LENFEST OCEAN PROGRAM

Study Finds Only Large MPA Would Protect Ross Sea Predators

RESEARCH SUMMARY

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Study 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

In Brief

The Ross Sea is the most untouched stretch of ocean on the planet, and the Commission for the Conservation of Antarctic Marine Living Resources is considering establishing a Marine Protected Area (MPA) there. A new study analyzed the seasonal movements of the Ross Sea's diverse predators—which include seals, whales, penguins, and other seabirds. It found that they eat similar diets but live and feed in different parts of the sea—in effect dividing it up among them. The study concludes that an MPA will need to cover the entire Ross Sea if it is to protect these predators and their ecosystem.

The Ross Sea

Because it is largely untouched, the Ross Sea supports an unusually large number of highly mobile marine predators. Fishing for Antarctic toothfish began in 1996, targeting large adults. Removing too many of these important predators would likely affect their main prey, silverfish and krill. This, in turn, could disrupt the entire Ross Sea food web, since the other predators also rely heavily on these prey species.

Geographically, the Ross Sea can be divided into the shelf and slope. The shelf is a relatively shallow basin, and the slope extends outward from the shelf, descending to a depth below 3,000 meters.

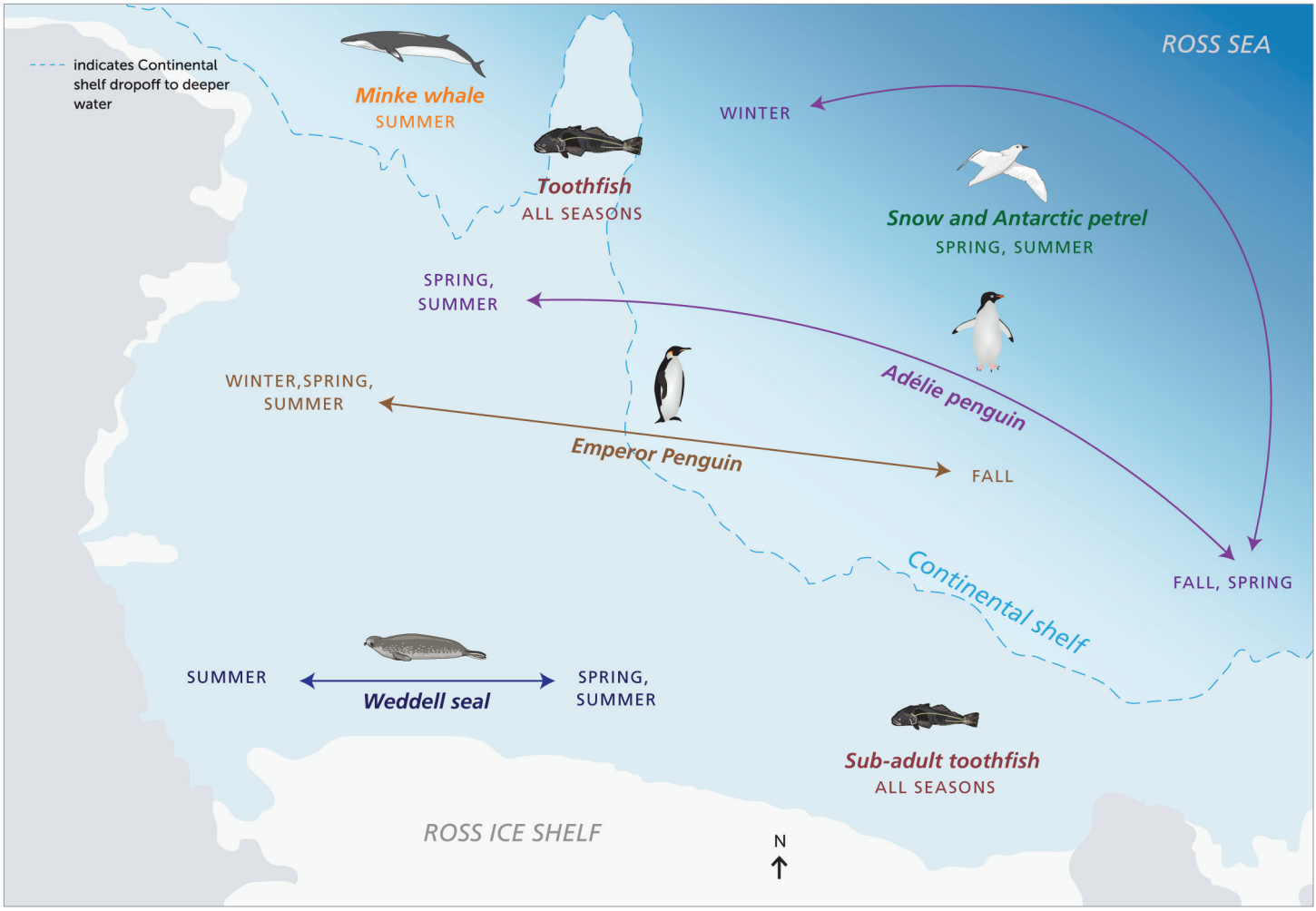
The Study

To identify appropriate boundaries for an MPA in the Ross Sea, the authors analyzed data on the diet and habitat use of the major predators. The data came from research surveys, satellite tracking, and the scientific literature. There are gaps in these data, however, so the authors used a computer model to extrapolate what areas each species was using based on existing species data and known habitat preferences.

Adélie penguins hunting krill and silverfish in a sea ice crack in the Ross Sea. Photo: John Weller

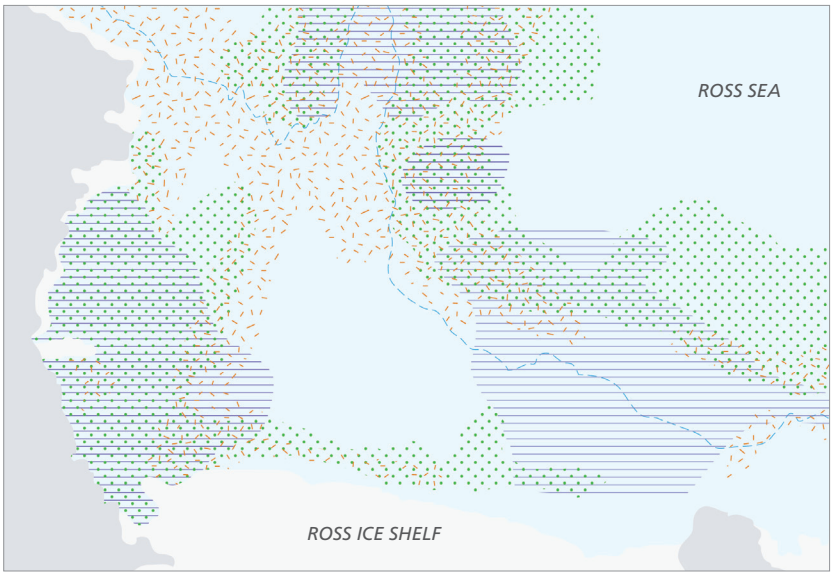
Predator use of the Ross Sea by Season

According to the authors' analysis of surveys, satellite tracking, and the scientific literature, predators use distinct but overlapping regions of the Ross Sea, changing with the seasons, so that ultimately the entire Ross Sea is used. Labels show highest environmental suitability rather than entire ranges.



Results

The scientists found that each species used a distinct region of the Ross Sea that changed with the season, resulting in a mosaic pattern that covers most of the sea. For example, albatross and petrels mainly use the outer continental shelf and the slope, whereas Weddell seals hunt over most of the shelf. Penguins live on the western edge of the sea in summer, then move east in fall to fatten and molt on what remains of the sea ice. This "partitioning" of the Ross Sea helps explain why it is possible for many large predators to co-exist in this ecosystem despite its small size and a limited selection of prey. These findings indicate that an MPA would need to include the entire Ross Sea in order to protect all predators. Such protection may be necessary to maintain the integrity of perhaps the only largely intact marine ecosystem remaining on the planet.



Detail for three species: Showing "high" presence zones for three species. These zones show more complete data than the larger map (above). Source: Adapted from Grant Ballard, Dennis Jongsomjit, and Sam Veloz of the Point Reyes Bird Observatory and David Ainley of H.T. Harvey & Associates