



**Demography and distribution of
Buller's Albatrosses *Thalassarche
bulleri bulleri*: Final research report of
the 2010 field season**

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Demography and distribution of Buller's Albatrosses *Thalassarche bulleri bulleri*: Final research report of the 2010 field season

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1. Background

This project was completed under contract to the Marine Conservation Unit, Department of Conservation, with additional support in kind from the British Antarctic Survey and NIWA. The main aims of the project were:

1. To build upon the comprehensive demographic database for Buller's albatrosses at The Snares, and
2. To determine the at-sea distribution of Buller's albatrosses over periods for which data are currently lacking.

This report describes the field work completed under permits granted by Southland Conservancy, Department of Conservation (Entry 0910/31 and Research and Collection 06/07/38 (SO-20374-RES)) during the 2010 field season at The Snares and outlines the results in comparison with those of previous years. Specifically, the aims of the trip were to: (1) complete a count of breeding pairs of Buller's albatrosses in 3 long-term study colonies (Mollymawk Bay, Lower Punui Bay, and Upper Punui Bay), with an additional count at a Razorback colony; (2) recapture banded birds for calculation of adult survival; (3) determine breeding frequency of banded birds; (4) record the colony attendance of banded pre- and non-breeding birds; (5) deploy GPS loggers on breeding birds for one foraging trip each during the guard stage of the chick; and (6) retrieve geolocation loggers that had been deployed on breeding birds during April 2008 and April 2009.

The Snares were visited from 8 to 15 April 2010 and the team comprised Paul Sagar (field leader, NIWA, Christchurch), Kate Willis (NIWA, Christchurch), Don Geddes (Ashburton) and Andy Woods (Wanaka). Logistical support was provided on charter by *Tiama* (skipper Henk Haazen, crew Steve Parsons).

Field work centred on obtaining further information regarding the population dynamics of Buller's albatross, particularly population size, adult survival, breeding frequency, and recruitment. Demographic data will be analysed using NIWA's dedicated seabird demographic model as part of complementary DoC and MFish supported research. This was the 19th consecutive year of recording demographic data of Buller's albatrosses at The Snares.

In addition, the at-sea range of Buller's albatrosses was assessed by the deployment and retrieval of GPS loggers (Earth & Ocean Technologies, Kiel, Germany) and retrieval of geolocation loggers (British Antarctic Survey, Cambridge, England). The GPS loggers weighed ca. 38 g and were attached to feathers on the bird's dorsal

surface, between the wings, using waterproof Tesa© tape. Deployment and retrieval of devices was completed in less than five minutes for each bird. The geolocation loggers weighed ca. 3.5 g and were attached to each bird's leg using a plastic darvic leg band and a UV-resistant cable tie during April 2008 and April 2009. Retrieval of the loggers also took less than 1 minute, though the bird usually had to be removed from the nest so that the darvic band could be unwrapped.

2. Results and discussion

2.1. Breeding population size

Counts of nests where breeding had occurred that season (based on the presence of an egg or chick, or the remains thereof) were made in each of the three main study colonies. During 2010 totals of 110, 48 and 69 nests with an egg or chick were counted in Mollymawk Bay, Lower Punui Bay and Upper Punui Bay, respectively.

These totals represent declines in the Mollymawk Bay and Lower Punui Bay study colonies of 12.7% and 14.3%, respectively, relative to the numbers counted during April 2009. This trend is consistent with the decline evident in these colonies since 2006 (Figure 1). The numbers of breeding pairs in the Upper Punui Bay study colony increased by 3.0% over the total recorded in April 2009, but remains lower than that recorded during 2006 (Figure 1).

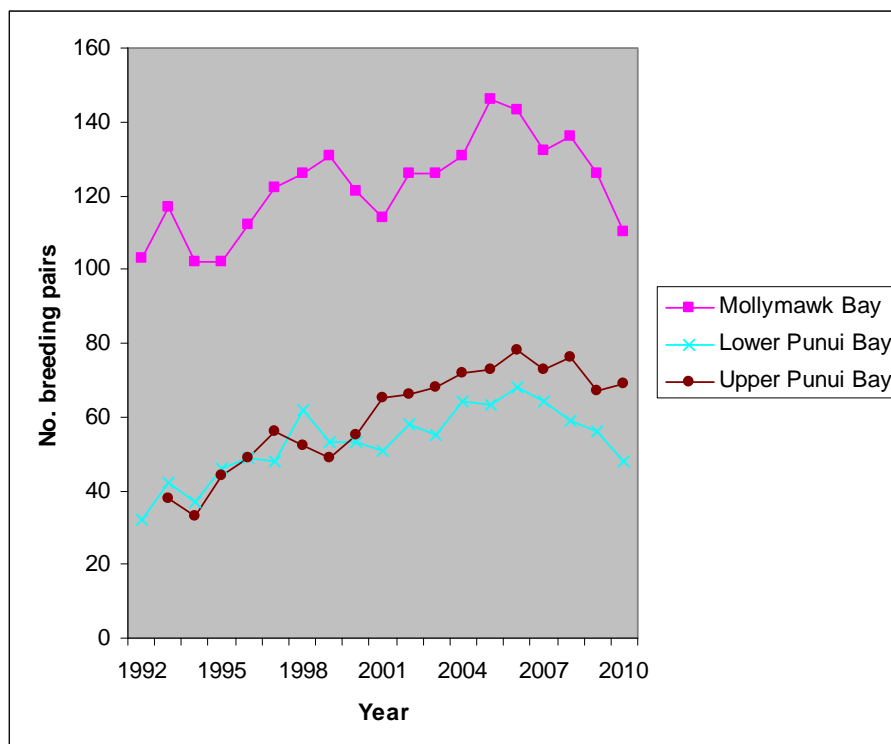


Figure 1: Numbers of breeding pairs of Buller's albatrosses counted annually at 3 study colonies, The Snares 1992-2010.

In addition, a count of nests in the Razorback colony, which has been studied intermittently since 1997, was made on 13 April, when 51 nests containing an egg or chick were recorded; this is one more occupied nest than was recorded on 11 April 2009.

2.2. Productivity

Of the 227 nests counted in the 3 study colonies on 8-9 April 2010, (43.2%) contained an egg, 12 (5.3%) contained a broken egg, 104 (45.8%) contained a recently hatched chick, and 3 (1.3%) contained a dead chick. The proportion of chicks hatched was substantially higher than the 23.2% (out of a total of 271 nests) hatched by 5 April 2008 and 32.9% (out of a total of 249 nests) hatched by 6 April 2009. This finding indicates that the timing of our trip was close to peak hatching. The number of broken eggs this year (12) was higher than the number recorded in 2008 (3) and 2009 (10), despite the decline in the number of nests in each of these years. In addition to the broken eggs we also noted that chicks were left alone at the nest at a much younger age than in any previous year of this study. The loss of eggs and abandonment of chicks recorded during 2010 are likely due to the El Nino conditions prevailing that year, resulting in less natural food available to the adults; and so resulting in lower breeding success.

2.3. Adult survival

A total of 395 birds that had been banded previously as adults of unknown age were recaptured within the study colonies. This total comprised breeding birds, non-breeders and failed breeders. In addition, a further 32 breeding birds were banded within the study colonies.

The oldest birds in the study colonies were banded as breeding birds of unknown age in 1975. Assuming a minimum age of first breeding of 10 years, these birds were at least 45 years old.

Banding schedules for all newly banded birds have been completed and sent to the Banding Office, Department of Conservation, Wellington.

2.4. Survival and recruitment of known-age birds

2.4.1. Survival

Of the 2765 birds banded as chicks near fledging in the study colonies and adjacent colonies between 1992 and 2004, 103 were recaptured during April 2010. These birds

were from cohorts banded from 1992 to 2004. The oldest known-age bird recaptured for the 1st time was from the 1992 cohort, thus indicating the length of time required to obtain complete survival estimates in these albatrosses. Of the 1076 birds banded as chicks near fledging in the study colonies during the period 1992-1999 (i.e. would now be >10 years old), 308 (28.6%) have been recaptured with the lowest rate of return (9.8%, 5/51) for the 1999 cohort in Punui Bay (Lower and Upper study colonies combined) and highest rate of return (44.3%, 27/61) from the 1995 cohort in these same study colonies (Table 1).

Table 1: Number (% of total banded as well-grown chicks) of known-age birds returning to The Snares, by cohort and colony of provenance

Colony/cohort	1992	1993	1994	1995	1996	1997	1998	1999
Mollymawk Bay	19 (27.1)	27 (30.7)	26 (37.1)	6 (26.1)	19 (22.4)	17 (17.9)	29 (35.8)	26 (29.5)
Punui Bay	20 (43.5)	12 (20.7)	17 (39.5)	27 (44.3)	21 (32.3)	22 (29.3)	15 (19.5)	5 (9.8)

As in previous years there was considerable bias in the sex ratio of the known-age birds recaptured, with 75.0% (66/88) estimated as males on the basis of leg and bill measurements. Of the 412 known-age birds recaptured since the start of this study where the gender was estimated from measurements, 71.6% (295/412) were male. This male bias in the known-age birds recaptured probably, in part, reflects differences in the behaviour of sexes. Our observations have shown that pre-breeding females spend considerably less time ashore and frequent colonies farther from their natal colony than do males. Consequently, females are less likely to be recaptured. However, more recently, we have shown that there was a male bias in the sex of chicks fledged in the study colonies during 2002-2004, and so this too would have contributed to the observed male bias in the known-age birds recaptured.

2.4.2. Recruitment

In April 2010, some known-age birds were found breeding for the first time. Of those that were found breeding for the first time in the study colonies, two were aged 10 years (banded as chicks in 2000), two were aged 11 years (banded as chicks in 1999), two were aged 12 years (banded as chicks in 1998), five were aged 13 years (banded as chicks in 1997), three were aged 14 years (banded as chicks in 1996), three were aged 15 years (banded chicks in 1995), one was aged 16 years (banded as a chick in 1994), and one was aged 17 years (banded as a chick in 1993).

Overall, the estimated age of first breeding is 10-11 years and given this extreme age of first breeding it is probably prudent to estimate recruitment (i.e. rate at which birds

banded as chicks enter the breeding population) only for the 1992-1995 cohorts. Currently, this ranges from 0 (for the 1995 cohort in Mollymawk Bay) to 28.3% (for the 1992 cohort in Punui Bay) (Table 2). However, given the bias in the sex ratio of birds returning to their natal colonies (see above), the figures for the recruitment rate should be considered minimal because it is likely that a proportion of females, in particular, will be breeding at other colonies and so are less likely to be recaptured.

Table 2: Numbers (% of total banded as well-grown chicks) of known-age Buller's albatrosses recruiting (i.e. returning to breed) to The Snares, by cohort and colony of provenance.

Colony/cohort	1992	1993	1994	1995	1996	1997	1998	1999
Mollymawk Bay	14 (20.0)	17 (19.3)	13 (18.6)	0 (0.0)	6 (7.1)	4 (4.2)	2 (2.5)	2 (2.3)
Punui Bay	13 (28.3)	8 (13.4)	8 (18.6)	10 (16.4)	8 (12.3)	10 (13.3)	2 (2.6)	1 (2.0)

2.5. Foraging

2.5.1. Foraging during the guard-stage

GPS loggers were used to track one foraging trip for each of 23 birds that were feeding a small chick during the guard stage. The birds were away from the nest for 1-4 days and the loggers recorded the location of each bird once every 2 minutes during this period. Such fine-scale resolution of the movements of the birds will enable us to determine any correlations of the foraging locations of the birds with bathymetry, marine currents, sea surface temperature and productivity, and the activities of fishing vessels.

Even though the birds were away from the nest for only relatively short periods, plots of their movements (Figure 2) showed that they dispersed widely. Foraging activity was concentrated on the SE of the Snares Shelf, the shelf around Stewart Island, and the shelf edges to the east and west of Stewart Island. One bird foraged south of the Gilbert Seamount in the Tasman Sea; three birds foraged off SE Otago; and three birds travelled south to forage just north of the Auckland Islands.

As in 2008 and 2009, an initial analysis of duration and destination of males and females indicated that females undertake trips of longer duration, mainly to the north, and males undertake shorter trips, mainly to the south.

2.5.2. Retrieval of geolocation loggers

During April 2008, geolocation loggers were deployed on 38 banded birds at Mollymawk Bay. Of these birds, 24 were recaptured during April 2009 and 19 loggers were retrieved; 5 loggers had become detached from the darvic band, and so were lost during the intervening period. During April 2009, a further 22 geolocation loggers were deployed on banded breeding and non-breeding birds at the Mollymawk Bay study colony.

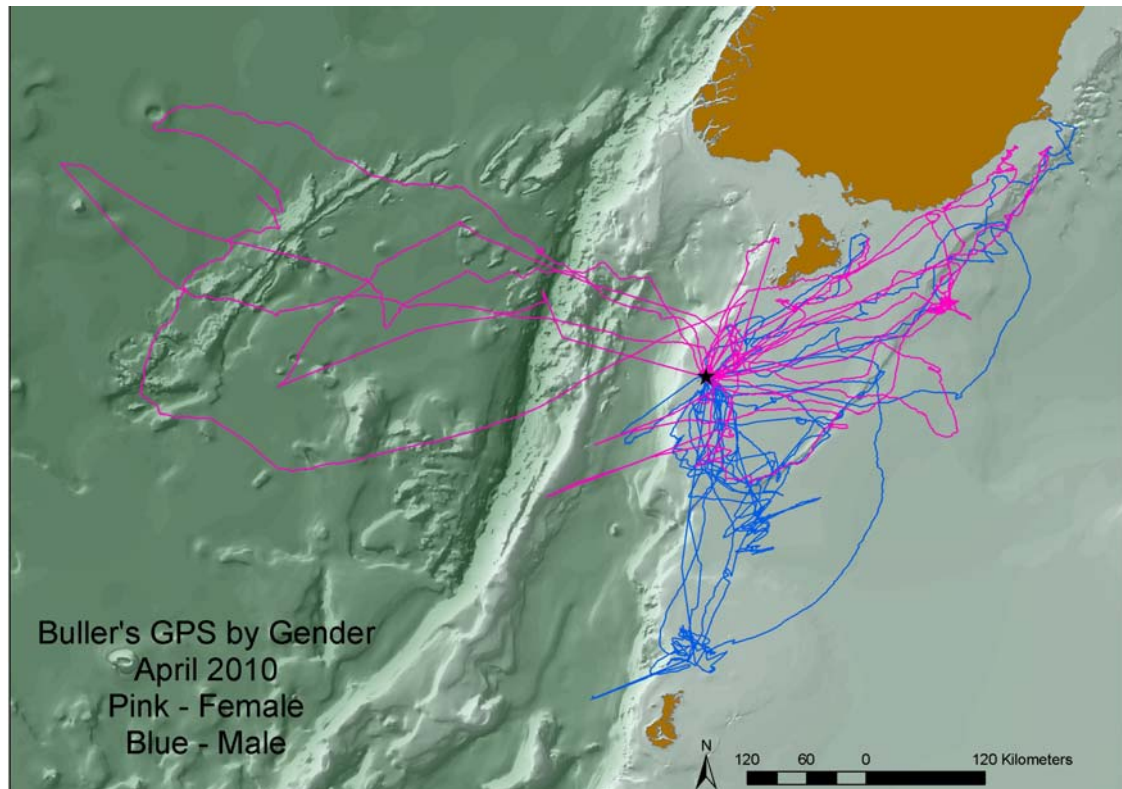


Figure 2: Generalised tracks, by gender, of 23 trips of Buller's albatrosses from The Snares determined by GPS loggers during the guard stage, 6-12 April 2010.

Of the loggers deployed during April 2008 a further 3 were retrieved and 2 more recorded as lost; leaving 9 loggers still to be accounted from this deployment. Likewise, of the loggers deployed during April 2009, 11 were retrieved and 2 recorded as lost; leaving 9 loggers still to be accounted from this deployment. Retrieval of the outstanding loggers is planned for April 2011.

Data from all the retrieved loggers were downloaded and sent to British Antarctic Survey for processing. The processed data provided information about the movements and locations of Buller's albatrosses for the period April 2008 to April 2010; this is the first time that this species has been tracked throughout its complete annual cycle.

Initial analysis of the resulting processed data shows (Figures 3-6) that:

- During November all birds were distributed off the coasts of Chile and Peru (Figure 3).
- During December, January and February there was movement west across the Pacific as breeding birds returned to Australasian waters for the start of the breeding season (Figure 4).
- In April, during the guard-stage of the chick, most breeding birds confined their foraging within the EEZ, primarily over the Snares Shelf and farther south (Figure 5).
- In May, after the guard-stage, foraging extended primarily off the east coast of the South Island. There was some movement of birds east across the Pacific, presumably following the death of their chick.
- During July, breeding birds continued to forage off the east coast and there was also an increase in foraging off the west coast of the South Island. Failed breeders foraged primarily off the coast of Chile (Figure 6).
- By August there was a contraction of the foraging range along the east coast of the South Island and the movement of presumed successful breeders east across the Pacific.
- The final birds migrated across the Pacific to South American waters during October.

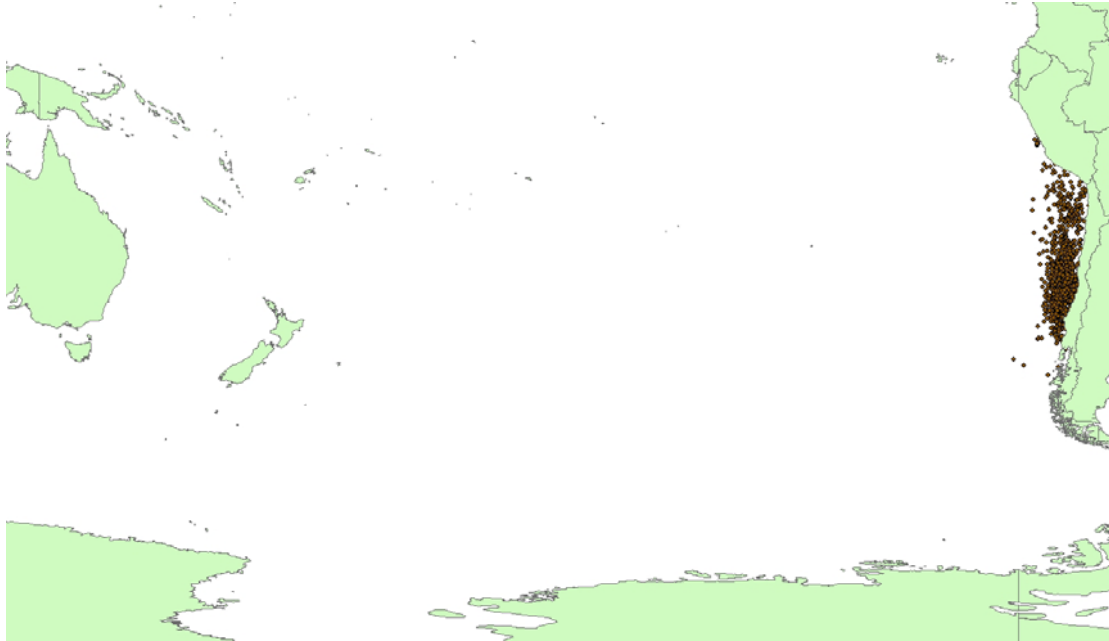


Figure 3: Distribution of Buller's Albatrosses during November 2008, as indicated by geolocation loggers.

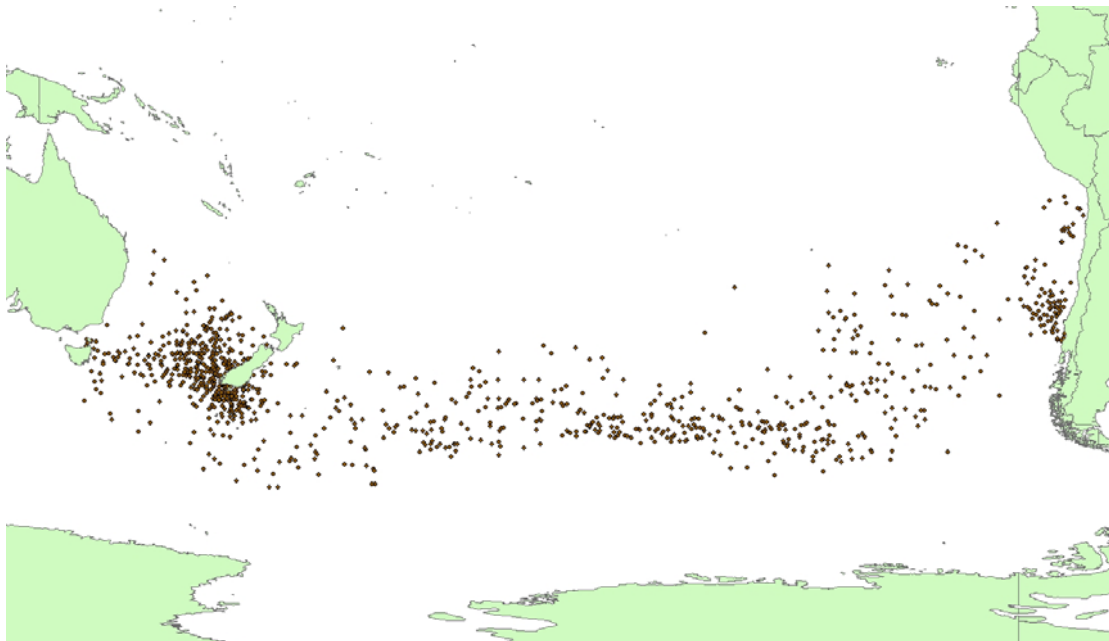


Figure 4: Distribution of Buller's Albatrosses during January 2009, as indicated by geolocation loggers.

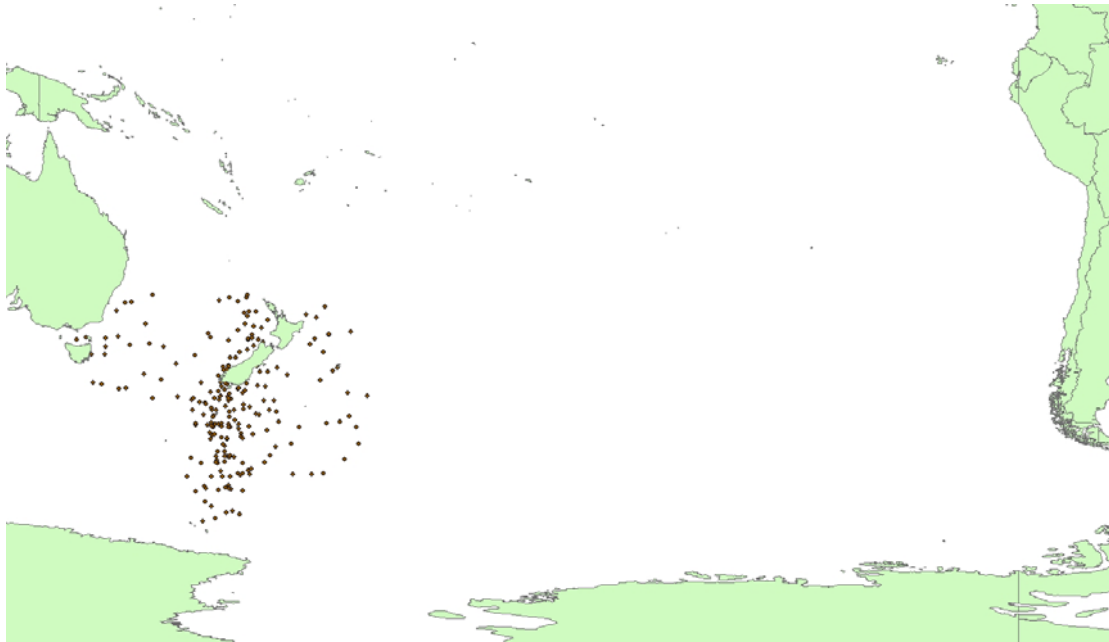


Figure 5: Distribution of Buller's Albatrosses during April 2009, as indicated by geolocation loggers.

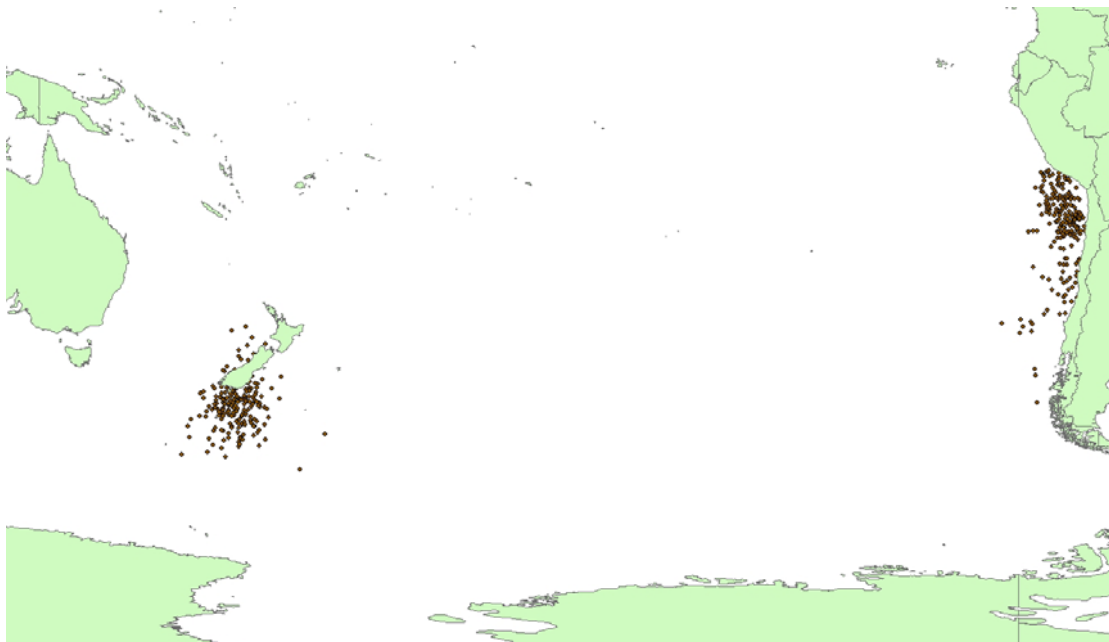


Figure 6: Distribution of Buller's Albatrosses during July 2009, as indicated by geolocation loggers.

Following the April 2011 field trip to The Snares, any further geolocation data will be incorporated with those already processed and detailed analyses undertaken that will include examination of foraging distribution by gender, age, and breeding status of

individuals. In addition, the foraging distribution of the birds will be overlain with other remote sensing datasets e.g., sea surface temperature, ocean colour and fishing catch effort to determine whether there are any associations.

3. Acknowledgements

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