Australian Marine Mammal Centre Grants Program
Final Report

- **Project No**. – 11/21
- **Title** - Status, Structure and Distribution of Southern Right Whales in South-east Australia – Phase 2
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- **Organisation** – Department Environment and Primary Industries (formerly Department Sustainability and Environment)

Table of contents

1. Project Summary

A clear, plain English summary of approximately 500 words outlining the work undertaken and any significant findings (for publication on the Department's web site). Include what was done, why and the key findings resulting in recommendations summarised from the sections below.

The project's primary objective was to gain an improved understanding of the status of the southern right whale population within South-east Australia via collection and analysis of genetic samples and photo-identification data from whales wintering along the coast of Tasmania, Victoria and New South Wales.

The project commenced with Phase One in 2010 and was completed with Phase Two in 2013.

Biopsy sampling and collection of photo-identifications of individual southern right whales was undertaken in Victoria, Tasmania and New South Wales during the 2010, 2011, 2012 and 2013 seasons. Data collected during the first phase of the project in 2010 – Phase One - included 26 photo-identifications and 7 skin samples. This work was detailed in the final report of project 09/44. Data collected during the second phase of the project in 2011, 2012 and 2013 – Phase Two - is comprised of 92 photo-identifications and 17 skin samples.

Opportunistic photo-identifications and biopsy samples of individual whales were directly obtained by the investigators (representing each State government agency involved), by conducting flights and/or boat trips in response to reports of sightings. Effort varied from year to year and location to location depending on numbers of whales detected, weather and sea conditions.

Skin samples for genetic analysis were collected using the Paxarms© biopsy darting system. Biopsy sampling was conducted by experienced scientists under permits issued to the investigators. Boat based lateral identification photographs were collected during biopsy.

Skin biopsy samples were stored in 70% ethanol.

Dorsal identification photographs were collected by experienced observers using Digital SLR cameras equipped with telephoto lens, from high wing aircraft (such as 182 Cessna). Aircraft work was conducted at or above the minimum height restrictions in each State. Individual whales were identified using the dorsal view of the callosity patterns (Payne & Dorsey 1983 and Kraus et al. 1986). Photo-identification data was collated and compared against local catalogues and within-location matches from each season were discounted. All photo-identifications were added to Sate based and region-wide catalogues.

The complete databank for the period 2010 – 2013 inclusive is comprised of 118 photo-identifications and 24 skin samples, demonstrating a significant data collection effort. The total databank is summarised in the **Appendix 1 attached**.

Photo-identification analysis was undertaken by comparing the complete project data-set against the South East Australian Photo-Identification Catalogue (SEA SRW PIC). This process detected nine (9) matches between whales identified during the project and whales previously known to the region. Four (4) of these matches involved breeding females recorded at the same location (Logans Beach, Vic) in different years. Five (5) matches provide evidence of long distance movement within the region both within-season and between season. These are summarised below.

Project ID	SEASRWPIC ID	Date	Location	Class	Match info	Comments
VICB1101	SE1102	29-Jul-11	Gippsland, Vic	SAG	VIC/VIC match between location	Biopsy, first identified at Logan's Beach 1 July same year
VIC1203	SE1008	24-Jul-12	Discovery Bay, Vic	SAG	NSW/VIC match between season	first identified 18 Aug 2010 NSW
NSW1201	SE0101	24-Jul-12	Sydney Harbour, NSW	CC pair	NSW/VIC match between season	Skinny Minnie first identified Logan's Beach 2001
TAS1303	SE1219	21-Jun-13	Great Oyster Bay, Tas	single	TAS/VIC match between season	first identified Port Fairy SAG 2 Sept 2012
TAS1304	SE0929	21-Jun-13	Prosser's Bay, Tas	CC pair	VIC/TAS match between season	first identified near Lorne 24 June 2009

Analysis of biopsy samples is described in **Appendix 2.** Based on mtDNA, there were no significant differences between SA and WA and between VIC and TAS, therefore, these pairs were pooled to form representative samples from SWA and SEA wintering grounds, respectively. When pooled, the SEA and SWA populations were significantly differentiated based on both F_{ST} and Φ_{ST}, confirming the difference first detected in Carroll et al (2011). Microsatellite based-analyses also showed some difference between WA and the two SEA states, VIC and NSW (G''_{ST}=0.06-0.08): the difference between WA and VIC was statistically significant.

Analysis of the photo-identification data revealed a small number of between-location matches indicating movement within region. This work helped to inform decision making around analysis of genetic samples (e.g. pooling of Victorian and Tasmanian samples). Results of biopsy data analysis show a greater degree of differentiation between SEA and SWA than either Australian populations and the NZ population confirming previous work by the investigators.

2. The Outcomes and Objectives – Key Findings

List the Project Objectives and address each one, noting the degree to which the objective was achieved through the research and issues that may have hampered its success. Describe the key findings as they relate to the objectives and the management questions identified in the initial application.
Previous studies of genetic diversity in south eastern Australia southern right whales suggested significant differentiation between the remnant south east coast population and animals from Western Australia and New Zealand (Patenaude and Harcourt (2006), Carroll et al (2011)). However, sample sizes were previously small and too low for inclusion in stock structure analyses. The objective of this project was to continue opportunistic biopsy sampling and collection of photo-identifications and to analyse the total project databank. 118 photo-identifications and 24 skin samples were collected and analysed directly as a result of this project. The results of this project confirm the previous work of the investigators, that there is significant genetic differentiation between the two Australian populations, based on mtDNA haplotype frequencies. This objective of this project has been achieved. Further funding has been obtained by the investigators to update the stock structure analysis of right whales in New Zealand and Australia with the larger sample size obtained from this and other AMMC funded projects as well as determine fine-scale population structure across south-east Australian southern right whale wintering grounds. The total photo-identification and genetic data from this and previous projects will form a comprehensive study of (i) the number of stocks present in Australian waters, (ii) the relationship of this stock(s) to others in the Southern Hemisphere, (iii) estimation of effective population size(s) for each stock and (iv) assess whether there is sufficient protection for individual stocks.

3. Implications for Management

What are the key recommendations for management based on the findings.
As a result of this project it is confirmed that there is greater genetic differentiation between the South-east and South-west Australian southern right whale populations than there is between either of these and New Zealand. There is also evidence of regional-level genetic differentiation that will be explored further in AMMC 2014-37. Given the small size of the South-east Australian population, this highlights the importance of the implementation of management measures to reduce impacts on South-east Australian whales as outlined in the Conservation Management Plan for the Southern Right Whale 2011 - 2016.

4. Other Benefits

How has this project advanced the field of research? (e.g. scientific discoveries, new methodologies)
N/A

5. Problems Encountered (if any)

Describe any major problems encountered during the Activity and how they were addressed.
No major problems were encountered during the Activity.

6. Communication

How will results be communicated to management
AMMC Final report IWC Scientific Committee reports Recovery Plans, management guidelines Conference presentations Meetings/Personal Communication
Stakeholder engagement feedback (plain English for feedback to stakeholders)
Biopsy sampling and collection of photo-identifications of individual southern right whales was undertaken in Victoria, Tasmania and New South Wales during the 2010, 2011, 2012 and 2013 seasons. Data collected during the first phase of the project in 2010 – Phase One - included 26 photo-identifications and 7 skin samples. This work was detailed in the final report of project 09/44. Data collected during the second phase of the project in 2011, 2012 and 2013 – Phase Two – included 92 photo-identifications and 17 skin samples. Analysis of the photo-identification data revealed a small number of between-location matches indicating movement within region. This work helped to inform decision making around analysis of genetic samples (e.g. pooling of Victorian and Tasmanian samples). Analysis of biopsy data showed a greater degree of differentiation between SEA and SWA than either Australian populations and the NZ population confirming previous work by the investigators.
Students supported (if any)
N/A
PhD Theses and dissertations (if any)
N/A
Publications (other than theses and dissertations)
Upon completion of complete data analysis from this and other AMMC funded projects on status, structure and distribution of southern right whales in South-east Australia.

7. Project Outputs

A list of the actual outputs of the research including milestones, progress reports and data products such as models etc.	Proposed date of completion	Actual date of completion
Following Phase 1 and Phase 2:		
Improved understanding of population size and structure in SE Australia	03/2014	31 March 2014
Final project report - Phase 1 and Phase 2	03/2014	31 March 2014
Management recommendations to DEWHA, DSE, DPIPWE, DECC	03/2014	31 March 2014