

An aerial photograph of a vast seabird colony on a rocky island. The birds are densely packed across the terrain, which consists of dark, jagged rocks and patches of green vegetation. The background shows a hazy, overcast sky and distant, low mountains. The text is overlaid in a bright yellow color.

**Seabird Population Research,
Chatham Islands**

2016/17 aerial photographic survey

Contract 4686-2

**Barry Baker, Katrina Jenz, Mike Bell, Peter
Fretwell & Richard Phillips
Latitude 42 Environmental Consultants**

background

- northern royal albatross
- northern Buller's albatross
(+ northern giant petrel)
- endemic NZ species
- breed principally in the Chatham Islands on two outer-island groups:
 - The Forty-fours
 - The Sisters
- no recent popn counts
- NRA – En
- Buller's NT



Northern royal albatross

— 5,800 annual pairs in 2003

— 44s 60%

— Sisters 39%

— 50 pairs on Taiaroa Head on the Otago Peninsula

— Biennial breeder



Northern Buller's albatross

— C. 17,000 annual pairs in 1994-1996

— 44s 87% 14,674 pairs

— Sisters 13% 2,150 pairs

— few pairs on Poor Knights

— probably annual breeder



Northern giant petrel

- C. 2,000 annual pairs in Chatham Islands but overall NZ population size poorly known
- ACAP has no popn estimates for 44s or Sisters
- Fraser et al (2010) reports annual nest counts from two sample areas along the north-eastern part of the 44s that ranged from 270 to 430 over the period 2007-2009.
- There are no other recently published records

project description

- in Nov 2006 we planned to undertake photographic counts of royal albatross, Buller's albatross & NGP colonies on the The Forty-Fours and The Sisters
- concurrent with:
 - satellite imagery
 - ground counts (Wildlife Management International)

Project Aims

1. determine population size for all species and island groups
2. compare aerial & satellite techniques with ground counts

- **Aerial survey**
- undertaken 23 November 2016,
areas: Sisters, Forty-Fours
- **Ground survey**
- undertaken 8 December 2016,
areas: Forty-Fours only +15 days
- **Satellite imagery**
- images acquired 20 December 2016,
areas: Sisters, Forty-Fours +27 days

Aerial survey

- undertaken 23 November 2016, fixed wing aircraft single-engine Cessna 207
- islands overflown & circled while photos taken using high-resolution 36-50 mp DSLR cameras
- complete series of overlapping images taken covering entire area where albatrosses & giant petrels nesting – c. 10 passes / island
- ground truthing Forty-fours only
- ‘close-up’ photos taken as well to assist in determining proportion of nesting / loafing birds

Timing of counts



	July	August	September	October	November	December
Northern royal albatross					Egg laying	
Northern Buller's albatross				Egg laying		
Northern giant petrel		Egg laying				

Photography timed to occur:

- late November /early December – end egg-laying
- between 1100 to 1600 NZDT to minimise loafers

ground counts

—Population estimates

5 – 9 December 2016

island separated into count sections

all nests counted, spray-painted, contents noted
previously reported

Bell, M.D.; Bell, D.J.; Boyle, D.P.; Tuanui-Chisholm, H. 2017. Motuhara Seabird research: December 2016. ■

—Ground truthing for aerial counts

15 days after aerial photography

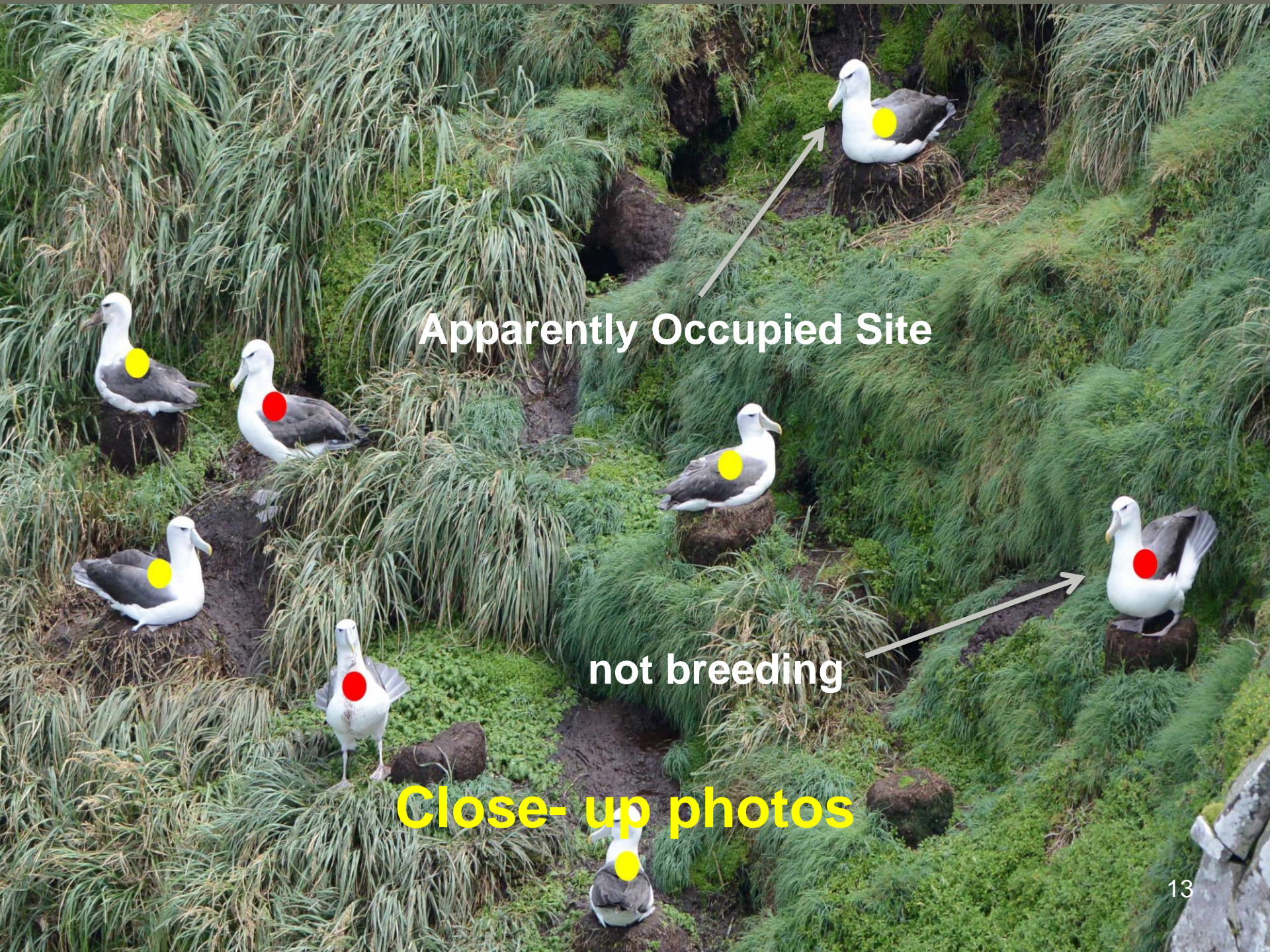
12 days before satellite images

Data collected via variable length transects X 2m wide

To determine proportions of

- nests containing eggs; &
- non-breeding birds present in the colony

- **Insert figure - Standard photos**



Apparently Occupied Site

not breeding

Close-up photos

Satellite-imagery counts

- Acquisition of images

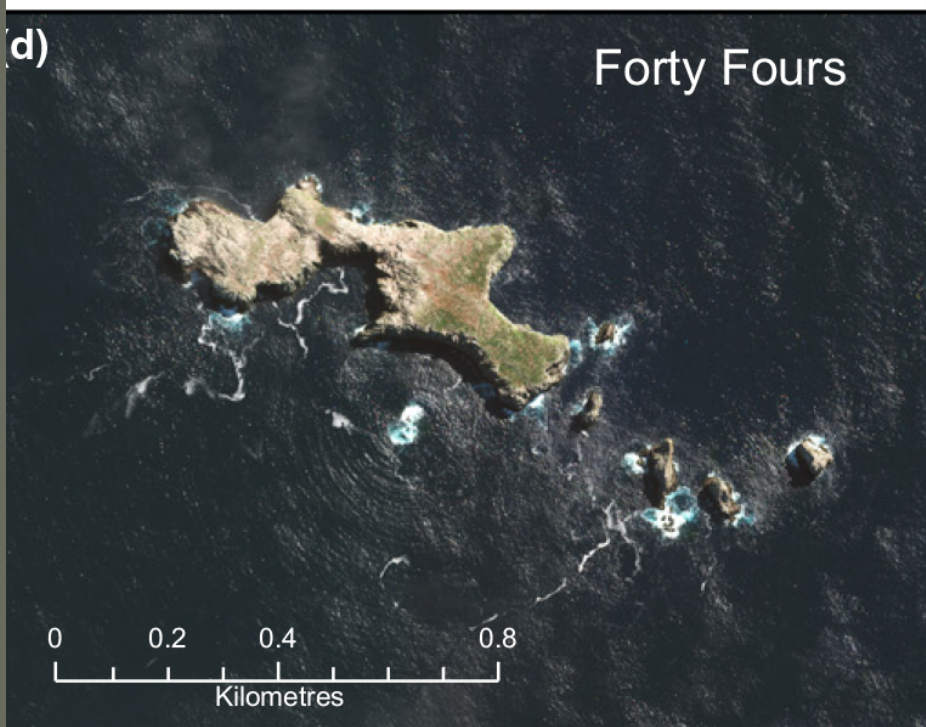
single WorldView-3 VHR satellite images, with the visible bands (2/3/5) pan-sharpened to provide a 31 cm resolution colour image using the Gram Schmidt algorithm in ENVI image processing software

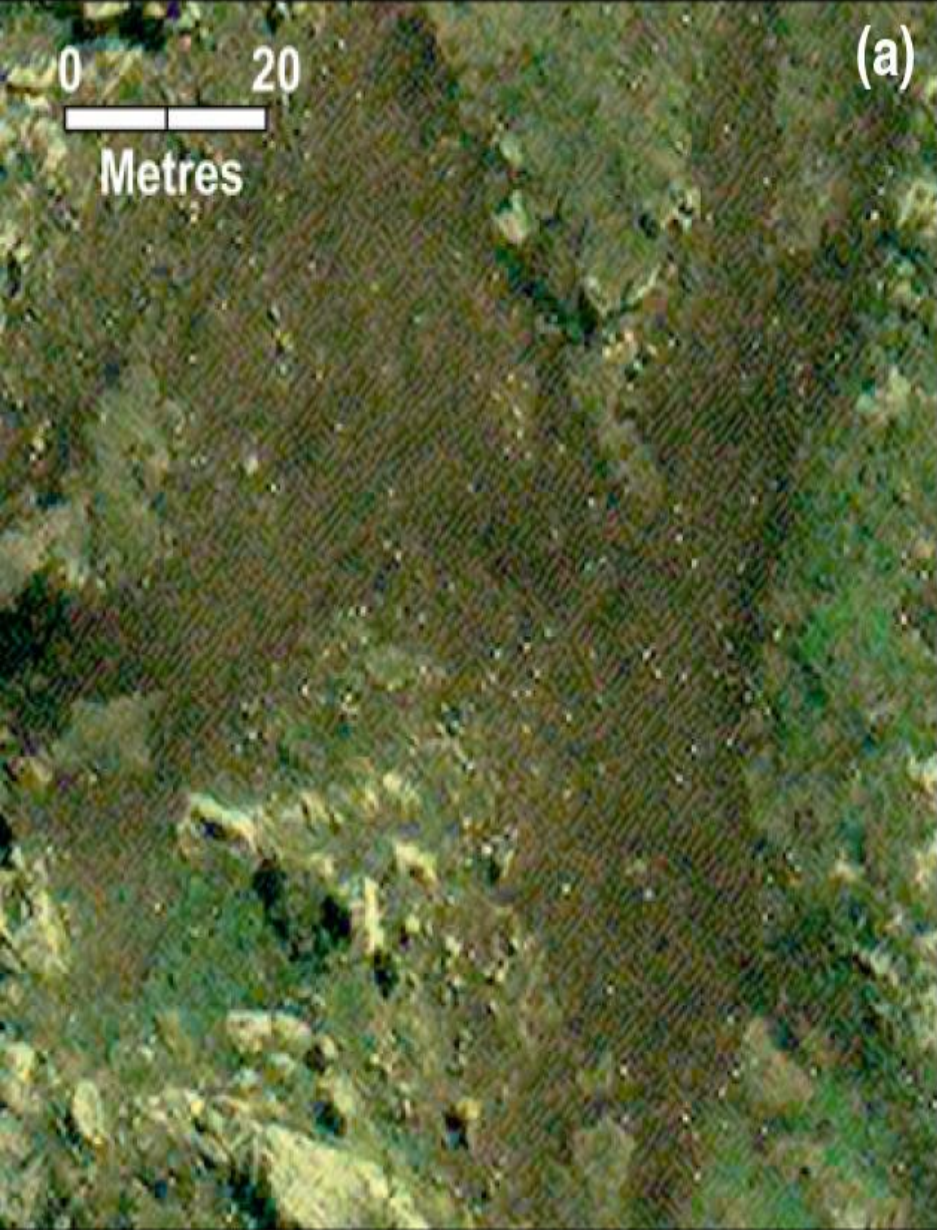
Fretnell , P.T., Scofield, P., Phillips, R.A. 2017. Using super-high resolution satellite imagery to census threatened albatrosses. ■

- images obtained for both islands on 20 Dec 2016

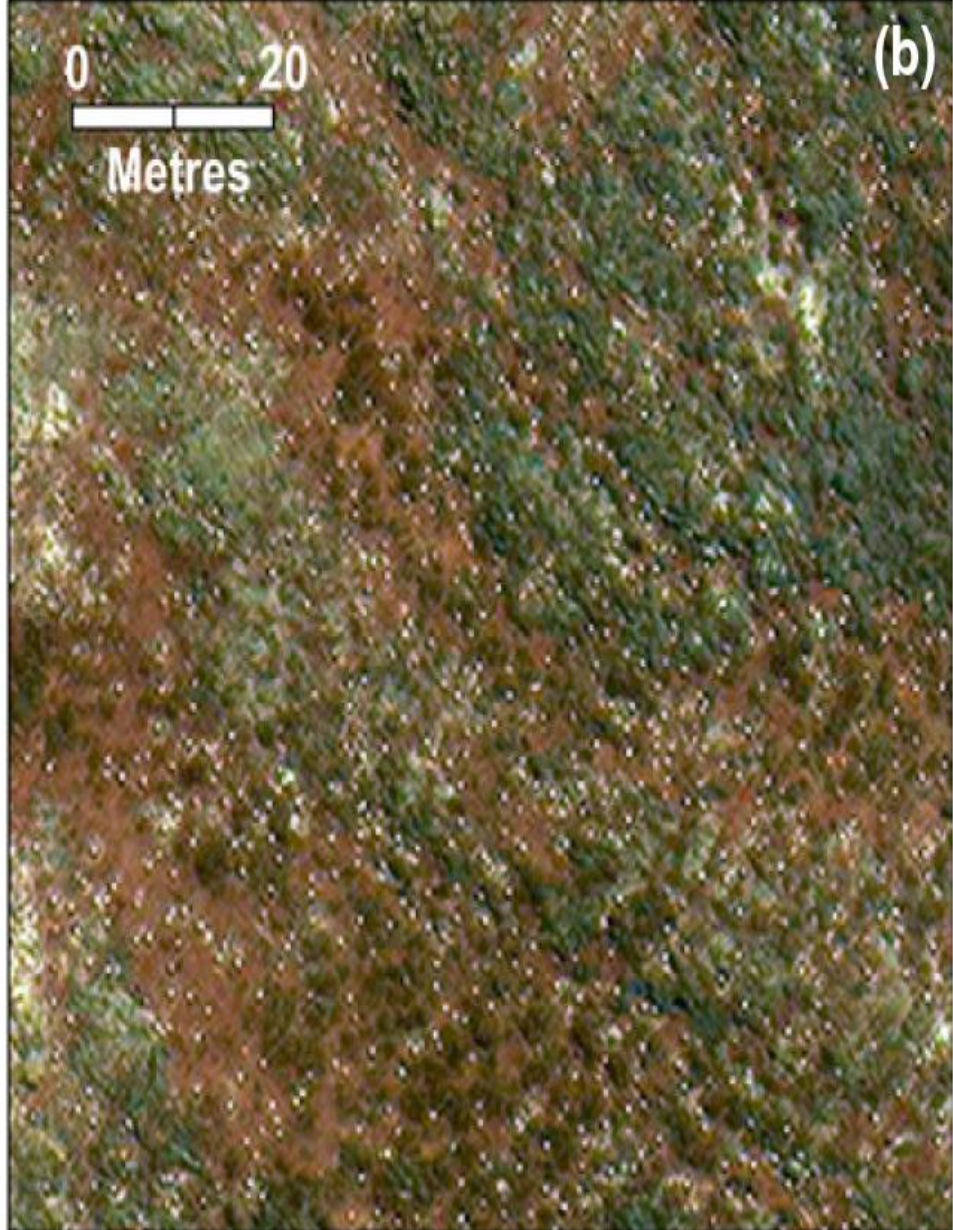
- To account for topographic distortion, desirable to orthorectify satellite images to match GPS ground-truthed nest locations with pixels in sat images, using a high resolution (5-m cell size) (DEM)

Not done but some GPS data is available





a. The Sisters



b. The Forty-Fours

royal albatross

Island	survey type and time from aerial survey (days)							
	Aerial raw count		Aerial adjusted count		Aerial adjusted count		Ground count	Satellite imagery
							+14 days	+ 27 days
The Sisters	3,269		3,047		2,824			2,578
LCI	3,155		2,936		2,718			
UCI	3,383		3,157		2,931			
Forty-Fours	1,830		1,726		1,581		1,404	2,533
LCI	1,744		1,643		1,502			
UCI	1,916		1,809		1,661			
Total Chatham Islands	5,099		4,772		4,406			5,111
LCI	4,956		4,634		4,273			
UCI	5,242		4,911		4,538			
Correction factor			0.068, 0.057	¹	0.136	²		

royal albatross

- Meaningful comparisons tricky because of timing differences
- Aerial counts for Forty-Fours adjusted for non-breeding birds (loafers):
 - aerial closeups – 23.0 % **higher** than ground count 14 days later;
 - ground truthing - 12.7% **higher** than ground count 14 days later.
- raw aerial count for The Sisters - 26.8 % **higher** than satellite-based count;
- raw aerial count for The Forty-Fours - 27.8 % **lower** than satellite-based count;
- satellite-based count for The Forty-Fours - 80.4% **higher** than ground count conducted 13 days earlier;

Buller's albatross

Island	survey type and time from aerial survey (days)						
	Aerial raw count		Aerial adjusted count		Aerial adjusted count		Ground count
							+14 days
The Sisters	2,692		2,646		2,366		
LCI	2,588		2,543		2,269		
UCI	2,796		2,749		2,464		
The Forty-Fours	15,667		15,322		13,771		16,492
LCI	15,417		15,075		13,537		
UCI	15,917		15,570		14,006		
Total Chatham Islands	18,359		17,969		16,138		
LCI	18,088		17,700		15,883		
UCI	18,630		18,237		16,392		
Correction factor			0.017, 0.022	¹	0.121	²	

Buller's albatross

- The concordance between aerial and ground counts was high, particularly when the difference in timing between the two counts is taken into account, and the knowledge that ground-based estimate includes a total of **3,345 failed nesting attempts**.
- Failed nesting attempt were defined by Bell et al (2017) to include all '*nests with a broken or abandoned egg, or dead chick*'
 - such nesting attempts would not have been evident from the air;
 - should failed nesting attempts be included in estimate in any case?.
 - uncertain if all failures occurred in 2016 ?

Northern giant petrels

- Aerial counting of northern giant petrels was not effective at either The Sisters or The Forty-Fours.
- Birds were not clearly visible in most images and detecting birds was difficult, no doubt due in large part to the habit of giant petrel chicks to seek cover under available vegetation.
- We counted:

44 chicks	The Sisters,
370 chicks	The Forty-Fours,
414 chicks	Chatham Islands total.
- In comparison, Bell et al. (2017) counted;

1,235 chicks	The Forty-Fours.
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Discussion

Utility of satellite images

- Pros and cons well discussed in Fretwell et al. 2017
 - only suitable for great albatrosses at this stage
 - largely white birds – may not work with Gibson's, for example
- Peter has now re-counted images for both island groups using a 'higher threshold' = mental analogue of how distinct a point needs to be to be classed as a bird, not an automated routine
- Sisters is more difficult to count as ground is less vegetated and harder to discern rocks from birds
- Revised counts:
 - The Sisters 2,961 probably accuracy will always be +/- 20%
 - The Forty-fours appears easier to count but still +900 on aerial counts

Thank you