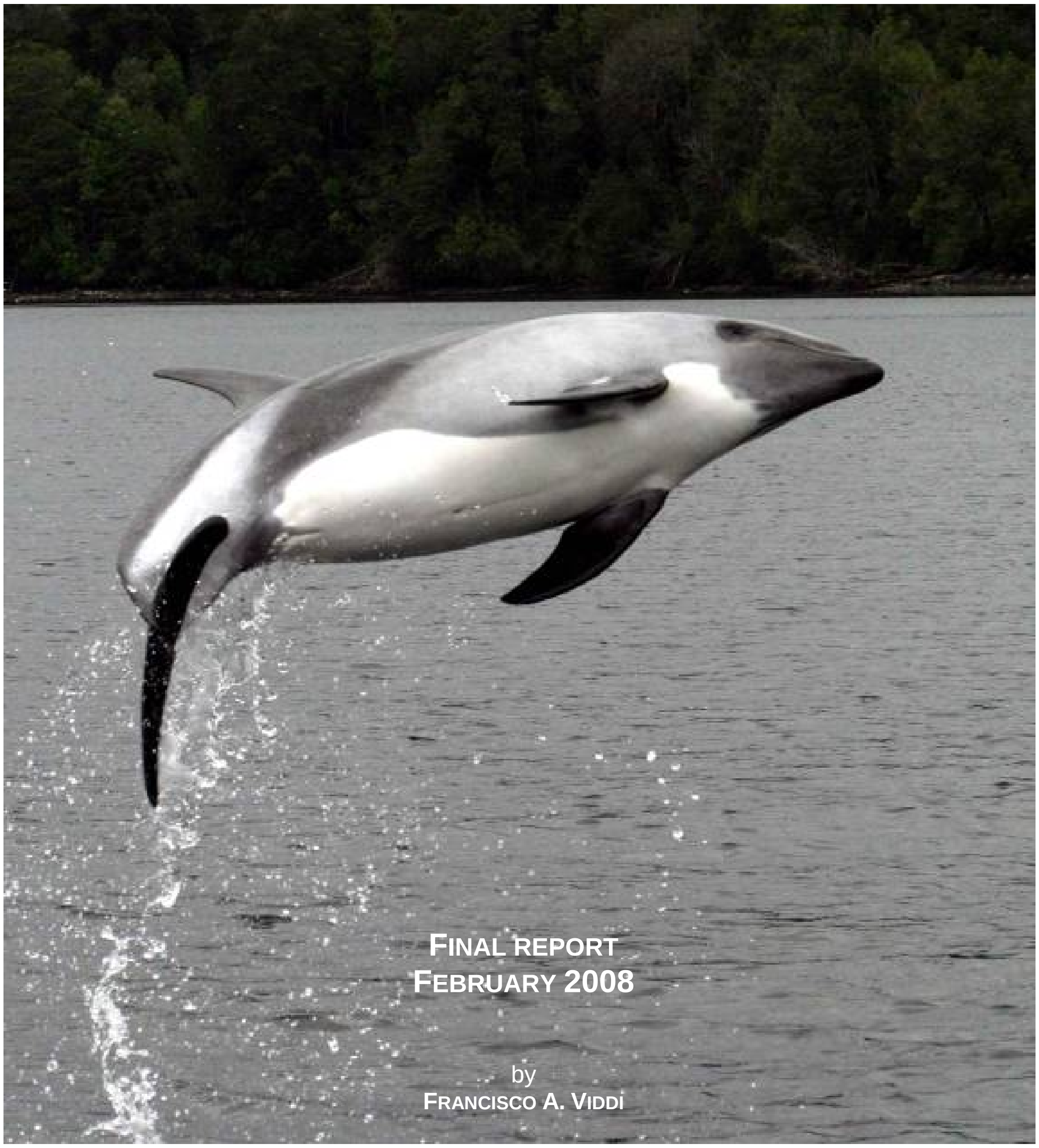
THE KEPENKLU PROJECT:
BEHAVIOURAL ECOLOGY AND CONSERVATION OF SMALL CETACEANS IN THE NORTHERN PATAGONIAN FJORDS, CHILE



FINAL REPORT
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by
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1. INTRODUCTION

Southern Chile is home to a great part of the 41 species found in the country; in fact, 25 species have been documented between 40°30'S and 47°S. From this, it is possible to find emblematic and endemic species such as Chilean dolphins (*Cephalorhynchus eutropia*), the smallest and the only endemic cetacean in Chile; and Peale's dolphins (*Lagenorhynchus australis*), a dolphin found only in Argentina and Chile.

The Chilean dolphin is a coastal species, inhabiting sheltered bays, channels, fjords and exposed coast with a distribution from Valparaiso (33° S) to Navarino Island, Cape Horn (55° S) (Aguayo-Lobo *et al.*, 1998). Peale's dolphin is another little known cetacean restricted to the coastal waters of southern South America. It has been reported from Golfo San Matías, Argentina (38° S), around the tip of South America, including the Falkland Islands, to Valparaiso, Chile (33° S) (Aguayo-Lobo *et al.,* 1998). Peale's dolphin is the most coastal and hence most easily observed of the three species of the genus *Lagenorhynchus* inhabiting the Southern Hemisphere, and also has the most restricted distribution.

Other common small cetacean species observed on a regular basis in the region are Burmeister's porpoises (*Phocoena spinipinnis*), bottlenose dolphins (*Tursiops truncatus*), orcas (*Orcinus orca*), false orcas (*Pseudorca crassidens*), and dusky dolphins (*Lagenorhynchus obscurus*).

Burmeister's porpoises is considered by some authors as one of the most common small cetaceans restricted to temperate waters of the Atlantic and Pacific coasts of South America. Its distribution extends from Peru to southern Brazil (Brownell & Praderi, 1982).

The other species found have a more cosmopolitan distribution, and are observed at greater spatial scales when compared to Chilean and Peale's dolphins.

Basic information about key species' biology and ecology is still very limited and there is no data available on abundance, population decline or trends, behavioural ecology, population dynamics, home range size or movement patterns. As a consequence, the current conservation status of most species is *Data Deficient* as listed by the IUCN (IUCN, 2004).

At present, the main threats and conservation concerns for small cetacean species are incidental takes (by-catch) in local fisheries and the progressive destruction of potentially critical habitat due to eutrophication, coastal development (including intense aquaculture), disruption of coastal hydrological cycles (such as hydro electrical dams), release of toxins and pathogens, introduction of exotic species, fouling by plastic litter (marine debris), unsustainable exploitation of resources, noise pollution, disturbance by boat traffic and global climate change (Alongi, 1998; Claude et al., 2000; Ribeiro et al., 2005).

Furthermore, there is now a generalized lack of basic information about marine conservation issues throughout Chile, in which most local inhabitants are not aware of the ecological value and role of marine mammals and other organisms in the marine ecosystem.

In the present report, we detail the progress achieved up to now on the original main and specific objectives of this project, which is to promote and work towards the conservation of small cetaceans in southern Chile through research and environmental education. This project mainly focused on Chilean and Peale's dolphins, the two more common species in the area. The project also focused on the functional mechanisms of habitat use by looking in detail at behavioural ecology of these key small cetacean species. Furthermore, the project aimed to identify current and potential conservation threats to dolphins and their habitat, and raise public awareness on marine conservation issues through environmental education considering the Chilean and Peale's dolphin as flagship species.

2. PROJECT AREA AND METHODOLOGY

2.1. Project area

The project was developed on the waters off Guaitecas Archipelago in the Chilean Northern Patagonian fjords (43°52'S, 73°45'W) (Figure 1 and 2). The general oceanographic conditions affecting this area are under the direct influence of the West Wind Drift. The bulk of the oceanic west-driven currents encounter the South American continent at about latitude 41ºS, originating a northbound current characterized by an equator ward flowing branch (the Humboldt Current, which in turn splits in two: coastal and oceanic) and a southbound current represented by a pole ward flowing branch (the Cape Horn Current) (Longhurst, 1998).

This region is distinguished by a considerably wide tidal regime (up to five meters) and abundant freshwater input from glacier melt, river drainage and copious precipitation (4000-7000 mm per year) (Davila et al., 2002). Freshwater runoff and glacier meltdown in some areas can remarkably determine anomalies in water salinity, density and temperature in inshore waters. In addition, river discharge brings sediments and terrigenous material to the coastline, which all combined affect the dynamics of coastal circulation (Silva et al., 1998).

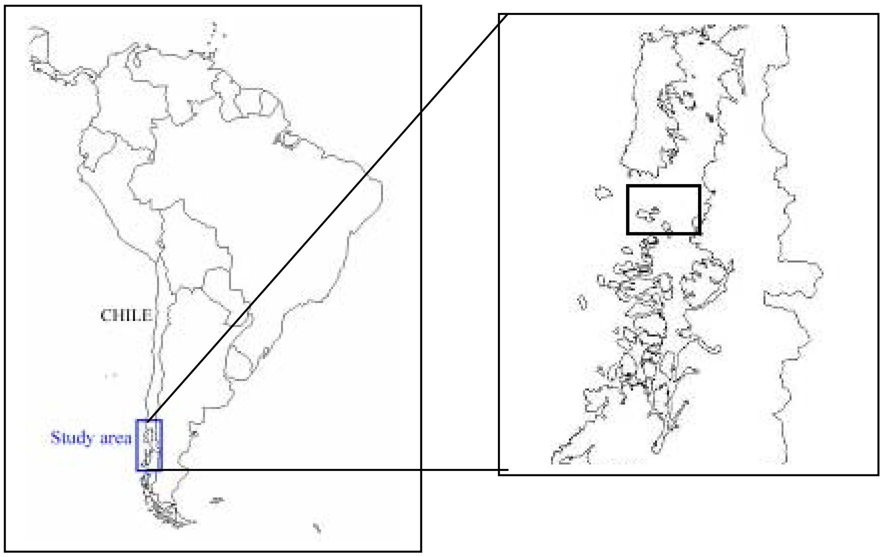

Figure 1. Project area in Southern Chile, showing an inset of the location of Guaitecas Archipelago

The main area was divided into two subareas, a northern subarea Puquitin and a southern subarea Leucayec (Figure 2)

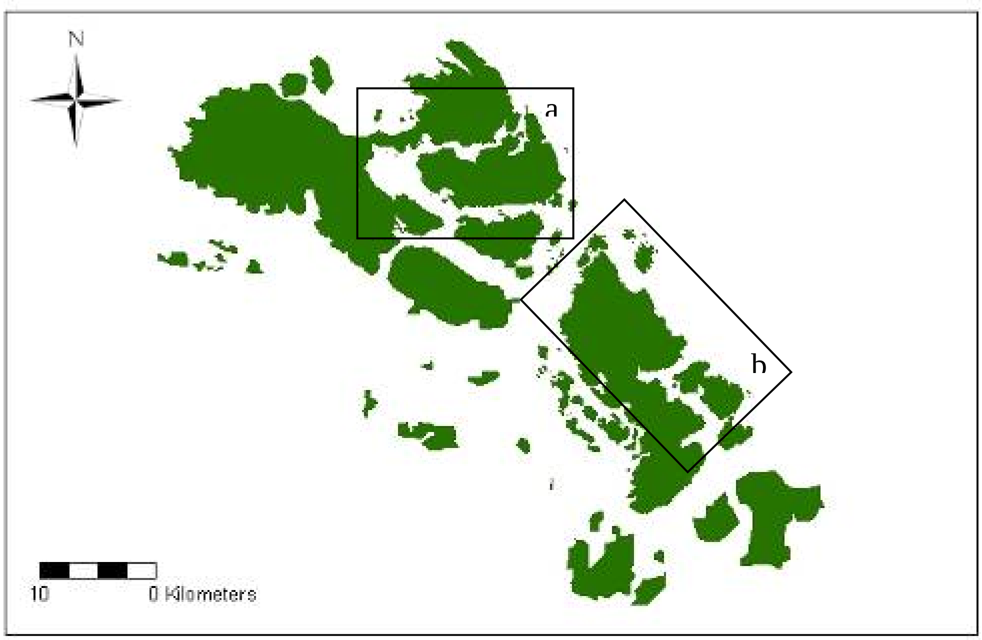

Figure 2. Guaitecas archipelago and the two sub-areas covered by this study. a) Puquitin Sub-area; b) Leucayec sub-area

2.2. Data collection

Fieldwork was conducted from December 2006 through April 2007 and included marine surveys and dolphin group follows.

Surveys:

Survey refers to encountering groups or individual dolphins for brief periods to census the number of animals and record location, identification and behavioural state.
Marine linear transect surveys were designed and predetermined *a priori* and later were performed on a 4.5m semi-rigid boat with an 18 hp outboard four stroke engine. These fix routes, downloaded and saved in a GPS Garmin eTrex Legend, were implemented in the study area to cover fully both sub-areas a) and b) (Figure 3). Predetermined marine surveys followed a rectangular pattern with changeable start and ending points.

Boat surveys were undertaken by two to three observers who looked for dolphins by naked eye and binocular 7x50 covering a strip of about 500m looking ahead to 90° on each side, at searching speed of 8 knots. At the beginning of each survey, and thereafter every 20 minutes without the presence of dolphins, data was recorded at stations including time, geographical coordinates, weather conditions (sea state, cloud cover, wind direction and relative strength) as well as a series of oceanographic variables: sea surface temperature, depth, sea surface salinity, water visibility and CTD vertical profile casts (Conductivity, Temperature and Depth). In addition, during surveys while on transit and between station, horizontal profiles of surface salinity and temperature were recorded every one minute by leaving the CTD sensors floating behind boat at about 8-10 m. For each minute, data on sea surface temperature and surface salinity were obtained together with location data, by synchronizing the CTD automatic logger and the GPS automatic logger for location.
Data on human activities such as salmon farms locations and boat traffic distribution was also recorded. Survey observations were restricted to Beaufort Sea states three or less.

Upon sighting of a group of dolphins, the transect track was interrupted in order to record dolphin geographical position (within a radius of 15-20 m of the dolphins), group size, group composition, behavioural state and identification of individuals by taking photos of dorsal fins. Data on environmental variables as well as weather conditions were also recorded in the location where dolphin where at first sighted. All battery of variables was recorded as described above for each station. All surveys were resumed at the point where the track was interrupted and continued along the original transect.
Digital photo-identification was performed as long as it is possible for up to 30 minutes. Photographs of dorsal fin were taken with a digital SLR camera Canon EOS D10 and canon lenses EF 75-300mm f4-5.6 IS USM. Photographs assisted in recognizing specific pigmentation patterns, scars, deformations, edge detail, incrustations, and imperfections which were used to identify individuals within the population. A well-marked individual was recognized by a matrix of marks, which formed a distinctive 'face' for the individual (Würsig & Jefferson, 1990).

Dolphin behavioural state was assessed by "Scan Sampling of Focal Group" protocol (Altman, 1974; Mann, 1999; Martin & Bateson, 1993) and were defined as:

-Foraging: repeated unsynchronized dives in different directions in a determined location, surfacing rapidly when not interacting with other dolphins. Frequent dives are characterized by steeply downward movements sometimes proceeded by fluking up or peduncle arches. Also dolphins can be seen making circles, having a parallel swimming formation, with fast, directional and synchronized movements. Dolphins can be observed engaging in rapid chases of fish, or observed with a fish in their mouth. Fish can be seen leaping out of the water. Dolphins could also be observed in association with marine birds.
-Resting: very slow movements with no direction, or staying still at the surface for several seconds or even minutes.
-Socializing: inter-individual interactions within a group, in frequent physical contact, rubbing, chasing each other, with frequent vigorous movements and aerial behaviours such as leaping and breaching. Sexual and aggressive behaviours are also included within this category.
-Travelling: directional and persistent movement at speed with regular patterns of surfacing. Dive angles are shallow.

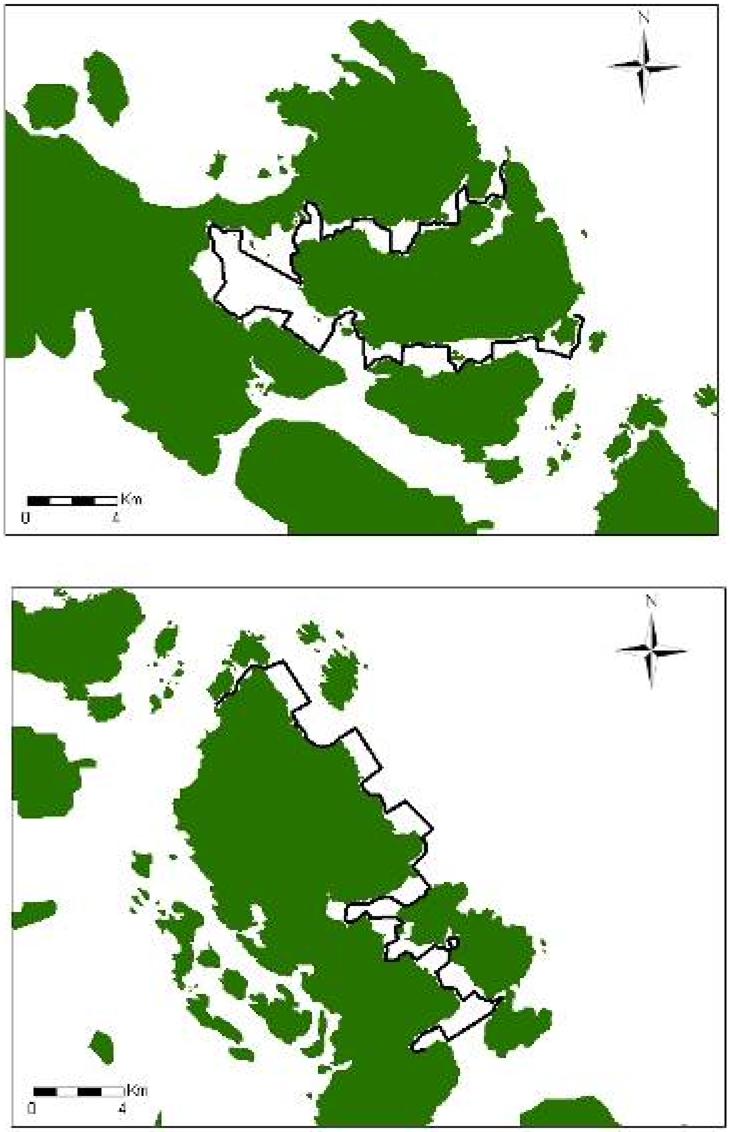

Figure 3. Fixed routes (black line) developed for marine surveys in Sub-areas Puquitin (A) and Leucayec (B)

Group follows:

Group follows refers to encountering groups or individual dolphins and track them (follow them) for periods of at least 15 minutes to register behaviour. Each follow session was divided into two minutes sampling interval to register behavioural state and events. Group follow were conducted under the premise of making as little disturbance as possible. Data on GPS track and specific position (waypoints) were recorded every two minutes together with distance to the dolphins (using a range finder) and angle with respect of magnetic north. The objective was to stay with a group of dolphin as long as light, weather conditions permitted or until the dolphin group were lost. If the latter occurred, a new track was started in search for a new group. Encounter- and leave-times were recorded for all groups. Behavioural observations will be quantified by following “Scan Sampling” rule with “instantaneous and all-occurrences” recording rule (Martin & Bateson 1993).
Behavioural states were defined as above for marine surveys.

3. RESULTS AND OBJECTIVES ACHIEVEMENT PROGRESS

3.1. Effort and sighting data

From 221 effort hours accomplished during the study period, 102 hours were completed on marine surveys and 119 hours of group follows.
During this study, seven species of cetaceans were registered (three dolphin species, one porpoise, two whales) (Table 1). Peale's dolphin was the species that presented more overall sightings. Chilean dolphins were scarce to what was expected. Single sightings of Burmeister's porpoises, orca and bottlenose dolphins were made indicating their presence might be only sporadic. Both humpback and blue whales are known to frequent the area, especially during summer time when oceanographic conditions are best for krill bloom, main food item for great whales in the area (Table 1). Whale sightings are very important since they were made less than 2 miles from shore.
Calves and neonates were seen for both Chilean and Peale's dolphin indicating that the area might represent an important region for dolphin nursery.

Table 1. Diversity of cetacean species registered, number of sightings, total number of animals and group size range per species in the project area during marine surveys.

Common name	Scientific name	Number of sightings	Total number of animals	Group size range
Peale's dolphin	*Lagenorhynchus australis*	69	349	1-25
Chilean dolphin	*Cephalorhynchus eutropia*	29	77	1-10
Bottlenose dolphin	*Tursiops truncatus*	1	50	
Burmeister's porpoise	*Phocoena spinipinnis*	1	15	
Orca	*Orcinus orca*	1	1	
Humpback whale	*Megaptera novaeangliae*	5	13	1-3
Blue whale	*Balaenoptera musculus*	4	6	1-2

During group follows, 48 hours were achieved in direct observation of dolphins (41.36% efficiency), which were performed only on the two most sighted cetaceans, Peale's and Chilean dolphins, but follows were made mostly on the first (Table 2). Only those groups tracked for more than 15 minutes were analysed.

Table 2. Number of dolphin group followed, analysed and effective time with dolphins for Chilean and Peale's dolphin. Mean group size and range also shown.

	Peale's dolphin	Chilean Dolphin	Mixed groups (Chilean and Peale's dolphins in the same group)
Number of groups tracked	38	19	2
Number of groups effectively analysed	26	9	2
Time with dolphins (hours) (of groups analysed)	30	15.2	2.8
Mean group size	5.28	4.13	
Group size range	1-12	1-10	

3.2. Habitat selection

Sighting of Chilean and Peale's dolphins during marine surveys did not occur throughout the study areas (Figures 4 and 5). In Puquitin area it was observed that Chilean dolphins were mostly observed in the inner and protected bays, whereas Peale's dolphins were mainly observed in the area exposed to the Corcovado gulf. Fixed Kernel density estimator analysis highlighted different core areas (50% Kernel) for both Chilean and Peale's dolphins, with very little overlap of representative ranges (95% Kernel) (Figure 6). Only in a few rare occasions dolphins were sighted in the same areas, although never interacting. Nevertheless, a different pattern was observed in Leucayec sub-area. Here, both species were found throughout. Fixed Kernel density estimator analysis featured an important overlap both in core areas and representative ranges (Figure 7). Not only they presented overall overlap at different sightings, but in many sightings both species were observed together, interacting either in social or feeding behaviours.

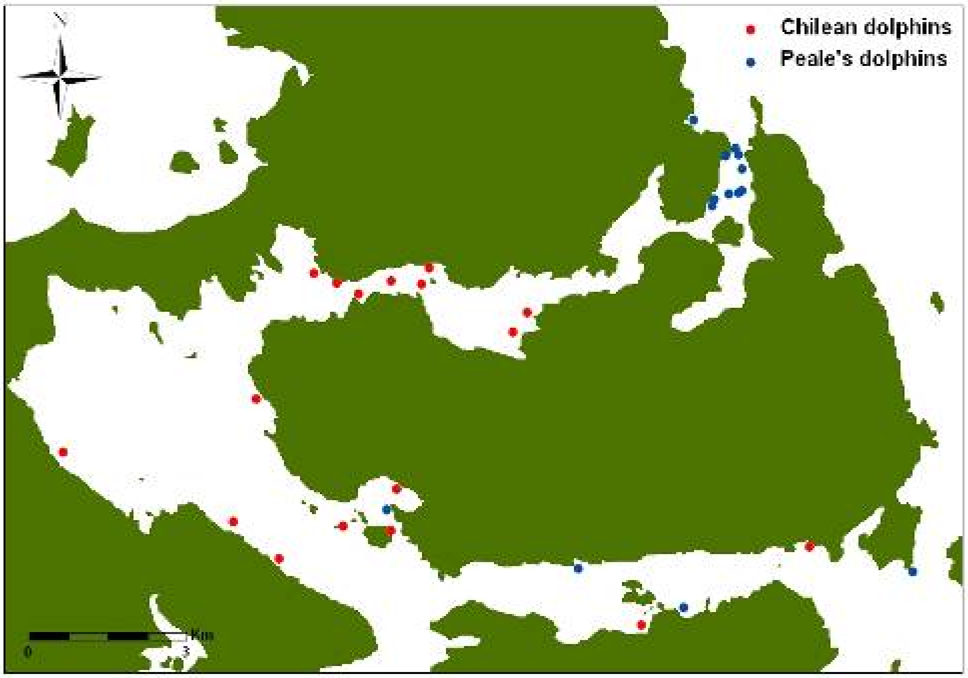

Figure 4. Overall distribution of Chilean and Peale's dolphins in Puquitin sub-area

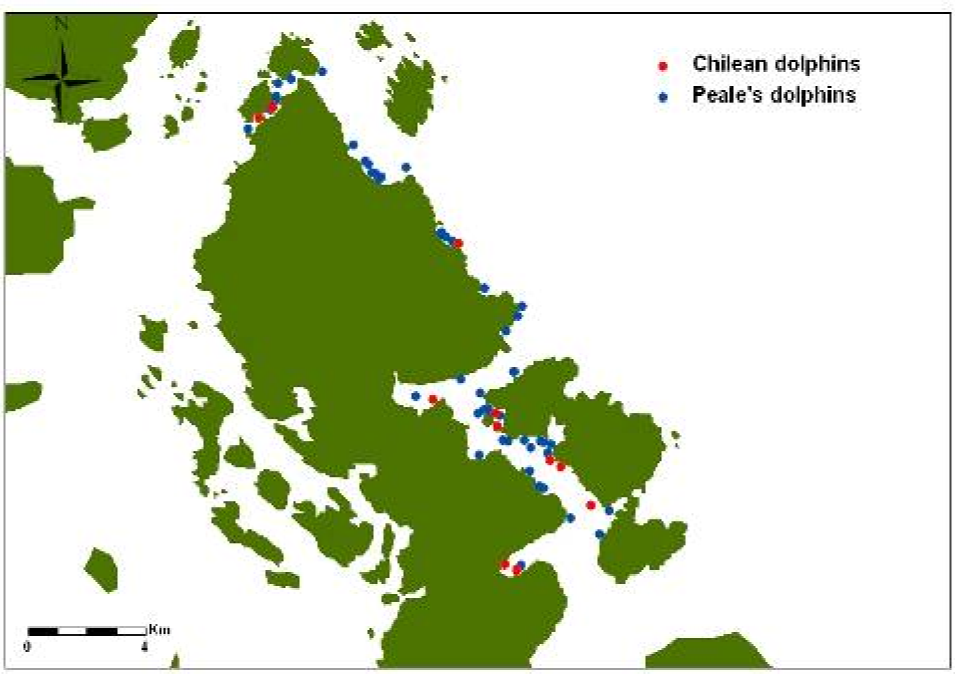

Figure 5. Overall distribution of Chilean and Peale's dolphins in Leucayec sub-area

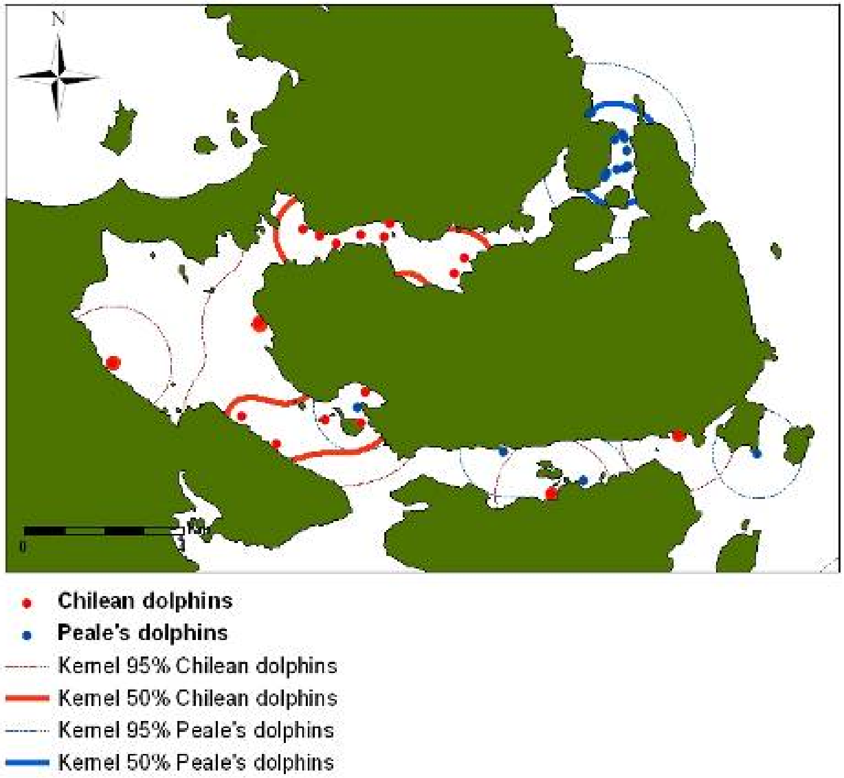

Figure 6. Fixed Kernel density estimator for Chilean and Peale's dolphins in Puquitin sub-area.

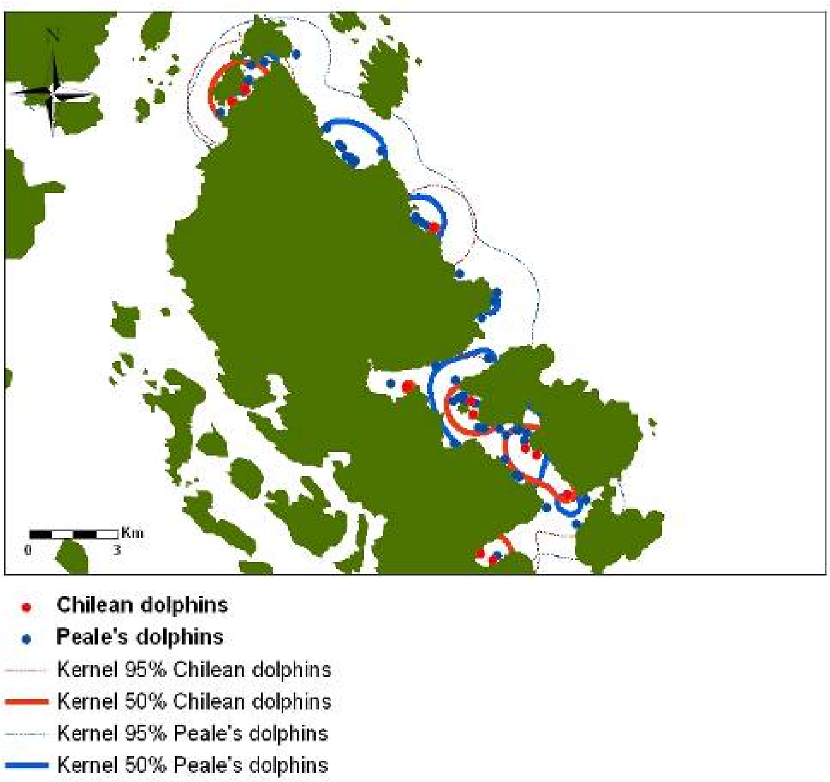

Figure 7. Fixed Kernel density estimator for Chilean and Peale's dolphins in Leucayec sub-area

The best environmental models for both Chilean and Peale's dolphins differed both in the amount of variables and in the specific variables explaining the habitat selection. For the Chilean dolphin the best model only included depth as predictor variable, whereas for Peale's dolphins both salinity and water visibility were included in the best model (Table 3 and 4).

Table 3. Estimated values of GLM coefficient parameters for best model for Chilean dolphins

GLM Coefficients

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	0.0415	0.50934	0.081	0.93507
Depth	-0.09413	0.03216	-2.927	0.00342 **

** denotes significance at 0.01

Null deviance: 110.52, *df*=117
Residual deviance: 97.22, *df*=116
AIC: 101.22

Table 4. Estimated values of GLM coefficient parameters for best model for Peale's dolphins

GLM Coefficients :

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	13.43891	5.78902	2.321	0.02026 *
Visibility	0.1599	0.05827	2.744	0.00607 **
Salinity	-0.48562	0.18038	-2.692	0.00710 **

** denotes significance at 0.01

Null deviance: 191.88, *df*=152
Residual deviance:170.5, *df*=150
AIC: 176.50

Only the effect of depth on the probability of Chilean dolphins being present is significant. For Peale's dolphin, only the effect of salinity and water visibility on the probability of being present were significant. In addition to the models developed for each species, a third model was developed to assess if there was any environmental variable selected by one dolphin species but not for the other. The best model shows that water visibility and salinity are the two main variables explaining any habitat segregation between the two species (Table 5).

Table 5. Estimated values of GLM coefficient parameters for best model for Peale's and Chilean dolphins

GLM Coefficients :	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	10.25	2.47	2.25	0.02014 *
Visibility	0.267	0.0458	2.78	0.00587 **
Salinity	-0.344	0.2358	-2.38	0.00108 ***

*** denotes significance at 0.001 and ** denotes significance at 0.01

Null deviance: 85.5, *df*=152
Residual deviance: 65.34, *df*=150
AIC: 71.34

Only the effect of salinity and water visibility on the probability of Peale's dolphins being present and not Chilean dolphin were significant. The linear effect of the predictor variable salinity indicates that the chances of occurrence of Peale's dolphins in relation to Chilean dolphins is greater at lower salinities, whereas for visibility, Peale's dolphins are more likely to occur at greater water visibilities in relation to Chilean dolphins.

3.3. Threats identified on marine ecosystems

Within the study area, three salmon farms have been set up so far, restricted to the area of Puquitin. Salmon farms generate a series of environmental impacts such as organic and inorganic pollution and increase in boat traffic, as well as take up space which might be suitable areas for dolphins and other animals.. This same subarea also includes the village of Melinka, which has become an important small port for the salmon industry. Within three years vessel traffic has increased drastically, in occasions over exceeding the village capacities. Melinka has 1500 resident inhabitants, including now more than 1500 floating inhabitants working directly or indirectly for the salmon industry. Including the social impact of this population increase, we have found drastic impacts on the environment, common of any human population bloom, such as increase in domestic garbage and waste, and over exploitation of natural resources. Furthermore, the increase of boat traffic has also brought several other negative outcomes such as increase of underwater noise and several types of pollution. Unfortunately, much of these activities are in areas where high occurrence of dolphins has been observed. In fact, we have already found a decrease in the ssighting rate of Chilean dolphins near Melinka, which could be directly related to the enhancement of ship traffic and pollution. Finally, during February 2007 a Chilean dolphin was found entangled in salmon anti-sea lion nets. This is the first evidence on the direct impact of salmon farms.

Figure 7. Chilean dolphin entangled in salmon anti- sea lion nets

3.4. ***Social component***

The social component of the project was developed between January and March 2007 and it took place in the two communities in the area: Melinka and Repollal. All activities, which were carried in collaboration with local stakeholders, were divided into two main field of focus: education and outreach.

Education

Several workshops of approximately three hours were organized both in Melinka and Repollal at least twice per week in each location.

In Melinka the workshops were open to all children willing to attend the activities. The aims of the workshops were: to promote awareness on the role of everyone in caring about the environment and the impact of litter and domestic disposal in the marine environment; to teach basic concepts regarding residual management, recycle and reuse; to carry out simple techniques and experiments on waste management and reuse.
Part of the activities developed during these workshops included an intense clean up in one of the main beaches in Melinka. This activity included the involvement of the Chilean Navy and the garbage collected was classified, stored and used in later activities (to construct instruments, flowerpots, etc). Complementary, the children had a guided visit to the community garbage dump. The objective of such a visit was to give an insight of the effects of the poorly managed dump site to the ecosystem in general and ended with a discussion on how it could be improved.

Figure 8. Clean-up and guided visit to the garbage dump

In Repollal, a small community 20 km from Melinka which currently presents an important isolation, the workshops focused on children and aimed to create awareness and strengthen the interest for scientific thinking thru observation and analysis of the natural surrounding. The activities included topics on marine ecology, archaeology, anthropology, navigation, cetacean and bird identification, and the construction of a dry aquarium.

Figure 9. Expeditions to the shore line, collection and observation of animals, algae and shells

Figure 10. Dry aquarium designed and made by the children of Repollal

5. DISCUSSION

From the results obtained in this study, seven species of cetaceans were recorded, making of this region a hotspot on cetacean diversity. These results are of great importance since the information gathered showed a very important diversity of small cetaceans at such small scale. This particular area (Chiloensis Province, (Sullivan Sealey & Bustamante, 1999)) is probably one of the most important sites or hot spot for marine mammal diversity as well as other marine biota in Chile.
Peale's dolphins were the most abundant and common of all small cetaceans registered, with more sightings in Leucayec subarea. A slight habitat segregation between the most common species (Peale's and Chilean dolphin) were observed in Puquitin subarea. In Leucayec both species had a degree of overlap in habitat selection and distribution.
Although only a few environmental variables were considered in the analysis, the presence of Chilean dolphins were related to more shallow waters, whereas Peale's dolphins were related to clearer water and lower salinities.

The activities derived from aquaculture might negatively affect movement, distribution and behavioural patterns, representing a potential threat to the local dolphin populations. The exclusion from core areas, in addition to the very restricted, high site fidelity distribution of these species, could be severely affecting important biological and social activities, as observed for other species (Würsig & Galley, 2002). The main environmental impact from aquaculture is the organic enrichment (eutrophication) of the water and sediment, which modifies the primary productivity and benthonic community (Wu, 1995). The effects of this impact could be reflected in the trophic chain and affect prey availability for a top predator, such as dolphins. Other potential impacts include the release of antibiotics, exotic diseases, alteration of native fish communities from escaped salmon, chemical and solid residues pollution and increased boat traffic (Würsig & Galey, 2000). The environmental impacts resulting from escaped salmon are very severe, such as disease transmission, habitat and prey competition, as well as predation on native fish, which might also have an effect on the abundance and diversity of dolphins' original prey species. Increased boat traffic might be causing significant behavioural alterations in cetaceans, as it has already been seen for Chilean dolphins in other areas (Ribeiro et al. 2005) and other cetacean elsewhere (Williams et al., 2002), which might include fatal collisions. It is probable that noise and boat presence not only alter dolphins' behaviour, but also their preys (Allen & Read, 2000). It is also possible that the impact from vessel traffic is not only restricted to the time they approach to a group of dolphins, but also their behaviour might be affected by the noise pollution and the constant "alert-state" that dolphins maintain (Richardson *et al.*, 1995). Impacts caused by boat traffic might restrict or exclude animals from important areas, producing long-term effects (Richardson *et al.*, 1995).

Coastal cetacean populations have been severely affected, especially in areas where human development is higher (Whitehead et al., 2000). Dolphin species with coastal restricted distribution generally tend to select and depend on specific habitat features (Hastie et al., 2003; Karczmarski et al., 2000) and hence, the loss of these areas can affect the population survivorship (Harwood, 2001). However, an earlier identification of important areas for the animals could help minimizing or even preventing the impacts from anthropogenic activities.

Protecting important areas for dolphins might be crucial to ensure not only the conservation of the dolphin population, but also for the whole complex system they inhabit. Since dolphins are top predators, they act as environmental indicators and biodiversity regulators (Bowen, 1997). Marine mammals might play important roles such as *key species* in some marine community and the decline of their population might cause significant alteration in species composition (Harwood, 2001). By knowing the ecological role of marine mammals and complementing with the concept of *umbrella species*, it can be used for the conservation of marine ecosystems in general and for making recommendations on the establishment of marine protected areas (MPA) (Hooker et al., 1999).

6. Recommendations and future work

Short-term:

During the next year it will be of great importance to be able to gather more data on the distribution, habitat selection and behaviour of dolphins. In this way we will be able to develop robust models, which will assist us in getting a better understanding of the relationship between dolphin species and the physical variables present in the ecosystem they depend on. New methods might need to be applied into the research protocol in order to get better details on dolphin movements and habitat use.

Data on anthropogenic impacts at the moment were focusing on salmon farming activities and boat traffic. Nevertheless, data on other human related impacts might need to be included, since evidence of garbage and waste disposal has been observed. Other main human impact to monitor is the local consumption of marine mammals.

Environmental education initiatives will include the consolidation of eco-groups within the community, where local participants can take the initiative to run the groups. Follow-ups on marine biology workshops to reinforce awareness on conservation issues will be implemented. A webpage will be published within the next year (design in process), which will not only give information about the project, but also a site with a strong educational component.

Mid-term:

We are living in probably one of the most critical times in the human history regarding environmental issues. Global warming, climate change and ozone depletion is nowadays one of the main concern worldwide. The information that can be collected regarding the effects of these global issues on marine mammals will be of importance to: understand how animals might respond or are responding to changes in the environment; and give recommendations to national authorities on mitigation and monitoring procedures. In this sense main mid-term goals are to elaborate a program to study small cetacean distribution and the potential effects of global climate change and ozone depletion and the implications of these in the conservation of cetaceans in southern Chile.

A major goal which will be addressed is designing and implementing a study on the abundance on small cetaceans. No study has ever been developed dealing with this, and the need for having abundance estimates is highly urgent.

At the end of a third year, enough data will be available in order to achieve one of the most important mid-term goals, to contribute and assist to develop and zoning a marine protected area. The information on cetacean distribution, hotspots and critical habitats are of major concern when designing marine protected areas.

Broad educational goals will be implemented. It will be necessary to cover more areas to create more general conservation awareness and disseminate projects goals and results. Also, an interactive educational webpage for difference audience will be designed.

Long-term:

Main goals at the long-term include maintaining a monitoring program on the distribution and ecology of cetaceans, relating their distribution to oceanographic variables and anthropogenic impacts, especially regarding global warming, climate change and ozone depletion.

In order to make this project sustainable over time, we aim to establish a local (run by locals) monitoring program on marine conservation, as well the implementation of a marine station where school students and other participants will get involved.

We also aim to get more involved in natural resources management policy making, for which our data and information will be used.

Finally, a book on the life history of dolphins will be published, where the entire information gathered will be presented. The book will include the best photographs of small cetaceans gathered until then. It is hoped it will assist in the identification of cetaceans and will help in raise awareness on marine conservation issues at the national and international level.

Main broad goals and steps need to include the effects of global warming, climate change and ozone depletion on marine ecosystems. This is urgently needed, since as a developing country our international political position might not have a tremendous effect when compared to developed countries. Nevertheless, information regarding the effects of these global issues on marine ecosystem in Chile, might certainly have a more remarkable effect in the international community.

Also important is to evaluate how local fisheries might be affecting cetaceans populations, and if it is, how it can be diminished or prevented. It is recommended that fishery management policies, which in Chile also comprise aquaculture activities, include information on the distribution and abundance of cetaceans and other marine mammals.

Finally, it is recommended the all above goals might be implemented into new areas. Furthermore, an environmental education program, dealing on marine biodiversity and conservation, needs to be implemented into school's curriculum.

7. PROBLEMS ARISEN AND SOLUTIONS ADOPTED

We have had a very successful season. On the scientific aspect we have achieved more than 200 hours of effort on the water doing both marine surveys and dolphin group follows, even though weather conditions were not the best due to the presence of an El Niño event. This has meant the collection of a good amount of high quality data. Everything worked as planned, although some logistic problems rose. Problems occurred with accommodation arrangements on the island and some vehicle failures. Some of these logistic difficulties will be fixed by arranging site work more in advance.

Melinka (the small town we were based during our field work) is a very socially complex community. People on this island work mainly on fishing and recently on the salmon industry. Due to the isolation of this village, the community and social component of the project was a bit harder to develop of what we had expected. People are a bit reluctant to share or trust outsiders, especially considering that we are dealing with environmental issues. Our approach to children gave good results, they brought home our willingness to learn from them and work together in order to solve several issues. We are aware that our endeavor must be planned at the long term and we must be patient if we truly want to be considered as part of the community. We have learnt already that we can not approach the community as if we were the ones with all the answers or as if we had *the plan* to solve their problems. We have a long journey to learn from them, to gain their trust and interest in order to work along with the community.

8. REFERENCES

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9. EXPENDITURE

Item	Cost £
Itemised Equipment	
1 digital camera Olympus FE-110	56.82
1 GPS Garmin e-Trex Legend receiver	85.23
1 pen drive 512 mb Rumba	39.76
1 fish finder Hummingbird	140.56
1 external hard disk Dac 80 Gb	77.11
1 head mic/earphone	8.03
1 sleeping bag	36.97
Subtotal Itemised Equipment	**444.48**
Expendable equipment	
Navigation	362.99
Photography	140.56
4x4 vehicle	100.68
Subtotal Expendable equipment	**604.23**
Travel and Subsistence	
Food and accommodation for 3 team members for 5 months	690.00
House rent	257.27
4wd vehicle fuel and maintenance	670.43
Boat fuel and maintenance for 5 months	1,220.00
Local transportation	232.31
Subtotal Travel and Subsistence	**3,070.01**
Outreach, Advocacy and Education	
1000 Posters, 1500 adhesives and 1000 postcards	418.60
Material for Education workshops	278.01
Subtotal Outreach, Advocacy and Education	**696.61**
Other (communication and administration)	
internet and telephone	35.50
Subtotal Other	**35.50**
TOTAL Expended	**4,850.83**

Project Team

Status	Name	Nationality	Affiliation
Leader	Francisco A. Viddi	Chilean	Centro Ballena Azul / Macquarie University
	Manuel Badilla	Chilean	Universidad Catolica de Concepcion / Centro Ballena Azul
	Juan Pablo Torres	Colombian	Universidad Austral de Chile / Centro Ballena Azul
	Tom Crowley	British	TSCPhotography / www.thomas-crowley.com
	Maximiliano Bello	Chilean	Centro Ballena Azul/ World Wildlife Fund, Chile
	Barbara Carstens	Chilean	Centro Ballena Azul
	Magdalena Diaz	Chilean	Universidad Austral de Chile
	Brianna Grieve-McSweeney	US citizen	
	Jorge Ruiz	Chilean	Centro Ballena Azul