Stress physiology and foraging of Diving petrels (*Pelecanoides urinatrix*) within the Hauraki Gulf.

Brendon Dunphy (The University of Auckland), Matt Rayner (Auckland Museum)

Diving petrels (*Pelecanoides urinatrix*) are an important local seabird species that was once found throughout New Zealand. Colonies within the Hauraki Gulf breed through the winter months and forage on zooplankton e.g. krill and copepods. However, higher densities of krill are found in the outer Gulf areas (i.e. near the Mokohinau Islands), with low densities occurring in the inner Gulf areas (i.e. near Tiritiri Matangi Island). Whether this results in inner Gulf colonies having greater levels of stress (and lower breeding success) as they work harder to obtain sufficient food for themselves and their chicks is unknown. Accordingly, we set out to test whether inner Gulf colonies are more stressed compared to outer Gulf diving petrel colonies.

To do this our study aimed to compare foraging effort, levels of stress physiology and hormone (CORT) levels, and chick rearing success among the Tiritiri and Mokohinau island colonies. Furthermore, we aimed to undertake an interannual comparison by utilising existing physiology samples. We did this by attaching GPS devices to birds and taking blood samples to get stress hormone and stable isotope samples.

Adult diving petrel foraging within the Hauraki Gulf (photo kindly provided by Edin Whitehead)

Results. We showed that despite predictions, birds located at an inner Gulf island site and tracked every 5 min fixes via GPS devices, did not travel to prime feeding grounds i.e. near shelf break areas, but instead foraged in the near shore waters around their colony (Fig 2). The number of foraging events undertaken by adult birds did not differ among islands; however, distinct differences in foraging effort were observed with Tiritiri Matangi birds undertaking feeding trips of 80 km and flying at an average speed of 8 km/h, compared to Mokohinau birds with trips of 40 km and 4 km/h average flying speed.

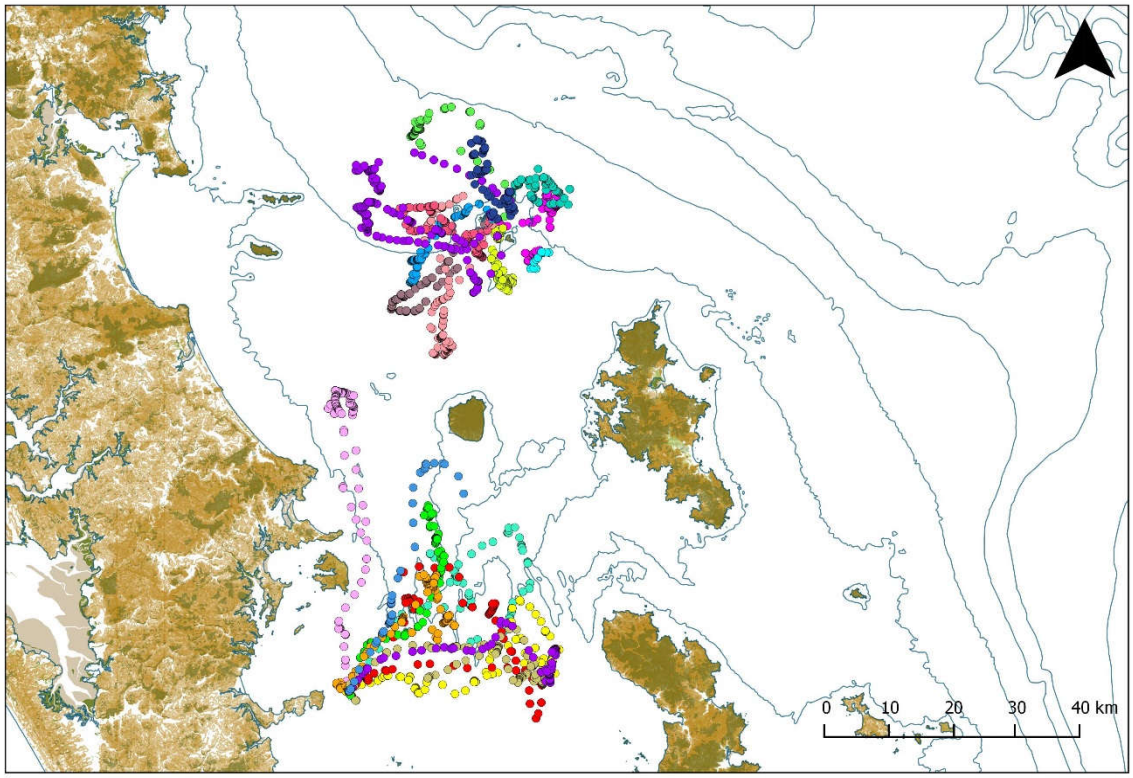

Figure 2: Foraging trips of adult diving petrels feeding at two sites within the Hauraki Gulf, 2016. (Image prepared by Chris Gaskin).

Interestingly, despite these differences in effort there was no difference in stress hormones among islands but among seasons (Fig 3). For example, compared to the 'prelaying' and 'incubating' phases, diving petrels during the 'chick rearing' phase had a significantly higher level of the stress hormone corticosterone circulating in the blood regardless of which island they came from.

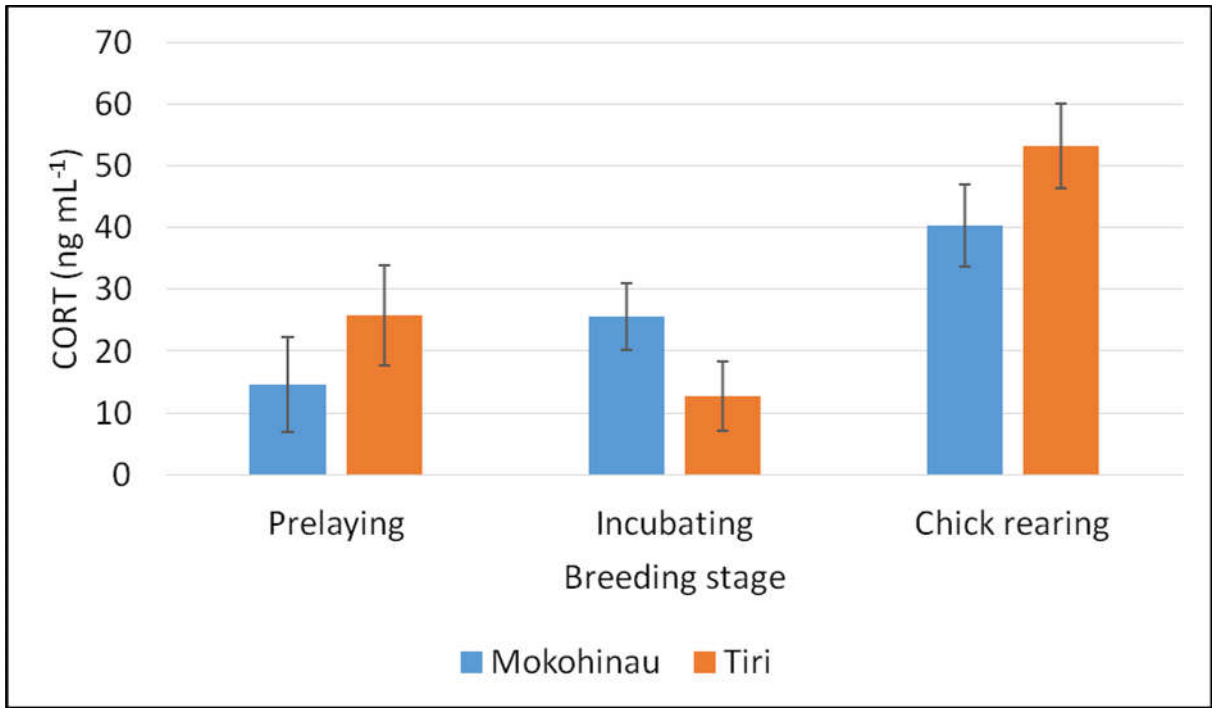

Figure 3: Corticosterone stress hormone levels of adult diving petrels from two islands within the Hauraki Gulf at various stages of the 2016 breeding cycle.

Stable isotopes showed differences in prey targeted between colonies. Birds from Tiri targeted a richer diet consisting of fish and squid compared to Mokohinau Island which preyed on lower trophic level zooplankton. Due to inclement weather preventing access, we are unable to report chick rearing success comparisons.

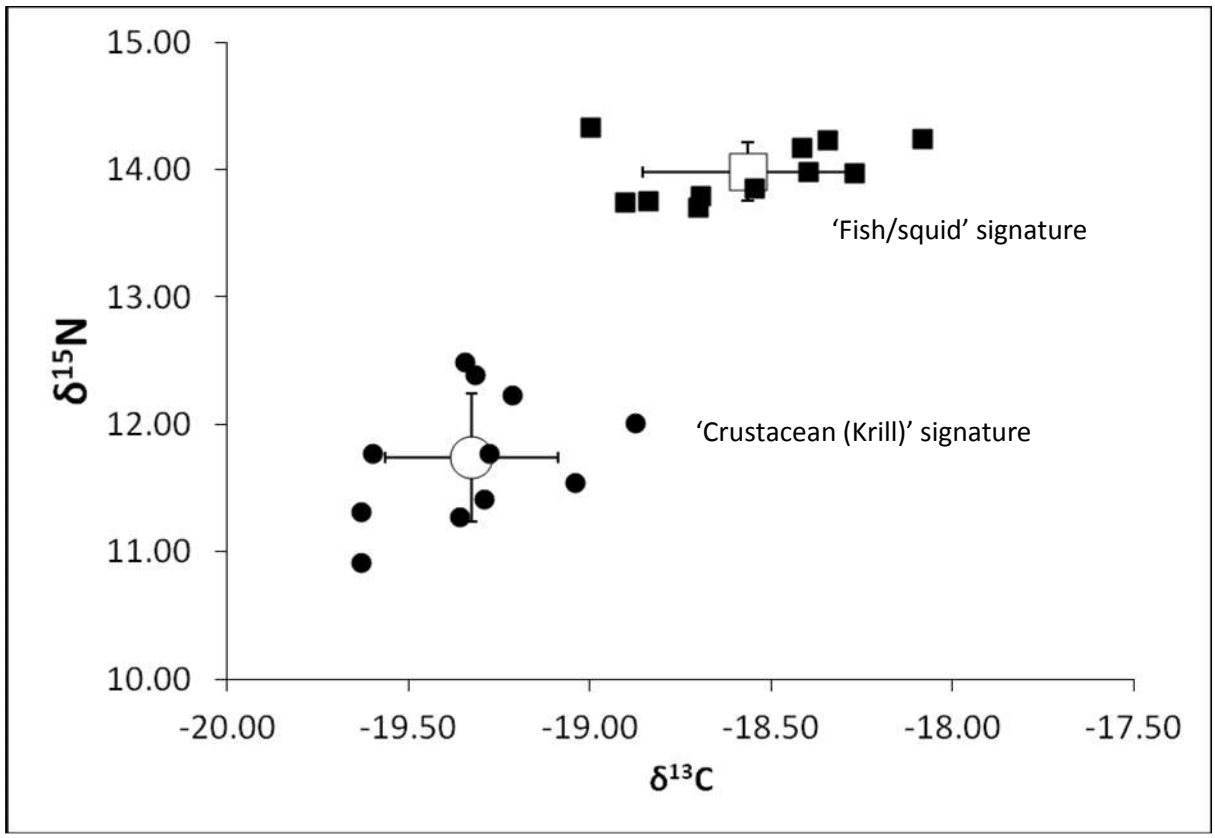

Figure 4: Plasma stable isotope signatures of adult diving petrels from two islands (Mokohinau = circles, Tiritiri Matangi = squares) within the Hauraki Gulf during the 'incubating' breeding cycle, 2016.

Taken together it seems that diving petrels on Tiritiri Matangi work harder when foraging, potentially as they reside in a zooplankton poor location. To offset this they have switched to target a richer prey and thus we do not see any increase in stress profiles as they are able to offset the energetic costs of flying further and faster to provision their chick from this richer prey.

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