

SOCIETY FOR MARINE MAMMALOLOGY: SMALL GRANTS IN AID OF RESEARCH (2018)

GRANT REPORT

PROJECT TITLE: Genetic validation of alpha-male paternity in southern elephant seals to determine the role of males in population dynamics

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Project Summary

This study aims to assess paternity in southern elephant seals *Mirounga leonina* at Marion Island using microsatellite DNA analysis. Generally, alpha-males dominate mating in harems in this extremely polygynous species, but genetic methods have shown that covert mating behavior by ‘sneaky’ subordinate males may reduce the reproductive success of alpha-males. This is the first study to distinguish between behavioral (observational) and genetic reproductive success of male elephant seals at Marion Island. Genetic paternity analysis is crucial to correctly interpreting the reproductive behavior and demographic role of males in this population, for which 35 years of individual-based mark-recapture data exists.

Research questions

Our objective is to assess the extent to which observational data of reproductive success reflect genetic parentage in male southern elephant seals from a population with high quality demographic data (Marion Island). The research questions are:

- 1) What is the reproductive success of alpha-male elephant seals, as determined by genetic paternity testing?
- 2) What is the reproductive success of subordinate (bachelor) males, as determined by genetic paternity testing?
- 3) Are behavioral observations of reproductive success consistent with genetic parentage assignment?
- 4) How does reproductive success of alpha-males at Marion Island compare to that at the similar-sized breeding population at Sea Lion Island, and larger breeding population at Peninsula Valdés?
- 5) Does harem size (the number of females) or competition (the number of subordinate males present) influence the reproductive success of alpha-males?
- 6) What is the variance of reproductive success among males at Marion Island?

Progress – Biopsy sample collection

October 2017: Hind-flipper biopsy samples were collected from most of the breeding male elephant seals present at the island (n = 31 alpha-males; n = 34 subordinate males) and a random sample of breeding females (n = 68). Regular mark-recapture surveys (once a week over 51 km of coastline) were conducted that facilitated classification of breeding males as alpha-males or subordinate males.

October 2018: Hind-flipper biopsy samples were collected from 65 pups born at Marion Island in October 2018. This is a smaller sample than we intended to collect (n > 200), with field work constrained by an injury to one of our three dedicated field assistants (the injury was unrelated to this project). In total, we now have n = 40 sets of samples where we collected biopsies from both the putative parents and the offspring. This sample is less than the number of pups sampled, as we sometimes lack genetic material from one of the parents. Additional noninvasive molt skin sampling of individually known individuals continued during the molting season. This material (collected from juveniles and adults, males and females) is not as conducive to genetic analysis as biopsy samples are, but may assist (if required) in addressing the questions we ask in this study.

Given that the 2018 breeding season sampling of pups did not go as well as we had hoped, we will look to increase our samples of complete genetic material sets (where we have samples of both putative parents and the offspring) during the 2019 elephant seal breeding season. This will largely involve biopsy sampling of adult females, and the pups born to these adult females who were breeding on beaches with known, already sampled males, in 2018.

Tissue samples collected in 2018 were returned from Marion Island to South Africa in May 2019, following the annual change of expedition teams. Analysis of these samples has not commenced, and will form a part of a doctoral dissertation of a student from the University of Pretoria in South Africa. Analysis will unfortunately be delayed while we await further samples (to be collected by the already-identified doctoral student). However, research findings will ultimately be published in a peer reviewed international journal, acknowledging the Society for Marine Mammalogy for awarding this grant, as we did with a previous grant (see the 2013 Small Grants in Aid of Research and Lübcker, Reisinger, Oosthuizen et al. 2017 *Marine Ecology progress Series* 577: 237-250. doi.org/10.3354/meps12240). Updates regarding this project will appear online at <https://www.marionseals.com/>.

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