VICTORIA UNIVERSITY WELLINGTON
TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI

Sensing Birder

A VICTORIA UNIVERSITY OF WELLINGTON SCIENCE TEACHING RESOURCE

WHO?

Johannes Fischer, a PhD candidate at Victoria University of Wellington, working with researchers from the Department of Conservation, Te Papa, and the Chizé Centre for Biological Studies in France.

WHAT DID THEY FIND?

A new species of seabird, the Whenua Hou Diving Petrel - *Pelecanoides whenuahouensis*.

HOW DID THEY FIND IT?

Fischer was studying what was thought to be a population of South Georgian diving petrels *(Pelecanoides georgicus)* on Whenua Hou (Codfish Island). However, when they examined the birds on the island and compared them to museum specimens from other populations, they noticed a number of differences that led them to the conclusion that this New Zealand population is a different species.

HOW DO WE DECIDE IF SOMETHING IS A NEW SPECIES?

- *What do you think are the key traits scientists consider when deciding whether a population of animals is a new species?*

Defining a species isn't actually that simple. The classic definition was published by Ernst Mayr in 1942 and is known as the Biological Species Concept. It describes a species as being a population of individuals that can breed together, but are reproductively isolated from other populations (they can't interbreed successfully).

- *Can you think of a group of organisms that this definition can't apply to?*
- *Are there any other exceptions?*

Because reproductive isolation has so many exceptions, researchers use a range of tests to decide whether a population is a different species. These include morphological, behavioural, and genetic differences.

HOW DID THEY DECIDE THIS WAS NEW SPECIES?

- *How would you design a method to identify new species?*

The researchers looked at 143 live birds, and 64 study skins (preserved dead specimens usually held in museums or research facilities). They measured 11 biometric variables, such as the length of the wings, and analysed 8 different plumage characteristics, such as wing markings.

- *What other biometric variables would you measure?*
- *How would you compare plumage characteristics between different birds?*

They found significant differences in eleven biometric variables and plumage characteristics, which alone can be enough evidence to warrant calling it a new species, though the argument isn't as strong. However, *P. whenuahouensis* has a very different breeding habitat to South Georgian diving petrels. It prefers sandy dunes at sea level instead of rocky scree at higher altitudes. This is extra evidence that this new species is reproductively isolated from the larger population of South Georgian diving petrels.

CAPITAL THINKING. GLOBALLY MINDED.
MAI I TE IHO KI TE PAE

Exploring the Data

Fischer used a method called 'principal component analysis' to compare the measurements of the different biometric variables and plumage characteristics. Principal component analysis takes all the variation of all measurements and uses a series of equations to convert those measurements into single coordinates which are then plotted out in a graph. This allows researchers to more easily identify patterns in the data. Graph 1 on the following page is a scatterplot of the principal component analysis of the biometric variables.

- *What patterns can you see that support the researcher's conclusion that the diving petrels found in the New Zealand region (Codfish Island and Auckland Island) are a different species?*
- *How would they justify the overlapping areas of the graph?*

Now look at Graph 2 on the following page, which is a scatterplot of the principal component analysis of the plumage characteristics.

- *How does this graph support or not support the conclusion of the researchers? Does it correlate with Graph 1?*
- *How significant are the overlapping areas shown on the graph?*

These measurements combined with the breeding behaviour of the petrels were enough for the researchers to declare the Whenua Hou Petrel a different species. However, they have also noted that there are other characteristics that could be analysed to provide more evidence.

- *What are some other characteristics that could be analysed aside from body measurements and plumage patterns?*

WHY IS THIS IMPORTANT?

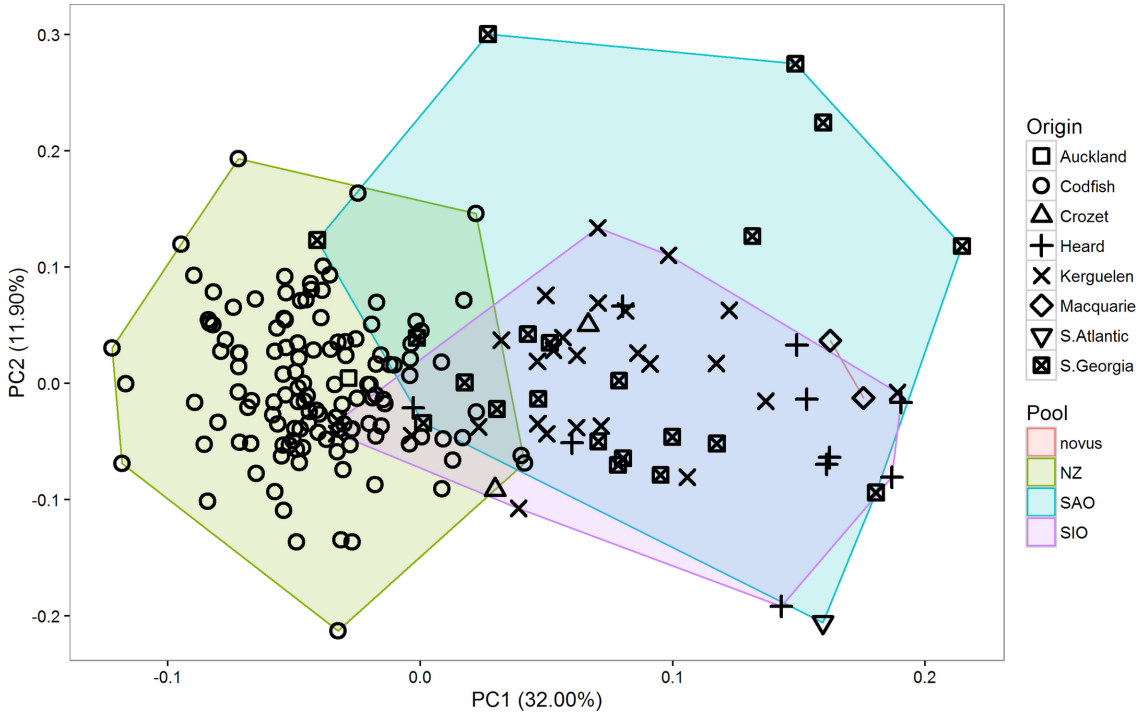
- *Why do you think it's important that researchers establish whether this is a new species?*

Establishing the Whenua Hou diving petrel as a separate species has enabled conservationists to develop a plan for its protection. There are only 150 individuals of the Whenua Hou diving petrel, though there is evidence that they formerly nested on Auckland Island and Stewart Island. The population is highly endangered as their breeding behaviour makes them vulnerable to extreme weather events.

- *What are some other potential threats to the Whenua Hou diving petrel?*
- *What steps could be taken to protect the petrel from these threats*

Exploring the Data – Graphs

Graph 1
Principal component analysis scatterplot of biometric characters of *Pelecanoides georgicus* samples.



Novus = Macquarie Island, NZ = New Zealand, SAO = South Atlantic Ocean, SIO = South Indian Ocean

Graph 2
Principal component analysis scatterplot of plumage characters of *Pelecanoides georgicus* samples.