Spatial and temporal components of female breeding strategies in southern elephant seals

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Abstract
Spatial and temporal factors are important components of breeding strategies. Breeding site fidelity and phylopatry may entail significant somatic benefits and costs, and may result in genetic substructure. Seasonality and synchrony of reproduction can be related to parental investment, breeding success and offspring survival. Longitudinal studies of breeding strategies in long-living species are rare. We studied breeding strategies of female southern elephant seals (Mirounga leonina) at Sea Lion Island (Falkland Islands) over 17 years.

Introduction
Spatial and temporal aspects of breeding strategies have been rarely studied in long living species, due to the practical problems of prolonged data collection on identified individuals. Nevertheless, they are very important aspects of the breeding strategies of mammals. In fact, breeding site fidelity may entail significant benefits and costs and, if coupled with phylopatry, may result in genetic substructure. Similarly, seasonality and synchrony of breeding, at population and individual level, can be related to breeding success.

Methods
Field work was carried out at Sea Lion Island (Falkland Islands, Fig. 1), from 1995 to 2011. The island shelters a small and isolated population of elephant seals (516-595 breeding females). We marked 4405 females at birth together with 1123 females that were already breeders at the beginning of the study (1995-1999) (Fig. 2). Tag loss rate was low (Galimberti & Boitani 1999).

Female breeding was very regular at population level. We found evidence of strong phylopatry and parturition site fidelity. Each female showed high repeatability in the time components of her breeding strategy. Breeding site fidelity and regularity in the timing of breeding were related to aspects of female phenotype, but we found scarce evidence of an effect on female parental investment.

Results
Phylopatry and site fidelity
• 63.2% (95% CI = 46.5-77.4) of females gave birth the first time in the zone where they were born.
• 71.7% (95% CI = 69.3-74.0%) of the females gave birth in the same zone of the previous year.
• The median distance of the parturition site in consecutive years was 340 m
• Females of larger size class showed greater site fidelity (Fig. 3).
• Experience (number of previous breeding seasons) and result of previous breeding attempt were not related to fidelity.

Breeding at population level
• Peak haul out was either on the 19th or the 20th of October (9 and 8 years, respectively).
• The percentage of females hauled out each day of the season showed a strong correlation among years (r = 0.983-0.999; Fig. 4).

Conclusions
• Phylopatry and site fidelity were strong, notwithstanding the lack of evident topographical features of Sea Lion Island sand beaches.
• At population level, breeding was strongly synchronized and regular among years.
• At individual level, the temporal components of each female breeding strategy were repeatable.
• Breeding site fidelity and regularity in timing of reproduction were related to female phenotype, and size in particular, but not to parental investment.

Literature cited