Foraging distribution, habitat preferences and diet of Antarctic petrels, cape petrels and southern fulmars – inter-specific overlap as a consequence of high environmental variability?

Dehnhard Nina[1], Achurch Helen[2], Clarke Judy[2], Kawaguchi So[2], Michel Loïc[3], Southwell Colin[3], Walters Andrea[4] and Eens Marcel[4]

[1] Behavioural Ecology & Ecophysiology Group, University of Antwerp, Universiteitsplein 1, 2610 Wilrijk-Antwerp, Belgium
E-mail: nina.dehnhard@uantwerpen.be
[2] Australian Antarctic Division, 203 Channel Highway, Kingston TAS 7050, Australia
[3] Laboratory of Oceanology, University of Liége, B6C, Allée du 6 Août 15, Quartier Agora, Sart-Tilman, 4000 Liége, Belgium
[4] Institute for Marine and Antarctic Studies, University of Tasmania, IMAS Waterfront Building, 20 Castray Esplanade, Battery Point, TAS 7004, Australia

Ecological theory predicts sympatric species to show different habitat or dietary preferences as a strategy to avoid competition. In a world with rising CO_2 concentrations, knowledge about the foraging habitat and diet of species is crucial to understand potential impacts of climate-change on populations, species and communities. Antarctic fulmarine petrels form a group of closely related, sympatrically breeding species which are predicted to face changes in sea ice dynamics, ocean temperatures and wind conditions in the future, while little is known about their current summer foraging behaviour.

In 2015/16 we investigated the foraging behaviour and diet of southern fulmars (*Fulmarus glacialoides*), Antarctic petrels (*Thalassoica antarctica*) and cape petrels (*Daption capense*) breeding sympatrically on Hop Island (68.82˚S, 77.68˚E) in the Prydz Bay region (East Antarctica).

Using lightweight GPS loggers, we recorded a total of 270 foraging trips, covering the entire 2015/16 breeding season from incubation to late chick-rearing in all three species, including multiple foraging trips made by several individuals. Blood, feather and egg membranes were collected from the same species, and complemented by prey items obtained in the foraging area during a marine science voyage in the 2015/16 austral summer.

Foraging locations were identified using wet/dry data recorded by the GPS loggers and Expectation-Maximization Binary Clustering (EMbC). We present the species' foraging distribution during the different breeding stages and identify habitat characteristics (bathymetry, sea ice concentration, chlorophyll among others) to determine whether these Southern Ocean predators share foraging 'hot-spots' or if they segregate their foraging activities. Consistency of individuals in their foraging behaviour (e.g. to visit specific areas or show preferences for specific environmental conditions) was also investigated. In addition, stable isotopes were used to explore the dietary overlap between the three seabird species using isotopic niche parameterisation and estimates of resource use through mixing models.

Our results indicate a strong overlap of the foraging locations of all three species at the population level throughout the entire breeding season. Similarly, stable isotope values reflecting the birds' diet during pre-laying, incubation and chick-rearing show a strong overlap among species. Finally, we found no individual specialisation in foraging behaviour or habitat characteristics. We will discuss our results in the light of high environmental variability which favours an opportunistic foraging behaviour and food generalists.

Keywords: Antarctica; foraging behaviour; GPS-tracking; seabirds; stable isotopes