Point Blue Publication Brief

Trends in the Breeding Population of Adélie Penguins in the Ross Sea, 1981-2012

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The abundance of breeding seabirds in a region is limited by food and nesting space availability. Adélie penguins require both ice-free terrain for nesting and open ocean to find their food. Most of Antarctica does not meet one or both of these requirements.

Because of these constraints, population responses of Adélie penguins to changing conditions can be complex. Long-term climate change and shorter-term atmospheric variability can have major impacts to nesting, foraging, and migratory conditions.

Significant changes in Adélie penguin and other Antarctic marine predator populations have also been linked to depletion of whales and large fish, which compete for limited numbers of prey species.

To begin to assess the relative roles of these factors, we used a long-term series of aerial photographs of penguin colonies to determine annual population sizes of penguin colonies in the Ross Sea from 1981-2012. We found that the Adélie population in the Southern Ross Sea decreased from 1981 to 2000, and then grew rapidly from 2001 to 2012.

An earlier study found that Adélies decline after years of extensive winter sea ice in the Ross Sea – conditions presumably unfavorable for inexperienced penguins trying to survive their first winter. But recent years have seen the highest extents of winter sea ice ever recorded.

We propose that unfavorable winter ice conditions have been offset by the Antarctic toothfish fishery (which began in 1997) by reducing competition for one of the penguins' main prey species: Antarctic silverfish. The earlier decline in penguin populations coincides with a period when Antarctic minke whales, another silverfish consumer, were in recovery after the international whaling moratorium went into effect in 1982.

Main Points

Numbers of Adélie penguins in the southern Ross Sea reached their highest recorded levels from 2009-2012, after shrinking from 1981-2000.

Climate factors and the recovery of whale populations likely influenced the declining trend until 2000.

Depletion of Antarctic toothfish, a competitor with penguins for smaller fish, may explain the sharp increasing trend in recent years.

Lyver PO, Barron M, Barton KJ, Ainley DG, Pollard A, Gordon S., McNeill S., Ballard G, Wilson P.R. 2014. Trends in the Breeding Population of Adélie Penguins in the Ross Sea, 1981–2012: A Coincidence of Climate and Resource Extraction Effects. PLoS ONE 9(3): e91188. doi:10.1371/journal.pone.0091188