



Survival differences and the effect of environmental instability on breeding dispersal in an Adélie penguin meta-population

High survival and breeding-site fidelity have been previously documented for Adélie penguins, but that was for a period of stable environmental conditions. It is important to understand whether these characteristics are consistent through periods of high environmental variability.

In a study published in the *Proceedings of the National Academy of Sciences*, we investigated survival and dispersal of breeding penguins in the southwestern Ross Sea, Antarctica, during 12 breeding seasons (1996–2007). High environmental variability was created by the temporary grounding of two immense icebergs that erected a veritable fence separating colonies and altering migration routes and by trapping extensive sea ice in the region during half the study. We collaborated with researchers from Oregon State University, H.T. Harvey and Associates, and Landcare Research, New Zealand to accomplish this work.

Because colony size in our study area varied by orders of magnitude, we were able to investigate survival and dispersal rates in relation to both environmental conditions and colony size simultaneously.

Survival was lowest for the smallest colony (4,000 pairs) and similar for the medium (45,000 pairs) and large colonies (155,000 pairs), despite increased foraging effort expended by breeders at the largest colony. Survival was not affected by environmental conditions, although there was high annual variability in survival.

Between-colony movement of breeding birds was low (<1% of studied birds) except during years of

difficult environmental conditions, when movements increased, especially away from the smallest colony (3.5% of studied birds). Lower survival at the smallest colony could reflect differences in timing of migration and winter habitat use compared with the other colonies, or it may reflect increased permanent emigration to colonies outside the study area.

Contrary to current thought, breeding penguins can change breeding locations; stressful conditions can significantly increase dispersal rates.

Main Points

- Environmental variability did not affect survival rates in this study
- Survival rates were lowest at the smallest of the three colonies studied, but similar for the medium and large colonies
- Adult penguins can and do change breeding locations when environmental conditions are particularly challenging

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