

A method for estimating colony sizes of Adélie penguins using remote sensing imagery

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Tracking population sizes of species sensitive to environmental change and resource extraction is essential for wise natural resource management decision making, but also extremely difficult to accomplish, particularly at large scales and in remote locations.

In the Southern Ocean, Adélie penguins are important predators of krill and fish, and are sensitive indicators of ocean ecosystem health. However, the cost and logistical difficulties in counting animals distributed around the entire Antarctic coastline have previously made it impossible to monitor much of the global population of this and other Antarctic species. In fact, it is likely that there are still Adélie penguin colonies that have not been discovered.

Working with researchers from the University of Minnesota, Stony Brook University, Landcare Research New Zealand, H.T. Harvey and Associates, and others, we attempted to find a cost-effective and quantitatively rigorous solution to this challenge. Using high-resolution (0.6 m) full color satellite imagery captured annually, we compared the amount of guano covered ground with concurrent counts of penguins that were made at our long-term study sites on Ross Island and in the Antarctic Peninsula.

After adjusting for the effects of terrain slope and other factors on penguin nesting density, we were able to develop a model that can accurately predict penguin numbers for areas where no ground counts are possible.

Using this approach, it will be possible to identify and

count every existing Adélie penguin colony in Antarctica, and to assess population trends on an annual basis. The approach will also work with other penguin species, and is probably applicable to several non-penguin species as well.

Main Points

Monitoring population trends of indicator species is an essential way to track environmental health in response to environmental change and resource extraction.

Adélie penguin population size can be determined from satellite imagery.

It is now possible to monitor the global populations of some polar species.

LaRue, M., H.J. Lynch, P. O'B Lyver, K. Barton, D.G. Ainley, A. Pollard, G. Ballard. 2014. Establishing a method for estimating populations of Adélie penguins (*Pygoscelis adeliae*) using remote sensing imagery. *Polar Biology*: DOI 10.1007/s00300-014-1451-8.

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