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# the tawaki project

a 5 year project to study the marine ecology,  
breeding biology and population dynamics  
of the world's most enigmatic penguin -  
the Fiordland crested penguin / tawaki



## rationale & research plan

*executive summary for year 1 (2014)*

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## Contents

Examining the marine ecology of tawaki .....	3
Overcoming challenges by collaboration.....	3
Year 1: 3D tracking at Jackson Head .....	5
About the tawaki project .....	6
Timeline – Year 1: September 2014-July 2015 .....	7



# the tawaki project

## Examining the marine ecology of tawaki

The enigmatic Fiordland crested penguin (*Eudyptes pachyrhynchus*) or tawaki is one of the rarest penguins worldwide. It is also one of the penguin species we know the least about. Only a handful of studies have been conducted so far, the majority of which focussed on aspects of the penguins' terrestrial biology such as breeding behaviour and population counts.

The IUCN red list ranks tawaki as 'vulnerable' due to its low population size (~5,000 mature birds) and apparent decline. In New Zealand, tawaki are ranked 'nationally vulnerable' with an estimated rate of decline between 10-50% over the course of just 10 years.

Introduced terrestrial predators like stoats represent an obvious threat on land. However, for an animal that spends more than 80% of its life at sea, marine ecology is a critically important aspect of its life history – an aspect we virtually know nothing about. To understand which factors are driving population developments it is vital to examine the penguins' behaviour at sea: where do the birds go to find food, how deep do they have to dive to catch their prey, and what prey species do the penguins rely on, especially when rearing chicks.

*Over the course of five years starting in September 2014, we plan to study the foraging ranges, diving behaviour and other aspects of tawaki's biology. The project will be one of the most comprehensive studies of a single species' marine ecology undertaken in New Zealand.*

## Overcoming challenges by collaboration

Even though their breeding range spans a mere 500 km – from Haretaniwha Point on the West Coast to Port Pegasus in the South of Stewart

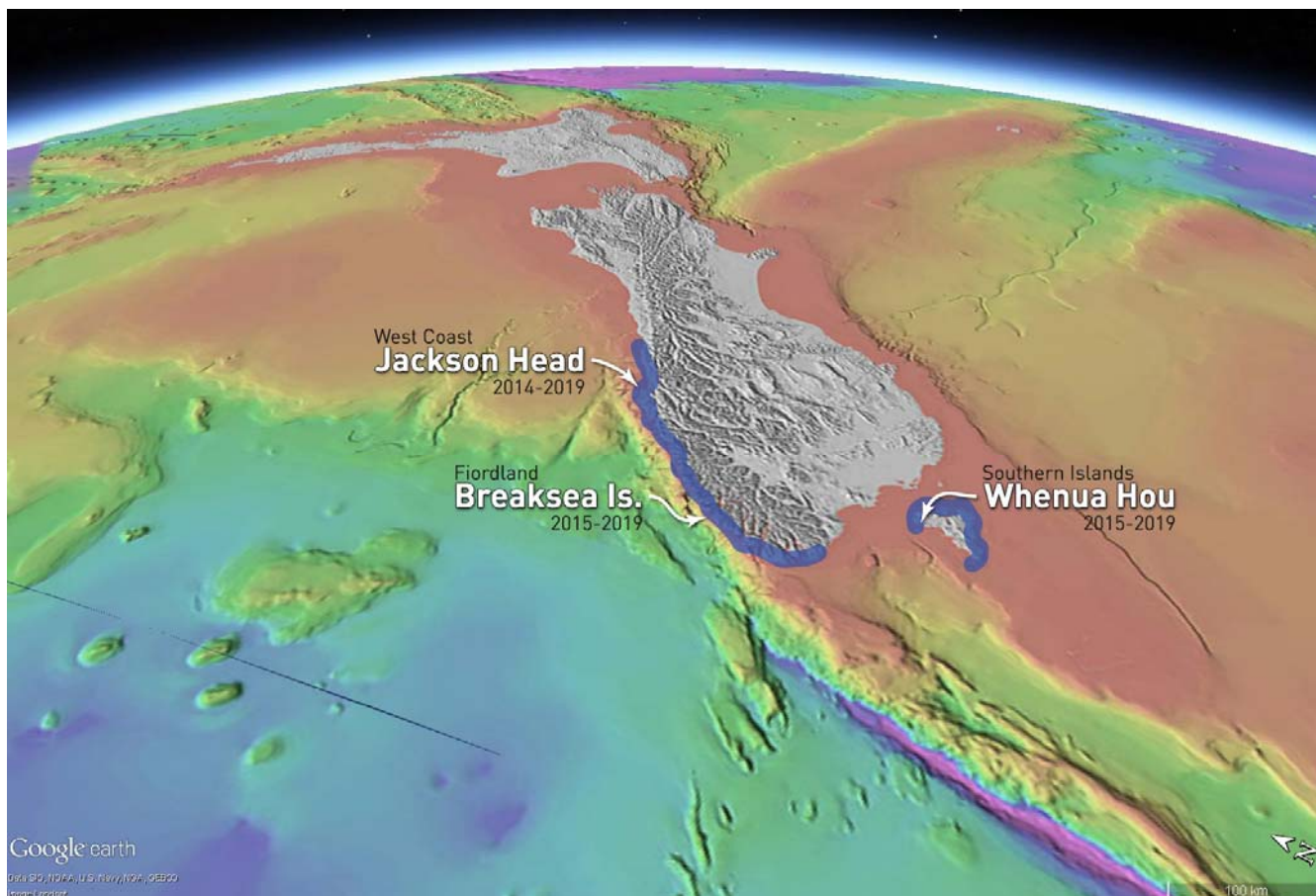
Island – tawaki occupy diverse marine environments. This means that studying the foraging behaviour of tawaki at a single site is very unlikely to reflect their foraging behaviour in general.

The majority of tawaki live and breed in remote, difficult to access places. As a result, research endeavours revolving around the species have to overcome many challenges, ranging from securing required resources to logistics, climatic conditions and safety issues.

Such challenges can only be overcome by collaboration. Several national and international research institutions have agreed to combine their forces that will allow us to study tawaki foraging at several sites simultaneously. Such collaboration is not the norm and represents a unique opportunity for New Zealand. However, this project can only succeed if it gains the support, participation and collaboration of the local communities and stakeholders. Any form of support – be it financially, logistically or by sharing local knowledge – will help move this project forward.

*Tawaki are a charismatic species that everyone knows but no one really knows anything about. Only a combined effort of science, conservation and the communities can change this. To this end, the tawaki project aims to be open – via social media, blogs and public talks.*





Overview of the tawaki breeding range (highlighted blue) and the proposed study sites. Note the highly variable marine environment along the West Coast, Fiordland and the Southern Islands. The West Coast features reasonably narrow (10-25 km) continental shelf with water depths <150m, Fiordland has no continental shelf to speak of while the Southern Islands are surrounded by very shallow (<50m) waters. Comparing the foraging behavior between these three environments will tell us a lot about the tawaki's behavioural plasticity, an important feat in the face of a changing environment.



Tawaki returning from a foraging trip in central Fiordland. Whether the bird foraged offshore or searched for prey within the confines of the fiords, we do not know.

## Year 1: 3D tracking at Jackson Head

Using cutting-edge miniature data loggers which combine GPS, dive and temperature sensors, we will track the penguins' at-sea movements as well as physical properties of their marine environment in three dimensions. We have used this technology with great success on Yellow-eyed and Snares penguins, the latter of which is a close relative of tawaki.

The data loggers will be attached to the penguins' backs using a special adhesive tape which can be easily removed without causing any damage to the plumage.

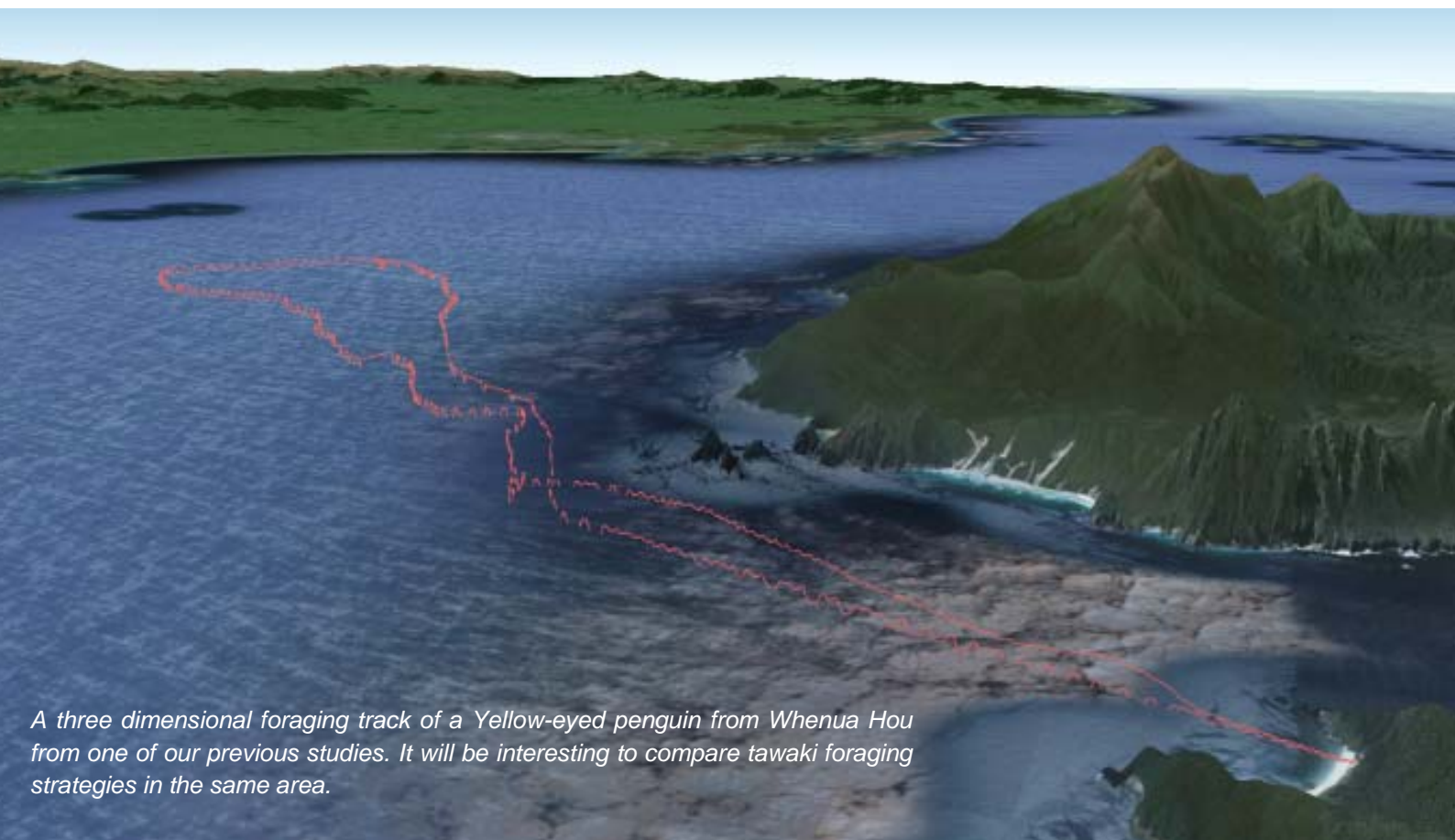
Between September and November 2014 we will establish necessary field protocols to ensure that we can safely deploy data loggers without harming the birds or risking loss of the expensive devices. For that we will initially deploy epoxy replicas of the data loggers on a few birds. During device deployment and recovery heart rate will be monitored to assess individual stress responses. Hidden surveillance cameras at the nest will be used to observe the penguins' behaviour while equipped with devices. Once

we are confident about our deployment protocols, we will proceed with deploying GPS loggers on at least 10 chick rearing tawaki to obtain first detailed information on their marine ecology.

In year 1 we will focus our attention on birds breeding at Jackson Head, West coast. The site has considerable logistic advantages and provides the best basis for the refinement of methodologies and establishment of field protocols.

From the season 2015 onwards, we will expand our activities to simultaneously work with several research teams on the West coast, in Fiordland (Breaksea Island\*) and the Southern Islands (Whenua Hou), thus covering tawaki's entire breeding range – a first for a seabird study in New Zealand.

*\* Inclusion of alternative Fiordland sites like Milford Sound or Doubtful Sound is subject to further consultation with DOC and local stakeholders.*



*A three dimensional foraging track of a Yellow-eyed penguin from Whenua Hou from one of our previous studies. It will be interesting to compare tawaki foraging strategies in the same area.*



## About the tawaki project

In New Zealand, an ambitious undertaking such as the tawaki project can only be realised through broad participation and support of stakeholders, institutions and researchers. The tawaki project represents a collaborative effort of the **Department of Conservation**, the **University of Otago**, and several national and international research institutions and organisations.

So far the following collaborators have expressed their support for the project: the Global Penguin Society (Dr Pablo Garcia-Borboroglu), Justus-Liebig-University, Giessen, Germany (Dr Petra Quillfeldt & Dr Juan Masello), Centre d'Etudes Biologique de Chizé, France (Dr Charles André Bost), the Antarctic Research Trust, Germany and Switzerland (Dr Klemens Pütz), University of Oxford (Dr Tom Hart) and NIWA (Paul Sagar).

The project is spearheaded by two of New Zealand's leading penguin scientists, both of whom have worked with tawaki before.

**Dr Thomas Mattern** (University of Otago, Eudyptes EcoConsulting Ltd) has studied the foraging ecology of several penguin species such as Little blue penguins, Yellow-eyed penguins and Snares penguins, a close relative to tawaki. He was one of the first scientists to successfully deploy GPS dive loggers on penguins and has extensive experience with overcoming technical challenges of working in remote places.



Collaborator	Contribution
 <b>Department of Conservation</b> <i>Te Papa Atawhai</i>	<ul style="list-style-type: none"> <li>• Field support</li> <li>• Logistics</li> <li>• Community relations</li> </ul>
 <b>UNIVERSITY OF OTAGO</b> <i>Te Whare Wānanga o Ōtago</i> NEW ZEALAND	<ul style="list-style-type: none"> <li>• Lab facilities</li> <li>• Field gear/consumables</li> <li>• Logistics</li> </ul>
 <b>GPS</b> GLOBAL PENGUIN SOCIETY	<ul style="list-style-type: none"> <li>• Partial funding</li> <li>• GPS loggers (<i>potentially</i>)</li> </ul>
 <b>JUSTUS-LIEBIG-UNIVERSITÄT GIESSEN</b>	<ul style="list-style-type: none"> <li>• 2-3 GPS Loggers</li> <li>• Field work collaboration (year 2 onwards)</li> </ul>
 <b>ANTARCTIC RESEARCH TRUST</b>	<ul style="list-style-type: none"> <li>• GPS Loggers (<i>potentially</i>)</li> <li>• Field work collaboration (year 2 onwards)</li> </ul>
 <b>Centre d'Etudes Biologiques de Chizé</b>	<ul style="list-style-type: none"> <li>• GLS loggers for tracking of migration movements (year 2 onwards)</li> </ul>
 <b>NIWA</b> Taihoro Nukurangi	<ul style="list-style-type: none"> <li>• GLS loggers (year 2 onwards)</li> </ul>
 <b>UNIVERSITY OF OXFORD</b>	<ul style="list-style-type: none"> <li>• Long-term surveillance cameras</li> </ul>

**Dr Ursula Ellenberg** (University of Otago, Eudyptes EcoConsulting Ltd) has worked on individual stress responses in timid species like Humboldt penguins in Chile and Yellow-eyed penguins. Her findings have significantly advanced our understanding of human-wildlife interactions. Since tawaki are known to be very shy, Ursula's expertise is crucial to minimise research effects in order to implement the tawaki project successfully.



## Timeline – Year 1: September 2014-July 2015

*Note: this timeline reflects the general research schedule valid also in the following seasons when three locations will be studied simultaneously. Additional research activities will be outlined in the final proposal.*

Date	Activity
<i>Field work</i>	
15 – 31 August	<ul style="list-style-type: none"> <li>Nest searches at key breeding sites</li> <li>Deployment of long-term surveillance cameras at Jackson Head to determine exact hatching dates and synchrony</li> </ul>
1 – 15 September	<ul style="list-style-type: none"> <li>Dummy trials with epoxy replicas of GPS loggers: 6 guard stage birds, deployment period 3-6 days</li> <li>Observation of behaviour at logger nests via time-lapse cameras</li> <li>Monitoring of heart rates during logger deployment and recovery (via special microphones)</li> </ul>
15 September – 31 October	<ul style="list-style-type: none"> <li>Deployments of GPS loggers on 10+ birds covering early chick rearing and crèching stages period 3-6 days</li> <li>Continued time-lapse observations of logger nests</li> <li>Heart-rate monitoring during handling of birds</li> </ul>
December	<ul style="list-style-type: none"> <li>Recovery of long-term surveillance cameras following chick fledging to avoid unnecessary disturbance</li> </ul>
<i>Data analysis</i>	
November 2014 – March 2015	<ul style="list-style-type: none"> <li>Heart-rate and research effects analysis</li> <li>Raw data processing</li> <li>GPS logger data analysis</li> </ul>
<i>Reporting, Publication of results</i>	
April-May	<ul style="list-style-type: none"> <li>De-briefing work shop and presentation of results at stakeholder meetings in Haast, Te Anau and/or Invercargill</li> <li>Production of DOC &amp; stakeholder reports</li> <li>Scientific publication of results</li> </ul>
July	<ul style="list-style-type: none"> <li>Presentation of year 1 results at Oamaru Penguin Symposium</li> </ul>



*Tawaki nesting in typical breeding habitat on Breaksea Island, Fiordland*



