Dietary and trophic characterisation of the nationally critical Whenua Hou diving petrels and common diving petrels breeding on Codfish Island

The newly described Whenua Hou diving petrel (WHDP, *Pelecanoides whenuahouensis*) is a small burrow-breeding seabird. The species is currently considered nationally critical by the NZ Department of Conservation due to its low remaining population size (approx. 200 individuals) and extremely restricted breeding range (a single colony occupying 0.018 km^2 on Codfish Island). While predation from invasive mammals was the likely cause for historic declines, the reasons for a lack in population recovery of WHDP on pest free Codfish Island remain unknown. As WHDP share their breeding ground with the more abundant common diving petrel (CDP, *P. urinatrix*), there is the potential for interspecific competition for burrow sites threatening their persistence. Addressing the potential for pelagic interspecific competition requires a detailed study investigating the level of trophic segregation between these two species. Ultimately, trophic characterisation is required to develop effective conservation strategies to support the WHDP population.

I expect to find a degree of trophic segregation between these two species of petrels which allows them to both occupy such a small breeding ground on Codfish Island. Nitrogen and carbon stable-isotope analyses are commonly used to infer diet and trophic relationships of seabirds. With the different turnover rates for different tissues, stable-isotope analyses can provide insight into temporal patterns in a species diet. I will be using blood and feather samples to determine the relative trophic positions of both petrel species. The blood samples will inform us about the diet of the petrels during the breeding season and the feather samples represent the diet during the non-breeding season. For further detail, I will extract DNA from fecal samples and use a staged multiplex PCR to determine the species present in the diets of each species. By combining these modern molecular methods I will be able to determine the degree of trophic overlap between these coexisting diving petrel species.

Photo taken by K. Hamilton of me holding a WHDP during our sampling on Codfish Island 2018.

I am also investigating the potential link between trophic level and exposure to plastic pollutants and heavy metal contaminants. Marine foods constitute a major source for magnesium exposure and biomagnifies in a food web. Due to their high trophic position, seabirds are at risk of exposure to this toxic heavy metal. Magnesium accumulates within a bird's system and is excreted through moulting feathers and egg production. Therefore, feathers present a non-invasive, non-destructive sampling method to analyse the degree of magnesium contamination from the time of feather formation. I will be using the same blood and feather samples mentioned above to determine whether there is a difference in the degree of heavy metal exposure for each species. Another potential health threat to these birds is marine plastic pollution. The high incidence of plastic accumulation in oceans leads to ingestion and entanglement of many marine species, including seabirds. The demonstrated effects of plastic ingestion on seabirds include reduction in body mass, starvation due to a physical blockage in the gut and perforation of the digestive tract. A minimally invasive method has been developed to monitor levels of plastic contamination in seabirds. Phthalate esters disassociate from ingested plastic into the surrounding animal tissue. The esters then accumulate in preen oil which can then be easily sampled from the uropygial gland at the base of the bird's tail. I will be using preen gland samples to determine the degree of plastic pollution each petrel species is exposed to. Both plastic and heavy metal contamination have the potential to impact physiology, reproduction, survival and population dynamics, which is of real concern for this struggling population of diving petrels.