

## DIVERSITY AND SUMMER DISTRIBUTION OF CETACEANS IN INLET WATERS OF NORTHERN AISÉN, CHILE.

### DIVERSIDAD Y DISTRIBUCIÓN ESTIVAL DE CETÁCEOS EN AGUAS INTERIORES DEL NORTE DE AISÉN, CHILE.

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Although the presence of 26 cetaceans species in channels and fjords of southern Chile has been already documented (Aguayo-Lobo *et al.* 1998), to date there is little published information available about diversity, distribution and habitat preferences. Progress in knowledge on populations of cetaceans in the region has been mainly achieved in the Straits of Magellan from several studies conducted since 1960's (compiled by Lescrauwaet & Gibbons 2008<sup>1</sup>). Recently some authors have pointed out that there seems to be a knowledge gap on cetaceans in northern Patagonian fjords, mainly inshore waters of Aisén, with only a low number of studies with a few published results.

Aguayo-Lobo *et al.* (1998) compiled records of 6 species of cetaceans for southern Chiloé and Aisén region: right whale *Eubalaena australis* (Desmoulins, 1822), Chilean dolphin *Cephalorhynchus eutropia* (Lacépède, 1804), right whale dolphin *Lissodelphis peronii* (Lacépède, 1804), Peale's dolphins *Lagenorhynchus australis* (Peale, 1848), dusky dolphins *Lagenorhynchus obscurus* (Gray, 1828) and Burmeister's porpoise *Phocoena spinnipinis* (Burmeister, 1865). In a recent descriptive study of marine mammals in the Los Chonos Archipelago

area (43°30' to 45°50' S) by Aguayo-Lobo *et al.* (2006), authors showed that Peale's dolphins and bottlenose dolphins *Tursiops truncatus* (Montagú, 1821) among small cetaceans and sperm whales *Physeter catodon*, (Linnaeus, 1758) blue whales *Balaenoptera musculus* (Linnaeus, 1758) and Sei whale *Balaenoptera borealis* (Lesson, 1828) among great cetaceans were the species more frequently recorded.

A feeding ground of blue whales was reported in the Gulf of Corcovado, Archipelago de los Chonos (Hucke-Gaete *et al.* 2003) and off northwestern Chiloé Island (Cabrera *et al.* 2005). In this last area a summer aggregation of humpback whales has been reported as well (Galletti *et al.* 2006<sup>2</sup>, 2008<sup>3</sup>, Hucke-Gaete *et al.* 2006<sup>4</sup>), and photographic identification has confirmed movements and interchange of humpback whales individuals within the Strait of Magellan near Carlos III Island (Capella *et al.* 2008).

Systematic sighting surveys of small cetaceans (mainly Chilean and Peale's dolphins in southern Chiloé Island and Chiloé Archipelago conducted in austral summer and autumn since 2001, showed high residence and high fidelity of dolphins to shal-

<sup>1</sup> Lescrauwaet, A.K.L. & J. Gibbons 2008. A review of the crab bait related exploitation of small cetaceans in Magallanes and Tierra del Fuego with an update on the current situation. SC/60/SM5.

<sup>2</sup> Galletti, B., C. Carlson, E. Cabrera & R.L. Brownell Jr. 2006. Blue, sei and humpback whale sightings during 2006 field season in northwestern Isla de Chiloe, Chile. Paper SC/58/SH17 presented to the International Whaling Commission Scientific Committee, St. Kitts and Nevis, May 2006 (unpublished). 6pp.

<sup>3</sup> Galletti, B., C. A. Carlson, E. Cabrera, J. Capella & R.L. Brownell, Jr. 2008. Recent humpback whale sightings off Isla de Chiloe, 2006-2008. Paper SC/60/SH26 presented to the Scientific Committee of the International Whaling Commission, June 2008, Santiago, Chile.

<sup>4</sup> Hucke-Gaete, R., J. P. Torres-Flórez, F. A. Viddi, S. Cuellar, Y. Montecinos & J. Ruiz 2006. A new humpback whale (*Megaptera novaeangliae*) feeding ground in northern Patagonia, Chile: extending summer foraging ranges. Report SC/58/SH10 to the Scientific Committee of the International Whaling Commission. St Kitts and Nevis. 16 – 20 June.

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low and close to shore waters with estuarine influence (Christie 2005<sup>5</sup>, Heinrich 2006<sup>6</sup>, Fuentes & Heinrich 2007<sup>7</sup>, Heinrich *et al.* 2008<sup>8</sup>).

Surveys of cetaceans carried out from December 2000 to November 2001 from Puerto Montt to south of Taitao Peninsula (41° 83' and 48°00'S) in northern Patagonian fjords, and in the waters off Puquitrin, Leucayec and in Cumau Fjord, have showed spatial and seasonal variability of cetacean distribution in the fjords (Viddi *et al.* 2010). Mysticetes were distributed along a north – south gradient with preferences for open gulfs with oceanic influence, and close to shore. In contrast, odontocetes were observed mainly within narrow channels, areas with complex coastal morphology, peaking at different water depths (Viddi *et al.* 2010).

In this paper we present results on diversity, local distribution and group composition of cetacean species along inshore waters of the fjord Puyuhuapi and Channels Jacaf and Moraleda (between 44°00' and 46°00'S), northern Aisén (Fig.1), obtained in an opportunistic way while we were recording underwater dolphins vocalizations, with the aim to contribute to cetacean basic knowledge in the inlet waters of southern Chile.

Fieldwork was conducted at the end of the summer season 2009, from 24th February through 26th March, with 194 hours of navigation effort accomplished in 23 days. Surveys were performed on a 5 m rigid boat with a 40 HP outboard two stroke engine. We navigated at 8 knots or less maintaining a distance of about 50 – 200 m off the coast, consistent with higher likelihood to observe Chilean dolphin, Peale's dolphin and Burmeister's porpoise suggested for the species in southern Chile (Gibbons *et al.* 2001, Ribeiro *et al.* 2005, Viddi & Lescrauwaet 2007). One or two observers scanned the area looking for cetacean, alternating naked eye and binoculars (7 x 40), in conditions of Beaufort 3 or less and visibility higher than 500 m. The navigation tracks were recorded taking position by a portable GPS (Fig.1). Survey effort varied within the study area, being a 50% concentrated on the head of the Puyuhuapi Fjord.

Whenever cetaceans were sighted, the track was interrupted in order to identify the species and to record group geographical position (GPS), group size and individual composition by photo-identification. During these 23 days it was possible to obtain colour photographs suitable for individual identification, based on long-term natural marks on the dolphins' dorsal fins (Wursig & Wursig 1977). At each encounter with a group of dolphins an attempt was made to obtain as many good photographs as possible of all individuals present, throughout the duration of the observation. Photo-identification was performed following Wursig & Jefferson (1990), with a NIKON D300 digital camera equipped with NIKON 100–400-zoom lenses at 5-50 m of the animals, considering that digital photography substantially improves the efficiency of individual dolphin identification (Markowitz *et al.* 2003). Digital photos were then cropped around the dorsal fin and visible part of the body and selected using consistent criteria (*i.e.* entire dorsal fin visible, fin perpendicular to camera, high sharpness and resolution, no water spray masking fin profile), based on recommendations provided by Read *et al.* (2003). Dorsal fin pigmentation patterns, nicks, scars, edge detail, tooth rakes and skin lesions were used to identify individuals across the different species within the population.

We obtained sightings of 86 groups of five species of cetaceans: Peale's dolphins (Fig.2), Chilean dolphins (Fig.3), bottlenose dolphins (Fig.4), Burmeister's porpoises (Fig.4) and blue whales (Fig.4). Peale's dolphin was the most common species with 55 groups sightings over 21 different days, followed by Chilean dolphin, with 17 groups sightings in 9 days. The ones sighted with lesser frequency were Burmeister's porpoise, with 8 groups sightings in 6 days, blue whale with 4 groups and bottlenose dolphin with 2 groups sightings (Table 1). Peale's and Chilean dolphin, the most frequently encountered species, did not distribute uniformly but occurred predominantly in shallow near shore waters on the head of the Puyuhuapi Fjord (67.3 and 88.2% of the sightings weighted by survey effort). Incidences of overlap of Chilean and Peale's dolphins were

<sup>5</sup> Christie, C. 2005. Niveles de organización social del delfín chileno *Cephalorhynchus eutropia* (Gray 1846) y del delfín austral *Lagenorhynchus australis* (Peale 1848) en la isla de Chiloé, X región, Chile. Tesis de biología marina. Universidad Austral de Chile, Valdivia

<sup>6</sup> Heinrich, S. 2006. Ecology of Chilean dolphins and Peale's dolphins at Isla Chiloé, southern Chile. Ph.D. Thesis. University of St Andrews, St. Andrews, UK (239pp.).

<sup>7</sup> Fuentes, M. & S. Heinrich 2007. Toninas en el sur del archipiélago de Chiloé. Ecología de conservación del delfín chileno y delfín austral. Resumen del estudio de pequeños cetáceos en el sur de Chiloé desde 2001. Informe técnico para el departamento de turismo de la ilustre Municipalidad de Quellón.

<sup>8</sup> Heinrich, S., M. Fuentes & P.S. Hammond 2008. Conservation status of small cetaceans in the Chiloé Archipelago, southern Chile. Paper SC/60/SM23 presented to the IWC Scientific Committee, June 2008 (unpublished). 12pp.

observed four times. On two occasions the Chilean dolphins chase Peale's dolphins and on two others we observed just neutral passes.

The largest groups were found on bottlenose dolphins with group sizes of about 100 individuals. Peale's and Chilean dolphins were seen in small groups, varying from 1 – 20 for Peale's dolphins and 2-25 for Chilean dolphins. Burmeister's porpoises group size range was 2 - 7 and blue whales 2-11. For Peale's dolphins, a total of 29 marked individuals out of 330 (12.4%) were photographically identified. Only three individual Peale's dolphins were resighted, one in four non consecutive days between a maximum interval of one week. The maximum interval was 25 days between March 1st and 26 for one mother-calf dyad and also for one adult male, all on the head of Puyuhuapi Fjord. The other two sightings were made on consecutive days. For Chilean dolphins, a total of 13 marked individuals out of 92 were photographically identified (12%). Five individual Chilean dolphins were resighted, with a maximum of four different non consecutive days for one female with her calf. For bottlenose dolphins, 26 out of 200 (10.3%) and for blue whales 8 from 23 (34.8%) were distinctively marked with fin nicks, tooth rakes and skin lesions documented via photo-ID. Furthermore, two bottlenose dolphins (one adult and one juvenile) and none blue whales individuals were resighted.

These new 86 groups sightings of cetaceans in the Puyuhuapi – Moraleda area reported here represent an important number of records in comparison with all Aisén coast sightings collected between 1964 and 1998 by Aguayo-Lobo *et al.* (1998). The near shore habits of the small cetaceans species have been documented by Goodall *et al.* (1988, 1995, 1997), Gibbons *et al.* (2001), Ribeiro *et al.* (2005), Viddi & Lescrauwaet (2007) and Viddi *et al.* (2010).

In general, the composition of species is similar to what is known for other areas of southern Chile. In Guaitecas archipelago, Viddi (2010) found Peale's dolphin, Chilean dolphin, killer whale *Orcinus orca* (Linnaeus, 1758), bottlenose dolphin and Burmeister's porpoise. In Chiloé Island, Chilean dolphins occurred mainly in several southern selected bays and channels (Heinrich *et al.* 2008). Peale's dolphins were distributed more widely, particularly in central Chiloé. Burmeister's porpoises

were sighted regularly at two locations in central and in one channel in southern Chiloé (Fuentes & Heinrich 2007). Blue whale sightings obtained in this study match with the southern distribution limits found by Hucke *et al.* (2004).

In the inshore waters southern of the Golfo de Penas, four species of cetaceans were more commonly recorded: Peale's dolphin, Chilean dolphin, humpback whale, and killer whale. Burmeister's porpoise is very rare and can be found only in the Beagle Channel (Gibbons *et al.* 2001, Goodall *et al.* 1995). In the Straits of Magellan the most frequent species are Peale's dolphin, humpback whale, Commerson's dolphin (Lacépède, 1804) and killer whales. The bottlenose dolphin is rare in Chilean fjords (Olavarria *et al.* submitted), but in recent years the species has been recorded in the Straits of Magellan, suggesting that it is becoming more common in the last decade.

Our results confirmed that Peale's dolphin and Chilean dolphin are the most frequent small cetacean species (65.5% and 20.2% of the sightings respectively) that inhabit in most of the sheltered areas of southern Chile as it has been documented in the region (Goodall *et al.* 1988, 1997, Goodall 1994, Viddi *et al.* 2010). An exception is the eastern Strait of Magellan where Commerson's dolphin is the most common one (Lescrauwaet *et al.* 2000). In Aisén, the Chilean dolphin seems to be the most frequent species of small cetaceans in the north of Laguna San Rafael. It is important to note that although reported in this study, the Burmeister's porpoise is very rare in the inshore southern Chile. Our results also confirmed that bottlenose dolphin is the cetacean that shows the largest group size observed (Viddi *et al.* 2010).

Our data are concentrated on the inshore waters of Aisén. For this reason, the information presented here, besides being consistent with, complement Viddi *et al.* (2010) study, that showed that the Moraleda channel and associated fjords and channels, especially those close to the Aisén fjord, seem to be a hotspot for odontocetes.

Spatial overlap between the dolphins and salmon and trout farming was extensive in Puyuhuapi Fjord. Different authors argue that aquaculture farms may negatively affect the Peale's and Chilean dolphin distribution (Heinrich 2006) and behavior (Ribeiro *et al.* 2005, 2007). An ecosystem approach

is needed to assess impacts of salmon farming and whale watching on coastal cetacean in southern Chile (Buschmann *et al.* 2006). The study area with a high density coastal cetacean although seems to have a high potential for commercial activities related to whale watching. From a management perspective, information on the occurrence of cetaceans in the area will help to introduce them to the regional planning authorities.

To date there is no published information

about interchange of individuals of small cetaceans among different regions of southern Chile. In the future the comparison among photo-identification catalogues of individual cetaceans that have been developed by different organizations at Chiloé, Aisén, Patagonian and Fuegian fjords and the Straits of Magellan, will be very useful to discover possible movements and interchange of individuals along the southern Chilean coast.

TABLE 1. Records of cetaceans sightings in inlet waters of northern Aisén.

species	peale's dolphin	chilean dolphin	bottlenose dolphin	Burmeister's porpoise	blue whale
N° groups	55	17	2	8	4
N° individual	330	92	200	26	23
modal size	10	2	100	2	3

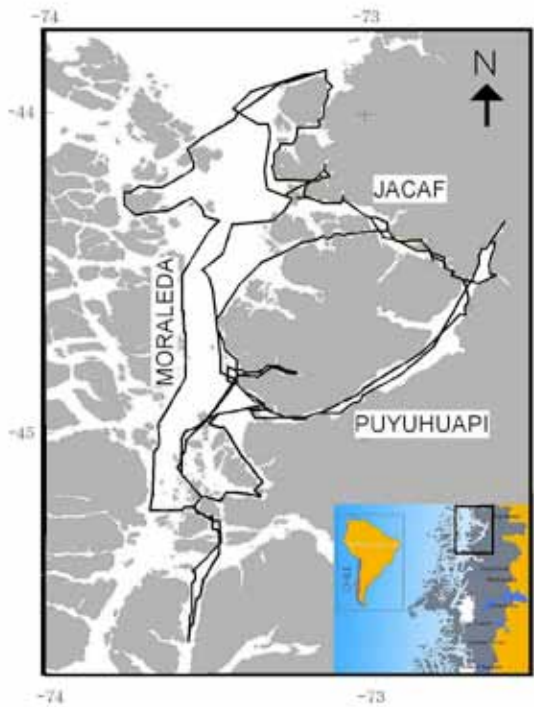


Fig. 1. Cetacean survey tracks in inlet waters of northern Aisén.

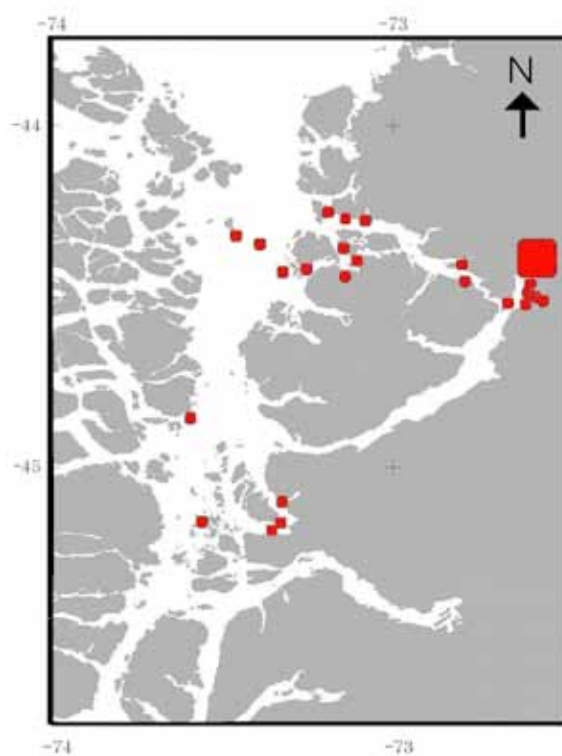


Fig. 2. Distribution of the Peale's dolphin sightings (dots) in inlet waters of northern Aisén.

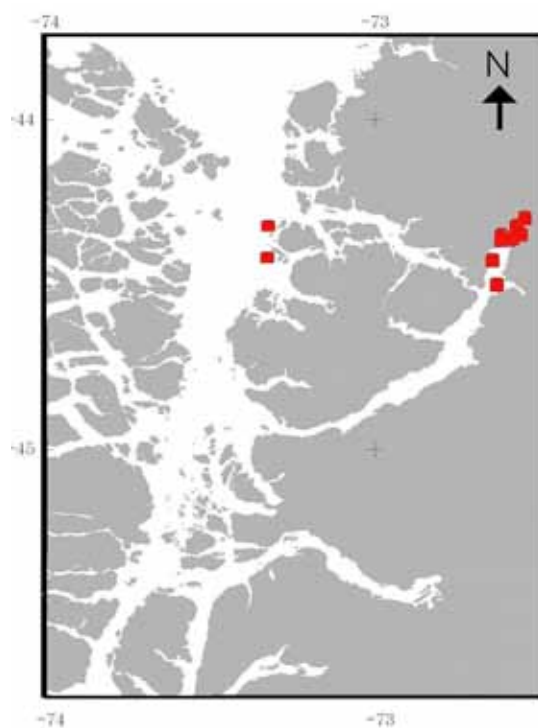


Fig. 3. Distribution of Chilean dolphin sightings (dots) in inlet waters of northern Aisén.

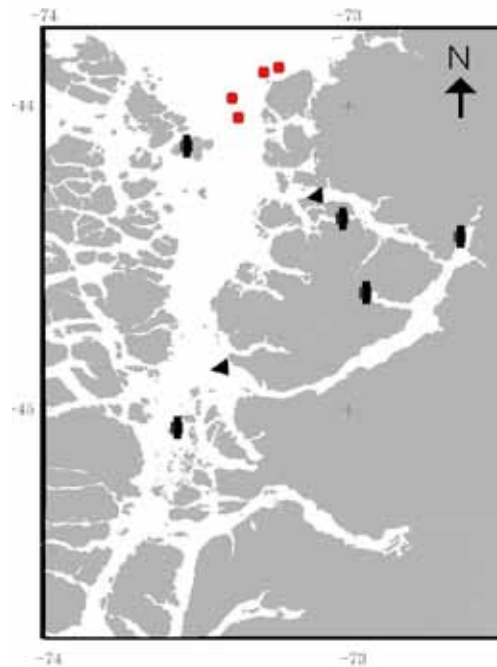


Fig. 4. Distribution of blue whale (dots), Burmeister's porpoise (crosses) and bottlenose dolphin (triangle) sightings in inlet waters of northern Aisén..

## ACKNOWLEDGMENTS

Research reported in this study was supported by project grants D/010828/07 and D/010828/08 "Acción Integrada Universidad Complutense de Madrid – Universidad de Magallanes" from the AECID (Agencia Española de Cooperación Internacional y Desarrollo), (IP. Fernando Colmenares); and by INNOVA Corfo (IP. Jorge Gibbons). José Zamorano - Abramson also wants to thank to the local fishermen from Puyuhuapi, Juan Fuentes and his son Camilo Fuentes, for their help and for keeping him safe while navigating through the fjords.

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