

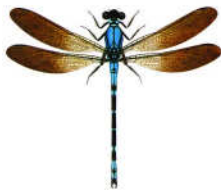
Assessment of the risk to seabird populations from New Zealand commercial fisheries – Supplementary material

YVAN RICHARD*
EDWARD R. ABRAHAM*
DOMINIQUE FILIPPI†

*Dragonfly Limited, PO Box 27535, Wellington 6141, New Zealand

† Sextant Technology Limited, 116 Wilton Road, Wellington 6012, New Zealand

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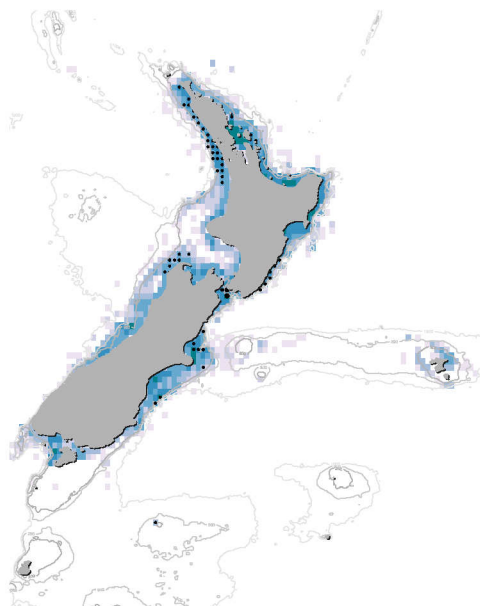
Yvan Richard, Edward R. Abraham & Dominique Filippi (2011). Assessment of the risk to seabird populations from New Zealand commercial fisheries – Supplementary material. Final Research Report for Ministry of Fisheries projects IPA2009/19 and IPA2009/20 (Unpublished report held by the Ministry of Fisheries, Wellington). 77 pages.

Supplementary materials to the Assessment of the risk to seabird populations from New Zealand commercial fisheries (Richard et al. 2011)

APPENDIX C: FISHERY GROUPS

C.1 Inshore trawl

(a) 2003–04 to 2005–06



(b) 2006–07 to 2008–09

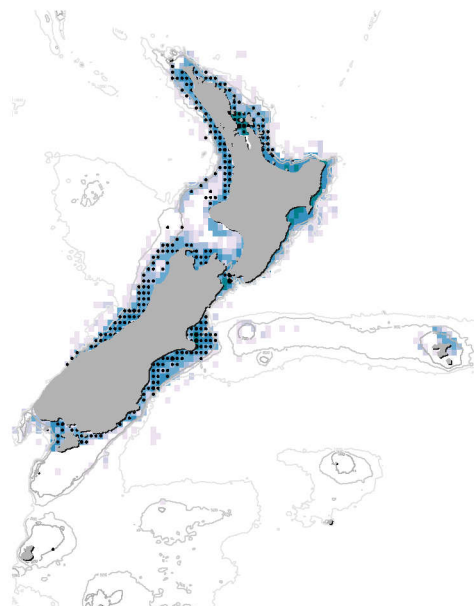
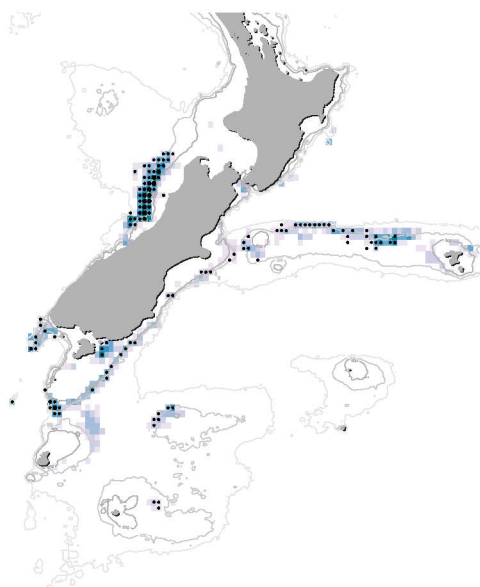


Figure C-1: Inshore trawl. Fishing effort (blue heatmap) and observation coverage (black dots) during the period (a) 2003–04 to 2005–06 and (b) 2006–07 to 2008–09.

C.2 Large trawler (without meal plant)

(a) 2003–04 to 2005–06



(b) 2006–07 to 2008–09

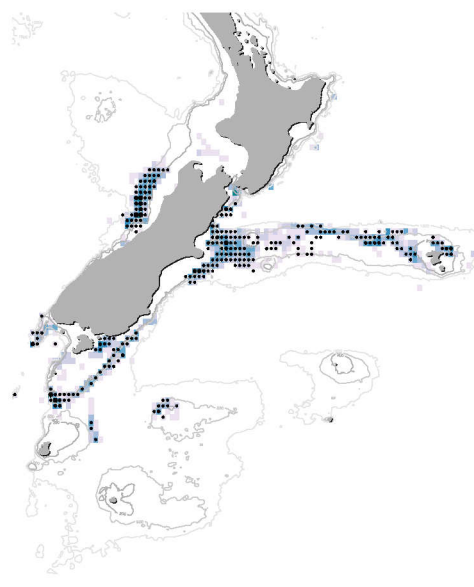
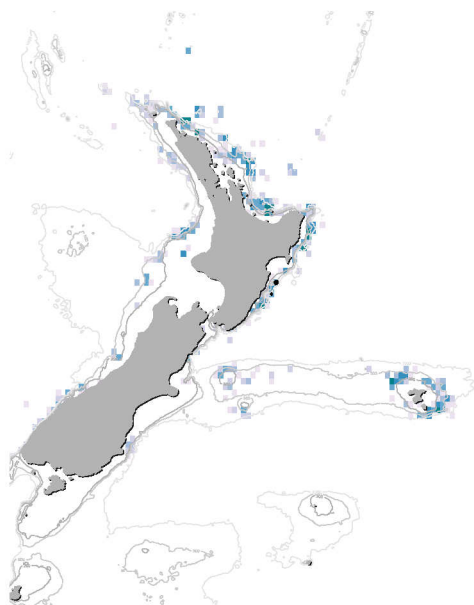


Figure C-2: Large trawler (without meal plant). Fishing effort (blue heatmap) and observation coverage (black dots) during the period (a) 2003–04 to 2005–06 and (b) 2006–07 to 2008–09.

C.3 Bluenose BLL

(a) 2003–04 to 2005–06



(b) 2006–07 to 2008–09

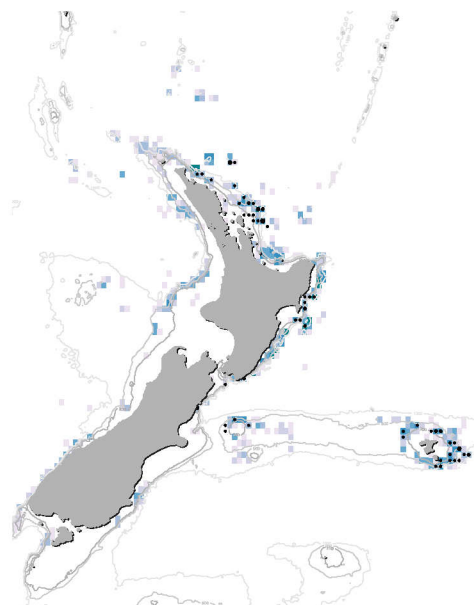
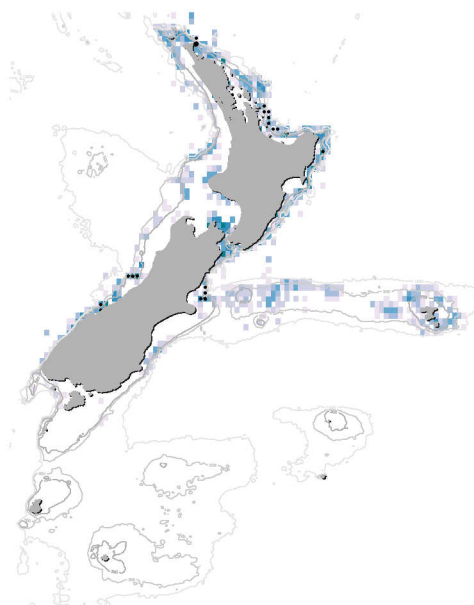


Figure C-3: Bluenose BLL. Fishing effort (blue heatmap) and observation coverage (black dots) during the period (a) 2003–04 to 2005–06 and (b) 2006–07 to 2008–09.

C.4 Small BLL

(a) 2003–04 to 2005–06



(b) 2006–07 to 2008–09

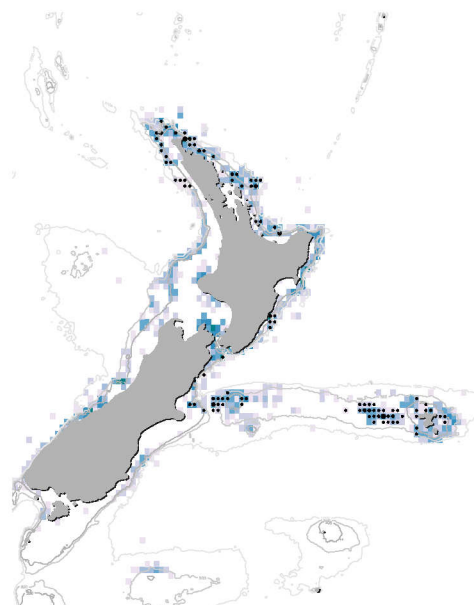
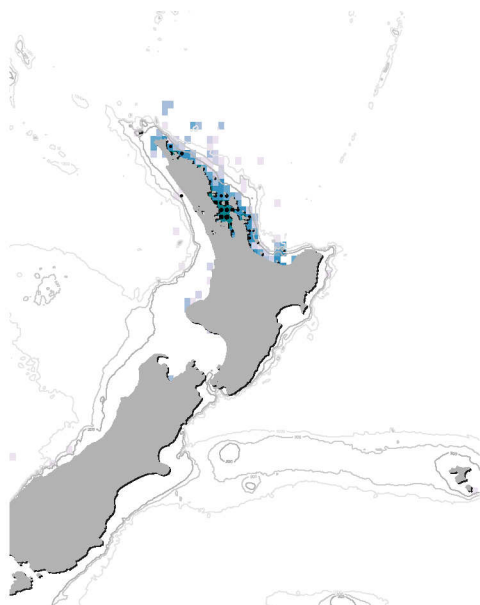


Figure C-4: Small BLL. Fishing effort (blue heatmap) and observation coverage (black dots) during the period (a) 2003–04 to 2005–06 and (b) 2006–07 to 2008–09.

C.5 Snapper BLL

(a) 2003–04 to 2005–06



(b) 2006–07 to 2008–09

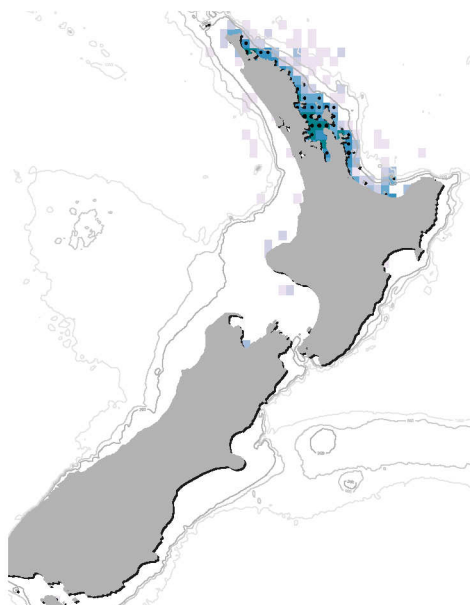
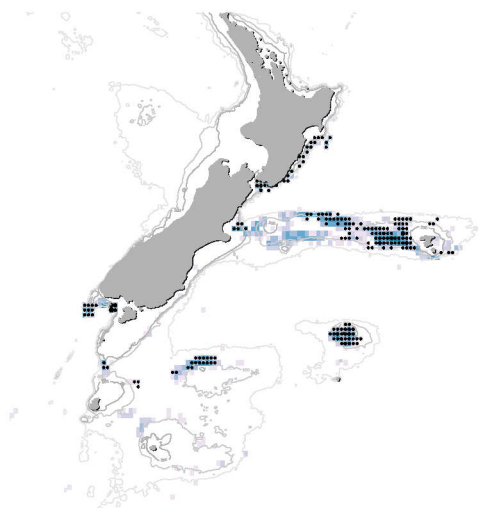


Figure C-5: Snapper BLL. Fishing effort (blue heatmap) and observation coverage (black dots) during the period (a) 2003–04 to 2005–06 and (b) 2006–07 to 2008–09.

C.6 Large BLL

(a) 2003–04 to 2005–06



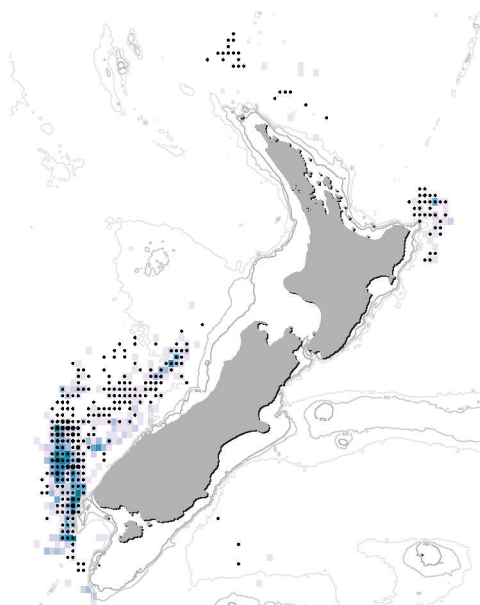
(b) 2006–07 to 2008–09



Figure C-6: Large BLL. Fishing effort (blue heatmap) and observation coverage (black dots) during the period (a) 2003–04 to 2005–06 and (b) 2006–07 to 2008–09.

C.7 Large SLL

(a) 2003–04 to 2005–06



(b) 2006–07 to 2008–09

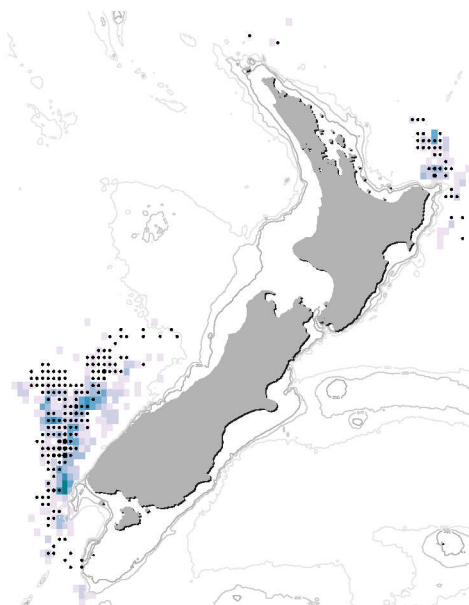
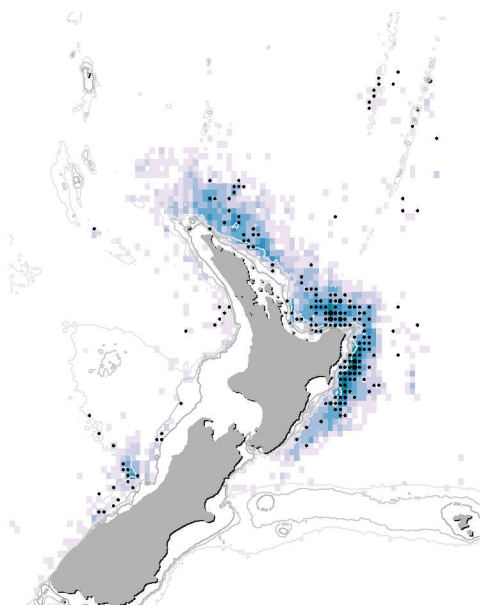


Figure C-7: Large SLL. Fishing effort (blue heatmap) and observation coverage (black dots) during the period (a) 2003–04 to 2005–06 and (b) 2006–07 to 2008–09.

C.8 Small SLL

(a) 2003–04 to 2005–06



(b) 2006–07 to 2008–09

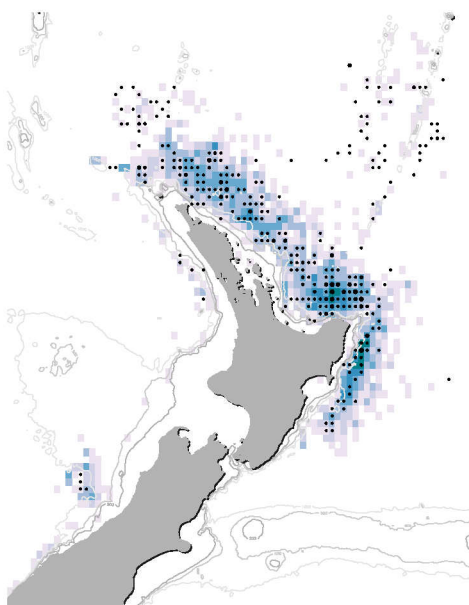
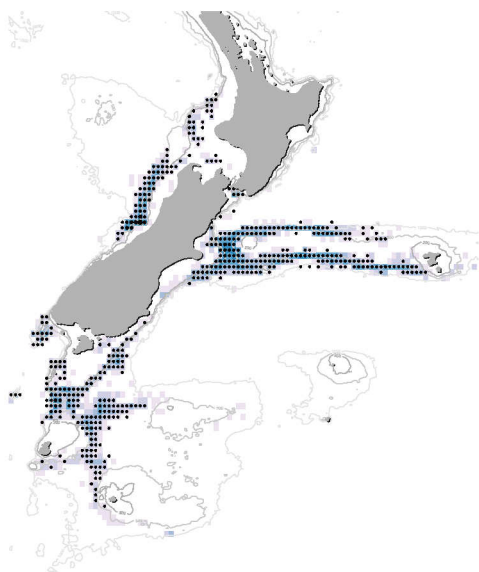


Figure C-8: Small SLL. Fishing effort (blue heatmap) and observation coverage (black dots) during the period (a) 2003–04 to 2005–06 and (b) 2006–07 to 2008–09.

C.9 Large trawler (with meal plant)

(a) 2003–04 to 2005–06



(b) 2006–07 to 2008–09

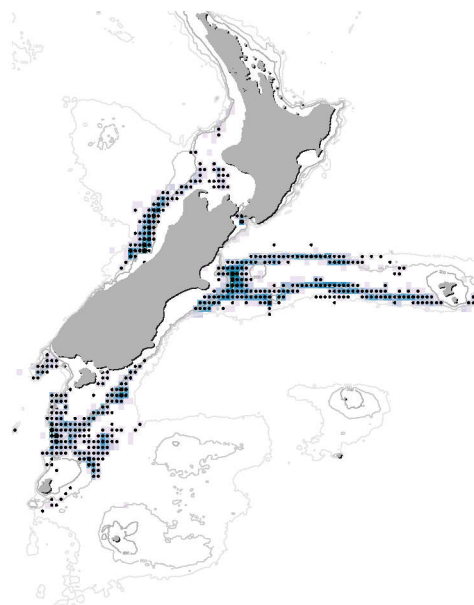
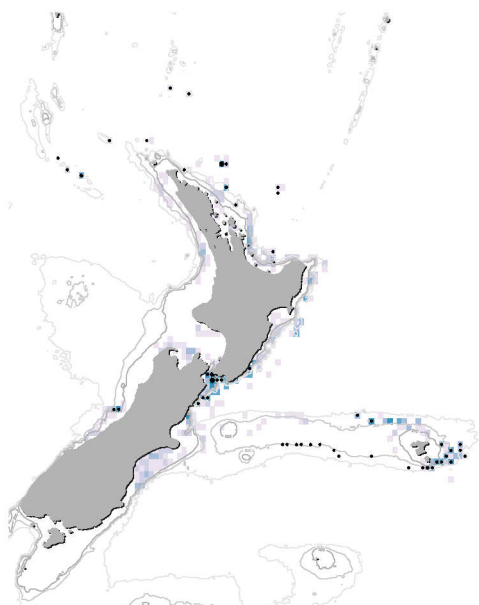


Figure C-9: Large trawler (with meal plant). Fishing effort (blue heatmap) and observation coverage (black dots) during the period (a) 2003–04 to 2005–06 and (b) 2006–07 to 2008–09.

C.10 Large fresher trawl

(a) 2003–04 to 2005–06



(b) 2006–07 to 2008–09

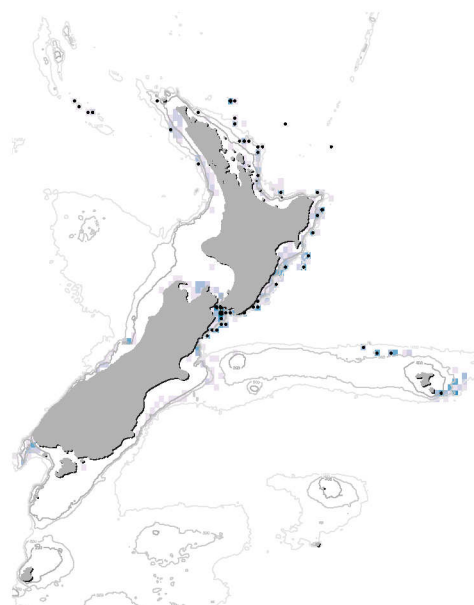
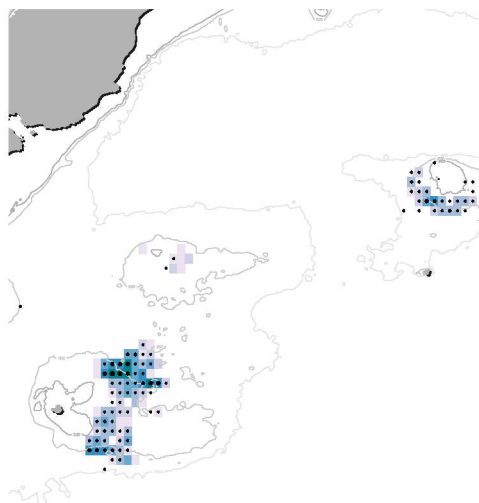


Figure C-10: Large fresher trawl. Fishing effort (blue heatmap) and observation coverage (black dots) during the period (a) 2003–04 to 2005–06 and (b) 2006–07 to 2008–09.

C.11 SBW trawl

(a) 2003–04 to 2005–06



(b) 2006–07 to 2008–09

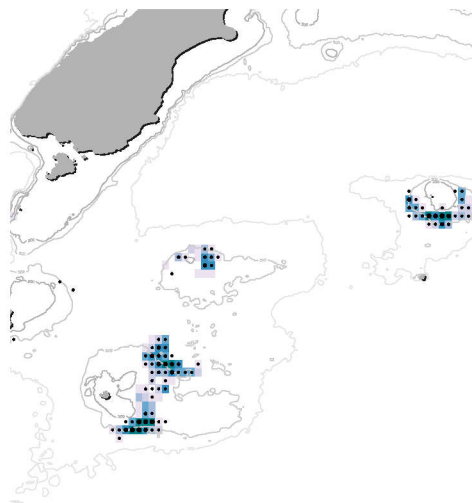
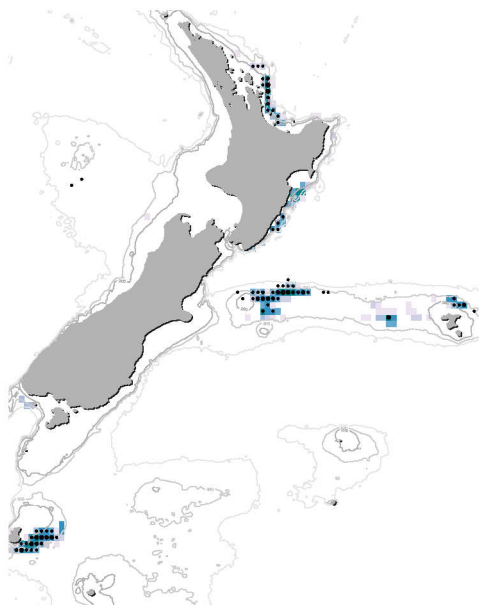


Figure C-11: SBW trawl. Fishing effort (blue heatmap) and observation coverage (black dots) during the period (a) 2003–04 to 2005–06 and (b) 2006–07 to 2008–09.

C.12 Scampi trawl

(a) 2003–04 to 2005–06



(b) 2006–07 to 2008–09

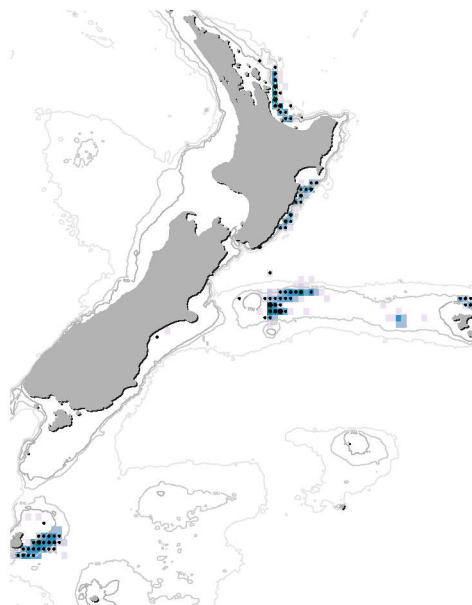
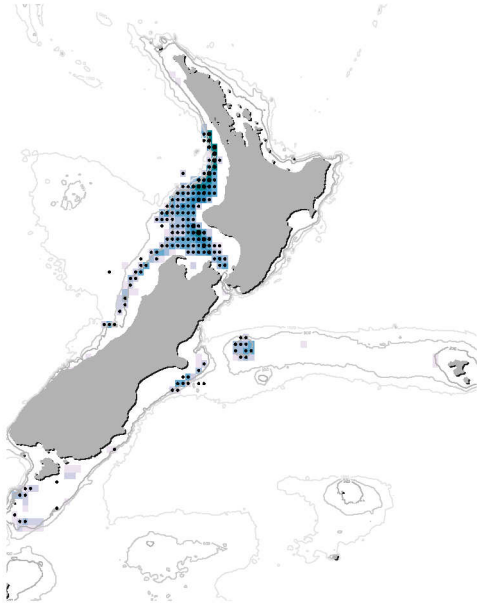


Figure C-12: Scampi trawl. Fishing effort (blue heatmap) and observation coverage (black dots) during the period (a) 2003–04 to 2005–06 and (b) 2006–07 to 2008–09.

C.13 Mackerel trawl

(a) 2003–04 to 2005–06



(b) 2006–07 to 2008–09

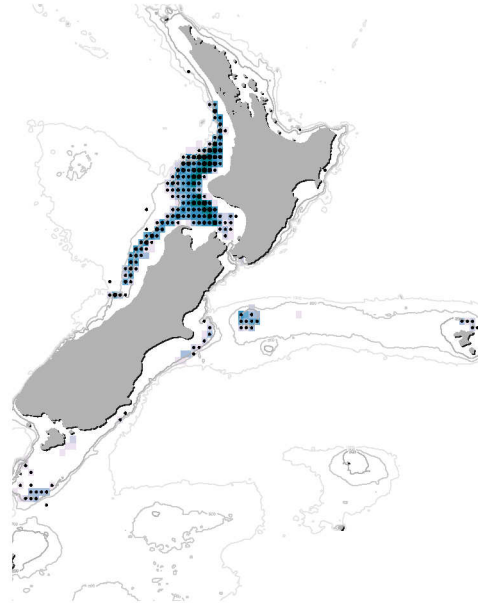
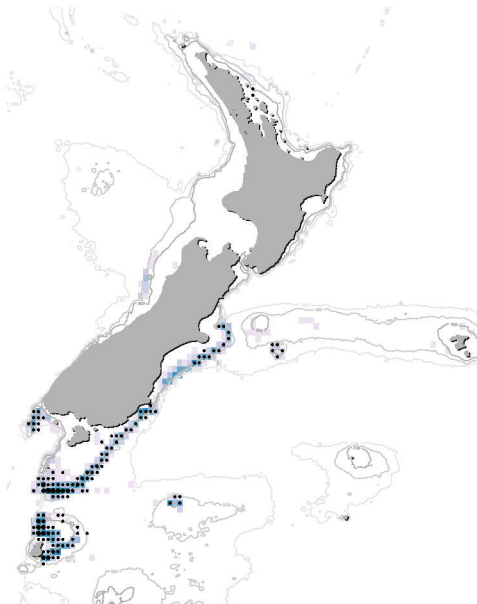


Figure C-13: Mackerel trawl. Fishing effort (blue heatmap) and observation coverage (black dots) during the period (a) 2003–04 to 2005–06 and (b) 2006–07 to 2008–09.

C.14 Squid trawl

(a) 2003–04 to 2005–06



(b) 2006–07 to 2008–09

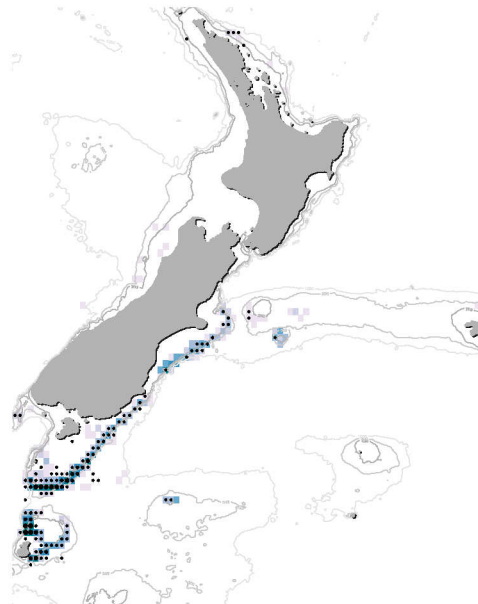
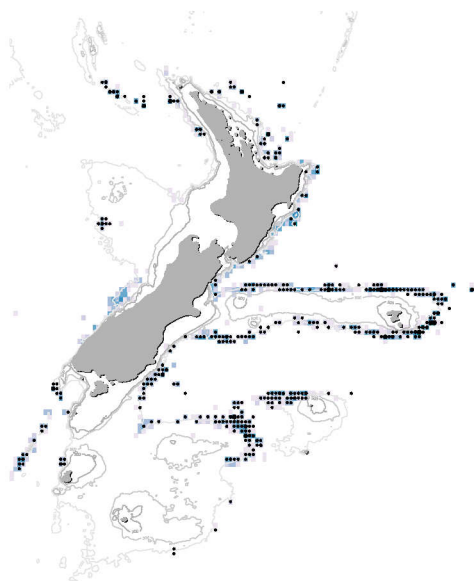


Figure C-14: Squid trawl. Fishing effort (blue heatmap) and observation coverage (black dots) during the period (a) 2003–04 to 2005–06 and (b) 2006–07 to 2008–09.

C.15 Deepwater trawl

(a) 2003–04 to 2005–06



(b) 2006–07 to 2008–09

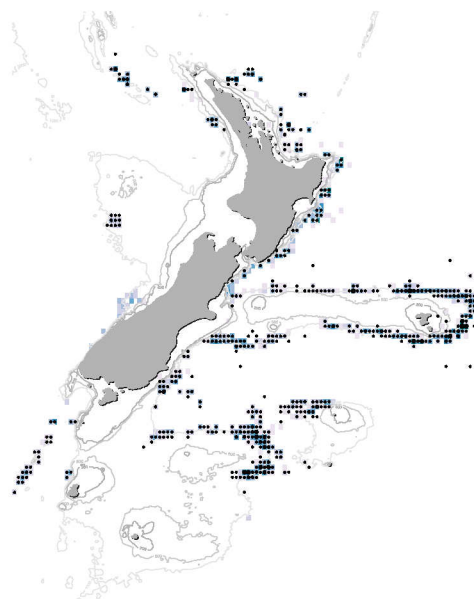
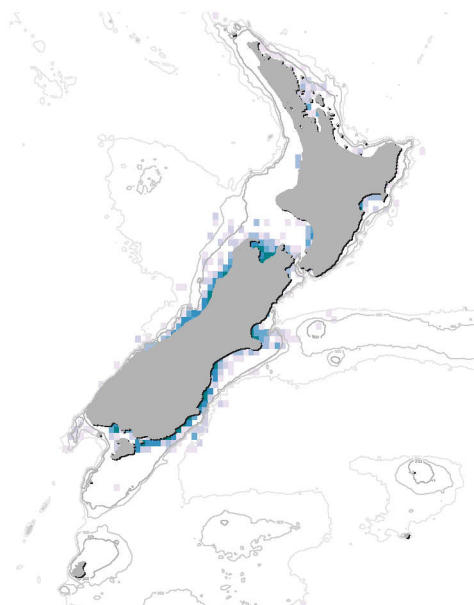


Figure C-15: Deepwater trawl. Fishing effort (blue heatmap) and observation coverage (black dots) during the period (a) 2003–04 to 2005–06 and (b) 2006–07 to 2008–09.

C.16 Flatfish trawl

(a) 2003–04 to 2005–06



(b) 2006–07 to 2008–09

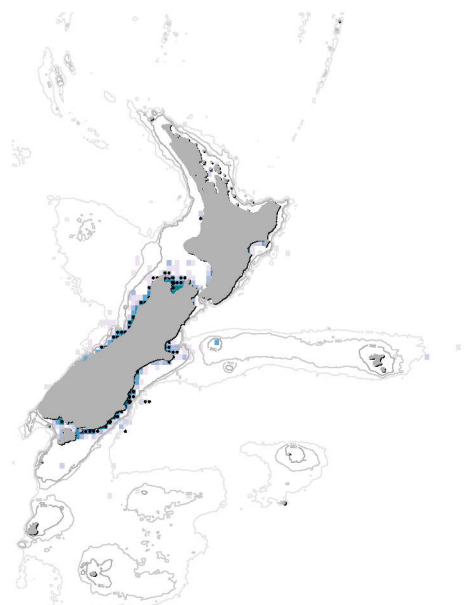


Figure C-16: Flatfish trawl. Fishing effort (blue heatmap) and observation coverage (black dots) during the period (a) 2003–04 to 2005–06 and (b) 2006–07 to 2008–09.

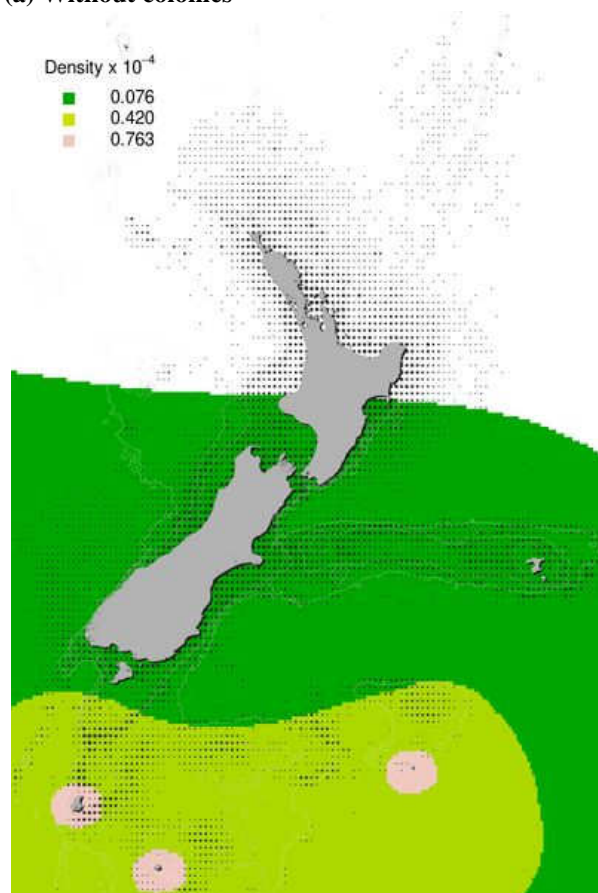
APPENDIX D: SPECIES DATA

This section presents all the demographic data we collated from the literature for each studied species, along with their reference. Estimates with an asterisk are those that were used to calculate the Potential Biological Removal (PBR). The year in square brackets is the last year of the study. This section also presents the two distributions we derived for each species (see Section 2.3.1), with the total fishing effort between 2003–04 and 2008–09 as black dots whose size depends on the effort, and the observed captures in trawl, bottom longline and surface longline fisheries.

D.1 Southern rockhopper penguin (*Eudyptes chrysocome*)

Population (NZ)	38 961 to 58 500 pairs*	Taylor (2000a)
Population (Campbell Is.)	fewer than 51 500 pairs [1985]	Taylor (2000a)
Population (Auckland Is.)	2700 to 3600 pairs [1990]	Taylor (2000a)
Population (Antipodes Is., Bollons Is.)	fewer than 3400 pairs [1995]	Taylor (2000a)
Population (World)	500 000 to 999 999 individuals [2007]	Birdlife (2009)
Age at first breeding	4.7 years*	<i>Eudyptes moseleyi</i> as proxy, Guinard et al. (1998)
Survival	81.6 to 86.1%	<i>Eudyptes moseleyi</i> as proxy, Guinard et al. (1998)
	84 ± 1.1% [1995]*	Northern rockhopper penguin as proxy, Guinard et al. (1998)

(a) Without colonies



(b) With colonies

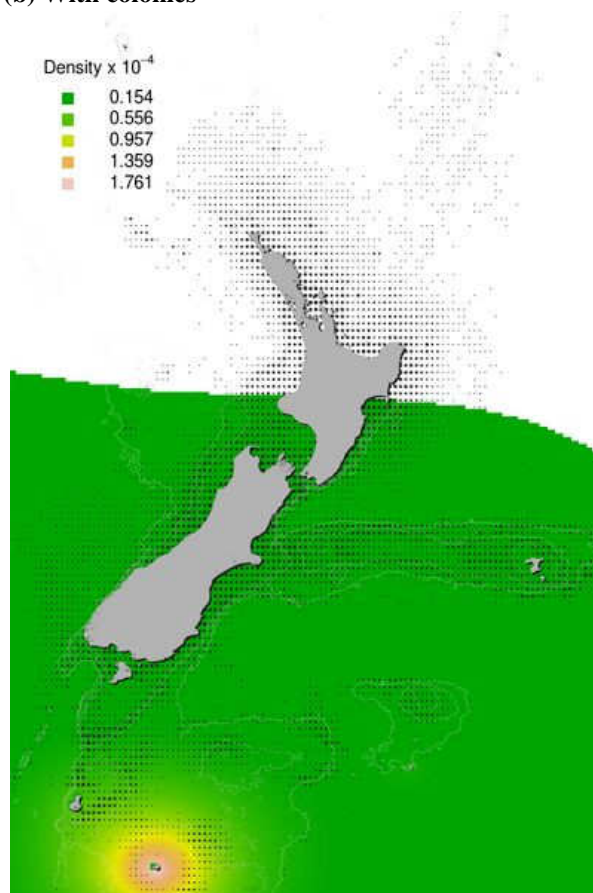
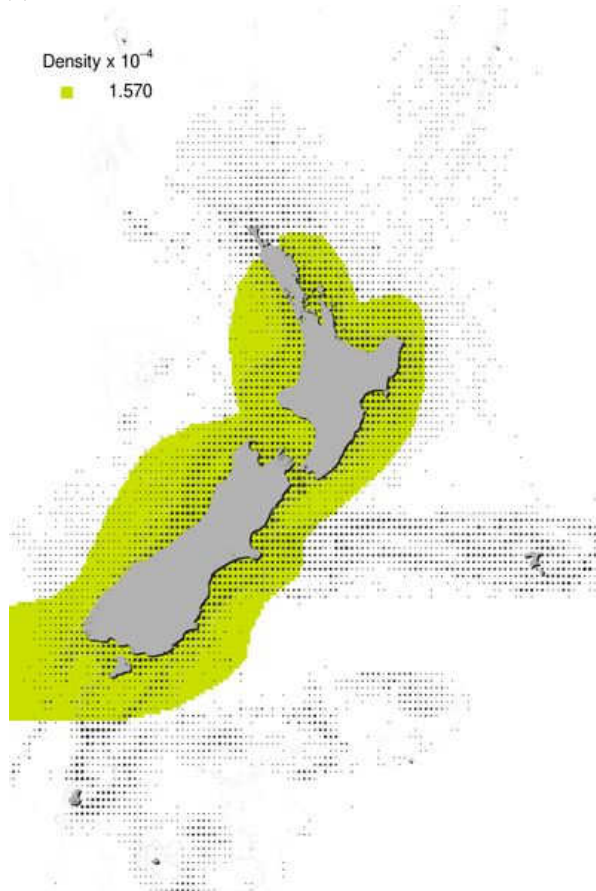


Figure D-1: Captures and relative density of Southern rockhopper penguin (*Eudyptes chrysocome*). The base map for the distribution was obtained from the NABIS database.

D.2 Fiordland penguin (*Eudyptes pachyrhynchus*)

Population (NZ)	5000 to 10 000 pairs 3000 pairs*	Marchant & Higgins (1990) Roots (2006)
Age at first breeding	5 years 3 to 4 years* 5 to 6 years*	Roots (2006) Schreiber & Burger (2001) Marchant & Higgins (1990)
Survival	$71 \pm 1\%$ $84 \pm 1.1\%$ [1995]*	St Clair et al. (1999) Northern rockhopper penguin as proxy, Guinard et al. (1998)

(a) Without colonies



(b) With colonies

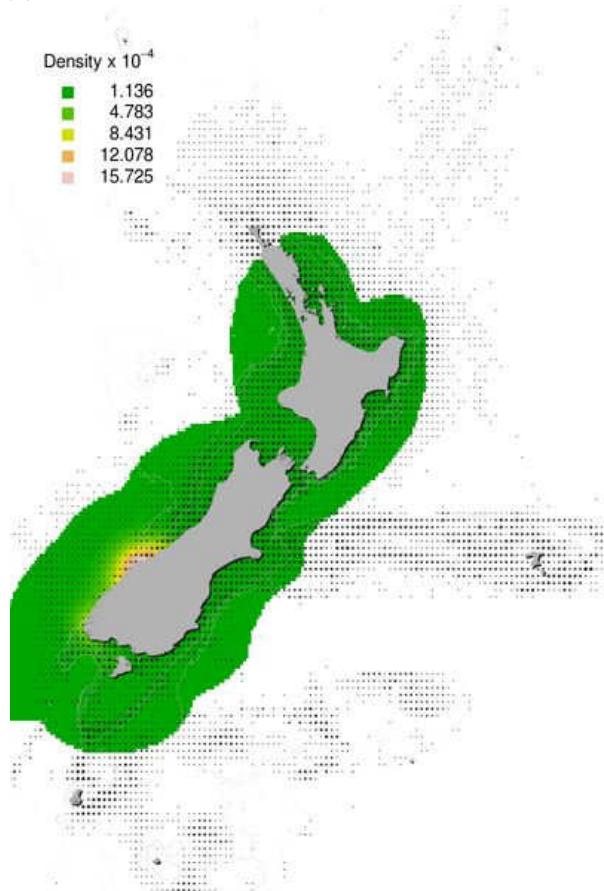
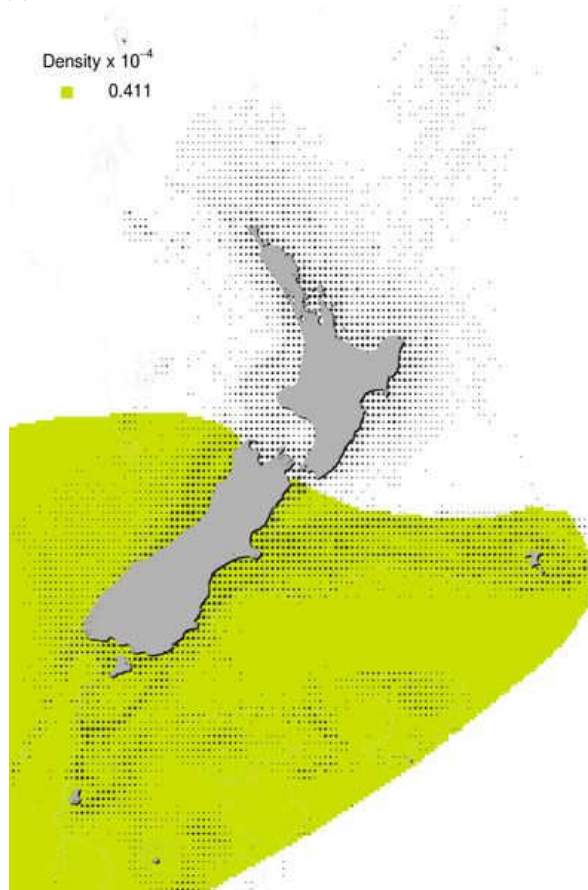


Figure D-2: Captures and relative density of Fiordland penguin (*Eudyptes pachyrhynchus*). The distribution base map was obtained from BirdLife single-layer range maps.

D.3 Snares penguin (*Eudyptes robustus*)

Population (NZ)	30 000 pairs*	Roots (2006)
Age at first breeding	5 years 5 to 6 years*	Schreiber & Burger (2001) Roots (2006)
Survival	71% $84 \pm 1.1\%$ [1995]*	<i>Eudyptes pachyrhynchus</i> as proxy, St Clair et al. (1999) Northern rockhopper penguin as proxy, Guinard et al. (1998)

(a) Without colonies



(b) With colonies

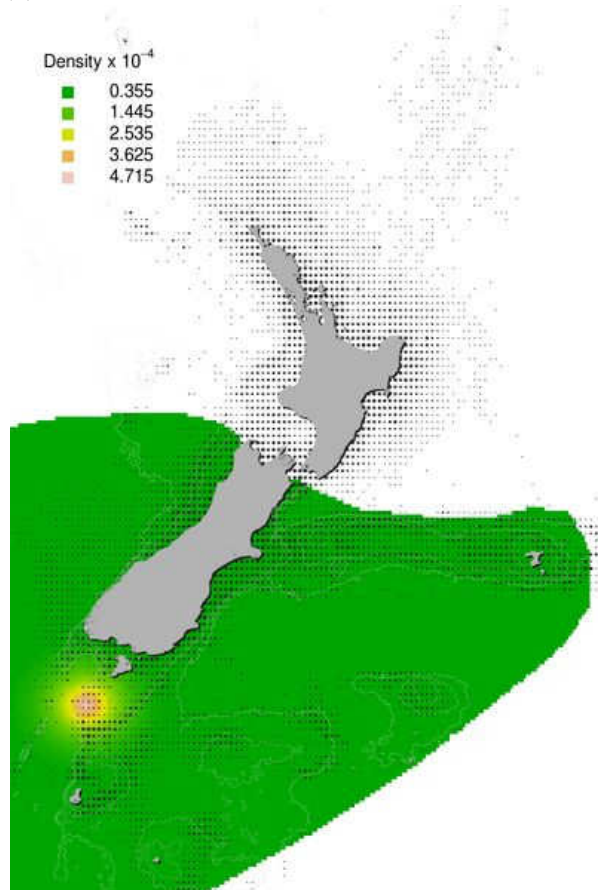
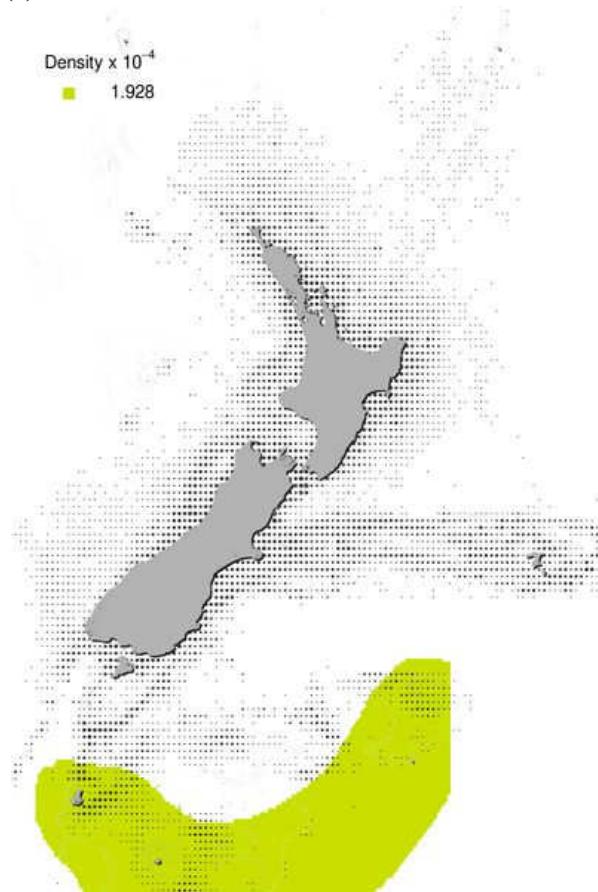


Figure D-3: Captures and relative density of Snares penguin (*Eudyptes robustus*). The distribution base map was obtained from BirdLife single-layer range maps.

D.4 Erect-crested penguin (*Eudyptes sclateri*)

Population (NZ)	81 000 (77 000 – 85 000) pairs*	Taylor (2000a)
Age at first breeding	5 to 6 years*	<i>Eudyptes pachyrhynchus</i> as proxy, Roots (2006)
Survival	71%	<i>Eudyptes pachyrhynchus</i> as proxy, St Clair et al. (1999)
	84 ± 1.1% [1995]*	Northern rockhopper penguin as proxy, Guinard et al. (1998)

(a) Without colonies



(b) With colonies

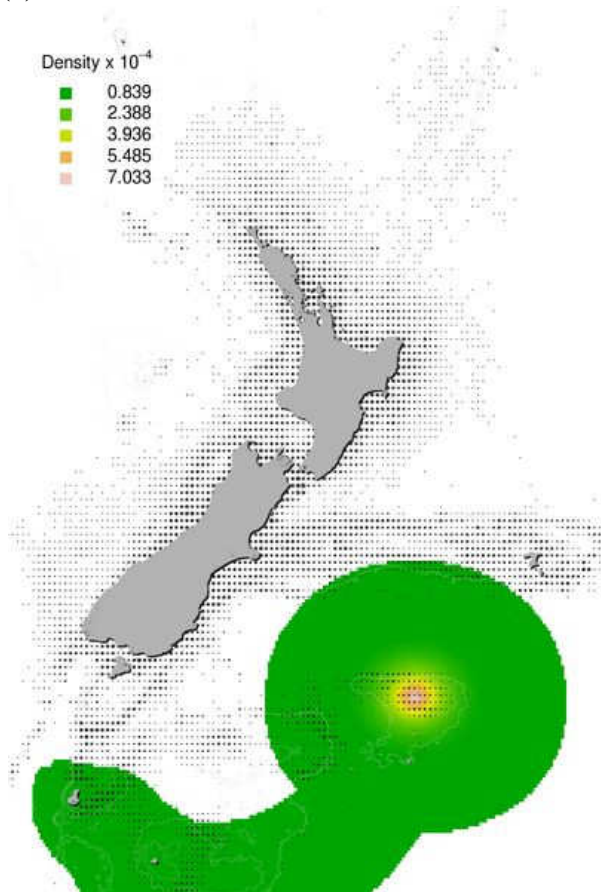
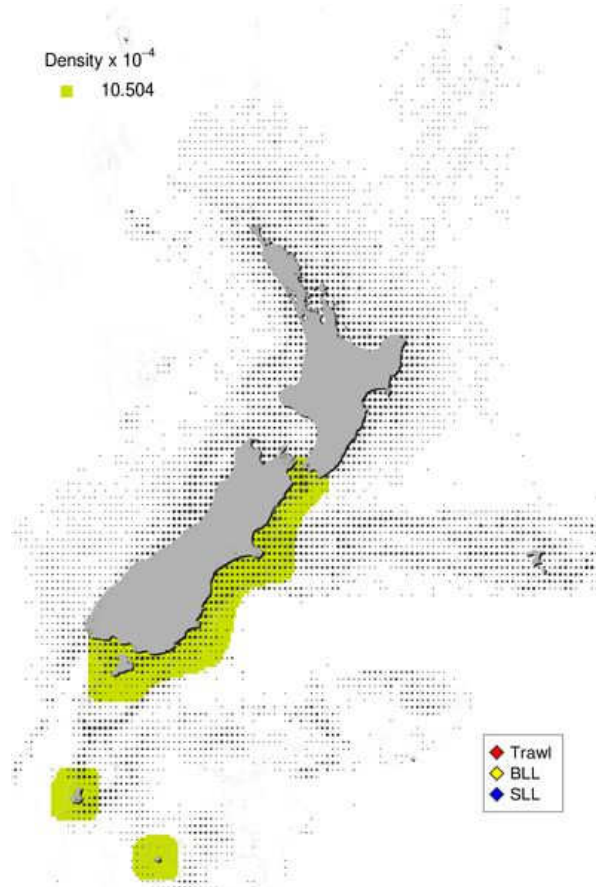


Figure D-4: Captures and relative density of Erect-crested penguin (*Eudyptes sclateri*). The distribution base map was obtained from BirdLife single-layer range maps.

D.5 Yellow-eyed penguin (*Megadyptes antipodes*)

Population (NZ)	2000 pairs 4800 individuals 1700 to 2420 pairs* 1780 to 2090 pairs [1997]	Roots (2006) Birdlife (2009) Taylor (2000a) Department of Conservation (2001)
Age at first breeding	2 to 3 years*	Schreiber & Burger (2001)
Survival	87%*	Schreiber & Burger (2001)

(a) Without colonies



(b) With colonies

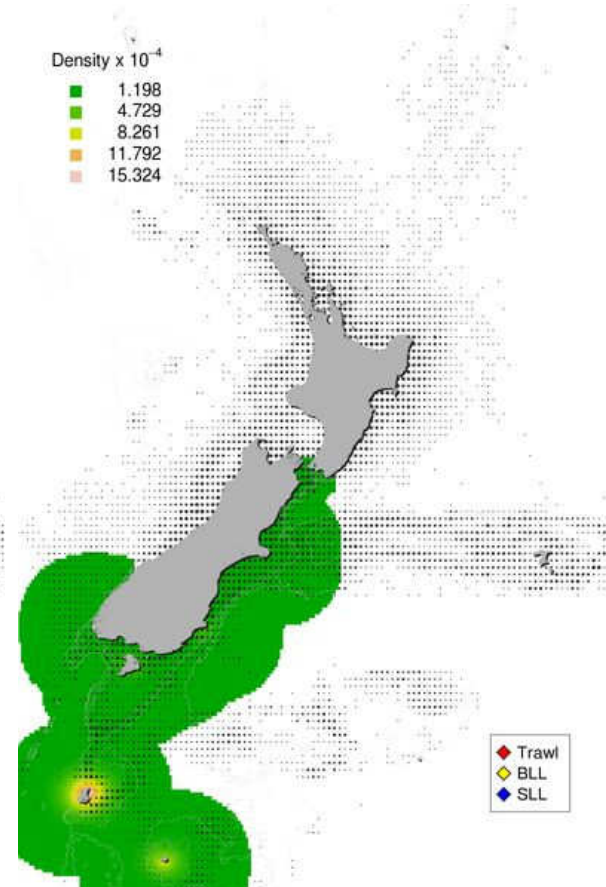
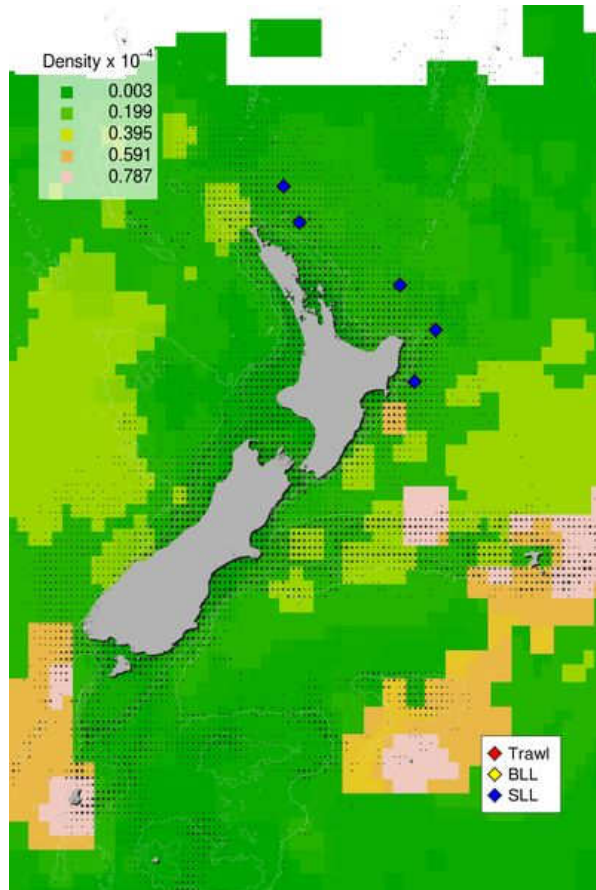


Figure D-5: Captures and relative density of Yellow-eyed penguin (*Megadyptes antipodes*). The distribution base map was obtained from BirdLife single-layer range maps.

D.6 Antipodean albatross (*Diomedea antipodensis antipodensis*)

Population (NZ)	4635 to 5737 pairs	Birdlife (2009)
	5150 pairs	Milot et al. (2007)
	5180 pairs [1996]	Walker & Elliott (2005)
	33 000 individuals [1996]	Gales (1998)
	5154 pairs [1996]	Gales (1998)
	8600 pairs [1996]	Walker & Elliott (2005)
Age at first breeding	6292 pairs [2009]*	ACAP (2010)
	10 to 12 years	Brooke & Cox (2004)
	10 to 13 years [1997]*	Walker & Elliott (2002)
Survival	95.7 ± 0.7% [2004]*	Walker & Elliott (1999)
	96 ± 0.7% [2004]	ACAP (2010)
	94.8 ± 5.2% [2007]	ACAP (2010)

(a) Without colonies



(b) With colonies

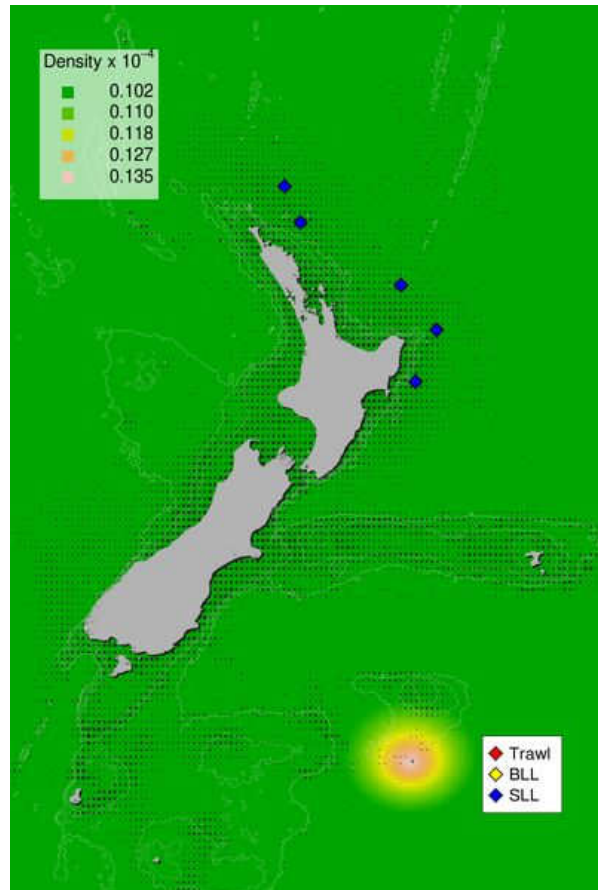
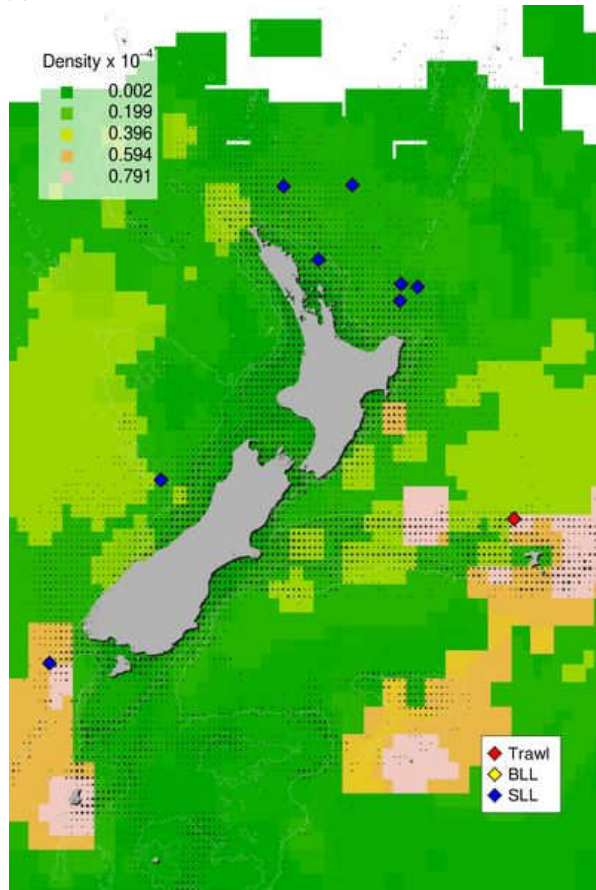


Figure D-6: Captures and relative density of Antipodean albatross (*Diomedea antipodensis antipodensis*). The distribution base map was obtained from BirdLife telemetry global distribution maps.

D.7 Gibsons albatross (*Diomedea antipodensis gibsoni*)

Population (NZ)	40 000 individuals	Gales (1998)
	5800 pairs	Birdlife (2009)
	6100 pairs	Milot et al. (2007)
	6077 pairs [1985]	Gales (1998)
	5831 (4826 – 7417) pairs [1997]*	Walker & Elliott (1999)
	5265 pairs [2009]	ACAP (2010)
Age at first breeding	10 to 12 years*	Brooke & Cox (2004)
Survival	93.8 to 98.5% [1996]*	Croxall & Gales (1998)
	96 to 98% [1997]*	Walker & Elliott (1999)
	95.9 $\pm$ 0.6% [2004]*	ACAP (2010)
	95.7 $\pm$ 0.7% [2004]	<i>Diomedea antipodensis antipodensis</i> as proxy, Walker & Elliott (1999)
	88.3 $\pm$ 2.6% [2007]	ACAP (2010)

(a) Without colonies



(b) With colonies

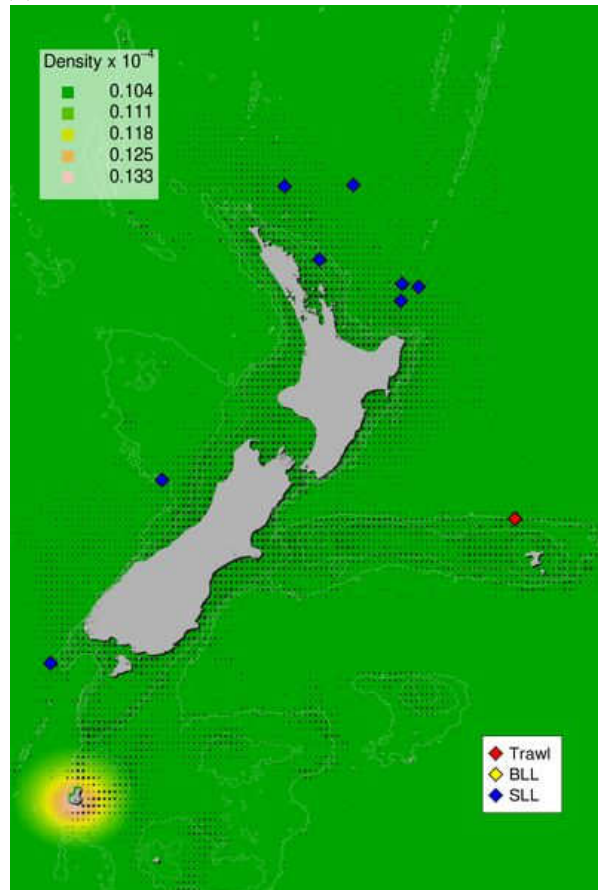
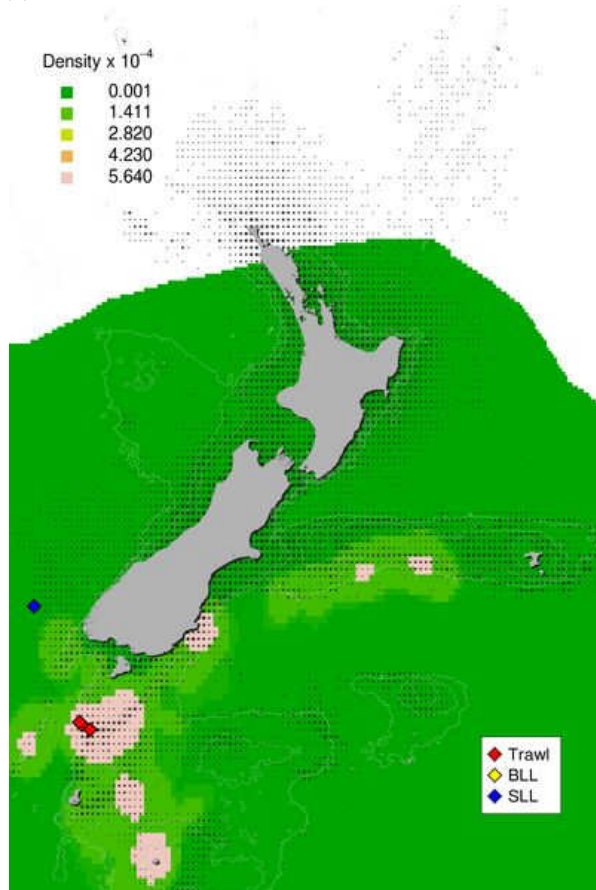


Figure D-7: Captures and relative density of Gibsons albatross (*Diomedea antipodensis gibsoni*). The distribution base map was obtained from BirdLife telemetry global distribution maps.

D.8 Southern royal albatross (*Diomedea epomophora*)

Population (NZ)	50 000 individuals	Gales (1998)
	28 000 to 29 500 individuals [1997]	Birdlife (2009)
	13 000 pairs [2008]	ACAP (2010)
	7886 pairs [2008]*	ACAP (2010)
Age at first breeding	7 to 11 years	Schreiber & Burger (2001)
	8.5 to 10.6 years*	Robertson (1993)
	6 to 12 years	ACAP (2010)
	8 to 10 years	Brooke & Cox (2004)
Survival	94.6%	Jouventin & Dobson (2002)
	97%	Schreiber & Burger (2001)
	90.3 ± 2.1% [1972]	ACAP (2010)
	93.5 ± 0.8% [1999]	ACAP (2010)
	94.9 ± 0.8% [2001]*	ACAP (2010)

(a) Without colonies



(b) With colonies

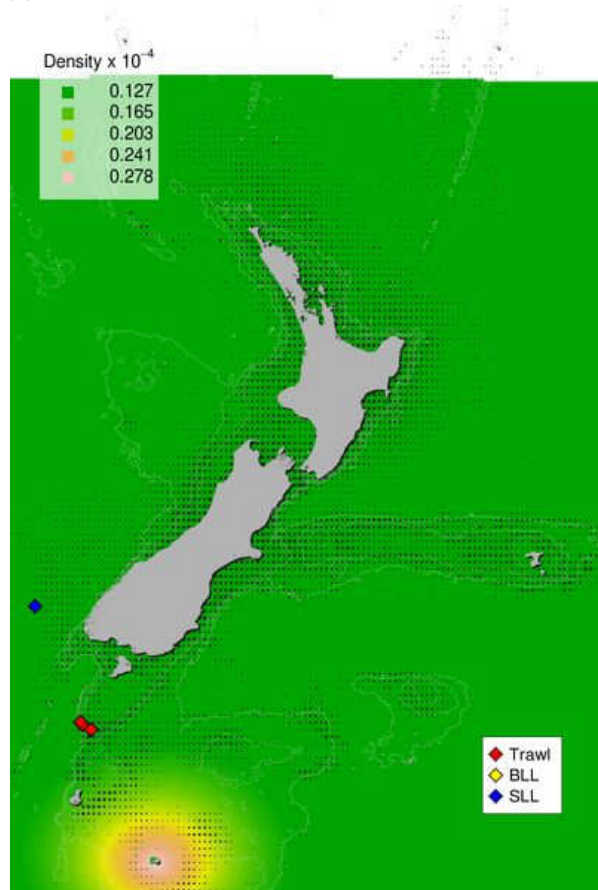
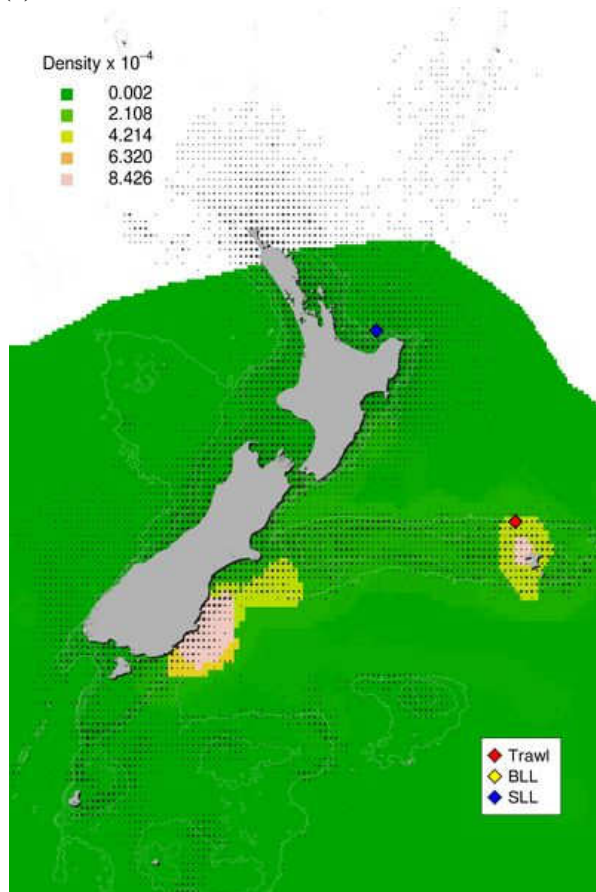


Figure D-8: Captures and relative density of Southern royal albatross (*Diomedea epomophora*). The distribution base map was obtained from BirdLife telemetry global distribution maps.

D.9 Northern royal albatross (*Diomedea sanfordi*)

Population (NZ)	34 000 individuals	Gales (1998)
	6500 to 7000 pairs [1995]	ACAP (2010)
	17 000 individuals [1995]	ACAP (2010)
	8500 pairs [1995]	Gales (1998)
	5218 pairs [1995]	Gales (1998)
	5832 pairs [2003]*	ACAP (2010)
Age at first breeding	8 to 10 years	Brooke & Cox (2004)
	8.59 ± 0.2 years [1993]	Robertson (1993)
	20 years [1993]	Robertson (1998)
	8.5 (more than 6) years [2009]*	ACAP (2010)
Survival	95.2% [1993]*	ACAP (2010)
	$94.6 \pm 1.5\%$ [1993]*	ACAP (2010)

(a) Without colonies



(b) With colonies

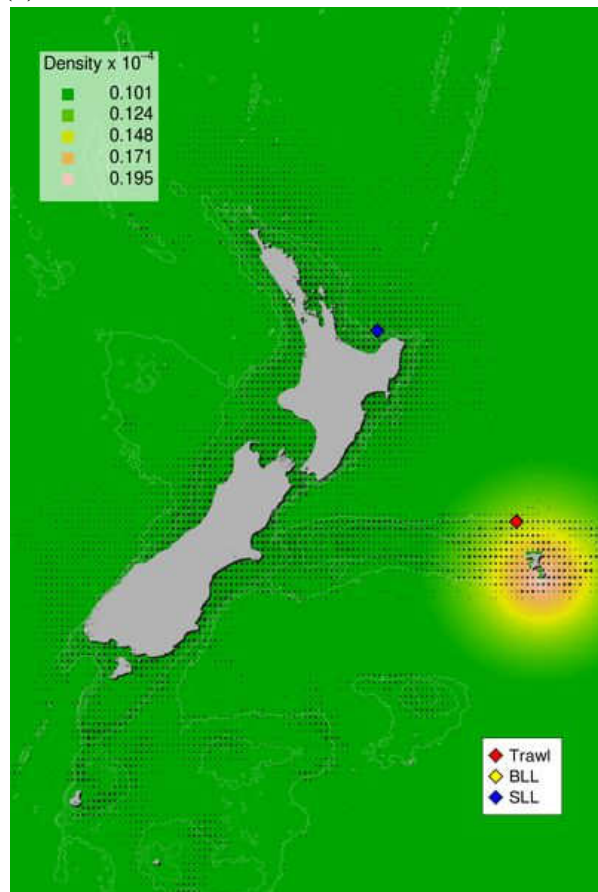
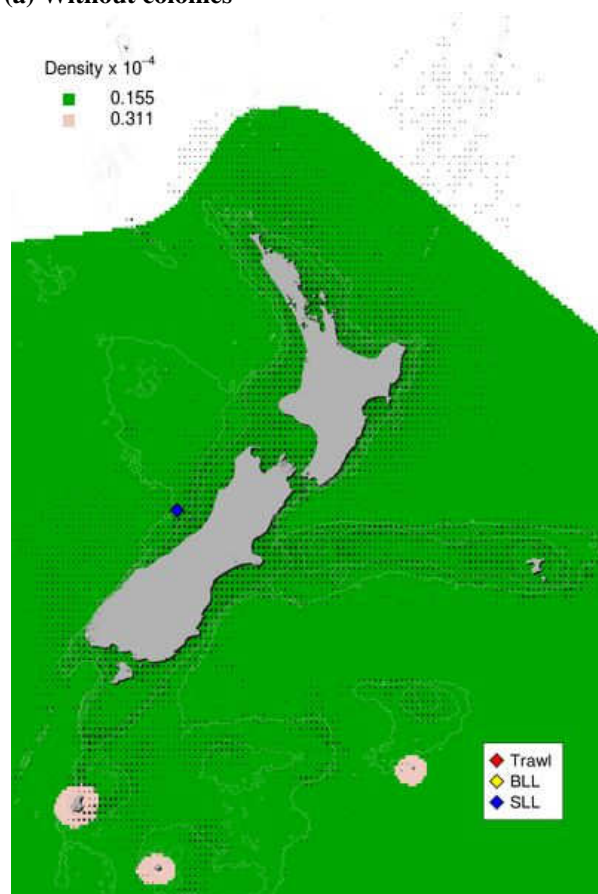


Figure D-9: Captures and relative density of Northern royal albatross (*Diomedea sanfordi*). The base map for the distribution was obtained from the NABIS database.

D.10 Light-mantled albatross (*Phoebetria palpebrata*)

Population (NZ)	more than 6770 pairs 6800 to 6900 pairs* 6850 pairs [1972] 7500 pairs [1973]	Brooke & Cox (2004) Taylor (2000a) ACAP (2010) Gales (1998)
Population (NZ, Macquarie Is.)	more than 8770 pairs	Brooke & Cox (2004)
Population (World)	15 655 pairs	Gales (1998)
Age at first breeding	7 years 12 (more than 7) years*	Schreiber & Burger (2001) Brooke & Cox (2004)
Survival	97.3% [1995]*	Brooke & Cox (2004)

(a) Without colonies



(b) With colonies

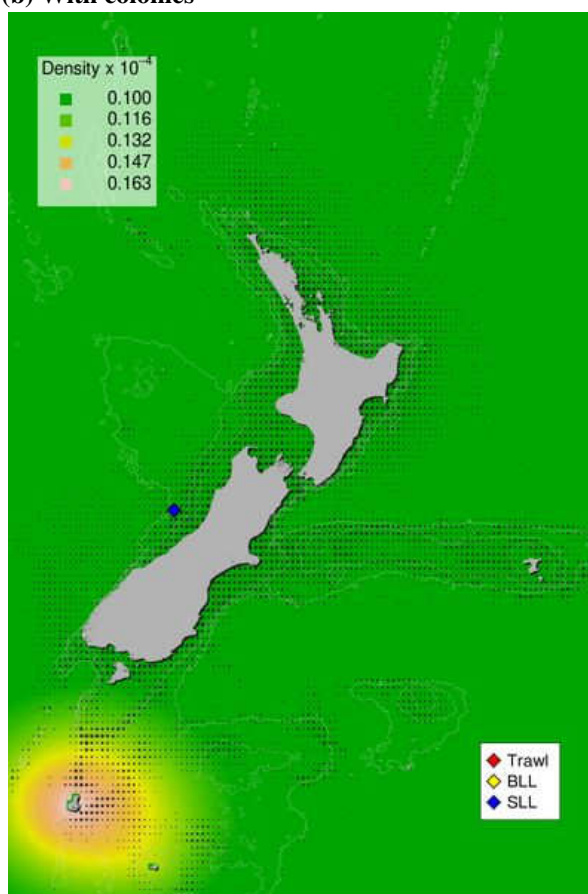
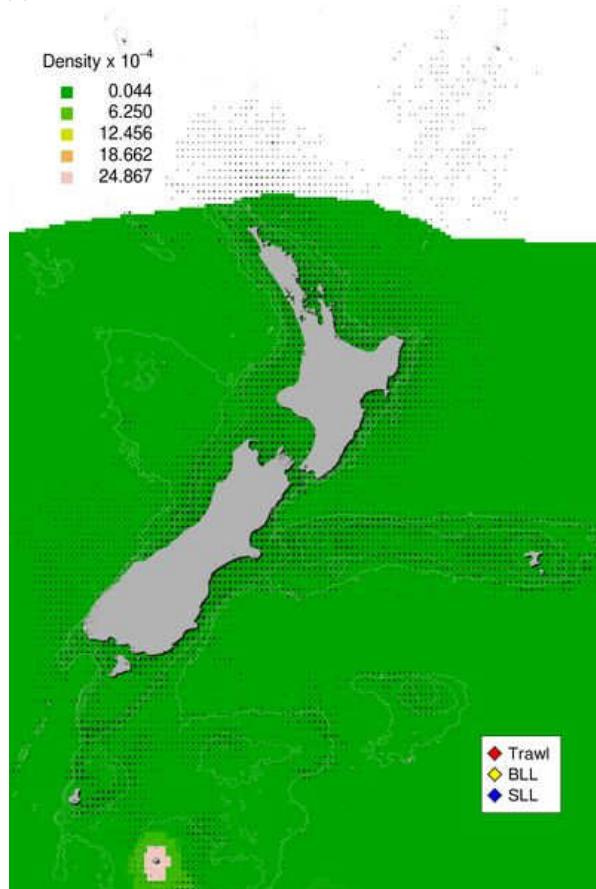


Figure D-10: Captures and relative density of Light-mantled albatross (*Phoebetria palpebrata*). The base map for the distribution was obtained from the NABIS database.

D.11 Grey-headed albatross (*Thalassarche chrysostoma*)

Population (NZ)	6400 pairs [1995] 6600 pairs [1997]*	Gales (1998) ACAP (2010)
Population (NZ, Macquarie Is.)	6484 pairs [1995] 6694 pairs [1997]	Gales (1998) ACAP (2010)
Population (World)	250 000 individuals [2004]	Birdlife (2009)
Age at first breeding	13.5 (10 – 17) years [1995] 7 to 13 years*	Waugh et al. (1999) Schreiber & Burger (2001)
Survival	95.3 ± 0.9% (<i>N</i> = 225) [1996]* 95%	Waugh et al. (1999) Schreiber & Burger (2001)

(a) Without colonies



(b) With colonies

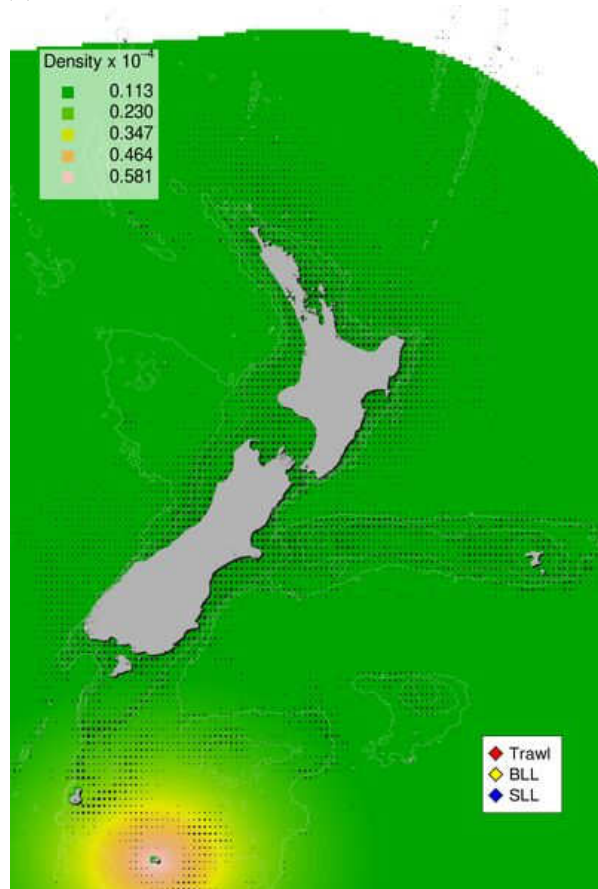
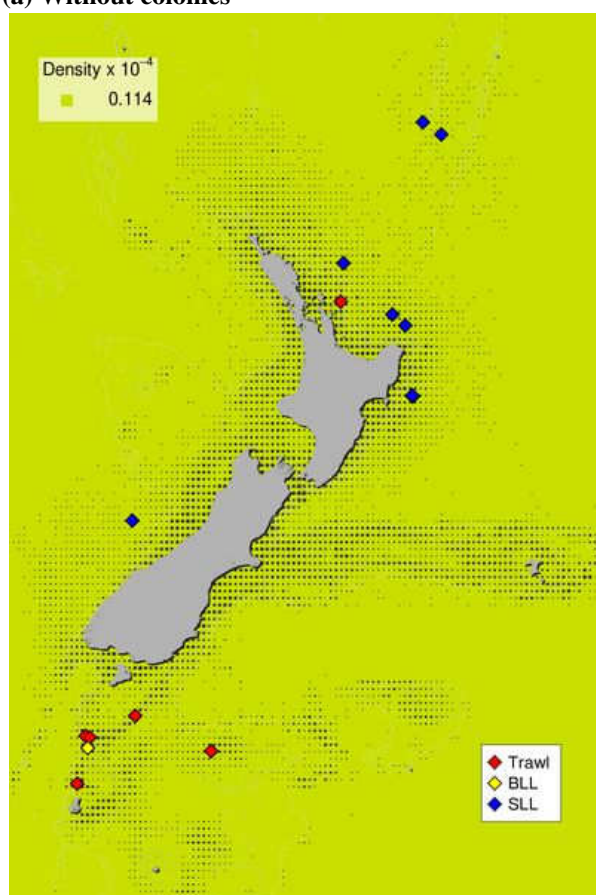


Figure D-11: Captures and relative density of Grey-headed albatross (*Thalassarche chrysostoma*). The base map for the distribution was obtained from the NABIS database.

D.12 Black-browed albatross (*Thalassarche melanophrys*)

Population (NZ)	145 pairs*	ACAP (2010)
	131 pairs	Gales (1998)
Population (World)	3 000 000 individuals	Gales (1998)
	682 316 pairs	Gales (1998)
	1 200 000 individuals [2005]	Birdlife (2009)
Age at first breeding	7 to 11 years*	Schreiber & Burger (2001)
Survival	94.5 ± 0.7% (<i>N</i> = 213) [1996]*	Waugh et al. (1999)
	90.6% [1995]	ACAP (2010)
	91.5 ± 1.1% [2000]	ACAP (2010)
	76.5 ± 4.9% [2003]	ACAP (2010)
	94.3 ± 1.4% [2003]	ACAP (2010)
	91.8 ± 0.4% [2005]	ACAP (2010)
	90.9% [1988]	ACAP (2010)
	92.5 ± 0.6% [1988]	ACAP (2010)
	95.7% [1988]	ACAP (2010)
	93.4 ± 0.6% [1990]	ACAP (2010)
	91.3 (84 – 98)% [2002]	ACAP (2010)
	94% [2009]	ACAP (2010)

(a) Without colonies



(b) With colonies

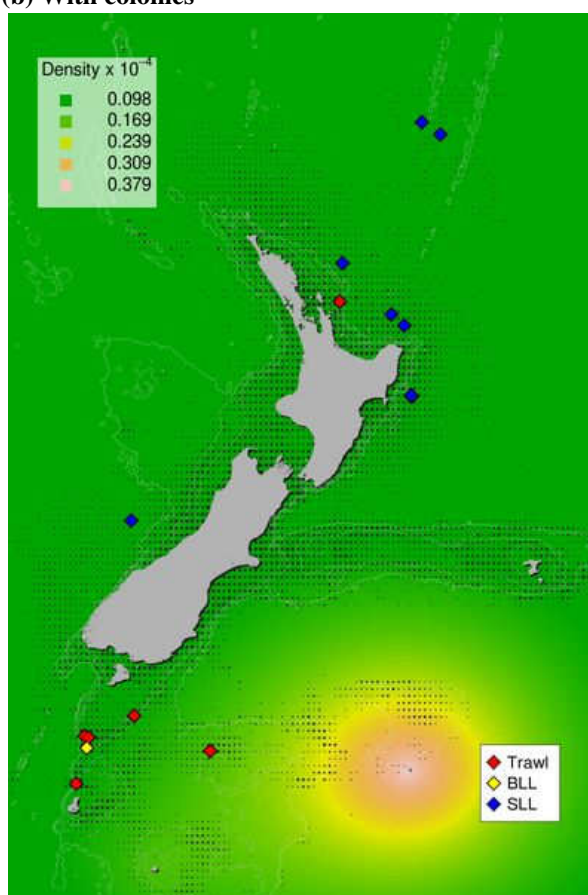
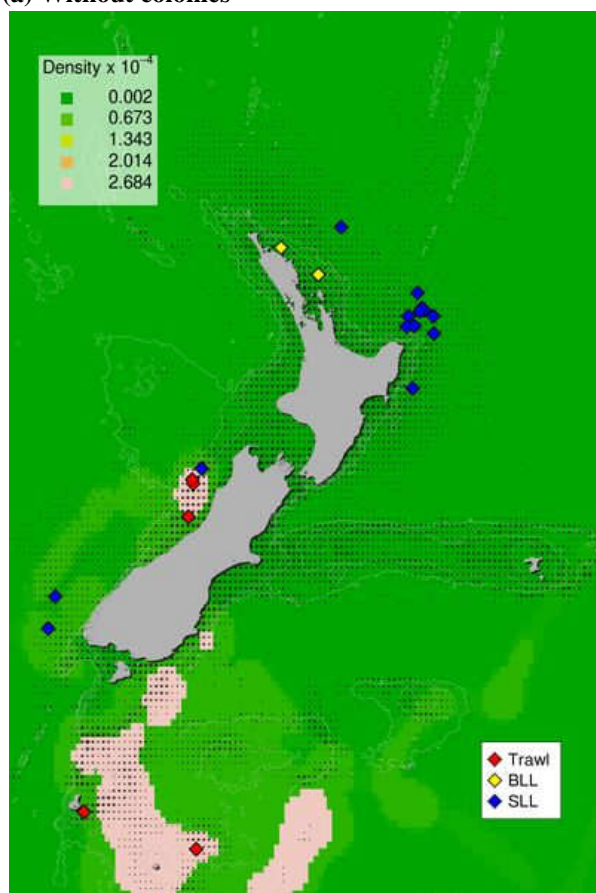


Figure D-12: Captures and relative density of Black-browed albatross (*Thalassarche melanophrys*). The distribution base map was obtained from BirdLife single-layer range maps.

D.13 Campbell albatross (*Thalassarche impavida*)

Population (NZ)	26 000 pairs	Gales (1998)
	49 000 individuals [1997]	Birdlife (2009)
	21 000 pairs [1998]*	ACAP (2010)
Age at first breeding	10.4 years	Croxall & Gales (1998)
	10 (6 – 13) years [1995]*	Waugh et al. (1999)
Survival	92%	Schreiber & Burger (2001)
	94.5%*	Schreiber & Burger (2001)
	95.4% [1992]	Croxall & Gales (1998)
	94.5% [1996]*	ACAP (2010)

(a) Without colonies



(b) With colonies

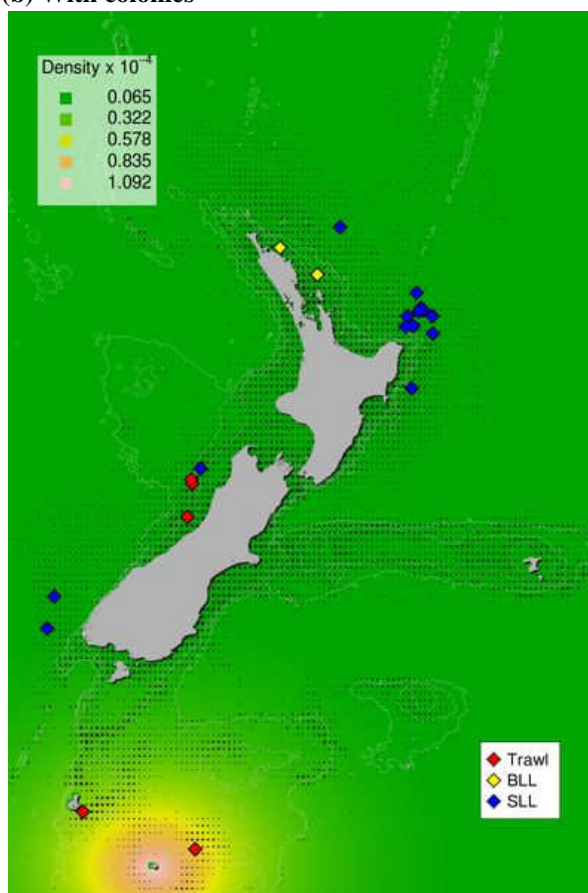
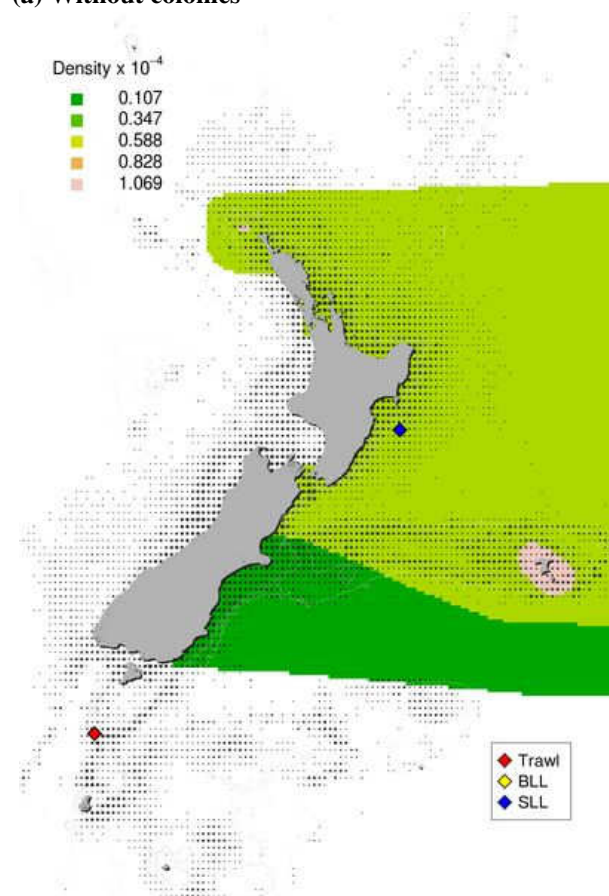


Figure D-13: Captures and relative density of Campbell albatross (*Thalassarche impavida*). The distribution base map was obtained from BirdLife telemetry global distribution maps.

D.14 Northern Buller's albatross (*Thalassarche bulleri platei*)

Population (NZ)	18 170 pairs	Gales (1998)
	18 150 to 18 190 pairs	Taylor (2000a)
Population (Chatham Is., Three Kings Is.)	16 346 pairs [2008]*	ACAP (2010)
Age at first breeding	10 to 11 years*	ACAP (2010)
	more than 5 years	Schreiber & Burger (2001)
Survival	93% [1995]	ACAP (2010)
	91.3%	Schreiber & Burger (2001)
	93.5% [1995]*	Taylor (2000a)

(a) Without colonies



(b) With colonies

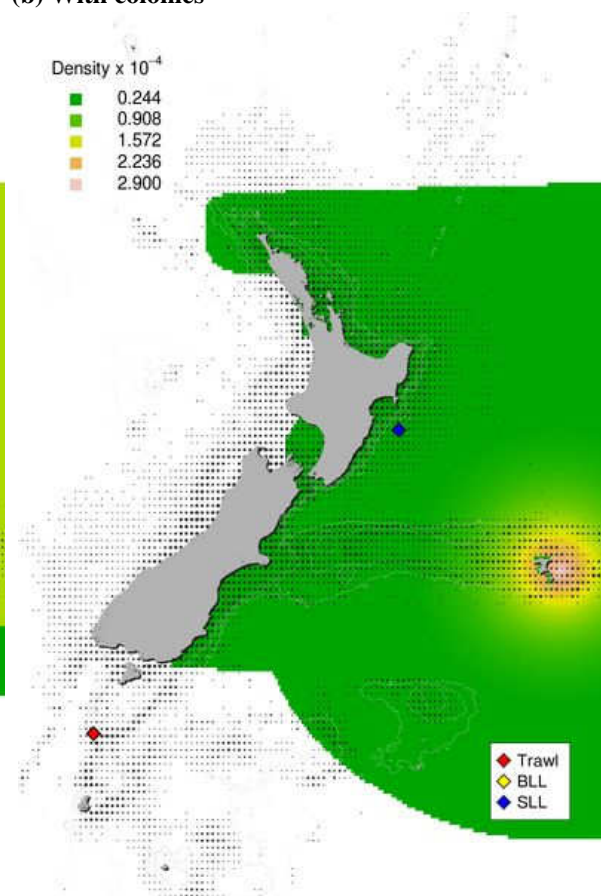
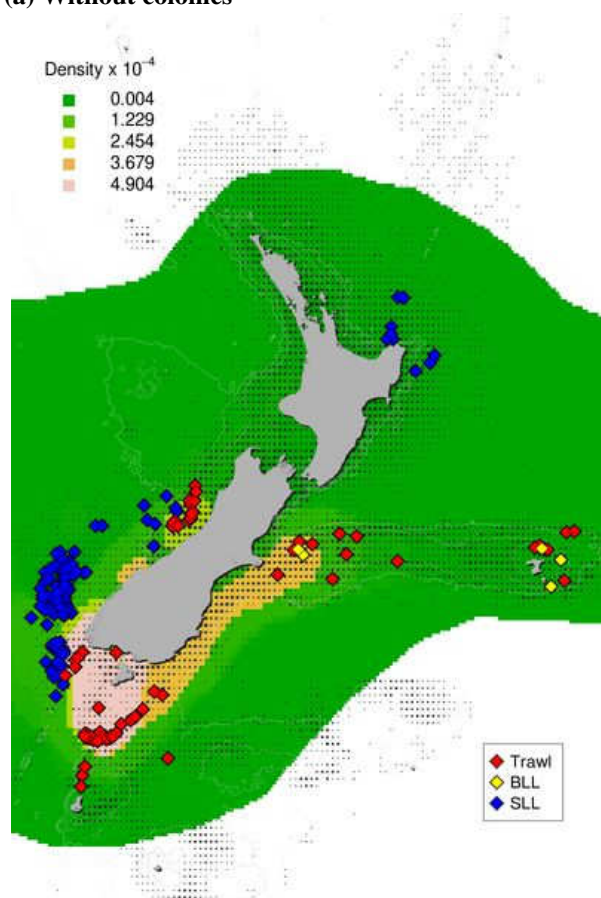


Figure D-14: Captures and relative density of Northern Buller's albatross (*Thalassarche bulleri platei*). The base map for the distribution was obtained from the NABIS database.

D.15 Southern Buller's albatross (*Thalassarche bulleri bulleri*)

Population (NZ)	12 760 to 13 760 pairs 11 502 pairs [1997]	Gales (1998) Sagar et al. (1999)
Population (Snares Is., Solander Is.)	13 625 pairs [2002]*	Sagar & Stahl (2005)
Age at first breeding	more than 5 years 7 to 14 years 10 to 11 years*	Schreiber & Burger (2001) Francis et al. (2008) ACAP (2010)
Survival	93% [1997] 95.5 (92.6 – 97.4)% [1997]* 91.3% 95%	ACAP (2010) Sagar et al. (2000) Schreiber & Burger (2001) Francis et al. (2008)

(a) Without colonies



(b) With colonies

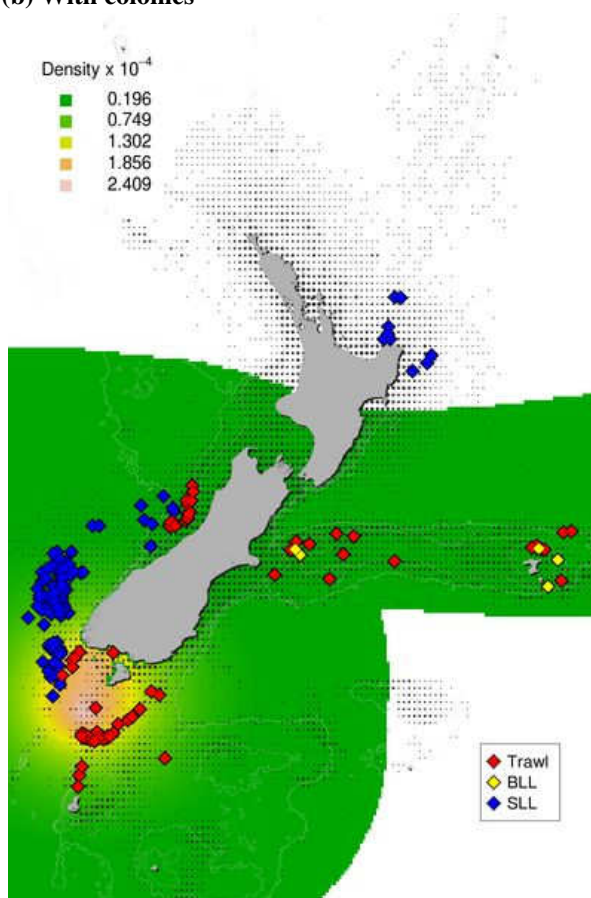


Figure D-15: Captures and relative density of Southern Buller's albatross (*Thalassarche bulleri bulleri*). The distribution base map was obtained from BirdLife telemetry global distribution maps.

D.16 White-capped albatross (*Thalassarche steadi*)

Population (NZ)	75 150 to 75 200 pairs	Gales (1998)
	100 000 to 499 999 individuals	Birdlife (2009)
	[2007]	
	96 489 to 97 735 pairs [2008]	ACAP (2010)
	97 089 pairs [2008]	ACAP (2010)
	74 229 to 75 545 pairs [2009]*	
Age at first breeding	more than 5 years*	Brothers et al. (1998)
Survival	$94.5 \pm 0.7\%$ ($N = 213$) [1996]*	<i>Thalassarche melanophrys</i> as proxy, Waugh et al. (1999)

(a) Without colonies



(b) With colonies

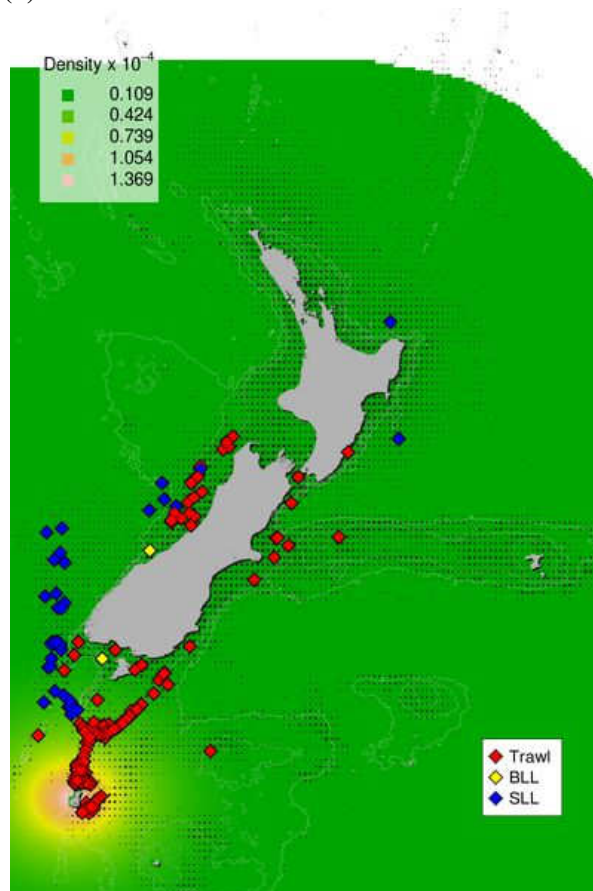


Figure D-16: Captures and relative density of White-capped albatross (*Thalassarche steadi*). The base map for the distribution was obtained from the NABIS database.

D.17 Chatham albatross (*Thalassarche eremita*)

Population (NZ)	4000 pairs [1992]	Gales (1998)
	4575 pairs [2001]	Robertson et al. (2003)
	11 000 individuals [2003]	Birdlife (2009)
	5247 pairs [2007]*	Birdlife (2009)
Age at first breeding	7 years [2002]*	Robertson et al. (2003)
Survival	86.8 ± 1.3% [2001]*	Robertson et al. (2003)

(a) Without colonies



(b) With colonies

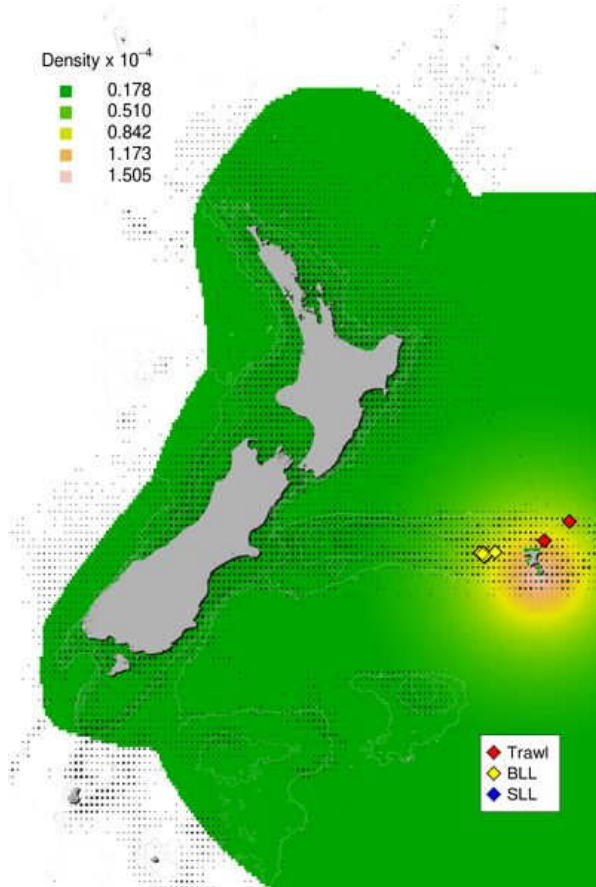


Figure D-17: Captures and relative density of Chatham albatross (*Thalassarche eremita*). The distribution base map was obtained from BirdLife telemetry global distribution maps.

D.18 Salvin's albatross (*Thalassarche salvini*)

Population (NZ)	fewer than 76 654 pairs [1978] 31 947 pairs [1998]*	Gales (1998) ACAP (2010)
Age at first breeding	7 to 11 years 10 to 11 years*	<i>Thalassarche melanophrys</i> as proxy, Schreiber & Burger (2001) <i>Thalassarche bulleri bulleri</i> as proxy, ACAP (2010)
Survival	94.5 ± 0.7% (<i>N</i> = 213) [1996] 95.5 (92.6 – 97.4)% [1997]*	<i>Thalassarche melanophrys</i> as proxy, Waugh et al. (1999) <i>Thalassarche bulleri bulleri</i> as proxy, Sagar et al. (2000)

(a) Without colonies



(b) With colonies

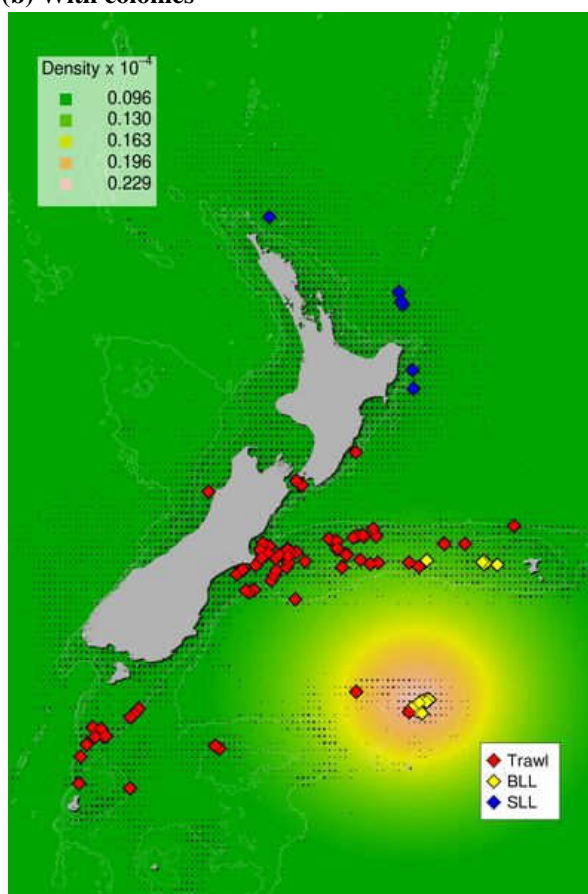
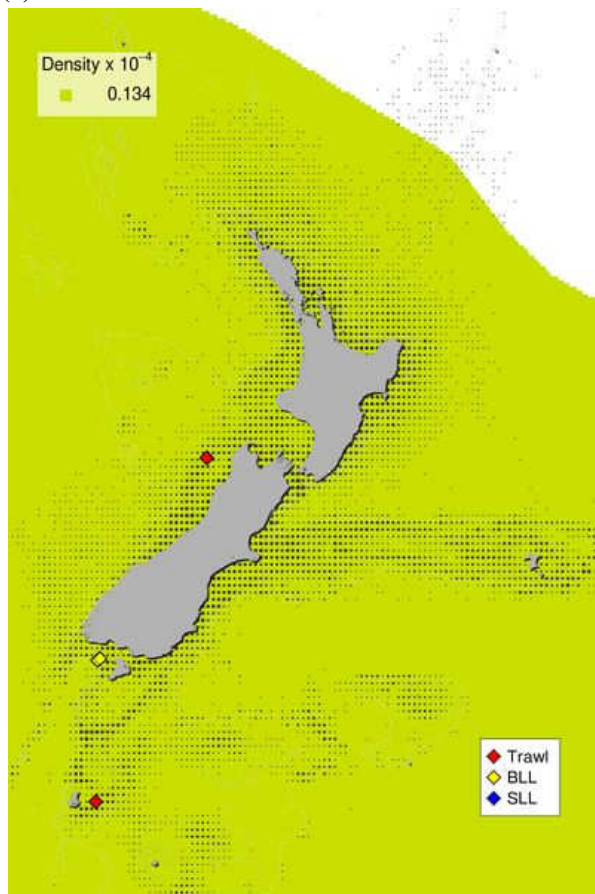


Figure D-18: Captures and relative density of Salvin's albatross (*Thalassarche salvini*). The base map for the distribution was obtained from the NABIS database.

D.19 Northern giant petrel (*Macronectes halli*)

Population (NZ)	2600 pairs 2567 pairs [1993]*	Brooke & Cox (2004) ACAP (2010)
Population (NZ, Macquarie Is.)	3900 pairs	Brooke & Cox (2004)
Population (World)	40 000 to 50 000 individuals	Brooke & Cox (2004)
Age at first breeding	4 to 11 years 9.7 (more than 6) years 6 to 10 years*	Schreiber & Burger (2001) Brooke & Cox (2004) Trivelpiece & Trivelpiece (1998)
Survival	92.3%* 88 to 93% [1981]* 88% [2003]*	Brooke & Cox (2004) ACAP (2010) ACAP (2010)

(a) Without colonies



(b) With colonies

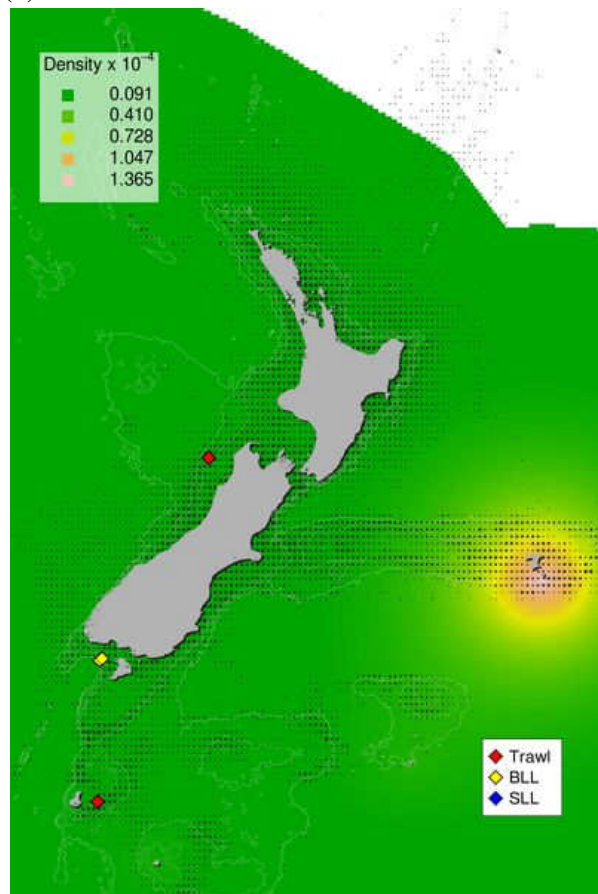
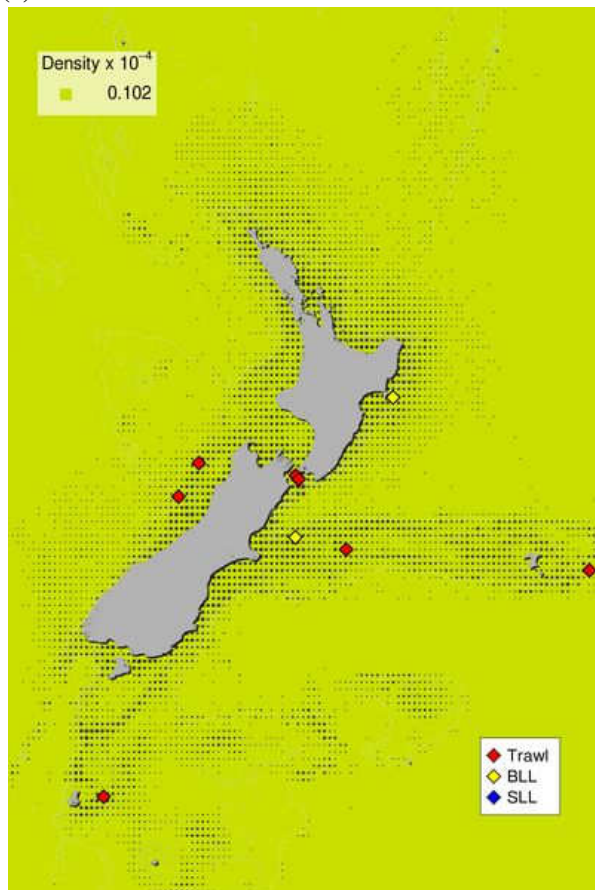


Figure D-19: Captures and relative density of Northern giant petrel (*Macronectes halli*). The distribution base map was obtained from BirdLife single-layer range maps.

D.20 Cape petrel (*Daption capense*)

Population (NZ)	8420 pairs*	Brooke & Cox (2004)
Population (World)	more than 2 000 000 individuals [2009]	Brooke & Cox (2004)
Age at first breeding	6 years* 3 to 5 years [1968]*	Schreiber & Burger (2001) Beck (1969)
Survival	77.1 to 93.9% [poor]* 94.17%	Sagar et al. (1996) Brooke & Cox (2004)

(a) Without colonies



(b) With colonies

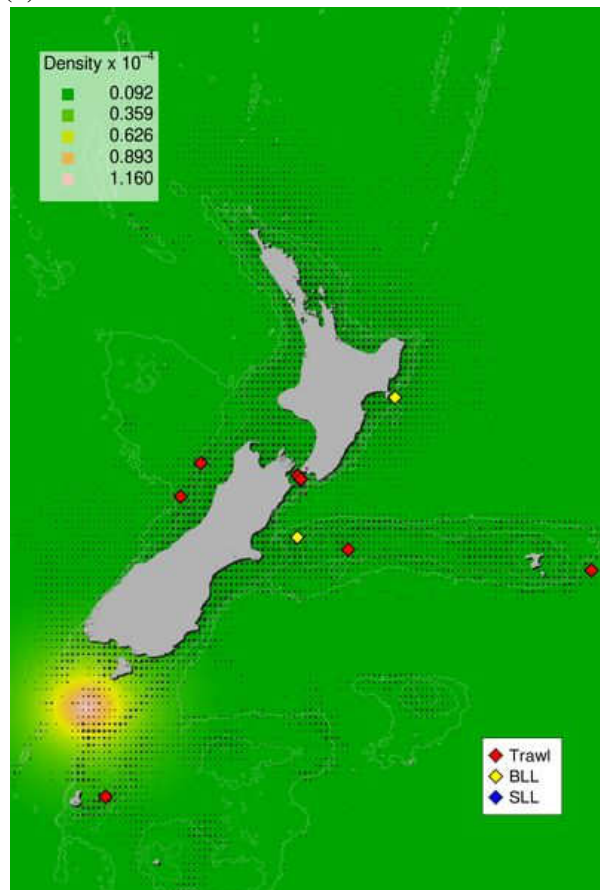


Figure D-20: Captures and relative density of Cape petrel (*Daption capense*). The distribution base map was obtained from BirdLife single-layer range maps.

D.21 Great-winged petrel (*Pterodroma macroptera*)

Population (NZ)	200 000 to 300 000 pairs*	Taylor (2000b)
Age at first breeding	6 to 7 years*	Schreiber & Burger (2001)
Survival	more than 94%*	Marchant & Higgins (1990)

(a) Without colonies



(b) With colonies

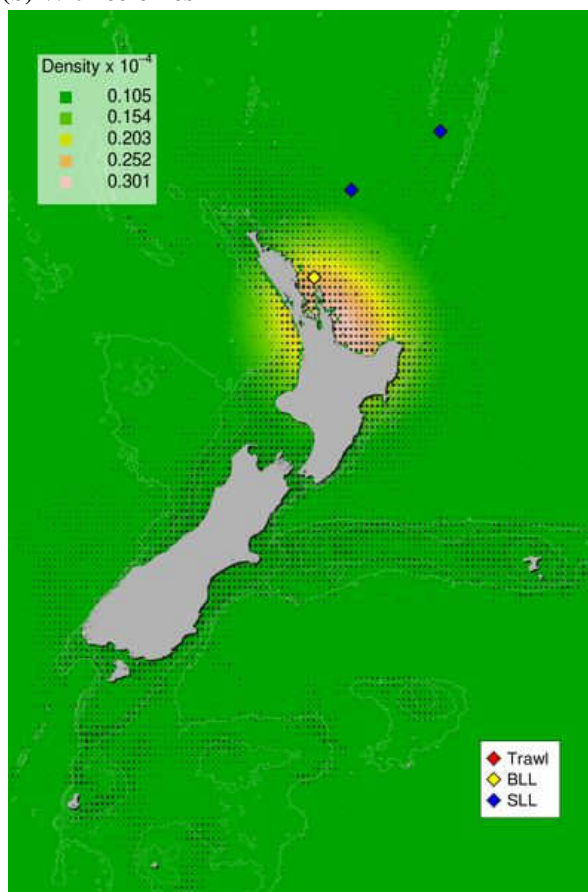
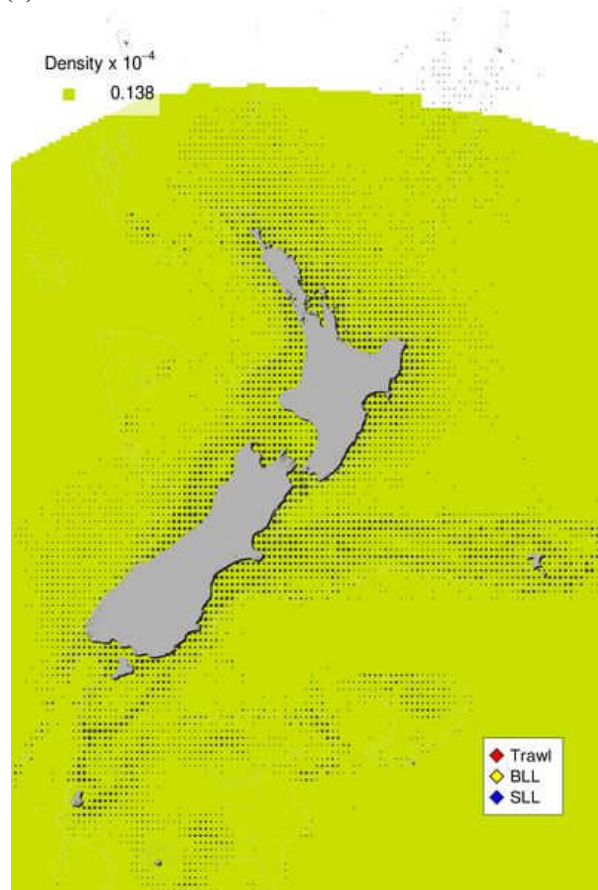


Figure D-21: Captures and relative density of Great-winged petrel (*Pterodroma macroptera*). The base map for the distribution was obtained from the NABIS database.

D.22 White-headed petrel (*Pterodroma lessonii*)

Population (NZ)	200 000 pairs*	Brooke & Cox (2004)
Population (World)	600 000 individuals [2009]	Birdlife (2009)
Age at first breeding	5.5 years*	Schreiber & Burger (2001)
Survival	more than 94%*	<i>Pterodroma macroptera</i> as proxy, Marchant & Higgins (1990)

(a) Without colonies



(b) With colonies

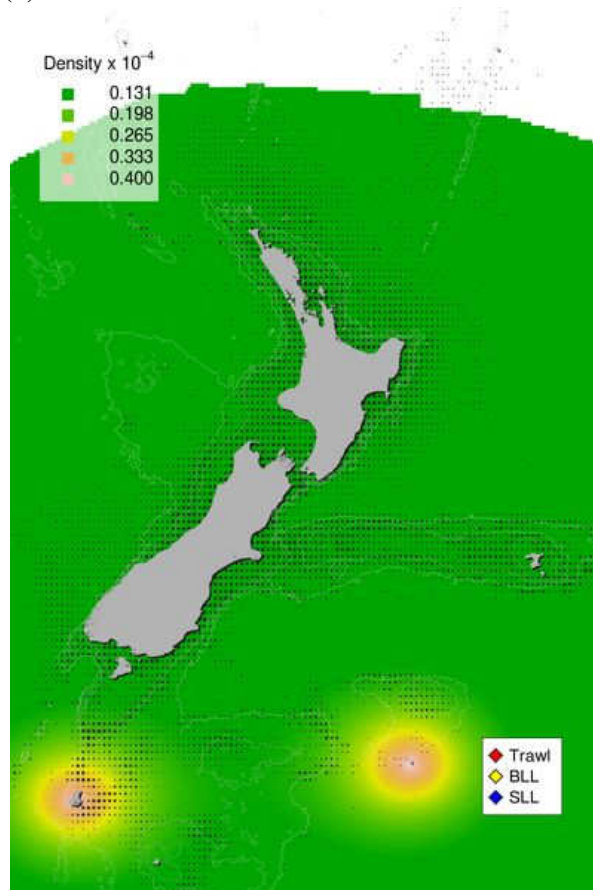


Figure D-22: Captures and relative density of White-headed petrel (*Pterodroma lessonii*). The distribution base map was obtained from BirdLife single-layer range maps.

D.23 Magenta petrel (*Pterodroma magentae*)

Population (NZ)	120 to 150 individuals [2006]*	Birdlife (2009)
Age at first breeding	6 to 7 years*	<i>Pterodroma macroptera</i> as proxy, Schreiber & Burger (2001)
Survival	more than 94%*	<i>Pterodroma macroptera</i> as proxy, Marchant & Higgins (1990)

(a) Without colonies



(b) With colonies

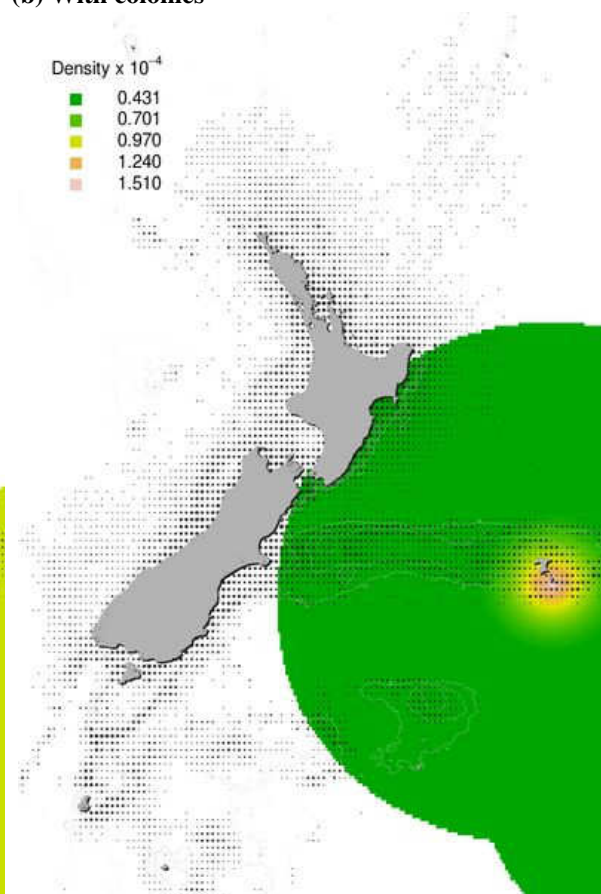


Figure D-23: Captures and relative density of Magenta petrel (*Pterodroma magentae*). The distribution base map was obtained from BirdLife single-layer range maps.

D.24 Kermadec petrel (*Pterodroma neglecta*)

Population (NZ) 5000 to 7000 pairs*

Taylor (2000b)

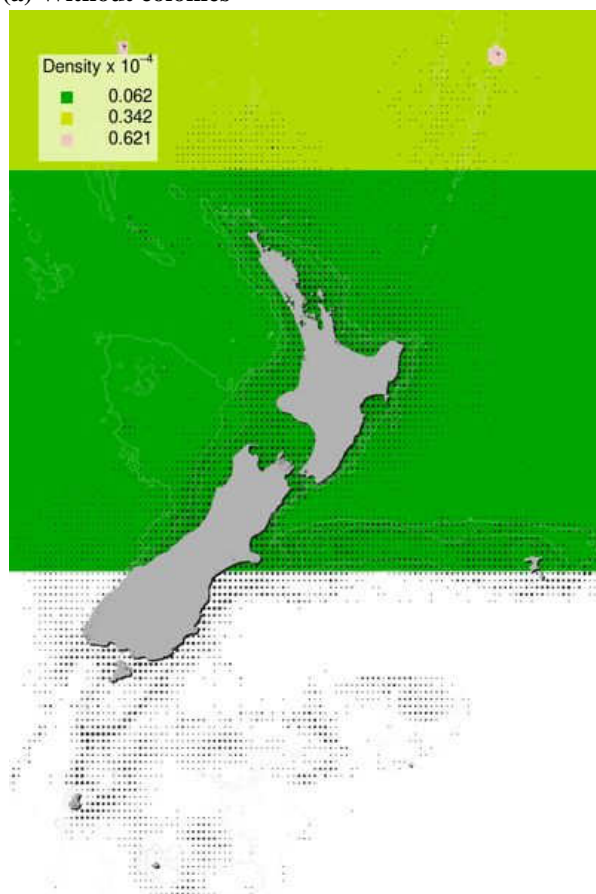
Age at first breeding 6 to 7 years*

Pterodroma macroptera as proxy, Schreiber & Burger (2001)

Survival more than 94%*

Pterodroma macroptera as proxy, Marchant & Higgins (1990)

(a) Without colonies



(b) With colonies

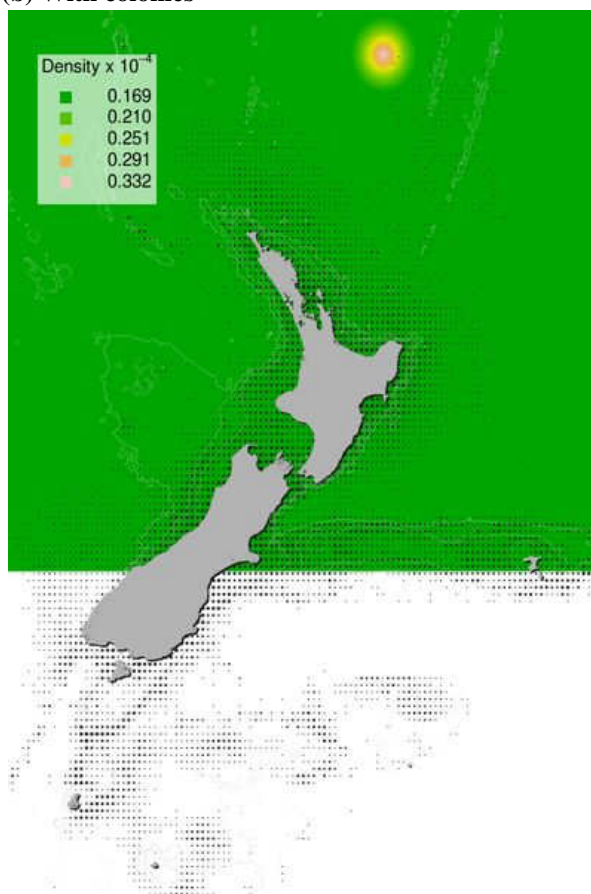


Figure D-24: Captures and relative density of Kermadec petrel (*Pterodroma neglecta*). The base map for the distribution was obtained from the NABIS database.

D.25 Soft-plumaged petrel (*Pterodroma mollis*)

Population (NZ)	1000 to 9999 pairs*	Taylor (2000b)
Age at first breeding	6 to 7 years*	<i>Pterodroma macroptera</i> as proxy, Schreiber & Burger (2001)
Survival	more than 94%*	<i>Pterodroma macroptera</i> as proxy, Marchant & Higgins (1990)

(a) Without colonies



(b) With colonies

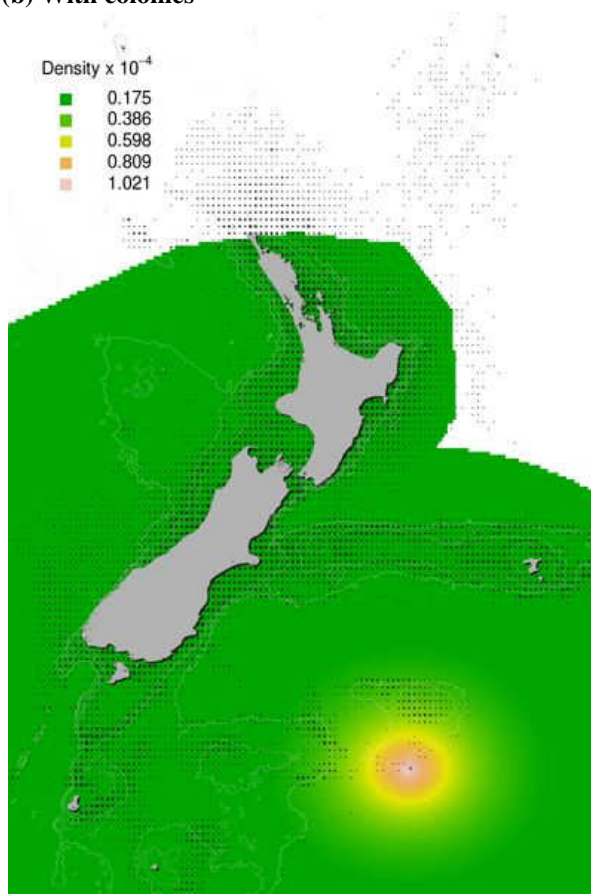
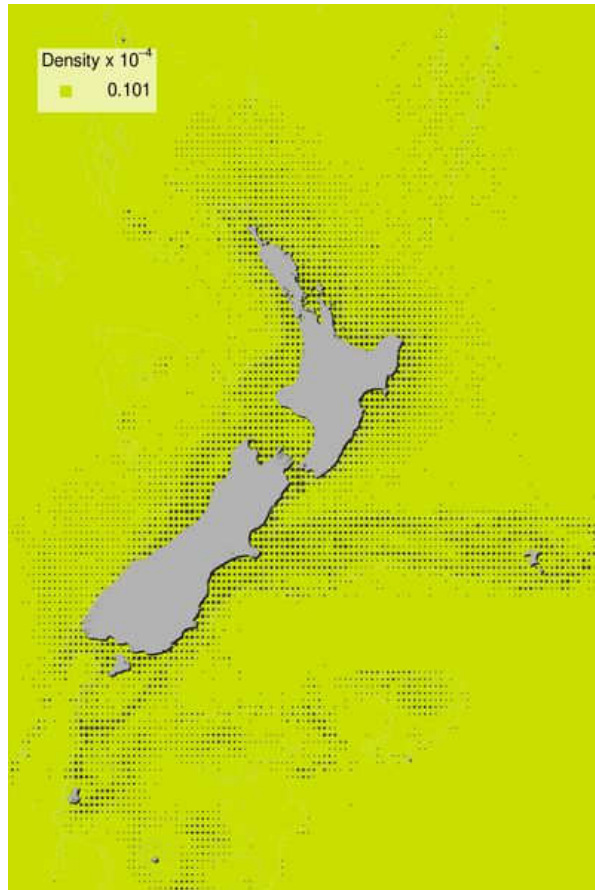


Figure D-25: Captures and relative density of Soft-plumaged petrel (*Pterodroma mollis*). The distribution base map was obtained from BirdLife single-layer range maps.

D.26 Mottled petrel (*Pterodroma inexpectata*)

Population (NZ)	300 000 to 400 000 pairs [1999]* 1 500 000 individuals [2004]	Taylor (2000b) Birdlife (2009)
Age at first breeding	6 to 7 years*	<i>Pterodroma macroptera</i> as proxy, Schreiber & Burger (2001)
Survival	more than 94%*	<i>Pterodroma macroptera</i> as proxy, Marchant & Higgins (1990)

(a) Without colonies



(b) With colonies

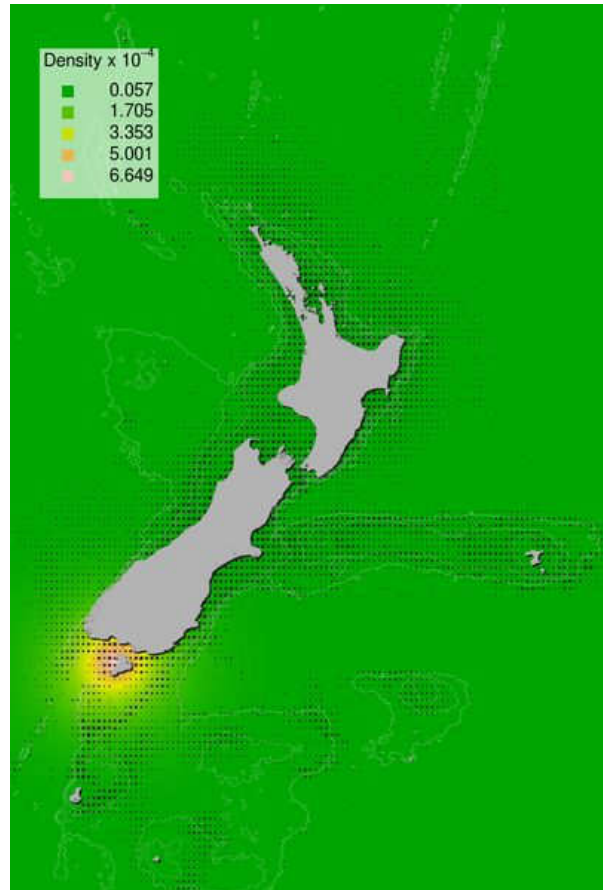
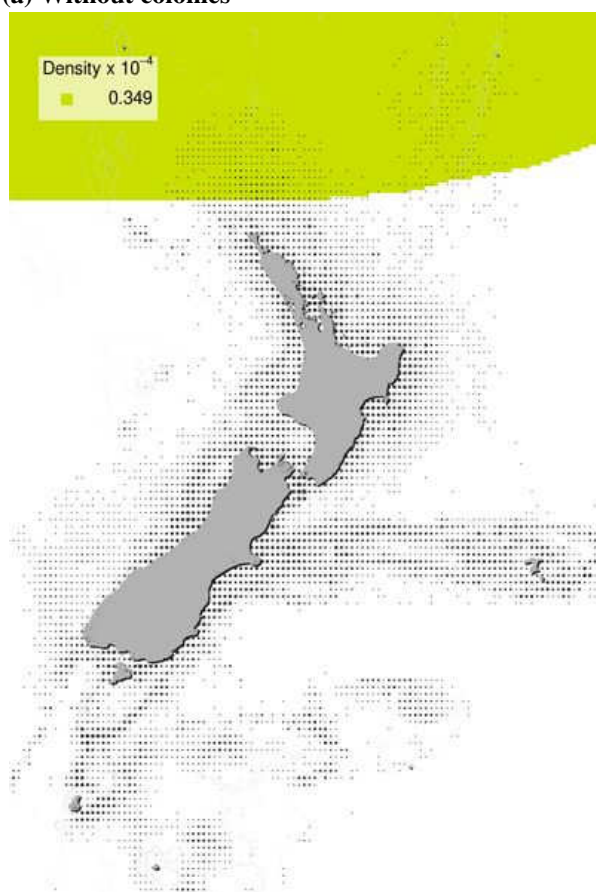


Figure D-26: Captures and relative density of Mottled petrel (*Pterodroma inexpectata*). The distribution base map was obtained from BirdLife single-layer range maps.

D.27 White-necked petrel (*Pterodroma cervicalis*)

Population (NZ)	50 000 pairs [1988]*	Taylor (2000a)
Age at first breeding	6 to 7 years*	<i>Pterodroma macroptera</i> as proxy, Schreiber & Burger (2001)
Survival	more than 94%*	<i>Pterodroma macroptera</i> as proxy, Marchant & Higgins (1990)

(a) Without colonies



(b) With colonies

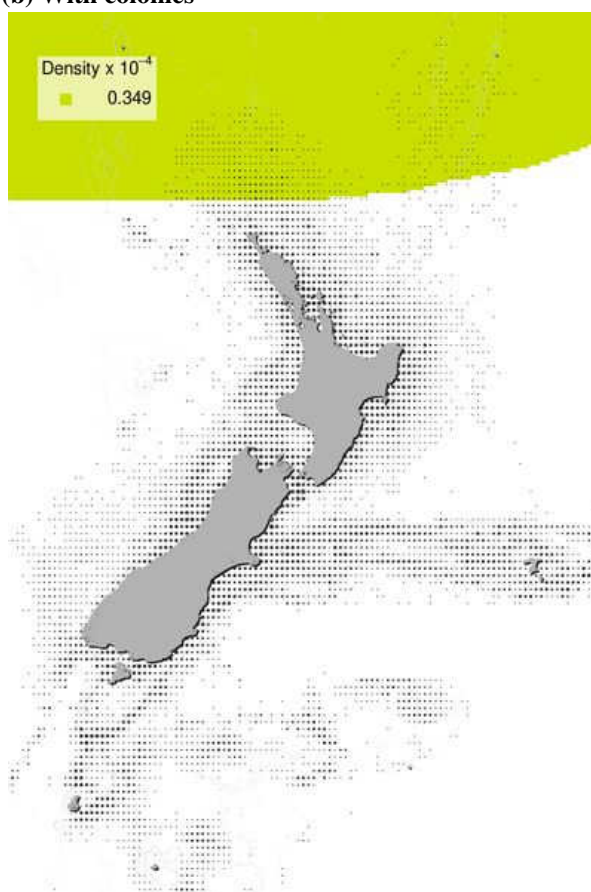


Figure D-27: Captures and relative density of White-necked petrel (*Pterodroma cervicalis*). The distribution base map was obtained from BirdLife single-layer range maps.

D.28 Chatham petrel (*Pterodroma axillaris*)

Population (NZ) 500 individuals [2009]*

Birdlife (2009)

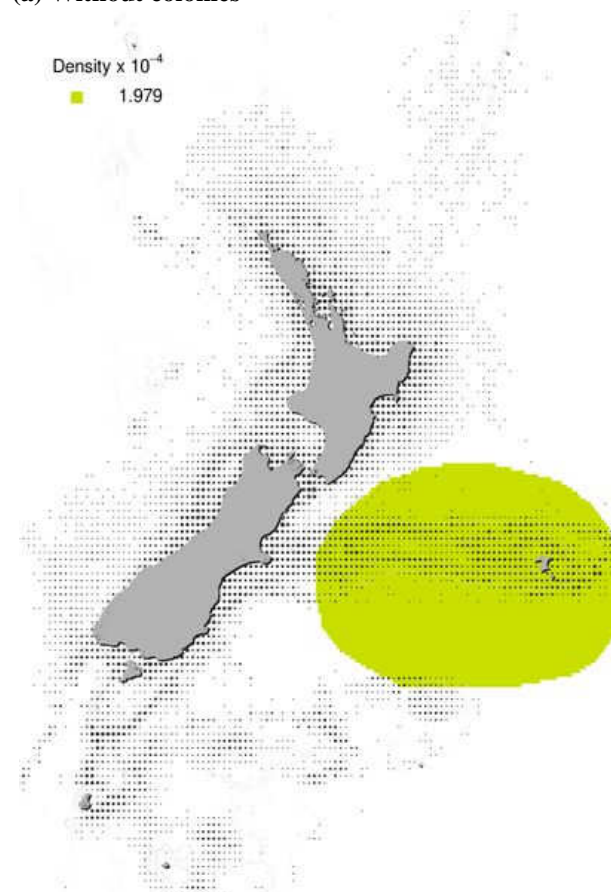
Age at first breeding 6 to 7 years*

Pterodroma macroptera as proxy, Schreiber & Burger (2001)

Survival more than 94%*

Pterodroma macroptera as proxy, Marchant & Higgins (1990)

(a) Without colonies



(b) With colonies

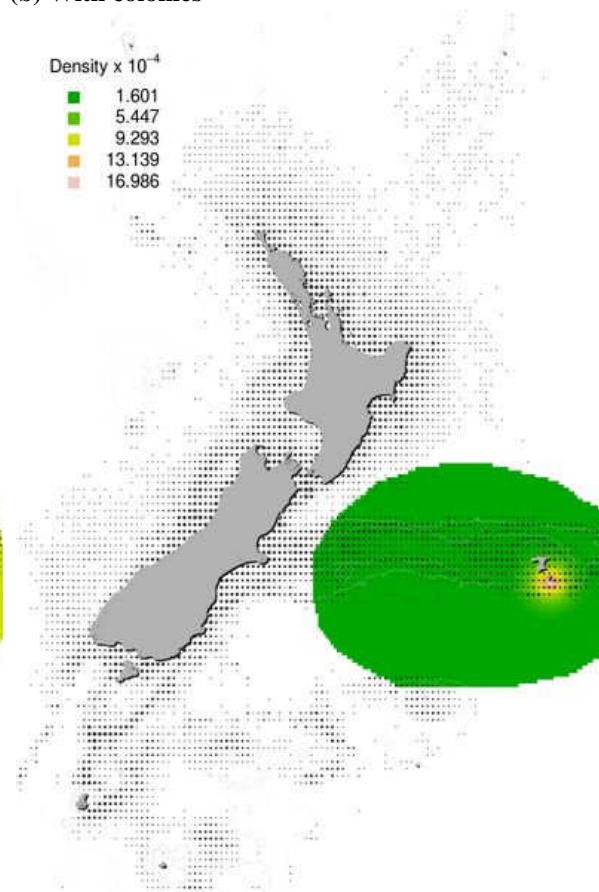
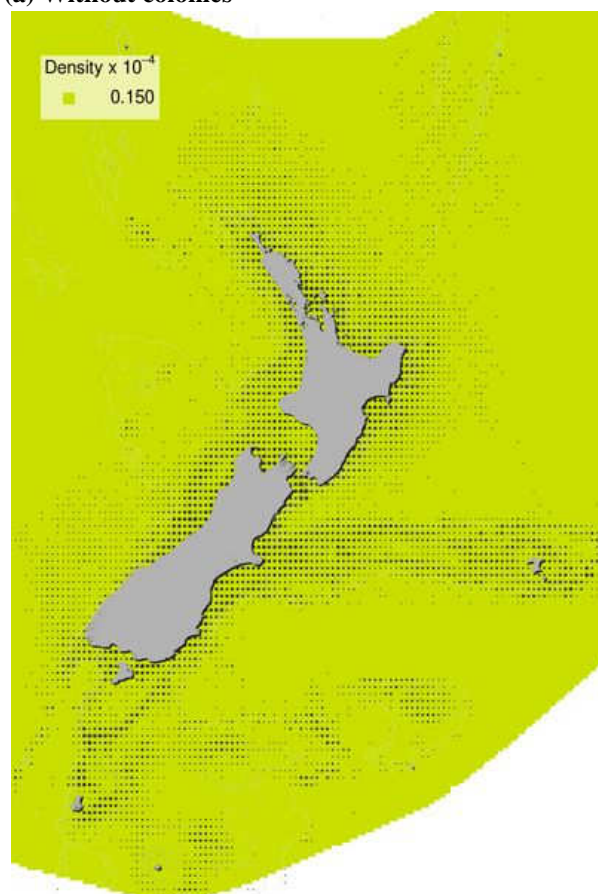


Figure D-28: Captures and relative density of Chatham petrel (*Pterodroma axillaris*). The distribution base map was obtained from BirdLife single-layer range maps.

D.29 Cook's petrel (*Pterodroma cookii*)

Population (NZ)	50 000 to 60 000 pairs*	Taylor (2000a)
Population (World)	1 258 000 individuals [2007]	Birdlife (2009)
Age at first breeding	6 to 7 years*	<i>Pterodroma macroptera</i> as proxy, Schreiber & Burger (2001)
Survival	more than 94%*	<i>Pterodroma macroptera</i> as proxy, Marchant & Higgins (1990)

(a) Without colonies



(b) With colonies

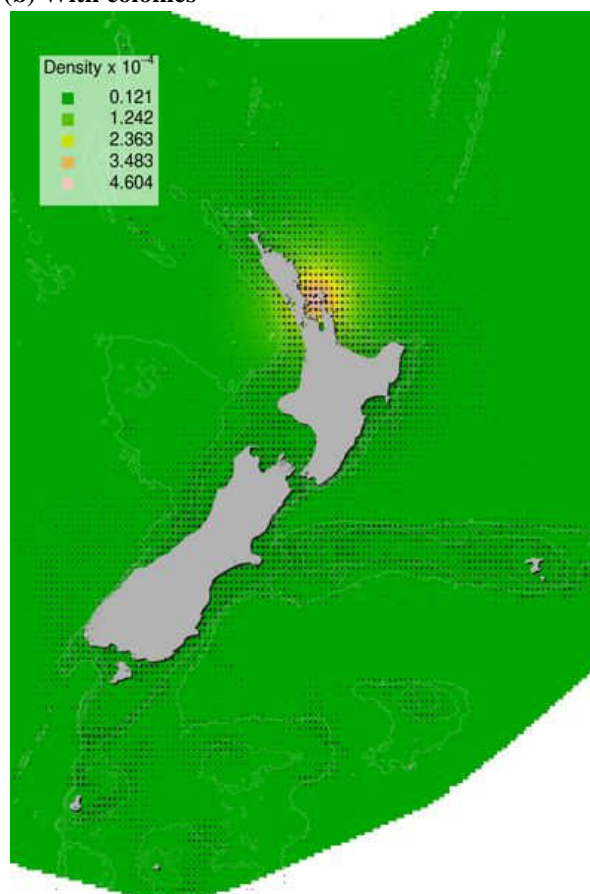
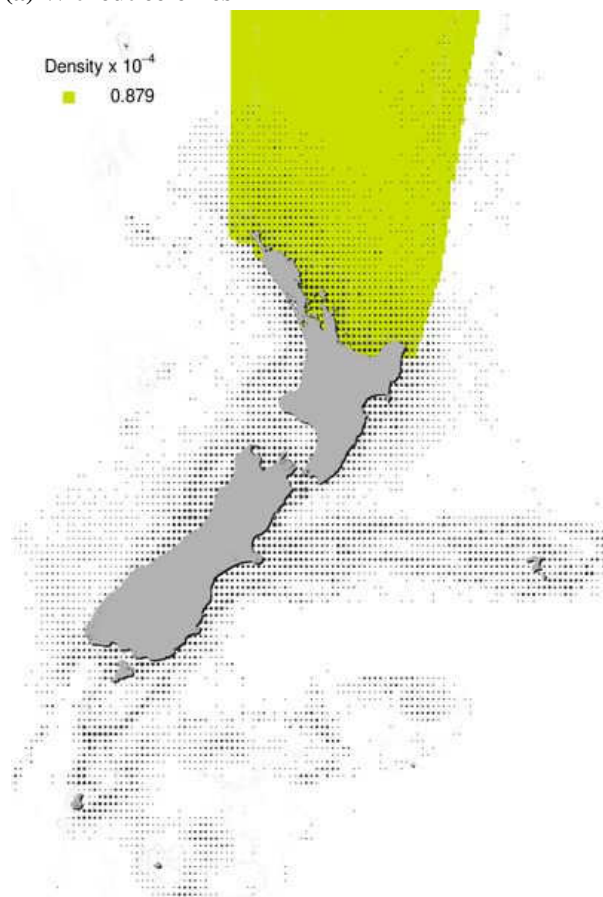


Figure D-29: Captures and relative density of Cook's petrel (*Pterodroma cookii*). The distribution base map was obtained from BirdLife single-layer range maps.

D.30 Pycroft's petrel (*Pterodroma pycrofti*)

Population (NZ)	10 000 to 20 000 individuals [1998]	Taylor (2000a)
	2500 to 4000 pairs [1998]	Taylor (2000a)
	2000 to 3000 pairs [1998]*	Taylor (2000a)
	5000 to 8000 individuals [2000]	Birdlife (2009)
Age at first breeding	6 to 7 years*	<i>Pterodroma macroptera</i> as proxy, Schreiber & Burger (2001)
Survival	more than 94%*	<i>Pterodroma macroptera</i> as proxy, Marchant & Higgins (1990)
	72%	Schreiber & Burger (2001)

(a) Without colonies



(b) With colonies

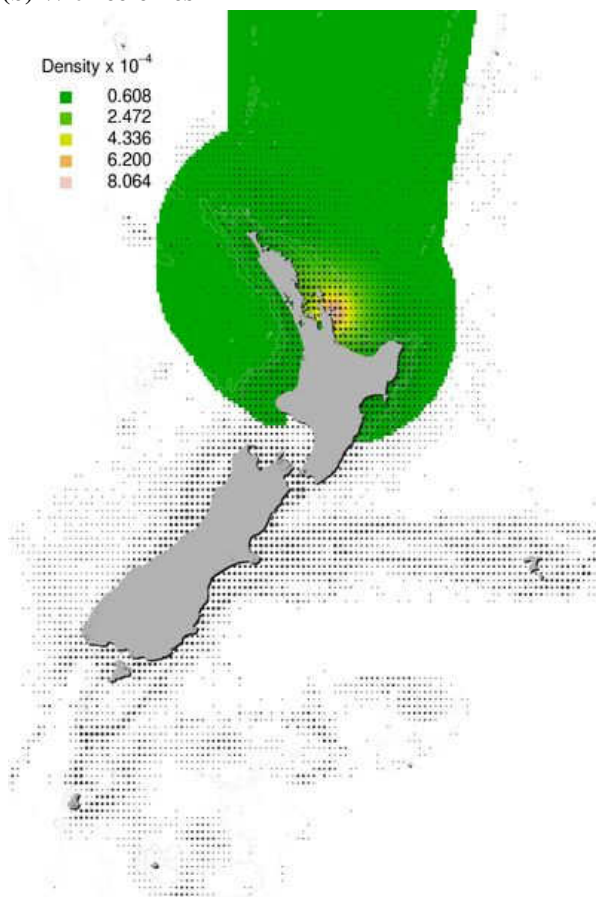


Figure D-30: Captures and relative density of Pycroft's petrel (*Pterodroma pycrofti*). The distribution base map was obtained from BirdLife single-layer range maps.

D.31 Broad-billed prion (*Pachyptila vittata*)

Population (NZ) 1 000 000 pairs*

Age at first breeding 4 to 5 years*

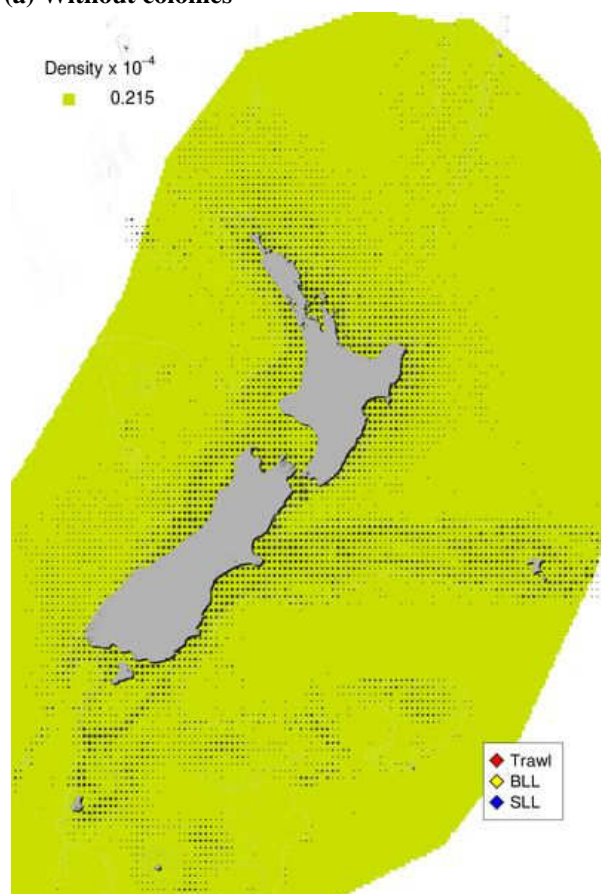
Survival 84%*

Brooke & Cox (2004)

Pachyptila turtur as proxy, Schreiber & Burger (2001)

Pachyptila turtur as proxy, Brooke & Cox (2004)

(a) Without colonies



(b) With colonies

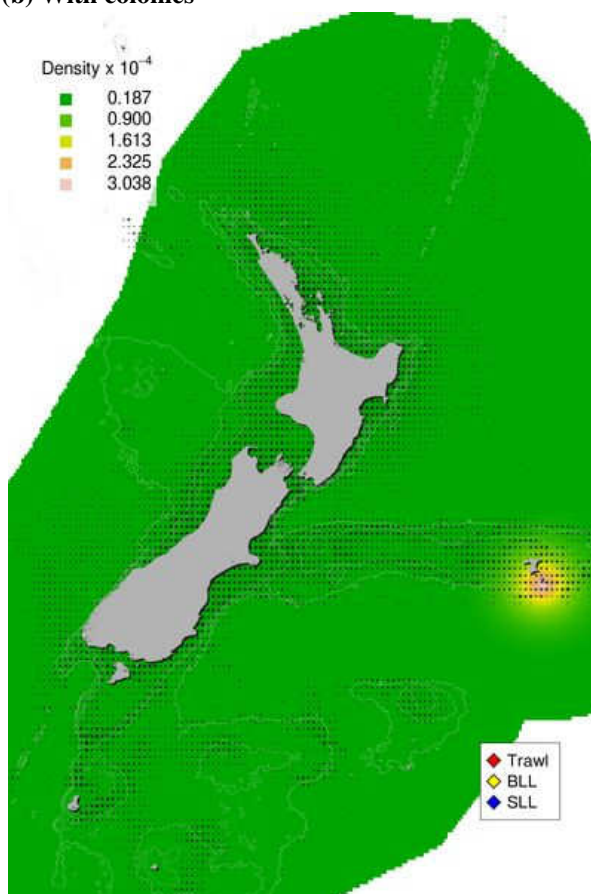


Figure D-31: Captures and relative density of Broad-billed prion (*Pachyptila vittata*). The distribution base map was obtained from BirdLife single-layer range maps.

D.32 Antarctic prion (*Pachyptila desolata*)

Population (NZ)	100 000 to 1 000 000 pairs*	Taylor (2000b)
Age at first breeding	3 to 6 years 5 to 6 years*	Schreiber & Burger (2001) Brooke & Cox (2004)
Survival	84%*	<i>Pachyptila turtur</i> as proxy, Brooke & Cox (2004)

(a) Without colonies



(b) With colonies

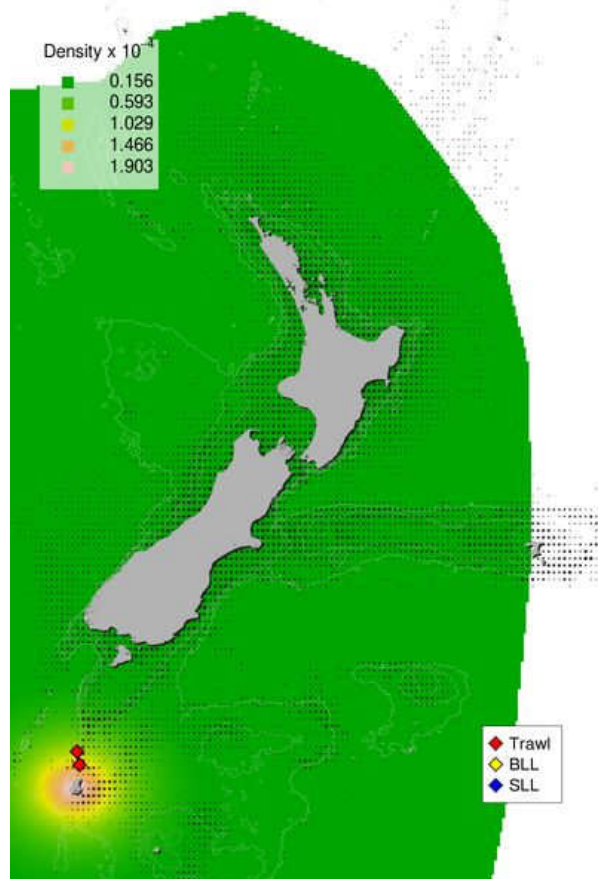
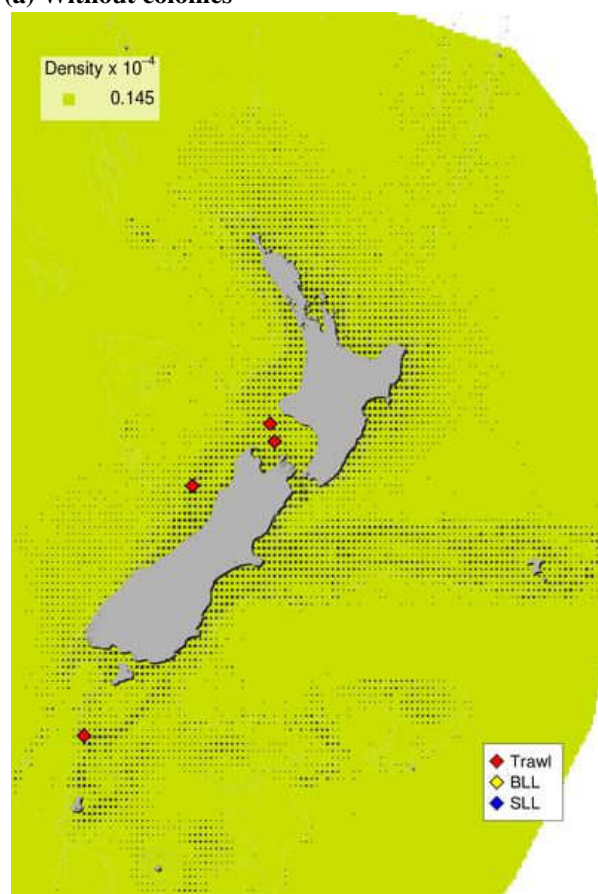


Figure D-32: Captures and relative density of Antarctic prion (*Pachyptila desolata*). The distribution base map was obtained from BirdLife single-layer range maps.

D.33 Fairy prion (*Pachyptila turtur*)

Population (NZ)	more than 1 000 000 individuals more than 1 000 000 pairs*	Marchant & Higgins (1990) Taylor (2000b)
Age at first breeding	4 to 5 years*	Schreiber & Burger (2001)
Survival	84%*	Brooke & Cox (2004)

(a) Without colonies



(b) With colonies

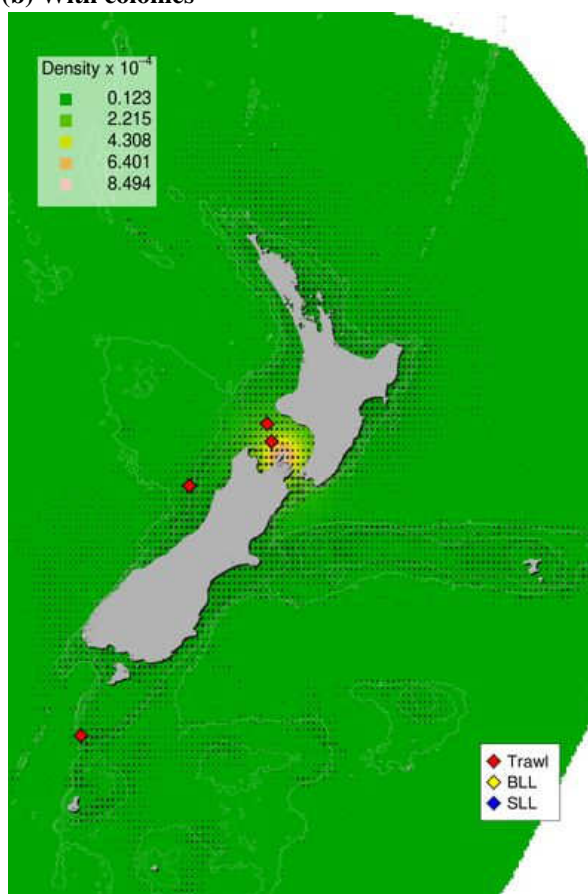
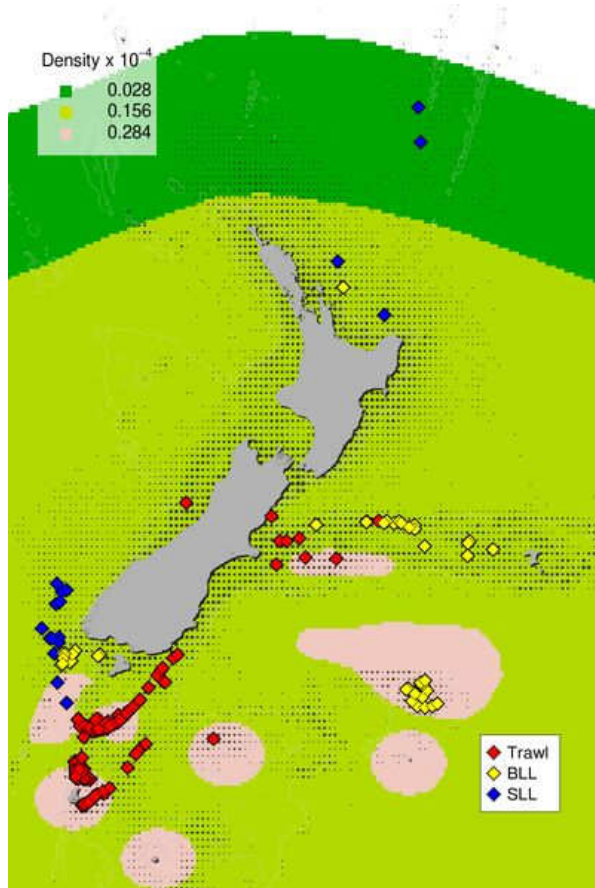


Figure D-33: Captures and relative density of Fairy prion (*Pachyptila turtur*). The distribution base map was obtained from BirdLife single-layer range maps.

D.34 White-chinned petrel (*Procellaria aequinoctialis*)

Population (NZ)	more than 210 000 pairs*	Taylor (2000a)
Age at first breeding	6.5 years*	Schreiber & Burger (2001)
Survival	90 to 97%*	Dillingham & Fletcher (2008)

(a) Without colonies



(b) With colonies

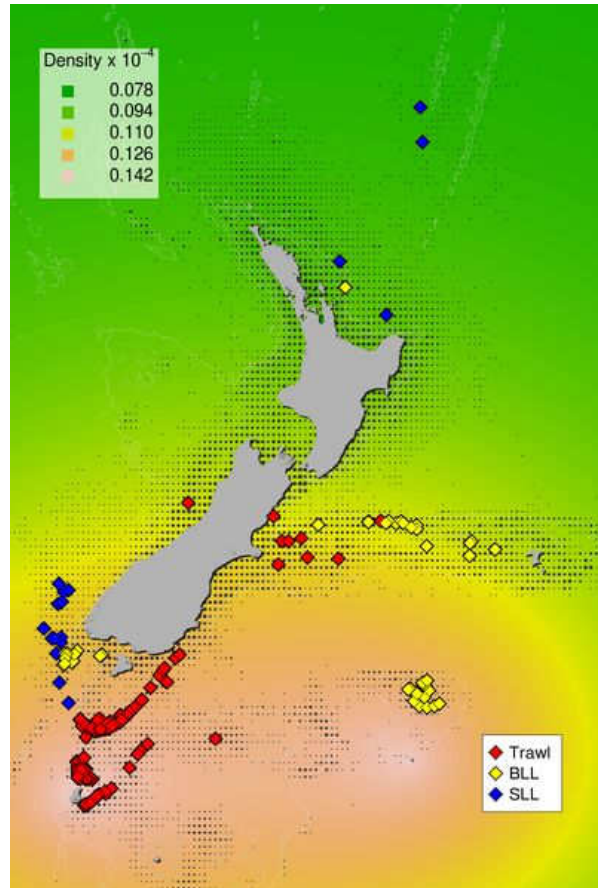
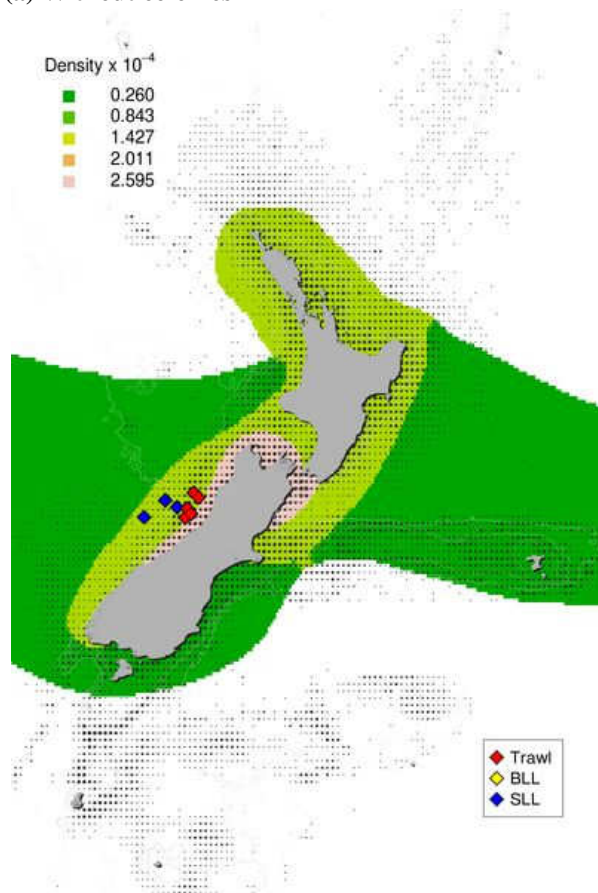


Figure D-34: Captures and relative density of White-chinned petrel (*Procellaria aequinoctialis*). The base map for the distribution was obtained from the NABIS database.

D.35 Westland petrel (*Procellaria westlandica*)

Population (NZ)	20 000 individuals [2004] 4000 pairs [2008]*	Birdlife (2009) ACAP (2010)
Age at first breeding	12 years 14 years 6.5 (5 – 10) years*	Schreiber & Burger (2001) Brooke & Cox (2004) Waugh et al. (2006)
Survival	88.4 to 93.3%* 73 ± 17% 96.5 ± 3.8% 96.5 ± 3.8% [2003] 72.6 ± 17.3% [2003]	Brooke & Cox (2004) Waugh et al. (2006) Waugh et al. (2006) ACAP (2010) ACAP (2010)

(a) Without colonies



(b) With colonies

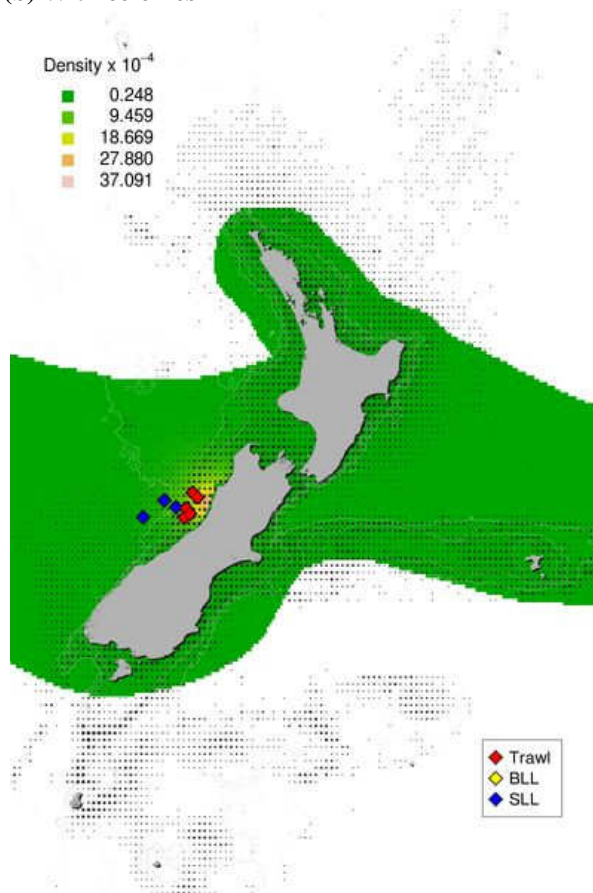
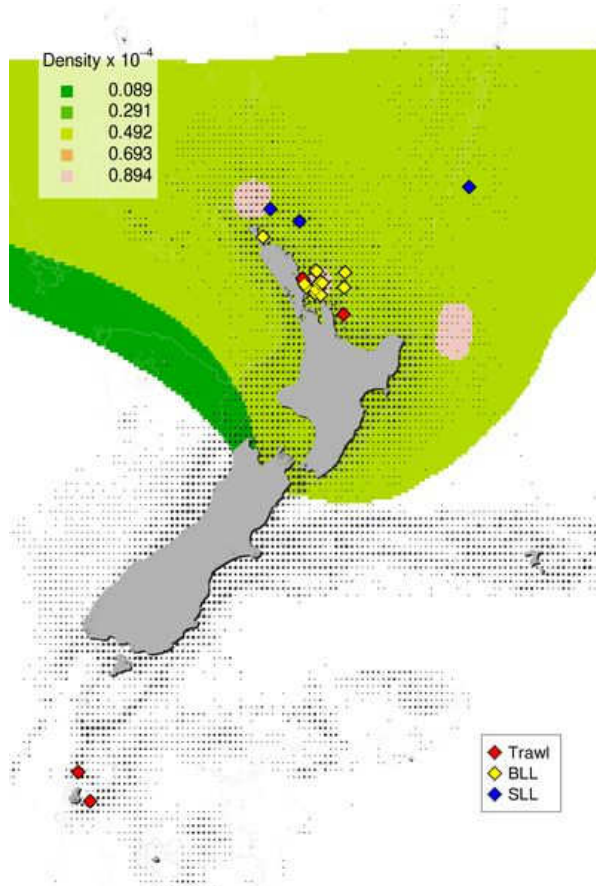


Figure D-35: Captures and relative density of Westland petrel (*Procellaria westlandica*). The base map for the distribution was obtained from the NABIS database.

D.36 Black petrel (*Procellaria parkinsoni*)

Population (NZ)	10 000 individuals [2000] 1750 pairs [2005]*	Birdlife (2009) ACAP (2010)
Age at first breeding	6 to 8 years 7.8 to 8.5 years 7.3 (6.9 – 8) years 6.7 (4 – 10) years 5 to 6 years [2000] 5 (more than 3) years [2005] 6.6 ± 0.2 years*	Schreiber & Burger (2001) Brooke & Cox (2004) Fletcher et al. (2008) Francis & Bell (2010) Bell & Sim (2003) Bell et al. (2009a) Bell et al. (2009b)
Survival	88% 94% 77.9% [2005] 79.23% [2005] 90.32 ± 2% [2007]* 89 (78 – 95)% [2007]	Brooke & Cox (2004) Schreiber & Burger (2001) ACAP (2010) Bell et al. (2009a) Bell et al. (2009b) Francis & Bell (2010)

(a) Without colonies



(b) With colonies

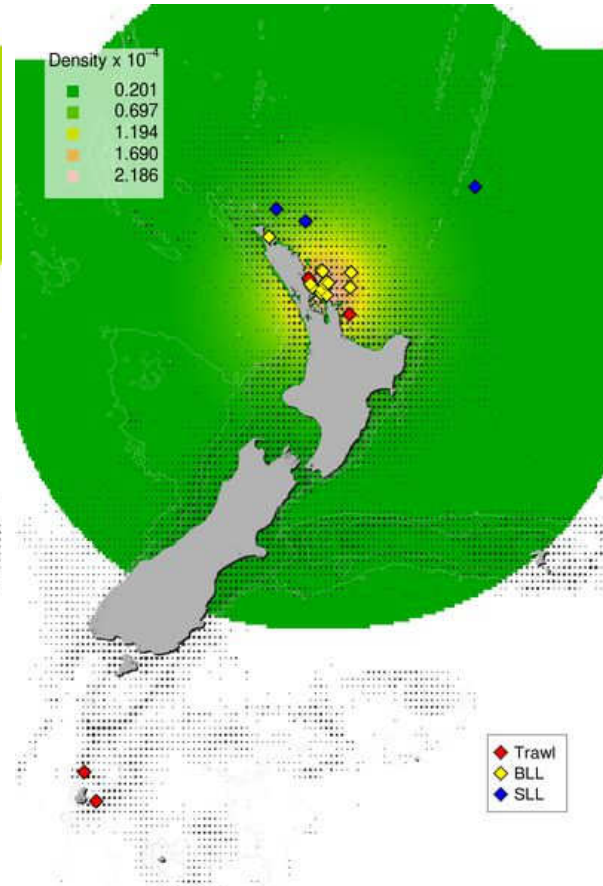


Figure D-36: Captures and relative density of Black petrel (*Procellaria parkinsoni*). The base map for the distribution was obtained from the NABIS database.

D.37 Grey petrel (*Procellaria cinerea*)

Population (NZ) 10 000 to 50 000 pairs
32 000 to 73 000 pairs [2001]*

Taylor (2000a)

Bell (2002)

Age at first breeding 7 years*

Barbraud et al. (2009)

Survival 90 to 97%*

Procellaria aequinoctialis as proxy, Dillingham & Fletcher (2008)

(a) Without colonies



(b) With colonies

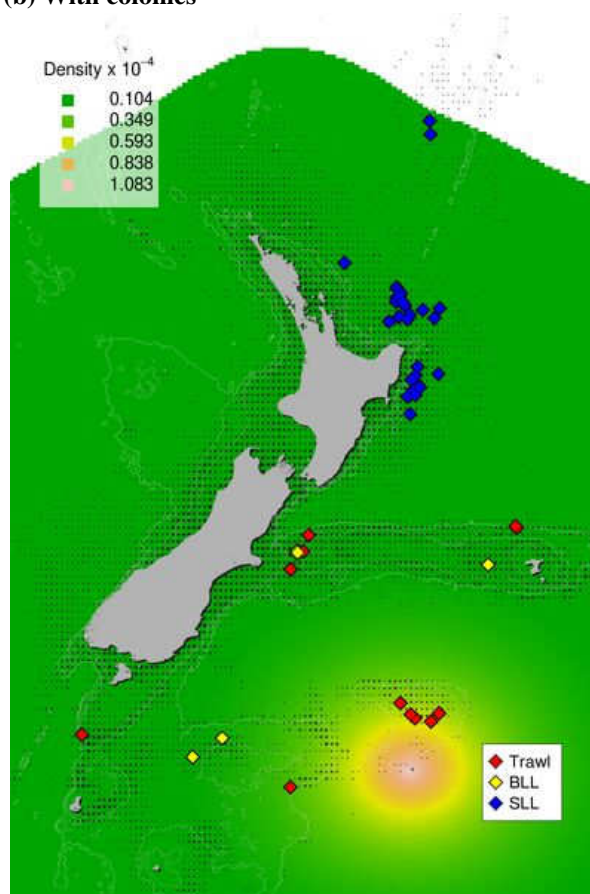
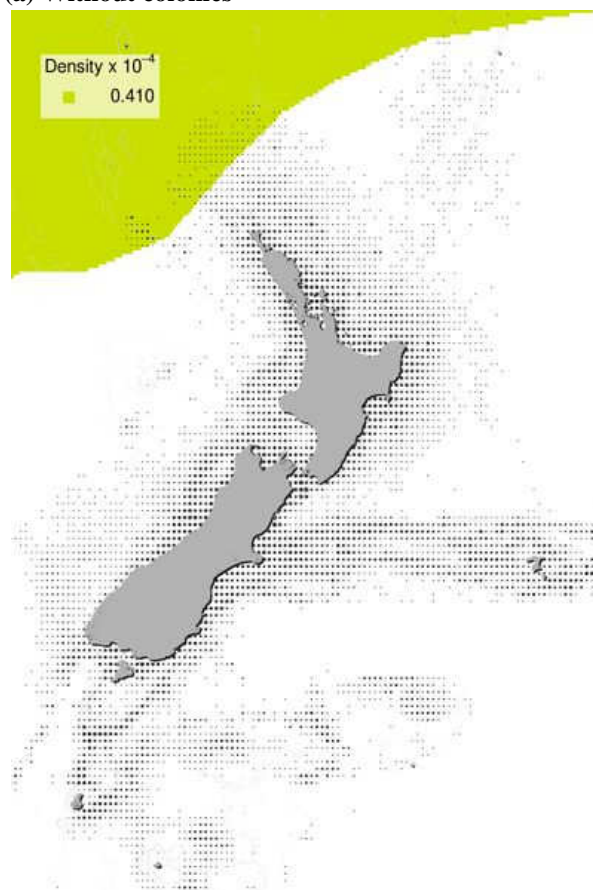


Figure D-37: Captures and relative density of Grey petrel (*Procellaria cinerea*). The base map for the distribution was obtained from the NABIS database.

D.38 Wedge-tailed shearwater (*Puffinus pacificus*)

Population (NZ)	52 500 to 60 000 pairs*	Taylor (2000b)
Age at first breeding	4 years*	Schreiber & Burger (2001)
Survival	93.1 (88.9 – 95.8)% [1999]*	<i>Puffinus huttoni</i> as proxy, Cuthbert & Davis (2002)

(a) Without colonies



(b) With colonies

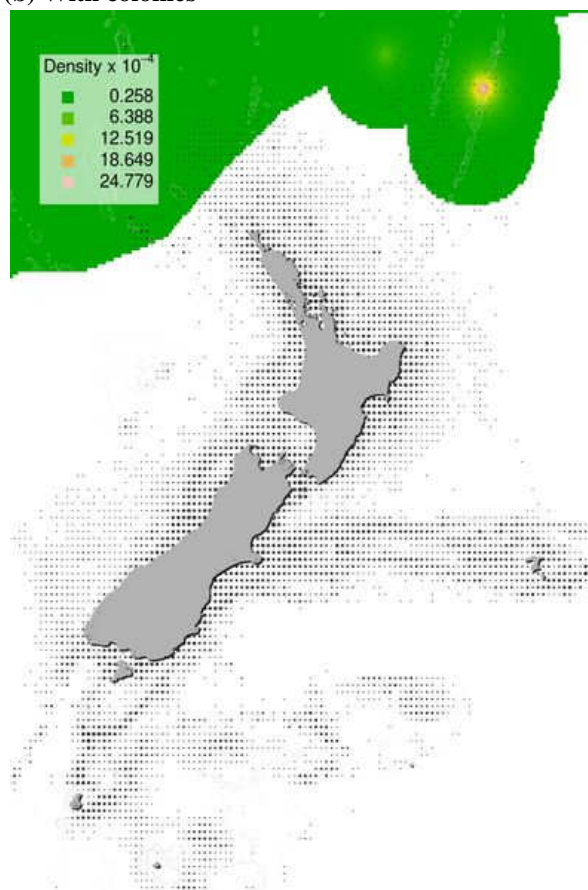


Figure D-38: Captures and relative density of Wedge-tailed shearwater (*Puffinus pacificus*). The distribution base map was obtained from BirdLife single-layer range maps.

D.39 Buller's shearwater (*Puffinus bulleri*)

Population (NZ) 2 500 000 individuals
200 000 pairs*

Age at first breeding 4 to 9 years [1973]*

Survival 92%*

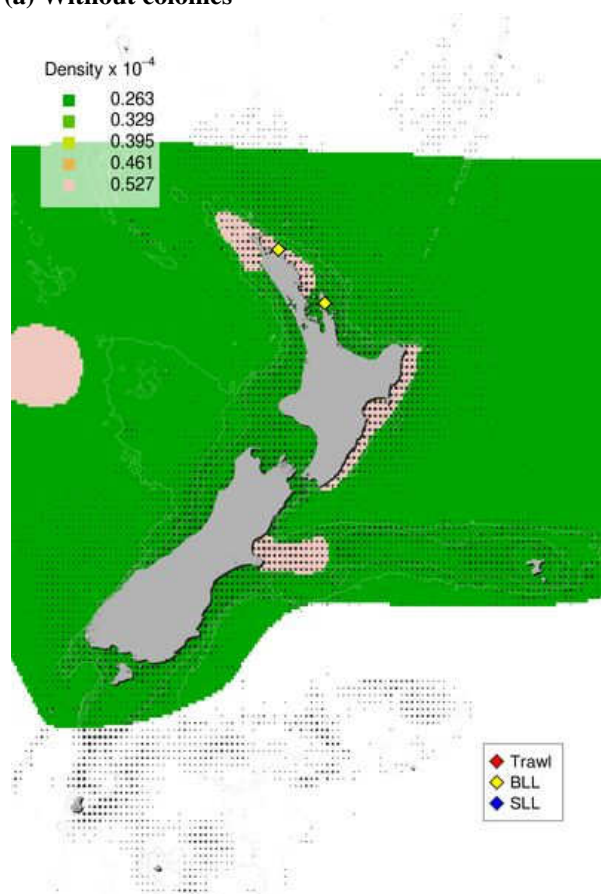
Brooke & Cox (2004)

Brooke & Cox (2004)

Bradley et al. (1999)

Short-tailed shearwater as proxy, Brooke & Cox (2004)

(a) Without colonies



(b) With colonies

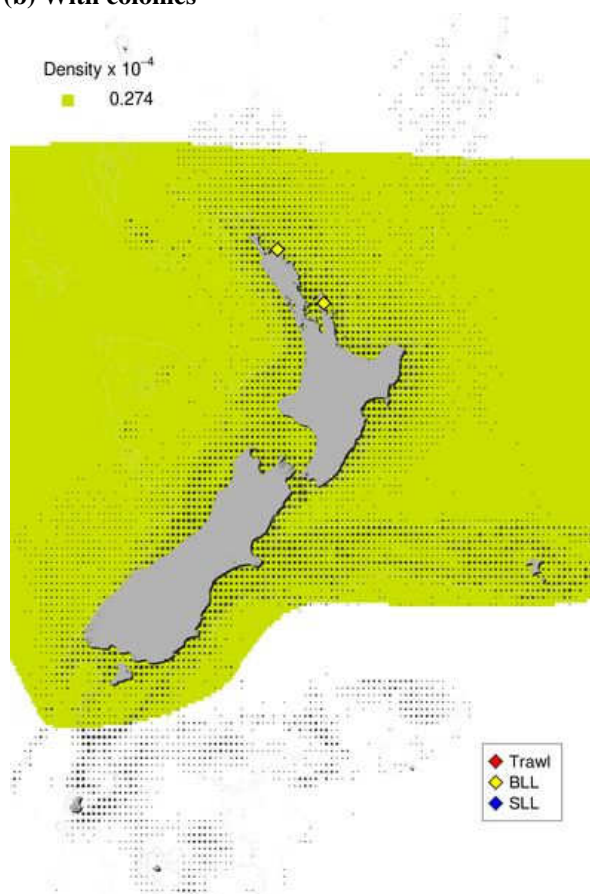


Figure D-39: Captures and relative density of Buller's shearwater (*Puffinus bulleri*). The base map for the distribution was obtained from the NABIS database.

D.40 Flesh-footed shearwater (*Puffinus carneipes*)

Population (NZ)	25 000 to 50 000 pairs 6689 to 10 540 pairs [2010]*	Taylor (2000b)
Age at first breeding	4 to 9 years [1973]*	Bradley et al. (1999)
Survival	92%*	Short-tailed shearwater as proxy, Brooke & Cox (2004)

(a) Without colonies



(b) With colonies

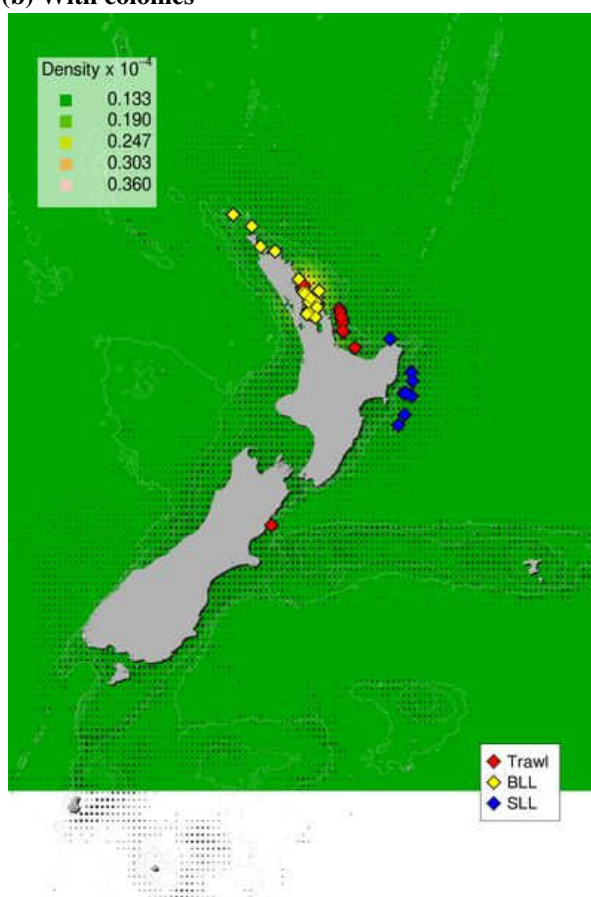


Figure D-40: Captures and relative density of Flesh-footed shearwater (*Puffinus carneipes*). The base map for the distribution was obtained from the NABIS database.

D.41 Sooty shearwater (*Puffinus griseus*)

Population (NZ)	5 000 000 pairs*	Taylor (2000b)
Age at first breeding	5 to 7 years* 7.9 years	Brooke & Cox (2004) Short-tailed shearwater as proxy, Newman et al. (2009)
Survival	87.2 ± 3.5% [1954]* 91.7 (86 – 97.3)% [2005]* 95.2 (89.6 – 97.9)% [2005]* 93 (92 – 94)%*	Scofield et al. (2001) Clucas et al. (2008) Clucas et al. (2008) Brooke & Cox (2004)

(a) Without colonies



(b) With colonies

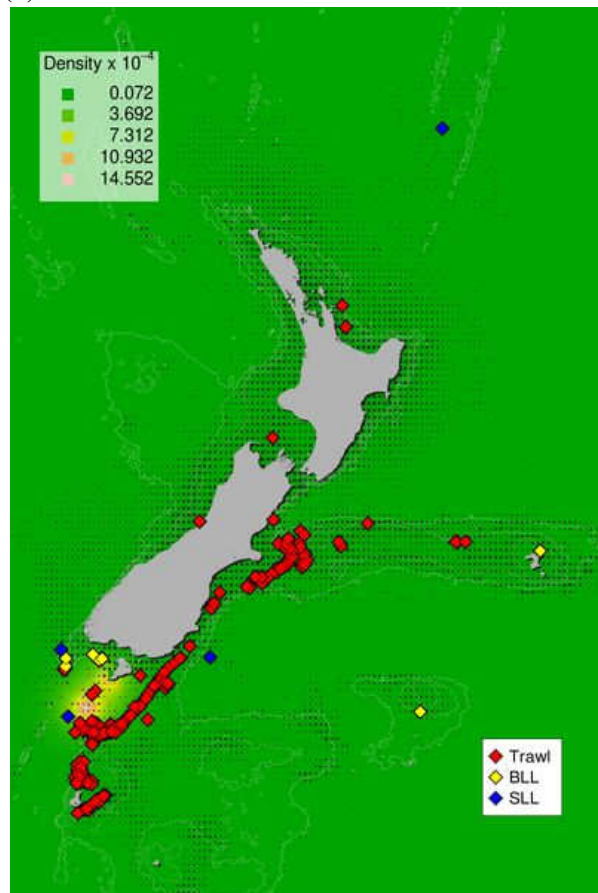
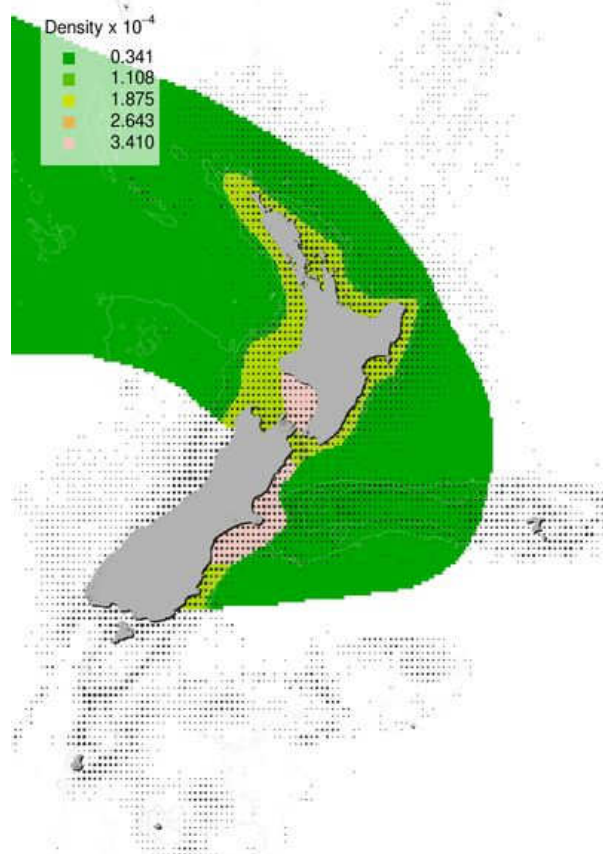


Figure D-41: Captures and relative density of Sooty shearwater (*Puffinus griseus*). The base map for the distribution was obtained from the NABIS database.

D.42 Hutton's shearwater (*Puffinus huttoni*)

Population (NZ)	94 000 pairs*	Taylor (2000a)
	300 000 to 350 000 individuals [2004]	Brooke & Cox (2004)
	460 000 individuals [2007]	Department of Conservation (2010)
Age at first breeding	4 to 6 years*	Waugh et al. (1999)
Survival	93.1 (88.9 – 95.8)% [1999]*	Cuthbert & Davis (2002)

(a) Without colonies



(b) With colonies

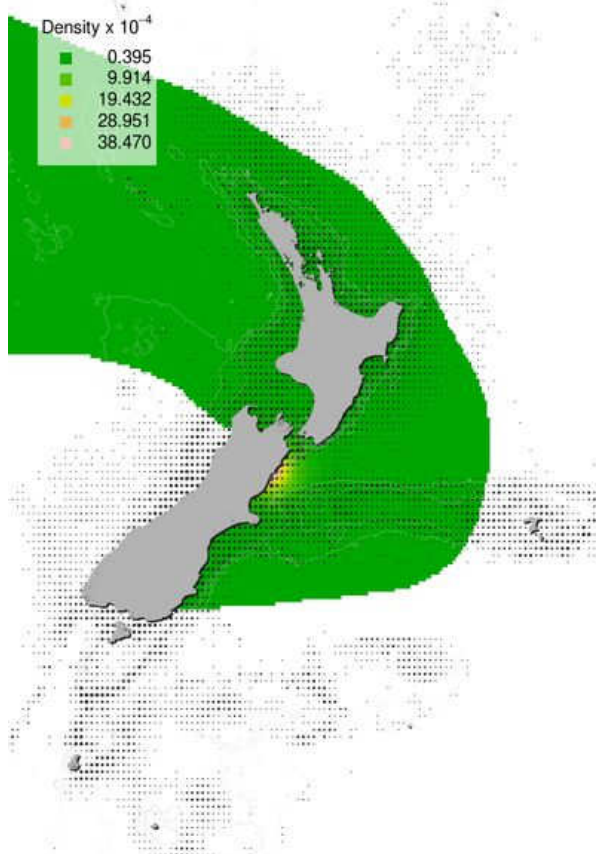
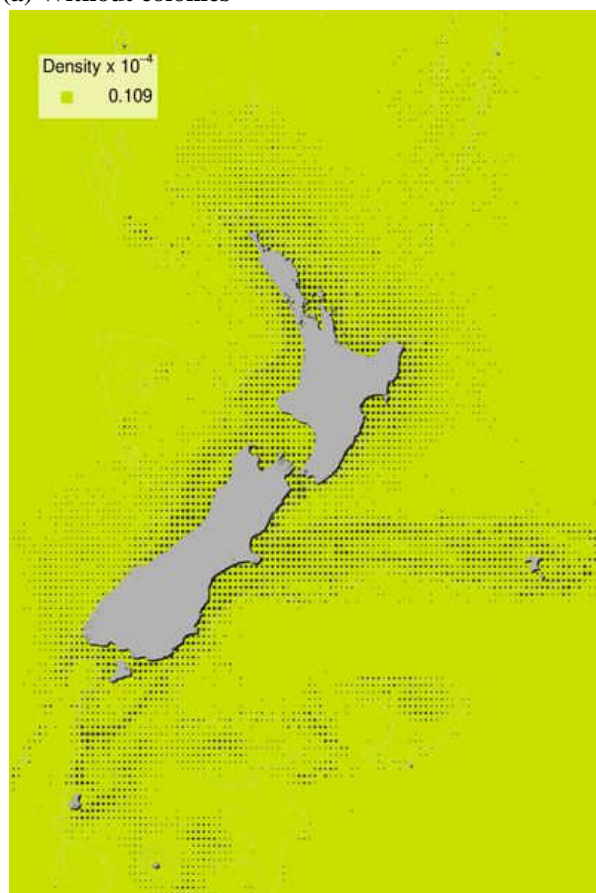


Figure D-42: Captures and relative density of Hutton's shearwater (*Puffinus huttoni*). The base map for the distribution was obtained from the NABIS database.

D.43 Little shearwater (*Puffinus assimilis*)

Population (NZ)	more than 100 000 pairs 100 000 to 220 000 pairs*	Brooke & Cox (2004) Taylor (2000a)
Population (World)	900 000 individuals	Brooke & Cox (2004)
Age at first breeding	4 to 6 years*	<i>Puffinus huttoni</i> as proxy, Waugh et al. (1999)
Survival	93.1 (88.9 – 95.8)% [1999]*	<i>Puffinus huttoni</i> as proxy, Cuthbert & Davis (2002)

(a) Without colonies



(b) With colonies

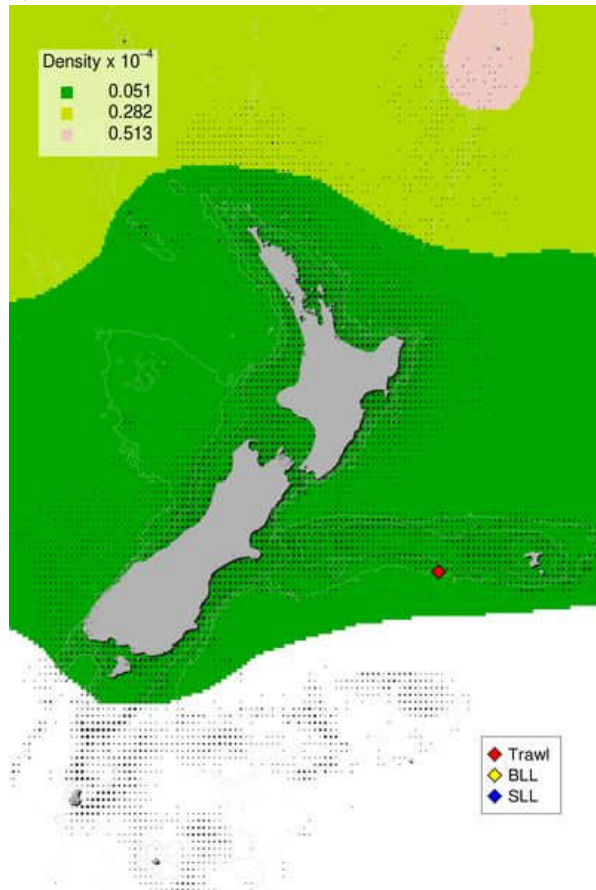


Figure D-43: Captures and relative density of Little shearwater (*Puffinus assimilis*). The distribution base map was obtained from BirdLife single-layer range maps.

D.44 New Zealand white-faced storm petrel (*Pelagodroma marina*)

Population (NZ)	more than 1 000 000 pairs*	Taylor (2000b)
Age at first breeding	4 to 5 years* more than 3 years*	several spp as proxy, Croxall (1987) Brooke & Cox (2004)
Survival	90%*	several spp as proxy, Croxall (1987)

(a) Without colonies



(b) With colonies

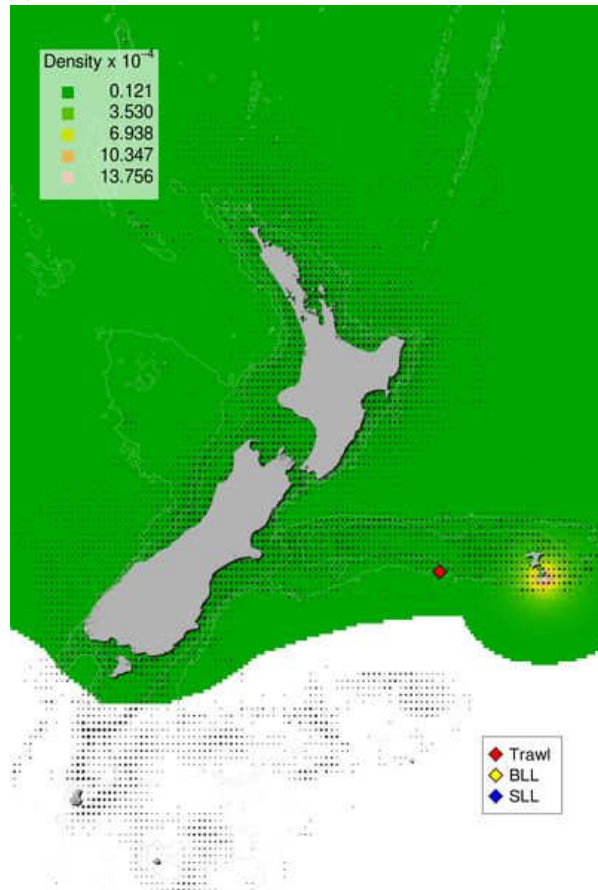
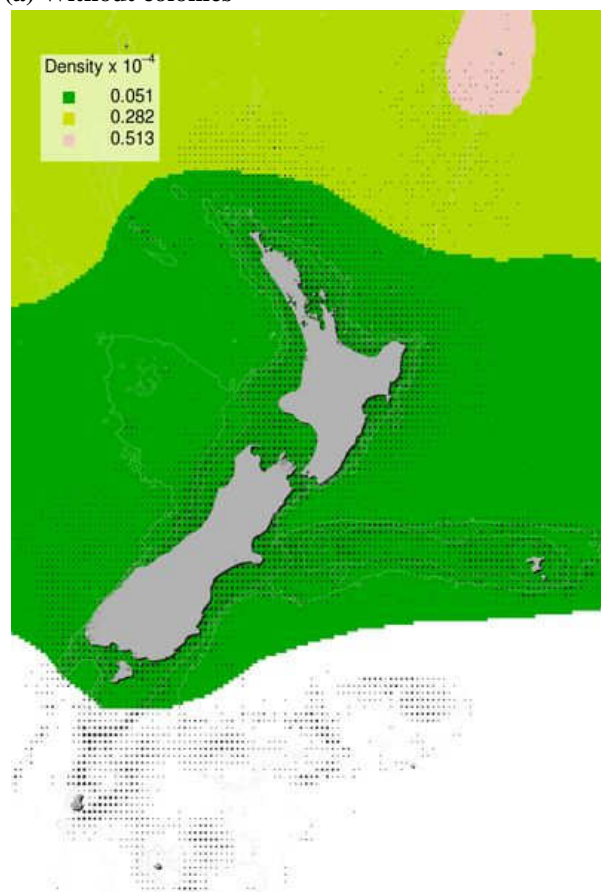


Figure D-44: Captures and relative density of New Zealand white-faced storm petrel (*Pelagodroma marina*). The base map for the distribution was obtained from the NABIS database.

D.45 Kermadec white-faced storm petrel (*Pelagodroma marina albiclunis*)

Population (NZ)	fewer than 100 pairs*	Taylor (2000a)
Age at first breeding	4 to 5 years* more than 3 years*	several spp as proxy, Croxall (1987) Brooke & Cox (2004)
Survival	90%*	several spp as proxy, Croxall (1987)

(a) Without colonies



(b) With colonies

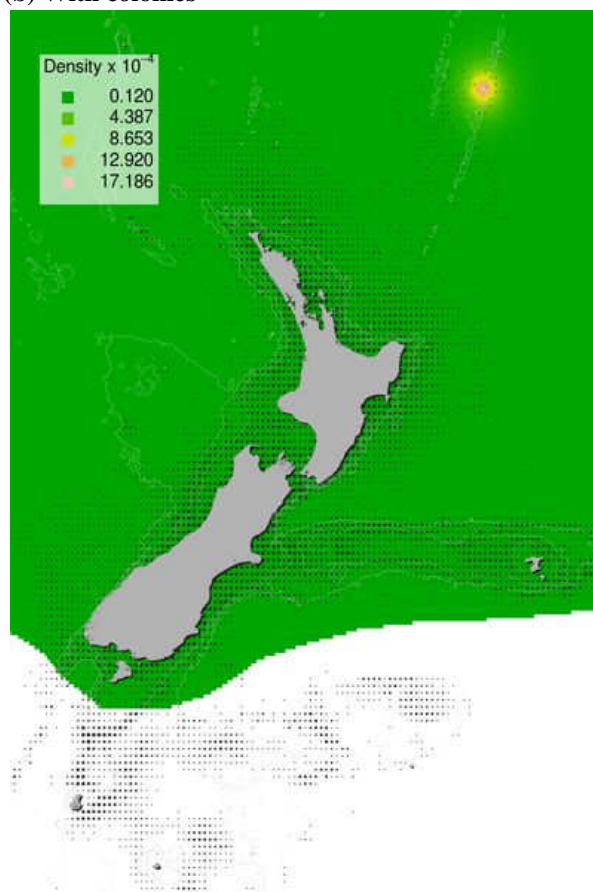


Figure D-45: Captures and relative density of Kermadec white-faced storm petrel (*Pelagodroma marina albiclunis*). The base map for the distribution was obtained from the NABIS database.

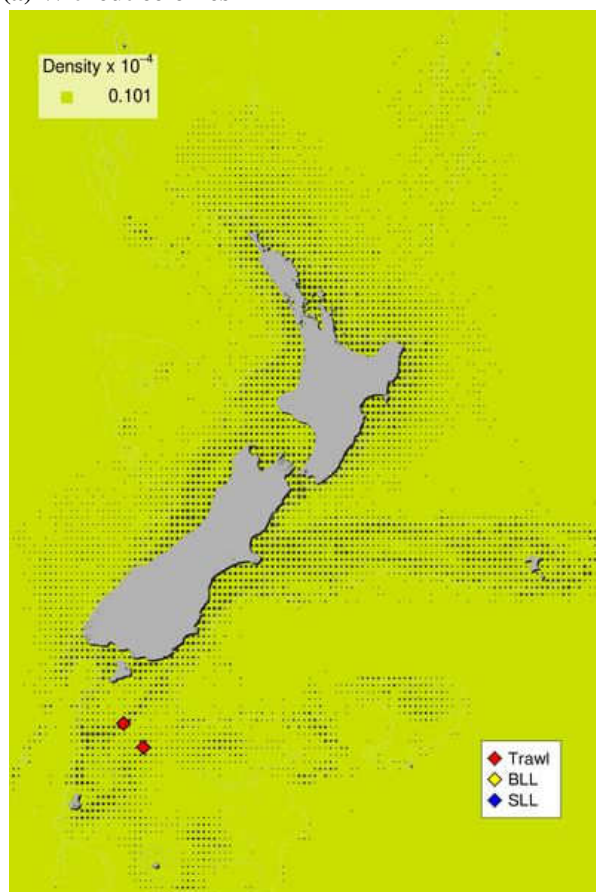
D.46 New Zealand storm petrel (*Oceanites maorianus*)

Population (NZ)	20 to 2000 pairs	
Age at first breeding	4 to 5 years*	several spp as proxy, Croxall (1987)
Survival	90%*	several spp as proxy, Croxall (1987)

D.47 Black-bellied storm petrel (*Fregetta tropica*)

Population (NZ)	50 000 to 100 000 pairs*	Taylor (2000b)
Age at first breeding	4 to 5 years*	several spp as proxy, Croxall (1987)
Survival	90%*	several spp as proxy, Croxall (1987)

(a) Without colonies



(b) With colonies

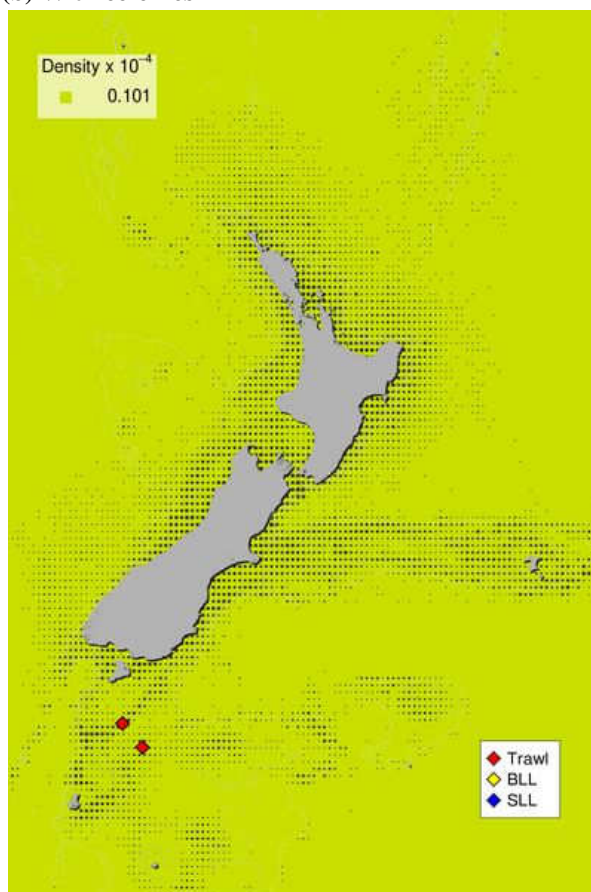
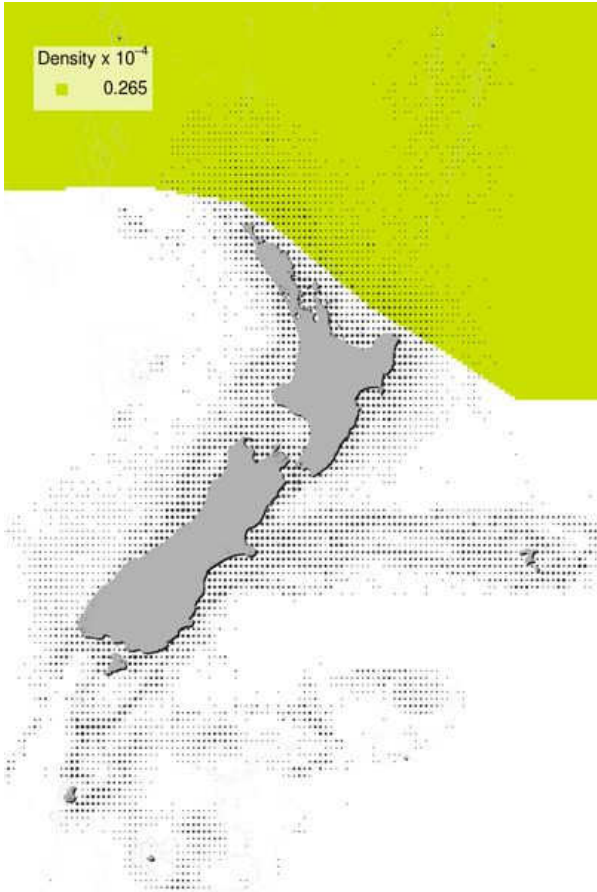


Figure D-46: Captures and relative density of Black-bellied storm petrel (*Fregetta tropica*). The distribution base map was obtained from BirdLife single-layer range maps.

D.48 White-bellied storm petrel (*Fregetta grallaria*)

Population (NZ)	1000 pairs*	Taylor (2000a)
Population (Australasia)	2000 pairs	Taylor (2000a)
Population (World)	100 000 pairs 300 000 individuals	Marchant & Higgins (1990) Marchant & Higgins (1990)
Age at first breeding	4 to 5 years*	several spp as proxy, Croxall (1987)
Survival	90%*	several spp as proxy, Croxall (1987)

(a) Without colonies



(b) With colonies

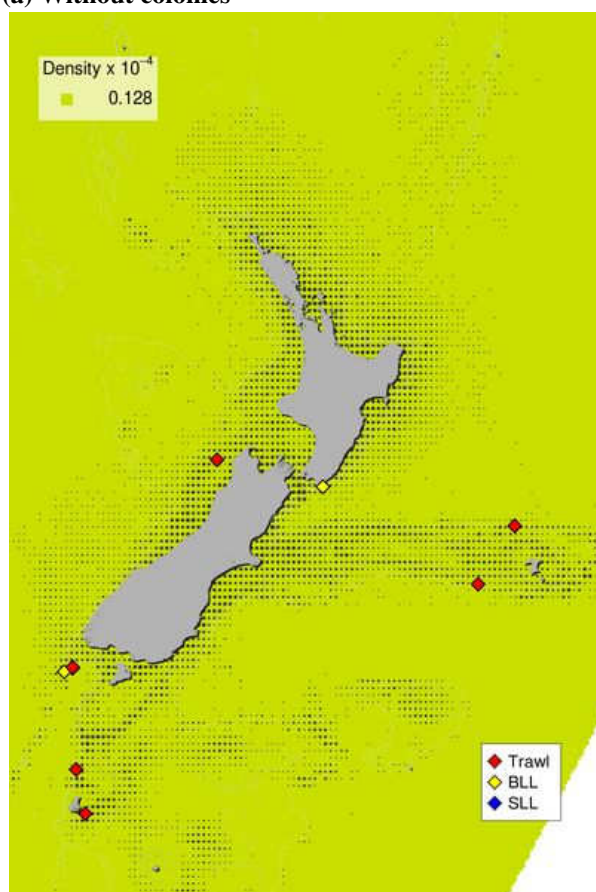


Figure D-47: Captures and relative density of White-bellied storm petrel (*Fregetta grallaria*). The distribution base map was obtained from BirdLife single-layer range maps.

D.49 Common diving petrel (*Pelecanoides urinatrix*)

Population (NZ)	300 000 to 2 150 000 pairs*	Taylor (2000b)
Age at first breeding	2 to 3 years*	Brooke & Cox (2004)
Survival	75% 75 to 87%*	Brooke & Cox (2004) Schreiber & Burger (2001)

(a) Without colonies



(b) With colonies

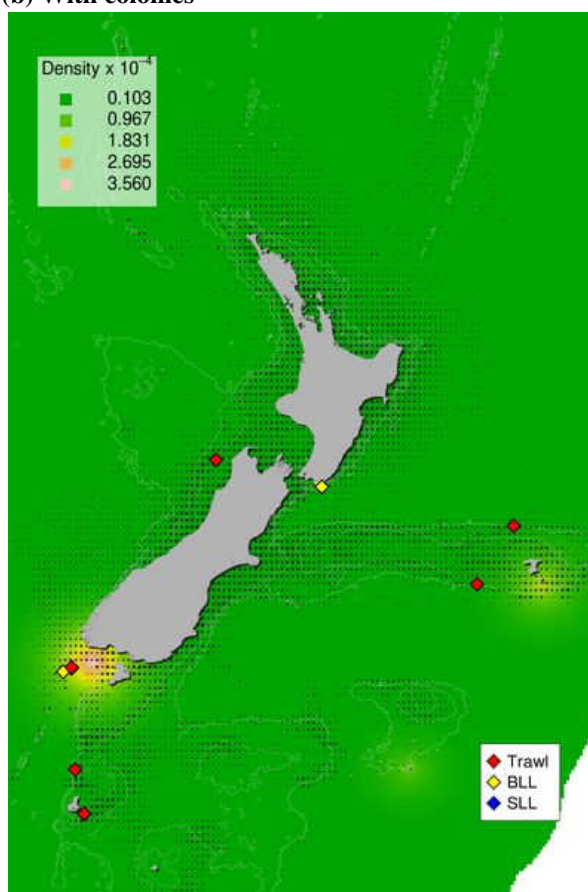
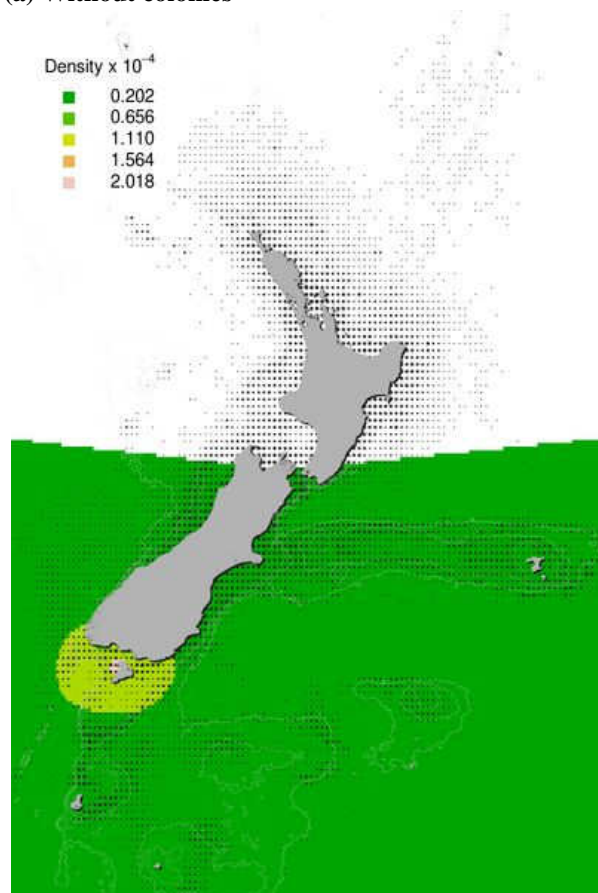


Figure D-48: Captures and relative density of Common diving petrel (*Pelecanoides urinatrix*). The distribution base map was obtained from BirdLife single-layer range maps.

D.50 South Georgia diving petrel (*Pelecanoides georgicus*)

Population (NZ)	100 to 200 individuals 64 pairs [1998]*	Taylor (2000b) Taylor (2000b)
Population (World)	15 000 000 pairs	Brooke & Cox (2004)
Age at first breeding	2 to 3 years*	<i>Pelecanoides urinatrix</i> as proxy, Brooke & Cox (2004)
Survival	75 to 87%*	<i>Pelecanoides urinatrix</i> as proxy, Schreiber & Burger (2001)

(a) Without colonies



(b) With colonies

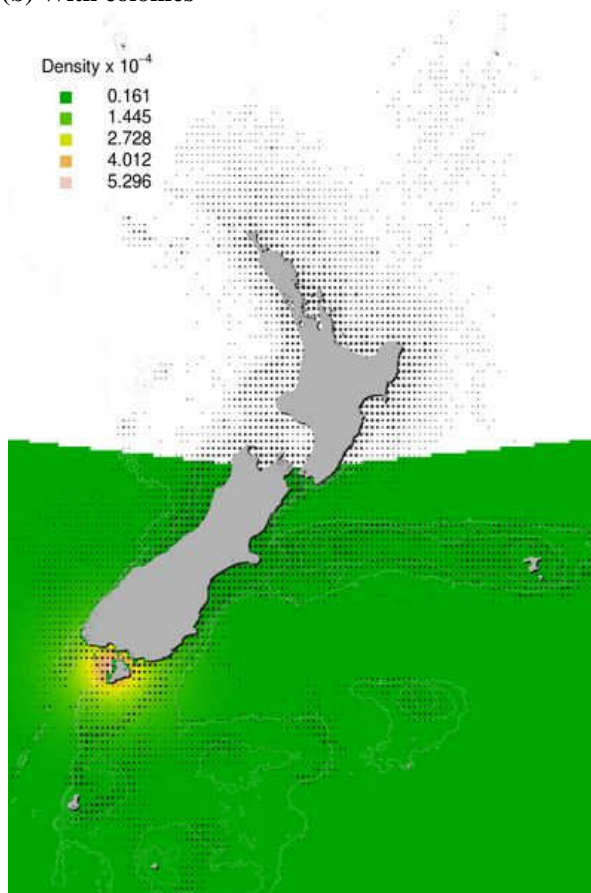


Figure D-49: Captures and relative density of South Georgia diving petrel (*Pelecanoides georgicus*). The base map for the distribution was obtained from the NABIS database.

D.51 Australasian gannet (*Morus serrator*)

Population (NZ) 46 004 pairs [1981]*

Age at first breeding 3 to 7 years*

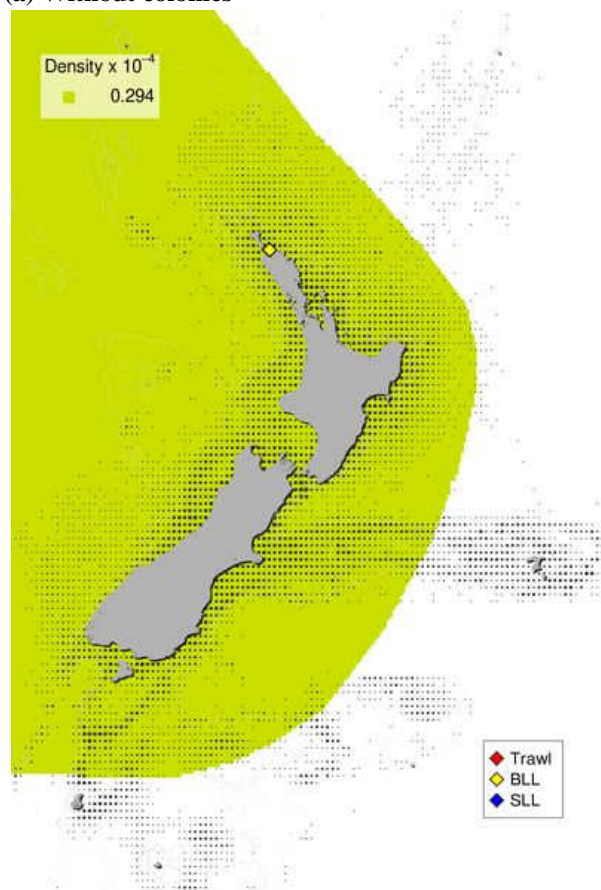
Survival 94%*

Wodzicki et al. (1984)

Schreiber & Burger (2001)

Northern gannet as proxy, Schreiber & Burger (2001)

(a) Without colonies



(b) With colonies

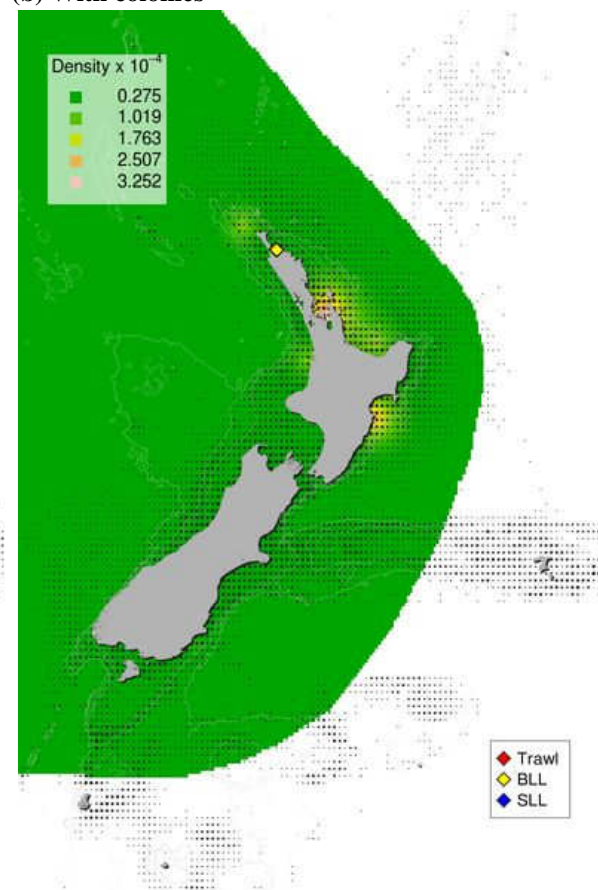


Figure D-50: Captures and relative density of Australasian gannet (*Morus serrator*). The distribution base map was obtained from BirdLife single-layer range maps.

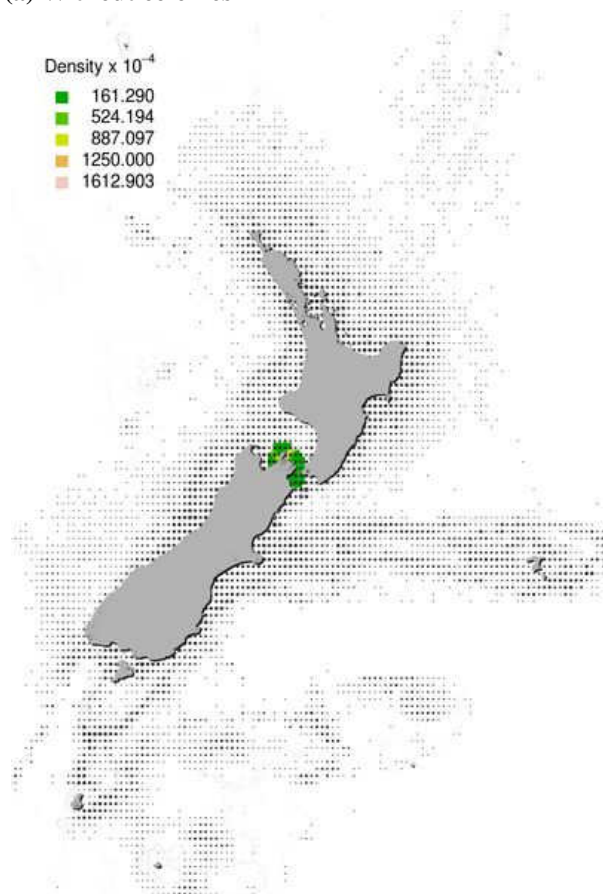
D.52 Masked booby (*Sula dactylatra*)

Population (NZ)	fewer than 1200 pairs*	Taylor (2000a)
Age at first breeding	2 to 4 years*	Schreiber & Burger (2001)
Survival	92.5% 85% [poor]*	Schreiber & Burger (2001)

D.53 New Zealand king shag (*Phalacrocorax carunculatus*)

Population (NZ)	650 individuals [2002]*	Birdlife (2009)
Age at first breeding	more than 3 years*	Black shag as proxy
Survival	87.8 (85.9 – 89.7)%*	European shag as proxy, Harris et al. (1994)

(a) Without colonies



(b) With colonies

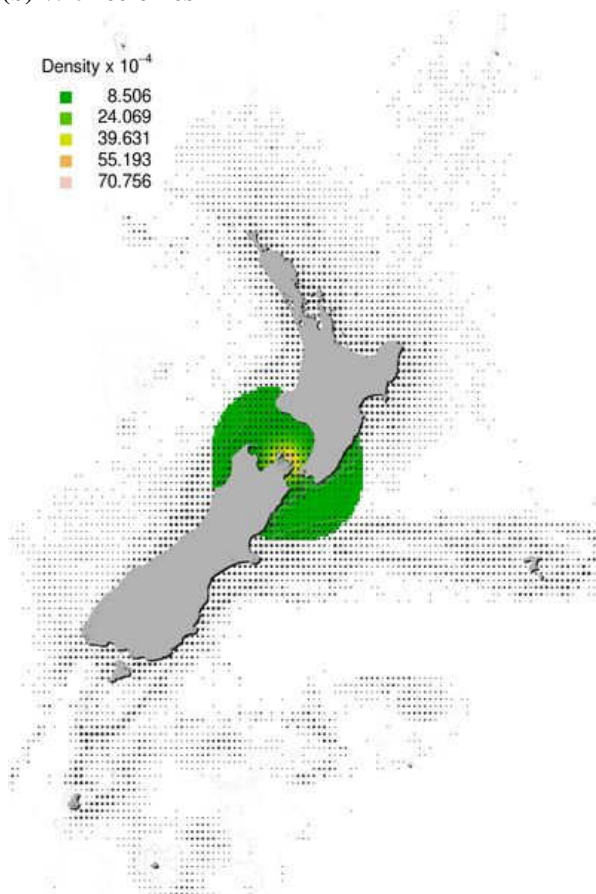
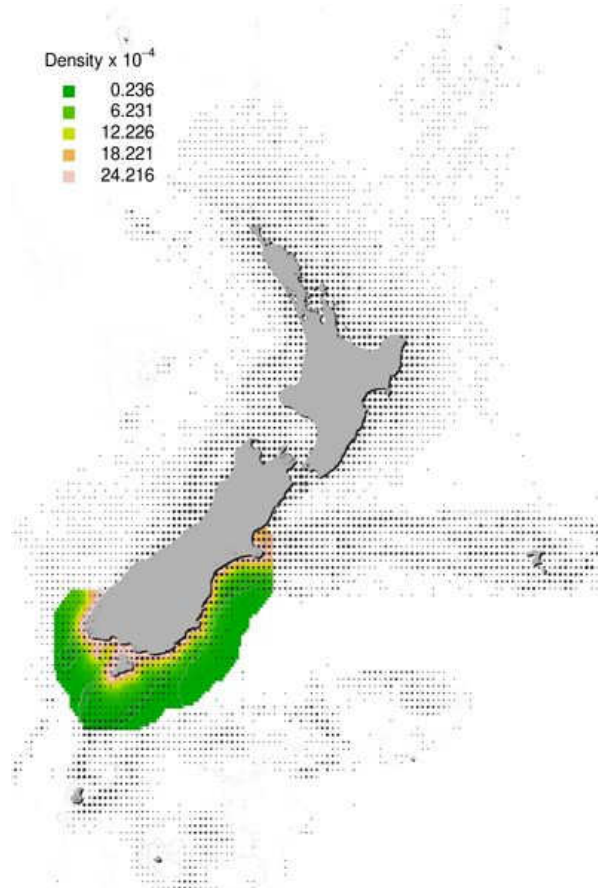


Figure D-51: Captures and relative density of New Zealand king shag (*Phalacrocorax carunculatus*). The base map was obtained by creating a buffer around the coast where the species was found.

D.54 Stewart Island shag (*Phalacrocorax chalconotus*)

Population (NZ)	5000 to 8000 individuals [1994]*	Birdlife (2009)
Age at first breeding	more than 3 years*	Black shag as proxy
Survival	87.8 (85.9 – 89.7)%*	European shag as proxy, Harris et al. (1994)

(a) Without colonies



(b) With colonies

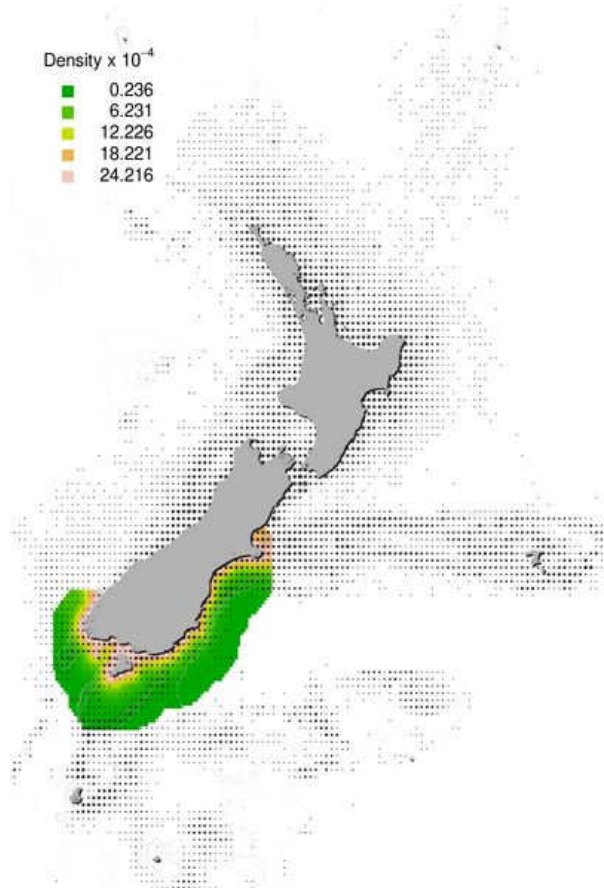
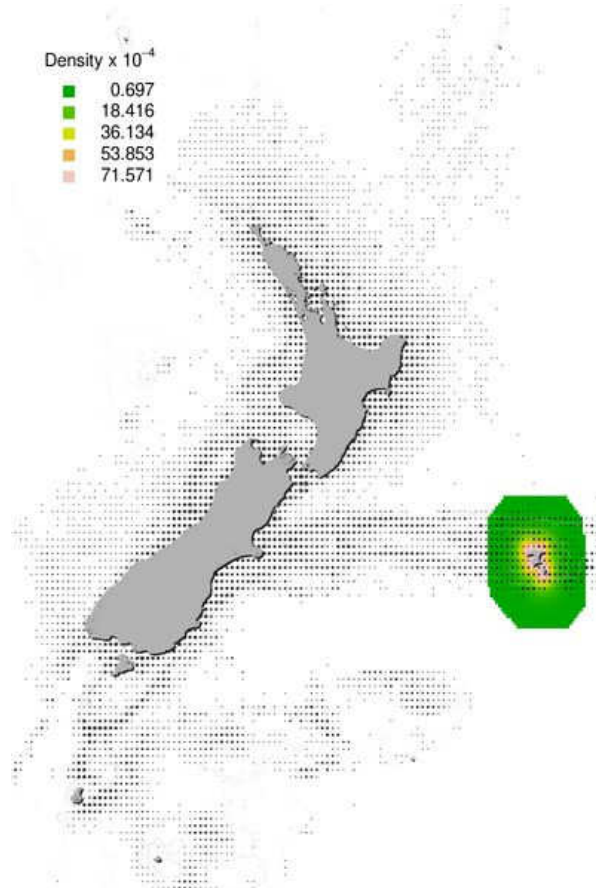


Figure D-52: Captures and relative density of Stewart Island shag (*Phalacrocorax chalconotus*). The base map was obtained by creating a buffer around the coast where the species was found.

D.55 Chatham Islands shag (*Phalacrocorax onslowi*)

Population (NZ)	540 individuals [2003]*	Birdlife (2009)
Age at first breeding	more than 3 years*	Black shag as proxy
Survival	87.8 (85.9 – 89.7)%*	European shag as proxy, Harris et al. (1994)

(a) Without colonies



(b) With colonies

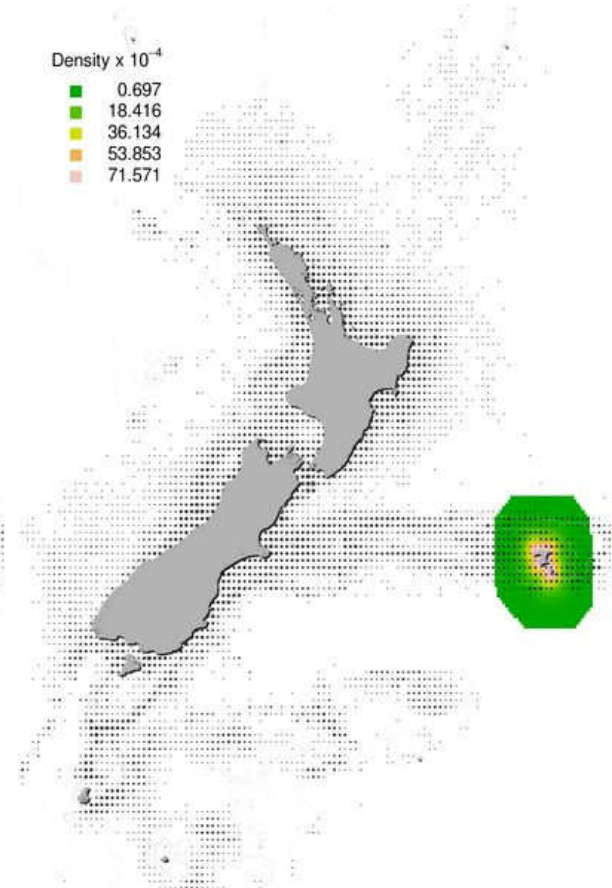
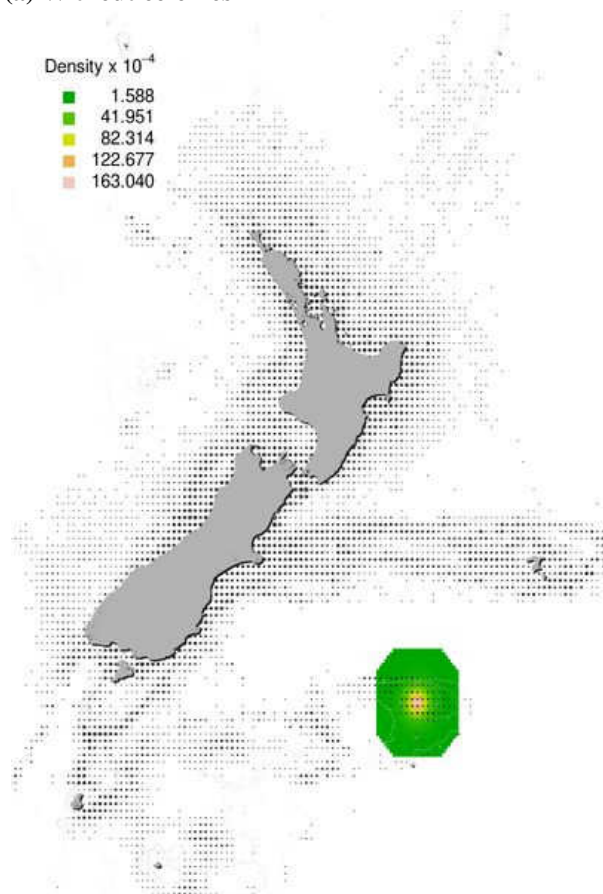


Figure D-53: Captures and relative density of Chatham Islands shag (*Phalacrocorax onslowi*). The base map was obtained by creating a buffer around the coast where the species was found.

D.56 Bounty Islands shag (*Phalacrocorax ranfurlyi*)

Population (NZ)	620 individuals [2005]*	Birdlife (2009)
Age at first breeding	more than 3 years*	Black shag as proxy
Survival	87.8 (85.9 – 89.7)%*	European shag as proxy, Harris et al. (1994)

(a) Without colonies



(b) With colonies

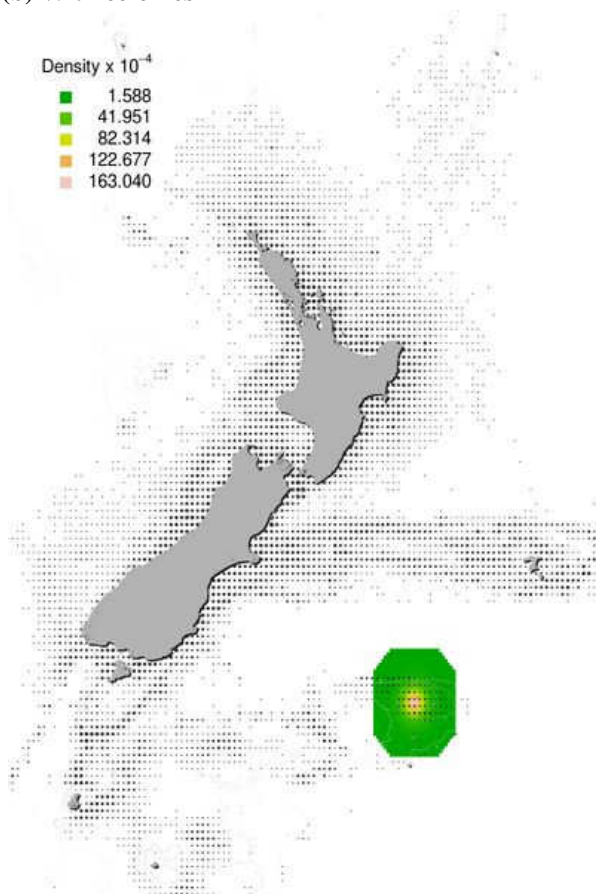
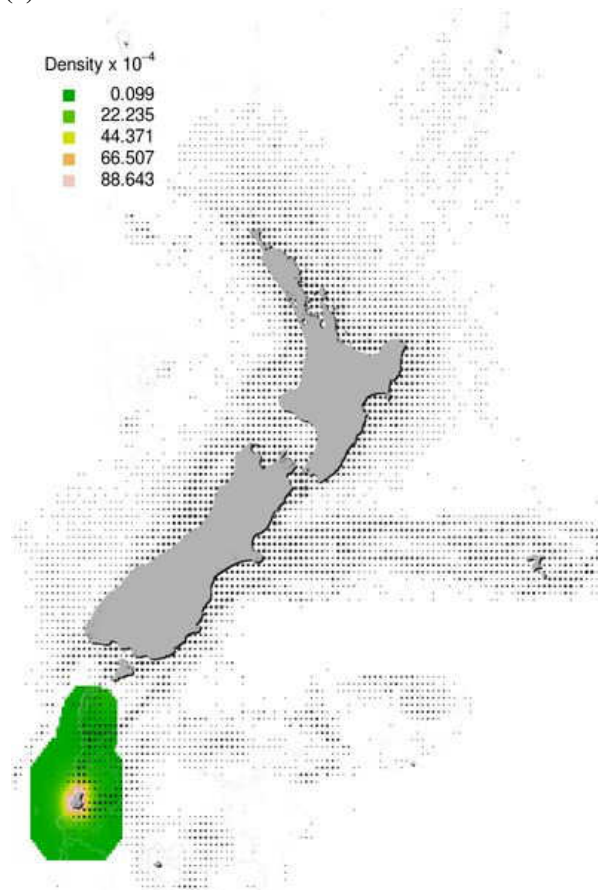


Figure D-54: Captures and relative density of Bounty Islands shag (*Phalacrocorax ranfurlyi*). The base map was obtained by creating a buffer around the coast where the species was found.

D.57 Auckland Islands shag (*Phalacrocorax colensoi*)

Population (NZ)	fewer than 2000 individuals 2000 individuals [2000]*	Nelson (2005) Birdlife (2009)
Age at first breeding	more than 3 years*	Black shag as proxy
Survival	87.8 (85.9 – 89.7)%*	European shag as proxy, Harris et al. (1994)

(a) Without colonies



(b) With colonies

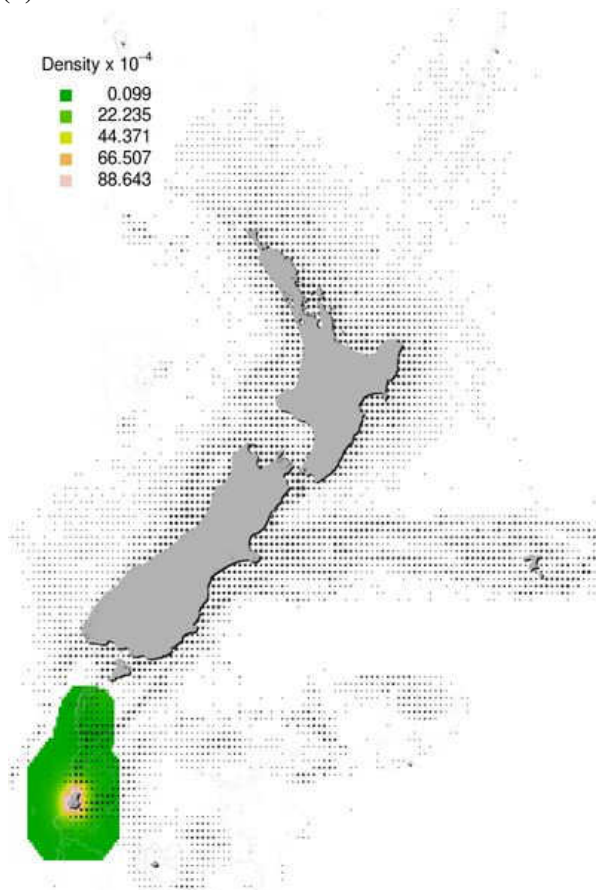
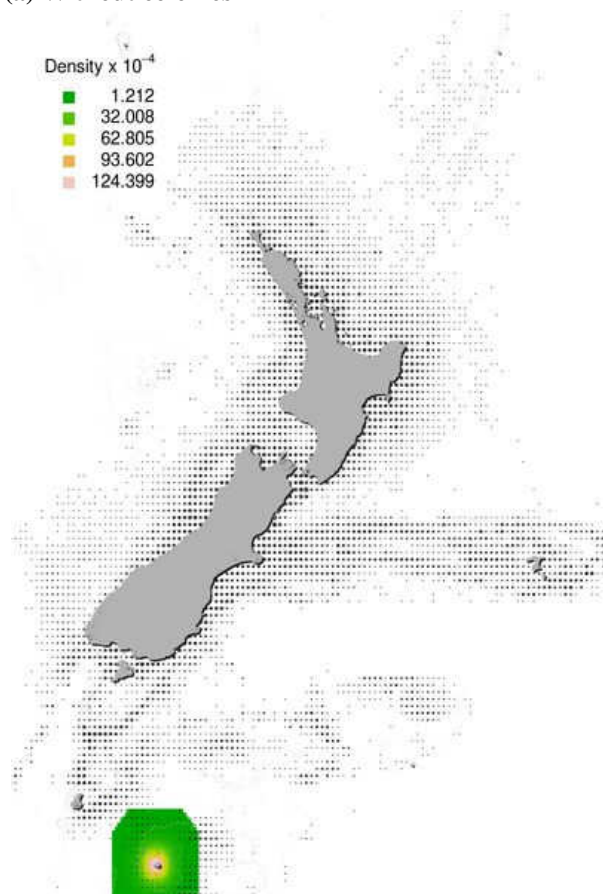


Figure D-55: Captures and relative density of Auckland Islands shag (*Phalacrocorax colensoi*). The base map was obtained by creating a buffer around the coast where the species was found.

D.58 Campbell Island shag (*Phalacrocorax campbelli*)

Population (NZ)	8000 individuals [1997]*	Birdlife (2009)
Age at first breeding	more than 3 years*	Black shag as proxy
Survival	87.8 (85.9 – 89.7)%*	European shag as proxy, Harris et al. (1994)

(a) Without colonies



(b) With colonies

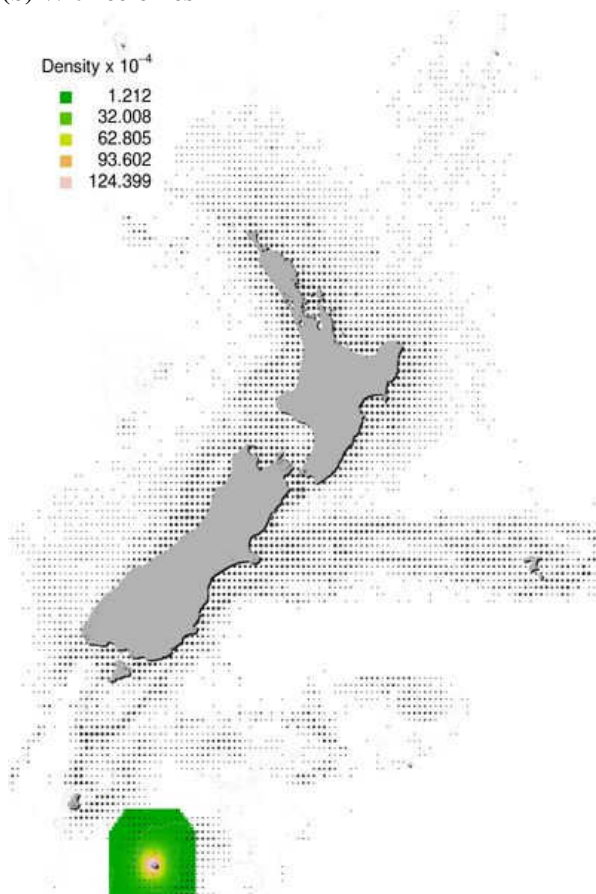
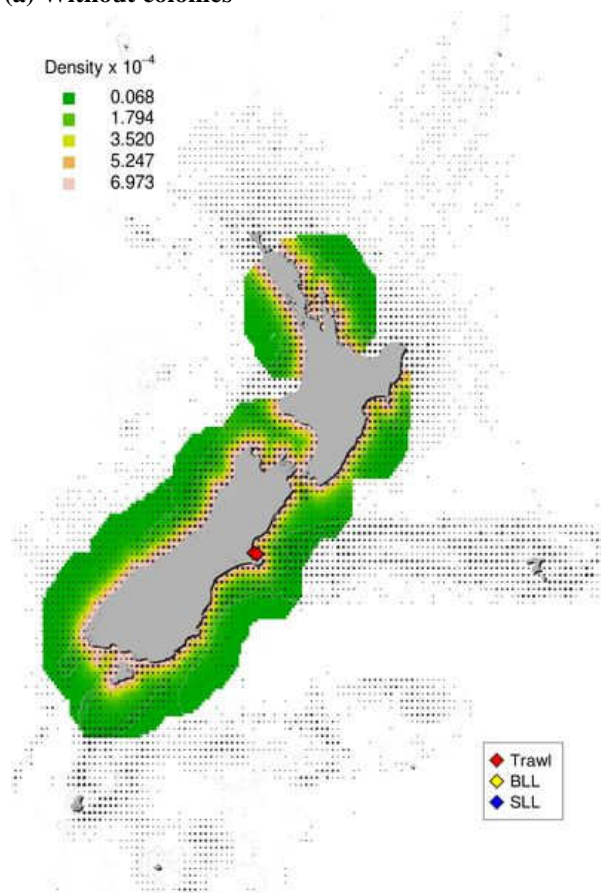


Figure D-56: Captures and relative density of Campbell Island shag (*Phalacrocorax campbelli*). The base map was obtained by creating a buffer around the coast where the species was found.

D.59 Spotted shag (*Phalacrocorax punctatus*)

Population (NZ)	fewer than 30 000 pairs 35 000 to 150 000 individuals [2009]*	Taylor (2000b) Birdlife (2009)
Age at first breeding	2 years*	Schreiber & Burger (2001)
Survival	87.8 (85.9 – 89.7)%*	European shag as proxy, Harris et al. (1994)

(a) Without colonies



(b) With colonies

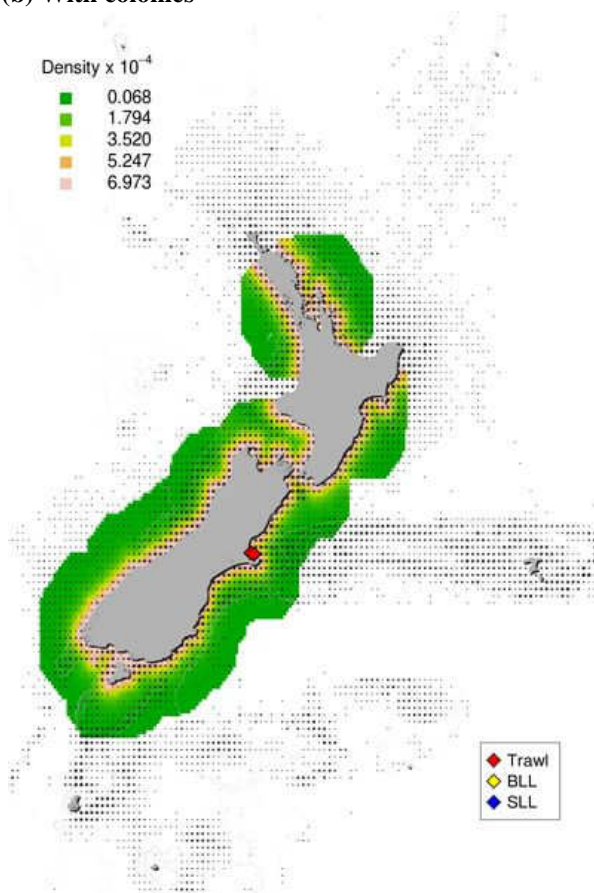
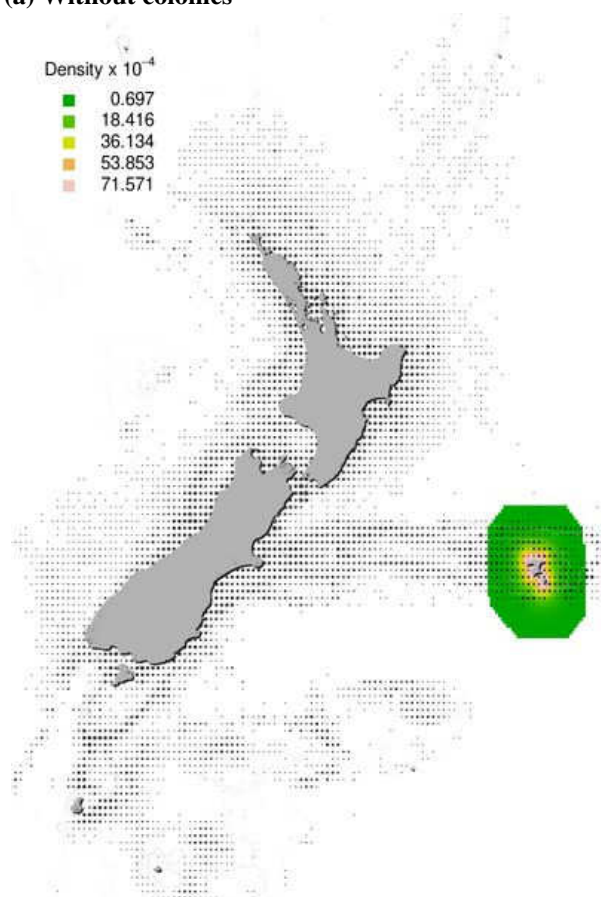


Figure D-57: Captures and relative density of Spotted shag (*Phalacrocorax punctatus*). The base map was obtained by creating a buffer around the coast where the species was found.

D.60 Pitt Island shag (*Phalacrocorax featherstoni*)

Population (NZ)	fewer than 1000 individuals 669 pairs [1997]* 1100 individuals [2004]	Nelson (2005) Taylor (2000a) Birdlife (2009)
Age at first breeding	more than 3 years*	Black shag as proxy
Survival	87.8 (85.9 – 89.7)%*	European shag as proxy, Harris et al. (1994)

(a) Without colonies



(b) With colonies

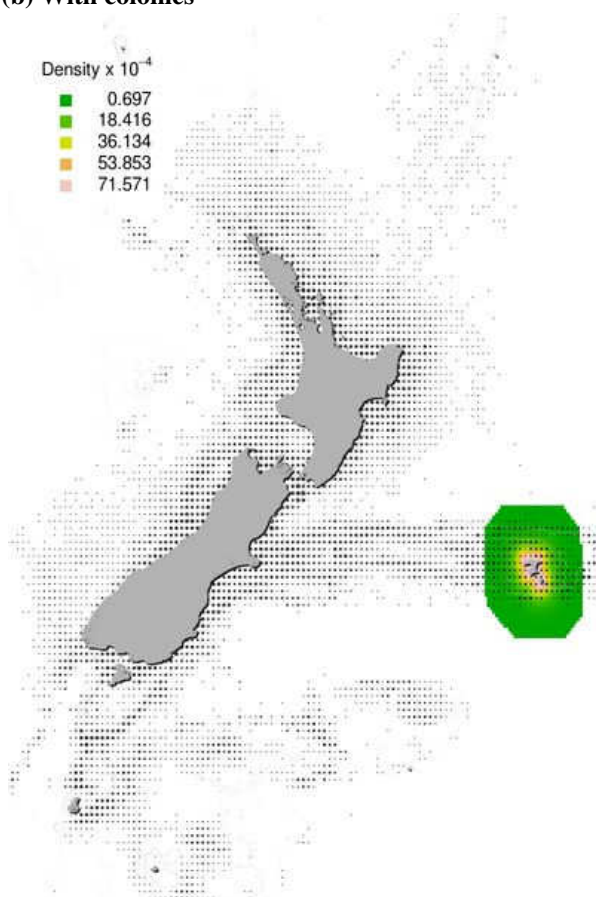
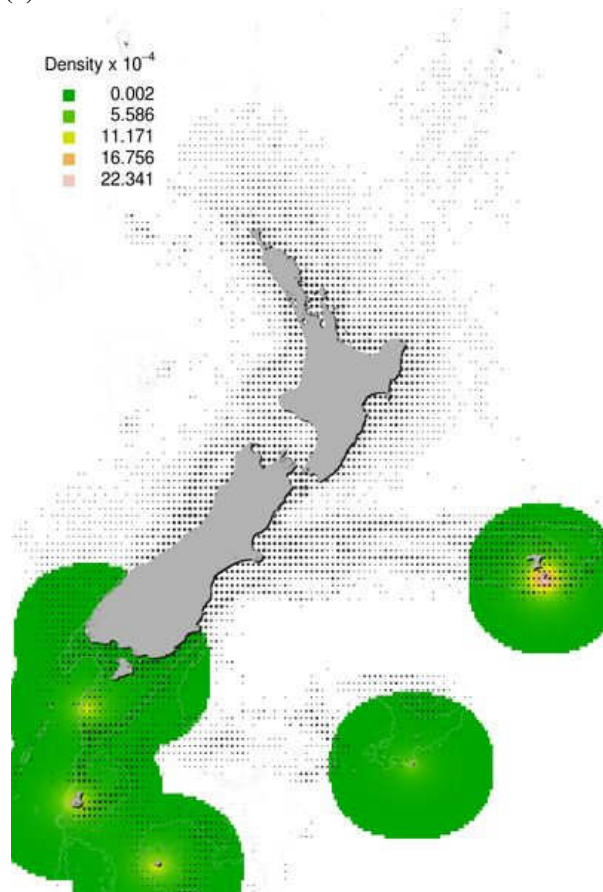


Figure D-58: Captures and relative density of Pitt Island shag (*Phalacrocorax featherstoni*). The base map was obtained by creating a buffer around the coast where the species was found.

D.61 Brown skua (*Catharacta lonnbergi*)

Population (NZ)	450 to 470 pairs*	Wilson (2006)
Population (World)	10 000 to 19 999 individuals [2009]	Birdlife (2009)
Age at first breeding	8.03 ± 0.21 years ($N = 96$) [1996]* more than 6 years	Young (1998) Schreiber & Burger (2001)
Survival	90 to 96% 93.8 (91 – 97)% [1965]*	Schreiber & Burger (2001) Wood (1971)

(a) Without colonies



(b) With colonies

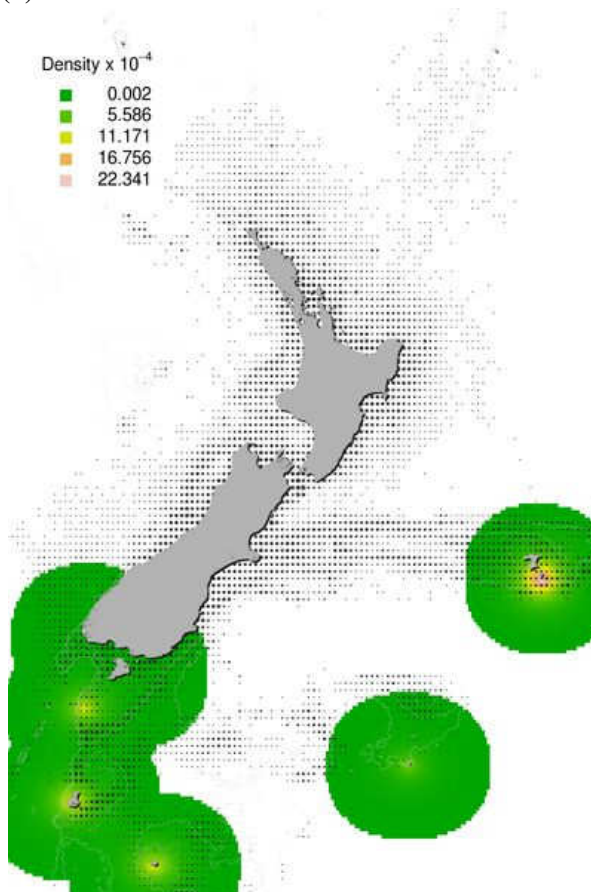


Figure D-59: Captures and relative density of Brown skua (*Catharacta lonnbergi*). The base map was obtained by creating a buffer around the coast where the species was found.

D.62 Black-backed gull (*Larus dominicanus*)

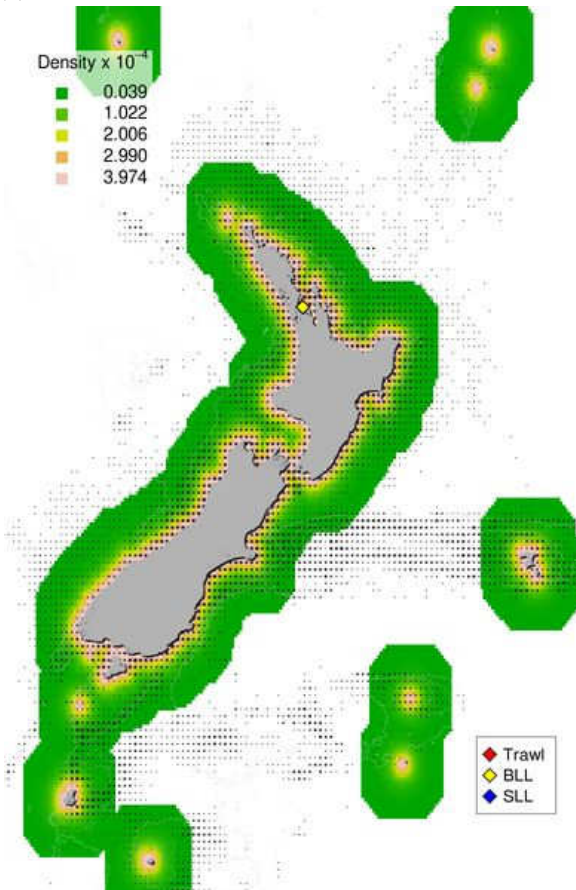
Population (NZ) more than 1 000 000 pairs*
 Age at first breeding 4 years*
 Survival 81%*

Taylor (2000b)

Schreiber & Burger (2001)

Schreiber & Burger (2001)

(a) Without colonies



(b) With colonies

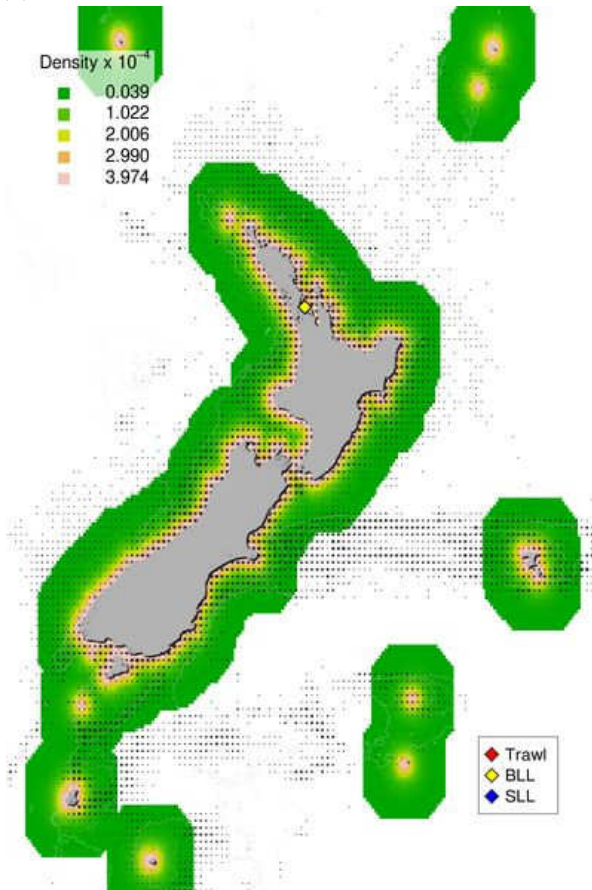


Figure D-60: Captures and relative density of Black-backed gull (*Larus dominicanus*). The base map was obtained by creating a buffer around the coast where the species was found.

D.63 Common white tern (*Gygis alba*)

Population (NZ)	fewer than 50 pairs*	Taylor (2000b)
Population (World)	more than 100 000 pairs	Taylor (2000b)
Age at first breeding	3 to 5 years*	Schreiber & Burger (2001)
Survival	78 to 83%*	Bridled tern as proxy, Schreiber & Burger (2001)

(a) Without colonies



(b) With colonies

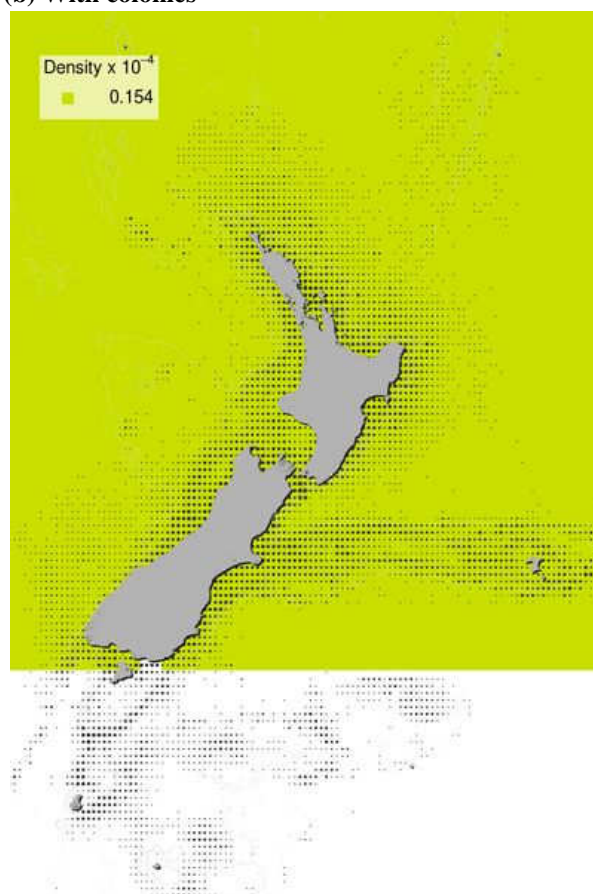
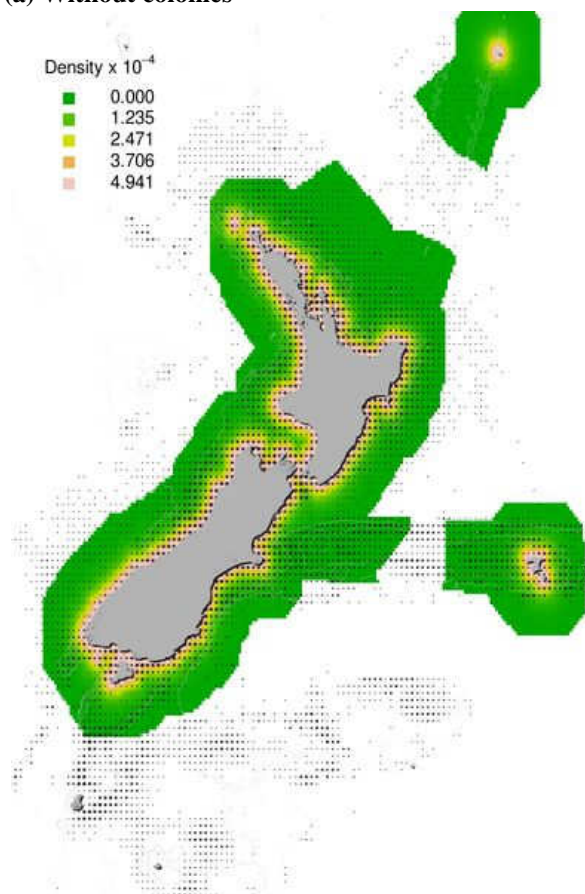


Figure D-61: Captures and relative density of Common white tern (*Gygis alba*). The base map for the distribution was obtained from the NABIS database.

D.64 Caspian tern (*Sterna caspia*)

Population (NZ)	1000 pairs [1992]*	Taylor (2000b)
Population (World)	50 000 pairs	Taylor (2000b)
Age at first breeding	2 to 4 years*	Schreiber & Burger (2001)
Survival	87 to 91%*	Schreiber & Burger (2001)

(a) Without colonies



(b) With colonies

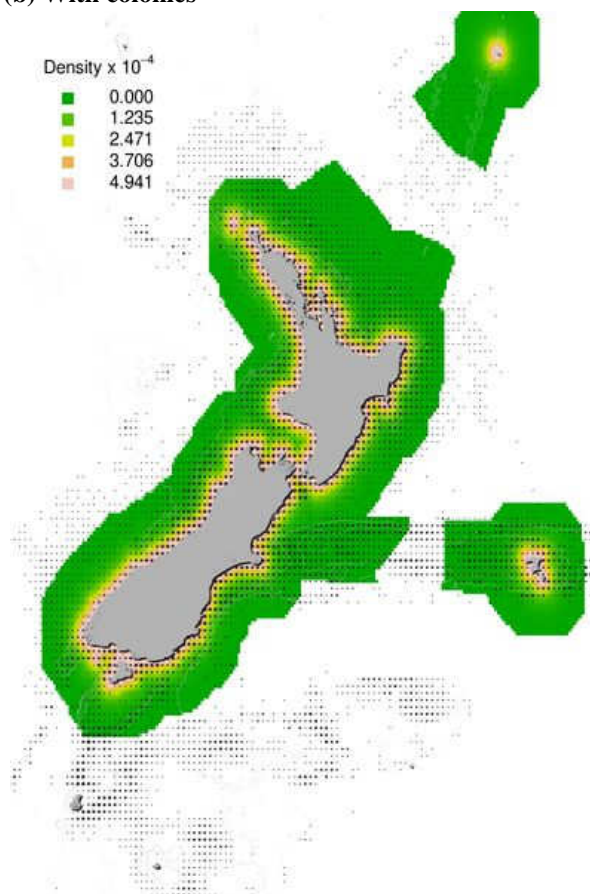


Figure D-62: Captures and relative density of Caspian tern (*Sterna caspia*). The base map was obtained by creating a buffer around the coast where the species was found.

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