

Insights from the first global population estimate of Weddell seals in Antarctica

Leo Salas

lsalas@pointblue.org

Antarctica is experiencing accelerating impacts from climate change and fishing pressure. The Ross Sea Marine Protected Area (MPA) was designed to alleviate these impacts in one of the most pristine regions on Earth. To monitor MPAs, scientists have targeted several sentinel species - species sensitive to changes in the food web and whose status indicates how the Southern Ocean ecosystem is responding to these impacts. One sentinel species is the Weddell seal, a piscivore that may be impacted by the fishery. Weddell seals raise their pups on fast ice (thick ice sheets attached to the shore), and thus may be also impacted by warming Antarctic waters.

Surveying the entire Southern Ocean to assess the status of Weddell seals is unfeasible. We developed a new method using high resolution satellite images taken in 2011 and engaging with > 350,000 volunteers to count seals throughout the entire coastline of Antarctica.

After processing the data to correct counting errors and other known biases, we were able to complete the first census of a species at a continental scale. Our estimate – about 202,000 seals – is much lower than a previous estimate, but in line with estimates from the known genetic diversity.

We discovered that seals use about 0.55% of the fast ice habitat in the continent. We evaluated variables that determine seal presence. Available deep waters nearby, fast ice characteristics, and distance to Emperor penguins (a proxy for the presence of good feeding grounds and stable fast ice) help explain why very few areas have seals.

Our method is an inexpensive, informative, and simple approach to monitoring the food webs in Antarctica and could be used to evaluate the effectiveness of MPAs there. Moreover, we raised awareness of conservation issues in the Southern Ocean by working

with thousands of volunteers from across the world.

Main Points

We engaged with > 350,000 volunteers to complete the first global count of Weddell seals.

Seal presence is predictable based on by ocean depth, reliable fast-ice, and food resources, for which they may compete with Emperor penguins.

Our method is a promising tool to help guide management of Antarctic MPAs, and to estimate the impacts of fisheries on the Southern Ocean food webs.

LaRue, M., Salas, L., Nur, N. Ainley, D., Stammerjohn, S., Pennycook, J., Dozier, M., Saints, J., Stamatiou, K., Barrington, L., and Rotella, J. 2021. [Insights from the first global population estimate of Weddell seals in Antarctica](#). *Science Advances*.