

Australian Marine Mammal Centre
Final Report
(subclause 9 and Schedule Item 5 of the Funding Agreement)

- **Project No.** – 26
- **Title** - Maintaining the monitoring of pup production at key Australian sea lions at colonies in South Australia
- **Chief Investigator** – A/Prof Simon Goldsworthy
- **Organisation** – SARDI Aquatic Sciences

Activity Period –

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1. Activity Summary

A clear summary of approximately 500 words outlining the work undertaken and any significant findings (for publication on the Department's web site)

This project maintained pup production monitoring of a number of key Australian sea lion breeding colonies within South Australia between late 2010 and late 2011. This included surveys at Seal Bay and the Seal Slide on Kangaroo Island, Lilliput and Blefuscu Islands in the Nuyts Archipelago, Olive and Jones Islands off the west Eyre Peninsula and Dangerous Reef and English Island in southern Spencer Gulf. The breeding status and pup production was also determined for a number of islands in southern Spencer Gulf (Peaked Rocks, North Island, Albatross Island, Smith Island) and off the lower Eyre Peninsula (Rocky [North] Island, Four Hummock Islands, Price and Golden Islands).

Pup production for the 2010 breeding season at Seal Bay was estimated to be 269 (range 267-276), based upon a range of methods including twice-weekly surveys of new pup births and deaths, the total number of tagged (micro-chipped) pups, mark-recapture methods using the Petersen estimate and direct counts of pups in Pup Cove.

At the Seal Slide, five surveys were undertaken to estimate pup production using the capture, mark and count method. The estimate of pup production for the 2010 breeding season was 10. Based on pup production estimates for the last six breeding seasons at the Seal Slide (which have ranged between 9-15), there has been no significant change in pup production.

Pup production at Lilliput and Blefuscu Islands based on the Petersen methods were 66 (95% CL, 64-66) and 108 (95% CL, 104-111), respectively. These survey represent the fourth surveys of pup abundance at these colonies, and the second survey using mark-recapture methods. Previous mark-recapture estimates for the 2007-08 breeding season were similar

- 64 (95% CL, 62-69) and 99 (95% CL, 92-106) for Lilliput and Blefuscu Islands, respectively.

At Olive Island, Petersen methods undertaken in August and September 2010, estimated pup production 173 (95% CL 165-181). Four consecutive breeding seasons of Petersen estimates have been made at Olive Island: 2006 season 206 (191-267), 2007 season 161 (151-172), 2008/09 season 221 (195-247), and 2010 season was 173 (95% CL 165-181). These data show the alternate pattern in pup production between seasons as seen at many other breeding locations and a high variation in pup production between seasons (23-37%).

A single ground survey was undertaken on 1 November 2010 at Jones Island when a total of 28 pups were sighted (2 brown, 1 moulting and 25 fully moulted pups). Given the elevated numbers of pups sighted based on previous surveys (previous maximum 15), it is probably that some pups had swam in from neighbouring colonies, such as West Waldegrave, Nicolas Baudin Island, and Point Labbatt.

Five surveys were undertaken at Dangerous Reef throughout the breeding season between April and September 2011. Estimates of pup abundance based on cumulative tagged plus cumulative dead (untagged) plus the maximum observed untagged (412), Petersen estimate plus cumulative dead (399, range 376 – 413) and cumulative pup production methods (402, range 376-444) were undertaken.

A survey was undertaken at English Island in August 2011, during which 35 live pups (30 brown and 5 moulted) and 2 dead pups were observed. However, one of the dead pups and two other live pups sighted were tagged pups from Dangerous Reef. As such, at least 3 of the pups sighted at English Island are likely to have originated from Dangerous Reef and the maximum pups numbers originating from English Island is 34.

Two helicopter surveys were undertaken to determine the breeding status and pup production for a number of islands in southern Spencer Gulf and off the lower Eyre Peninsula in November 2010 and May 2011. Surveys confirmed breeding at Peaked Rocks (East), North Islet, and Albatross Island and surveys of pup abundances were undertaken at these sites (58, 21 and 69 respectively). Off the lower Eyre Peninsula, pup abundance was estimated at Price Island (17), but surveys at Rocky [North] Island, and the Four Hummock Islands were undertaken approximately 6 months after breeding, however, the timing of the next breeding season has been estimated to assist follow-up surveys. Breeding was not observed to take place at Peaked Rocks (West), Smith or Golden Islands.

2. The Outcomes/Objectives

List of the Project Objectives

1. Undertaking pup production surveys at key monitoring sites including Dangerous Reef, and English Island, Blefuscu and Lilliput Islands, Olive and Jones Islands, Seal Bay and the Seal Slide; and
2. Undertake single surveys at sites that have not been surveyed during the breeding season for long periods; including Albatross, Four Hummocks, Rocky North Island, Peaked Rocks and Smith Island (Southern Eyre Peninsula). These surveys will involve one-off counts of pup production at the end of the breeding season.

The degree to which the Activity has achieved each of the objectives

Pup production surveys were completed at all the key monitoring sites. Surveys were also

undertaken to determine the breeding status and pup production for a number of islands in southern Spencer Gulf and off the lower Eyre Peninsula including Albatross, Four Hummocks, Rocky (North) Island, Peaked Rocks, North Islet, Smith, Price and Golden Islands.

3. Appropriateness

The appropriateness of the approaches used in the development and implementation of the Activity

A range of survey methods were used to achieve pup production estimates. These varied relative to the size of populations and the number of repeat surveys undertaken. A full report of the methods and results of surveys will be provided to the AMMC shortly. This will be a fully peer reviewed SARDI report – as has been provided to the AMMC in previous years.

4. Effectiveness

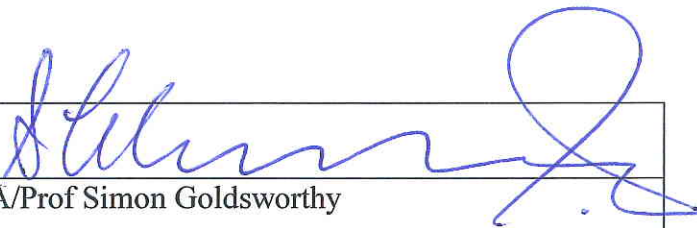
The degree to which the Activity has effectively met its stated objectives

The project has met all its stated objectives. That being said, planning and implementing Australian sea lion surveys is challenging given the asynchronous non-annual breeding where intervals between consecutive breeding seasons can vary between 15 to 19 months. For this project, breeding commenced about 3 months earlier than expected for most west coast Eyre Peninsula/Nuyts colonies surveyed during 2010. This meant that instead of our first survey visit occurring about 3 months into the breeding season (approximately half way), they all occurred at the end of the breeding season. This meant that instead of several surveys occurring, for most colonies only one or two surveys were possible. In our 2011/12 AMMC project we will trial the use of remote phone linked cameras to monitor breeding chronology in order to optimise the timing of surveys.

Further work needs to be undertaken to optimise analytical methods used for estimating pup production at larger colonies where multiple mark-recaptures are undertaken. As we collect more data on consecutive breeding seasons we are noticing a marked alternate pattern in breeding season characteristics that appear to change the conditions under which mark-recapture methods are used. We suspect assumptions that re-sight probabilities and temporary migration remain constant between seasons is wrong, and this is presently reflected in some of our pup production estimates, most notably from Dangerous Reef. Applying more sophisticated modelling approaches to improve our estimates of pup production is required and we hope to develop these as part of future AMMC proposals.

5. Financial Account of the Activity

All grant moneys have been spent – a Statement of Income and Expenditure is presented below for the period July 2010 to November 2011. A fully audited statement is currently being arranged but will not be available until early in 2012.

Signature of Chief Investigator	
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Date	13/1/12
Signature of Organisation Representative	
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Date	13/01/2012

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