Royal albatross (*Diomedea epomophora*) on Enderby Island, Auckland Islands

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CONTENTS

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ABSTRACT

Since 1992 there has been annual monitoring of southern royal albatross (*Diomedea epomophora*) nests during the austral summer (December–February) on Enderby Island, in the Auckland Islands group. Annual nest counts from these and earlier surveys document the recovery of nesting albatross on Enderby I. over the period 1954–2001. The most recent survey from the 2001 breeding season yielded a total of 69 nests on the island, which is the highest number ever reported. The mean (± SD) number of nests on the Island over the last 10 years (1992–2001) was 50.3 ± 11.5 (range 32–69). Winter surveys conducted in 1996, 1997 and 1998 to investigate chick survival found that a mean of 74 ± 7.8 % of nests still had a live chick, although this should be treated as a maximum estimate of chick survival as some surveys were conducted several months prior to fledging. Since 1962, a total of 402 birds have been banded on Enderby I., 224 of these over the last 10 years.

Keywords: Auckland Islands, *Diomedea epomophora*, monitoring, nest counts, southern royal albatross

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1. Introduction

The southern royal albatross (*Diomedea epomophora*) and its close relative, the northern royal albatross (*D. sanfordi*) are endemic to New Zealand (Croxall & Gales 1998; Robertson & Nunn 1998). Previously they were classified as subspecies, *D. e. epomophora* and *D. e. sanfordi* (Marchant & Higgins 1990; Turbott 1990). The majority (99%) of northern royal albatross breed on three islets in the Chatham Is group and the remainder at a single location, Taiaroa Head, on the South Island of New Zealand (Robertson 1993) (Fig. 1). Most (99%) southern royal albatross breed on Campbell I. with a small number of birds breeding on the Auckland Is group, including Enderby and Adams Is (Turbott 1990; Gales 1998). Estimates of the total number of annual breeding pairs are approximately 5200 and 7900 for the northern and southern taxa respectively, although the number of pairs is declining in northern royal albatross while increasing in southern royal albatross (summarised in Gales 1998).

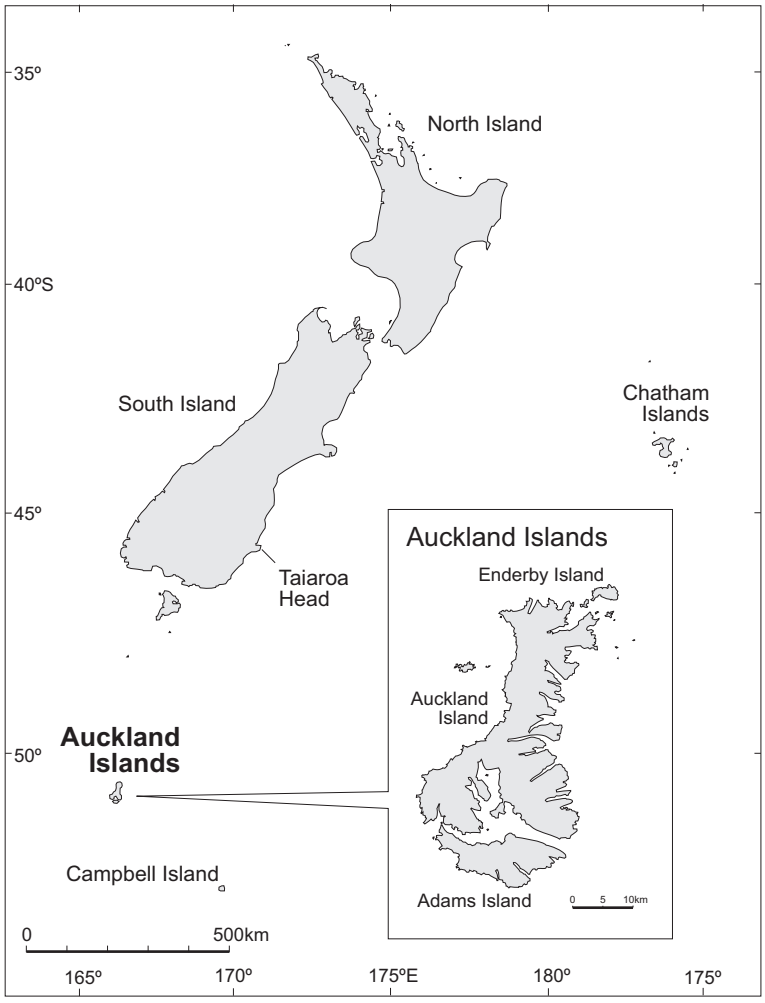

Figure 1. Breeding locations of royal albatross in New Zealand.

Royal albatrosses were extirpated from Enderby I. by human exploitation by about 1868 (Taylor 1971). They re-colonised in the 1940s, after which the population has steadily increased (Robertson 1975; Yaldwyn 1975; Marchant & Higgins 1990). The increase of royal albatross on Enderby I. coincided with an increase in the core population on Campbell I., which has been recovering from depredation during the farming era between 1895 and 1931 (Moore et al. 1997).

Both taxa of royal albatross are biennial breeders and have a similar incubation period although the timing is approximately 2–3 weeks later in southern royal albatross (Richdale 1942a, b, c; Sorensen 1950; Waugh et al. 1997). Royal albatross live up to 60 years and generally do not start breeding until they are 8–10 years old for northern (Robertson 1993) and 6–12 years old for southern royal albatross (P. Moore, pers. comm.). Threats to both taxa include their bycatch in longlining and trawling operations (Bartle 2000a, b; Robertson & Bell 2002a, b) while habitat degradation and introduced mammalian predators are significant threats to northern royal albatross (Robertson 1998).

Royal albatross forage in the waters around New Zealand during breeding, with a non-breeding range centred mainly on the seas off southern Chile and Argentina. Reports of banded birds, studies of diet, and satellite tracking of movements have confirmed these latter areas as important feeding areas although the birds also feed in New Zealand waters (Robertson & Kinsky 1972; Nichols et al. 1994, 2002; Imber 1999).

This report describes the ongoing monitoring of southern royal albatross on Enderby I. in the Auckland Is group. Almost all the royal albatross on Enderby I. are of the southern taxa but a few northern individuals have been recorded (Taylor 1988; C.J.R. Robertson, pers. comm.) and for the purpose of this paper we have assumed that all birds are southern royal albatross. The aims of this ongoing work include the monitoring of population size and potential impacts, estimation of survival and reproductive rates, and providing baseline information on an important component of the subantarctic ecosystem. This report provides a detailed description of the methods used in this study and summarises annual data, including nest locations, individuals identified, and breeding pair combinations. The purpose of this report and its data supplement (http://www.doc.org.nz/dsis144sup.pdf) is to publish the data from this long-term study in a permanent form that will be accessible to future researchers.

2. Methods

2.1 GENERAL METHODOLOGY

This work reports on monitoring carried out at Enderby I. (50°30´S, 166°20´E) over the period 1992–2001. Methodology has been generally consistent, although with changes in personnel and varying amounts of time available it has not always been possible to use identical methods.

In addition to reporting on our monitoring work (1992–2001) we include information from unpublished reports and surveys on Enderby I. for nesting birds over the period 1954–1987 (Table 1). The methods reported for our monitoring do not necessarily reflect the methods used between 1954 and 1987.

TABLE 1. PREVIOUSLY REPORTED ROYAL ALBATROSS SURVEYS ON ENDERBY I.

YEAR OF SURVEY	REFERENCE
1954	Falla (1954); Dell (1954)
1963	B. Bell in Taylor (1971)
1966	Taylor (1971)
1973	Russ (1974)
1974	Russ (1974)
1981	Bell (1982)
1987	Taylor (1988)

2.2 ISLAND CENSUS BY NEST MARKING

During the summer field season (December to February) between 1992 and 2001 a complete search of Enderby I. for royal albatross nests was made. Searching was undertaken on foot generally starting at the western end of the Island and moving to the eastern end. Searches were undertaken by up to 2–3 people, walking 20–40 m apart, keeping in visual and voice contact. Some parts of the Island were searched by a single person. Most of the effort was spent searching the relatively clear herbfields and along the edge of the rata (*Metrosideros umbellata*) forest and mapou (*Myrsine* sp.) bush on the top (approximately 40 m a.s.l.) of the Island. Other parts of the Island were surveyed opportunistically during extensive searches for tagged New Zealand sea lions (*Phocarctos hookeri*), which are found in all habitats. The only areas which were not searched were inside the dense rata forest which has an average canopy height of 4–5 m. Most of the census work was carried out opportunistically in spare time when not involved in other work programmes on the Island (e.g. sea lion research).

Most searches were conducted by naked eye, but binoculars were used to scan areas from high vantage points prior to ground searches. If a bird or suspected nest was seen from a distance, it was visited to confirm the presence of a nest. The locations of all nests were recorded on a map taken from an aerial photograph, which showed vegetation boundaries that were useful as landmarks. The nest position, as marked on the map, was recorded relative to vegetation boundaries and other nests and reflects the approximate, rather than the exact, location of the nest. In addition, during the 2000 season only, GPS positions of nests were taken using a Garmin® handheld GPS.

A nest was considered active in that season if it contained a bird sitting on an egg or chick. Recently abandoned nests were included in the census if the remains of either an egg (whole or broken) or dead chick were found in or near

the nest. All birds sitting on a nest were checked to confirm the presence of an egg or chick. All nests were given an individual number, marked on the map, and marked with either a small numbered peg or piece of numbered tape. These nest markers were removed either during a winter visit or the following summer season. Years are reported as the year in which the egg was laid (e.g. normally November–December) although most of the work was undertaken in the following calendar year.

2.3 BANDING, BAND READING AND CHEST MARKING

Little effort was made to band non-breeding birds, but most birds which were on nests were banded. Birds found on a nest were checked for the presence of a band on either leg. When a nest was first found, the bird present was marked with a non-toxic marker pen on the centre of its chest and the band was checked. Later, in checking the nest for the partner we could tell if the first identified bird was present or not from a distance and so keep disturbance to a minimum. On some occasions the mark was reapplied to the first bird after some time as it started to fade and the partner had still not been identified. Most nests were visited regularly (every 1–5 days) until both partners had been identified.

Where possible, all birds were slowly approached from the front and with the researcher kneeling. Exceptions were made when thick scrub around the nest made it necessary to approach from another angle. If the first leg checked did not have a band, the other leg was examined. The band was generally read while the bird was still sitting on the nest, but sometimes the bird would stand and allow easy reading of the band. If there was any sign of distress from the bird, the researcher paused, withdrew and waited for the bird to calm down before attempting to read the band.

If a bird was found to be unbanded, it was either banded or temporarily marked. Banding was not undertaken every year, but only when researchers experienced with banding were present. In general, most banding was undertaken by two people. One person approached the bird from the front and grasped the beak, removed the egg from the nest, and placed it in a warm hat away from the nest to prevent accidental breakage or predation by brown skua (*Catharacta skua*). With the beak firmly held, the left leg was held by reaching over the back and then under the belly so the bird could be gently restrained. The second person then put an individually numbered stainless steel leg band (provided by the National Banding Office, DOC, Wellington) on the right leg. Before release of the bird, the band was checked to ensure that it rotated freely on the leg, could slide up and down, and that the join of the band was flush inside and out, without sharp edges. The bird was then taken slightly away from the nest (about 0.5 m), the egg was replaced in the nest and the bird was released so that it could see the egg in front of it and easily move back onto the nest.

2.4 WINTER SURVEYS

In some years, Enderby I. was visited during the winter (July–October). At this time, all nests that had been identified the previous summer were visited and examined for the presence or absence of a chick. Where a chick was found away from a nest it was assigned to the nearest nest that appeared to have been used recently. If a chick was not present at a nest, the nest and surrounding area were examined for signs of a failure (e.g. broken egg, dead chick).

3. Results

Detailed results are given in a separate data supplement to this report. It is available from DOC Science Publishing, and on its website at http://www.doc.govt.nz

3.1 NEST LOCATIONS

Nest locations were recorded each year during the 1992–2001 study. They are illustrated in Part 1 of the data supplement. In addition, nest maps from previous researchers (Table 1) have been put onto the map that was used in the 1992–2001 study for comparison and these nest maps are also included in Part 1. A sample all the nest maps is given in Appendix 1. The numbers on the maps correspond to the number of the nest in that year and relate to nest numbers reported in other parts of the data supplement. Numbered nests prior to 1992 relate to data provided in the original references and are not discussed in this report. GPS locations of nests in 2000 (the only year for which this information is available) are listed in Part 2 of the data supplement. The mean number ± SD of nests on the island over the last 10 years (1992–2001) was 50.3 ± 11.5 (range 32–69).

3.2 ANNUAL NUMBER OF NESTS

The annual numbers of nests recorded on Enderby I. between 1954 and 2001 are shown in Fig. 2.

3.3 INDIVIDUAL RE-SIGHTING

Band numbers of breeding pairs which were present each year (1992–2001) were ordered by their nest number (see Part 3 of the data supplement for numbers and Part 1 for the nest positions). Some birds could not be identified, because either they did not have a band or they were not seen, e.g. the nest was abandoned prior to our arrival.

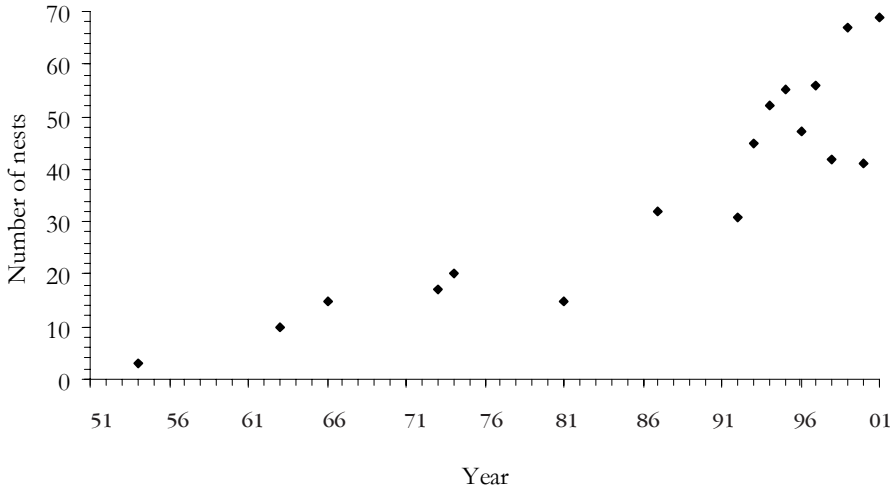

Figure 2. Number of royal albatross nests on Enderby I., 1954–2001.

3.4 BANDING OF BIRDS

A total of 402 birds have been banded on Enderby I. between 1962 and 2001. Two hundred and twenty-four of these have been banded over the last 10 years. Over this latter period, all unbanded birds found on nests were banded each year with the exception of 1996, 1997 and 1998, when only a small proportion were banded. Fig. 3 shows the number of birds banded each year.

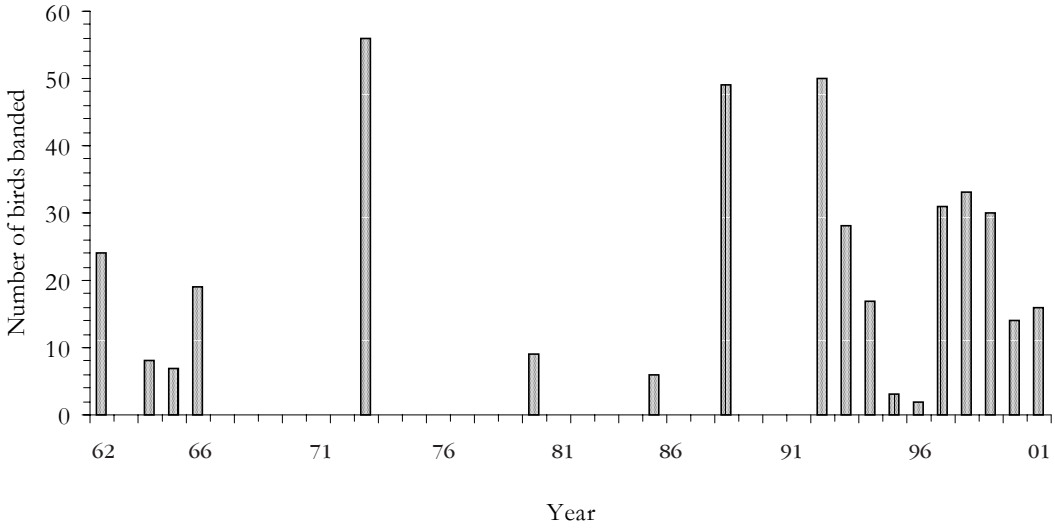

Figure 3. Number of royal albatross banded on Enderby I., 1962–2001.

3.5 RE-SIGHTING OF BANDED BIRDS

The full re-sighting record of each banded bird during 1992–2001 is given in Part 4 of the data supplement. All of the re-sighting effort was directed at nesting birds and there is only a single record of a non-breeding bird.

3.6 IDENTIFICATION OF NESTING PARTNERS

Nesting partners of individual birds in the years that they were identified are shown in Part 5 of the data supplement.

3.7 WINTER SURVEYS

Surveys of nests were carried out during the winter in three years to assess chick survival. The surveys were undertaken on 29 July 1996, 30 September 1997, and 15 August 1998. Of the nests that were found during incubation, a mean (± SD) of 74% (± 7.8) still had a chick present when surveyed the following winter.

4. Discussion

This monitoring project is ongoing and this report provides a summary of progress to date. Much of the early work summarised here is not easily accessible (e.g. Dell 1954; Falla 1954; Russ 1974) as it was contained in unpublished reports and internal memos. Royal albatross are a long-lived species and many of the individuals we have banded or worked with will still be alive in 40 years, much longer than any of the current project staff are likely to be involved.

For the early surveys (e.g. Dell 1954; Falla 1954), it has been difficult to determine the exact nature of the surveys or techniques used. However, the maps of nest sites and field notes reported in this paper indicate that reasonably comprehensive searches were made for albatrosses on Enderby I. in these years. The 1954 survey, and perhaps those in other years, should be viewed with some caution and regarded as minimum counts rather than the absolute number of nests. However, these historical data points provide a useful baseline for population trend analysis.

There was little variation in location of nests over the years surveyed between 1992 and 2001. There is a strong pattern evident with birds nesting along the middle, higher ground, of the Island. Most of the nests were found along the *Myrsine* scrub-herbfield boundary, with herbfields dominating the upper altitudinal range. In most cases, the nests were found inside openings in the *Myrsine*, which appeared to offer shelter from the prevailing westerly wind.

Some nests were found well inside (> 10 m) the *Myrsine* scrub, but in most cases these were accessed by clear paths in from the herbfield. Most of the nests were on the southern boundary of the herbfield.

There appears to have been a gradual extension of nests from the western to the eastern end of the Island since the early surveys. However, without detailed explanations of the early survey methodology it is difficult to determine if this is a real change or perhaps an artefact of incomplete or variable survey effort.

Annual nest counts reported in this paper have documented the recovery of nesting albatross on Enderby I. over the period 1954–2001. The annual number of nests has increased slowly over the last 50 years. Since regular surveys began in 1991, there has been an average of c. 50 nests per year, although there has been considerable inter-annual variation. This recovery is likely to reflect a variety of factors, including a slow reproductive cycle; but a potentially important factor was the removal of rabbits, sheep and cattle from Enderby I. between 1991 and 1993 (DOC 1999) which would have led to less disturbance of nesting birds.

These estimates of chick survival should be considered as maximum estimates rather than accurate figures. The winter surveys were conducted between July and September each year (several months prior to fledging of chicks). There was considerable variation in the timings of surveys, with the survey in 1996 commencing almost two months earlier than that in 1997. This makes it difficult to make direct comparisons between the estimates for each year. It is possible that there was additional chick mortality after the winter surveys were completed which would reduce the estimate of chick survival presented in this report. In addition, some breeding attempts may have failed prior to the nest searches being conducted. Overall, these estimates provide a useful indication of chick survival for royal albatross on Enderby I.

It is possible that not all breeding birds were identified each year. Reasons for this could include nest failure prior to both partners being identified, or because some birds were not banded until a subsequent breeding attempt. While this is unlikely to be a significant issue, it needs to be considered in further analysis of this dataset. In addition, some individuals may have been present on Enderby I. during years when they were not nesting, and would not have been re-sighted as we restricted our band reading efforts only to nesting birds.

Overall, the project has provided a useful insight into royal albatross ecology and biology. Because the population on Enderby I. is relatively small and easily accessible we were able to visit the entire breeding population each year. This has provided a useful dataset for the estimation of population parameters such as adult survival, breeding frequency and mate retention, some of which will be dealt with in subsequent publications. These and previous surveys have provided accurate annual counts of nests and document the recovery of nesting royal albatross on Enderby I.

5. Acknowledgements

This work would not have been possible without the hard work and dedication of numerous researchers over the last nine years, usually as an adjunct to the New Zealand sea lion research programme. It is a credit to all those involved that it has continued and yielded such good results. Peter Moore provided useful advice and comments about the project, and gave constructive comments on the draft manuscript. Gus MacCalister and Peter Moore demonstrated bird banding and aided the team with carrying it out. In addition, the work could not have occurred without the transport vessels (and their crew) that got us to Enderby I., including *Pacific Ruby*, *Breaksea Girl*, *Academic Schokalski*, *Marine Countess*, *Taliska* and vessels of the Royal New Zealand Navy. Southland Conservancy provided excellent logistic support and advice, particularly Pete Tyree. Chris Edkins has provided excellent nest maps and figures. The work was conducted under permit from Southland Conservancy and the National Banding Office of the DOC.

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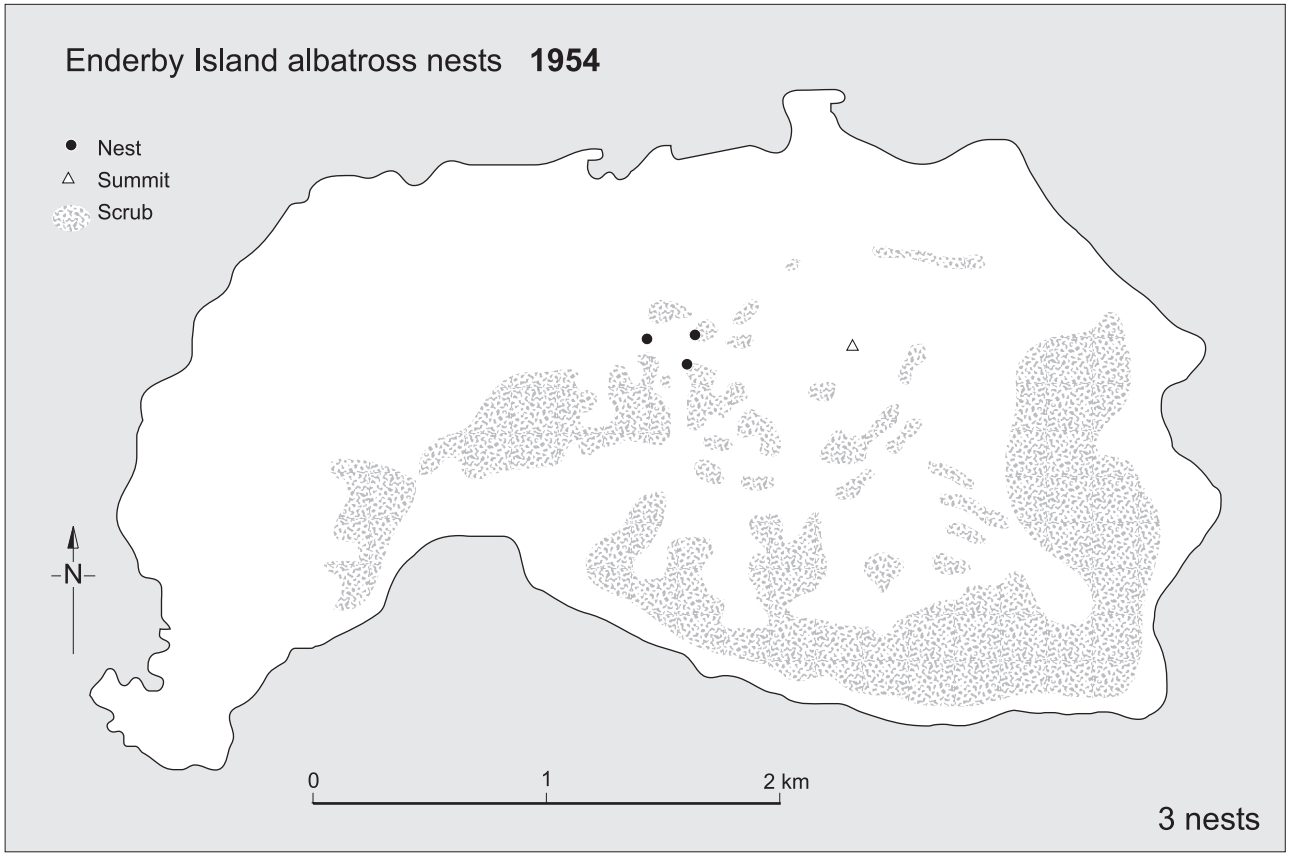
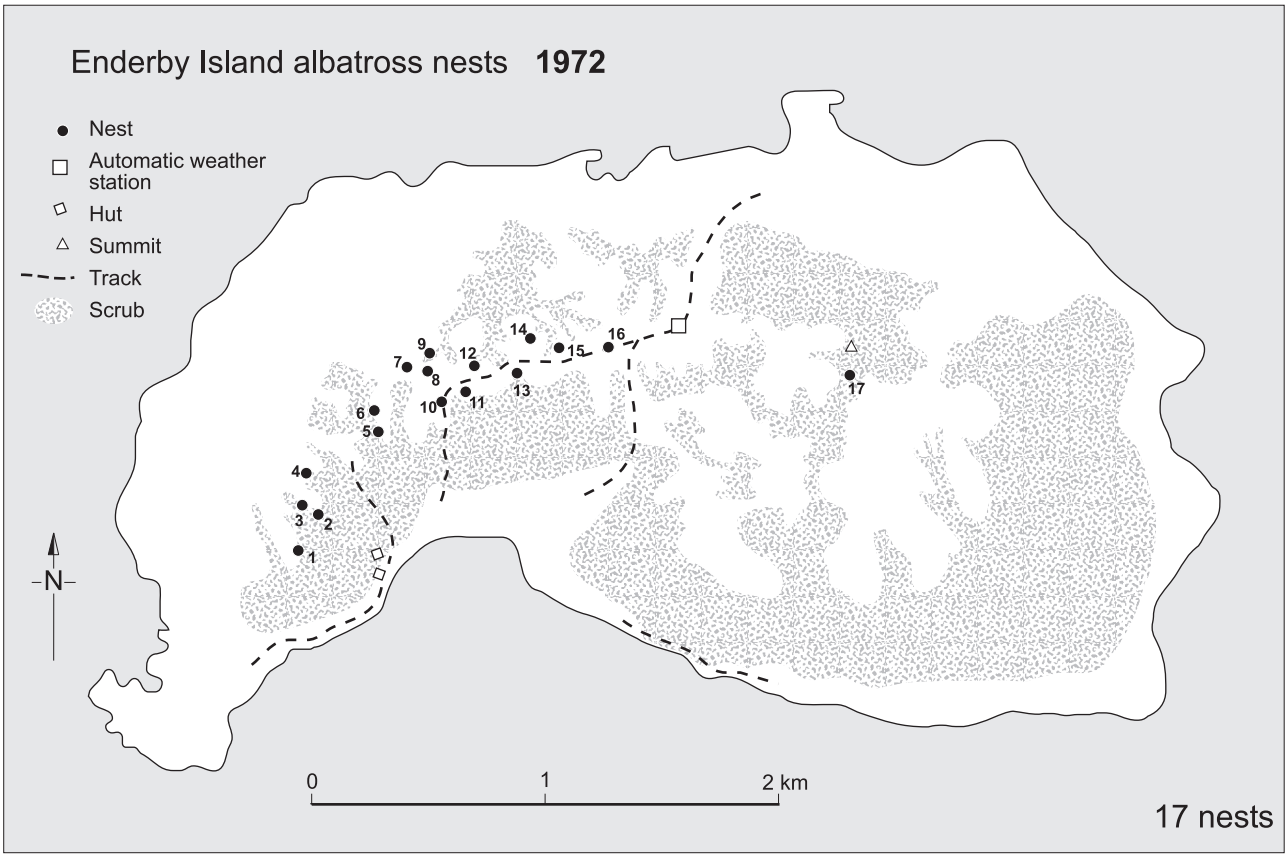
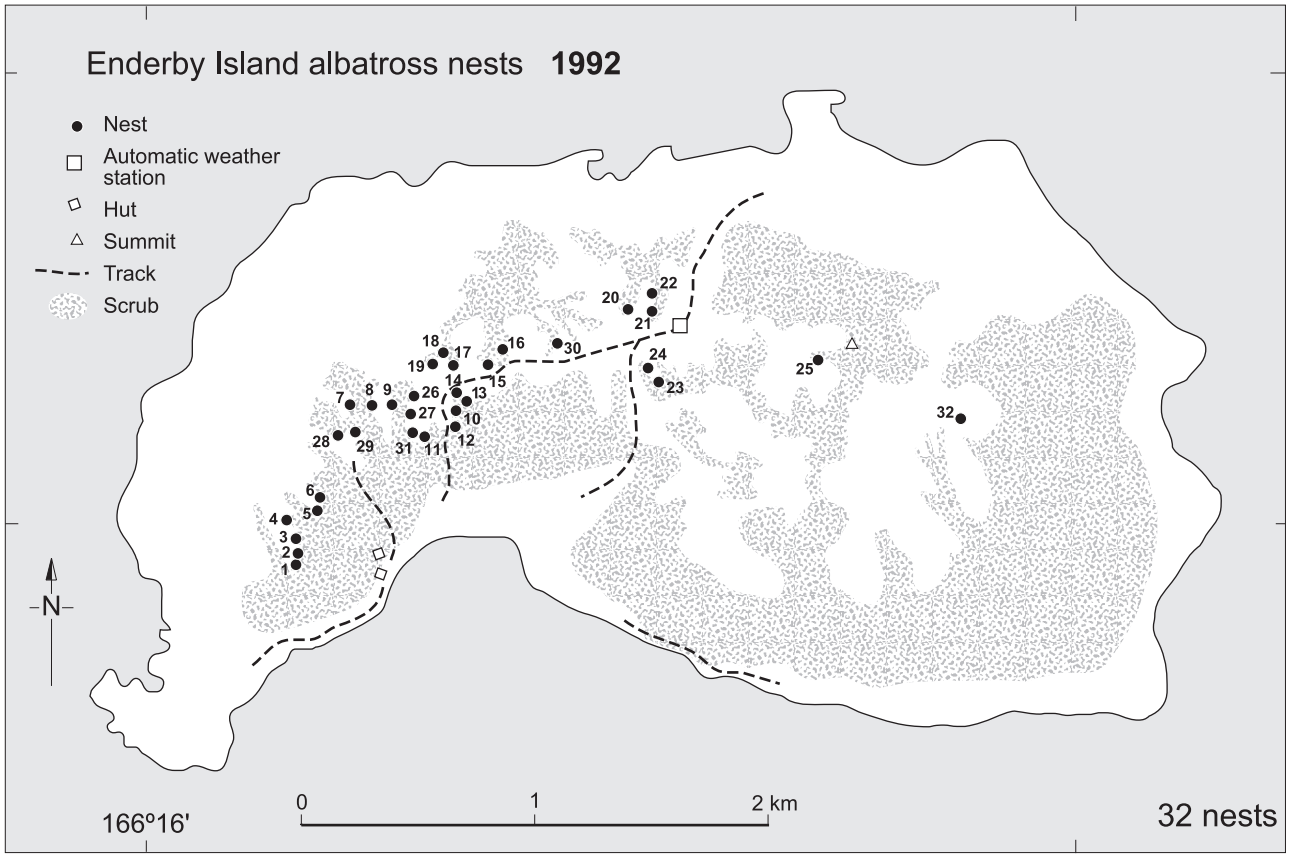
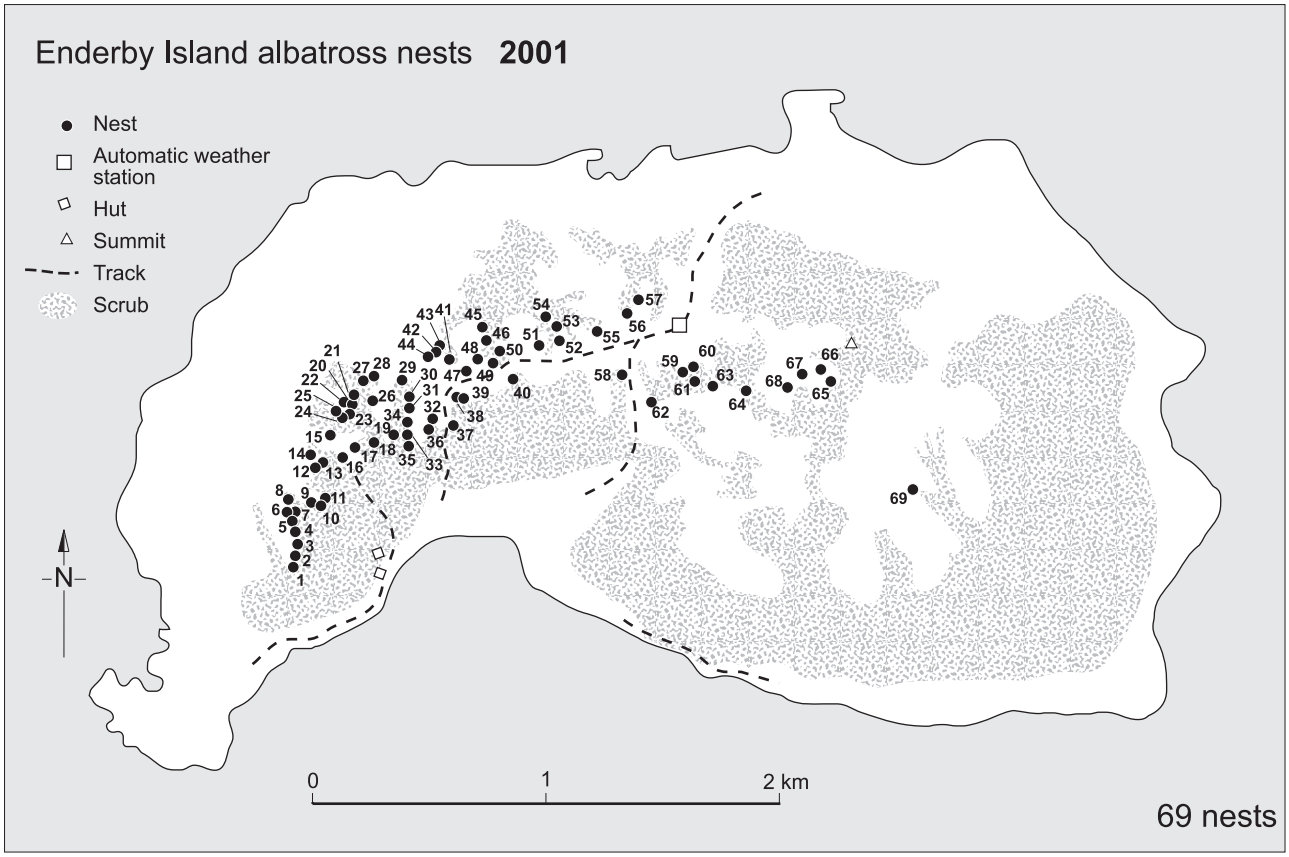
Appendix 1

Approximate locations of royal albatross nests on Enderby I. 1954, 1972, 1992 and 2001


Enderby Island albatross nests 1954
Nest
Summit
Scrub
N
0
1
2 km
3 nests


Enderby Island albatross nests 1972
Nest
Automatic weather station
Hut
Summit
Track
Scrub
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
N
0
1
2 km
17 nests


Enderby Island albatross nests 1992
Nest
Automatic weather station
Hut
Summit
Track
Scrub
N
166°16'
0
1
2 km
32 nests


Enderby Island albatross nests 2001
Nest
Automatic weather station
Hut
Summit
Track
Scrub
N
0
1
2 km
69 nests