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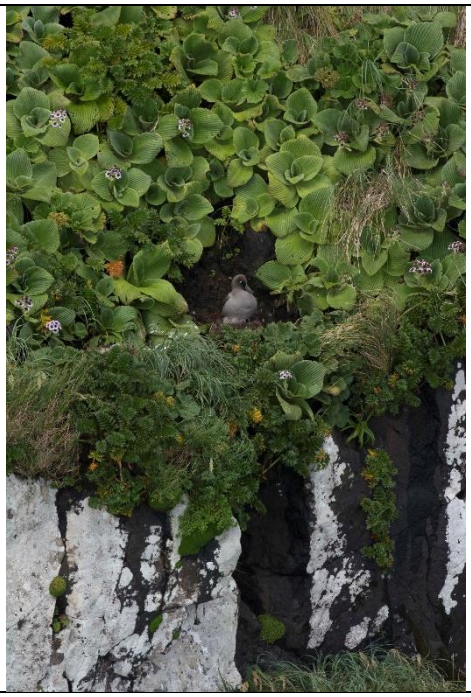
Light-mantled sooty albatross aerial survey Auckland Islands 2014 - Draft Report



Report prepared for

Department of Conservation

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Light-mantled sooty albatross aerial survey Auckland Islands 2014

Draft Report

Executive Summary

The light-mantled sooty albatross *Phoebetria palpebrata* (LMSA) is a poorly studied albatross species with a circumpolar distribution. It breeds on a number of sub Antarctic islands and forages over cold Antarctic waters in summer as far south as the pack ice. LMSAs nest solitarily or in small colonies, building pedestal nests along sheltered vegetated cliff edges in remote locations. For these reasons population monitoring poses considerable challenges and, consequently, there are few accurate population estimates. In 1998, the global population was estimated to be about 21,600 breeding pairs. Of these, 5,000 breeding pairs, or 25 % of the global population, are thought to nest in the Auckland Islands.

In January 2014 we photographed LMSA colonies to assess the potential of aerial survey methods for monitoring population trends. Survey work was undertaken on three islands in the north of the Auckland Island archipelago (Enderby, Rose and Disappointment Islands) and along the cliffs of Adams Island in the south.

We located few nesting birds on any of the four islands we visited, and believe we counted almost all of the birds nesting on Enderby, Rose and Disappointment islands. The estimated number of pairs breeding on these three islands in 2014 totalled 97 (95% CI 77 - 117). Many of the birds appeared to be brooding small chicks, based on the posture of birds on nests, and 4% of the nests observed contained unattended small chicks.

Logistical constraints shortened the time we had available to survey Adams Island, but we managed to cover c. 15 km of the southern coastline. Along this section of coastline we counted 32 nesting pairs (95% CI 21 – 43), but this figure was not a complete count of this area. The cliffs are extremely high (550-600 m) and in many places there are two terraces with suitable nesting habitat, but only the upper terrace was extensively searched. Nonetheless, the density of nesting birds on the terraces and cliff tops searched was low (c. 2 pairs per km) and we would doubt that a complete search would find more than another 30-40 nesting pairs.

Aerial photographic survey employing helicopters as a photographic platform is an appropriate technique for counting breeding light-mantled sooty albatross on the Auckland Islands. We recommend this technique for future censuses of light-mantled sooty albatross breeding in the Auckland Islands archipelago. The sites established in our study could form a foundation of an annual monitoring program, and we recommend that further sites be added over time to form an effective long-term monitoring programme.

1. Introduction

The light-mantled sooty albatross *Phoebetria palpebrata* (LMSA) is a poorly studied albatross species with a circumpolar distribution. It breeds on a number of sub Antarctic islands including Heard and Macquarie Islands (Australia), South Georgia (UK), Prince Edward and Marion Islands (South Africa), Iles Kerguelen and Iles Crozet (France), and Auckland, Campbell and Antipodes Islands (New Zealand), and forages over cold Antarctic waters in summer as far south as the pack ice (ACAP 2010).

Light-mantled albatrosses nest solitarily or in small colonies, building pedestal nests along sheltered vegetated cliff edges. This species is considered a biennial breeder when successful, although unsuccessful breeders may breed the following year (Jouventin and Weimerskirch 1988, cited in ACAP 2010). Because of its habit of nesting in small colonies on cliffs in remote locations, population monitoring poses considerable challenges and, consequently, there are few accurate population estimates. In 1998, the global population was estimated to be about 21,600 breeding pairs or approximately 140,000 individual birds (Gales 1998). Of these, 5,000 breeding pairs, or 25 % of the global population, were thought to nest in the Auckland Islands (ACAP 2010).

Within the Auckland Islands LMSA are known to breed on Adams, Disappointment, Auckland, Enderby and Rose Islands (Taylor 2000). There have been no detailed breeding studies undertaken in the Auckland Islands but from research elsewhere adults are known to return to their breeding colonies in mid-September to early October, and lay eggs in late October to early November. Eggs hatch late December to early January and chicks are brooded for 19-21 days by both parents equally and fledge at between 140-157 days (ACAP 2010). From earlier observations in the Auckland Island, breeding phenology in the Auckland Islands would appear to be similar (B.Baker, unpublished data).

In January 2014 we undertook aerial survey work in the Auckland Islands on white-capped and Gibson's albatrosses breeding on the islands. While undertaking these projects, we also opportunistically photographed LMSA colonies with the following objectives:

1. Analyse and report on aerial photographic survey work on light-mantled sooty albatross undertaken at the Auckland Islands in January 2014.
2. Provide recommendations regarding the potential for aerial survey methods for monitoring population trends of light-mantled sooty albatross at the Auckland Islands.

2. Methods

The Site

The Auckland Islands (50^0 44'S, 166^0 06'E) lie 460 km south of New Zealand's South Island, and comprise the largest island group in the New Zealand sub Antarctic. The archipelago consists of four larger islands (Auckland, Enderby, Adams and Disappointment Islands, together with a set of smaller islands (Peat 2006). Within the archipelago, LMSAs breed on Adams, Disappointment, Auckland, Enderby and Rose Islands (Taylor 2000, Tickell 2000). Most birds are thought to breed on the west coast of Auckland Island and the south coast of Adams Island (Tickell 2000).

Auckland Island (510 km², 42 km long) is notable for its steep cliffs and rugged terrain, which rises to over 600 m. The southern end of the island broadens to a width of 26 km where Carnley Harbour separates the main island from Adams Island. LMSA breed mainly on the western cliffs, with some birds found on the inland cliffs on the main island (B.Baker unpublished data). Adams Island (101 km²), which lies at the southern end of main Auckland Island, is mountainous with high coastal cliffs on the western and southern side of the island, rising to 705 m at Mount Dick (Cooper 2014). LMSA principally breed on the southern coastal and inland cliffs of the island (B.Baker and S.Hamilton unpublished data). Enderby Island (7 km²) and Rose Is (1 km²) are two low-lying islands in the northern end of the archipelago, where LMSAs breed on the cliffs on the northern and western edges (Baker and Cooper 2013). Disappointment Island (4 km²) rises steeply from the sea to a plateau, with white-capped albatrosses breeding extensively on the slopes but avoiding the plateau, and Gibson's albatrosses nesting on the plateau. LMSAs breed on most of the steeper slopes of Disappointment Island.

Field Work

The aerial survey was undertaken using an AS350-B3 squirrel helicopter on the 18th and 20th January 2014 between 10am and 4pm. The aircraft was piloted by Mark Deaker (Southern Lakes Helicopters Company). On board was Barry Baker (photographer and project coordinator), Mark Holdsworth (back-up photographer), and Louise Chilvers (flight logistics manager and Department of Conservation representative). All cliffs of Enderby Island, Ewing Island and Rose Island, and the southern cliffs of Adams Island, were searched for light-mantled sooty albatross (LMSA) colonies as the aircraft circumnavigated the islands anticlockwise. When nesting birds were located the sites were photographed and recorded using a Garmin 60CSx hand-held GPS. The GPS coordinates represent the location of the helicopter at the time photographs were taken, and were generally c.150m to the seaward side of nesting sites.

For the photography, two photographers were positioned on the port side of the aircraft to permit each to take photographs of the island simultaneously. All photographs were taken through the open port door using standard 35mm photographic gear; Nikon D800 cameras fitted with either a Nikon 70 to 200mm F2.8 zoom lens or a 300mm F2.8 telephoto lens. Both lenses were fitted with the Vibration Reduction feature. Shutter

speeds were set to be faster than 1/1000s to minimise camera shake and the effects of vibration from the helicopter on image quality. All photographs of colonies were saved as fine JPG format files. The photographs of Disappointment and Adams Island were taken at an altitude of about 400 metres, while those at Enderby and Rose Islands were taken at 40 metres. The aim was to produce a complete series of overlapping images which could be used to compile a collage of all surfaces of sites where LMSAs occur, and to ascertain appropriate flight heights and perspectives to minimise disturbance to the birds. Photographs were taken as raw or fine scale JPEG digital files of minimum 20 MB size. The entire set of photographs was subsequently replicated to ensure that adequate back-up sets were available for storage in at least three different locations.

Disappointment Island was not specifically photographed to count LMSAs, but photographs used for population assessment of breeding white-capped albatrosses (Baker et al 2014) were re-examined and all visible LMSAs were counted. As a result, breeding sites were not recorded using a GPS, but are linked to the 18 areas used for white-capped albatross counts (Figures 1-3; Baker et al 2014).

The timing of the survey coincided with the late incubation / brood-guard period of the breeding cycle and was not ideal. At this time it is likely that some birds that had bred may have failed and have abandoned their breeding sites. Counts derived from photographs taken at this time of year would therefore be conservative.

For flights we selected a weather window for the operation that predicted clear flying conditions with minimal low-level cloud. At the time of the 20 January 2014 flight the weather around the Auckland Islands was overcast, with winds gusting to 40 knots, and a cloud base of 1500 metres. We were able to obtain clear photographs of all colonies although the strong winds around Adams Island led to our work in that area being curtailed. To minimise the probability of non-breeding birds being present at breeding sites, all photography was timed to occur between 1000 to 1700 hrs.

Counting protocols previously developed for aerial censuses of albatross colonies (Arata et al. 2003; Baker et al. 2014) were used to count nesting birds. Photographic montages of all LMSA colonies were constructed from overlapping photographs using the image editing software package ADOBE PHOTOSHOP CS6 (http://www.adobe.com/). Counts of all birds on each montage were then made by magnifying the image to view individuals and identifying which birds occupied a nest. The paintbrush tool in PHOTOSHOP was then used to mark each bird with a coloured circle as they were counted (yellow for occupied nest, blue for an unattended chick, red for non-breeding bird, pink for a bird probably on a nest and green for a 'possible bird'). Once all LMSAs had been counted on a photo-montage, the file was saved to provide an archival record of the count.

Each single bird was assumed to represent a breeding pair. While most birds were alone at nest sites, we also counted instances when two birds were sitting close together (i.e. inside the pecking distance that defines the minimum distance between nests) and assumed to both be members of a nesting pair. In this situation, both birds were counted, and the number of pairs recorded. The number of pairs was subsequently deducted from the total number of birds to derive an estimate of annual breeding pairs.

Previously for other species we have undertaken multiple counts of photomontages to estimate counter variability associated with miscounting and misidentifying spots on the ground as birds (Baker et al 2014). These count data were statistically modelled by Poisson regression, a special case of a Generalised Linear Model (McCullagh and Nelder, 1989), with observer and area as fixed effects. After allowing for both mean observer and mean area differences, there was no evidence to suggest that our model and data were incompatible, based upon regression diagnostics and model checking. There was also no evidence of a difference between observers and hence an observer bias. We have no reason to believe that data collected for light-mantled sooty albatrosses should have different distributional properties to our data for other species. Although LMSAs are dark birds generally nesting against dark substrates, the light mantle provides contrast with backgrounds. We therefore assume the current data are also compatible with a Poisson model, and we present raw counts only and assume the standard deviation is estimated as the square root of the count, a property of the Poisson model.

Ground counts

Ground counts were not undertaken to verify the effectiveness of aerial counts.

3. Results and discussion

3.1 Aerial counts

We located few nesting birds on any of the four islands we visited, and believe we counted almost all of the birds nesting on Enderby, Rose and Disappointment islands. The estimated number of pairs breeding on these three islands in 2014 is 14, 4 and 79 annual breeding pairs, respectively (Table 1), a total of 97 (95% CI 77 - 117). Many of the birds appeared to be brooding small chicks, based on the posture of birds on nests, and 4% of the nests observed contained unattended small chicks (Table 1). LMSA nests occurred on most of the sea cliffs on Disappointment Island (Figure 1).

Strong winds and a fuel shortage following a medical emergency shortened the time we had available to survey Adams Island. We had hoped to survey the entire southern coastline of Adams Island but only managed to cover c. 15 km. The extent of our survey work is shown on Figure 2. Along this section of coastline we counted 32 nesting pairs (95% CI 21 – 43), but this figure was not considered to be a complete count of this area. The cliffs are extremely high (550-600 m) and in many places there are two terraces - an upper terrace and a mid-level terrace at c. 200 m above sea level. Both these terraces contain rock ledges suitable for nesting LMSAs, and only the upper terrace was extensively searched. Nonetheless, the density of nesting birds on the terraces and cliff tops searched was low (c. 2 pairs per km) and we would doubt that a complete search would find more than another 30-40 nesting pairs.

3.2 Feasibility of photographic surveys of light-mantled sooty albatross at the Auckland Islands

Aerial photographic survey employing helicopters as a photographic platform is an appropriate technique for counting breeding light-mantled sooty albatross on the Auckland Islands. It is probably the most cost-effective technique for rapidly assessing population status in the Auckland Islands, given the extremely high sea cliffs favoured by LMSAs for nesting sites. We were able to obtain high quality survey photographs, which readily permitted an assessment of albatross population size and breeding status. We recommend this technique for future censuses of light-mantled sooty albatross breeding in the Auckland Islands archipelago.

Taylor (2000) called for a baseline census of the breeding populations on the Auckland Islands, and recommended the survey census Adams Island as a priority site, then Auckland Island, and finally Disappointment Island. He further recommended that the census needed to be done in two consecutive years as a minimum to overcome some of the variation caused by biennial breeding patterns.

Our work in 2014 has established a set of 41 sites which had 129 breeding birds present in 2014. These sites could form a foundation of an annual monitoring program, as GPS waypoints have been recorded and the sites can be quickly and easily re-surveyed. We recommend that further sites be added as time and resources permit, such that in each year c.300 nesting pairs are monitored. While annual counts of the white-capped albatross population on Disappointment Island continue to be undertaken, careful analysis of the photographs taken for that purpose will be also suitable for counting breeding LMSA. With the other northern breeding sites (Enderby and Rose Islands) easily covered, we concur with Taylor (2000) that priority be given to Adams Island, particularly focussing on the southern and inland cliffs. We see Auckland Island as less of a priority. Although it the largest island in the archipelago, we have not noted many LMSA flying along the western cliffs, or inland cliffs, except in the vicinity of South West Cape. We recommend that any work on Auckland Island be initially directed toward the south-western cliffs.

Careful consideration needs to be given to photography of birds nesting on the high cliffs of Adams Island, where suitable breeding habitat exists on an upper and mid-level terrace. Attempting to photograph both terraces from one elevation point may not lead to production of high quality images that are desirable for detecting and counting this species against dark substrates. In some situations this would be best done by photographing each terrace with the helicopter positioned at an optimal elevation. For monitoring purposes, the optimal elevation for each cliff face should be noted along with the GPS coordinates, and form part of the monitoring prescription for each site in future surveys. Deviation from a defined optimal elevation for

photography could lead to reduced precision in future counts, although there would probably be an acceptable tolerance of ±50 m.

Acknowledgements

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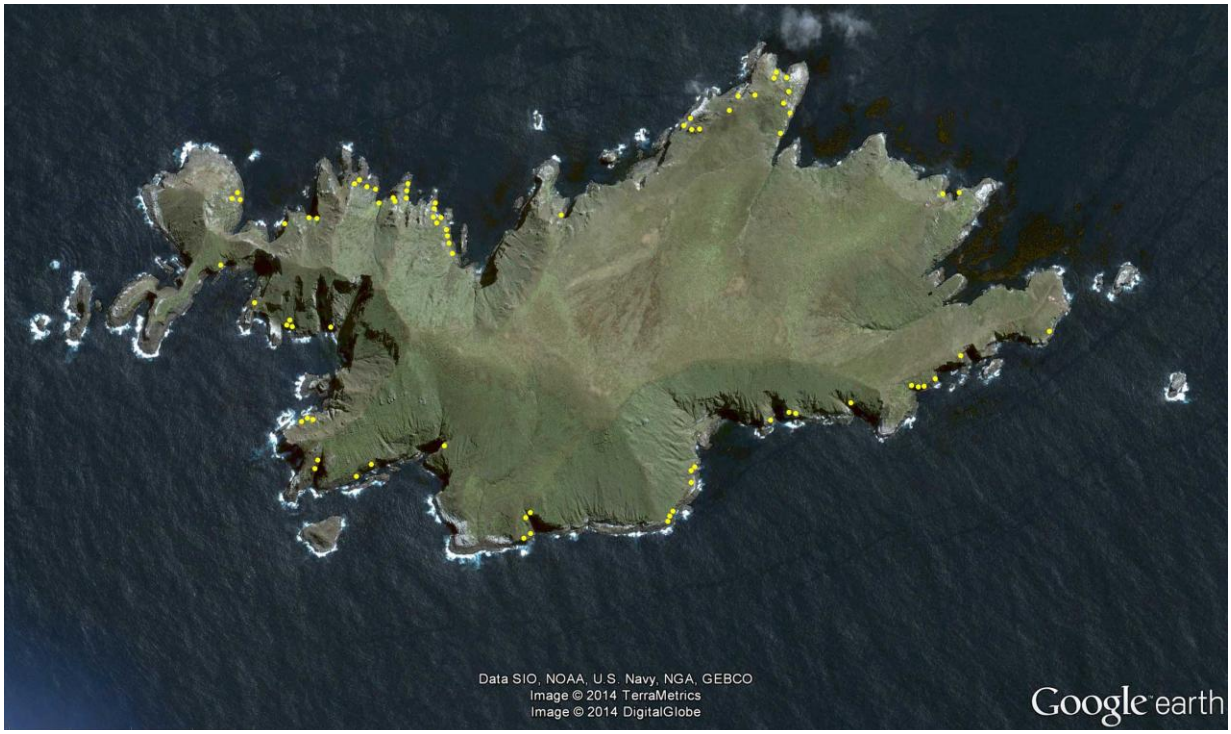

Figure 1. Areas of Disappointment Island where light-mantled sooty albatross were found to be nesting (yellow dots).

Figure 2. The extent of survey work undertaken on Adams Island in 2014. Yellow dots indicate waypoints where nesting light-mantled sooty albatross were photographed.

Table 1. Counts of nesting light-mantled sooty albatrosses, made from photomontages of Enderby, Rose, Disappointment and Adams Islands, Auckland Islands, 18-20 January, 2014

Island / Site Number	Birds flying, site not investigated	Total nests - annual breeding pairs	On nest	Chicks unattended	Probably on nest	Partner of nesting bird	Non-breeding birds	Latitude	Longitude
Enderby									
1		1	1				2	S50.48935	E166.28912
2		1	1					S50.48945	E166.28677
3		3	3					S50.48815	E166.28367
4		1		1			2	S50.49407	E166.26805
5		3	3					S50.49421	E166.26740
6		2	1	1			2	S50.49421	E166.26740
7		1	1					S50.49421	E166.26740
8		1	1					S50.49413	E166.26667
9		1	1				1	S50.50878	E166.26848
10		0					2	S50.50328	E166.27531
Rose Is									
1		0					3	S50.51428	E166.24625
2		3	3					S50.51441	E166.24428
3		1	1		1		1	S50.51407	E166.24251
4		0					1	S50.51382	E166.24161
Disappointment Is									
1		2	2						
2c		1	1			1	1		
2d		1	1				2		
2e		3	3				1		

Island / Site Number	Birds flying, site not investigated	Total nests - annual breeding pairs	On nest	Chicks unattended	Probably on nest	Partner of nesting bird	Non-breeding birds	Latitude	Longitude
3a		1	1						
3b		2	2				4		
5b		1	1		1				
6c		2	2				4		
6d		7	7				3		
6e		3	3				2		
6f		5	4	1	1		2		
7b		2	2				3		
8a		3	3						
11		1	1						
12a		1	1				1		
12c		1	1		1	1	1		
12d		0					1		
13		7	7		1		2		
14a		3	3						
14b		2	2				1		
15a		0			1				
15d		0					1		
16a		9	9				3		
17a		3	3						
17b		5	5				3		
17c		3	3				1		
17d		1	1						
18a		8	7	1		2			
18b		2	1	1					
18c		0					2		

Island / Site Number	Birds flying, site not investigated	Total nests - annual breeding pairs	On nest	Chicks unattended	Probably on nest	Partner of nesting bird	Non-breeding birds	Latitude	Longitude
Adams Is									
1		1	1					S50.86484	E165.91756
2	**c. 6 birds**	0						S50.87142	E165.91755
3	**2 birds**	0						S50.88276	E165.95886
4		1	1					S50.88372	E165.95798
5	**c. 5 birds**	0						S50.90219	E165.95731
6	**c. 5 birds**	0						S50.90182	E165.96389
7		2	1	1				S50.90455	E165.97973
8		6	3	3	1		9	S50.90690	E165.98864
9		18	17	1	4		5	S50.90733	E165.99984
10		4	4		1		1	S50.90785	E166.00532
Auckland Is, Lake Hinemoa		0					2	S50.65346	E166.13610
Total		**129**	**119**	**10**	**12**	**4**	**69**		