

## **NZ sea lion research trip, Auckland Islands, December 4<sup>th</sup> 2007 to February 15<sup>th</sup> 2008**

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This report outlines the work completed in the summer programme of the 2007/08 New Zealand sea lion research field trip to the Auckland Islands for CSP. The period covered in this report is from December 4<sup>th</sup> 2007 when the first team arrived on Enderby Island through to the departure of the second team from the Island on February 15<sup>th</sup> 2008.

This work continues annual surveys of the Auckland Island breeding sites of the New Zealand sea lions (*Phocartos bookeri*). The projects objectives were to collect data to allow quantification and estimation of: i) NZ sea lion pup production; ii) survival of previously marked NZ sea lions; iii) reproduction by known age female NZ sea lions; iv) maintain and update the NZ sea lion database; v) make available 2007/08 field data for relevant modelling work; vi) characterise at-sea distribution of poorly known age and sex classes of NZ sea lions; and vii) to analyse data collected in vi above in a fisheries context.

### **Logistics**

The scientific trip was split into two parts: December 4<sup>th</sup> - January 10<sup>th</sup>, and January 10<sup>th</sup> - February 15<sup>th</sup>. The breaks in the field season permitted changes in personnel during the summer. The first science team comprised of three people: Amelie Auge (Otago University), Laura Boren (DOC contractor) and Federico Reit (DOC contractor). The second team comprised of six people: Louise Chilvers (DOC, MCU), Wendi Roe (Massey University), Laura Boren (DOC contractor), Jacinda Amey (DOC contractor), Amelie Auge (DOC contractor) and Helen McConnell (DOC contractor).

Transport during the season was aboard the Evohe under charter to DOC RD&I. All personnel were accommodated in the two huts at Sandy Bay and the Apple Hut at Dundas Island. We are grateful for the significant logistical support provided throughout the whole trip from DOC Southland, particularly Sharon Trainor, Gilly Adams, Pete McClelland and Andy Roberts. We also appreciate the helpful and friendly radio skeds coordinated by DOC Stewart Island staff. We thank Conservation Services Programme (CSP) and the Department of Conservation for funding the programme.

### **Sea lion counts**

Daily counts were undertaken for pups (live and dead) from 4<sup>th</sup> December 2007 to 15<sup>th</sup> February 2008 and for adults at the Sandy Bay from the 4<sup>th</sup> December 2007 to January 20<sup>th</sup> 2008. Adult and pup counts were undertaken daily at South East Point between 4<sup>th</sup> December 2007 and 20<sup>th</sup> January 2008 and then weekly until the 15<sup>th</sup> February 2008. Counts were made at approximately one week intervals at East Bay and other areas around Enderby Island. One four day trip was made to Dundas Is. during the season to count, tag and resight animals. Figure of Eight Island was counted on January 10<sup>th</sup> with 48 females, 43 males, and 72 live and 2 dead pups being recorded. Resightings were also conducted by the sea lion team at Kekeno and North Harbour on the main Auckland Island and Rose Island. There was no sign of breeding at any of these sites. Two groups of researchers studying Albatross were located on Adams Island and in the Western Arm of Carnley Harbour. Reports from these areas yielded no tag resights and no sign of breeding in any of these areas. See Figure 1 for locations.



Figure 1: The Auckland Islands showing areas where sea lions were sighted: Figure of Eight Island, Dundas Island, Kekeno, North Harbour, Enderby Island and Rose Island.

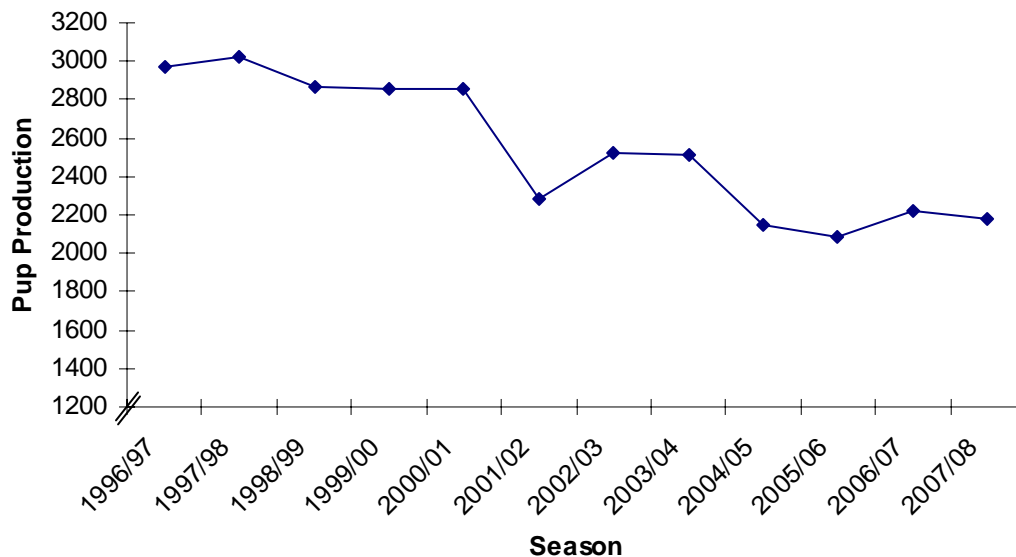
## Pup production estimate

Estimates of pup production were calculated for the breeding sites in the Auckland Islands between 10 Jan to 21 Jan 2008 (Tables 1 and 2). Mark recapture estimates have been used as the estimates of pup production from Sandy Bay and Dundas Island, while Figure of Eight Island and South East Point areas were estimated using direct counts. The total pup production estimate was  $2175 \pm 46$  (Fig. 2).

On the 16<sup>th</sup> of January, the mark-recapture estimate at Sandy Bay was  $425 \pm 3$ . On the 17<sup>th</sup> January all live pups were tagged at Sandy Bay with a total of 417 pups tagged. There was a cumulative total of 23 dead pups from the area as of the 16<sup>th</sup> January giving a total pup production for Sandy Bay for the 2007/2008 season of  $448 \pm 3$ . The mark recapture estimate at Dundas Island was completed on 21<sup>st</sup> January 2008 with an estimation of 1512 live pups  $\pm 44$ . 123 dead pups were counted on the island on the same day giving a total pup production for Dundas Island of  $1635 \pm 44$ . Direct counts from Figure of Eight Island on the 10<sup>th</sup> Jan yielded a count of 72 pups + 2 dead giving a total of 74. The direct count at South East Point yielded 13 live pups + 5 dead giving a total of 18 pups.

The estimate of pup production from the Auckland Islands was 2% lower than that seen in 2006/07. Pup mortality during the first 4 weeks of the 2007/ 08 season from all studied locations was 7% as of the 16<sup>th</sup> January (Table 2). Pup mortality at Sandy bay was 5.1% at the same date however was 14% by 15<sup>th</sup> Feb 2008. This increase in the level of pup mortality recorded between one and two months of age has been seen consistently over the last eight years it has been recorded.

Figure 2. Annual pup production for the Auckland Islands 1995/96 to 2007/08.



**Table 1:** Pup production estimates for Auckland Islands

Season	Sandy Bay			Dundas Island			Figure of Eight Island			South East Point		
	total	alive	dead	total	Alive	Dead	Total	alive	dead	total	alive	Dead
94/95	467	421	46	1837	1603	234	143	123	20*	71	59	12
95/96	455	417	38	2017	1810	207	144	113	31	69	49	20
96/97	509	473	36	2260	2083	177	143	134	9	63	39	24
97/98	477	468	9	2373	1748	625	120	97	23	51	37	14
98/99	513	473	40	2186	1957	229	109	100	9	59	42	17
99/00	506	482	24	2163	2039	124	137	131	6	50	37	13
00/01	562	527	35	2148	1802	346	94	92	2	55	47	8
01/02	403	320	83	1756	1395	361	96	90	6	27	21	6
02/03	489	408	80	1891	1555	336	95	89	5	43	26	17
03/04	507	473	34	1869	1749	120	87	86	1	52	39	13
04/05	441	411	30	1587	1513	74	83	79	4	37	31	6
05/06	422	383	39	1581	1349	232	62	55	7	24	20	4
06/07	437	414	23	1693	1587	106	70	67	3	24	19	5
<b>07/08</b>	<b>448</b>	<b>425</b>	<b>23</b>	<b>1635</b>	<b>1512</b>	<b>123</b>	<b>74</b>	<b>72</b>	<b>2</b>	<b>18</b>	<b>13</b>	<b>5</b>

\* Denotes that the number of dead pups was estimated from mean mortality rates derived from Sandy Bay and Dundas Island

**Table 2:** Total pup production from the Auckland Islands (NB. These estimates do not include an estimate of pup production from Campbell Island).

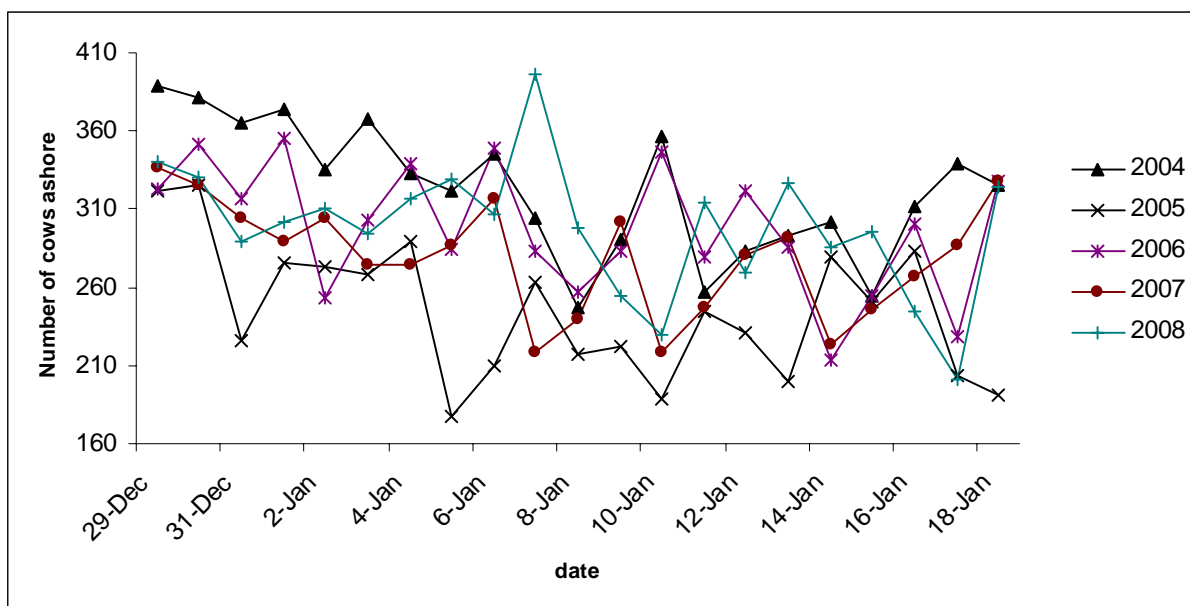
Season	Annual pup production			% Annual change in no. pups born	% Mortality at mark recapture estimate date		% Mortality at end of season (SB only)
	Total	Alive	Dead		Total	SB only	
94/95	2518	2206	312	5.4%	12.4%	10%	n.a.
95/96	2685	2389	296	6.6%	11.0%	8%	n.a.
96/97	2975	2729	246	10.8%	8.3%	7%	n.a.
97/98	3021	2350	671	1.5%	22.2%	2%	42%
98/99	2867	2572	295	-5.1%	10.3%	8%	9%
99/00	2856	2689	167	-0.4%	5.8%	5%	11%
00/01	2859	2468	391	0.1%	13.7%	6%	10%
01/02	2282	1826	456	-20.2%	20.0%	21%	33%
02/03	2518	2078	438	10.3%	17.4%	16%	21%
03/04	2515	2347	168	-0.001%	6.7%	8%	15%
04/05	2148	2034	114	-14.6%	5.3%	7%	12%
05/06	2089	1807	282	-2.8%	13.5%	9%	16%
06/07	2224	2087	137	6.4%	6.2%	5.3%	16%
<b>07/08</b>	<b>2175</b>	<b>2022</b>	<b>153</b>	<b>-2%</b>	<b>7%</b>	<b>5.1%</b>	<b>14%</b>

## Pup tagging

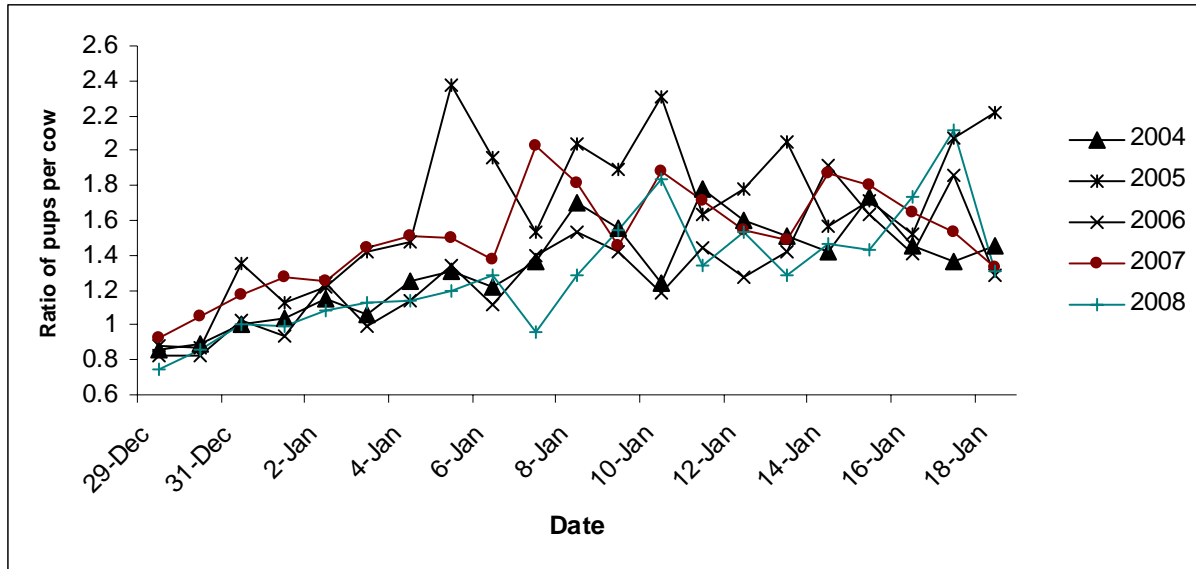
Pups have been tagged to provide a pool of known age individuals for the estimation of parameters such as survival, recruitment and reproductive rate as part of the long-term study. Tags applied were white 'coffin' shaped Dalton 'Jumbo' tags with a four-digit number. All pups were tagged in both flippers. All live pups at both Sandy Bay (417) and South East Point (13), and 400 pups (100 males and 300 females) at Dundas Island were tagged with white tags. 38 pups were tagged on Figure of Eight Island with red Dalton tags. 202 pups were captured approximately 4 weeks after tagging at Sandy Bay and checked for tag loss, 14 pups had lost a single tag giving a probability of losing a single tag of 3.5%, within 4 weeks. Tag loss over the first 4 weeks during the first seven years of use of Dalton tags has been 0.3%, 0.2%, 0.5%, 0.2%, 0.4%, 1.4%, 0.6%, 1.3% and 3.5%. This years high tag loss was the result of a change in tag pin size by the manufactures of the Jumbo tags – although the tags are the same size the size of the pin (the part that punctures the pups flipper) was substantially larger resulting in a higher tag loss rate. This change can be overcome next year by placing the tags higher up the pups flipper (towards their body) resulting in the tag hole not being so close to the flipper edge and therefore decreasing the tag loss seen this year. Tag loss over the first 4 weeks has still been consistently lower with the Dalton tags compared with the Allflex tags used previously (4 week single tag loss estimate 11.5%).

## Number of cows breeding and daily Pup:Cow ratios

As is done every season, daily counts of all animals and resights of tags and brands on NZ sea lions were undertaken on Enderby Island to understand the composition of animals at this breeding site and to enable the calculation of survivability, recruitment and fecundity of animals. Daily checks were undertaken at Sandy Bay with 7000 resights made on 1200 animals previously tagged or branded (including 218 individuals identified from a chip). Figure 3 and 4 represent a comparison of the daily number of females ashore at Sandy Bay in 2007 (Fig. 3) and pup:cows ashore ratios (Fig. 4) with the previous seasons.



**Figure 3.** Numbers of females recorded ashore each day between 29<sup>th</sup> December and 18<sup>th</sup> January for the years 2003/04 to 2007/08.



**Figure 4.** Pup:cow ratio at Sandy Bay between 29 December and 18 January for the years 2003/04 to 2007/08.

**Maintenance and updating the NZ sea lion database and making available the 2007/08 field data for relevant modelling work**

The NZ sea lion database has had the data from this seasons resights entered into it and checked. Data extraction has occurred to allow for the estimation of survival of previously marked NZ sea lions and reproduction by known age female NZ sea lions.

**Satellite tagging**

Ten juvenile sea lions (4 male and 6 female) between the age of 2 and 5 years were captured at Sandy Bay, Enderby Island. Tags were deployed for between 2 and 49 days. Plots of satellite locations are shown in Figs. 5a, b, c & d. A kernel range plot of all juvenile sea lions locations from 2007/08 is shown in Fig. 6a. A comparative kernel range plot of previous tracking results from adult female sea lions is shown in Fig 6b. An analysis of sea lion distribution data in relation to fishing effort will be reported at a later date when fisheries data is available.

**Table 4: Dates, tag number, satellite tag identification, sex, age, weight, length, girth, number of days deployed and number of satellite locations received from 10 juvenile sea lions captured January 2008.**

<b>Date</b>	<b>Tag</b>	<b>Satellite tag id</b>	<b>Sex</b>	<b>Age</b>	<b>Weight</b>	<b>Length</b>	<b>Girth</b>	<b>Days</b>	<b>Number of satellite locations</b>
14/01/2008	4121	49094	M	5	103.5	180	108	14	215
14/01/2008	5051	49095	M	4	134.5	184	126	49	366
14/01/2008	5093	54757	M	4	83	164	100	2	7
14/01/2008	3727	54760	M	5	102	177	106	16	309
17/01/2008	6130	76964	F	3	68	153	87	17	248
18/01/2008	5857	76966	F	3	71	141	92	14	183
24/01/2008	5863	54756	F	3	68	152	89	2	26
25/01/2008	6463	67259	F	2	73.5	146	91	31	322
25/01/2008	5913	54761	F	3	68	156	95	11	217
26/01/2008	6059	54759	F	3	84.5	154	96	4	39





Figure 5a Satellite locations of juvenile male NZ sea lions 4121 ●, 5093 + and 3727 ▲.

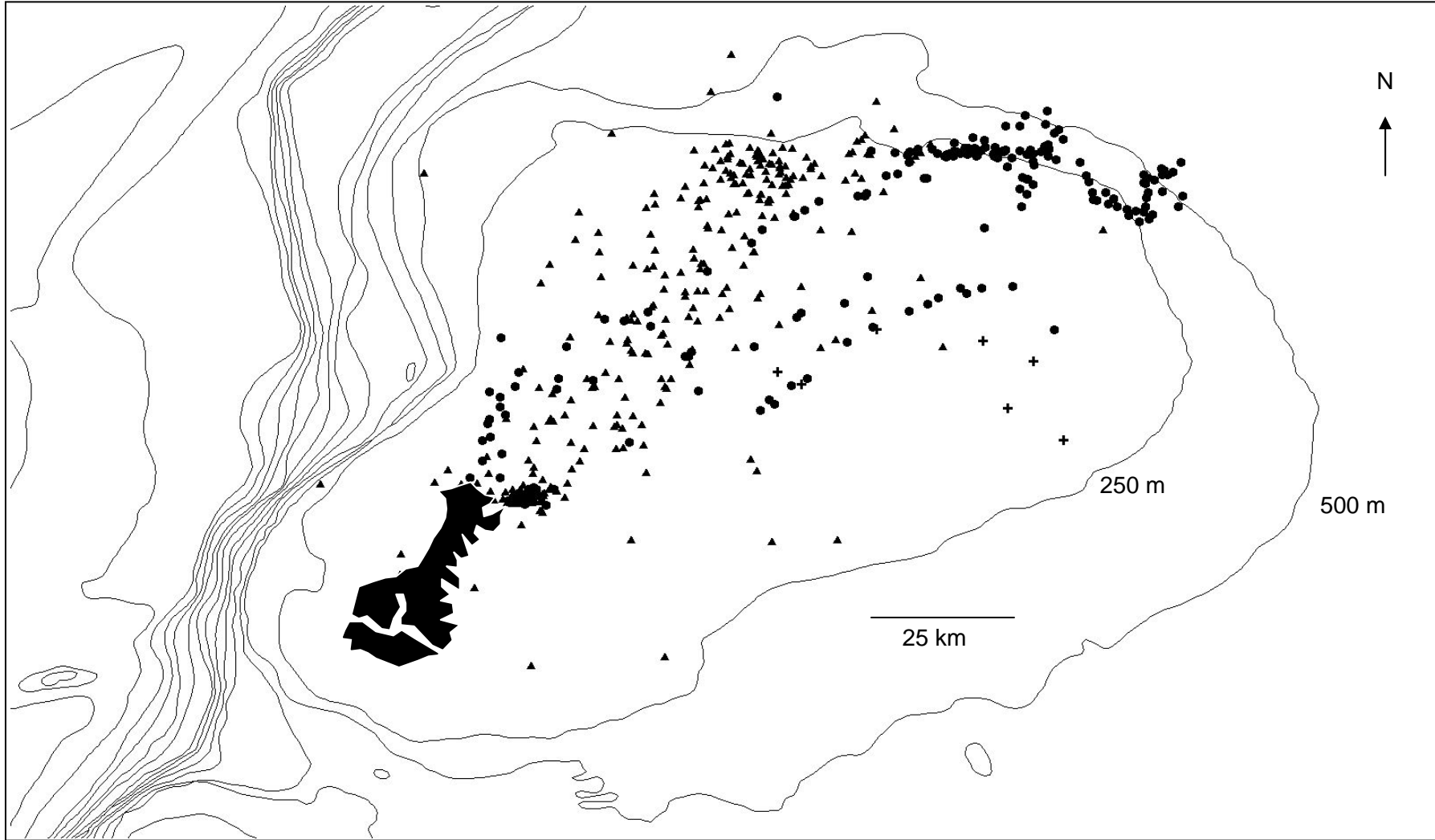


Figure 5b Satellite locations of juvenile female NZ sea lions 5863 + & 6059 ●.

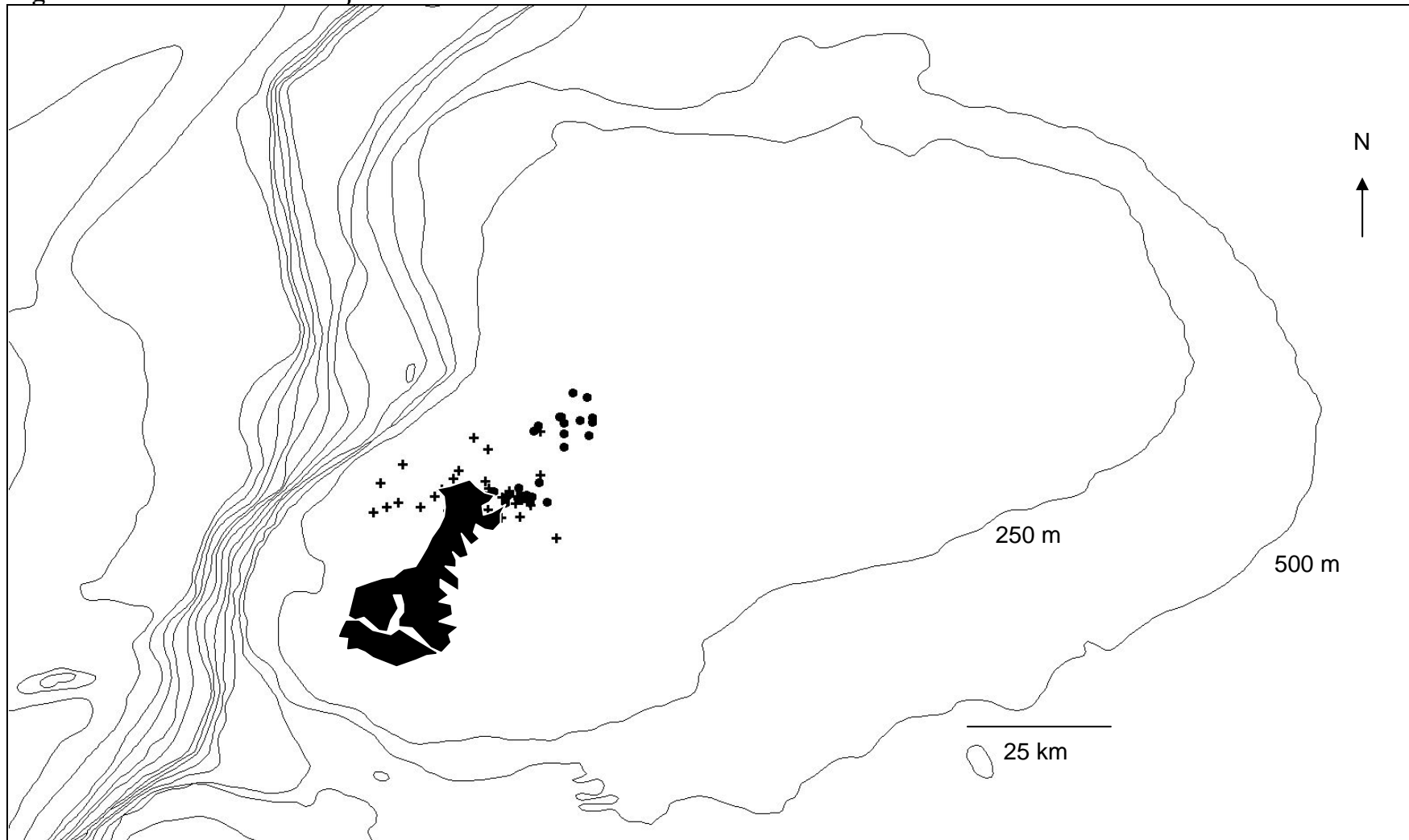


Figure 5c Satellite locations of juvenile female NZ sea lions 5913 + & 6463 ●.

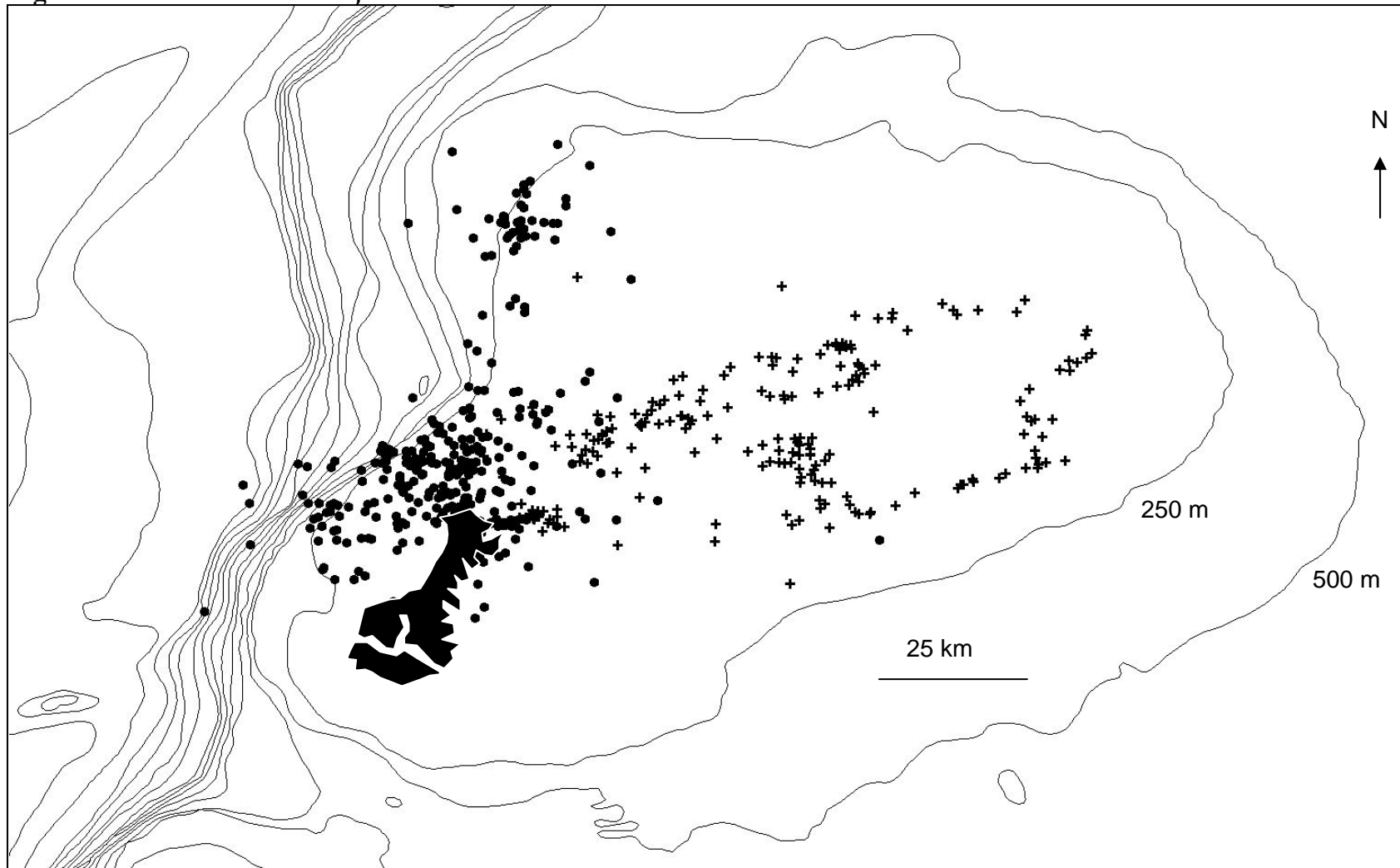
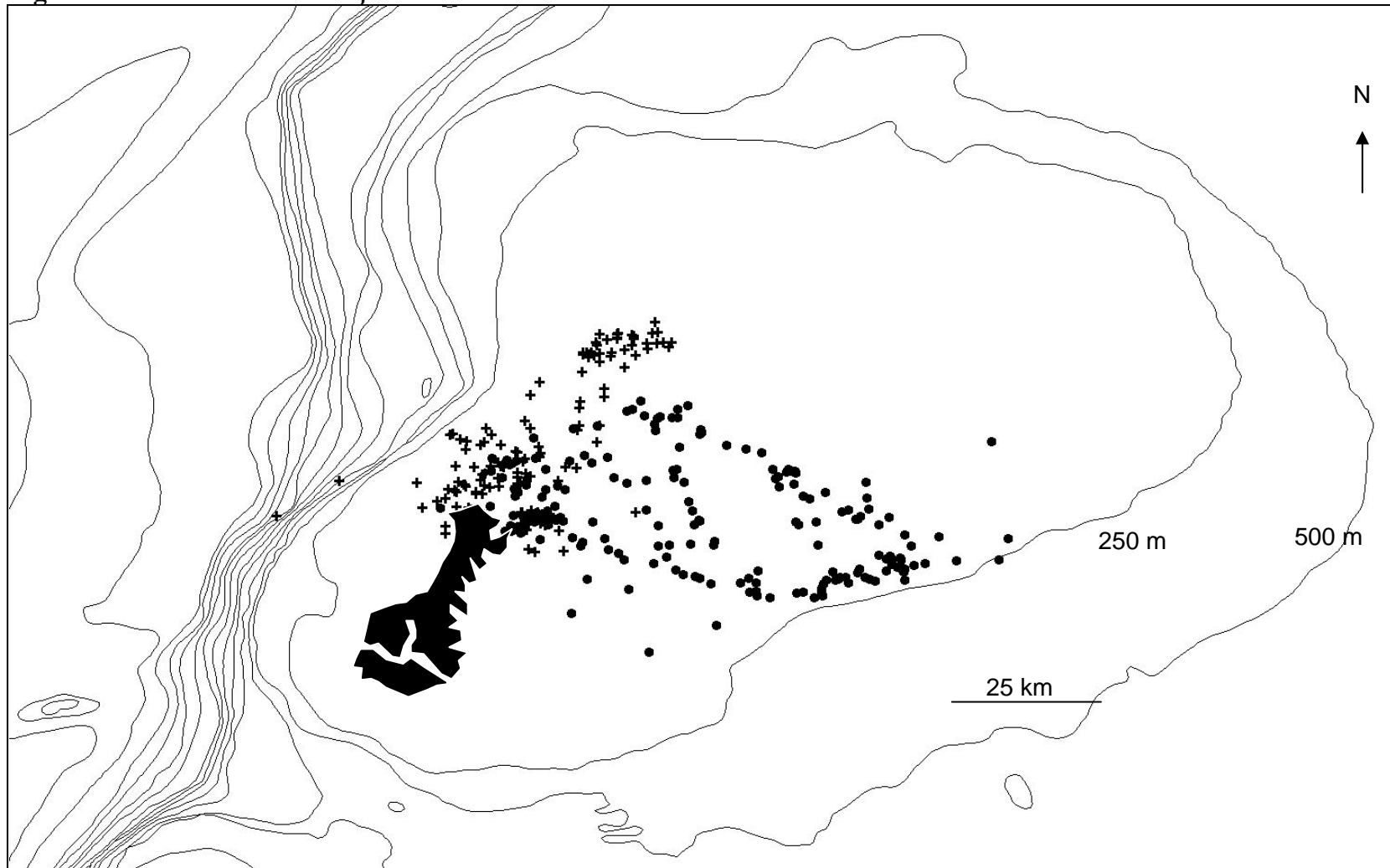


Figure 5d Satellite locations of juvenile female NZ sea lions 6130 ● & 5857 +.



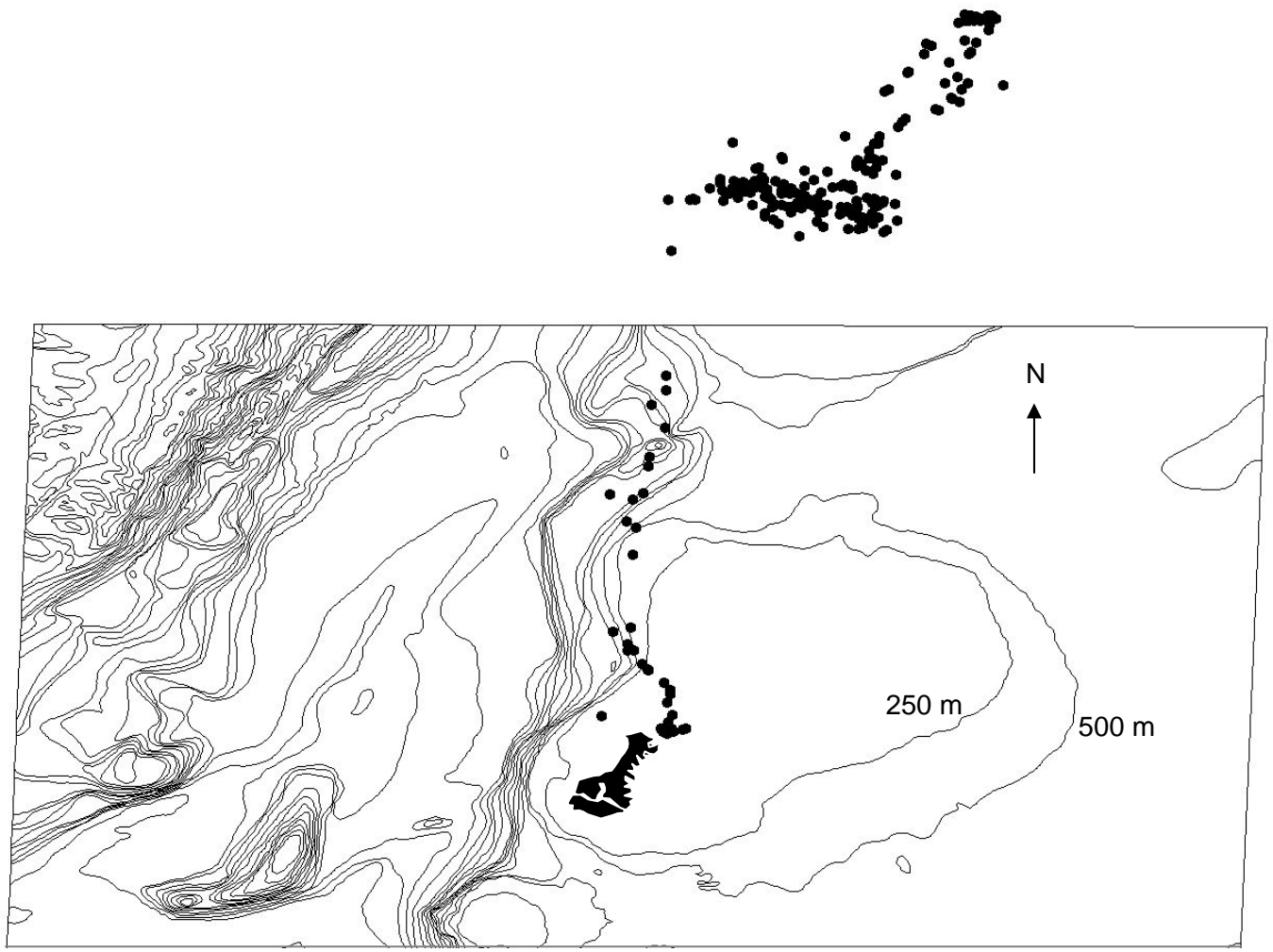
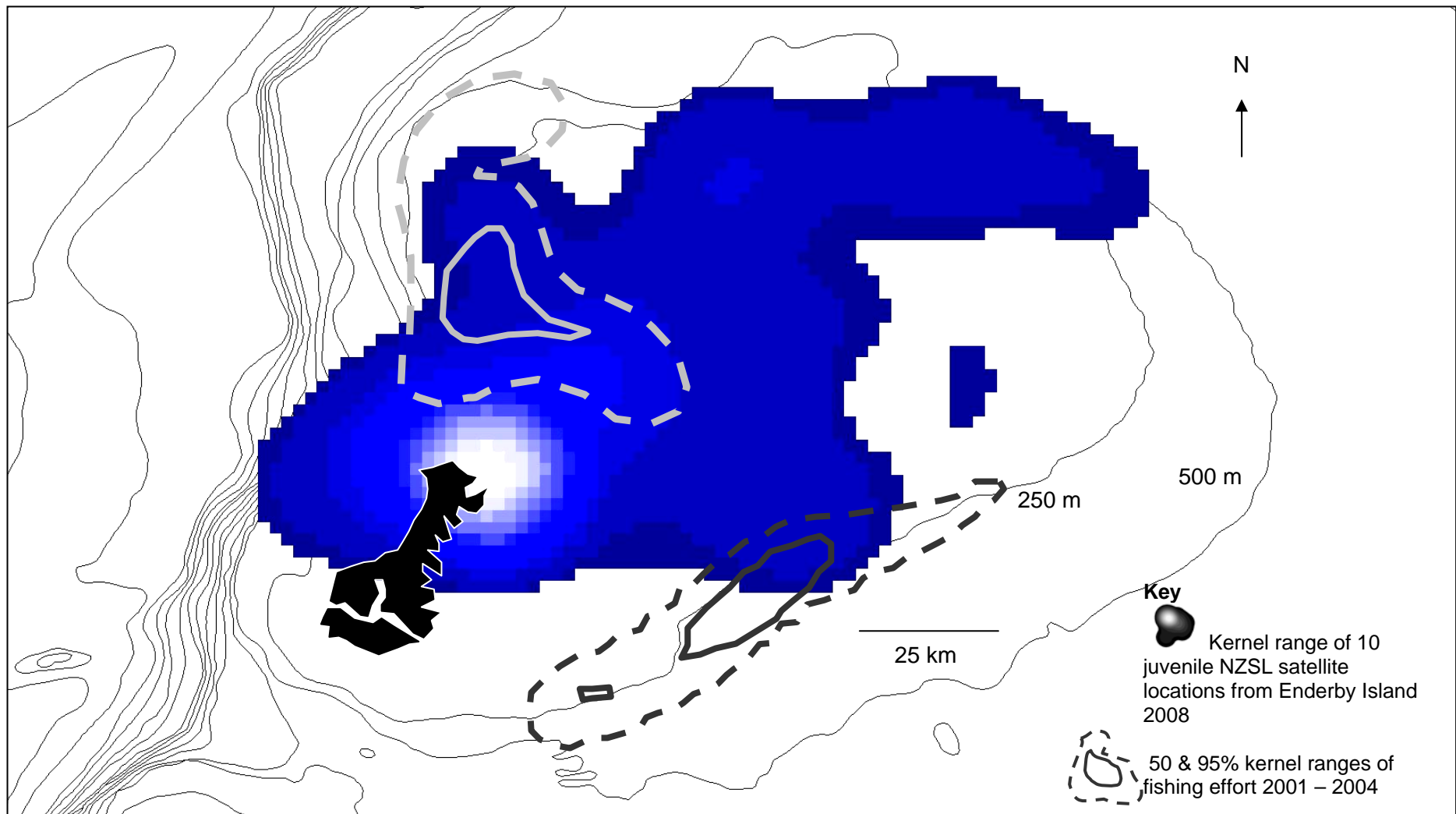


Figure 5e Satellite locations of juvenile male NZ sea lions 5051.

**Fig 6a Kernel range plot of 9 juvenile NZ sea lion locations within the Auckland Island area.**



Note: 2007/08 fishing data was not available at the time of preparation. Foraging trip from sea lion 5051 was excluded.

**Fig 6b Kernel range plot of 35 female NZ sea lion locations within the Auckland Island area**

