



Australian Government



# The Southern Ocean Non-Lethal Research Partnership Australia-New Zealand Antarctic Whale Expedition





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## Acknowledgements

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## Image credits

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**Page 2:** Researchers following humpback whales in southern ocean © Anthony Hull, Australian Antarctic Division.

**Page 4:** Image of survey track from the Antarctic Whale Expedition

**Page 5:** Image 1: humpback whale breaching sideways © Dave and Fiona Harvey. Image 2 satellite whale tagging © Sarah Robinson, Australian Antarctic Division.

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## Minister's Foreword



I am pleased to present this summary of the inaugural Antarctic Whale Expedition preliminary science field report.

The six week expedition to Antarctic waters to undertake cutting-edge non-lethal whale research was held earlier

this year during the Australian summer. It was the first major voyage of the Australian-led multinational Southern Ocean Research Partnership – the largest non-lethal whale research project in the world.

The Partnership's aim is to develop a multi-lateral, non-lethal scientific research program that will improve the coordinated and cooperative delivery of science to the International Whaling Commission.

The objective of this expedition was to add substantially to our understanding of the behaviour of Southern Ocean whales. Using state of the art non-lethal research techniques such as biopsy sampling, satellite tagging and acoustic and hydrographic surveys, scientists from Australia, New Zealand and France conducted research that will improve our understanding of the population structure, abundance, trends, distribution and ecological role of whales in the Southern Ocean.

Importantly, the research demonstrates clearly that there are effective and achievable ways to address important scientific questions which help with whale conservation and management without the need to kill these amazing creatures.

During the expedition, researchers collected 64 biopsy samples, many photo-identifications of individual humpback whales and acoustics data. Additionally, 30 satellite tags were deployed on humpback whales. It is hoped that these will provide movement data on the feeding grounds and also migration routes back to their tropical breeding areas in winter.

Australia has invested over \$14 million in the Partnership which is actively supported by more than eight countries. It is part of the Australian Government's \$32 million commitment to non-lethal whale research.

The Partnership's work plan has been endorsed as part of the scientific work program of the International Whaling Commission and last year Australia made a voluntary contribution of \$500,000 to facilitate the participation of developing countries and research organisations in the activities of the Partnership.

I very much look forward to the Partnership building its capacity to provide cutting-edge non-lethal cetacean research to better inform our understanding of these great sea creatures, and secure their existence in the years ahead.

**The Hon Peter Garrett AM MP**  
Minister for Environment Protection,  
Heritage and the Arts



## The Southern Ocean Non-Lethal Research Partnership – Australia-New Zealand Antarctic Whale Expedition

The joint Australia-New Zealand Antarctic Whale Expedition is the first major voyage of the Australian-led Southern Ocean Research Partnership, a five-year multinational collaboration on non-lethal whale research in the Southern Ocean.

A team of 17 scientists from Australia, New Zealand and France spent six weeks conducting non-lethal whale research in the Southern Ocean in February and March 2010.

The aim of the voyage was to gather information on whale:

- population structure
- distribution
- movement patterns
- trophic and environmental linkages, and
- ecological role in the Southern Ocean.

## Target species

Research carried out during the expedition primarily focused on humpback whales, Antarctic minke whales and Antarctic blue whales but also collected valuable information on other species such as fin whales.

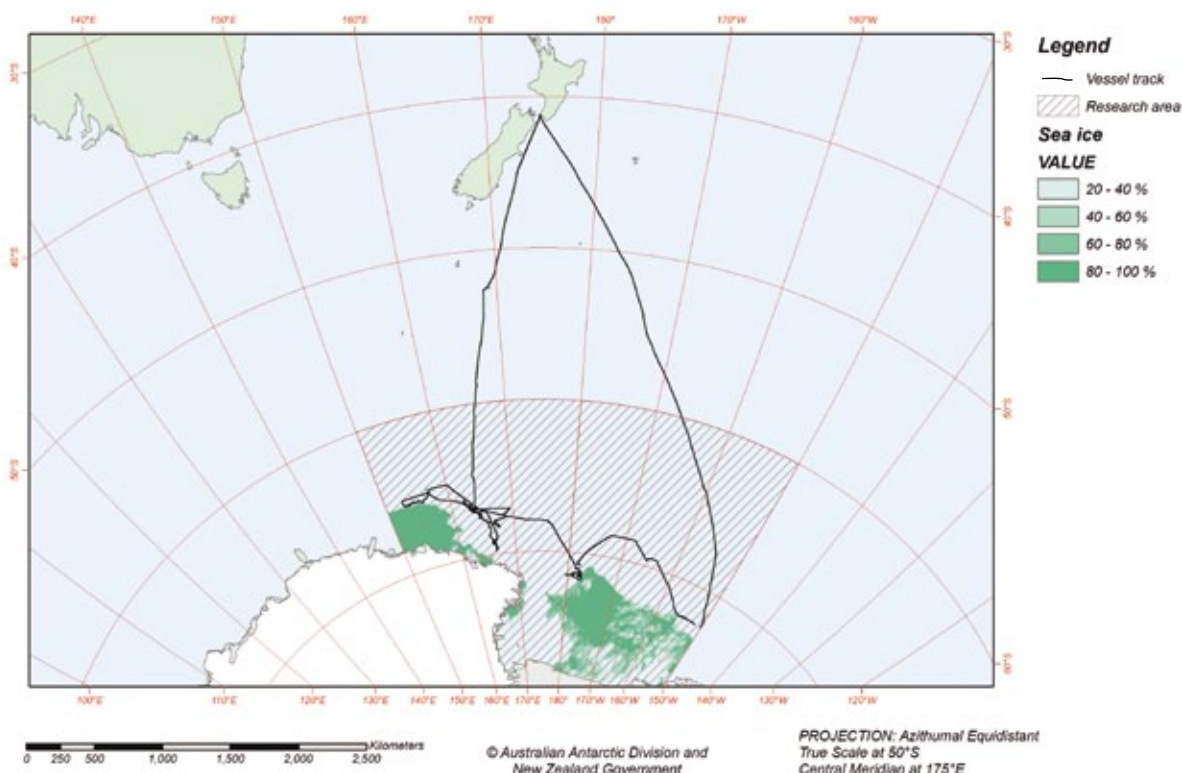
During the voyage, the scientists encountered 624 whales and dolphins on 326 occasions.

Scientists identified at least eight cetacean species including humpback whales, Antarctic minke whales, fin whales, sperm whales, southern bottlenose whales, sei whales, killer whales, hourglass dolphins and an unidentified beaked whale.

## Research

The expedition used the New Zealand National Institute of Water and Atmospheric Research vessel *RV Tangaroa* for the research in the Ross Sea region of the Southern Ocean. The ship covered about 5,800 nautical miles on the voyage, with 30 days spent south of 60°S.

The scientists successfully tested a new operational approach, working from two small boats launched from the ice-strengthened *RV Tangaroa*. The voyage was an important pilot study for this method of working with whales on the high seas in challenging high latitude environments.



## Preliminary results

### 1. Collection of 64 biopsy skin samples

This research aimed to:

- determine the proportion of mixing of humpback breeding stocks to Antarctic feeding areas
- genetically assign humpback whale individuals from Antarctic feeding areas to low-latitude breeding grounds using genotype matching
- determine the population structure of humpback whales in the Antarctic feeding grounds between 150 degrees East and 150 degrees West
- compare the sex composition of humpback whales in the Antarctic feeding grounds to those migrating along the eastern Australian coast using molecular genetic techniques, and
- determine the sex and origin of humpback whales that are satellite tagged.

Sixty-four biopsy samples were taken from humpback whales and one sample from a fin whale. The small boats were the main platform for collecting the biopsies, and humpback whales were the main species encountered during the survey. On some occasions the *RV Tangaroa* slowed down and humpback whales approached the ship enabling eight biopsies to be collected from the ship. Although some other species, such as minke whales also approached the ship, no biopsies were collected.

The biopsy samples collected during the expedition will be curated and stored at the Australian Antarctic Division. Sub-samples of each biopsy will be preserved under different conditions to ensure they are suitable for future research. These samples are available for collaborative research under the Southern Ocean Research Partnership.

DNA and its expressed component RNA will be extracted from each biopsy for genetic studies. RNA studies could lead to a simple, non-lethal ageing method for baleen whales. The DNA will be used to generate mitochondrial DNA sequence data and microsatellite genotypes for each individual sampled. This information will be used in population genetic analyses to determine which low-latitude breeding population individual whales belong to. This will require comparisons with existing genetic datasets from humpback whale breeding populations of

eastern and western Australia and the western Pacific. Mitochondrial DNA data will be derived from the single fin whale sample and submitted to a public genetic database as reference data for the Southern Hemisphere form of the species.



### 2. Satellite tagging of 30 humpback whales

This research aimed to:

- determine meso-scale movement patterns of humpback whales on high latitude feeding grounds and investigate relationships with the biological and physical environment, and
- identify linkages between high latitude feeding grounds and low latitude breeding grounds.

Humpback whales were the highest priority species for tagging studies. Thirty animals were tagged between 12th February and 8th March. Nearly all tagging took place in the region of the Balleny Islands where humpback whales were encountered in the greatest density and numbers.

The transmitting tags are providing extremely valuable information on the foraging behaviour of this species in this region. This is the first time humpback whales have been tagged in eastern Antarctica. If these tags endure, it is anticipated they will generate novel data on migratory routes between the Ross Sea region and tropical humpback whale breeding grounds.





### 3. Photo identification of 61 individually identifiable humpback whale tail flukes



This research aimed to determine the linkages between humpback whales in Antarctic waters and their breeding grounds and migratory paths outside Antarctic waters.

Sixty-one individual humpback whales were identified using photographs of the underside of the tail flukes. The pigmentation patterns of humpback whale tail flukes are unique and a great deal of effort over the past few decades has been invested in developing large catalogues of photographs of humpback whales on their lower latitude breeding grounds. Relatively few photographs have been collected from high latitude feeding areas, where whales from different breeding populations mix.

The humpback whale identification photos are available to all scientists with catalogues of photographs of humpback whale tail flukes in the Australasian and South Pacific region. The photographs are available at the Australian Marine Mammal Centre website ([www.marinemammals.gov.au](http://www.marinemammals.gov.au)). Matches from photographs taken on the feeding grounds to those taken on breeding grounds will provide further important evidence of the nature and extent of mixing patterns between breeding populations on the common feeding grounds around Antarctica.

### 4. Acoustic detections and recordings of whale sounds, including Antarctic minke, humpback, sperm, fin and Antarctic blue whales

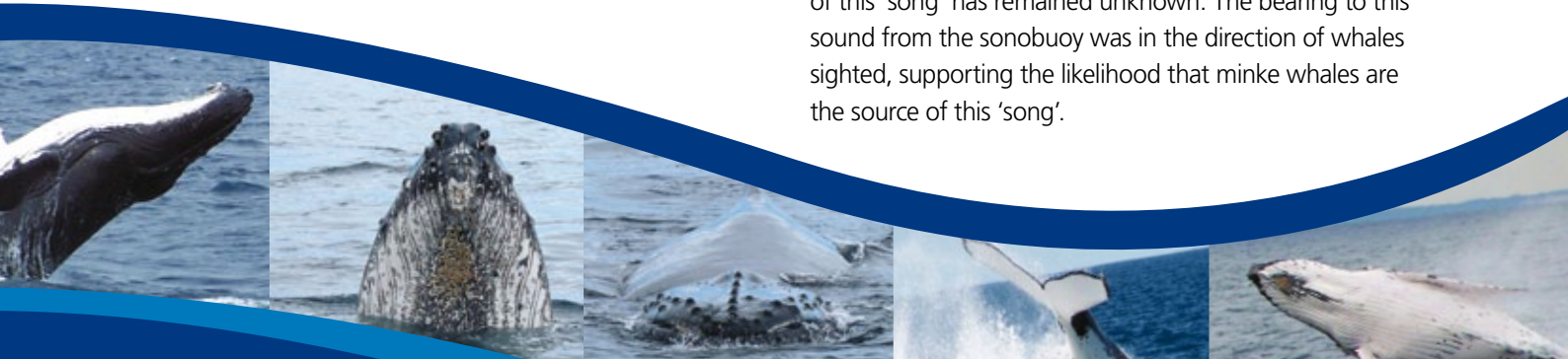
This research aimed to determine:

- the sounds produced by marine mammals in this region of the Antarctic and whether they are distinct from sounds produced in other regions of the Southern Ocean
- the relative distribution of vocalising marine mammals across the study area, and
- how accurately and from what distance vocalising blue whales can be tracked.

Sonobuoys were deployed opportunistically depending on vessel operations. When the *RV Tangaroa* was moving consistently, deployments occurred regularly and without regard to sightings of whales in order to independently acoustically survey for distributions of vocalising whales. When the *RV Tangaroa* was in the vicinity of whales, sonobuoys were deployed to record sounds from the species known to be in the immediate area. A total of 111 sonobuoys were deployed during the voyage. Species recorded include blue, humpback, minke, fin, sperm, and most likely an unidentified beaked whale.

Blue whales were the most commonly recorded species, occurring on over half of all successful sonobuoy deployments. The sounds recorded in the Ross Sea were similar to the sounds recorded from blue whales at other locations around the Antarctic. Humpback whale song, with the repetition of distinct stereotypic phrases, was also recorded. This appears to be the first instance where humpback whale songs have been recorded on their Southern Ocean feeding grounds. This runs counter to the notion that humpback whales sing only during their migration to and from, and while on their breeding grounds.

Minke whales have been notoriously difficult to acoustically monitor during their summer feeding season due to a lack of understanding of their vocal repertoire. On this expedition there was one particular instance when a sonobuoy was deployed in the midst of an aggregation of minke whales. A pulsed vocalisation was recorded that is very similar to repetitive song-like sounds often recorded in long term Southern Ocean acoustic datasets. To date, the source of this 'song' has remained unknown. The bearing to this sound from the sonobuoy was in the direction of whales sighted, supporting the likelihood that minke whales are the source of this 'song'.



## 5. Use of hydro-acoustics data to better define the correlations between krill and whales in the Southern Ocean.

This research aimed to determine:

- how whales were distributed within the study area in relation to prey abundance, and
- the relationship between whales and the biological and physical environment.

Acoustic data using hull-mounted echosounders were recorded continuously throughout the expedition. These sounders operated at five acoustic frequencies (18, 38, 70, 120 and 200 kHz), recording over 115 gigabytes of data. Information collected during the general survey will enable a detailed assessment of meso-scale variability of prey which can be related to estimates of relative whale density collected during the survey and the foraging patterns of satellite tagged whales.

Several aggregations of krill (*Euphausia superba*) were observed along the survey track. Patches of discrete and dense schools were typically found in the vicinity of whale aggregations. The largest of these schools were near the surface (down to 60–70 m depth) and were approximately one kilometre across. Throughout the survey a one metre diameter hoop drop-net was deployed on 16 occasions to collect organisms from the water column. Specimens of krill were collected on several of these deployments, along with a variety of other invertebrate species (including salps, copepods, amphipods, prawns, and a cranchiid squid paralarva). Mesopelagic fish (most likely myctophids of the *Electrona* genus) were also observed during the survey, particularly on the eastern side of the study area.



## Final research results

The data collected on the expedition will be analysed over the next year, before being presented to the International Whaling Commission (IWC).

## Southern Ocean Research Partnership

The Partnership was established in March 2009 to enhance cetacean conservation and the delivery of non-lethal whale research to the IWC.

The partners – including Australia, Argentina, Brazil, Chile, France, New Zealand, South Africa and the United States – aim to maximise conservation results through research into the status, health, dynamics and environmental linkages of whale populations and the threats they face.

Research under the Partnership focuses on two main areas:

- post-exploitation whale population structure, health and status, and
- changing atmosphere and oceans – Southern Ocean whales and their ecosystems.

The Australian Government has committed about \$14 million over six years to support the participation of Australian scientists in research activities undertaken as part of the Partnership.

Data from the expedition will contribute primarily towards two Southern Ocean Research Partnership projects:

- the distribution and extent of mixing of southern hemisphere humpback whale populations around Antarctica, and
- the distribution, seasonal occurrence, abundance and trends of Antarctic blue and fin whales in the Southern Ocean.





