



Blue whale photographed in Northern Hemisphere waters. Research conducted by SORP will help to understand the range of such whales. Credit: Mike Johnson, courtesy of the Australian Antarctic Division.

PROTECTING the icons of the ocean

Stephenie Cahalan, Communications Coordinator for the Southern Ocean Research Partnership, presents an important treatise on the importance of protecting the Earth's whale populations and outlines their work to improve our understanding of these mysterious and ancient animals

HOW CAN ONE of the most popular species on the planet be so poorly understood? Whales have been the subject of mythology, music and cultural lore, yet from a scientific perspective, so much remains undiscovered. This is particularly true for those living in Antarctic waters, where the inhospitable remoteness has made them even harder to locate and study.

Whales have been highly sought after for many purposes through the ages. Traditionally killed for products derived from their blubber, bones and ambergris, whales in the Southern Ocean were hunted from whaling stations on sub-Antarctic islands, such as South Georgia and South Shetland Island, the Kerguelen and Crozier Islands. The development of factory ships in 1923 liberated whalers from the logistics and expense of such stations, allowing them to take more animals at a greater rate than ever before, with a profound effect on whale populations.

The case of the Antarctic blue whale is a stark and tragic illustration of the impact of industrial exploitation. During the 20th Century, many thousands of blue whales were killed before the International Whaling Commission (IWC) – the global intergovernmental body now charged with the conservation of whales – banned the activity in 1964. Antarctic blue whales are now listed as critically endangered and, at its lowest ebb, numbers went as low as just 360.

Current population estimates are derived from historical data such as catch records and sightings surveys, but a more detailed understanding of the Southern Ocean species is severely limited. This is due partly to their elusiveness, but also because of the challenging logistics and great expense of conducting research in the Southern Ocean. The Southern Ocean Research Partnership seeks to change this by coordinating ongoing studies of Antarctic blue, fin, minke, humpback and killer whales.

BIRTH OF THE PARTNERSHIP

The Southern Ocean Research Partnership arose after the Australian Government proposed the formation of a body dedicated to the development of new scientific techniques for cetacean research in the Southern Ocean, reporting to the IWC. In 2009 a partnership of 10 countries was endorsed for the coordination and delivery of non-lethal Southern Ocean cetacean science. The current membership of the Southern Ocean Research Partnership comprises Argentina, Australia, Brazil, Chile, France, Germany, New Zealand, Norway, South Africa and the US, with new members constantly welcomed. The global nature of the organisation has resulted in a major collaboration between scientists bringing vast and varied expertise to the six major projects underway.

The Partnership has a dual purpose at its core; an intention to establish innovative, accurate and effective non-lethal research techniques, and the delivery of data that will lead to a greater understanding of the components of Southern Ocean ecosystems. Feeding behaviour, seasonal migration patterns and contemporary abundance indications are all statistics that have yet to be determined for many species, and it is these fundamental elements of species conservation-planning that the Southern Ocean Research Partnership hopes to assemble.

Thankfully, the commercial value of whales is now largely derived from booming whale-watching and tourism industries, and as cetacean scientists continue to scrutinise these iconic creatures, the body of knowledge will grow. Ishmael – Herman Melville's narrator in *Moby Dick* – described the whale ship as his 'Yale and Harvard', but today it is the whales themselves that are imparting precious knowledge.

SCIENCE AND OVERSIGHT

The Southern Ocean Research Partnership has appointed International Scientific Steering Committees to each project, endorsed by the IWC, to govern and guide the research of the projects. Technical committees advise on the use of satellite tagging for tracking animals, the use of passive acoustics, biopsy sampling for the identification of individual whales, and seagoing activities.



Dr Brian Miller launches a sonobuoy during science trials in the Bonney Upwelling, SE Australia.

Credit: Dave Donnelly, courtesy of the Australian Antarctic Division.

SCIENTIFIC CROWD-SOURCING

The Partnership's collaborative approach has extended to the shipping, tourism and fishing industries with the launch of a web-based, whale sighting reporting page. Anyone spotting whales in the Southern Ocean, in particular blue, killer, southern right and humpback, is encouraged to add to the research database by uploading images at www.marinemammals.gov.au/sorp/sightings.

PROJECT SPOTLIGHTS

THE ANTARCTIC BLUE WHALE PROJECT

Put simply, the Antarctic Blue Whale Project aims to discover if the population of *Balaenoptera musculus* is recovering after 50 years of protection from exploitation. Yet, just as determining the abundance and distribution of the whale populations is a fundamental aim of the Partnership, so too is the testing of scientific methods for obtaining the data. The availability of new technology for finding and tracking Southern Ocean whale species is best illustrated with the flagship Antarctic Blue Whale Project. The six objectives of the project are:

- To identify the most appropriate and efficient method to deliver a new circumpolar abundance estimate
- To develop and refine methods to improve efficiency
- To deliver a new circumpolar abundance estimate
- To improve understanding of population structure
- To improve understanding of linkages between breeding and feeding grounds
- To characterise behaviour on the feeding grounds

Dr Mike Double is the Australian Antarctic Division's Principal Investigator, working with a steering committee chaired by Professor Phil Hammond at the University of St Andrews. Dr Double has described looking for Antarctic blue whales in the Southern Ocean as akin to finding a needle in a haystack. As sightings are rare and hard to predict, new acoustic methods are being employed to increase the distance from which the whales can be detected.

The work comprises a series of voyages which will combine the use of new technology with traditional scientific methods, such as the mark-recapture method in which some animals are 'marked' (or sighted) then later re-sighted to measure the number of those individuals and estimate the size of the population. In 2012, directional sonobuoys were tested in a 100 km area along the Bonney Upwelling in southeast Australia, locating whales in real-time. The directional sonobuoy has a hydrophone, which is deployed to a depth of 30, 100 or 300 m. The hydrophone transmits sound back to the ship via a VHF radio link and scientists can process the sound to gain direction to the whales. If more than one sonobuoy is deployed, then the two bearings are used to triangulate the precise position of the whale. Acoustic scientist Dr Brian Miller of the Australian Antarctic Division, describes the method as "like a giant game of Marco Polo" (the children's game in which one person calls while another, blindfolded, follows the sound to catch them). ☺

THE ANTARCTIC BLUE WHALE VOYAGE

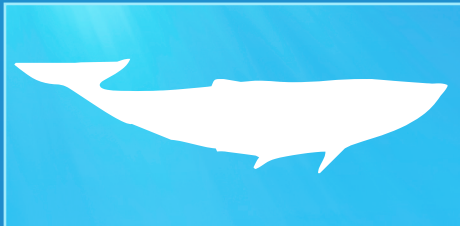
The success of the Bonney Upwelling tests meant the technology was ready to be used in tougher Antarctic conditions. During February and March 2013, the Antarctic Blue Whale Voyage has plied the waters on the edge of the ice shelf, west of the Ross and Davis seas, in search of the biggest – and possibly the most elusive – creature ever to inhabit Earth. A team of 18 scientists and researchers, boasting acousticians, observers and data surveyors drawn from around the world, are working from the FV Amalata Explorer and a rigid inflatable boat (RIB) to gather genetic samples and insert satellite tags into the whales. Flukes, fins and markings will be photographed and compared for identification like fingerprints.

Posts from the voyage and accounts of their encounters with the colossal Antarctic blue whale can be read at www.marinemammals.gov.au/sorp/expeditions/antarctic-blue-whale-voyage-2013/whale.



KILLER WHALES

There are three ecotypes of killer whales identified in Antarctic waters that comprise at least three separate species. This project is investigating the distribution, relative abundance, migration pattern and foraging ecology of killer whales in the Southern Ocean. As killer whales play a key role in the Antarctic ecosystem it is necessary to learn more about these three ecotypes to understand the impacts they have on prey populations including marine mammals, fish and penguins. (Principal Investigator: Dr Robert Pitman, National Oceanic and Atmospheric Administration Fisheries, Southwest Fisheries Science Centre, USA).



BLUE AND FIN WHALES

This project is using bottom-mounted, long-term buoys for passive acoustic monitoring. These measure trends in the Southern Ocean blue and fin whale population growth, distribution and seasonal movement, to augment the paucity of information relating to the life history of these animals post-whaling. (Principal Investigator: Dr Kate Stafford, University of Washington, USA).



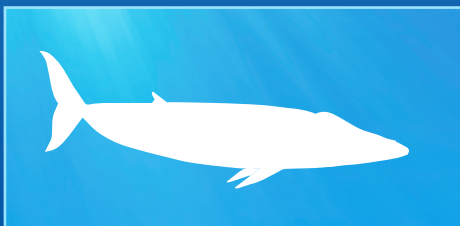
SOUTHERN HEMISPHERE HUMPBACKS

The work sets out to understand the movement and mixing of humpback whales in the Southern Hemisphere which is essential to assessing depleted populations. This requires estimating the pre-exploitation size and allocating the catch numbers to the appropriate stocks. Greater understanding of migratory patterns and feeding behaviour will also improve assessments of recovery. (Principal Investigator: Dr Rochelle Constantine, University of Auckland, New Zealand).



LIVING WHALES IN THE SOUTHERN HEMISPHERE

Sharing the intent and outcomes of the Southern Ocean Research Partnership is a fundamental part of the initiative. In 2012 the first technical workshop took place in Puerto Varas, Chile, where partnering scientists shared research methods and early findings. Papers and proceedings from the Living Whales Symposium can be found in English and Spanish at www.simposioballenas.cl.



MEASURING THE APPETITE OF BALEEN WHALES

This study pursues the foraging ecology and predator-prey interaction between baleen whales and krill in a multi-scale comparative study across Antarctic regions. As research reveals more about the lynchpin role of krill and threats posed due its susceptibility to climate change, there is a grave gap in the understanding of cetacean foraging ecology. This study is logging data from the Southern Ocean relating to the types and frequency of consumption of krill by recovering populations of humpback and minke whales. (Principal Investigator: Dr Ari Friedlaender, Duke University, USA).