

Preliminary voyage plan for the 2013 austral summer SORP Antarctic Blue Whale Project

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Abstract

The Antarctic Division of the Australian Government is planning an Antarctic Blue Whale Voyage in the austral summer of 2013. This voyage will be a part of the Southern Ocean Research Partnership's (SORP) Antarctic Blue Whale Project. The aim of the Antarctic Blue Whale Project is to develop technologies and collect data that will result in an estimation of the abundance of Antarctic Blue whales (*Balaenoptera musculus intermedia*), to improve understanding of population structure and linkages between breeding and feeding grounds, and to characterise the behaviour in the feeding grounds.

The 2013 Antarctic Blue Whale Voyage will be the first voyage (of hopefully many) that will combine acoustic tracking and photographic and genetic identification in order to obtain a relatively precise estimate of circumpolar abundance of Antarctic blue whales. The voyage is currently planned to be a minimum of 42 days in length and will be departing from either Nelson (New Zealand) or Hobart (Australia) in early February 2013. The voyage will target blue whales in waters west of the Ross Sea (i.e., 135-175°E), an area that has been associated with higher densities of blue whales from analyses of historical catch data, IWC-SOWER sighting data, and IWC-SOWER sonobuoy deployments. Other potential 'hotspots' that were considered include the area from the Davis Sea and west across the top of Prydz Bay (i.e., 60-100°E), and the Haakon VII Sea (i.e. 10°W - 30°E).

Further collaborations and developments from countries and scientists who could contribute to the SORP Antarctic Blue Whale Project are welcome and encouraged. Feedback on this, the preliminary Antarctic Blue Whale Voyage plan, is also welcome and encouraged through the soon to be established SORP Technical Committees and the Scientific Coordinator of the Antarctic Blue Whale Project.

KEYWORDS: MARK-RECAPTURE, IWC-SOWER, PASSIVE ACOUSTICS, PHOTO ID, GENETICS, SORP, ANTARCTIC BLUE WHALE

Introduction

The blue whale is an iconic species. Reaching over 30m in length, it is the largest animal to have existed on Earth. Two subspecies occur in the Southern Hemisphere: the Antarctic blue whale (*Balaenoptera musculus intermedia*) and the pygmy blue whale (*B. m. brevicauda*). During the austral summer Antarctic blue whales feed in the krill rich waters close to the Antarctic continent. Half a century ago Antarctic blue whales were perilously close to extinction (Branch 2008). During the twentieth century, some 330,000 Antarctic blue whales were killed, first by shore-based operations and then by pelagic catcher and factory ships. With Antarctic blue whales close to extinction, in 1964 the International Whaling Commission banned the hunting of blue whales, although they were still caught by illegal Soviet whaling operations until 1973 (Branch et al. 2004).

The Antarctic Blue Whale Project is one of six collaborative research programs of the Southern Ocean Research Partnership (SORP). The project aims to undertake research to better understand blue whale recovery from near extirpation by developing technologies and collecting data that will result in an estimation of circumpolar abundance of Antarctic blue whales. The project will also provide an insight into the general ecology of Antarctic blue whales in a post whaling environment by improving our understanding of population structure and linkages between breeding and feeding grounds, as well as improving characterisations of the blue whales' behaviour in the feeding grounds.

As part of the preliminary work conducted by the Antarctic Blue Whale Project, Kelly et al. (2012) provided a thorough analysis of potential methods to obtain a circumpolar abundance estimate for Antarctic blue whales. They concluded that the most plausible approach would involve a series of acoustically-assisted mark-recapture surveys targeting areas suspected of high density of blue whales. Pilot studies conducted in 2012 demonstrate the viability of this methodology (Kelly et al. 2012; Miller et. al. 2012; Miller 2012; Peel et al. 2012), and the 2013 Blue Whale Voyage will represent the initial application of these methods with Antarctic blue whales.

The first voyage of the Antarctic Blue Whale Project will occur in 2013. Voyage planning is presently underway, and the first voyage is expected to be conducted in a survey area between 135°E and 175° E. The voyage is currently planned to be a minimum of 42 days in length, departing from either Nelson (New Zealand) or Hobart (Australia) in early February 2013. There are three high-potential research sites identified from the analysis of IWC-SOWER blue whale sightings, acoustic detections, and blue whale historical catch data: waters west of the Ross Sea, 135-175°E; area from the Davis Sea and west across the top of Prydz Bay, 60-100°E; and the Haakon VII sea, 10°W-30°E (see Kelly et al. (2012; SC/64/SH10)).

Research vessel

Gardline Australia has submitted a tender for the Australian Antarctic Division to use the FV Amaltal Explorer (Figure 1 and Table 1), a 65 m long ice classed stern trawler owned and operated by Talley's in New Zealand. The vessel was built in 1986, and was originally built for a fishing company based in Spain until it was bought by Talley's approximately five years after its launch. The vessel's home port is Nelson, New Zealand. The FV Amaltal Explorer has the ability to support small boat operations from the main vessel, including launching and retrieving small ridged hull inflatable boats (RHIB) that are between 5-8 m in length. The location and extent of the ice edge to be surveyed has not been finalised, however, historically higher densities of blue whales have been found near the ice edge (Kelly et. al. 2012), hence the requirement for an ice-strengthened vessel.



Figure 1 - FV Amaltal Explorer, a 65 m long stern trawler owned and operated by Talley's in New Zealand.

Table 1 - Specifications of the FV Amaltal Explorer

<i>FV Amaltal Explorer</i>	
Call sign	ZMTZ
Home port	Nelson, New Zealand
Length overall [m]	65.0
Moulded breadth [m]	12.0
Gross tonnage (GT)	1386
Monkey deck height above Waterline [m]	10 – 10.5
Bridge height above waterline [m]	9 - 9.5
Engine power [PS / kW]	1986kW
Class	Lloyds 100A1 class 111D Ice no 8510805
Ice capacity	Ice classed
Cruising Speed [knots]	10
Passenger berths (i.e. science staff)	14

Number of personnel

The FV Amaltal Explorer will consist of a crew of 16 and there will be up to 18 passengers onboard. The number of researchers dedicated to each of the acoustician, observing and biopsy teams are yet to be confirmed. The report by Miller (2012) recommends that at least 5 acousticians are required for 24 hour operations. The RHIB crew will consist of a driver, tagger, biopsier and photographer (derived from a mix of the acoustics and observer teams). The Voyage Management Team will include a voyage leader, deputy voyage leader, chief scientist, a medical doctor and possibly an ice pilot. We encourage national and international collaboration and input from countries and researchers who could contribute to the SORP Antarctic Blue Whale Project and the 2013 Antarctic Blue Whale Voyage plan.

Choice of survey area

Three possible survey sites have been identified by Kelly et. al. (2012) as good candidates for initial voyages (Figure 2). The area located south of Africa, in the Haakon VII Sea (i.e., 10°W – 30 °E; green area in Figure 2) is generally considered to be an area of higher Antarctic blue whale density. However, voyages in this area are not within the realistic logistical support region of the Australian Antarctic Division and would likely need to be undertaken by researchers departing and returning to South Africa. This leaves two possible survey areas for the 2013 Antarctic Blue Whale Voyage. Further analysis of vessel availability and transit times

(Appendix A) indicates that only the area west of the Ross Sea (Figure 2 red line) is logistically feasible for the 2013 voyage.

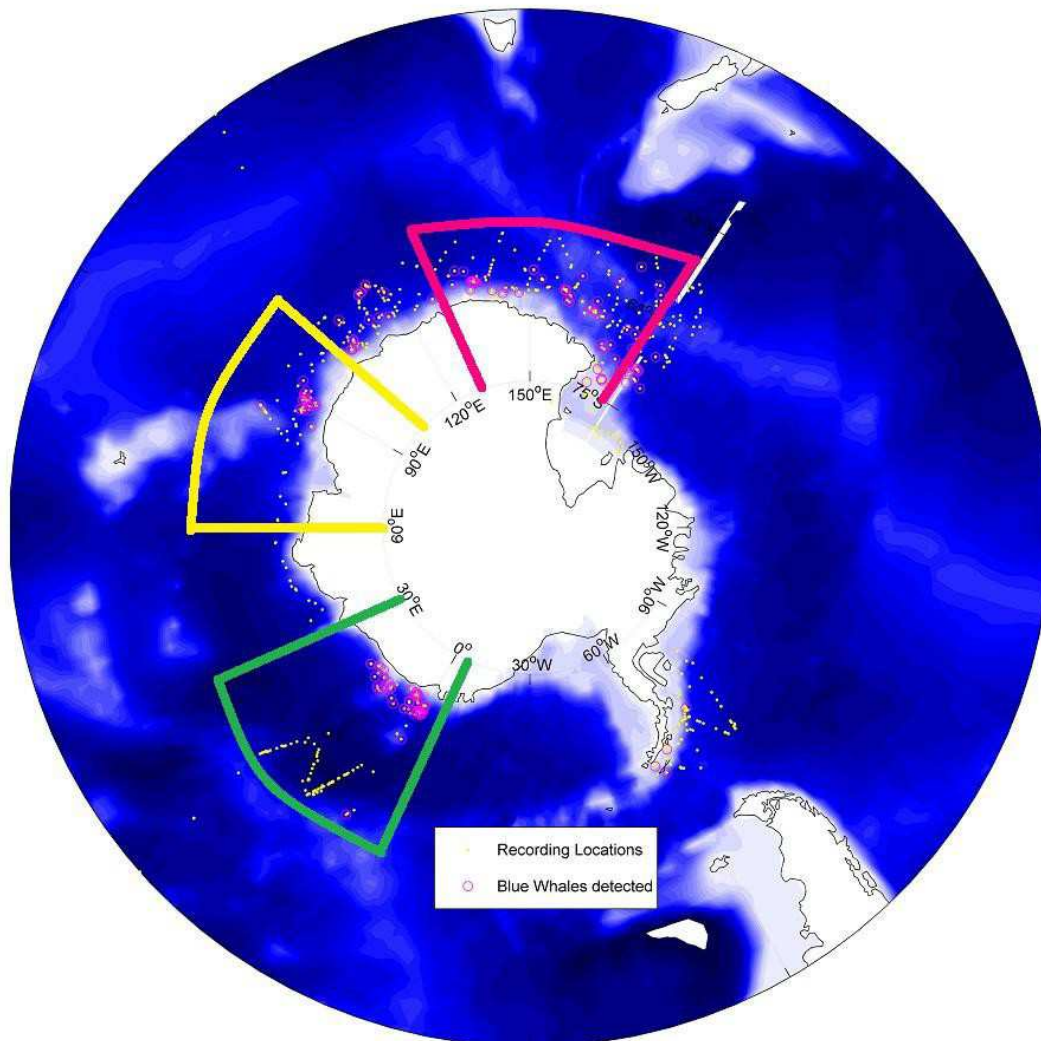


Figure 2 - Blue whale detections on sonobuoys deployed during various IWC-SOWER voyages, 1999-2009. Map shows possible survey sites, the area in the red lines is west of the Ross Sea, around the Balleny Islands (i.e., 135-175°E) and in the yellow survey area east of Prydz Bay, around the West Ice Shelf (60 - 100°E). The comparable survey area (in green lines) south of Africa in the Hakkon VII Sea (between 10°W and 30°E).

Voyage Schedule

The 2013 Antarctic Blue Whale Voyage is currently being planned as a minimum 42 day research voyage between early February and late March 2013. If the voyage is extended the departure date will be brought forward. Tradeoffs between whale density, acoustic activity, and favourable weather will likely have to be made when deciding when the voyage will proceed. In order to conduct small boat operations safely, and to effectively sight whales from FV Amaltal Explorer, good weather conditions with relatively calm sea states and good visibility are required. In the proposed survey area suitable conditions are expected to occur nearly half of the time for the late January to mid-March time period (Kelly et. al 2012). While peak blue whale densities may occur earlier in the season (Kelly et. al 2012), Gedamke et al. (2007) and Širović et al. (2009) report a peak in acoustic energy at Antarctic blue whale frequencies in Eastern Antarctica from April-June. However, in another study, Širović et al. (2004) reports a peak in Antarctic blue whale calling at a site in the Ross Sea over March. Finally, mid-March is the end point for surveying for 24 hours as the daylight is greatly reduced as the austral summer is drawing to an end.

Data Collection

The 2013 Antarctic Blue Whale Voyage aims to apply acoustically-assisted mark-recapture methodologies described by Kelly et al. (2012). The specific protocols that will be used during the 2013 Antarctic Blue Whale Voyage will be finalised by SORP Technical Committees. The 2013 Antarctic Blue Whale Voyage will likely involve 24 hour operations to undertake passive acoustics as well as general blue whale science (e.g., tagging, biopsy and photo-identification). In order to conduct small boat operations safely, small boat work will only be conducted when visibility is greater than 2nmi, wind speed is less than 20 knots and the sea state is less than Beaufort 6.

Photo identification

Identification photos and video will be taken following the methods reported by Olson (2010). Selected images and footage for each whale will be submitted to the Southern Hemisphere Blue Whale Catalogue (Galletti and Cabrera 2011). Blue whales may be approached within approximately 15-20 meters. Photo-identification of all adult and juveniles blue whales will occur. If the opportunity arises, females accompanied by calves may be approached for photo-identification, but efforts will cease immediately if there is any evidence that the activity may be interfering with a pair bonding, nursing, reproduction, feeding or other vital function. Photographs will be made available under standard IWC guidelines.

Genetic sampling

Biopsy samples will be taken of Antarctic blue whales as appropriate and decided by the Chief Scientist and Voyage Management. Biological samples will be collected from the RHIB using biopsy sampling (skin/blubber collected by projectile dart). Projectile biopsies will be collected using pneumatic line throwers and biopsy rifles (Larsen gun system). During a single encounter, no more than five biopsy sampling attempts per individual will be made. If signs of harassment such as rapid changes in direction, prolonged diving and other behaviours are observed from an individual or a group, the biopsy activities will be stopped on that individual or group. The repository and processing of the acoustic and genetic data will be determined by the soon to be developed SORP and Antarctic Blue Whale Project technical committee and will be made public through the IWC and/or the data centre at the Australian Antarctic Division.

Passive acoustics

Passive acoustic tracking was used to improve sighting rates of pygmy blue whales during the early 2012 voyages (Miller 2012; Miller et al. 2012), and the same methodology will be applied in Antarctic waters during the 2013 Antarctic Blue Whale Voyage. The main use of passive acoustic tracking during the voyage will be to increase encounter rates with blue whales, but acoustic tracking of Antarctic blue whales will also yield measurements of the source level of many Antarctic blue whale vocalisations. When conducted concurrently with visual observations and genetic sampling, passive acoustics may also provide information on behavioural and social context of blue whale vocalisations. Such observations may, in conjunction with long-term recording stations, provide an alternative means to estimate density of blue whales using relatively affordable long-term recorders (Samaran et al. 2012). Such data will contribute to further developing methods to meet the aims of the Antarctic Blue Whale Project.

Additional research

The main focus of this voyage will be the collection of individual identification marks for Antarctic blue whales, however, additional research may be undertaken at the discretion of the Chief Scientist and Voyage Management. Additional research that can be conducted without significant disruption to the primary objective is likely to be favoured in order to maximise time dedicated to the primary research objectives. At this point, additional research may include satellite tagging, daily CTD casts, and opportunistic collection of active acoustic data. Sighting data will be collected for all species of marine mammals encountered, and species other than blue whales may be approached for additional observation if time and conditions allow.

Future Planning

While this document provides an overview of the 2013 Antarctic blue whale voyage, it is hoped that the final plan will be driven by the soon to be established SORP Technical Committees. It is envisioned that a SORP Technical Committee will represent major research objectives (e.g., individual identification, mark-recapture survey methodology and passive acoustics) outlined by Kelly et al. (2012), and that these committees will be comprised of a panel of international experts in each area.

The Antarctic Blue Whale Project is in its infancy stage and we welcome and encourage further collaborations and developments from countries and scientist who could contribute to the Project. The vessel charter will be secured shortly and logistical and operational preparation will commence in earnest. Feedback on the preliminary 2013 Antarctic Blue Whale Voyage plan and collaboration from nations and researchers who could contribute to the Antarctic Blue Whale Project is welcome and encouraged through the soon to be established SORP Technical Committees and the Antarctic Blue Whale Project Scientific Coordinator, Dr Victoria Wadley.

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Appendix A

There are three potential voyage departure locations for the 2013 Antarctic Blue Whale Voyage: Nelson (New Zealand), Hobart (Australia) and Fremantle (Australia). The transit and survey times for the two potential study sites and three potential voyage departure locations are presented in Table 2. The calculations in Table 2 use a hire period for the FV Amaltal Explorer of 42 days and assume that the vessel must transit to/from Nelson, NZ, to whichever port(s) are nominated during that 42 day hire period, and further assumes a steaming speed of 10 knots. Approximately 24 hours turn around at that port(s), for both start and finish of survey, is also assumed. The start and end point of the survey area have been defined as the boundary longitudes, and latitude of approximately 65°S.

The analysis of the transit and survey times indicates that the area west of the Ross Sea is the preferential survey area as this area allows the greatest time in the survey area and it is thought that the longer time in the survey area the number of sightings will increase. Taking this in to account the departures and arrival into Nelson or departing from Hobart and returning to Nelson (or vice versa) are the two preferred options.

Table 2 - Transit and survey times for the two potential study sites and three potential voyage departure locations

Departure and Arrival port	Transit to/from home port (nmi)	Transit to/from survey area (nmi)	Total Transit (nmi)	Roundtrip transit time (days)	Survey time (days)
Ross Sea Survey area 135-175°E					
Nelson, NZ	0	3470 (1450+2020)	3470	15	25
Nelson, NZ/Hobart, TAS	1230	2770 (1450+1320)	4000	16.6	23.4
Hobart, TAS	2460	2920 (1600+1320)	5380	22.4	17.6
Davis Sea Survey area 60-100°E					
Hobart, TAS	2460	5050 (2050+3000)	7510	31.3	8.7
Hobart/Fremantle, WA	4230	4720 (2700+2020)	8950	37.3	2.7
Fremantle, WA	6000	4700 (2700+2000)	10700	44.6	-4.6