indicator				Priority	Time scale <sup>1</sup>
				Successful	Moderately Successful	Moderately Unsuccessful	Unsuccessful		
A7	All species/stocks	Coordinate whale research in the South Atlantic Ocean	a) Organize periodic workshops for the coordination of whale research in the South Atlantic Ocean.	Relevant research cooperation projects planned and developed.	Some research cooperation projects planned and developed.	Few research cooperation projects planned and developed.	No research cooperation projects planned and developed.	High	Medium term
			b) Standardize research methodologies and promote capacity building. c) Establish a communication network of research institutions.	Relevant number of researchers trained.	Reasonable number of researchers trained	Low number of researchers trained.	No researchers trained	High	Medium term

Action	Species/Stock	Objective	Strategy	Indicator				Priority	Time scale <sup>1</sup>
				Successful	Moderately Successful	Moderately Unsuccessful	Unsuccessful		
A8	All species/stocks	Promote data sharing.	a) Create unified databases. b) Integrate information with other existing programs and databases (e.g. IWC Southern Ocean Research Program (SORP)), IWC photo identification catalogs and ship strikes database, Global Biodiversity Information Facility (GBIF)).	Relevant shared databases planned and developed.	Some shared databases planned and developed.	Few shared databases planned and developed.	No shared databases planned and developed.	Low	Medium term

<sup>1</sup>Time scale (short term = 2 years, medium term = 5 years, long term = 10 years)

## Education and Outreach Action Plan

The Education and Outreach Action Plan (EOAP) is key to increase the development of the sustainable use of whales and to disseminate the information gathered for local, national and international communities.

### Goal 4. Raise awareness and engagement.

Action	Species/Stock	Objective	Strategy	Indicator				Priority	Time scale <sup>1</sup>
				Successful	Moderately Successful	Moderately Unsuccessful	Unsuccessful		
A9	All species/stocks	Increase awareness about South Atlantic Whale Conservation.	<p>a) Disseminate and share information about this Action Plan (e.g. social media, press releases).</p> <p>b) Develop a webpage within the CMS portal to spotlight the initiatives and results of this Action Plan's actions.</p>	High number of reports, conferences, press release, and media campaigns, etc. Internet metrics on this Action Plan's webpage.	Moderate number of reports, conferences, press release, and media campaigns, etc. Internet metrics on this Action Plan's webpage.	Few number of reports, conferences, press release, and media campaigns, etc. Internet metrics on this Action Plan's webpage.	No relevant reports, conferences, press release, and media campaigns, etc. Internet metrics on this Action Plan's webpage.	High	Medium term

<sup>1</sup>Time scale (short-term = 2 years, medium-term = 5 years, long-term = 10 years)

**Goal 5. Develop sustainable, non-extractive and non-lethal economic and educational use of whales.**

Action	Species/ Stock	Objective	Strategy	Indicator				Priority	Time scale <sup>1</sup>
				Successful	Moderately Successful	Moderately Unsuccessful	Unsuccessful		
A10	All species/stocks	Maintain and improve the quality of existing whale watching activities.	<p>a) Develop international workshop on responsible whale watching considering best practices.</p> <p>b) Stimulate further research to evaluate the status of whale watching procedures in the range countries.</p> <p>c) Stimulate the implementation of IWC's Strategic Plan on Whale Watching.</p>	Strategic Plan on Whale Watching planned and implemented in most countries in the South Atlantic region based on IWC'S Handbook on Whale Watching as a guideline and considering research information.	Strategic Plan on Whale Watching planned and implemented in some countries in the South Atlantic region based on IWC's Handbook on Whale Watching as a guideline and considering research information.	Strategic Plan on Whale Watching planned and implemented in few countries in the South Atlantic region based on IWC's Handbook on Whale Watching as a guideline and considering research information.	No Strategic Plan on Whale Watching planned and implemented in countries in the South Atlantic region based on IWC's Handbook on Whale Watching as a guideline and considering research information.	High	Medium-term

Action	Species/ Stock	Objective	Strategy	Indicator				Priority	Time scale <sup>1</sup>
				Successful	Moderately Successful	Moderately Unsuccessful	Unsuccessful		
A11	All species/stocks	Contribute to the education of the general public about whales and their ecosystems in the South Atlantic Ocean	Identify opportunities in educational policies to include information about this Action Plan.  Produce content for educational activities.	Educational policies and activities developed in most countries in the region of the South Atlantic Ocean.	Educational policies and activities developed in some countries in the region of the South Atlantic Ocean.	Educational policies and activities developed in a few countries in the region of the South Atlantic Ocean.	No Educational policies and activities developed in countries in the region of the South Atlantic Ocean.	Low	Medium - term

<sup>1</sup>Time scale (short term = 2 years, medium term = 5 years, long term = 10 years)

## GOALS AND ACTIONS

In this section the Action Plan's goals, actions, strategies and performance measures are contextualized. The methodology suggested to achieve the objectives is not extensively detailed and should be investigated in the referenced literature, as well as in the vast published bibliography.

### **Goal 1. Assess the distribution, status and trends of whale populations.**

The distribution, abundance and stock structure of baleen whales and the sperm whale in the South Atlantic are poorly understood. This lack of information has serious management implications since resource managers require reliable data on stock structure and abundance, along with knowledge of the distribution patterns of the species to be managed. With the exception of the southern right whale and the humpback whale, which have been studied for a longer time in the South Atlantic area (e.g. Payne, 1983; Best, 1981; Findlay et al., 1994; Martins et al., 2001; Zerbini et al., 2006) and consequently have the best baseline information on some of these parameters, most species still need systematic research to establish a baseline.

This first Goal proposes four Actions to assess the distribution, status and trends of whale populations in the South Atlantic Ocean.

#### **Action 1. Define and refine whale stock identity**

The selection of the appropriate management unit is critical to the conservation of animal populations (Clapham et al., 2008). The understanding of the stock structure is fundamental in assessing the effects of previous exploitation and in making management decisions. Stocks have been regarded as population units that can be managed effectively (Donovan, 1991) and are referred to groups of individuals of the same species that are demographically, but not necessarily genetically, isolated (Taylor, 2005; Clapham et al., 2008).

Stock structure can be assessed using different tools, such as genetics, tagging, photo-identification, acoustics, differences in parasites and contaminant loads, or morphological and demographic data (e.g. Dizon et al., 1992; Gorbics and Bodkin, 2001). A multidisciplinary approach to assess stock structure has been recommended by a number of authors (Donovan, 1991; Clapham et al., 2008) because it increases the power to detect differences of importance to management.

Action A1 aims at defining the stock identity of whales in the South Atlantic area, as well as to refine the existing information on humpback and southern right whales.

#### **Strategy**

Develop multi-methodological approaches, increase sampling effort and area coverage for stock identity.

A multi-methodological approach for assessing whale stock identity and also refine the current knowledge on the subject comprises the concomitant application of several methodologies, including (1) genetics, (2) isotopes, (3) contaminant load, (4) acoustics, (5) satellite tagging, (6) photo-identification, (7) parasite load and (8) morphology and demography (e.g. Dizon et al., 1992; Zerbini et al., 2006; Delarue et al., 2008; Vighi et al., 2014).

In order to increase the sampling effort and area coverage for stock identity, dedicated vessel survey programs must be created, mainly in areas less studied such as in offshore regions of the South Atlantic. This platform of observation is especially useful for sampling tissue through biopsies and carrying out the studies 1, 2, 3, 4, 5 and 6. The development of studies 7 and 8 depends on the sampling of carcasses and consulting of scientific collections.

## **Performance measure**

Action A1 will be considered fully successful if all whale species have their stocks satisfactorily identified, with great increase on sampling effort area coverage in the South Atlantic Ocean during the Action Plan's period.

### **Action 2. Determine habitat use patterns and critical areas**

The understanding of the distribution and habitat use of a species is required for many aspects of conservation planning and resource management. It has been demonstrated that environmental heterogeneity influences marine mammal habitat use, with the presence of distinct core areas within individuals' home-ranges (e.g. Ingram and Rogan, 2002; Whitehead and Rendell, 2004).

In order to make recommendations regarding habitat management, it is of paramount importance to have a comprehensive understanding about the habitat use of the species. In this sense, identifying critical areas within the whale species' range and recognizing their critical habitats are central components of THIS Action Plan.

Action A2 aims at determining the habitat use patterns and critical areas for the whale species in this Action Plan.

## **Strategy**

A multi-methodological approach to determine habitat use and critical areas should include dedicated vessel and aerial surveys, applying traditional detection and analytical methods as well as new technologies. The development and application of acoustic detection methods (Mellinger and Barlow, 2003; Wade et al., 2006) in large scales is highly recommended to achieve the objectives of this Action Plan, especially in regard to the most elusive and low density species. Habitat use at an individual level can be assessed through photo-identification and tagging studies, in order to examine the ranging patterns of individual animals. Sampling effort and area covered in the surveys must be increased in relation to previous studies.

## **Performance measure**

Action A2 will be considered fully successful if all whale species have critical areas determined with great increase on sampling effort and area coverage in the South Atlantic Ocean during the Action Plan's period.

### **Action 3. Produce abundance estimates and trends**

Knowledge of population size plays a crucial role in wildlife conservation and management. Population abundance is fundamental in evaluating management strategies and it is required as a means to assess population trends. Trends in population abundance are used to monitor species affected by human activities. It is an important component of population management (Forney, 2000). In the context of the South Atlantic Ocean, producing trends estimates of the whales' populations is key to the understanding whether the species are recovering, and what is its pace.

In this sense, this Action Plan stimulates systematic research in order to produce abundance estimates for whales and compute population trends for the whale species in the South Atlantic area.

## **Strategy**

Comprehensive field surveys for abundance estimation must be conducted. Abundance may be estimated through traditional methods such as surveys applying distance sampling (e.g.

Buckland *et al.* 2001) and through capture-recapture methodologies using the recording of individuals' unique characteristics (e.g. Katona and Whitehead, 1981; Payne *et al.*, 1983), as well as through the application of new alternative approaches.

Distance sampling methods may be applied by vessel or aerial surveys. Aerial surveys cover more area in much less time, but need to be corrected for visibility biases (Marsh and Sinclair, 1989). In order to improve corrections for such biases, it is recommended the inclusion of new technologies such as satellite tagging with time-diving recorders (Heide-Jorgesen *et al.*, 2007), the combination of two simultaneous observation platforms (Zerbini *et al.*, 2011), among others.

Long-term studies should be conducted to detect temporal trends of the whale populations. The most direct method to assess population trends is through the temporal analysis of abundance estimates. Nevertheless, absolute population abundance estimates may be only feasible for coastal species with well-defined stocks breeding grounds, such as the Humpback Whales and Southern Right Whales in the South Atlantic area. Consequently, it is recommended the application of alternative indexes of population size, a statistic assumed to be correlated to actual population size (Bowen and Siniff, 1999) for the remainder whale species. Temporal variation in sighting rates and acoustic detection rates collected in systematic and carefully designed long-term surveys may be applied as alternative indexes to produce trends.

### **Performance measure**

Action A3 will be considered fully successful if abundance and trend estimates are produced for all whales in the South Atlantic Ocean during the Action Plan's period.

## **Goal 2. Maintain or increase current whale population sizes.**

One of the main objectives of this Action Plan is to maintain or increase current whale stocks levels by mitigating known threats to whale stocks. Several anthropogenic factors are known to affect the conservation of whale stocks worldwide. Present and potential threats to whale stocks and their habitats in the South Atlantic Ocean include contaminants, acoustic and noise pollution, hydrocarbon exploration and exploitation, interaction with fisheries, collision with ships, climate change and die-offs. However, in the South Atlantic area, two threats in particular are considered to be more dangerous: entanglements in fishing gear (nets or ropes) and collision with ships.

The second Goal of this Action Plan proposes three Actions aiming at maintaining or increasing current whale stock sizes in the South Atlantic Ocean: ensure zero deliberate whale catches, reduce mortality by fishery and reduce whale-vessel collision rates.

### **Action 4. Zero deliberate whale catches in the South Atlantic area**

The South Atlantic area must be regarded as a non-take zone for stocks of all whales. No animal could be deliberately caught for commercial, scientific or aboriginal subsistence purposes.

### **Strategy**

In order to guarantee the South Atlantic area as a non-take zone for whales, it is essential to maintain the existing international legal protection and management measures for whales. Any infraction to the zero whale catches must be reported.

### **Performance measure**

Action A4 will be considered fully successful if no whale catch is reported in the South Atlantic area.

### **Action 5. Reduce mortality due to entanglements in fishing gear**

Entanglement in commercial fishing gear is one of the main causes of serious injury and mortality in large whales (Knowlton and Kraus, 2001; Robbins and Mattila 2004, Johnson *et al.* 2005). Since the interaction with the fisheries may potentially compromise the recovery of whales' stocks it is important to develop management strategies aimed to prevent this. Action 6 aims to evaluate, monitor and reduce the magnitude of this anthropogenic impact on whales' stocks in the South Atlantic Ocean.

#### **Strategy**

In order to reduce mortality due to entanglements in fishing gear it is necessary to evaluate the degree of overlapping between different types of fisheries and the distribution of whale populations. This should integrate data on spatial distribution and density of whale stocks, historical or achieved by Actions 2 and 3, with data on distribution and density of the fishery effort. Spatial analysis methods should be applied in order to identify higher risk areas.

It is also recommended to promote cooperation with fishermen, the fishing industry and other stakeholders in order to minimize entanglements. In some regions, cooperation with the fishermen may be the only way to achieve data on distribution of the fishery effort and entanglement rates. After the risk areas and fisheries in the South Atlantic Ocean are identified, cooperation with all stakeholders is required in order to achieve the reduction of entanglements.

It is important to recognize that similar actions have already been recommended regionally in National Action Plans. In this manner, the implementation of these Plans should be reinforced where they are available and new ones should be developed elsewhere.

The participation of marine mammal experts in national forums on fishery management is advised in order to discuss specific management questions, such as the proposition of non-fishery zones, restrictions in fishing gear and the reduction of lost or abandoned fishing gear in the sea. In this context, it is worth noting that the Marine and Coastal Protected Areas (GEF MAR) Project has been created to support the creation and implementation of a marine and coastal protected areas (MCPAs) system in Brazil to reduce the loss of biodiversity.

Finally, promoting capacity building in all countries in the South Atlantic area is recommended.

#### **Performance measure**

Action 5 will be considered successful if the indexes of whales killed due to entanglements show negative trends during the Action Plan's period. Entanglement indexes are difficult to achieve and should, if possible, be collected through a cooperation system with fishermen and the fishing industry, including log-books and on-board observers. As an alternative, stranding data may be applied in combination with other entanglement indexes.

### **Action 6. Reduce whale-vessel collision rates in breeding grounds.**

Vessel-whale collisions are of growing concern worldwide (Ritter, 2012). It is not known how many whales are affected annually by vessel collisions, although it is widely accepted that numbers are underestimated and likely increasing (IWC, 2008). Vulnerability to vessel strikes varies among species, but most interactions are with right, fin, humpback and sperm whales (Van Waerebeek *et al.*, 2007; Van Waerebeek and Leaper, 2008). Depending on the size of the whale stock and the rate of collision, this can be a concerning factor in the recovery of some species. Action 6 aims to evaluate, monitor and reduce the magnitude of this anthropogenic impact on whales' stocks in the South Atlantic Ocean.

## Strategy

A broad and long-term programme to evaluate the degree of overlapping between vessel routes and the distribution of whale populations should be initiated. This should integrate data on spatial distribution and density of whale stocks, historical or achieved by Action 2 and 3, with data on distribution and density of the vessel routes. The probability of whale-vessel strikes in an area may be modelled based on vessel size and speed, route lengths, stock density and the surfacing behaviour of whales (Bezamat et al., 2015). Rates of whale-vessel strikes may be also estimated through photography marks in breeding grounds where a systematic research effort has been conducted. Marks verified in stranded animals may also be an alternative approach to estimate collision rate.

As a management action, the information about areas of risk should be incorporated on international nautical charts in order to minimize the probability of whale-vessel strikes. If appropriate, mitigation actions such as lower vessel speed and changing vessel routes should be evaluated and proposed.

Finally, this Action must contribute with data to the IWC vessel-strike database and other relevant assessments. In this sense, every case should be informed to the IWC ship strikes database (<http://www.iwcoffice.org>).

## Performance measure

Action 6 will be considered successful if the indexes of collision rates show negative trends during the Action Plan's period.

## Goal 3. Foster coordinated research in the region.

### Action 7. Coordinate research on whales in the South Atlantic Ocean

The central spirit of this Action Plan is the cooperation and collaboration among nations and researchers towards the conservation and management of whales in the region. The coordination of the whale research in the South Atlantic area is considerably beneficial to the achievement of several objectives of this Action Plan and may be done in several ways. Action 8 proposes strategies to stimulate the coordinated research in the South Atlantic area.

## Strategy

Workshops for the coordination of research on whales in the South Atlantic Ocean should be organized periodically during the Action Plan's period. The meetings' main objectives shall be to elaborate a standardized research protocol among nations, establish a network of research institutions and continuing evaluate the performance of the Action Plan.

The standardization of research methodologies is of paramount importance to the achievement of this Action Plan's objectives. Several actions of this Action Plan depend upon solid collaborative research, especially those in Goals 1 and 2. Standardization of methodologies allows researchers of different geographical areas to compare and integrate their data more properly. An effort to elaborate a detailed protocol of methods should initiate in the first workshop relating to this Action Plan.

Building local human capacity through training and collaborations is also a strategy to be followed. The training of researchers is considered an important component of this Action Plan, in order to improve and maximize research expertise. Training may take place during collaborative field surveys and laboratory research, as well as during the aforementioned workshops. In this context, research cooperation projects are highly recommended.

Finally, to establish a communication network of research institutions is recommended.

## **Performance measure**

The success of this Action will be measured by (1) the number of research cooperation projects and (2) the number of researchers trained. Since the goal is to maximize both the number of cooperation projects and the number of researchers trained, there is no specific metric to be achieved for both indexes. It is expected that both indexes increase their numbers during the Action Plan's period. This must be a continuous strategy during the lifetime of the Action Plan.

### **Action 8. Promote data sharing**

Data sharing is fundamental to a rapid transformation of research results into knowledge and procedures to improve the conservation status of whales' stocks. Data sharing among researchers is a central component to the success for the research coordination in the South Atlantic area. Making data available to other investigators is essential to put South Atlantic researchers on the same page, improve the quality of the data interpretations, accelerate the achievements of results and facilitate data-driven management and conservation decisions. In order to increase the success probability of the Actions from Goals 1 and 2, Action 8 aims to promote data sharing among South Atlantic scientists.

#### **Strategy**

To encourage data sharing, the creation of unified databases to store collected and analyzed research data is advised. Online unified databases should include research guidelines and protocols, taxonomic and distribution maps, and biological and ecological datasets. Those datasets should be continuously updated during this Action Plan's lifetime. Intellectual property policies should be established.

Besides that, information collected and generated during this Action Plan's lifetime should be integrated with other existing programs and databases, such as the IWC SORP (International Whaling Commission's Southern Ocean Research Partnership), IWC photo-identification catalogues and ship strike database, and the Global Biodiversity Information Facility.

## **Performance measure**

The success of this Action will be measured by the number of records shared among databases. There is no specific metric to be achieved, although it is expected that this index presents an increasing trend during this Action Plan's period. This must be a continuous strategy during the lifetime of this Action Plan.

### **Goal 4. Raise awareness and engagement.**

#### **Action 9. Increase awareness about the Action Plan**

Support from the population is essential to ensure that governments ratify and give long-term support for this Action Plan. People will only demand action from governments to support this Action Plan if they are aware of the Action Plan's goals and implementation. Therefore, increasing awareness is an essential step in order to achieve this Action Plan's goals.

**Strategy:** Disseminate and share information about this Action Plan (e.g. social media, press releases).

Even though other actions will raise important scientific information about whale species and stocks in the South Atlantic Ocean, in order to increase awareness in the general population scientific information must be translated to non-scientific terms and disseminated in other fora.

Nowadays social networks have the potential to disseminate information much faster than other traditional ways, such as books and reports.

However, even though they have a smaller audience, traditional news outlets must also be a target when disseminating information about this Action Plan. Press releases must also be produced and sent to news agencies, in order to increase the number of information nodes available.

**Performance measure:** Number of reports, conferences, press release, and media campaigns, etc.

Since the goal is to share information about this Action Plan, there is no specific metric to be achieved. This must be a continuous strategy during the lifetime of this Action Plan.

**Strategy:** Develop a webpage within the CMS portal to spotlight the initiatives and results of this Action Plan's actions.

Even though social media is important to disseminate information, a stable node must be created in the internet to hold information permanently available about the Action Plan. As it is an CMS initiative, the most logical place to hold this node is the CMS website.

The webpages dedicated to the Action Plan will contain links to reports, scientific articles, infographics, and any other media produced. These can be used as anchor points for information disseminated through other channels.

**Performance measure:** Internet metrics on the Action Plan's webpage.

Since the goal is to share information about the Action Plan, there is no specific metric to be reached. Changes in accesses to the webpage over time can be used to gauge the effectiveness of information released in different news channels.

## **Goal 5. Develop sustainable, non-extractive and non-lethal economic and educational use of whales.**

### **Action 10. Maintain and improve the quality of existing whale watching activities**

Whale watching is a significant and growing tourism industry worldwide (Hoyt and Hvenegaard, 2002) and is defined by the IWC as: 'any commercial enterprise which provides for the public to see cetaceans in their natural habitat' (IWC, 1994). It has been recognized as "...contributing largely to the economy, education and to the furthering of scientific knowledge of a number of countries..." (IWC, 1993). Moreover, whale watching tourism is frequently presented as the economic and moral antithesis of whaling (Evans, 2005).

However, exposing animals in their natural environment to millions of tourists may present risks. The potential impact of whale watching on the animals has been studied for decades and several effects have been detected (e.g. Corkeron, 2004). It is crucial to ensure that the economic and conservation value of whale-watching does not cause excessive stress to individual whales or their stocks (Williams et al., 2002). In this sense, Action 10 proposes strategies in order to maintain and improve the quality of existing whale watching activities in the South Atlantic countries.

#### **Strategy**

The development of international workshops on responsible whale watching considering best practices is highly recommended by the countries in the South Atlantic area. Those meetings would be important to systematically evaluate the status and development of this activity in different regions of the South Atlantic Ocean. It would also be a forum for knowledge and experience exchange on this activity, which is fundamental to the improvement of its quality.

The status of whale watching procedures in the South Atlantic countries should be continuously evaluated by long term research. Concerns have been expressed regarding concentration of whale watching vessel (or aircraft) traffic, which may negatively affect the whales.

Consequently, this Action Plan stimulates research on the short and long-term effects of the presence of tourism platforms on the behaviour, habitat use and distribution patterns of whales (e.g. Lusseau, 2003, 2004; Bain et al., 2006).

Finally, the implementation of IWC's Strategic Plan on Whale Watching is stimulated.

### **Performance measure**

The performance of Action 10 will be measured by the number of Strategic Plan on Whale Watching planned and implemented in countries in the region of the South Atlantic Ocean based on IWC's Handbook on Whale Watching as a guideline and considering research information. Another index of the Action's performance is the number of scientific papers published evaluating whale watching status in the South Atlantic countries. At least one comprehensive assessment is expected to be published in each country where whale watching occurs during this Action Plan's lifetime.

### **Action 11. Contribute to the education of the general public about whales and their ecosystems in the South Atlantic area**

Contributing to spread knowledge throughout all sectors of society is an important role of scientists and educators. This Action Plan's goals will be fully achieved in a broader context if the comprehension about its relevance to the conservation of whales and their ecosystems is not restricted to governmental, academic and environmentalist circles. In this manner, the creation of this Action Plan is a unique opportunity to increase the knowledge on marine mammal conservation and management among the general public. Action 11 aims to propose strategies to better achieve this objective.

### **Strategy**

The first step in Action 11 is to identify opportunities in educational policies towards including information about this Action Plan. In this sense, official national educational programs for undergraduate and graduate students should be consulted and, if appropriate, a collaborative network among researchers and educators should be initiated in order to include the subject in those programs.

As a means to maximize the outreach of information, it is recommended that appropriate content be offered for educational activities. Information must be diversified in content and format (press, video and digital formats) in order to reach people of different ages and educational levels, as well as to account for the heterogeneity of culture and logistics among the educational systems in the South Atlantic countries.

### **Performance measure**

The performance of Action 11 will be measured by the number of educational policies and activities developed in countries in the region of the South Atlantic Ocean. There is no specific metric to be achieved. However, it is expected that all South Atlantic countries initiate educational programs to disseminate information about the Action Plan.

## ANNEX 1

## LITERATURE CITED

- Andriolo, A., C.C.A. Martins, M.H. Engel, J.L. Pizzorno, S. Mas-Rosa, A.C. Freitas, M.E. Morete and P.G. Kinas (2006). The first aerial survey to estimate abundance of humpback whales (*Megaptera novaeangliae*) in the breeding ground off Brazil (Breeding Stock A). J. CETACEAN RES. MANAGE. 8(3):307-311.
- Andriolo, A., P.G. Kinas, Engel, M.H., C.C.A. Martins, A.M. Rufino, AM. (2010). Humpback whales within the Brazilian breeding ground: distribution and population size estimate. ENDANG. SPECIES RES. 11.: 233-243.
- Bain, D.E., R. Williams, J.C. Smith and D. Lusseau. (2006). Effects of vessels on behavior of southern resident killer whales (*Orcinus* spp.) 2003-2005. NMFS Contract Report No. AB133F-05-SE-3965. 66pp.
- Barendse J., Best P.B., Thornton M., *et al.* (2011). Transit station or destination? Attendance patterns, movements and abundance estimate of humpback whales off west South Africa from photographic and genotypic matching. AFR. J. MAR. SCI. 33: 353-373.
- Best, P.B. (1981). The status of right whales (*Eubalaena glacialis*) off South Africa, 1969-1979. SOUTH AFR. SEA FIS. RES. INST. INVEST. REPORT 123. 43 pgs.
- Best, P. B. and H. A. Scott. (1993). The distribution, seasonality and trends in abundance of southern right whales *Eubalaena australis* off De Hoop Nature Reserve, South Africa. SOUTH AFR. J. MARINE SCI. 13:175-186.
- Bezamat et al., (2015). Potential ship strikes and density of humpback whales in the Abrolhos Bank breeding ground, Brazil. AQUATIC CONSERV: MAR. FRESHW. ECOSYST.
- Borchers, D. L., S.T. Buckland and W. Zucchini. (2002). Estimating animal abundance. Closed populations. Springer-Verlag, London, U.K.
- Bowen, W.D. and D.B. Siniff. (1999). Distribution, population biology, and feeding ecology of marine mammals. In: Biology of Marine Mammals. John E. Reynolds, III and Sentiel A. Rommel (eds.). Smithsonian Institution Press, Washington. p.423- 484.
- Buckland S.T., D.R. Anderson, K.P. Burnham, J.L. Laake, D.L. Borchers, and L. Thomas (2001). Introduction to Distance Sampling: Estimating Abundance of Wildlife Populations. Oxford University Press, New York.
- Clapham, P. J., Aguilar, A., and Hatch, L. T. (2008). Determining spatial and temporal scales for management: Lessons from whaling. MAR. MAMMAL SCI. 24: 183–201.
- Corkeron, P. (2004). Whale watching, iconography, and marine conservation. CONSERV. BIOL. 18: 847–849.
- Delarue, J., S.K. Todd, S.M. Van Parijs and L. Di Lorio. (2009). Geographic variation in northwest Atlantic fin whale (*Balaenoptera physalus*) song: Implications for stock structure assessment. J. ACOUS. SOC. AM. 125(3):1774-1782.
- Donovan, G. P. (1991). A review of IWC stock boundaries. REP. INT. WHAL. COMM. 13, 39–68.
- Dizon, A. E., Lockyer, C., Perrin, W. F., Demaster, D. P., and Sisson, J. (1992). Rethinking the stock concept: A phylogeographic approach. CONSERV. BIOL. 6, 24–36.
- Dufault, S.; H. Whitehead and M. Dillon. (1999). An examination of the current knowledge on the stock structure of sperm whales (*Physeter macrocephalus*) worldwide. J. CETACEAN RES. MANAGE. 1(1):1-10.
- Evans, M. (2005). Whale-watching and the compromise of Tongan interests through tourism. 1st International Small Island Cultures Conference. p.49-54. Kagoshima University Centre for the Pacific Islands, February 7-10, 2006.
- Findlay, K. P.; P. B. Best; V. M. Peddemors and D. Gove. (1994). The distribution and abundance of humpback whales on their southern and central Mozambique winter grounds. (*Megaptera novaeangliae*). REP. INT. WHAL. COMM. 44:311-320.
- Freitas, A.C.; P.G. Kinas; C.C.A. Martins and M.H. Engel. (2004). Abundance of humpback whales on the Abrolhos Bank wintering ground, Brazil. J. CETACEAN RES. MANAGE. 6(3):225-230.
- Forney, K.A. (2000). Environmental models of cetacean abundance: Reducing uncertainty in population trends. CONSERV. BIOL. 14(5):1271-1286.
- Gorbics, C. S., and J.L. Bodkin (2001). Stock structure of sea otters (*Enhydra lutris kenyoni*) in Alaska, MAR. MAMMAL SCI. 17, 632–647.
- Groch, K.R., J.T. Palazzo, P.A.C. Flores, F.R. Adler and M.E. Fabian. (2005). Recent rapid increases in the right whale (*Eubalaena australis*) population off southern Brazil. LAJAM. 4: 41-47.
- Heide-Jorgensen, Mads Peter; Kristin Laidre; David Borchers; Filipa Samarra and Harry Stern. (2007). Increasing abundance of bowhead whales in West Greenland. BIOL. LETTERS 3(5): 577-580.
- Hoyt, E. and G.T. Hevnegaard. (2002). A review of whale-watching and whaling with applications for the Caribbean. COASTAL MANAGE. 30(4): 381-399.

- Ingram, S.N. and E. Rogan. (2002). Identifying critical areas and habitat preferences of bottlenose dolphins *Tursiops truncatus*. MAR. ECOL. PROG. SERIES. 244:247- 255.
- International Whaling Commission. (1993). Report of the Scientific Committee. REP. INT. WHAL. COMM. 43: 30-45.
- International Whaling Commission. (1994). Chairman's report of the forty-fifth annual meeting. Appendix 9. IWC Resolution on whale-watching. REP. INT. WHAL. COMM. 44, 33-4.
- International Whaling Commission. (2008). Third Progress Report to the Conservation Committee of the Ship Strike Working Group. Paper IWC/60/CC3 presented to the IWC Conservation Committee, Santiago, Chile, June 2008 (unpublished). 15pp.
- International Whaling Commission. (2008). Third Progress Report to the Conservation Committee of the Ship Strike Working Group. Paper IWC/60/CC3 presented to the IWC Conservation Committee, Santiago, Chile, June 2008 (unpublished). 15pp.
- International Whaling Commission. (2014). Report of the Scientific Committee Intersessional E-mail Group on Sanctuary and Sanctuary Proposals. IWC/65/CCRep08 Rev1.
- Johnson, A., G. Salvador, J. Kenney, J. Robbins, S. D. Kraus, S. Landry and P. J. Clapham. (2005). Fishing gear involved in entanglements of right and humpback whales. MAR. MAMMAL SCI. 21:635-645.
- Katona, S. K. And H.P. Whitehead. (1981). Identifying humpback whales using their natural markings. (*Megaptera novaeangliae*). POLAR RECORD 20(128):439-444.
- Knowlton, A. R., and S. D. Kraus. (2001). Mortality and serious injury of northern right whales (*Eubalaena glacialis*) in the western North Atlantic Ocean. J. CETACEAN RES. MANAGE. (Special Issue 2):193-208.
- Lusseau, D. (2003). Effects of tour boats on the behavior of bottlenose dolphins: using Markov chains to model anthropogenic impacts. CONSERV BIOL 17:1785-1793
- Lusseau, D. (2004). The hidden cost of tourism: detecting long term effects of tourism using behavioural information. ECOLOGY AND SOCIETY 9(1):2. Available at: [www.ecologyandsociety.org/vol9/iss1/art2/](http://www.ecologyandsociety.org/vol9/iss1/art2/)
- Martins, C.C.A., Morete, M.E., Engel, M.H., Freitas, A.C., Secchi, E.R. & Kinas, P.G. (2001). Aspects of habitat use patterns of humpback whales in the Abrolhos Bank, Brazil, breeding ground. MEMOIRS OF THE QUEENSLAND MUSEUM. 47, 83- 90.
- Marsh H., and D.F. Sinclair (1989). Correcting for visibility bias in strip transect aerial surveys of aquatic fauna. J. WILDL. MANAGE. 53: 1017-1024.
- Mellinger, D. and J. Barlow. (2003). Future directions for acoustic marine mammal surveys: Stock assessment and habitat use. NOAA OAR Special Report Contribution 2557 from NOAA/PMEL. Report of a Workshop held in La Jolla, CA. 20-22 Nov. 2002. 45pgs.
- Moore, M. J.; S. D. Berrow; B. A. Jensen; P. Carr; R. Sears; V. J. Rowntree; R. Payne and P. K. Hamilton. (1999). Relative abundance of large whales around South Georgia (1979-1998). MAR. MAMM. SCIE. 15(4):1287-1302.
- Payne, R., O. Brazier; E.M. Dorsey, J.S. Perkins; V.J. Rowntree and C.A. Titus. (1983). External features in southern right whales (*Eubalaena australis*) and their use in identifying individuals. In: Communication and behavior of whales. R. Payne (ed.). p.371-445. AAAS Selected Symposium Ser. Westview Press, Boulder.
- Ritter, F. (2012). Collisions of sailing vessels with cetaceans worldwide: First insights into a seemingly growing problem. J. CETACEAN RES. MANAGE. 12(1): 119- 127.
- Robbins, J. and D. Mattila. 2004. Estimating humpback whale (*Megaptera novaeangliae*) entanglement rates based on scar evidence. National Marine Fisheries Service Final Report Contract 40ENNF030121. 16 pp. Available from Center for Coastal Studies, Provincetown, MA.
- Taylor, B. L. (2005). Identifying units to conserve, in *Marine Mammal Research: Conservation Beyond Crisis*, edited by J. E. Reynolds III, W. F. Perrin, R. R. Reeves, S. Montgomery, and T. J. Ragen \_The John Hopkins University Press, Baltimore, MD\_, pp. 146-164.
- Van Waerebeek K. and R. Leaper (2008). Second Report of the IWC Vessel Strike Standardisation Working Group. Report to the International Whaling Commission Scientific Committee 60th Annual Meeting, Santiago, Chile. Rep. No. SC/60/BC5; 8.
- Van Waerebeek K, Baker AN, Felix F, Gedamke J, Iniguez M, Sanino GP, Secchi E, Sutaria D, van Helden A, Wang Y. (2007). Vessel collisions with small cetaceans worldwide and with large whales in the Southern Hemisphere, an initial assessment. LAJAM 6: 43-69. Vanderlaan ASM, Tagga.
- Vighi, M., A. Borrell, E.A. Crespo, L.R. Oliveira, P.C. Simões-Lopes, P.A.C Flores, N.A. García and A. Aguilar. (2014). Stable isotopes indicate population structuring in the Southwest Atlantic population of right whales (*Eubalaena australis*). PLoS ONE 9(3): e90489 doi:10.1371/journal.pone.0090489.
- Wade, P., M. P. Heide-Jorgensen; K. Shelden; J. Barlow; J. Carretta; J. Durban; R. Leduc; L. Munger; S. Rankin; A. Sauter and C. Stinchcomb. (2006). Acoustic detection and satellite-tracking leads to discovery of rare concentration of endangered North Pacific right whales. BIOL. LETTERS 2(3):417-419.

- Ward E., A.N. Zerbini, P.G. Kinas, M.H. Engel. and A. Andriolo (2011). Estimates of population growth rates of humpback whales (*Megaptera novaeangliae*) in the wintering grounds off the coast of Brazil (Breeding Stock A). J. CETACEAN RES. MANAGE. (Special Issue) 3, 145-152.
- Whitehead, H. and L. Rendell. (2004). Movements, habitat use and feeding success of cultural clans of South Pacific sperm whales. J. ANIMAL ECOL. 73(1):190-196.
- Williams, R., A.W. Trites and D.E. Bain. (2002). Behavioural responses of killer whales (*Orcinus orca*) to whale-watching boats: Opportunistic observations and experimental approaches. J. ZOOL. (LONDON). 256(2):255-270.
- Zerbini, A.N.; A. Andriolo; J.M. da Rocha; P.C. Simoes-Lopes; S. Siciliano; J.L. Pizzorno; J.M. Waite; D.P. Demaster and G.R. Vanblaricom. (2004). Winter distribution and abundance of humpback whales (*Megaptera novaeangliae*) off northeastern Brazil. J. CETACEAN RES. MANAGE. 6(1):101-107.
- Zerbini, NA., A. Andriolo, M.P. Heide-Jorgensen, J.L. Pizzorno, Y.G. Maia, G.R. VanBlaricon, D.P. DeMaster, P.C. Simões-Lopes, S. Moreira and C. Bethlem. 2006. Satellite-monitored movements of humpback whales *Megaptera novaeangliae* in the Southwest Atlantic Ocean. MAR. ECOL. PROG. SER. 313: 295-304.
- Zerbini, A.N., D. Danilewicz, E.R. Secchi, A. Andriolo, P.A.C. Flores, M. Cremer, E. Ferreira, L.C. Alves, F.S. Perez, F.R.C. astro, D. Pretto, C.M. Sartori, B. Schulze, P. Denuncio and J.L. Laake, (2011). Assessing bias in abundance estimates from aerial surveys to improve conservation of threatened franciscana dolphins: preliminary results from a survey conducted off southern Brazil. Presented at IWC meeting at Tromsø, Norway.

## CETACEAN SPECIES OF THE SOUTH ATLANTIC AREA

### MYSTICETES

#### Southern Right Whale, *Eubalaena australis*

Southern Right Whales migrate from feeding areas in sub-antarctic regions and concentrate near the coast along the South American and African coasts. The species has been observed in its major wintering grounds off the coast of Argentina (*Península Valdés*), Brazil (South-eastern and Southern Brazil, with recent and increasing sightings at Abrolhos Bank in the North-east), Uruguay and Western South Africa. Genetic studies suggest that Right Whales from the south-western Atlantic Ocean and Western South Africa are different populations, with gene flow occurring primarily between adjacent calving grounds and mixing of lineages from different calving grounds occurring on feeding grounds.

Right Whales were hunted for centuries and are now the most endangered of all baleen whales. It is estimated that around 4,400 whales were killed from 1900 to 1980 in the Southern Ocean, reducing the Southern Right Whale population from an estimated 55,000-70,000 animals before commercial whaling to nearly 12,000 at present. The annual growth rates of these right whale populations range between 7 to 8 per cent per year but a recent study found that right whales off Brazil have been increasing at a rate of 14 per cent per year. A possible explanation for the increase is immigration from other wintering grounds such as *Península Valdés*, Argentina, where a reduction from 6.9 per cent to 5.1 per cent in the annual rate of population increase has been reported.

Re-sightings of females photographed in Brazil that were also photographed in other years with calves on the wintering ground off *Península Valdés* indicate that some females are using different calving grounds in different years. The preliminary comparison of catalogues from these two wintering grounds resulted that 11 per cent of Right Whales identified off Brazil have been re-sighted off *Península Valdés*, in different years. Re-sightings have also been observed between Argentina and Tristan da Cunha as well as South Africa and Gough Island, indicating that Right Whales can also make eastward movements in the South Atlantic. Changes in the spatial distribution of Right Whales around *Península Valdés* and South Africa have been observed, indicating that Right Whales can be flexible in several aspects of their habitat use. With the increasing number of Right Whales along the southern hemisphere, we can expect the whales to expand their range as they have off Argentina and South Africa.

Since 1994, new sightings of Southern Right Whales were recorded at the province of Santa Cruz (Patagonia, Argentina) approximately 500km south of *Península Valdés* wintering grounds and the species seems to be recovering in the area.

Southern Right Whales have been dying in unprecedented numbers at *Península Valdés*, Argentina since 2005. The Southern Right Whale Health Monitoring Program (a consortium of local NGOs and Universities), recorded 672 right whale deaths from 2003-2013, with a peak of 116 dead whales in 2012. Most of the dead animals were first-year calves. Despite intensive studies of tissue samples collected during necropsies, no common cause of death has been identified. Three possible causes that require further study include: decreased food availability, exposure to biotoxins, and infectious disease. Kelp Gulls have learned to feed on the skin and blubber of Southern Right Whales at *Península Valdés*. The attacks may affect the health and survival of newborn calves in this right whale population.

Locations of primary feeding grounds for most southern hemisphere Right Whale populations are not well understood. Only recently it has been established that at least some of the Southern Right Whales breeding off South Africa remain alongshore towards the North-west, where they spend summer feeding on copepods, a previously undescribed phenomenon for coastal waters of the southern hemisphere. Recent research combining genetic and stable isotope analyses has shown that the whales from *Península Valdés* feed on at least four different areas in the

South Atlantic.

There were open-ocean seasonal concentrations as recorded in Yankee whaling logbooks and charts, but these areas, in particular those in the vicinity of the Rio Grande Rise and southwards, have not been properly surveyed mainly due to lack of material means. This is a very illustrative example of how much needs to be done in scientific research in international waters to better understand and manage whale species in the South Atlantic – something that will rely heavily on international cooperation that this Action Plan can promote.

### **Pygmy Right Whale, *Caperea marginata***

The Pygmy Right Whale remains to date one of the least known cetaceans. Being the smallest of the baleen whales, it is found exclusively in the southern hemisphere and it probably has a circumpolar distribution, with South Atlantic records mostly based on strandings from South Africa and several parts of eastern South America. It is probably restricted to temperate and subtropical waters, but migration patterns – if any – or seasonal movements are unknown. There is no information at all on its population sizes or conservation status.

### **Humpback Whale, *Megaptera novaeangliae***

The South Atlantic hosts two of the Humpback Whale stocks currently recognized by the IWC: stock breeding A, in the south-western Atlantic, coast of Brazil, occurring mainly from the north-east of Brazil down to Rio de Janeiro (from ~5°S to ~21°S) and stock breeding B, in the South-eastern Atlantic, encompassing the coast of West Africa, from the Gulf of Guinea down to South Africa. Recent genetic studies have provided current information on stock structure for humpback whales in the South Atlantic Ocean, fully supporting the current IWC designation of Breeding Stocks. Additionally to reinforcing genetic differences between Humpback Whales from south-western and south-eastern South Atlantic, these studies identified further sub-structuring between individuals from western South Africa and Gabon, and presented evidences of possibly geneflow between Brazil and Gabon. Similarities in song production between humpback whales from Brazil and Gabon also suggests that these populations could experience some degree of mixing; possibilities include a significant overlap in feeding grounds leading to regular interchange between the two breeding areas, or Gabon and Brazil being way-points on the same migratory route.

The Abrolhos Bank (Lat. 19° 30'S to Lat. 16° 40'S) constitutes one of the most important breeding grounds for the species in the Western South Atlantic. Mitochondrial DNA analyses, photo-identification and telemetry data indicate that the correspondent feeding area of the Brazilian humpback whales is near South Georgias and the South Sandwich Islands. An increasing number of whales, including mother-calf pairs, has been observed southward and northward of Abrolhos Bank, suggesting that the recovering population may be moving again to areas previously used for breeding and calving prior to the species' exploitation. Recent aerial surveys estimated population size in 9,330 whales (95%CI=7,185-13,214; %CV=16.13) from 5°S to 24°S in 2008. This population was estimated to be at about 30-37 per cent of its pre-exploitation population size, suggesting that conservation measures are still required to ensure its recovery.

Humpback whales are seasonally observed in South Africa and the west coast of the African continent, in Angola and Gabon. The coastal waters of Gabon are the most important wintering area off equatorial West Africa for Humpback Whale breeding, calving and nursing. Current status and population trends are unknown for Humpback Whales in these areas.

At the Republic of São Tomé and Príncipe, an archipelagic State, preliminary research indicates that Humpback Whales are present in austral winter and spring. Plans are being made to study these whales genetically and acoustically to determine stock affiliation.

Photo-identification data obtained from Humpback Whales in Brazil is held in the Antarctic

Humpback Whale Catalogue to facilitate comparison with other regions of the Southern Hemisphere and promote cooperative research. This led to identify a migration from one humpback whale from Brazil to Madagascar, in a transoceanic migration. These data are being compared with those obtained from Gabon, as part of the Indo-South-Atlantic Humpback Whale Consortium/ISACH.

### **Common Minke Whale, *Balaenoptera acutorostrata***

The Common Minke Whales (recognized as “Dwarf Minke Whales” in the southern hemisphere - a nomenclature usually accepted to differentiate it from the “form” of Common Minke Whales from North Atlantic) have been reported for western South Atlantic waters off Brazil and Chilean Patagonia, western South Pacific waters off New Zealand and central and northern Great Barrier Reef in Australia, and western Indian Ocean waters off Durban in South Africa. Little is known about the population’s genetic structure and migratory links for the Common Minke Whale in the southern hemisphere. A genetic-based study has recently suggested that Minke Whales from western South Atlantic and western South Pacific should be considered different Evolutionary Significant Units (ESUs). Within western South Atlantic, frequencies in sighting data from Brazil, Uruguay and Argentina indicate a possible north-south seasonal movement of this species. Results from another recent genetic study is consistent with this hypothesis, reinforcing the possibility of migratory connection between Dwarf Minke Whales at low-latitude waters off Brazil and Chilean Patagonia and whales in high-latitude feeding grounds on the western side of the Antarctic Peninsula.

Stranding records indicate the species may not be rare in Brazil, where it is commonly found in the winter and spring. During austral summer few sightings were made at headlands near Cabo Frio in south-eastern Brazil, where apparent feeding behaviour has been observed in conjunction with aggregations of sardines and squid. This may indicate the importance of the region’s upwelling for feeding baleen whales along their yet undetermined migratory pathways along the western South Atlantic. Interactions with Humpback Whales and humans were recorded in this region.

In medium and low latitudes, Common Minke Whales seem to inhabit coastal waters, usually over the continental shelf. Their ecology is poorly known. There is no current information on population size and trends in the wintering grounds off eastern South America. The species feeds on small crustaceans and small pelagic schooling fishes.

### **Antarctic Minke Whale, *Balaenoptera bonaerensis***

The Antarctic Minke Whale spends much of the year in waters around the Antarctic, migrating to lower latitudes in winter. This species is larger and presents different colour patterns than common minke whales. Antarctic Minke Whales occur off the eastern coast of South America, being usually found in oceanic waters between 200 and 1,000 m depth and in greater numbers between August and October. The north-eastern coast of Brazil is considered a putative breeding ground for the species. From 1966 to 1985 nearly 15,000 whales were taken off north-east Brazil from a coastal whaling station located in Costinha (~7°S), Paraíba State. This station was closed after the moratorium on whaling. Recent surveys have shown that the species is relatively common in this area, where breeding behaviour has been observed.

Little is known about the social structure or behaviour of *B. bonaerensis*, however this species frequently travels alone or in small groups, but also sometimes gathers in large feeding aggregations. Evidence suggests that the populations are segregated by age, sex, or reproductive condition, even during migrations. Antarctic Minke Whale migrations between the eastern coast of South America and the IWC management Areas II and III have been confirmed by marking experiments, showing that this population feeds in the Antarctic Sector of the South Atlantic. The stock size and population identity of whales wintering off Brazil is poorly known, and population status, after predation of both Minke species by commercial whaling in the late 20<sup>th</sup> century, is currently unknown. However, Antarctic Minke Whales are abundant. Present estimates of total Antarctic abundance based on multi-year circumpolar surveys range from around 460,000 – 690,000 whales.

### **Sei Whale, *Balaenoptera borealis***

This species occurs in all non-polar waters both in coastal and oceanic areas. Sei whales were heavily exploited in Southern Ocean after the declining of catches of blue and fin whales. It is estimated that about 204,589 Sei Whales were hunted by industrial whaling. This number is likely underestimated because of the known unreliability of whalers to correctly distinguish Sei Whales from other rorquals. There are insufficient data to undertake an assessment of their status in any area of the Southern Ocean.

Sei whale distribution along its breeding grounds is broadly similar to Blue and Fin whales. Off Western South Africa the species was found most frequently off the continental shelf, and its South Atlantic populations were heavily affected during whaling operations along both continental coasts. Recent sightings of the species are rare and some were recently recorded in Southern Patagonia, where it was also hunted and severely depleted.

Sei Whales are the main target of whalers operating at Costinha whaling station in north-east Brazil. From at least 1947 to 1965 nearly 3600 whales were taken. Data collected from catcher boats in later years of whaling operations (1981-1985) and, more recently, during sighting surveys conducted from 1998 to 2001 have shown that sei whales are still very rare in their former whaling grounds off NE Brazil and suggest that this population has not shown any recovery. The species was also taken further south, at a whaling station operating in Cabo Frio, where the current occurrence of Sei Whales is not known.

The species preys mainly on krill and copepods, with small fish occasionally being part of its diet. Unlike other species, Sei Whales apparently change their concentration areas over time, though it is generally believed that they make seasonal movements between high and low latitudes as do other large whales. Research on this species is scarce in the South Atlantic and very little has been done in recent years to elucidate its conservation status.

### **Bryde's Whale, *Balaenoptera edeni***

Although Bryde's Whales may present latitudinal movements, they do not migrate to Antarctic waters and therefore feed and reproduce in tropical to warm temperate waters. At least two different stocks – onshore and offshore – are found off western Africa and, possibly, eastern South America. Both populations differ from another group in Eastern South Africa, which possibly constitute a third (pelagic) stock.

Bryde's whales were taken by the whaling stations operation in Costinha and Cabo Frio, Brazil. The total number of whales taken for this region is unknown because this species was recorded together with the Sei Whale, but estimates for the Southern Ocean suggests at least 7,913 whales removed by commercial whaling.

Bryde's Whales are regularly found off the coast of Brazil, with the majority of the sightings in southern and south-eastern coasts, where cetacean survey efforts concentrate. In this region, seasonal abundance seems to be higher in the summer and fall and seems to be correlated with the spawning season of schooling fishes such as sardines.

Recent regular sightings of Bryde's Whales off south-eastern Brazil indicate the occurrence of a resident population around some oceanic islands, especially in the vicinity of the Laje de Santos (Santos Rocks) Marine State Park (25 nautical miles off the south-eastern Brazilian coast), possibly extending its longitudinal movements towards the east. Recent sightings have been recorded in the region at the 3000m isobath and breaching behaviour was observed for the first time near the 1200m isobath. Population structure and current stock size of these whales off Brazil is unknown and a detailed regional survey project is under way aiming to assess the actual status and distribution of this population.

### **Blue Whale, *Balaenoptera musculus***

One of the icons of the greed and irresponsibility of the whaling industry, the largest mammal species on Earth was almost entirely wiped out. It was originally a wide-ranging species occurring from polar to tropical waters. Krill is its primary food source, though blue whales can also prey upon copepods and amphipods. Its taxonomy remains subject to debate, but it is generally accepted that the so-called pygmy blue whale (*Balaenoptera musculus brevicauda*) is significantly different from the “true” blue whales to warrant separate taxonomic status.

It is shocking that, like in so many other cases where the whaling industry has so heavily pursued whale species and pretended to know enough to “sustainably exploit” them, very little is known about the social structure of blue whales (and, to be sure, of most other whales). There is insufficient information on the areas of concentration for breeding populations of blue, fin and sei whales. Nevertheless, it has been accepted that blue and fin whales disperse in open tropical waters of the southern hemisphere, generally around 20°S. Both species were relatively common along the western African coast but seemed to be proportionally rare off the South American coast, where blue whales were exterminated by commercial whaling up until the 1960s. No sightings of live blue whales have been confirmed in Brazil over the last four decades. There is not a proper estimate of surviving blue whales in the South Atlantic, and numbers could be as low as a few hundreds.

### **Fin Whale, *Balaenoptera physalus***

The second largest species of cetacean, the fin whale originally had a wide distribution much like that of the blue whale, encompassing all waters from the polar regions to the Equator. Just like the blue whale, however, the species was recklessly slaughtered by industrial whaling, with more than 700,000 animals killed in the Southern Hemisphere alone, and its current numbers are unknown. Its breeding and feeding areas are also not known. The species feeds on krill and Clupeidae fish. Eighty-four whales were taken in Costinha and Cabo Frio respectively, suggesting that the species is rare off Brazil. Strandings have occurred widely along the eastern seaboard of South America, but in relatively small numbers. Occasionally they are seen associated with blue whales, and interspecific mating has been recorded. The extent to which this may be due to the drastic reduction in numbers of both species by commercial whaling, which makes it harder to find intraspecific mates, is open to discussion.

## **ODONTOCETES**

### **Sperm Whale, *Physeter macrocephalus***

The Sperm Whale, *Physeter macrocephalus*, is relatively well known in comparison with other large cetaceans, and has been studied in many parts of the world. Breeding and rising of young Sperm Whales take place in warm waters in harem groups, while old males and groups of young males migrate toward cooler waters in summer. In the southern hemisphere, old males reach Antarctic waters, but it is believed that bachelor herds seldom reach 50° S. In the South Atlantic Ocean, female and young male sperm whales are only found up to the Subtropical Convergence (approximately 40°S). In Argentina’s southernmost province, systematic beach surveys for stranded animals revealed more than 50 stranded sperm whales in an 11-year period, all of them males. All were found in or near Bahía San Sebastián (53°S 68°W), which with its imperceptibly sloping beaches and high tides (10.6 m) is a natural trap. Further north, Sperm Whales have been recorded from strandings all along the Brazilian coast and observed during oceanic surveys from 29°S to 34°S being the most sighted species in the surveyed area. In Southern Brazil, groups of up to 17 individuals have been observed along the fringes of the continental shelf in depths of 850m to 1550m.

### **Pygmy Sperm Whale, *Kogia breviceps***

The Pygmy Sperm Whale inhabits tropical and temperate seas worldwide. Its habits are markedly oceanic, and the species distribution and abiological aspects have been mainly

studies through strandings, of which several have occurred along the north-eastern Brazilian coast and parts of South Africa. Many recorded strandings of the species are from mothers and calves. It exhibits opportunistic feeding behaviour targeting small and medium-sized squid and deep-sea fish and crustaceans, possibly found along the continental shelves beyond 200m deep. The species also shows tolerance towards a larger range of water temperatures than *K. sima*, facilitating long distance movements. Bycatch of the species has been reported off Brazil.

### **Dwarf Sperm Whale, *Kogia sima***

Dwarf Sperm Whales, like the pygmy sperm whale, occur worldwide in the tropics and subtropics. They are apparently more coastal than *K. breviceps*, probably inhabiting the edges of continental shelf and slopes, with no evidence for migration, and in African waters the species can be observed year-round. Deep-sea cephalopods, crustacean and fish of several deep-water species are among its food items. Group sizes so far observed are usually small, not surpassing ten animals.

### **Cuvier's Beaked Whale, *Ziphius cavirostris***

Cuvier's Beaked Whale is known to be the most cosmopolitan of the beaked whales, occurring in all oceans and most seas. In the South-west Atlantic records of at least 37 specimens are known, from Fernando de Noronha, Brazil, to Argentina's southernmost province. Although most of these records occurred in Argentina, 12 have been reported for Brazilian waters, widely distributed along the Brazilian coastline. The species is little known in terms of its biology, but data from strandings indicate that it feeds on deep-sea squid, crustaceans and echinoderms. The species appears to be particularly vulnerable to acoustic trauma and there have been several mass strandings of Cuvier's Beaked Whales coincident with military exercises involving the use of very loud, low-frequency sonar.

### **Arnoux's Beaked Whale, *Berardius arnuxii***

This species has a circumpolar distribution and, reaching up to 10m in length, is the largest of the Ziphiidae together with *B. bairdii* from the northern hemisphere. It is one of the least known cetacean species in terms of its biology and ecology; other than feeding on squid and appearing to gather in groups of up to ten animals, almost nothing else is known. The species has a circumpolar distribution from the ice edge to approximately 35°S, though a lower latitude stranding was recorded in south-eastern Brazil. Stranding records of Arnoux's Beaked Whales were common in late spring or early summer in higher latitudes. There is evidence that the species could move onshore during summer months.

### **Shepherd's Beaked Whale, *Tasmacetus shepherdi***

This is an extremely rare species, known only from a little more than twenty stranded specimens and virtually no information about its behaviour and actual distribution. Strandings records indicate that the species may be circumpolar distribution. Five strandings were recorded from Argentina. Putative sightings of live individuals were reported from the western South Atlantic (53°45'S, 42°30'W) and off New Zealand.

### **Southern Bottlenose Whale, *Hyperoodon planifrons***

The Southern Bottlenose whale is distributed throughout the Southern Hemisphere from the floating ice limits in Antarctica to approximately 30° S. Its habits are mainly oceanic, and it is most common beyond the continental shelf and over submarine canyons, in water deeper than 1,000m. It is rarely found in water less than 200m deep. During summer, this species is most frequently seen within about 100km of the Antarctic ice edge, where it appears to be relatively common. Its presence in the South Atlantic is evidenced by strandings from both the South American and African coasts. Large cephalopods constitute its dietary item. There are no population estimates for the species.

**Andrew's Beaked Whale, *Mesoplodon bowdoini***

Andrew's Beaked Whales are only known from fewer than 40 strandings in the southern hemisphere, most of which have occurred in Southern Australia and New Zealand. Nevertheless, the species has been recorded in the southern South Atlantic as well, between 1988 and 2002. A stranding has also been recorded in the archipelago of Tristan da Cunha.

**Blainville's Beaked Whale, *Mesoplodon densirostris***

This species is probably the most common beaked whale and the one with the widest distribution, reaching from both subtropical areas in the northern and southern hemispheres into the tropics, and is also the only *Mesoplodon*, which has been regularly observed at sea, both in the North Pacific and the Caribbean. The species seems to avoid coastal areas and stay in offshore areas where depths are over 500m. No reliable population estimates exist. As with other cetacean species, beaked whales also suffer from contamination in the oceans, as evidenced by the ingestion of plastic debris found in a stranded specimen of *M. densirostris* in Brazil.

**Gervais' Beaked Whale, *Mesoplodon europaeus***

Gervais' Beaked Whales inhabit warm temperate and tropical waters of the North and South Atlantic oceans, with most confirmed records being from strandings, with very few live animal sightings. The southernmost confirmed record of the species in the South Atlantic is from south-eastern Brazil. Three other confirmed records in the South Atlantic are from Ascension Island, and on the north-eastern coast of Brazil. There is very little information available on the species, virtually nothing about its actual behaviour and no estimates for population size.

**Gray's Beaked Whale, *Mesoplodon grayi***

Gray's Beaked Whale occurs mainly in temperate waters of the southern oceans. At least ten specimens have been reported from the south-west Atlantic, almost all of them from Argentina. There are also records for the extreme south of Brazil, where its distribution may follow the colder waters of the Malvinas Current. Though there have been live animal sightings, virtually nothing is known about its ecology and behaviour.

**Hector's Beaked Whale, *Mesoplodon hectori***

With scarce information available about its actual distribution, strandings indicate that Hector's Beaked Whale may have a circumpolar distribution in the Southern Hemisphere, with occurrence confirmed in the South Atlantic through records from Argentina, South Africa, and Southern Brazil, which apparently represents the northernmost limit of the species. It is probably an open sea species and its status remains unknown.

**Layard's Beaked (Strap-toothed) Whale, *Mesoplodon layardii***

Layard's Beaked Whales occur in temperate and cold waters. Strandings in the South Atlantic were recorded in Southern continental locations of Argentina, Uruguay, southern Brazil, Malvinas Islands, Namibia and South Africa. Analyses of stomach contents from several strandings indicate that the species' food preference consists of oceanic squid.

**True's Beaked Whale, *Mesoplodon mirus***

True's Beaked Whales are rare animals (with only around 20 records worldwide) and their distribution puzzles researchers. Records have been made in the North Pacific and Indian Ocean, and strandings in the Cape Province, South Africa, indicate that the species probably reaches the eastern South Atlantic. Indications are that the species is restricted to latitudes higher than 30° on both hemispheres. They are probably pelagic animals, which feed on squid, but nothing else is known about their habits, nor there are any population estimates.

### **Franciscana, *Pontoporia blainvillei***

Despite research and monitoring efforts over many years, the species is still largely unknown in regard to its actual population sizes, status and rates of decrease due to incidental catch, and recent initiatives to provide international coordination for research and management initiatives must be encouraged and supported. Total abundance has been estimated as nearly 20,000 Franciscanas for the whole Rio Grande do Sul, and Brazilian and Uruguayan coastal waters, considering the 30m isobath as the offshore border, and about 2.1 - 10.8 per cent of the population may be removed each year by fisheries in the region.

An apparently resident inshore population of Franciscanas was discovered at Babitonga Bay, Southern Brazil, where it coexists with *Sotalia fluviatilis*, an unique phenomenon for this otherwise open-water species.

Offshore distribution of the species in southern Brazil seems to be limited by the 35m isobath. Other factors affecting distribution can be related to limiting habitat characteristics such as river discharge, which offers food resources, protection against predators and maintenance of the water temperature; ocean floor morphology, especially depth; presence of predators and trophic competitors. These factors may account for the observed discontinuity in the population along southern and south-eastern Brazil.

### **Guiana Dolphin, *Sotalia guianensis***

Guiana Dolphin is a species restricted to eastern South America and the Caribbean coasts of Central America extending into the South Atlantic always inshore and south to Florianópolis, Brazil at 27° 35´S, where the southernmost resident population of the species is located. Pelagic clupeids, demersal sciaenids and cephalopods account for most of its diet.

Abundance estimates of Guiana dolphins only exist for localized, resident populations in several estuaries, bays and embayments along the Brazilian coast in which groups range from some dozens to several hundreds, indicating that its total numbers for the marine form are probably not beyond a few thousands. Therefore, though the species is widespread along eastern South America, it is highly vulnerable, especially due to its inshore habits and constant exposure to habitat degradation, contaminants and anthropogenic disturbances such as bycatch in artisanal fisheries.

### **Commerson's Dolphin, *Cephalorhynchus commersonii***

The Commerson's Dolphin is distributed south of 41°S in the coastal waters of southern South America, though stranding records have been made in Southern Brazil. It is also found off Malvinas and the Kerguelen islands. The species apparently favours inshore waters and feeds on a wide variety of shrimp, fish and squid. No overall population estimates exist.

There have been many reports of incidental capture of Commerson's Dolphins in gillnets, trammel nets and mid-water trawls in Argentine waters.

In Santa Cruz Province, Argentina, Provincial Law 2,582 declared the Commerson's Dolphin to be a Provincial Natural Monument in July 2001 to protect the local resident populations.

### **Heaviside's Dolphin, *Cephalorhynchus heavisidii***

Heaviside's Dolphins occur only in the west coast of southern Africa, between Table Bay in South Africa and northern Namibia, with nearshore coastal distribution. Very little is known about their ecological context and anthropogenic impacts that may threaten their survival in the region, e.g. fisheries by-catch and contamination from land-based mining. Though it is currently considered common, and possibly the most common dolphin species seen in Namibia, no reliable population estimates exist and its restricted distribution alone makes the species vulnerable.

### **Rough-toothed Dolphin, *Steno bredanensis***

The Rough-toothed Dolphin is commonly thought to be a tropical to subtropical species which inhabits deep oceanic waters, rarely ranging north of 40°N or south of 35°S and away from continental coasts. However, in Brazil, it has also been regularly observed close to shore, both in the northeast and in the south-eastern coasts. It has also been observed at the Abrolhos Bank, off Bahia, and along the coastal archipelago of Arvoredo Biological Reserve in Santa Catarina State. Its diet is composed of a wide variety of fish and squid. Rough-toothed Dolphins are rather difficult to study at sea due to schools staying submerged often for long periods of time (sometimes up to 15 minutes). Groups observed usually vary from 10 to 50 animals. Global population is unknown but probably in the hundreds of thousands.

### **Hump-backed Dolphin, *Sousa teuszii***

Taxonomy of the genus *Sousa* remains under controversy, and the hump-backed dolphins can belong to anything from three to a single species. Atlantic Humpback Dolphin or *S. teuszii strictu sensu* known distribution limits are, in the north, Dahkla Bay (23° 50'N), Western Sahara, and in the south, Tombua (15° 47'S), southern Angola, while *S. plumbea*, the Indian Ocean species, occurs from the Cape Province of South Africa east along the African coast towards Arabia and the Indian sub-continent. Its habitat is predominantly inshore coastal and estuarine, over soft- sediment bottoms, in areas less than 20m deep and in the surf zone on more open coasts. There are no reports of its presence in offshore waters. The preferred habitat is near sandbanks and mangrove areas, in turbid waters with temperatures ranging between 17°C and 28°C. The main threats for this species may be the mortality by fisheries activities and habitat encroachment, even though further studies are needed to confirm that. There are no global population estimates but the South Atlantic *Sousa* probably numbers in the few thousands.

### **Bottlenose Dolphins, *Tursiops truncatus***

The Common Bottlenose Dolphin, *T. truncatus*, is practically a cosmopolitan species. The species tends to explore a wide variety of habitats from inshore to pelagic, and offshore sightings in the western South Atlantic are common. Its diet varies with local availability of prey species; in southern Brazil, resident groups of bottlenose dolphins cooperate with artisanal fishermen in capturing mullet in river and lagoon mouths. Coastal home ranges may comprise extensive areas and long-range movements have been recorded for individuals in Argentina and between south Brazil and Uruguay. There are no global population estimates for bottlenose dolphins, but the combined result of some surveys indicates it may be in the hundreds of thousands.

A recent study reported unprecedented low genetic variation in coastal bottlenose dolphins from Southwestern Atlantic. It was proposed that coastal bottlenose dolphins from Southern Brazil - Uruguay (SB-U) and those from Argentina represent two distinct evolutionarily significant units, and that dolphin communities from SB-U comprise five distinct Management Units (MUs). Genetic data indicate very low population sizes for coastal bottlenose dolphins in south-western Atlantic. Mark-recapture abundance estimates available for some of these coastal communities in Brazil, Uruguay and Argentina confirmed the genetic data, indicating very low population sizes (not exceeding 90 dolphins). Bycatch in gillnets is the main threat to coastal Bottlenose Dolphins. Bycatch is higher in southern Brazil than in other areas, but resident communities seem to be stable in the last years.

The most threatened population of Bottlenose Dolphins seems to be located in Argentina. Abundance estimates based on mark-recapture data reconfirmed a maximum estimate of 83 individuals (95%CI=45.8- 151.8) in Bahia San Antonio, Rio Negro Province, Argentina. Of this population, it appears only 14 females are successfully reproducing. Data suggests this population of Bottlenose Dolphins is declining due to birth- and calf recruitment rate insufficient to compensate the overall mortality in the population. The reported high contamination of the area is believed to be among the causes of this apparent failure in successful reproduction and

needs to be investigated further. Measures need to be taken to protect this species and its habitat, including a controlled management of rural, urban and industrial wastes, protective laws to limit harassment, as well as educational projects to increase public awareness. Additionally, a more detailed insight in the fine-scale population structure of Bottlenose Dolphins in Argentina and local conservation needs are strongly recommended.

Due to the failure to respond to the precipitous decline in Argentina since the 1980s, Bottlenose Dolphins have been described as nearly vanished from the coasts of the Province of Buenos Aires and Chubut. Nowadays only infrequent and isolated observations are reported in the areas where they were once most common (Bahía Samborombón, Peninsula Valdés, Bahía Engaño), without any information on numbers, morphotype or ecotype observed. Consequently, Bahía San Antonio was recently suggested to be home to one of the last remaining resident communities in that country. However, data strongly indicates this population is highly vulnerable and at risk. Continuous failure in their conservation would therefore have a devastating effect on the presence of coastal Bottlenose Dolphins in Argentina.

### **Pantropical Spotted Dolphin, *Stenella attenuata***

The pantropical spotted dolphin is both one of the most abundant dolphin species and one of the most impacted by fisheries by-catch and direct takes, particularly in the North Pacific. The species is found in tropical and subtropical offshore water between approximately 40°N and 40°S, sometimes in aggregations of hundreds of individuals. Prey items include a wide variety of fish, cephalopods and crustaceans. In the Western South Atlantic it is found mainly in northeastern Brazil beyond the continental slope in depths ranging from 850 to 4,900m. Few strandings were recorded there as of yet, probably as a consequence of the species' offshore distribution. The global population of pantropical spotted dolphins is probably in excess of 3 million animals.

### **Clymene Dolphin, *Stenella clymene***

The Clymene Dolphin occurs in the South and North Atlantic Ocean basins, in tropical and subtropical waters, and appears to be one of the rarest oceanic dolphins. In the Western South Atlantic it is distributed from southern to north-eastern Brazil, but it is more frequently observed in offshore waters of the north-eastern coast between the 1,000m and 4,500m isobaths. Strandings of this species are common in north-eastern Brazil, with many along the State of Bahia, but sporadic in the southern and south-eastern regions. One of the least known species of its genus, the Clymene Dolphin feeds on small mesopelagic squid and fish. No global population estimates exist.

### **Striped Dolphin, *Stenella coeruleoalba***

A cosmopolitan species, the Striped Dolphin occurs in tropical and subtropical seas. In the western South Atlantic the Striped Dolphin is mostly found from 7 to 42 degrees South, and sightings closer to the continental margin are more frequent from October to February, and it is considered to be one of the least known species off Brazil. Prey species include a wide range of shoaling fish and cephalopods. The species appears to be relatively rare in parts of the South Atlantic, and there are no global population estimates.

### **Atlantic Spotted Dolphin, *Stenella frontalis***

The Atlantic Spotted Dolphin occurs in the North and South Atlantic from temperate to tropical waters. Its distribution along the African coast in the South Atlantic is poorly studied, but along South America it is distributed from southern to north-eastern Brazil, where the species exhibits the highest preference for nearshore habitats within its genus, being generally found west of the 1,000m isobath. Small fish, cephalopods and benthic invertebrates are its main food items. There are no reliable population estimates for the species.

**Spinner Dolphin, *Stenella longirostris***

The Spinner Dolphin is found in tropical and subtropical pelagic waters and around oceanic islands. In the Western South Atlantic, from southern to north-eastern Brazil, it inhabits waters over the shelf and slope, in depths ranging from 170 to 2,700m. It forages for small mesopelagic fish, squid and shrimp usually in waters between 200 to 300m deep. Though it is a widespread species numbering probably in the few millions, local populations around oceanic islands are very vulnerable to anthropogenic impacts. At the archipelago of Fernando de Noronha, groups of a resident population (which may reach about two thousand individuals) are observed on an almost daily basis at a specific bay, now protected inside a National Marine Park, allowing for the development of long-term studies.

**Fraser's Dolphin, *Lagenodelphis hosei***

Fraser's Dolphin is a typically high-seas dolphin of tropical waters, occurring usually beyond the 1000m isobath, and strandings in temperate areas are considered to represent extralimital occurrences related to temporary oceanographic anomalies, such as the *El Niño* phenomenon. In the Southwestern Atlantic the species was first recorded in Uruguay, where several strandings have been recorded in recent years, as well as in the southern and south-eastern Brazilian coast. It feeds basically on mesopelagic fish. No population estimates exist for the species.

**Short-beaked Common Dolphin, *Delphinus delphis***

A recent study showed that all common dolphins in the Atlantic Ocean belong to a single species, *Delphinus delphis*. *D. delphis*, is distributed discontinuously in tropical and subtropical waters both above continental shelves and in pelagic environments. In the eastern South Atlantic it is recorded in Gabon, and recent records indicate that, contrary to earlier assumptions, the species most likely also occurs off Brazil. Its dietary habits are similar to the long-beaked species, and it has been proposed that its foraging is attuned to the night-time vertical migration of the deep scattering layer. There are no global population estimates for the species.

**Peale's Dolphin, *Lagenorhynchus australis***

Peale's dolphins are found mainly in the coastal waters of southern South America, normally from 44°S in the Atlantic to 38°S in the south-eastern Pacific and exceptionally to 33°S in the south-eastern Pacific to 38° in the south-western Atlantic. The species is confined to near-shore waters and it seems to be closely associated with kelp beds. The dolphins in Beagle Channel, the Magallanes and southern Isla Grande de Tierra del Fuego have been harpooned for crab bait since the 1970s, which cause reduced abundance by the late 1980s. Nevertheless recent evidence suggests that the scale of exploitation has declined and that some recovery may be occurring.

**Hourglass Dolphin, *Lagenorhynchus cruciger***

The hourglass dolphin is a cold-water species occurring around Antarctica and in temperate offshore waters at least to 36°S in the South Atlantic. It apparently prefers offshore areas. Its main prey species are myctophiid fish, squid and crustaceans. Population estimates in the Antarctic indicated the existence of at least 140,000 animals.

**Dusky Dolphin, *Lagenorhynchus obscurus***

The dusky dolphin is distributed in cool temperate waters of the southern hemisphere. Its occurrence is well documented inter alia along the coasts of South-west Africa and Argentina, associated respectively with the Benguela and Malvinas currents in areas over the continental shelf and slope. The species has been also recorded from the vicinity of many oceanic island groups in the South Atlantic and elsewhere. Off the waters of Angola and Namibia, the species has been observed in September in deep waters, feeding on Cape horse mackerel *Trachurus*

*trachurus capensis* at depths down to approximately 170m. Off South America, southern anchovy *Engraulis anchoita* and several cephalopods compose the species' diet. Dusky Dolphins are caught accidentally in fisheries off Namibia, and their current population is unknown.

#### **Southern Right Whale Dolphin, *Lissodelphis peronii***

Southern Right Whale Dolphins are found mainly in Subantarctic waters, but in the South Atlantic there are records as far as São Paulo State in Brazil at about 25°S, with most records from winter months, and Walvis Bay in Namibia at about 23° S; they most likely follow the colder waters of the Malvinas and Benguela currents. In Namibian waters the species is probably resident. Large schools of these dolphins have been recorded, with hundreds of individuals. A variety of fish and squid comprise its diet, with lanternfish being a common food item. The species is poorly studied and there are no population estimates.

#### **Risso's Dolphin, *Grampus griseus***

This large delphinid is widely distributed in oceanic and continental shelf margins from tropical to temperate waters worldwide, usually found in waters 400-1000m deep, where it preys on a mix of neritic, oceanic, and occasionally bottom dwelling cephalopods. In Argentina, there have been several coastal sightings, particularly in Patagonia, interacting with Dusky Dolphin groups. No population estimates exist for the species.

#### **Melon-headed Whale, *Peponocephala electra***

The Melon-headed Whale is a pantropical species, which reaches into the South Atlantic from the Equator to south-eastern Brazil and South Africa's Cape Province. They are markedly oceanic but may reach coastal areas following upwellings, and are usually found in large pods. A variety of fish and small squid comprise their diet. There are no reliable population estimates for the species.

#### **Pygmy Killer Whale, *Feresa attenuata***

Pygmy Killer Whales have been recorded in all major oceans in tropical, subtropical and temperate waters. Very few records exist in the Western South Atlantic, with stranded animals recorded for Argentina and south-eastern Brazil. Fish and squid comprise most of their diet, though there have been records of attacks on smaller cetaceans. Very little else is known about this species, and its population size has not been estimated.

#### **False Killer Whale, *Pseudorca crassidens***

The False Killer Whale occurs in all tropical, subtropical and warm temperate seas, and its distribution is largely determined from stranding records. The species habitat is considered to be primarily oceanic. Occurrence has been confirmed in the Western South Atlantic from the South and other regions of Argentina, Northeastern to Southern Brazil, including mass strandings. The species is also known from Southern Africa where large mass strandings have been recorded. Epipelagic and oceanic squid species including *Ommastrephes bartramii* apparently are an important food item for false killer whales in the Western South Atlantic, confirming their oceanic distribution.

#### **Orca, *Orcinus orca***

Orca is a cosmopolitan species with a very wide distribution and occurring along most of the South Atlantic with widespread coastal and offshore sightings. In Brazil, sightings off the south-eastern coast appear to have become more frequent in recent years. The species has been studied since 1975 in Northern Patagonia, Argentina. Thirty killer whales have been identified and studied in the region since 1975 and some individuals use a 1,000 km stretch of northern Patagonian coastline.

Prey species for orca include the South American Sea Lion (*Otaria flavescens*) and Southern

elephant seal (*Mirounga leonina*) among many other marine mammals, besides large-sized fish and penguins. Resident orcas from Patagonia exhibit a peculiar intentional stranding behaviour to capture pinnipeds. Recently, predation on Sevengill Sharks (*Notorhynchus cepedianus*) in Patagonia, Argentina was recorded. Interaction with fisheries of *Xiphias gladius*, *Thunnus* spp. and orcas were registered in Uruguay and Brazil as well as sightings along the coast.

### **Short-finned Pilot Whale, *Globicephalamacrorhynchus***

Though no comprehensive studies have been conducted on the species, short-finned pilot whales appear to vary on a geographical basis. Present in all tropical and subtropical seas, it occurs in the South Atlantic from the Equator to, in the east, the Cape Province in South Africa, and in the west the vicinities of São Paulo, Brazil (Rice, 1998). There is a marked preference for deep water areas, and though they can also take fish, short-finned pilot whales are especially well-adapted to eat squid (Hacker, 1992), which they hunt down to at least 800m deep. There are no global population estimates for the species.

### **Long-finned Pilot Whale, *Globicephala melas***

With little range overlap in relation to the former species, *G. melas* occurs in all cold and temperate waters of both hemispheres. In the South Atlantic it can be found north to south-eastern Brazil and to Angola, following the colder currents. In Argentina, it is one of the most common cetacean species in strandings records. Though it is probably more common offshore, coastal records do exist. It preys mainly on squid, but small and medium-sized gregarious fish is also preyed upon opportunistically. There are no global population estimates, but it has been estimated that some 200,000 long-finned pilot whales may exist around Antarctica (Bernard et al., 1999).

### **Spectacled Porpoise, *Phocoena dioptrica***

The Spectacled Porpoise occurs mostly south of the Antarctic Convergence, but is also recorded northwards following the Malvinas Current into the subtropical South Atlantic (Goodall et al., 2002). Strandings records indicate that sexually mature animals can reach Southern Brazil. This species is among the less studied of the small cetaceans and almost nothing is known of its biology, and virtually nothing of its population size or status.

### **Burmeister's Porpoise, *Phocoena spinipinnis***

Burmeister's Porpoises are restricted to waters around Southern South America; in the South Atlantic they range from Argentina's southernmost province to the State of Santa Catarina, Brazil. Its distribution is most likely restricted to the cooler waters carried by the Humboldt (in the Pacific coast) and Malvinas currents (Brownell et al., 1999). The species is very difficult to detect in the field due to its inconspicuous behaviour and dark colour, and very little is known about its biology. It feeds on demersal and pelagic fish, as well as squid and crustaceans. There are no population estimates for the species.