

Antipodes grey petrels

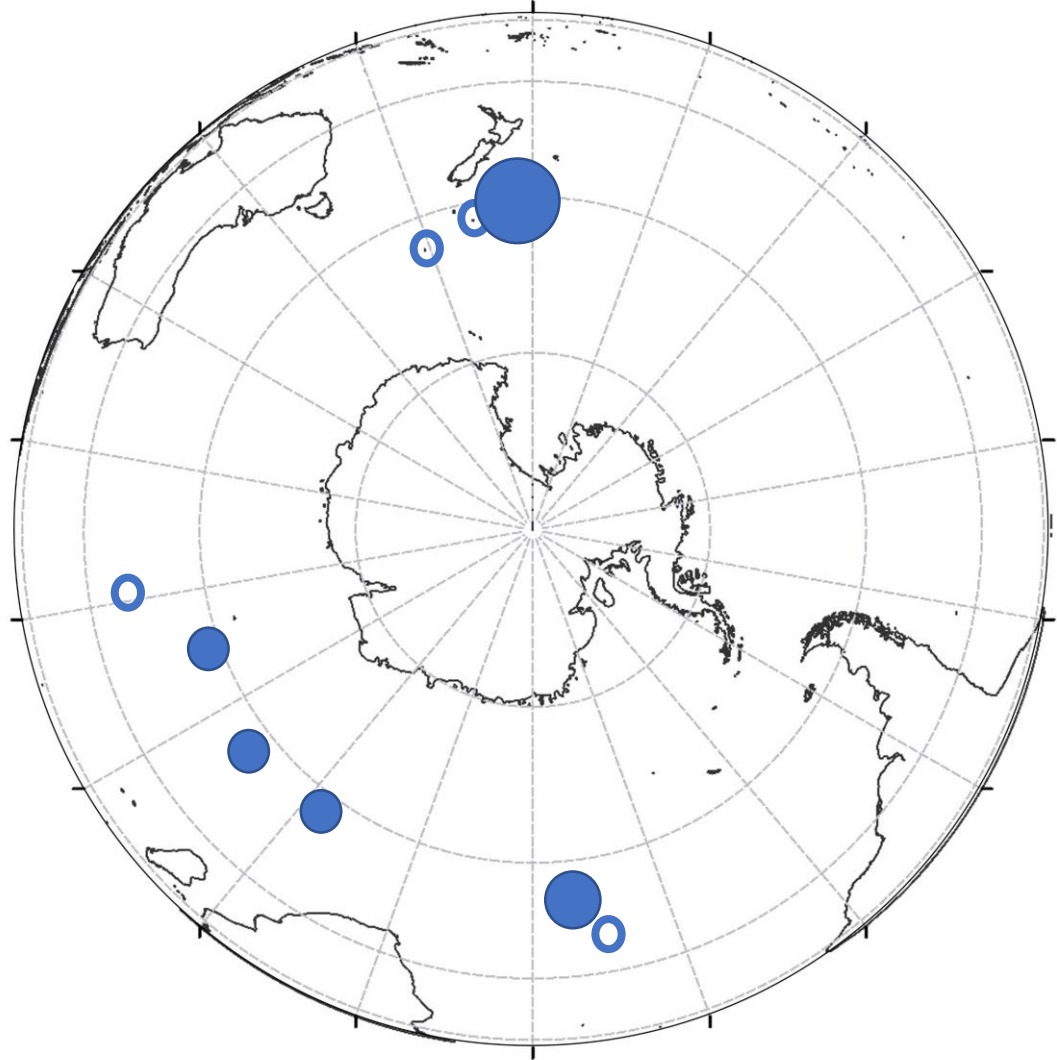
population estimate data and planning



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PARKER CONSERVATION



- 10s-100s
- <10,000
- <25,000
- ~50,000

Scope



Plan an updated estimate of population size and trend

- Collate and assess resources from previous work
- Develop field work plan for robust population estimate



Assess existing information

Compare methods, findings of previous work

Design a robust population estimate

Requirements, approaches for a useful population size estimate

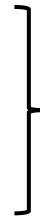
Ranked methodologies

Options for pop size estimation

Assess existing information



- 1969 UC expedition
- 1978 BAAS expedition
- 1994, 1995 trips



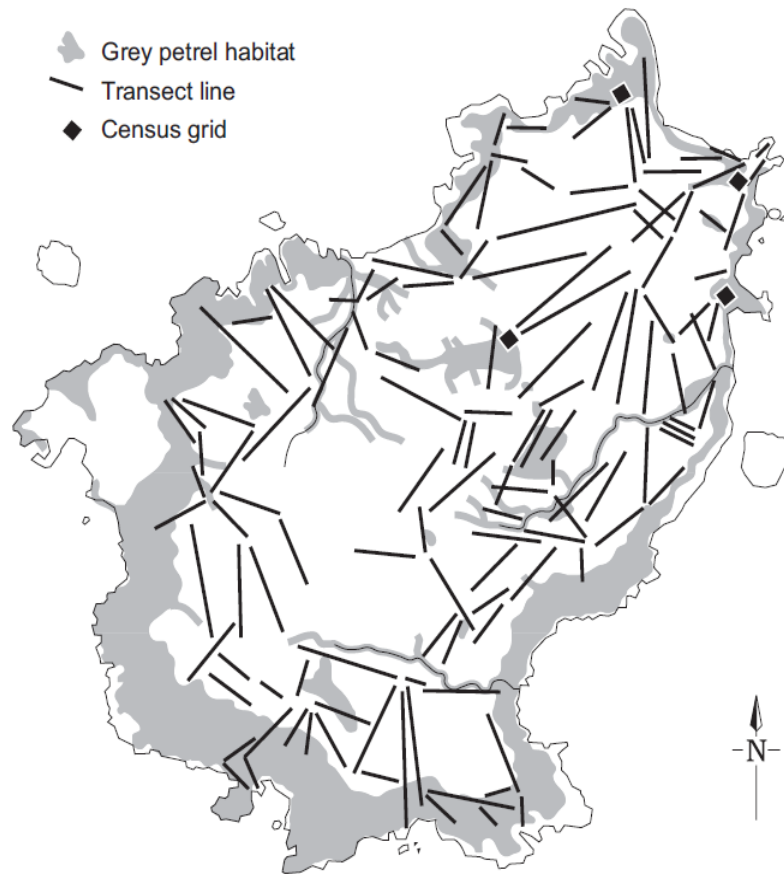
Summarised Bell &
Burgin 2020

10–50,000 pairs

Studies focused on the grey petrel population:

- feasibility study for DOC CSP in 2001 by WMIL
- population research in 2009, 2010 for MFish by NIWA

Assess existing information



Assess existing information



Table 2. Sampling effort for grey petrels and white-chinned petrels on Antipodes

		N	type	Effort days	Area/length		Focus	Source
2001	greys	4	quadrates	12 d	50x50m grid	measured	Density, occupancy	[1]
2006–07	wcp	30	quadrates	9 d	10x10m grid	measured	Density	[2]
2007–08	wcp	20	quadrates	4.5 d	10x10m grid	measured	Density	[3]
	wcp	36	transects	1.5 d	50m	measured	Occupancy	[3]
2008–09	wcp	29	transects	10 d	62–955m	calculated from wpt	Occupancy	[4]
	greys	16	transects	4 d	17–130m	calculated from wpt	Occupancy	[4]
2009–10	wcp	20	transects	6 d	152–1112m	calculated from wpt	Occupancy	[5]
	greys	38	transects	13 d	25–253m	calculated from wpt	Occupancy	[5]
2010–11	wcp	31	transects	5 d	43–875 m	calculated from wpt	Occupancy	[6]

Sources: 1 (Bell 2002); 2 (NIWA unpubl. data 2007); 3 (Sommer *et al.* 2008; NIWA unpubl. data 2008); 4 (Sommer *et al.* 2009; NIWA unpubl. data 2009); 5 (Sommer *et al.* 2010; NIWA unpubl. data 2010); 6 (Sommer *et al.* 2011; NIWA unpubl. data 2011)

Assess existing information



Table 4. Occupancy by breeding grey petrels of grey petrel-sized burrows

	Occupancy	N grey-sized burrows checked	Sampling coverage	Timing
2001	47.1%	221	4 census grids	mid-late incubation (9–21 May)
2009	26.8%	257	study burrows 2 areas	during lay (Mar–mid-Apr)
	28.6%	105	16 transects	just after lay (last half Apr)
2010	32.3%	133	study burrows	during and after lay (21 Mar–28 Apr)
	22.5%	360	38 transects	egg laying near end but not yet complete (9–30 Apr)

Assess existing information



Lay 21 March–9 April (Sommer et al. 2009)

Ideal timing for occupancy: second half April, once lay is largely complete

Feasibility study: burrow checks 9-21 May, a bit late
2009-10: 15-20 April and 9-30 April just after most eggs laid

Design robust pop estimate



Population size or trend study?

	Population size estimate	Trend
✓	Pilot study	
✓	Distribution survey	
➔	Burrow number estimate	Burrow number estimate
➔	Occupancy estimate	Occupancy estimate

- More effort

+ One-off so trend monitoring of a smaller, representative sample

Design robust pop estimate



Sampling burrow density

- Randomisation and replication
- Sampling method
- Unit size, type
- Precision



Design robust pop estimate



Sampling burrow density

- Randomisation and replication
- Sampling method
- Unit size, type
- Precision
- Burrow count accuracy
- Area accuracy
- Habitat availability

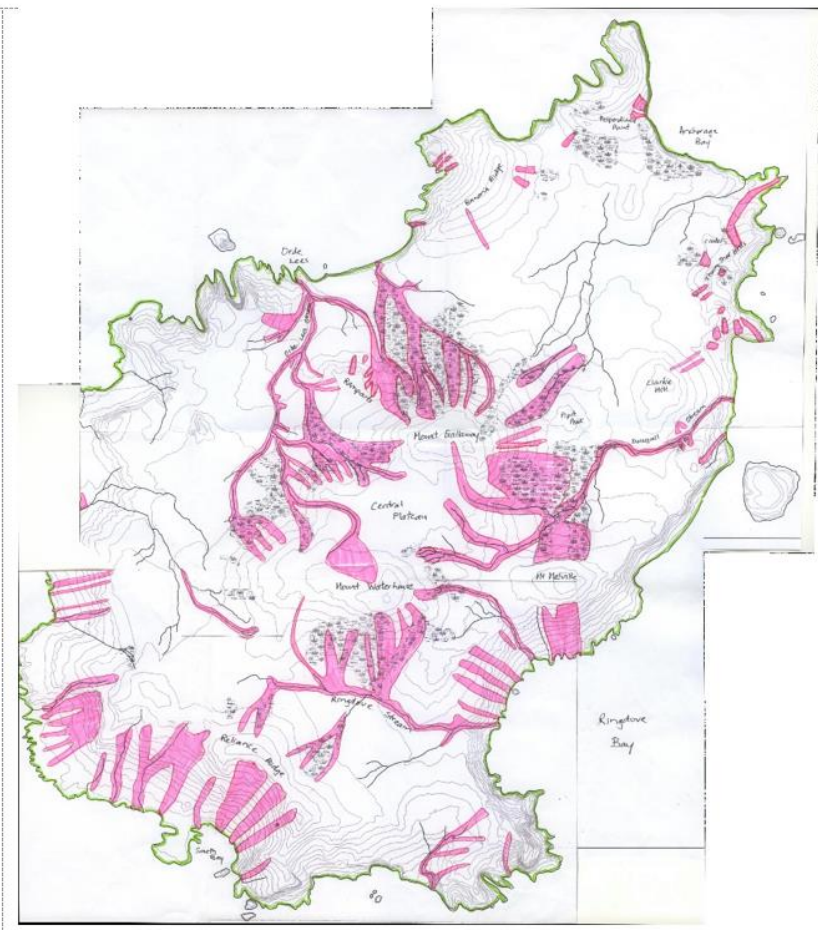


Figure 2. Antipodes slips in January 2014 shown in a composite of satellite images (left) and mapped shortly after slips occurred (right). Composite satellite image by G. Elliott with imagery from [DigitalGlobe Inc.](#); map by K. Walker and G. Elliott (unpubl. data 2014)



Browser

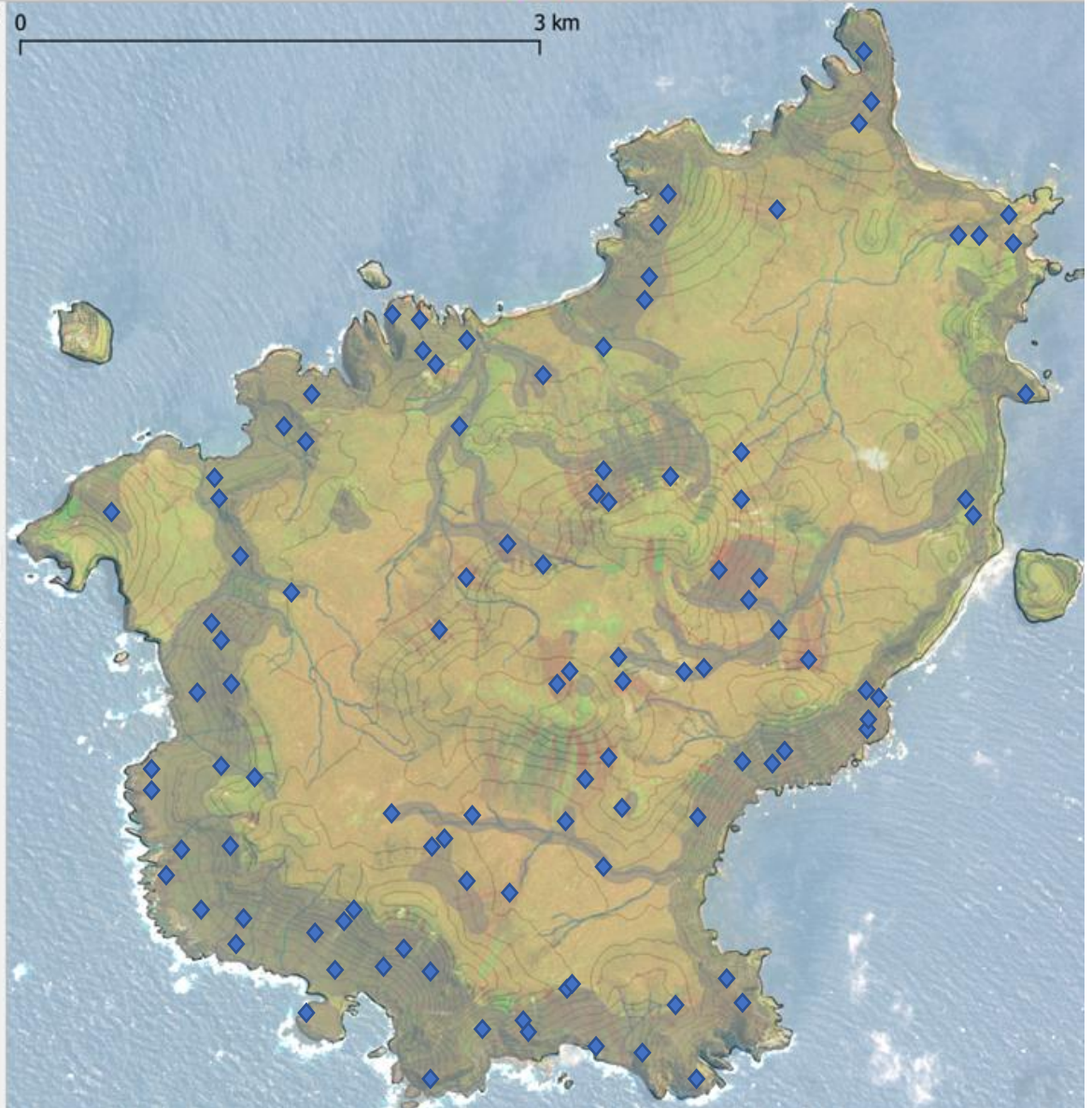


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- ▶ XYZ Tiles
- WCS
- WFS
- OWS
- ArcGisMapServer
- ArcGisFeatureServer
- GeoNode

Layers



- GreyPetrelDistribANT
- 14DEC09220002-M2AS-...
- ▶ 14DEC09220001-P2AS-...
- nz-antipodes-island-cont...
- nz-antipodes-island-river...
- nz-antipodes-island-sw...
- nz-antipodes-island-roc...
- nz-antipodes-island-poly...



Design robust pop estimate



Sampling burrow occupancy

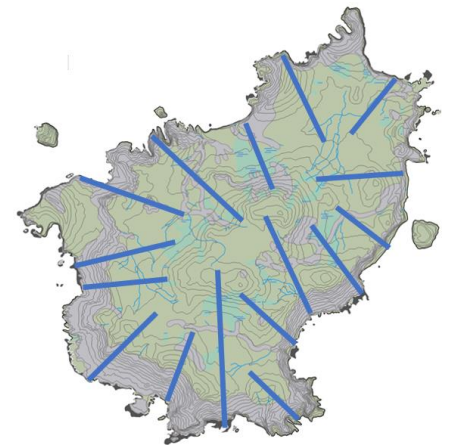
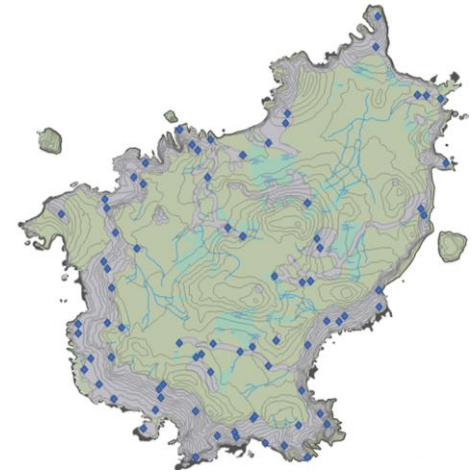
- Methods
- Separating density and occupancy samples
- Accuracy

Design robust pop estimate



Ranked methodologies

- A. Spatial coverage, distance sampling
- B. Spatial coverage
- C. Systematic whole-island distance sampling
- D. Population size estimate AND trend
- E. Trend assessment alone

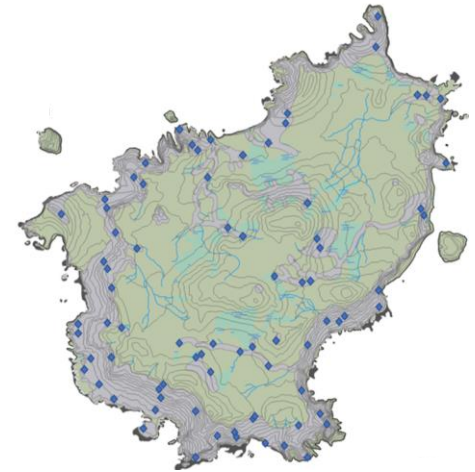


Design robust pop estimate



A. Spatial coverage, distance sampling

- Burrow density via distance sampling , simple random design, short transects
- Burrow occupancy determined by burrowscope second half April
- Breeding population size calculated using the true surface area of grey petrel habitat (DEM) with area lost to slips subtracted



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