

## Quantifying foraging niche separation of two sympatric penguin species in the Antarctic Peninsula

Sympatric species can respond to interspecific competition by segregating foraging behaviour along different niche axes.

Our study aims were to determine how the foraging behaviour and habitat use of two closely related seabird species - Gentoo (*Pygoscelis papua*) and Chinstrap (*Pygoscelis antarcticus*) penguins - co-inhabiting two study sites in the Antarctic Peninsula differ as a function of competitive interactions and environmental factors. Specifically, we assessed if there was niche partitioning along 1) spatial (horizontal)-, 2) vertical-, and 3) temporal axes between the species, one which is increasing in number (Gentoo) and the other which is declining (Chinstrap), and whether they targeted specific water temperatures when foraging.

Tags with high-resolution GPS, dive and temperature loggers were deployed on adult penguins from both species throughout the 2018/19 breeding season, at Nelson Island and Kopaitic Island. We obtained GPS tracks for 1096 foraging trips from 155 Chinstrap and 66 Gentoo penguins. We interpolated the diving and at-sea locations along each track by fitting continuous-time correlated random walk models, and estimated utilization distributions of space used by penguins assuming bivariate normal probability densities. The degree of overlap between the observed utilization distributions of Chinstrap and Gentoo penguins was quantified and compared to a set of pseudotracks simulated to create a null spatial distribution which assumed no interspecific competition.

At Nelson Island, Chinstrap penguins had larger utilization distributions than Gentoo penguins, with clear segregation between species evident during incubation. At Kopaitic Island, both species had small foraging ranges throughout the breeding season, with higher spatial overlap. We found that remotely sensed sea surface temperature data were not of high enough resolution to examine whether penguins targeted specific temperatures while foraging. Our next step is therefore to create high-resolution maps of temperature through the water column using the 1-second resolution temperature data collected by the penguins and kriging (geostatistical interpolation) which will enable us to determine whether Gentoo and Chinstrap penguins target specific water temperatures.