

Discovery of a blue whale feeding and nursing ground in southern Chile

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After the extensive exploitation that reduced the Southern Hemisphere blue whale (*Balaenoptera musculus*) populations to less than 3% of its original numbers, studies on its recovery have been compounded by the inaccessibility of most populations and the extensive migrations between low and high latitudes, thus ensuring that knowledge about blue whale ecology and status remains limited. We report the recent discovery of, arguably, the most important blue whale feeding and nursing ground known to date in the Southern Hemisphere, which is located near the fjords off southern Chile. Through aerial and marine surveys ($n = 7$) 47 groups, comprising 153 blue whales including at least 11 mother-calf pairs, were sighted during the austral summer and early autumn of 2003. The implications of this discovery on the biological understanding and conservation of this endangered species are discussed.

Keywords: *Balaenoptera musculus*; endangered species; conservation; whaling; Cetacea; marine protected area

1. INTRODUCTION

Between the start of modern whaling in 1904 and protection during the 1965–1966 season, ca. 330 000–360 000 blue whales, *Balaenoptera musculus* (Linnaeus 1758), were killed in the Southern Hemisphere (Tønnessen & Johnsen 1982; Clapham *et al.* 1999). This extensive exploitation reduced populations to less than 3% of original numbers (Laws 1977) and data with which to reliably estimate current abundance and trends are sparse because of their wide-ranging distribution, extensive migrations and the inaccessibility of most populations. Furthermore, studies are compounded by the presence of two potential subspecies within the Southern Hemisphere (*B. m. intermedia* and *B. m. brevicauda*), which have made research difficult and thus knowledge about blue whale ecology and status remains limited (Clapham *et al.* 1999). Since legal protection from commercial whaling, certain blue whale stocks have shown signs of recovery, while others have been insufficiently monitored to determine their status (NMFS 1998). The IUCN Red List of Threatened Animals lists the North Pacific stocks as ‘low risk: conservation dependant’,

North Atlantic stocks as ‘vulnerable’ and the Antarctic stocks as ‘endangered’. Clearly, the discovery and scientific monitoring of readily accessible aggregations of blue whales in the Southern Hemisphere is of fundamental importance to further understanding of blue whale ecology and to aid in formulating sound recommendations for the conservation of these, the largest animals on Earth. We document the recent discovery of such a place that arguably corresponds to the most important blue whale feeding and nursing ground known to date in the Southern Hemisphere.

2. MATERIAL AND METHODS

The study area (figure 1) was chosen due to historical and opportunistic accounts, from as early as 1907, of blue whale occurrence in southern Chile (Tønnessen & Johnsen 1982); it had been said that ‘masses of blue whales’ were present in the Gulf of Corcovado. This was soon confirmed by the whaling ship *Vesterlide* that caught 37 blue whales in this area between autumn and spring of 1909. More recent incidental sightings of blue whales made from platforms of opportunity in Chilean waters, include the following:

- (i) a cow–calf pair of blue whales sighted on 26 November 1997 (by K.P.F.) in the Moraleda Channel (44°30′ S; 73°30′ W);
- (ii) in excess of 60 blue whales sighted on 18 January 1998 between the Moraleda Channel and the southern tip of Chiloé island, including the Gulf of Corcovado (by D.K.L.);
- (iii) two sightings of two blue whales in March 2000 in the Gulf of Corcovado (by K.P.F.); and
- (iv) four sightings of nine blue whales in late summer and early autumn 2001 in the Gulf of Corcovado (by R.H.-G.).

This region receives direct influence from the eastern South Pacific Ocean and is located where the West Wind Drift diverges upon reaching South America to form the Humboldt Current to the north and the Cape Horn Current to the south. A number of fjords lead off the nearby Moraleda Channel to the east (continental Chile).

Five aerial and two boat-based surveys were undertaken during the austral summer and early autumn of 2003 (table 1) and were designed to identify the general distribution of blue whales and their seasonal occurrence patterns along the western coast of Chiloé Island, Gulf of Corcovado, Guaitecas and Chonos Archipelagos and the Moraleda Channel located in southern Chile (figure 1). Aerial surveys were conducted within ca. 40 km from the coastline and followed saw-tooth and linear protocols. All surveys were undertaken in sea states less than 2 on the Beaufort scale at a speed of 90–130 kt and, in general, maintaining a fixed altitude of ca. 500 m (1500 ft) above sea level. On two occasions, a mid-sized vessel (15–20 m) was chartered and sea-based observations were conducted from the highest platform of the vessel. Upon making a sighting, trained observers using 7 × 50 binoculars immediately provided information on the cue seen and an estimate of the distance and direction of the sighting. Once these data were recorded, the vessel diverted from the trackline and approached the sighting to confirm the species. Upon confirming the presence of a blue whale, behavioural and photo identification data were collected while the vessel gently approached the animal(s) and an estimate was made of group size and composition, taking particular care not to disrupt their original behaviour. Whenever available, faeces were collected with a dip net or bucket for dietary analysis.

3. RESULTS

Between 5 January and 12 April 2003, 47 groups comprising 153 blue whales were sighted (mean group size of 3.255; range of 1–12; figure 2) including at least 11 mother–calf pairs (table 1) between 0.8 and 16 km from the shore in water depths ranging between 45 and 219 m. Although the surveys were not designed to provide an abundance estimate for blue whales in the area, the maximum number of blue whales seen in any one day suggests that the area was populated by at least 35 animals (Survey 3, day 1; see table 1). During the study period we observed blue whale mother–calf pairs, together with feeding behaviour and defaecation, which suggests that the area is mainly used by blue whales for behaviours that include feeding and nursing their young.

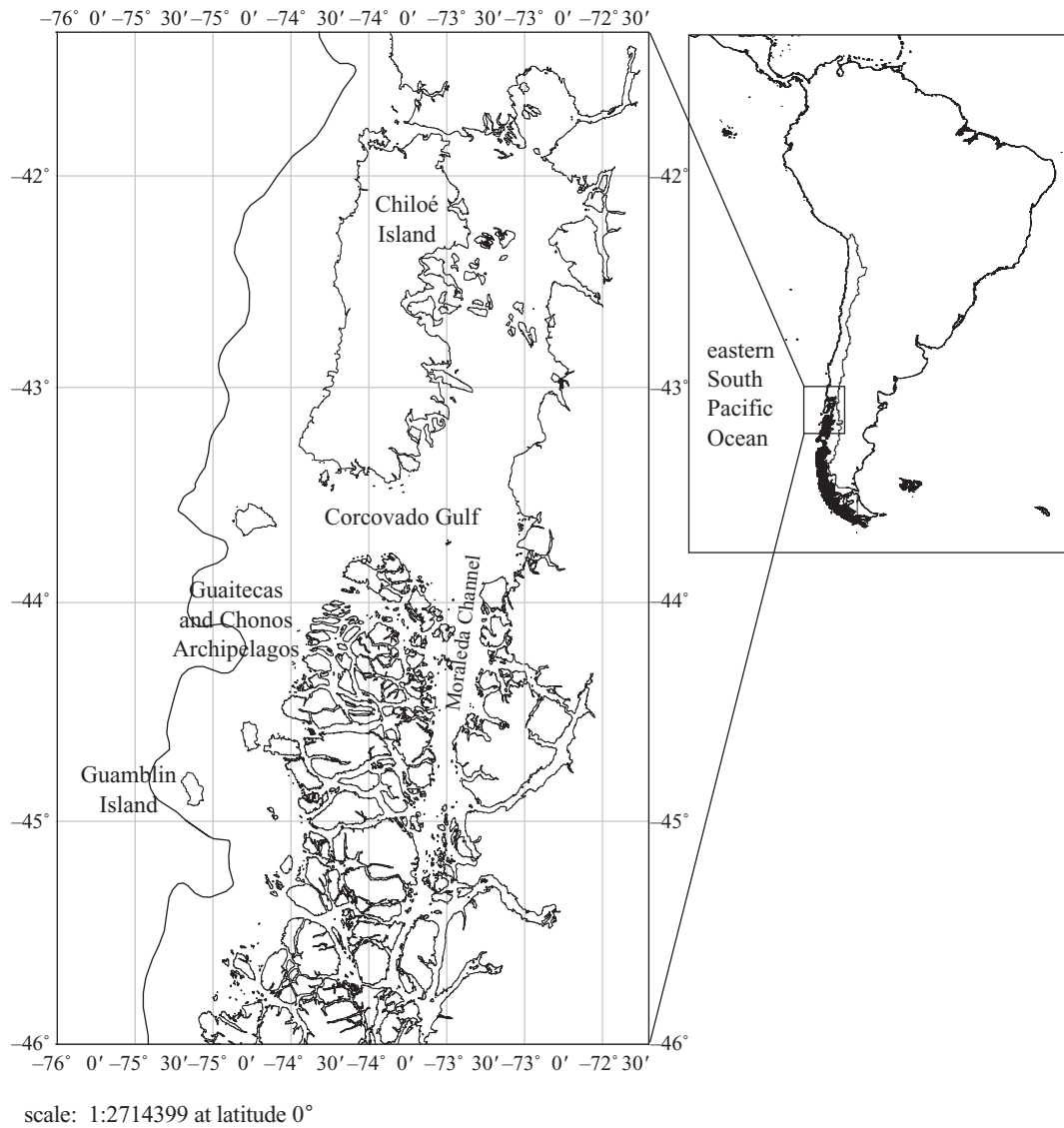


Figure 1. Location of the study area in southern Chile in relation to South America including the place names mentioned in the text.

Table 1. Survey details and blue whale sightings throughout the study period.

survey number	date	type	area covered	weather (Beaufort scale)	number of blue whale groups/individuals	number of calves
1	5 January 2003	aerial	Corcovado Gulf	1	0/0	0
2	12 February 2003	aerial	western Chiloé Island, Chonos Arch. and Corcovado Gulf	1–2	4/14	3
3	20–21 February 2003	marine	western Chiloé Island and Corcovado Gulf	1–3	12/46	0
4	16 March 2003	aerial	western Chiloé Island and Corcovado Gulf	1	9/19	2
5	10 April 2003	aerial	western Chiloé Island	1	10/13	5
6	10–12 April 2003	marine	Corcovado Gulf	1	12/41	1
7	12 April 2003	aerial	eastern Corcovado Gulf	1	0/0	0
				total	47/153	11

4. DISCUSSION

The blue whale densities reported here are significantly higher than previous accounts in the Southern Hemisphere (Donovan 1984; Palacios 1999; Gill 2002) and also higher

than those found during the International Whaling Commission (IWC SOWER) Blue Whale Cruise along the entire Chilean coast, *ca.* 40–280 km offshore during the early summer of 1997–1998 (Findlay *et al.* 1998).

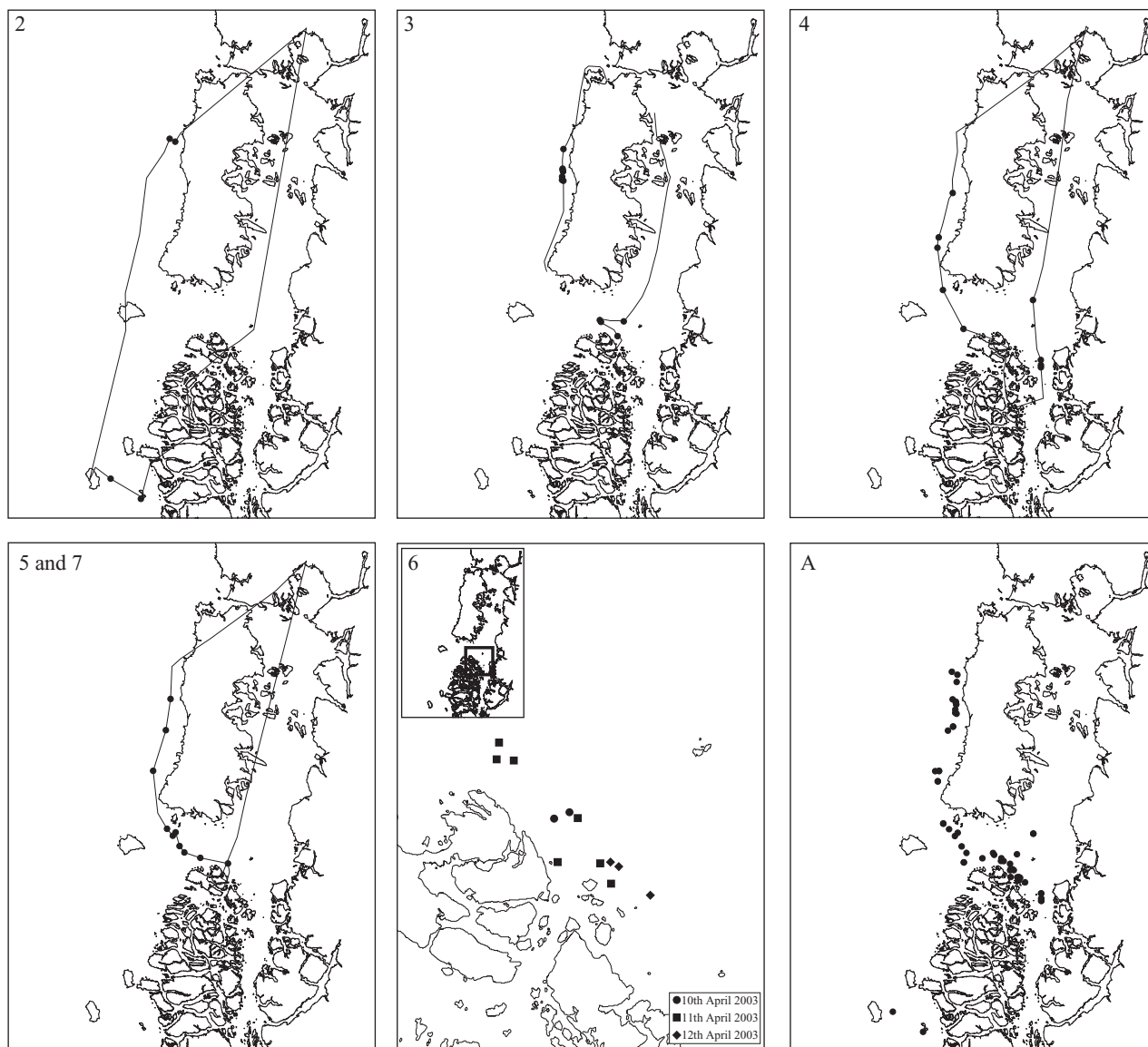


Figure 2. Aerial and marine surveys undertaken throughout the study area showing locations of blue whale sightings (closed symbols) and the tracklines followed. The numbers in each panel indicate the survey numbers (refer to table 1 for details), except for panel A, which groups all sightings of blue whales made from 12 February to 12 April 2003 off southern Chile. The tracks in panel 6 are not shown for clarity.

The classical view on the life strategy of blue whales (and most other large baleen whales) includes a seasonal migration between summer high-latitude feeding areas and low-latitude wintering areas where they apparently do not feed (Mackintosh 1965). If this is so, why are blue whales using this low-latitude area during summer?

Our particular view is that these populations may have specialized in using an alternative life strategy—other than conventional migration—by selecting and exploiting predictable productive areas located in low- and mid-latitudes, which are most conducive to feeding success. The water masses in the study area are fed by glacial ice-melt and extensive river run-off, which form a complex and dynamic system that is thought to influence the formation of large phytoplankton blooms during summer (up to 200–300 km offshore) (Longhurst 1998). Furthermore, Chilean waters have been documented to maintain one of the highest biological productivities in the world, supporting an annual fish catch of over 7×10^6 tons (Daneri *et al.* 2000).

This view is supported by a considerable number of blue whale summer sightings made in the relatively low latitudes of the Indian Ocean (10° N), southern Australia (38.5° S), Costa Rica Dome (10° N), Galapagos Islands (0°) and Peru (10° S) (see Donovan 1984; Yochem & Leatherwood 1985; Reilly & Thayer 1990; Palacios 1999; Gill 2002) and has previously been suggested as a strategy used by some humpback whale populations elsewhere in the world (Papastavrou & Van Waerebeek 1998).

These mid-latitude blue whales have been tentatively regarded as belonging to populations of pygmy blue whales (*B. m. brevicauda*). However, in the case of blue whales using Chilean waters, the question of population identity must remain open until further investigations, which include genetics, photogrammetry and satellite tracking, shed light on this issue.

The cumulative evidence that this area is used every year by blue whales—at least during summer—further stresses the importance of the Chiloé–Corcovado region, since it can be regarded as the most important blue whale

feeding and nursing ground discovered to date in the Southern Hemisphere. This occurrence provides a unique opportunity to investigate blue whale ecology and apply the obtained knowledge to identify, prevent and/or solve conservation conflicts in Chilean marine ecosystems. Additionally, the area seems important for the feeding activities of humpback whales (*Megaptera novaeangliae* (Borowski 1781)) (six groups of 20 animals) and large breeding populations of South American sea lions (*Otaria flavescens* (Shaw 1800)) and South American fur seals (*Arctocephalus australis* (Zimmerman 1783)). Auspiciously, the Chilean National Environmental Agency (CONAMA) has endorsed a proposal towards creating a marine protected area in the western Chiloé Island, Corcovado Gulf and Guamblin Island by using the blue whale as a flag- and umbrella-species. The adequate administration and development of soundly regulated activities, such as scientific monitoring and ecotourism, will invariably increase local and national environmental awareness together with providing an, as yet, undeveloped and economically rewarding activity for the inhabitants of one of the most isolated regions of Chile.

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