

**DRAFT**

**Conservation Management Plan for Eastern South Pacific Southern Right  
Whale Population (*Eubalaena australis*)**

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(submitted by Chile)

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## EXECUTIVE SUMMARY

Heavily impacted by whaling operations during centuries, eastern South Pacific (ESP) southern right whales are classified as Critically Endangered. The population does not show increasing rates observed in other regions (e.g. the eastern South American seaboard, Southern Africa and Australia), and has a possible mature population size of around 50 individuals (Reily *et al.*, 2011).

The government of Chile therefore decided in 2007 to propose its inclusion in the IWC Conservation Committee agenda (IWC, 2008). Furthermore, the IWC agreed to nominate the South America southern right whale populations for a Conservation management Plan (SRW CMP – doc. IWC/63/CC4). A workshop to begin the development of the SRW CMP was held in Buenos Aires, Argentina from 19 – 20 September 2011.

The ESP SRW Conservation Management Plan aims to guide and encourage range state stakeholders (*i.e.* government, industry, coastal communities and civil society, among others) and international partners to take steps towards the recovery of this population to levels that will **allow the species to withstand both environmental and anthropogenic impacts and ensure its long-term survival.**

In the short term, it will be required to **1) obtain baseline data, particularly referring to population size, areas of concentration of the species (breeding or feeding areas) and stock structure; 2) conduct a detailed assessment of potential impacts in identify areas of concentration and; 3) develop specific mitigation strategies.**

The following CMP includes several sections that: summarize why this CMP is needed; review national and international legal framework; review scientific information available on the population and identify current knowledge gaps; identify current and potential threats; perform a risk assessment of the threats and propose mitigation measures and priority of actions to improve conservation of this critically endangered population as well as a governance framework for the implementation of this CMP.

Depending on the information available, some actions can be achievable in short term. Actions of high priority identified that should be addressed in the short-term include:

<i>ID</i>	<i>Action</i>
COORD-01	Implementation of the Conservation and Management Plan: Establishment of a Co-ordinator and Steering Committee
COORD-02	Development of a Web-based exchange of scientific information
PACB-01	Development of a strategy to increase public awareness and build capacity in range states
PACB-03	Create capacities in coastal communities on species identification and sightings reporting and documentation
RES-01	Development of a web-based platform to report southern right whale sightings
RES-02	Increase documentation of sightings and photo-identification of individuals
RES-03	Start collection of genetic samples
RES-05	Identify breeding area(s) for southern right whales
MON-01	Ensure long-term monitoring of distribution, abundance and trends of southern right whales
MON-02	Ensure long-term monitoring of potential threats & effectiveness of mitigation measures
MIT-01	Release entangled whales and prevent entanglements
MIT-03	Develop and implement contingency plan to afford maximum protection when a sighting is recorded
MIT-05	Inclusion of Right Whale Conservation Considerations and Mitigation Measures in the Environmental Impact Evaluation and Permitting System for Large-Scale Coastal/Marine Projects

## 1. INTRODUCTION

### 1.1. Why a conservation and management plan is needed for eastern South Pacific southern right whale population

Despite an observed increase of several populations of whales in the Southern Hemisphere over the last few decades, the Southern Right Whale (*Eubalaena australis*) is still one of the large cetacean species with fewer individuals worldwide; the eastern South Pacific (ESP) breeding population, located off Chile and Peru (Figure 1), is likely the smallest surviving population of the species.



Figure 1 – Sightings of eastern south Pacific southern right whales from 1975 to 2010 (Galletti Vernazzani *et al.*, 2011)

Since 2000 systematic scientific information has been collected about this population in Chilean waters through sightings networks. The information highlighted that the population continues to be very depleted (Galletti Vernazzani *et al.*, 2008, 2011). The government of Chile therefore decided to propose its inclusion in the IWC Conservation Committee agenda (IWC, 2008).

Heavily impacted by whaling operations during centuries, ESP southern right whales were classified as Critically Endangered. The population does not show increasing rates observed in other regions (e.g. the eastern South American seaboard, Southern Africa and Australia), and has a possible mature population size of around 50 individuals (Reily *et al.*, 2011). Any anthropogenic removal would be very detrimental to the population and therefore urgent efforts must be undertaken to ensure that it recovers from its current status and in particular receives protection from further anthropogenic disturbances that may hamper such recovery.

Additional efforts have also been done in Chile to afford maximum protection to southern right whales at individual level and to develop regulations that only allow land-based whale watching operations for this population. Furthermore, a proposal for a national action plan for the recovery of the species in Chilean waters (Palazzo and Galletti Vernazzani, 2011) was developed and presented by Chile at IWC Conservation Committee in 2011. The proposal provided a very useful starting point for the development of this Conservation and Management Plan (CMP) for ESP southern right whales and therefore most of its contents are included here.

The State of Policy of Chile regarding the protection and non-lethal use of cetaceans is consolidated in the national law 20.293 for the Protection of Cetaceans. This CMP are in line with such policies as well as the fulfillment of Range States' obligations under international law to promote the best possible management of shared cetacean resources that occur in its jurisdictional waters. It is hoped that, in return, the international community will provide the necessary support both to implement the measures recommended in this Plan and, moreover, to ensure that these and other whale species of the Southern Hemisphere are adequately protected when spending part of their life cycle in international waters.

## **1.2. Overall Objectives of eastern South Pacific SRW CMP**

The Conservation Management Plan for the eastern South Pacific southern right whales aims to guide and encourage range state stakeholders (*i.e.* government, industry, coastal communities and civil society, among others) and international partners to take steps towards the recovery of this population to levels that will allow the species to withstand both environmental and anthropogenic impacts and ensure its long-term survival.

To achieve this long term objective, medium term objectives will focus in monitoring population status, anthropogenic threats and effectiveness of conservation measures implemented. In the short term, it will be required to 1) obtain baseline data, particularly referring to population size, areas of concentration of the species (breeding or feeding areas) and stock structure; 2) conduct a detailed assessment of potential impacts in identify areas of concentration and; 3) develop specific mitigation strategies.

Ideally, all management actions are based on adequate scientific data. However, the ESP SRW population has considerable research gaps and when the potential conservation consequences of waiting for confirmatory scientific evidence are so serious, it is better to take action immediately and apply the "precautionary principle" whilst collecting the necessary information.

## 2. LEGAL FRAMEWORK

### 2.1. International Conventions and Agreements

Right whales have been afforded formal international protection since the early 19th century, when the impacts of whaling on its populations worldwide were already widely recognized. Upon negotiation by the League of Nations of the 1931 Geneva Convention on the Regulation of Whaling, it was agreed that the killing of right whales would be prohibited. The Convention entered into force in 1935, but the turmoil caused by the II World War largely prevented its proper implementation. In 1946 the International Convention for the Regulation of Whaling (ICRW) was signed and protection for right whales upheld. The International Whaling Commission, formed by the parties to the ICRW in 1949, has since its inception reviewed the status of right whales worldwide and makes recommendations concerning their protection. Chile adhered to the Convention in 1946 but only ratified it in 1979 through Decree 489 of the Foreign Affairs Ministry.

Chile, Peru and Ecuador were founding parties to the Permanent Commission of the South Pacific (CPPS), now comprised also of Colombia. CPPS was formed in 1952 and among its initial activities established a whaling normative, *Regulations For Maritime Hunting Operations In The Waters Of The South Pacific*, with detailed measures aimed at ensuring the sustainability of whaling operations<sup>1</sup>; it established that “the hunting and treatment of grey or right whales shall be permitted only in cases where the meat and by-products of these whales are to be used exclusively for consumption by the local population”. Whales under 10.70 meters in length were not to be hunted under any circumstances. This normative has later been abandoned as the ICRW entered into force for Chile and Peru and finally when nations in the region abandoned whaling altogether.

In 1973, Chile adhered to the Convention on the International Trade in Endangered Species of Wild Fauna and Flora – CITES, and ratified it in 14 February 1975. Southern right whales are listed in its Appendix I (full prohibition of international trade).

Southern right whales are also listed in Appendix I (comprising migratory species threatened with extinction) of the Convention on Migratory Species – CMS, to which Chile has been a Party since 1983.

### 2.2. National Legislation and Management Arrangements

#### 2.2.1. Chile

The first time large cetaceans were awarded a certain degree of protection against indiscriminate killing under Chilean law was under the declaration of its Exclusive Economic Zone in 23 June 1947, aiming *inter alia* at putting an end to the abuses of the foreign whaling fleets which were decimating whale populations along the coasts of Chile.

The last three whaling stations in Chile operated as joint venture with Japanese companies since 1960's until 1984 when Chile finally suspended the hunting in its waters to comply with the global commercial whaling moratorium adopted by the International Whaling Commission.

In 2008, Chile has enacted a series of legal instruments consolidating a State policy for the protection and non-lethal use of cetaceans, including Decrees 179 and 230 from the Ministry of Economy which respectively prohibit whaling permanently and declare Chilean cetaceans - including the southern right whale -as Natural Monuments and finally the Law for the Protection of Cetaceans (Law 20.293) which bans any type of whaling operations in Chilean jurisdictional waters and set the legal frameworks of additional measures such as penalties, whale watching regulations, and marine protected areas for cetaceans among others.

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<sup>1</sup> <[http://untreaty.un.org/unts/1\\_60000/28/18/00054894.pdf](http://untreaty.un.org/unts/1_60000/28/18/00054894.pdf)>. Downloaded on 04 June 2011.

Whale species are a fundamental part of Chilean natural and cultural patrimony. Its conservation is a national responsibility and whales populations are considered relevant for marine conservation, science, education and also, as an economical touristic source for coastal communities. Sustainability is a key component of the National Strategy of Tourism and therefore it promotes a sustainable tourism to preserve whale species for future generations.

### 3. FROM WHALING TO CONSERVATION

#### 3.1. Historical catches

Right whales of the genus *Eubalaena* earned their common name due to their being considered the ‘right whale to kill’; relatively slow-moving, easy to approach, coming very close to shore during the mating and calving season and yielding a large amount of oil from its blubber. Small wonder then that right whales were the first species to be decimated by the thousands. In Europe, Basque whalers wiped out the Northern right whales (*Eubalaena glacialis*) from the Bay of Biscay and surroundings already between the 11th and the 16th centuries, moving to the North and South American shores afterwards, literally ‘mining’ the right whales in their breeding grounds until the targeted populations were either extinct, as the European ones, or brought to the brink of extinction.

Along South Atlantic shores, coastal whaling established by the Basques in 1602 for the southern right whale spread all the way from Salvador de Bahia to Imbituba, Brazil at approximately 27 degrees South (Palazzo *et al.*, 2007), and by the middle of the 18th century French, British and American whaling fleets were plundering the South Atlantic for the remnants of this population. The quest for sperm whales and their valuable spermaceti made whalers venture round Cape Horn in large numbers, already as early as the mid-18th century, and killing right whales on the way was commonplace (Richards, 1994). There is a paucity of solid data, however, related to the potential captures of right whales off Chile, which were likely very abundant at the time of European settlement and into the 19th Century according to historic reports<sup>2</sup>; it is known that British, French and American whalers - of which in 1792 approximately 40 whaling ships were recorded in Chilean waters (Pereira Salas, 1971) - killed large whales off Chile between the 18th and 19th centuries (Martinique, 1973); whaling grounds extended between approximately 30 and 50 degrees South, with most right whale catches concentrated near the coast (Clarke, 1965). Along the coast of Chile, approximately 2,372 right whales were taken by French whalers in the 19th century (DuPasquier, 1986).

Occasional whaling activities from Chilean nationals started in 1852, when Casa Lopez y Sartori from Valparaiso send a vessel to the Arctic and on the way back collected 800 barrels of whale oil and 50 from sperm oil. From 1867 onwards Chilean nationals entered commercial whaling, with at least 20 sailboats (D. Quiroz pers. comm.) and the Macaya family presided over a coastal whaling enterprise (Sepulveda, 1997) which also took Southern right besides blue and sperm whales. Several other whaling firms, employing second-hand foreign vessels mostly, would register in Chile at the end of the 19th century (Quiroz and Careño, 2010).

On the other side of the Pacific, Northern right whales were extirpated by Japanese whalers already in the 17th century, and newly discovered populations of Southern right whales were systematically destroyed by European settlers in New Zealand and Australia in the 18th and early 19th centuries.

Best (1987) estimated that approximately 14,600 right whales were killed by American fleets in the South Pacific between 1815 and 1909, but he did not allocated the catch to geographic regions and this number does not even take into account British, French and German whaling in the region nor struck and lost animals.

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<sup>2</sup> <[http://openlibrary.org/books/OL17774091M/Un\\_testigo\\_en\\_la\\_alborada\\_de\\_Chile\\_%281826-1829%29](http://openlibrary.org/books/OL17774091M/Un_testigo_en_la_alborada_de_Chile_%281826-1829%29)> Downloaded on 06 June 2011.

### **3.2. Hunting Right whales off eastern South Pacific in the 20th Century**

The establishment of the Macaya Brothers whaling firm in Chome (Bio Bio Region), which only closed its doors in the 1980's forced by the global whaling moratorium, was followed in a few decades by other enterprises aimed at 'mining' the large whales off Chile from coastal stations strategically positioned along the coast or using whaling vessels scouting the southern channels of Magellan. In 1904 Punta Arenas already had its first whaling company, Valdivia/San Carlos de Corral hosted their first ones in 1906, and Ancud/Isla San Pedro, Chiloe Island, in 1908 (D. Quiroz, pers. comm.).

Most likely, these whaling operations had very little regard for discriminating among species, and whenever encountered right whales should have fallen prey to them. Records kept by the International Bureau of Whaling Statistics between 1909 and 1983 show catches in Chilean waters of 45,194 whales, of which 209 were right whales, including 32 killed after the first international bans on the species were established. In the 1934-35 season alone, 43 right whales were reported killed off Chile.

One particular case of misreporting and under-reporting, however, sheds some light on the fate of Southern Hemisphere whales impacted by commercial whaling was the deliberate catch of southern right whales and other protected species by the fleets of the Union of Soviet Socialist Republics (USSR) in the 1960's and 70's. The breakup of the former Soviet Union allowed for the discovery of extensive under-reporting in its whaling records. Southern Hemisphere whale populations, of supposedly protected species, were particularly impacted. It is estimated that illegal Soviet operations between 1951 and 1971 killed at least 3,349 Southern right whales. No known Soviet pelagic catches of right whales were reported from Chilean and Peruvian waters during this period (Tormosov *et al.*, 1998).

### **3.3. A Sea Change: Whales as a Non-Lethal Use Asset for Chile**

The Chilean transition from whaling to whale conservation nation was strongly influenced by the input of civil society towards the consolidation of a sovereign State policy based on the best national interests. Among such interests the *non-lethal use of whale resources* stands out as a major incentive for sustaining such a policy over time.

Recent studies indicate that whale watching revenues total more than US\$ 2.1 billion annually, benefitting coastal communities in 119 countries and territories (O'Connor *et al.*, 2009). In Latin America, country-by-country studies indicate that the region already earns revenues totaling approximately US\$ 278 million/year and Chile, one of the countries in the region with the fastest recent growth (19.5% between 1998 and 2006) and strongest potential for further development of the activity, already earns around US\$ 2,450,000 annually (Hoyt and Iniguez, 2008).

There is great potential for watching several cetacean species along the Chilean coast, and southern right whales, as the population recovers, are among those. However, because of the very small size of the surviving population, particular care should be taken so as not to add tourism as a potential source of disturbance or harassment.

## **4. GOVERNANCE**

### **4.1. Coordination of a CMP**

In order to be effective, experience suggests that CMPs must have a recognized, full-time co-ordinator. This is particularly true for an international initiative such as this where effective conservation requires action (including legislative action) by a number of stakeholders including: intergovernmental and national authorities; representatives from industry; local communities; NGOs; and scientists from several disciplines. At least initially, it is not sufficient for such a Plan to be run part-time. Ideally, the Co-ordinator should have a scientific and management background and be an effective communicator to the various stakeholders. The importance of actively involving stakeholders, especially those whose livelihoods may be affected (e.g. fishermen, whalewatchers), cannot be overemphasised.

The Co-ordinator should report to a Steering Committee appointed with close collaboration between appropriate authorities (see also Action COORD-01).

*Inter alia*, the Co-ordinator/Steering Committee should:

- promote and coordinate the implementation of the CMP (including investigating funding) with particular attention paid to direct stakeholders;
- gather information on its implementation, results obtained, objectives reached, and difficulties encountered;
- communicate this information to the general public through regular reporting in an accessible format;
- appoint a group of experts to evaluate the effectiveness of the Conservation Plan every three-five years (see below) and to update it. The conclusions of this group should be made public.

Finally, it has to be stressed that the CMP will not be effective without sufficient funding. At the very least, sufficient funds must be made available for the appointment of a co-ordinator and the functioning of the Steering Group at the earliest opportunity.

#### **4.2. Timeline for a CMP**

No CMP should be regarded as a definitive and unalterable document. It is rather a document that covers a temporal phase within the framework of the efforts for the conservation of a species, and therefore needs to be reviewed periodically to adjust the actions to the diverse changes that can occur, either in response to the results of the monitoring of the CMP actions themselves or to changing external factors.

It is proposed that this CMP is reviewed annually and updated as needed but that a more thorough review is conducted every three-five years.

The most important *initial stages (within 1 year of approval of this CMP)* are:

- (1) appointment of a Steering Group and co-ordinator;
- (2) full development of the actions outlined below, including all aspects of funding and, as appropriate, contracts to undertake actions.

### **5. SCIENCE**

#### **5.1. Biology, Status and Environmental Parameters**

##### **5.1.1. Population structure**

The IWC has identified several calving grounds for southern right whales in the Southern Hemisphere (IWC, 2001). In particular, along the east coast of South America, important calving grounds have been identified off Brazil (8-32°S) and Argentina (42-43°S). It is not known if the Uruguayan coast was an historical reproductive ground that is now being repopulated (Piedra *et al.*, 2006).

Eastern South Pacific population of southern right whales is found along the coast of Chile and Peru. Reported sightings from the Magellan Straits and Beagle Channel are likely to correspond to individuals from the Southwest Atlantic population (Goodall and Galeazzi, 1986; Gibbons *et al.*, 2006; Belgrano *et al.*, 2008.).

Although more data are needed, particularly from photo-identification and genetics analyses, the population off the west coast of Chile and Peru may be considered one population, classified Critically Endangered, while the individuals in Magellan Straits and Beagle Channel may be considered individuals of the Southwest Atlantic population.

**Information Gaps:** There is no genetic information on population structure and matching of available individual photo-identifications from Centro de Conservacion Cetacea Chile with catalogue from Instituto de Conservacion de Ballenas, Argentina has not been completed yet.

### 5.1.2. Distribution, migration and movements

Southern right whale distribution in the eastern South Pacific is primarily unknown due to the small population size and limited number of sightings.

Main aggregation areas are likely found in northern Chile (23°S to 25°S) and in central and southern Chile (33°S to 42°S) (Galletti Vernazzani *et al.*, 2008, 2011). In general, observations north of 20°S are infrequent, however in recent years three sightings have been reported off the coast of Peru. This could suggest that the range of southern right whales is expanding (Van Waerebek *et al.*, 1992) or a result of increased interest and effort in Peru. The northernmost reported sighting is from 15°08' S in Bahia San Fernando, Peru (Santillan *et al.*, 2004).

As in the western part of South America, it is probable that there are two major calving areas within the range of the Chile/Peru population; somewhere in northern (15-25°S) and central/southern (33-42°S) areas. Additionally, based on movements of cow-calf pairs, all coastal waters appear to be used as migratory corridors (Galletti Vernazzani *et al.*, 2008, 2011).

**Information Gaps:** There is an urgent need to identify a calving ground for this population to start monitoring the population systematically.

### 5.1.3. Basic biology

*E. australis* make long annual migrations between mid-latitude coastal winter nursery grounds and high-latitude offshore summer feeding grounds where they feed primarily on euphausiids (krill) and copepods.

The IWC has identified five feeding areas (IWC, 2001). Based on geographical considerations, it has been proposed that southern right whales off Chile may feed in Antarctic Peninsula (Aguayo *et al.*, 1992).

Major wintering grounds have been identified off South America, Australia, New Zealand and South Africa. Southern right whales show maternally inherited site fidelity to near-shore winter nursery grounds and based on female right whales calving at Peninsula Valdés, Argentina, the maternally directed site fidelity is also to feeding grounds (Valenzuela *et al.*, 2009).

Calving intervals are most frequently every three years (Burnell, 2001; Best *et al.*, 2001; Cooke *et al.*, 2001). 27 calves were reported from 1975 to 2010 and assuming a three or four year calving intervals, the Chile-Peru population is likely to have at least eight mature females (Galletti Vernazzani *et al.*, 2011). Cows reach sexual maturity around nine years (Best *et al.*, 2001; Cooke *et al.*, 2001) and gestation and weaning take approximately one year each (Kenney, 2002).

Deleterious impacts of inbreeding depression are potentially the greatest among small populations. The IWC has recognized inbreeding depression as a factor potentially affecting the recovery of right whales and that the threats may only exist for some of the smaller breeding populations such as those off New Zealand and Chile/Peru (IWC, 2001).

**Information Gaps:** No data on calving intervals, reproduction or survivorship are available for this population, nor feeding or breeding ecology.

### 5.1.4. Abundance and trends

Aguayo *et al.* (2008) compiled 124 southern right whale sighting from 1976 to 2008 but these include animals from Magellan Straits - considered to belong to southwest Atlantic population - and Antarctic Peninsula. Furthermore,

there is concern about the accuracy of species identifications in the database since sightings reports often come from non-specialists without photographs and even some reports are inconsistent with right whale behaviour/ecology (IWC 2011a).

Using a filtered database and based on 79 southern right whales sightings reported from 1975 to 2010, the Chile-Peru population does not show any trend of increase in numbers of sightings nor individuals, however a small increase in number of calves has been detected by simple linear regression (Galletti Vernazzani *et al.*, 2011). In 2008, same analyses did not show any trend of increase (Galletti Vernazzani *et al.*, 2008) and therefore it is probable that the population is starting to move out of the bottleneck population level.

Although there is no abundance estimates for this population, based on limited sighting data, it is possible that the current population size is below 50 mature individuals (Reily *et al.*, 2008).

**Information Gaps:** Systematic collection of individual identification photographs and genetic samples are needed to estimate population size and continual monitoring through years to obtain trend in abundance.

## 5.2. Attributes of the Population to be Monitored

Little is known for the ESP SRW population and most data comes from opportunistic sightings contributed by sighting network members during last decade. Few systematic efforts to survey areas of historical catches or presumed sightings have been conducted with little or no results.

It is critical to start systematic efforts through time to document all sightings and photo-identify all individuals reported. The primary ‘attributes’ (*i.e.* quantifiable characteristics) of the population that need to be monitored are **abundance** (number of individuals in the population), **whale distribution** as a population attribute that may reflect range contraction or expansion, **calving interval** to assess reproductive rates, and **overall trends in abundance** (whether the population is growing, declining or constant).

It is also important to conduct a power analysis to determine the scale of photo-identification effort, in terms of both days in the field and time interval between surveys, needed to detect any alarming change in abundance, calf production or trend for this population. According to the results of that analysis, it will be important as the next step to establish a reliable funding base and scientific capacity to assure monitoring at the required level into the future.

## 6. THREATS, MITIGATION MEASURES AND MONITORING

During the SRW CMP workshop, it was agreed that this CMP will intend to address mainly short term, immediate threats to small populations. This is not to say that other issues should not be identified in the CMP but that these will not form the focus for action of the CMP. Such issues might include oil spills, inbreeding depression and climate change.

### 6.1. Identification of Threats

Eastern south Pacific southern right whales face a number of both direct and indirect threats throughout their range (Table 1). Direct threats include entrapment and entanglement in fishing gear and collisions with vessels (vessel strikes). Deliberate killing has been reported in one occasion in 1980’s (Aguayo *et al.*, 1992) and is considered no longer a threat. Indirect threats include harassment, noise in breeding areas and on migratory routes, habitat degradation, physical disturbance and contamination of prey populations, and physical modification of the coastal zone.

Priority for Actions is determined based on a risk assessment matrix that considers likelihood and possible impact (Figure 2).

Likelihood ↑	Very likely	Medium 2	High 3	Extreme 5
	Likely	Low 1	Medium 2	High 3
	Unlikely	Low 1	Low 1	Medium 2
	What is the chance it will happen?	Minor	Moderate	Major
		Impact →		

Figure 2 – Risk Assessment Matrix

### 6.1.1. Entanglement and vessel strikes

Due in part to its biological imperatives of concentrating during the mating/calving season along coastal areas, right whales are particularly vulnerable to negative physical interactions with man-made devices, and have been subject to entanglement in fishing gear and collisions with ships, to the extent that the survival of at least one species, the North Atlantic right whale (*Eubalaena glacialis*), may be impaired by these events (Knowlton and Kraus, 2001). In the Southern Hemisphere, entanglements and ship strikes of several Southern right whales were recorded in Brazil (Pontalti and Danielski, 2011; Greig *et al.*, 2001) and South Africa (Best *et al.*, 2001). Although in these countries the population recovery rate is likely satisfactory enough to overcome the impact of these events, the Chilean right whale population is probably smaller than the western gray whale (Brownell *et al.*, 2010). Any anthropogenic removal would be very detrimental to the population and therefore potential impact from entanglement/vessel strike at population level is **major**.

In Chile, a calf that bore both net marks (apparently from entanglement) and small-boat propeller stranded in central-southern Chile (37°S) in 1986 (Canto *et al.*, 1991). On July 2009, a dead southern right whale, probably from the southwest Atlantic Population, was photographed floating at sea in Punta Delgada, Strait of Magellan showing evenly spaced abrasions/gouges in the blubber. Possible reasons where attributed either the whale was hit by a ship or the wounds were deep line abrasions from entanglement (MFA, 2010).

During the IWC southern right whale assessment workshop in 2011, it was noted that two mortality events related to ship strike and/or entanglement in Chile was very high compared to mortality events from South Africa and other regions where the populations are much larger than the ESP (IWC, 2011a).

Although in southern Chile tourism ship traffic might be of highest concern, in particular because some routes overlap with potential habitat for the population of right whales such as in the Straits of Magellan population (Goodall and Galeazzi, 1986; Gibbons *et al.*, 2006; Belgrano *et al.*, 2008.), the likely breeding grounds further north are subject to intense and intensifying large ship traffic, both from the existing major harbors of Valparaiso (33°S-71°W) and Talcahuano (37°S-73°W), which directly intersect with known past or recent records of right whales.

Given the **strong** likelihood for these threats to occur and its serious impact at population level, priority for action are **EXTREME** in both cases.

### 6.1.2. Harassment in breeding areas

There are three recorded cases in Chile of mother/calf pairs being harassed by opportunistic whale watching by private marine vessels off Arauco Gulf in 1986 (Canto *et al.*, 1991), Quintay (CCC, 2008) and Laguna Verde in 2008 (BGV pers. obs.). The first event resulted in the death of the calf while in the second, a contingency plan was implemented by the Chilean Navy and National Fisheries Service to afford maximum protection to the cow-calf

pair. Navy personnel were assigned to monitor that no one disturbed the animals. Only land-based whale watching was allowed and no fishing operations were conducted in the area used by the mother and calf during the period of their stay (two weeks). In the third case, it was not necessary to implement the contingency plan since the pair stayed less than half a day in that area.

Unregulated approaches to mothers and calves may seriously disrupt nursing behavior and result in impacts such as displacement of mother-calf pairs (Salden, 1998) and increases in swim speed (Scheidat *et al.*, 2004), thereby altering the energetic expenditure of the animals, these being of critical importance on such a small surviving population. It has been proposed to allow land-based whale watching to the species (Cabrera and Galletti Vernazzani, 2006) and national whale watching regulations that will soon be adopted by the Ministry of Economy includes these special considerations for southern right whales other than the ones found in the waters of Magellan Straits.

Given the **strong** likelihood for this threat to occur and its **major** impact at population level in case it resulted in another death of individual or **moderate** impact in case of energetic disturbance, priority for action is **EXTREME to HIGH**.

### 6.1.3. Noise in breeding areas and migratory routes

Over the last few decades, background noise in the world's oceans have increased enormously, in particular due to increased ship traffic and the expansion of seismic surveys for oil and gas (Delory and Potter, 1998). This has led, in some areas, to a detectable impact on whale communication, to the extent that some species have increased the level and frequency of their vocalizations (Parks *at al.*, 2007), such as happened with the North Atlantic right whale.

In coastal areas, although noise emitted locally can be muffled somewhat in the shallower depths it can still have a severe localized impact in increasing background noise, thereby increasing the risk of disruption in cetacean communication.

Of particular concern for the ESP southern right whales is the increase in traffic noise and prospect of developing large scale coastal energy projects. In this regard, increasing concerns on impacts on cetaceans from coastal wind farms and associated ports have been raised by Scientific Committee of IWC (IWC, 2011b).

The increase in ship traffic due to the expansion both of coastal development and international trade also increases pollution of ESP waters by anthropogenic noise. This is of particular concern as southern right whale migration routes and potential calving areas may be heavily impacted by noise from the port operations in Valparaiso, Talcahuano and Antofagasta. Chilean ship traffic has steadily increased over recent years; container port traffic in 2008 reached 3,123,012.00 TEUs (twenty-foot equivalent units, or a standard-sized container)<sup>3</sup>. Recent traffic statistics from selected ports show that Arica handled around 1.5 million tons of cargo in 2007; Iquique, 2.58 million tons; Valparaiso, 9.7 million tons; and Antofagasta, 2.44 million tons<sup>4</sup>. Several such installations have plans for operational expansion, thereby increasing potential impacts both on noise generation and ship strike probability as mentioned under 5.1.

Given the **strong** likelihood for this threat to occur and its **moderate** impact at population level, priority for action is **HIGH**.

### 6.1.4. Habitat degradation and physical modification of coastal zones

Right whales are closely dependent of coastal/inshore zones for their breeding. It is not known to which extent coastal features may affect breeding right whale distribution, other than in some regions they seem to prefer particular embayments for calving (Rowntree *et al.*, 2001). Modification of coastal features such as man-made

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<sup>3</sup> <<http://www.tradingeconomics.com/chile/container-port-traffic-teu-20-foot-equivalent-units-wb-data.html>> Downloaded on **30 June 2011**

<sup>4</sup> <<http://www.worldportsource.com/ports/index/CHL.php>> Downloaded on **30 June 2011**

structures extending out to sea – in particular those that may affect water and sediment dynamics - in areas of potentially vital coastal breeding habitat may result in changes in whale distribution or perhaps abandonment of breeding habitat.

To better assess specific impacts, habitat degradation refers here to water pollution and quality degradation and has been analyzed separately from physical modification of coastal zones that refers to physical occupation of habitat.

Oil spills from extraction, transport and storage operations are known to produce severe impacts on the marine biota (O'Rourke and Connolly, 2003). If caught in such disastrous events, large whales are known to be negatively impacted. Recently the Gulf of Mexico oil spill is shown to have direct detrimental effect on cetacean species (IWC, 2011b). In Chile, recorded spill events in known right whale habitat such as San Vicente/Talcahuano, Valparaiso/San Antonio and Antofagasta have occurred. Expansion of activities in these and other areas may represent a further risk to the survival of the species as it recovers. The likelihood that these events occur is therefore **moderate**. However, Chile has no oil extraction activities, except in Magellan Straits, and therefore the impact of oil spills from transport and storage are localized and its impact to population level is considered to be **minor**. Priority for action is therefore **LOW**.

In Chile, aquaculture experienced a fast growth since 1980's, particularly the country has become a leading producer of salmon farming, concentrating most of its production in southern Chile fjords. Excessive use of antibiotics and copper antifouling, considered an environmental toxin, has been reported (Cabello, 2005; Bravo *et al.*, 2005; Willoughby, 1999). In addition, organic residuals from aquaculture and waste waters from urban centers have been associated to toxic algal bloom (Cabello 2004, 2005).

In southern Chilean fjords, tattoos and tattoo-like lesions have been reported in bottlenose dolphins, *Tursiops truncatus*, and Chilean dolphins, *Cephalorhynchus eutropia* (Viddi *et al.*, 2005) and blue whales, *Balaenoptera musculus* (Brownell *et al.*, 2008). Van Bresseem *et al.* (2003a) suggested that tattoo disease in small cetaceans is a potential indicator of a degraded or stressful environment and if tattoo-like skin disease is a cetacean poxvirus, it could have conservation implications. It has been hypothesized that in small cetaceans this infection may kill neonates that do not have protective immunity (Van Bresseem, Van Waerebeek and Raga, 1999). Based on studies of resident bottlenose dolphins with tattoo skin disease in the Sado Estuary, Portugal, it has been shown that the disease prevalence was significantly higher in immatures than in adults and that the population in this area is declining (Van Bresseem *et al.*, 2003b).

Given the **strong** likelihood that aquaculture activities occurs and that **moderate** impacts at population level may be driven by pollution of the surrounding waters by an array of chemicals, priority action is **HIGH**.

On the other hand, waste waters from urban centers, mining activities and other industrial activities, particularly in northern and central Chile, may pollute coastal waters. Considering the relative distance between discharged points, the likelihood is considered **moderate** and the effect at population level **moderate**, therefore priority action is **MEDIUM**.

No recent sightings have been documented in San Jorge Bay, near Antofagasta, an area were several sightings occurred during 1980's. Today, the Bay is being used for aquaculture of scallops (Galletti Vernazzani *et al.*, 2008). The occupation of some areas by extensive mariculture & aquaculture enterprises (e.g. salmon farming) is a cause for concern, not only due to the physical occupation of habitat and hence the increase in the possibility of interactions, but also for the pollution that was already referred previously. Physical occupation of coastal areas from these enterprises as well as coastal developments entering to sea has a **strong** likelihood and its impact at population level due to habitat loss may be **moderate**, therefore priority action is **HIGH**.

#### 6.1.5. Climate change and prey depletion

There are many dimensions in which human-induced climate change, now an established fact and a serious concern shared by the vast majority of expert scientists (Pachauri and Reisinger, 2007) is likely impacting the ecology of cetaceans and the characteristics of their environment. Right whales, however, have been proven to be particularly sensitive to climate oscillations. Studies conducted in the South Atlantic indicate that southern right whale breeding

success is affected by climate changes expressed in e.g., sea surface temperature (SST), and even quite small changes in oceanographic conditions in the Southern Ocean could affect right whale population dynamics (Leaper *et al.*, 2006). High-SST have been correlated with periods of low krill abundance (Trathan *et al.*, 2003). Matrilineal site fidelity to feeding grounds may limit the exploration of new feeding opportunities (Valenzuela *et al.*, 2009), and therefore it raises concern a significant impact on krill abundance (Atkinson *et al.*, 2004.).

In addition, increasing krill fisheries in Southern Ocean has been highlighted as an additional cause of concern (IWC, 2011a).

The likelihood of prey depletion occurs is **moderate** but its impact at population level is **major**, therefore priority action is **HIGH**.

6.1.6. Summary of threats and impacts

Actual/ Potential Threat	Cause or related activity	Likelihood	Possible Impact population (at level)	Priority for Action	Relevant Actions	Party Responsible
<b>Direct lethal threats</b>						
Entanglement	gillnet, aquaculture gear, trap fishing, coastal fishing gear	Very Likely	Major	Extreme	RES-01to 05 MON-01&02 PACB-01&02 MIT-01&04	Sernapesca, research institutions, NGOs
Ship Strikes	shipping in general	Very Likely	Major	Extreme	RES-01to 05 MON-01&02 PACB-01 MIT-02,04&07	Ministry of Foreign Affairs, Directemar, NGOs
<b>Sub-lethal threats</b>						
Harassment	opportunistic whale watching, recreational boats	Very Likely	Major to Moderate	Extreme to High	RES-01to 05 MON-01&02 PACB-01&03 MIT-03&04	Directemar, Sernapesca, Subsecretaria de Turismo, NGOs
Noise	marine ship traffic, Construction, seismic survey, wind turbines, military exercises	Very Likely	Moderate	High	RES-01to 05 MON-01&02 MIT-05	Directemar, Subsecretaria de Pesca, research institutions, NGOs
Habitat degradation	oil spills	Likely	Minor	Low		
	aquacultue	Very Likely	Moderate	High	RES-01to 05 MON-01&02 MIT-05&06	Subsecretaría de Pesca, research institutions, NGOs
	waste water	Likely	Moderate	Medium	RES-01to 05 MON-01&02 MIT-05&06	Subsecretaría de Pesca, research institutions, NGOs

Physical modification of coastal zone	aquaculture, ports, other coastal developments	Very Likely	Moderate	High	RES-01to 05 MON-01&02 PACB-01 MIT-04&05	Subsecretaría de Pesca, Sernapesca, Directemar, research institutions, NGOs
Prey depletion	climate change, overfishing of krill, habitat degradation due to pollution	Likely	Major	High	MON-02 MIT-07	Ministry of Foreign Affairs, NGO's

Table 1 – Summary of threats and impacts

## 6.2. Mitigation Measures and Monitoring

Threats that are considered at this stage to be of medium to extreme priority and where mitigation measures can be identified are included. This only excludes oil spills which priority for actions was considered low.

At this stage, research priorities should be focused on the collection of sufficient scientific information to accurately assess the status of the population as a baseline for the future monitoring of the species and the effectiveness of the conservation management plan. In this sense all research actions (Res01-05) and monitoring action (MON01-02) are essential for almost all mitigations measures, except under the threat of prey depletion, and therefore will not be listed below unless specific aspects are related to threats.

### 6.2.1. Entanglement

One of the first priorities should be to develop a GIS database that map areas with different sighting rates of the southern right whales along with current and potential threats (RES-04). Include the species in monitoring program to better assess the extent of this threat should also be considered, either by investigating carcasses or examining photographs of live animals.

GIS database will help to identify areas with risk for the conservation of the species and provide useful management advice on where mitigation measures should be applied.

Mitigating large whale mortality from entanglements is most efficiently implemented by establishing 'disentanglement networks' such as those in Australia, Canada, Mexico, New Zealand, South Africa, United Kingdom and United States of America. The establishment of emergency disentanglement teams' needs to be pursuit (MIT-01) and capacity building workshops conducted (PACB-01 and PACB-02).

If breeding areas are identified (RES-05), establishment of protected areas (MIT-04) should be considered.

### 6.2.2. Ship strikes

As suggested in 6.1.1, there is some overlap between high-volume vessel traffic from major harbors and areas when sightings of southern right whales occur. Similarly to previous threat, one of the first priorities should be to develop a GIS database that map areas with different sighting rates of the southern right whales along with current and potential threats (RES-04). Improve the state of knowledge on the overlap there and elsewhere is needed in order to implement mitigation measures in the highest-risk areas.

The most effective mitigation measures will be the proper regulation to reduce ship strikes in areas of high concentration of whales, either by changing vessel routing or by reducing vessel speeds when such avoidance is impractical (MIT02). If breeding areas are identified (RES-05), establishment of protected areas (MIT-04) should be considered.

To ensure compliance with regulations, it will be needed to adopt a warning system in sensitive areas and create awareness among vessel crews (PACB-01).

Monitoring (MON01-02) should be an essential part for this threat as well as improve reporting to relevant databases on ship strikes in intergovernmental organizations such as IMO and IWC (MIT-07) in order to improve knowledge on this threat.

### **6.2.3. Harassment**

As explained in 6.1.2, harassment is a major concern but is one of the few threats that may be address in the short term since it is related to a protection at an individual level, whenever an animal approach the coast.

In this sense, the most efficient mitigation measure is to develop and implement a contingency plan to afford maximum protection when a sighting is recorded (MIT-03). To improve effectiveness of this measure, it would be necessary to conduct public awareness on its critically endangered status in coastal communities, fishermen, sailboats, etc. (PACB-01) in order to avoid harassment. This can also be accompanied by capacity building on species identification and sighting reporting and documentation in order to involve people along coast in the collection of sighting records and the immediate reporting that will improve research effectiveness (PACB-03).

If breeding areas are identified (RES-05), establishment of protected areas (MIT-04) should be considered.

### **6.2.4. Noise**

Most concerns arise from overlap of major harbours that overlap sightings of southern right whales. In addition, new planned developments of large scale projects, including coastal and marine arrays of renewable energy, should be considered.

One of the first priorities should be to develop a GIS database that map areas with different sighting rates of the southern right whales along with current and potential threats (RES-04).

As immediate action, inclusion of southern right whale conservation considerations and mitigation measures in the environmental impact evaluation and permitting system for large-scale coastal/marine projects should be enforced (MIT-05).

### **6.2.5. Aquaculture & water waste**

Habitat degradation, particularly water pollution, is a cause of concerns for this population. Although aquaculture has high priority of action while water waste has been considered of medium priority of action, both have similar proposed mitigation strategies.

As immediate action, inclusion of southern right whale conservation considerations and mitigation measures in the environmental impact evaluation and permitting system for large-scale coastal/marine projects should be enforced (MIT-05). In addition, develop regulations to minimize water pollution (MIT-6) and continual monitoring of water quality (MON-02) should be considered.

### **6.2.6. Physical modification of coastal zone**

Physical occupation of habitat, or habitat loss, and hence the increase in the possibility of interactions, are a cause of concern in areas known to be used by southern right whales.

One of the first priorities should be to develop a GIS database that map areas with different sighting rates of the southern right whales along with current and potential coastal and marine developments (RES-04).

In addition, inclusion of southern right whale conservation considerations and mitigation measures in the environmental impact evaluation and permitting system for large-scale coastal/marine projects should be enforced (MIT-05).

### 6.2.7. Prey depletion

Although climate change can't be address in the short term, krill fisheries may be regulated in Southern Ocean within CCAMLR. Therefore mitigation measure should be coordinate actions with this intergovernmental organization to ensure sustainability of this fishery (MIT-07).

## 7. ACTIONS

### 7.1. Summary and Implementation of Actions

#### Co-ordination actions

<i>ID</i>	<i>Action</i>	<i>Importance</i>	<i>Feasibility</i>	<i>Responsible</i>
COORD-01	Implementation of the Conservation and Management Plan: Establishment of a Co-ordinator and Steering Committee	Essential	High	All
COORD-02	Development of a Web-based exchange of scientific information	High	High	Research institutions, NGOs

#### Public awareness and capacity building actions

<i>ID</i>	<i>Action</i>	<i>Importance</i>	<i>Feasibility</i>	<i>Responsible</i>
<i>PACB-01</i>	Development of a strategy to increase public awareness and build capacity in range states	High	High	Subsecretaria de Turismo, Directemar, Sernapesca, NGOs
<i>PACB-02</i>	Promote the establishment of a disentanglement team and workshops	Medium	High	Sernapesca, Directemar, NGOs, research institutions
<i>PACB-03</i>	Create capacities in coastal communities on species identification and sightings reporting and documentation	High	High	Directemar, NGOs

### Research actions

<i>ID</i>	<i>Action</i>	<i>Importance</i>	<i>Feasibility</i>	<i>Responsible</i>
RES-01	Development of a web-based platform to report southern right whale sightings	High	High	Directemar, NGOs, research institutions
RES-02	Increase documentation of sightings and photo-identification of individuals	High	Medium-High	NGOs, research institutions
RES-03	Start collection of genetic samples	High	Medium-High	Subsecretaría de Pesca, NGOs, research institutions
RES-04	Develop a GIS database and identify areas where southern right whales & potential threats overlap	Medium-High	To be evaluated	NGOs, research institutions
RES-05	Identify breeding area(s) for southern right whales	High	Medium	NGOs, research institutions

### Monitoring actions

<i>ID</i>	<i>Action</i>	<i>Importance</i>	<i>Feasibility</i>	<i>Responsible</i>
MON-01	Ensure long-term monitoring of distribution, abundance and trends of southern right whales	High	High	Directemar, Sernapesca, NGOs, research institutions
MON-02	Ensure long-term monitoring of potential threats & effectiveness of mitigation measures	High	High	Sernapesca, NGOs, research institutions

### Mitigation measures actions

<i>ID</i>	<i>Action</i>	<i>Importance</i>	<i>Feasibility</i>	<i>Responsible</i>
MIT-01	Release entangled whales and prevent entanglements	High	Medium	Sernapesca, NGOs, research institutions
MIT-02	Adopt a warning system and the proper regulation to reduce ship strikes in areas of high concentration of SRW	High	Medium	Directemar
MIT-03	Develop and implement contingency plan to afford maximum protection when a sighting is recorded	High	High	Directemar, Sernapesca, NGOs
MIT-04	Designation of areas for protection of the species	Medium-High	To be evaluated	Subsecretaria de Pesca, Subsecretaria de Turismo
MIT-05	Inclusion of Right Whale Conservation Considerations and Mitigation Measures in the Environmental Impact Evaluation and Permitting System for Large-Scale Coastal/Marine Projects	High	High	Subsecretaria de Pesca Companies, Servicio de Evaluación Ambiental
MIT-06	Minimize water pollution and habitat loss	High	Medium	Directemar, NGOs, research institutions
MIT-07	Coordinate actions with intergovernmental organizations such as CCAMLR, IMO, IWC, etc. to address specific threats.	Medium-High	To be evaluated	Ministry of Foreign Affairs, DIRECTEMAR

## 7.2. Stakeholder Engagement, Public Awareness and Education

Considering that ESP SRW range extends more than 4,000km of coastline, sightings are difficult to document. Since *E. australis* is a coastal species at their wintering breeding grounds, it is important to strengthen public participation in the reporting of sightings.

Sighting networks have already shown to be a cost-effective tool and to play a key role in increasing sighting records of the species (Cabrera *et al.*, 2007). During the 1980's a sighting network was established and coordinated by CODEFF and in 2000's, Centro de Conservacion Cetacea established the National Marine Mammal Sighting Network to promote the active involvement of a variety of stakeholders in the collection of sighting data of the species in Chilean waters and to create awareness about their conservation needs. Afterwards, the Law for the Protection of Cetaceans (Law 20.293 of 2008), includes national whale watching regulations that have special considerations for southern right whales. This regulation also institutionalizes a Cetacean Sighting Network under management of the Chilean Navy. Most sighting records have been reported while sighting networks have been in place and therefore it is critical to strengthen sighting network (RES-01) to ensure conservation goals for this population are achieved.

Providing range state, groups, organizations, governments and societies with suitable access to information and knowledge about the status of southern right whales in the eastern South Pacific is essential for meeting the conservation objectives detailed herein. This outreach could be effectively undertaken by the use of the mass media and social networks, including: internet, newspaper, radio and television. Other activities, including public lectures, forums, education programmes for teachers and students of all ages, and dissemination of information in written form would also be an effective means of increasing public awareness (PACB-01). Capacity building, while similar to public outreach, differs somewhat in that the overarching objective is to foster the procurement of skills and abilities of key individuals and organizations within each of the range states. An example of capacity building would be the training of coastal communities, maritime authorities, etc. to release southern right whales from entanglement or to train in species identification and sighting documentation (MIT-02, PACB-02 and PACB-03). The strengthening of sighting networks and transfer of necessary skills are the initial step in this process.

### **7.3. Reporting Process**

It will be the responsibility of the appointed Co-ordinator and Steering Group to provide annual progress reports on work undertaken as part of the CMP to the IWC, through its Scientific and Conservation Committees. A major review of work, including the possibility of updating the CMP should occur every four-six years (depending on the timetable of actions within the plan).

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