

The Great Humpback Whale Trail: Discovering the Feeding Grounds of Oceania's Humpback Whales

Preliminary Field Report
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Rochelle Constantine^{1,2}, Olive Andrews³, Simon Childerhouse^{1,4}, Remi Dodemont⁵, Claire Garrigue^{1,5,6}, Rebecca Lindsay⁷ & James Tremlett²

¹ Southern Ocean Research Partnership – International Whaling Commission

² University of Auckland, Auckland, New Zealand - r.constantine@auckland.ac.nz

³ Conservation International, Auckland, New Zealand

⁴ Blue Planet Marine, Nelson, New Zealand

⁵ Operation Cétacés, Noumea, New Caledonia

⁶ Institut de Recherche pour le Développement, Perpignon, France

⁷ REL Marine Ltd, Auckland, New Zealand

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SUMMARY

We successfully completed the three week voyage of The Great Humpback Whale Trail project to Raoul Island, New Zealand from the 26th September to 14th October 2015. The research is a major contribution to the 'Distribution and extent of mixing of southern hemisphere humpback whale populations around Antarctica', one of the five core research programmes dedicated to non-lethal whale research of the multi-national International Whaling Commission - Southern Ocean Research Partnership. The voyage focused on collecting data on the endangered Oceania humpback whales (*Megaptera novaeangliae*) migrating past Raoul Island with the primary aims being 1) to deploy satellite tags on whales as they migrate south to their Antarctic feeding grounds, 2) to collect tissue biopsy samples and photographs of individual whale flukes to determine the tropical breeding ground origins and mixing of stocks on the feeding grounds and 3) use the tissue samples for stable isotope analysis and interpretation of these results in an isoscape model to predict feeding grounds. With Raoul Island waters having the highest reported number of whales in the Oceania region once they leave their breeding grounds, it provided an ideal site to study the Antarctic whales from a logistically less challenging environment than the Southern Ocean.

The main outcomes from the field season were:

- Completion of the second dedicated voyage to understand tropical breeding and Antarctic feeding ground connectivity for the humpback whales of Oceania. The 2010 Antarctic Whale Expedition identified the Balleny Islands as a major feeding ground for east Australian whales but the feeding grounds of Oceania whales remain unknown.
- The successful deployment of 25 satellite tags into adult whales as they migrate south.
- The collection of 85 tissue samples from whales, including a sample from every tagged whale. Fifty-four of the samples included a blubber sample.
- Approximately 140 individually identifiable fluke photographs of humpback whales.
- The recording of 10 song samples covering almost four hours of recording time.

This report is a brief summary of the field work and will be followed by progress reports on the results of the research.

RESEARCH OBJECTIVES & AIMS

To determine the breeding ground origins, migratory path, Antarctic feeding grounds and prey of New Zealand's endangered humpback whales satellite telemetry, DNA-based genetic markers, stable isotopes and photo-identification.

Specific objectives:

- i) Deploy satellite tags on humpback whales at Raoul Island to determine the migration pathways and habitat use in Antarctica using spatial analysis tools.
- ii) Determine the breeding and feeding ground linkages, site fidelity and levels of mixing through genotype and photo-identification analysis of individual whales.
- iii) Determine the isotopic signatures of prey and model the values across the broader Ross Sea region to allow predictive models of humpback stock recovery.

Now we have collected the data, we will use a multidisciplinary approach integrating satellite telemetry, DNA fingerprinting, photo-identification and bulk stable isotopes to understand the movement, relatedness, site fidelity and diet profile of humpback whales.

PRELIMINARY RESEARCH RESULTS

Effort:

We spent 13 days in the field at Raoul Island (29.2500 °S 177.9167 °W) from 29th September to 11th October (inclusive) and were able to conduct research on a total of 11 days. We were based on the 36m expedition vessel, *RV Braveheart*, and used a 6m rigid-hulled vessel with a 150hp outboard engine and a 4.8m Naiad inflatable with an inboard jet engine as the research vessels. Both small boats were operating at the same time and in the same region with non-systematic surveys of the area that aimed to target different pods of whales and thereby increase our data collection. We were primarily based near the Meyer Islands or in Denham Bay, depending on the weather conditions; this allowed us to optimise our time on the water. The boats spent a cumulative total of approximately 100 hours on the water with both vessels covering a combined total of ~800 nm (1,480 km) with data collected on 127 pods of whales (Figure 1).

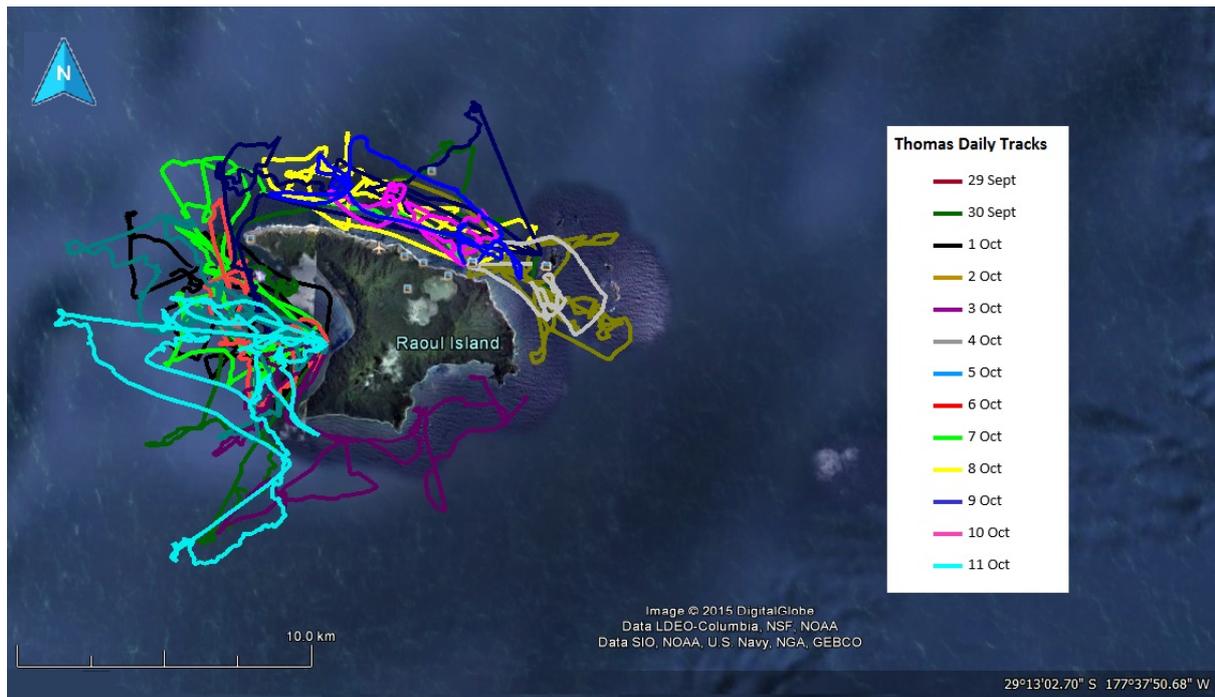


Figure 1. Tracks of the 6m research vessel *Thomas* at Raoul Island. The 4.8m *Naiad* research vessel undertook similar tracks as they worked in the same area. To simplify the map only one set of tracks have been shown.

We did not record all pods of humpback whales observed so the data cannot be used for abundance or density estimates of whales at Raoul Island. Instead we have recorded only those pods from which we collected data, where either a tag was deployed and/or a tissue sample or identification photograph taken.

Satellite tagging:

We successfully deployed 25 satellite tags on adult whales including seven females with calves. The response to tag deployments ranged from no apparent response to a single tail slap. In some cases the response was directed at the close boat approach (<5m from the whale) rather than the tag event itself. We resighted four of the tagged whales on subsequent field-days either through direct observation of the tag or listening to the signal via a handheld receiver. All tagged whales were biopsy sampled at the same time as tag deployment and photographs were taken of the tag placement. As of 20 October 2015, 17 tags were successfully transmitting location data to the Argos system (Figure 2) with some tags beginning transmission after a few days delay post-tag deployment (this is not unusual for the satellite tag performance). We will continue to track the whales until their signals cease. These tracks will allow us to determine the migration path of humpback whales and their fine-scale movements on their Antarctic feeding grounds.

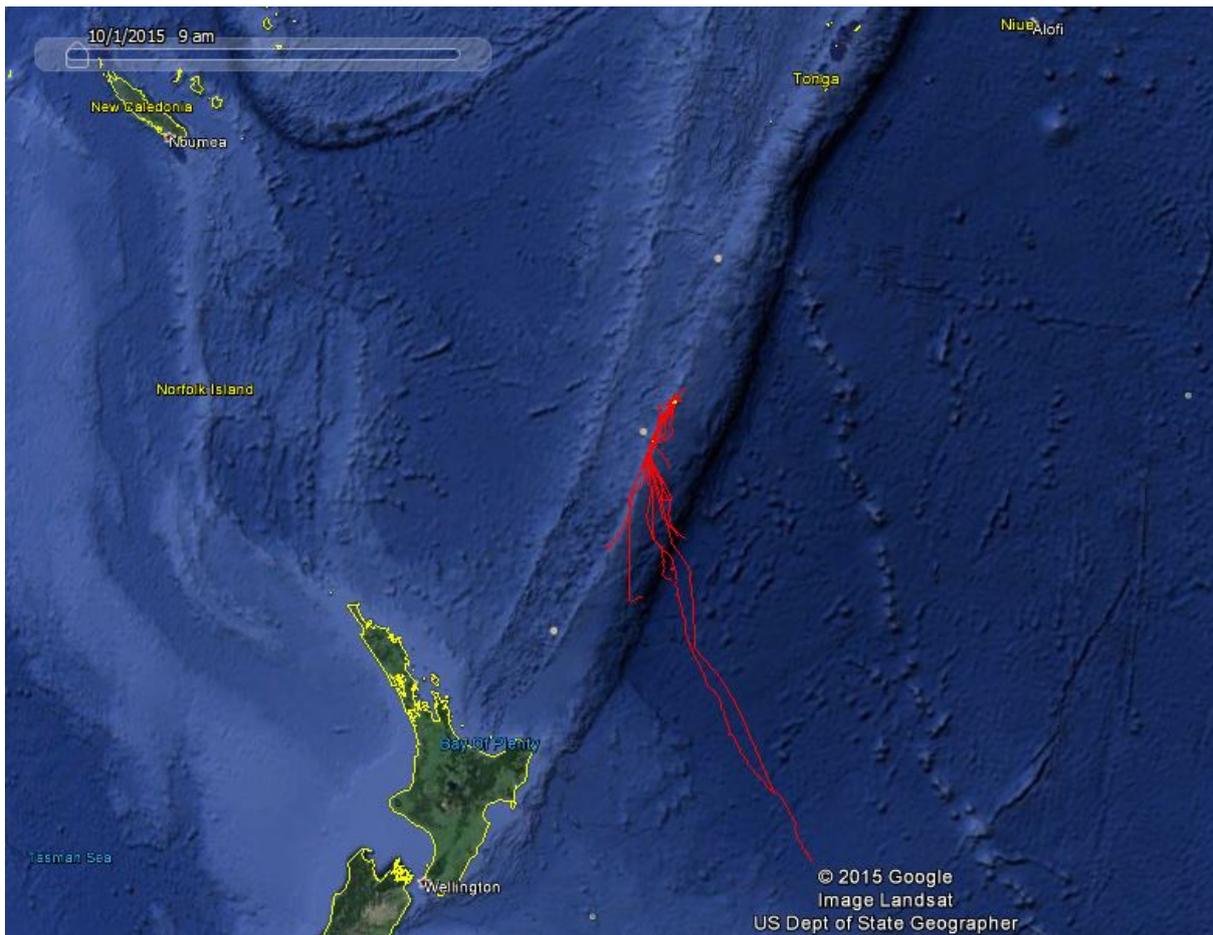


Figure 2. Satellite tag tracks of 17 transmitting tags as of 20 October 2015. The breeding ground origins of New Caledonia, Tonga and Niue are shown at the top of the image.

Tissue samples:

In addition to the tissue samples from tagged humpback whales, we sampled non-tagged whales and collected sloughed skin from surface active whales for a total of 85 samples including the tagged whales (73 biopsy, 12 sloughed skin). Of these, 54 had a small piece of blubber attached to the skin sample. With the exception of the sloughed skin samples, the majority are of sufficient size to be divided up to determine sex, individual identification using genotyping and then matched to the genetic catalogues for Oceania, east Australia and Antarctica. Another sub-sample will be used for stable isotope analysis and isoscape modelling to determine their feeding grounds.

Photo-identification:

In order to individually identify whales we photographed the underside of approximately 140 humpback whales flukes. In addition, we photographed their dorsal fins for short-term movement patterns when we were unable to obtain a fluke photograph. These photographs will be matched to a comprehensive database of several thousand whales from Oceania, east Australia and Antarctica to ascertain

breeding and feeding ground linkages. The research team have already identified whales originally photo-identified in Niue and New Caledonia providing an early indication that Raoul is an area of mixing for whales on their migration path.

Song:

We recorded a total of 3hr 56 min of humpback whale song over 10 recording sessions. This song will be analysed at the University of Queensland and song themes matched to those of whales throughout east Australia and Oceania as this is another method for connecting whales to their breeding grounds (Garland et al. 2011).

Unusual events:

On 7 October 2015, the Braveheart observed a recently dead humpback whale calf approximately 6m in length being predated upon by a ~4m long male, white shark and approximately 20 Galapagos sharks. There were two giant petrels and an Antipodean petrel also scavenging upon the carcass as well as Kermadec storm petrels picking up small pieces of tissue from the water. The blubber layer was exposed and was estimated at approximately 10cm depth indicating that the calf was in good physical condition when it died; we did not examine the carcass in detail but there was no indication of cause of death. The shark has been identified by Clinton Duffy, Department of Conservation, as STWI1009 known from Edwards Island, Foveaux Strait in March 2010. This shark was tagged in March 2011 and detected via an acoustic array at the Chesterfield Reefs, Coral Sea on October 2011 (Francis et al. 2015).

We encountered a single pygmy blue whale on the 9th October near Denham Bay and photographed its dorsal fin for identification purposes. We had observed a large blow consistent with a blue whale on another day. The dorsal fin identification image has been sent to blue whale researchers for matching to catalogues throughout the Antarctic, Australian and New Zealand regions.