



Coexistence of Mesopredators in an Intact Polar Ocean Ecosystem: The Basis for Defining a Ross Sea Marine Protected Area

Designation of an effective Marine Protected Area (MPA) requires substantial knowledge of how key wildlife species use the area. Within the Ross Sea, Antarctica, the least altered high seas marine ecosystem on Earth, incredibly large populations of several marine bird and mammal species coexist. Understanding how that is possible is a key to maintaining the ecological integrity of the system, the major goal in designating the Ross Sea as an MPA.

In a paper published in *Biological Conservation*, Grant Ballard, Dennis Jongsomjit and Sam Veloz of PRBO teamed with David Ainley of H.T. Harvey and Associates to assess the niche occupation, habitat use, and overlap for the majority of middle-trophic level predator species (mesopredators) in the Ross Sea. We did this by analyzing three components of their life histories simultaneously: (1) diet, (2) foraging depth, and (3) horizontal distribution and habitat relationships. To do this required a massive data aggregation and modeling effort, bringing together observations from nine cruises, several animal-tracking studies, and extensive literature review.

We found that diet and foraging depth overlapped among species, whereas horizontal use fell into three distinct habitat associations: (1) continental shelf break (2) shelf and slope and (3) marginal ice zone of pack ice which typically rings the Ross Sea. In aggregate, the species used the entire continental shelf and slope, with the outer shelf and slope and the deeper troughs of the Ross Sea shelf being the most important areas for wildlife – a complex pattern implying that, to be effective, a Ross Sea MPA will need to incorporate substantial, contiguous areas. We ranked the conservation

priority for every 5km square in the region, and these rankings are being used to evaluate the conservation value of competing Ross Sea MPA proposals.

The study benefited from support by the Lenfest

Main Points

- We documented the environmental niches of 9 of the 13 mesopredator species in the Ross Sea.
- Species had high environmental niche overlap, but low overlap in horizontal space.
- We ranked every 5-km grid cell in the region in terms of conservation priority.
- Results show that a piecemeal approach to MPA designation in this system is not likely to be successful.
- Our findings are being used to evaluate the conservation value of competing Ross Sea MPA proposals.

Ocean Program and the National Science Foundation, grant OPP 0440643.

Paper citation:
Ballard, G., D. Jongsomjit, S. D. Veloz, and D. G. Ainley. 2011. Coexistence of mesopredators in an intact polar ocean ecosystem: The basis for defining a Ross Sea marine protected area. *Biol. Conserv.*, doi:10.1016/j.biocon.2011.11.017