MEASO18
Marine Ecosystem Assessment for the Southern Ocean

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Characterising the preferred at-sea habitats used by chinstrap penguins and the fishery for Antarctic krill: slow-flowing, nearshore waters over shallow bathymetry

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Habitat models can be used to predict the distribution of species in areas where no empirical data exist. In the Southern Ocean, the at-sea distribution of most predators of Antarctic krill are poorly known, primarily because tracking studies have only been undertaken at a relatively limited number of sites. For chinstrap penguins, one of the most abundant krill predators, we show that habitat models, adjusting for the at-sea density of Pygoscelis penguins from other colonies, can be used to predict with a high level of confidence the at-sea distribution of chinstrap penguins from untracked colonies during the breeding season.

Comparison of predicted penguin distributions with output from a high-resolution oceanographic model shows that chinstrap penguins prefer nearshore habitats over shallow bathymetry with slow-flowing waters, but that they also travel to areas beyond the edge of the continental shelf where faster-flowing waters of the Coastal Current or fronts of the Antarctic Circumpolar Current exist. These habitats are also locations preferentially used by the Antarctic krill fishery which potentially competes with natural krill predators.

In the slow-moving shelf waters, large penguin colonies may lead to krill depletion during incubation and chick rearing periods when penguins are behaving as central place foragers. Our results suggest that a better understanding of krill retention and depletion in areas used by natural predators and by the krill fishery are needed, and that risk management strategies for the fishery should include assessment of how krill movement can satisfy the demands of both predators and the fishery across a range of spatial and temporal scales.

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