Monitoring Antipodean and Gibson's wandering albatrosses, 1996/97

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ABSTRACT

This report describes population monitoring of the Antipodean wandering albatross (*Diomedea antipodensis*) on Antipodes I., and Gibson's wandering albatross (*D. gibsoni*) on Adams I. in the Auckland Is in 1996/97. Breeding success for Antipodean wandering albatross was again high (78.5%), but that for Gibson's wandering albatross was lower than in previous years (60%). Numbers of nests were similar to previous years for both species. Improved harnesses and release mechanisms for satellite transmitters were trialled on Antipodean wandering albatross, and several foraging flights were monitored.

Keywords: Antipodean wandering albatross, *Diomedea antipodensis*, Gibson's wandering albatross, *Diomedea gibsoni,* breeding success, recruitment, adult survival, nest census, satellite tracking, at-sea distribution.

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1. Introduction

The Antipodean wandering albatross (*Diomedea antipodensis*) and Gibson's wandering albatross (*D. gibsoni*) are endemic to the New Zealand region. High levels of bycatch of both by long-line fishing boats (Murray et al. 1993) led to concern that the fisheries bycatch may be causing population declines. Wandering albatrosses are long-lived (> 40 years), breed late (> 10 years) and produce a chick only once every 2–3 years, and because of these characteristics are less able to sustain increased bycatch mortality than many other species.

Unlike other wandering albatrosses, the New Zealand species have been little studied and their conservation status was unknown. In 1991 we began a long-term study of Gibson's wandering albatross on Adams I. in the subantarctic Auckland Islands group (Walker & Elliott 1999), and in 1994 a similar study on Antipodean wandering albatross on Antipodes I. (Walker & Elliott 2002).

The following is a summary of research and monitoring of both the Antipodean and Gibson's wandering albatross during 1996/97.

2. Antipodean wandering albatross

We spent two months on Antipodes Island, arriving on 3 January 1997 on the tourship *Akademik Shokalski* and departing on 27 February 1997 on the *Marine Countess*, which we chartered. In January the team comprised Kath Walker, Graeme Elliott, Peter Dilks, and Belinda Studholme. The *Marine Countess* picked up Graeme and Peter from the island on 3 February and dropped off Peter McCelland, Mike Aviss, and Shannel Courtney to replace them.

2.1 BREEDING SUCCESS

Breeding success in our study area (see Walker & Elliott 2002, fig.2) in 1996 was again high, at 78.5% (cf. 74.8% in 1994, 74.4% in 1995 (Walker & Elliott 2002)). This was reassuring given the intensity of our work in the study area in January and February 1996 when we regularly visited nests and measured and weighed most birds. It was particularly good to find 100% breeding success in the nine pairs we had weighed every 2–3 days.

Eggs were laid in 147 nests in the study area this year, and in three of these nests we were surprised to find two eggs. We have only once before had a two-egg nest in either the Adams I. or Antipodes I. study areas (a combined total of 10 seasons' monitoring). In all three cases on Antipodes I. it seems a female accidentally laid in a nearby neighbour's nest, and was chased off when the rightful female returned to lay. This means in total 150 pairs laid eggs in the study area.

We checked all nests in the study area almost daily for the whole two months to determine mean date of chick fledging and egg laying (both of which will, amongst other things, help us timetable future visits) and average incubation/foraging shift length.

2.2 RECRUITMENT

We had planned to band three consecutive cohorts of 500 chicks in and near the study area, just before they fledged in late December, to provide an estimate of recruitment when birds first return to the island (5–7 years after fledging) and/or at first breeding (10–13 years after fledging).

In 1995/96, this was achieved through the fortuitously timed spring (October/November) taiko expedition to Antipodes I. This year, to save costs we put the work back-to-back with the midsummer work on adult survival. This made for a long summer field programme (and the necessity of staff change-overs), and the possibility that most of the chicks would have fledged before we arrived on Antipodes I. Fortunately only about 15–20% had fledged, and a long calm spell just before and after we arrived prevented the remainder from leaving before we banded them.

We put big, bright-orange numbered Darvic bands on each chick, as well as the usual metal bands. This will make the future task of recruitment assessment much easier as Darvic band numbers can be read from a distance without catching the birds.

2.3 ADULT SURVIVAL

We read the bands of all birds in the study area, banded any new nesting pairs and mapped their nests. This will enable a first estimate of adult survival to be made in March 1998, five years after the first pairs were banded.

Every 2–3 days we also weighed 15 birds nesting in the study area to gather data on 'normal' weight gains of foraging birds at that time of year.

2.4 POPULATION SIZE AND TRENDS

Due to a wet, misty season, a less experienced census team, and the concentration on detailed study area work associated with solving satellite telemetry problems, the southern third of the island was not counted this year. To maximise recoveries we concentrated our census work on the blocks in which birds were banded in 1969 and 1978.

Numbers breeding were very similar to last year, with 3167 counted within the same blocks in which there were 3108 in 1996, 3511 in 1995, and 2884 in 1994. We recovered 121 birds banded on Antipodes I. prior to 1985, and two birds banded off the south-eastern coast of Australia. Even though a complete census of the island had been done twice previously, 55 of the birds banded on Antipodes I. and one of those banded in Australia had not previously been recovered on Antipodes I.

In the 1969 expedition to Antipodes I. 793 birds (37 chicks, 150 adults with eggs, and 606 non-breeding adults) were banded (Warham & Bell 1979). In the 1978 expedition 1200 birds (1096 chicks and 104 adults) were banded (Bell 1979), and an unknown number were banded in a brief visit in 1985.

We tried to check all birds over the whole island for bands in order to calculate survival for the 1969, 1978, and 1985 cohorts. Although the majority of early banding occurred on the northern half of the island, some sporadic banding was also undertaken in the south. Unfortunately there are no detailed records of banding localities, so all surviving banded birds must be found for an accurate survival estimate. The density of Antipodes I. tussock and scrub make this a daunting prospect, especially as the whole island should be searched 2–3 times for 3–4 successive seasons for us to be confident of recovering all surviving birds. These recovery difficulties highlighted the need for any future banding on the island to be limited to small, well-defined areas that can be easily and accurately re-surveyed.

The main value of the recoveries made at this stage was in monitoring the age-related plumage changes of birds which were banded as chicks 17 years ago. The plumage changes of these known-age birds enabled us to estimate the age of other birds.

In the four summers between 1994 and 1997, an average of 5136 pairs nested on Antipodes I. Another series of 3–4 annual counts after about five years would give an indication of population trends.

2.5 MONITORING AT-SEA DISTRIBUTION

In other satellite telemetry studies of albatrosses, satellite transmitters (PTTs) have been attached to the back feathers of birds with adhesive tape or glue. These attachments only last 2–3 months at best, but on islands with permanent research stations such as Crozet and South Georgia, the PPTs can be repeatedly retrieved and redeployed on albatrosses at all stages of the breeding cycle. Unfortunately, this is not an option for the New Zealand wanderer studies, and we have only tracked breeding birds during early incubation (January/February). The long-line fishing season runs from March to August.

There is very little information on foraging by post-breeding wandering albatross and those that have failed breeding (a handful of these birds have been caught at sea off Australia by David Nicholls' research group, Albatross Research La Trobe University) and no information on where juveniles forage in the 7–11 years before breeding.

On Adams I. in 1995 we tested a harness system for longer-term PTT attachment. Promising results led us to put 18 harnessed transmitters on Antipodes I. birds in 1996: 16 on breeding birds and two on birds that had just finished breeding. Five of the breeding birds deserted.

Although they were due to return to Antipodes I. to breed in 1997, none of the five birds that deserted did so, nor did the two post-breeding birds which were still wearing harnessed PTTs attached in 1996. One of the PTTs had long-lasting batteries, and from this we knew the bird was still alive and apparently foraging 'normally' in January 1997. We presume the harnessed PTTs were limiting the birds' ability to gain enough condition to allow breeding.

In an effort to overcome these difficulties we carried out further satellite telemetry trials on Antipodes I. in summer 1996/97. Without improvements, we wil have to abandon plans to use satellite telemetry to examine the fisheries effort/foraging zone conflict.

There were two components to the trials: development and field testing of a timed release mechanism which automatically shed harnessed PTTs when their batteries were exhausted; and attachment of 10 dummy PTTs using two different harness styles, and comparison of the weight gains and foraging trip lengths of birds with harnessed PTTs and those without.

Harness release mechanism

We developed the timed release mechanism with SIRTRACK Ltd. It comprised a timer and a capped tube enclosing a detonator. When the timer set the detonator off, the cap flew off, releasing all harness cords. After laboratory tests, we tested it on a domestic goose, then on two wandering albatross chicks about to fledge. In all cases the PTT and harness fell off quickly without harming the bird.

Harness design

We attached dummy PTTs to 10 birds nesting outside the study area and removed them within a month. Five of the dummy PTTs were attached with a harness based on a modification of those we used the previous year and five were similar to a design used by Chris Robertson on royal albatross last year, with the back loop behind the birds' legs. We put three of each design on females and two on males. Both designs tested held the PTT further down the bird's back, in an effort to reduce wind resistance.

Each of the dummy PTT packages had a 'weak link' in the harness—a piece of fine wire which would rust through on repeated exposure to saltwater. All harness cords should have released simultaneously when the wire broke, but all the PTTs were removed before then.

We compared the weight gains and foraging trip durations of the 10 birds carrying dummy PTTs with those of the non-PTT birds in the study area. We found that birds wearing the modified royal albatross harnesses put on less weight (in fact usually no weight) and their foraging trips were longer than those of birds without harnessed PTTs. These differences were statistically significant.

Our modified 1996 harness design was obviously much improved. There was no significant difference between the weight gains and foraging duration of birds wearing this harness and those without such harnessed PTTs. However, birds with the harness gained slightly less weight and stayed away longer than non-transmittered birds.

On the strength of this, we attached three long-life PTTs to birds with our improved harness just before we left the island. The PTTs were set to transmit only briefly, once every day or two, and were expected to last a year. They had timed release mechanisms which should free birds of harnesses after two years, if we did not manage to catch them and remove the PTTs before then. One was put on a breeding male, and the others on both partners of a pair with an infertile egg.

In addition to March–December foraging location data, we hoped to get information on whether the improvements to the harness design were sufficient to allow the bird to continue breeding. We also wanted to evaluate the two different duty cycles used to make the PTT battery life last longer than usual.

Unfortunately the caps to the detonator tubes were probably too easy to pull out, and only six weeks after attachment, two of the harnesses and PTTs fell off while the birds were at sea . Fortunately, by then we had gained some useful data on foraging locations used by the same individuals on successive trips, and on the most suitable duty cycles.

2.5.1 Satellite telemetry during early incubation

In addition to long-term PTT deployments, we taped PTTs on seven Antipodean wandering albatross in January and February. This provided a between-year comparison of foraging areas used, and will allow a between-species comparison of foraging by the Antipodean and Gibson's wandering albatross in early incubation. Though the sample sizes were small, it also allowed comparisons of the foraging duration and weight gains of birds wearing relatively small, taped-on PTTs with those with bigger, harnessed PTTs, and with birds without any PTTs. Once again we borrowed the PTTs from David Nicholls and Durno Murray of Albatross Research La Trobe University, though we paid for the tracking time. The flights we monitored followed much the same pattern as the previous year's, with females largely foraging north of the Chatham Is and males around and south of there, and often also south of Antipodes I.

3. Gibson's wandering albatross

A team of four spent about two months monitoring Gibson's wandering albatross on Adams I. during summer 1996/97. Jacinda Amey (team leader), Gus McAllister, Hamish McFarlane, and Jim Henderson arrived on the *Akademic Shokalski* on 16 December 1996 and departed on the Navy frigate *Waikato* on 18 February.

In all wandering albatross populations, the previous season's chicks depart just as the new season's adults arrive to begin nesting. We used this feature to reduce transport costs to Adams I., with one long trip incorporating 1996 season chick banding and 1997 season nesting and adult survival, rather than two shorter trips as in previous years.

3.1 BREEDING SUCCESS

Breeding success in the study area (see Walker & Elliott 1999, fig. 1) in 1996 was relatively low, at 60% (cf. 67%, 78%, 68% and 63% in 1991, 1993, 1994, and 1995, respectively (Walker & Elliott 1999)). A possible cause of the 1996 season's relatively low breeding success could be harsh winter weather, as an unusually high number of nests failed at young chick stage. Although the winter of 1996 was exceptionally cold in the southern South Island and on Stewart I., we have no climate data from the Auckland Is.

Once the 1996 season chicks were banded, there was a lull in work before the new season's breeders could be monitored. This provided an opportunity to determine the timetable of egg laying in part of the study area. The median date of laying was 7 January, very similar to that of previous years (6 January in 1995; 4 January in 1996).

3.2 RECRUITMENT

For the second successive year, 500 chicks were banded in December 1996, in and around the study area on Adams I. This time, however, Darvic bands were used in addition to metal bands.

3.3 ADULT SURVIVAL

The bands of all birds in the study area were read, new nesting pairs were banded, and all nests were mapped. There were 213 nests in the study area this season. These data gave survival estimates for the 1991, 1993, and even 1994 cohorts (Walker & Elliott 1999).

3.4 POPULATION SIZE AND TRENDS

Enough time was available this year for a census of the whole island. The low-density northern ridges were 'sweep counted' for the first time, and observers in each sweep stayed consistently about 25 m apart, whereas in earlier years this distance had occasionally drifted much wider. Other improvements in accuracy came from marking the tussock beside each nest with paint as it was counted, to ensure it was not counted twice. Transects were made back through some blocks, at right angles to the original sweep, to check the proportion of nests that had been counted.

There were 5473 nests in the two main blocks in 1997, cf. 4885 in 1995 (the previous highest total year (Walker & Elliott 1999)). Some of this relatively high total is probably due to improved accuracy, and the remainder to the low breeding success of 1996. In six summers between 1991 and 1997, an average of 5831 pairs nested on Adams I. (Walker & Elliott 1999).

Wandering albatross nests on one ridge were counted from the Navy helicopter, and, as we found in 1995, it seemed a good method of counting the low-density nesting areas. It does not seem to worry the birds, and fewer birds seem likely to be missed, even when they are nesting in the tall tussock and scrub. Helicopter counts are probably unsuitable for the large dense colonies on gentle, featureless terrain such as at Fly Basin. These areas would have to be flown in several strips, and it would be difficult to keep track of nests that had been counted. When the next major whole island census is required, the cost efficiency of bringing a helicopter to count all but the two main basins should be investigated.

4. Discussion

Though Janice Molloy's research has provided some promising leads (e.g. Molloy et al. 1999), effective mitigation devices for long-line vessels are still being developed. Hopes that long-lining would reduce as southern bluefin tuna stocks declined have been dashed by the more recent rapid growth in long-lining for Patagonian tooth-fish, and by continued large-scale hook-setting for the increasingly valuable southern bluefin tuna.

Telemetry data so far indicate that both Gibson's and the Antipodean wandering albatross are at risk not just from long-line fishing in New Zealand's EEZ, but also from long-line fishing within Australia's EEZ and from the unregulated long-line fisheries in the Tasman Sea, the Pacific Ocean, and on the west coast of South America.

With about 5500 pairs of each species breeding annually, they are a highly significant (though apparently much reduced) component of the world's population of great albatross species. With whales, they are top predators in the southern oceans marine ecosystem and are good indicators of the health of that system.

We conclude that annual monitoring of both species should continue for the present.

If parties are to visit both these pristine subantarctic islands every year, we need to investigate ways to further limit the impact, and to make the monitoring as effective and efficient as possible.

Reducing party size

As there is now a good estimate of the size of the breeding population of both species, it will be some years before the large teams of people needed to census the whole island are again required. Instead population trends will be assessed by normal census of several small well-defined blocks.

Instead of banding a large number of chicks over a wide area in only a couple of seasons, we believe banding only the chicks from the 150-odd nests in each island's study area every season would be a more effective way to measure recruitment.

With these refinements the work each season may only require two people for about six weeks. They would need to be skilled, experienced and motivated so that the small party size was not an unacceptable safety risk.

The cost of a regular annual visit to both islands would be partially offset by reduced party size.

Reducing amount of equipment landed on Adams I.

We would like approval from Southland Conservancy to put a portable bivvy temporarily near the study area on the south side of Adams I. This would save about three hours' walking every day, and allow fewer people to do more work in a shorter visit.

We would also like approval for placement of a temporary hut at Magnetic Bay, similar to the hut on Enderby I. This would limit the opportunities for rodent introduction in camping equipment, greatly reduce the quantity of canvas and living equipment needing to be organised and transported every year to the subantarctic, and reduce the wasted time spent on the island just 'living'.

5. Acknowledgements

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