Foraging movements and prey of short-tailed shearwaters in the Southern Ocean

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In the Southern Ocean ecosystem, Antarctic krill is a key species while a recent review study indicate that myctophids can be altanative when krill abundance is low (Murphy et al. 2007). Short-tailed shearwaters (*Ardenna tenuirostris*) breeding around Tasmania employ a dual foraging strategy involving short trips in the Tasman Sea (< 2 days) and long trips to the Indian Ocean sector of Southern Ocean (> 9 days). In the Indian Ocean sector, krill abundance is relatively low compared to the Scotia Sea (Atkinson et al. 2008). Further it is supporsed that krill-dependent and krill-independent food web is dominant in shelf slope area and oceanic area, respectively (Koubbi et al. 2011). Short-tailed shearwaters feed on both krill and myctophids in the Southern Ocean (Connan et al. 2010; Kerry et al. 1983). To understand how short-tailed shearwater utilize these two habitats, we measured foraging movement of individuals using GPS loggers and specified their prey species using fatty acid signature of stomach oils collected when they returned to the colony after long trips. We conducted a survey on Fisher Island (Jan to Feb of 2018) and Wedge Island (Jan to Mar of 2019 and Feb to Mar of 2020) in Tasmania, Australia. We deployed three kind of GPS logger (Gipsy-Remote, Axy-Trek and Axy-Trek Remote, technosmart) to 71 chick rearing birds. Finally, we tracked 40 long trips from 38 birds and sampled 13 stomach oils. During long trips, we assumed that the critical speed separating flying from landing was 7m/s; under this speed birds were assumed to be resting or feeding. Short-tailed shearwaters fed in both basin and shelf slope area in the Southern Ocean in all three years. Almost all individuals went directly to the area around Balleny islands (162° E, 66° S) staying longest period, moved west to the shelf slope area along the ice edge (80° E to 160° E , south of 65° S), then visited Polar Front basin (90° E to 150° E, 52° S to 60° S) during the return journey. Thus, we separated the Southern Ocean to three habitats: “Islands”, “Shelf slope” and “Basin” (Figure 1). We analyzed their small scale movement along the environmental gradients (SST, sea ice, seafloor topography and chlorophyll concentration) within each of three habitat. Then we analyzied daily pattern of foraging behavior: % time on water , %time of diving and dive depth. In the Islands region, short-tailed shearwaters sit on the water for a long time in the both day and night-time, and they made relatively deep dives (7.2 ± 6.5 m) around dawn and dusk. In the Shelf slope region, not clear diel pattern of %time on water and diving, and they made shallow dives (5.2 ± 4.7 m). In the Basin reagion, the birds sit on the water for longer time in the night-time than they did in daytime, and they made deep dives (9.4 ± 10.6 m) around dawn and dusk. The change of daily feeding between the habitats may relate to diel vertical migration of prey species, Antarctic krill in the shelf slope shows not clear diel migration whereas myctophids in the deep in the daytime and shallow in the nighttime in the basin and around Balleny Islands. We will report the prey type in each habitat that was depermined using stomach oil.

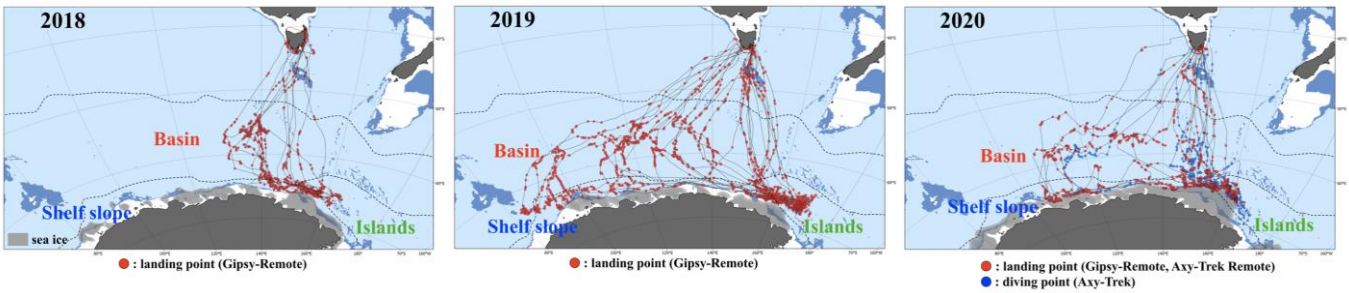

Figure 1. The tracks and foraging (landing or diving) points in each year. Three habitats are defined by dotted lines.

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