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The Retrospective Analysis of Antarctic Tracking Data identifies Areas of Ecological Significance in the Southern Ocean

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Information Paper submitted by SCAR

Summary

This Information Paper provides further detail in support of Working Paper 52 and the draft Resolution on Areas of Ecological Significance identified in the Retrospective Analysis of Antarctic Tracking Data (RAATD) project.

Background

In 2009, the marine predator research community was invited to provide tracking data to the Scientific Committee for Antarctic Research's Expert Group on Birds and Marine Mammals. Over the next decade, and with the support of WWF and Centre d'Etudes et de Synthèse pour l'Analyse de la Biodiversité (CESAB, France), the Retrospective Analysis of Antarctic Tracking Data (RAATD) team collated and painstakingly quality-controlled and filtered over 4,000 tracks (3 million locations) from 17 marine predator species, studied between 1991 and 2016. This dataset, published in a recent data paper (Ropert-Coudert et al. 2020), includes contributions from more than 70 scientists from 12 National Antarctic Programs and represents the field efforts of hundreds of individuals. An important feature of the dataset is that it is freely available to everyone. The data underpinned a second paper, published in the journal *Nature* (Hindell et al. 2020), wherein the RAATD team identified 'Areas of Ecological Significance' in the Southern Ocean, and highlighted the relevance of these areas for management and conservation of the region.

Identifying which oceanic areas warrant special protection from existing, developing, and forthcoming threats is inherently difficult in the vast Southern Ocean. However, electronic tracking data from birds and marine mammals can be used to provide fundamental insights into zones that are relevant to their biology. The approach relies on a simple principle - these mobile animals primarily go to places at sea where they find food. Therefore, identifying areas of the Southern Ocean where predators most commonly go tells us where their prey can be found. For example, baleen whales and penguins go to places where they can feed on krill, whereas some seals and albatrosses go where they can find fish, squid, or other prey, in general. If different predators and their diverse prey are found in the same place then this area has both high diversity and abundance of species from multiple trophic levels, indicating that the area is of high ecological significance.

Key findings

Hindell et al. (2020) used these animal tracking data to model the circumpolar habitat preferences of 17 marine predator species (12 seabird species and 5 marine mammal species) to identify regions that were important to all these species, termed 'Areas of Ecological Significance' (AESs).

The most important of these areas are scattered around the Antarctic continental shelf and in two wider oceanic regions, one projecting from the Antarctic Peninsula engulfing the Scotia Arc and another surrounding the sub-Antarctic islands in the Indian sector of the Southern Ocean.

The locations of AESs correspond with the availability of suitable breeding or resting habitat, and regional oceanography and sea ice dynamics that affect biological productivity. However, climate model projections indicate that these areas of important habitat may change by 2100. Continued monitoring of species and an on-going assessment of the effectiveness of conservation and management actions will therefore be important. Further predator tracking work will also provide an important means to guide understanding of the efficacy of conservation actions, and to inform dynamic management into the future.

Conclusions

The findings of Hindell et al. (2020) identify regions that are likely to have high biodiversity and biomass of the prey of the animals that were tracked, and the ecosystems that support these prey, providing an ecosystem-level analysis of the areas that most warrant protection. Pressures on AESs owing to climate change will affect all parts of the Southern Ocean, but their effects are likely to be strongest on the Antarctic continental margin. The responses of species to these pressures are difficult to predict, highlighting the need for continued monitoring as part of ongoing management actions. Adaptive management approaches to conservation, including protected areas, will be necessary to deal with future changes in a timely way. This work highlights where future science-informed policy efforts might best be directed.

References

Hindell, M. A., Reisinger, R. R., Ropert-Coudert, Y., et al. (2020) Tracking of marine predators to protect Southern Ocean ecosystems. *Nature* 580, 87-92, doi:10.1038/s41586-020-2126-y.

Ropert-Coudert, Y., Van de Putte, A., Reisinger, R. R., et al. (2020) The retrospective analysis of Antarctic tracking data project. *Scientific Data* 7, doi:10.1038/s41597-020-0406-x.