NZ sea lion research trip, Auckland Islands, November 28th 2006 to February 27th 2007

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This report outlines the work completed in the summer programme of the 2006/07 New Zealand sea lion research field trip to the Auckland Islands for CSP. The period covered in this report is from December 2nd 2006 when the first team arrived on Enderby Island through to the departure of the second team from the Island on February 27th 2007.

This work continues annual surveys of the Auckland Island breeding sites of the New Zealand sea lions (*Phocarctos hookeri*). 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) tag pups produced during the 2006/07 breeding season and; v) maintain and update the NZ sea lion database. On the 2 July 2007, these objectives were extended to include the analysis of sea lion pup production estimates for the 2006/07 season.

Logistics

The scientific trip was split into two parts: December 2nd - January 10th, and January 10th - February 28st. The breaks in the field season permitted changes in personnel during the summer. The first science team comprised of three people: Clayson Howell (DOC, RD&I), Andy Maloney (DOC contractor) and Amelie Auge (Otago University). The second team comprised of six people: Louise Chilvers (DOC, MCU), Lauraline Meyneir (Massey University), Simon Childerhouse (DOC contractor), Jacinda Amey (DOC contractor), Kerri Morgan (DOC contractor) and Murray Blake (DOC contractor).

Transport during the season was aboard the Marine Countess and the Clan McCleod 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 Southland, particularly Sharon Trainor, Gilly Adams, Jeremy Carroll, Pete McClelland and Andy Roberts. We also appreciate the helpful and friendly radio skeds coordinated by Stewart Island staff, particularly Ann Pullen. We thank Conservation Services Providers (CSP) and the Department of Conservation for funding the programme.

Sea lion counts

Daily counts were undertaken of pups (live and dead, dead pup count continued 4th December 2006 to 20th February 2007) and adults at the Sandy Bay (4th December 2006 - January 20th 2007) and South East Point (4th December 2006 - January 20th 2007) breeding areas. Counts were made at approximately one week intervals at East Bay and other areas around Enderby Island. One eight day trip was made to Dundas Is. during the season to count, tag and resight animals. Figure of Eight Island was counted on January 10th with 55 females, 25 males, and 67 live and 3 dead pups being recorded. Counts and resightings were also conducted by the sea lion team at Rose and Ewing Islands and Kekeno on the main Auckland Island. 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.

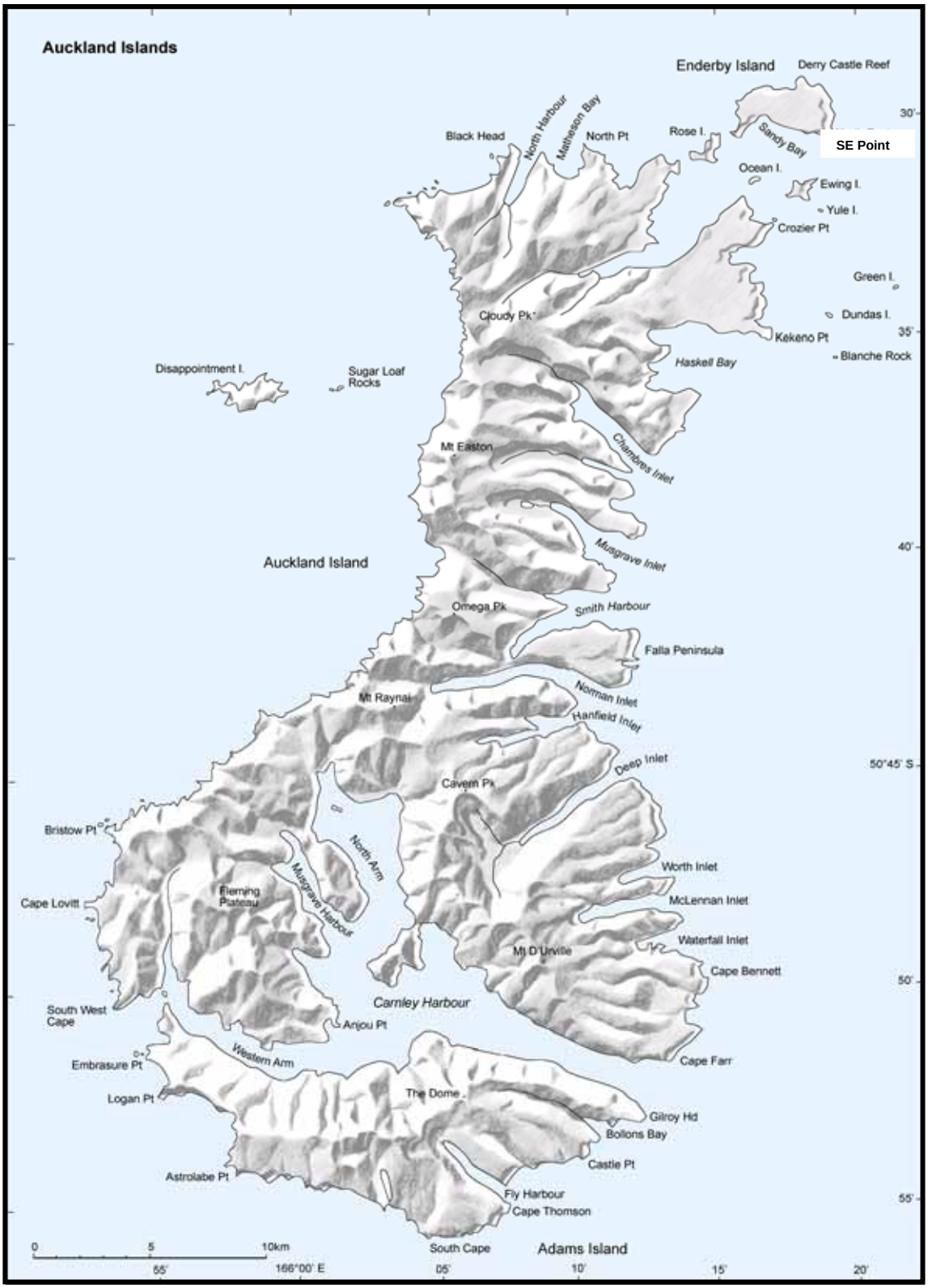

Figure 1: The Auckland Islands showing areas where sea lions were sighted: Figure of Eight Island, Dundas Island, Kekeno, Enderby Island and Rose Island.

Pup production estimate

Estimates of pup production were calculated for the breeding sites in the Auckland Islands between 10 Jan to 21 Jan 2006 (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 2224 ± 41 (Fig. 2).

On the 16th of January, the mark-recapture estimate at Sandy Bay was 414 ± 4. On the 17th January all live pups were tagged at Sandy Bay with a total of 412 pups tagged. There were 23 dead pups from the area at the 16th January giving a total pup production for Sandy Bay for the 2006/2007 season of 437 ± 4. The mark recapture estimate at Dundas Island was completed on 21st January 2006 with an estimation of 1587 live pups ± 36.5. 106 dead pups were counted on the island on the same day giving a total pup production for Dundas Island of 1693 ± 36.5. Direct counts from Figure of Eight Island on the 10th Jan yielded a count of 67 pups + 3 dead giving a total of 70. The direct count at South East Point yielded 19 live pups + 5 dead giving a total of 24 pups.

The estimate of pup production from the Auckland Islands were higher than that seen in 2006/07. Pup estimates from Figure of Eight increased by 13%. Pup mortality during the first 8 weeks of the 2006/ 07 season from all studied locations was 6.2% as of the 16th January (Table 2). Pup mortality at Sandy bay was 5.3% at the same date however was 16% by 26th Feb 2006. This increase in the level of pup mortality recorded between one and two months of age is seen consistently over the last eight years it has been recorded. This information needs to be included in management models for more appropriate survival and population estimates for New Zealand sea lions.

Figure 2. Annual pup production for the Auckland Islands 1995/96 to 2006/07.

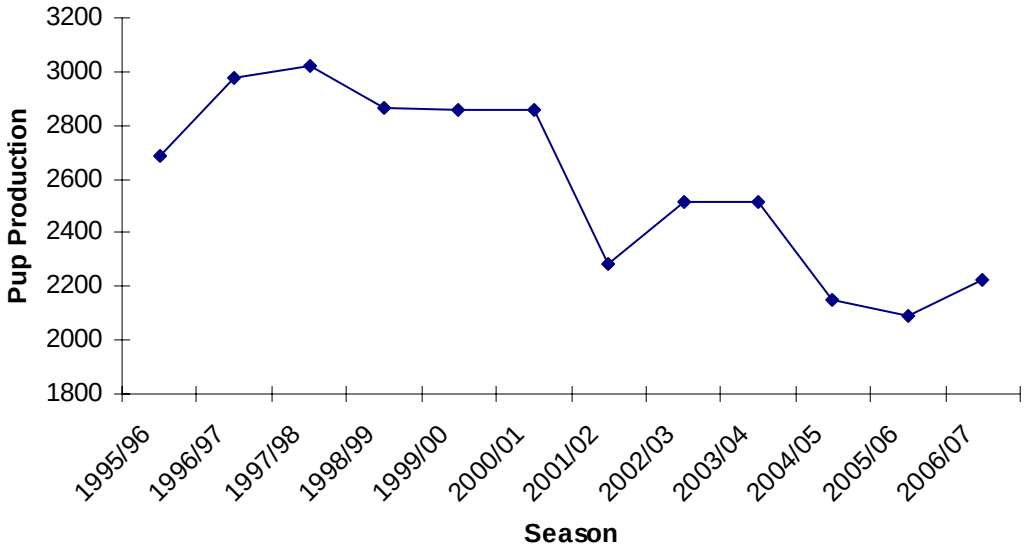

Table 1: Pup production estimates for Auckland Islands

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**

* 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%**

Population Estimation

The 2006/07 population estimate of New Zealand sea lions was 12348 (95% CI 10689 – 14213, Table 3) using Gales and Fletcher model for comparison with previous years.

Table 3: Population estimates of New Zealand sea lions, 1994 / 95 to 2006 / 07.

Season	Pup Production (s.d.)	Population size estimate using Gales & Fletcher model# 1996 including Campbell Island estimates	
		Mean	95% CI
94/95	2640 (20.8)	12797	10883 – 14339
95/96	2807 (22.3)	13606	11564 – 15239
96/97	3097 (25.5)	14661	12732 – 16826
97/98	3143 (93.8)	14868	12812 – 17175
98/99	2989 (32.5)	14163	12337 – 16262
99/00	2978 (42.6)	14104	12272 – 16230
00/01	2980 (24.3)	14108	12305 – 16163
01/02	2404 (33.7)	11376	9896 – 13058
02/03*	2902 (70.0)	13719	11849 – 15854
03/04	2899 (40.0)	13716	11891 – 15698
04/05	2533 (44.5)	11995	10391 – 13791
05/06	2474 (33.5)	11709	10172 – 13493
06/07	**2609 (46.5)**	**12348**	**10689 – 14213**

* Campbell Island estimate increased from 122 to 385 from the 02/03 season.
# Gales and Fletcher model used to allow for comparisons between years.

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 Purple 'coffin' shaped Dalton 'Jumbo' tags with a four-digit number. All pups were tagged in both flippers. All live pups at both Sandy Bay (412) and South East Point (19), and 325 pups (50 males and 275 females) at Dundas Island were tagged with Purple tags. 53 pups were tagged on Figure of Eight Island with red Dalton tags. Unfortunately after tagging at Sandy Bay is was discovered that approximately 10% of tags had manufactures faults with the connection pins base being split. Tags were therefore all checked before being placed out on Dundas Island resulting in 75 less tags going out on Dundas than would usually be put out.
264 pups were captured approximately 4 weeks after tagging at Sandy Bay and checked for tag loss, 7 pups had lost a single tag giving a probability of losing a single tag of 1.3%, within 4 weeks. This tag loss rate is though to be due to the manufactures fault in the tags. 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% and 1.3%. Tag loss over the first 4 weeks has 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 8200 resights made on 1800 animals previously

tagged or branded (including 162 individuals with double tag scars 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.

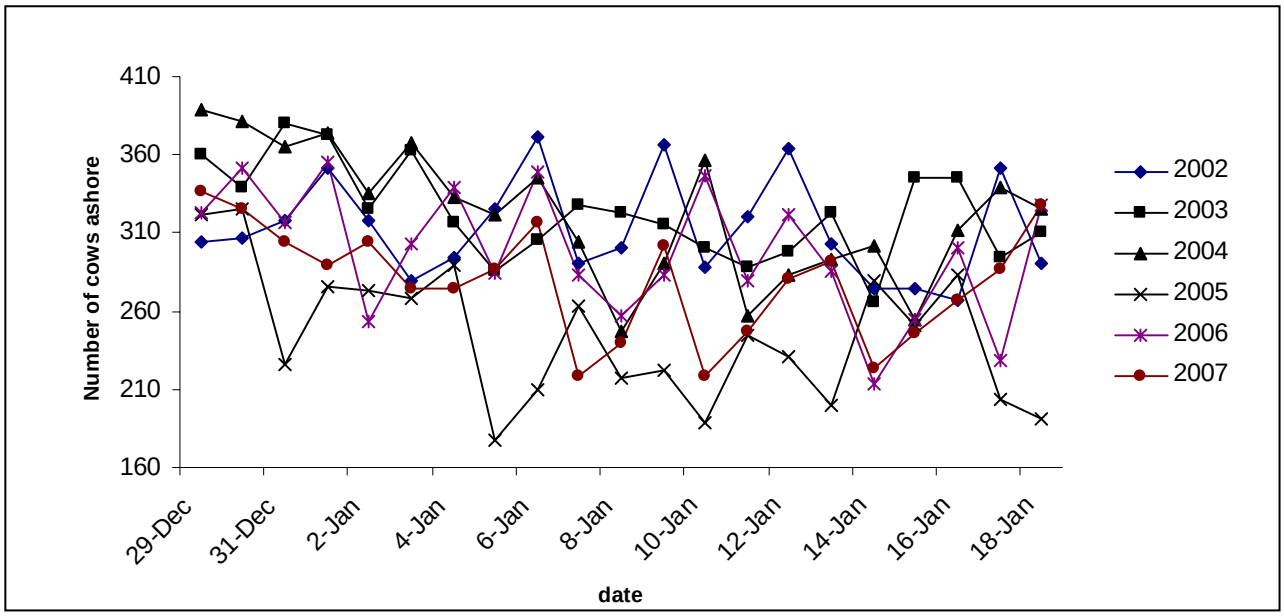

Figure 3. Numbers of females recorded ashore each day between 29th December and 18th January for the years 2001/02 to 2006/07.

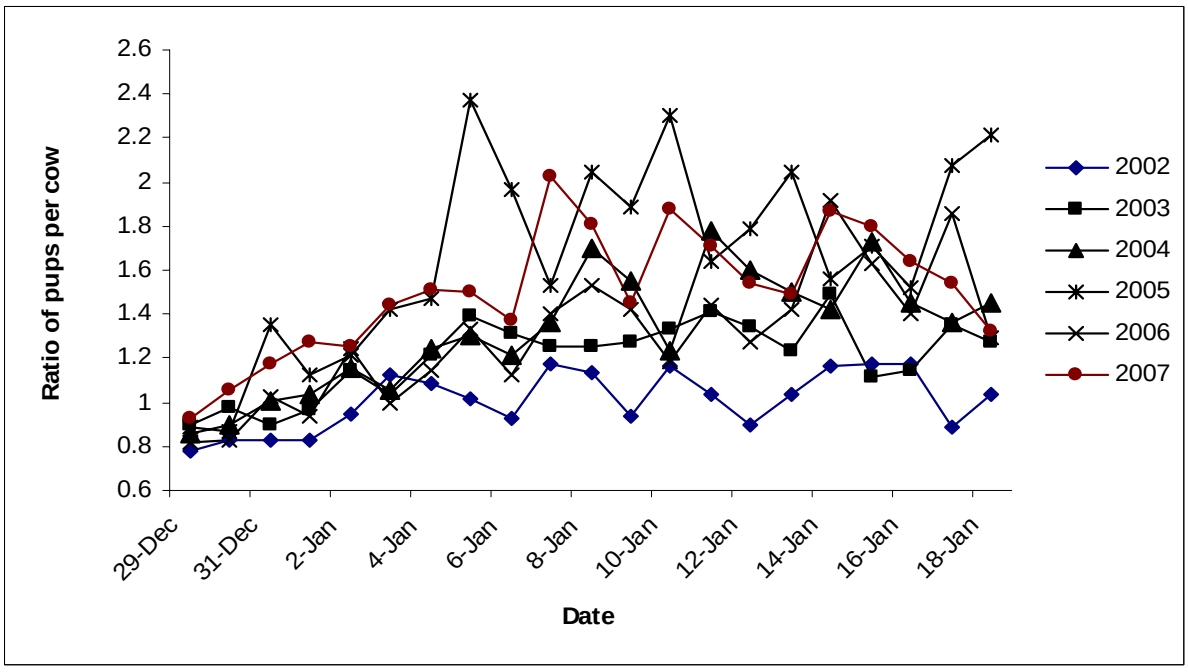

Figure 4. Pup:cow ratio at Sandy Bay between 30 December and 18 January for the years 2000/01 to 2006/07.

Maintenance and updating the NZ sea lion database

The NZ sea lion database has had the data from this seasons resights entered into it and checked. It is ready for possible data extraction required for the estimation of survival of previously marked NZ sea lions and reproduction by known age female NZ sea lions.