Manly Little Penguin Project

Monitoring Report

May 2008

Report prepared for:
Biodiversity Conservation Section, Metropolitan Branch and the Little Penguin Recovery Team

Acknowledgements

This report was prepared by Dr Lisa O'Neill, consultant under contract to the Department of Environment and Climate Change (DECC).

DECC Parks & Wildlife Division staff from Harbour Area North and Biodiversity Conservation Section, Metropolitan Branch assisted in the monitoring program in 2007/08.

The Little Penguin Recovery Team has developed and continues to review the monitoring program results and objectives.

Executive Summary

The breeding of Little Penguins, *Eudyptula minor*, at Manly was monitored in 2007/08 for the Little Penguin Recovery Team under contract to the DECC. Breeding was monitored fortnightly from July 2007 to the end of February 2008.

The following data are a summary of the results of the Manly Little Penguin monitoring program for 2007/08. The results for this period are presented in relation to five-year running means calculated using data from the 2002/03 season onward. This will continue to be the focus of monitoring in future years with the aim of identifying and illustrating trends or changes in the population over longer time frames, which will be particularly useful given the considerable natural variation observed between years. Annual breeding results are presented in Appendix 1.

Summary of breeding results from 2007/08 nest monitoring of the Manly Little Penguins

	2007/08.	Mean ±S.D. 2002/03-06/07	Mean ±S.D. 2003/04-07/08
Total active nests	98	85 ± 12	86 ± 12
Total breeding pairs	60	54 ±7	55 ± 7
Total eggs laid	130	133 ± 17	132 ± 17
Total chicks fledged	104	106 ± 12	106 ± 12
Breeding success *	69%	69% ± 9%	69% ± 9%

* calculated on a subset of total eggs and fledglings, see definitions on page v.

Three new nests were recorded in 2007/08, all of which produced fledglings. Two nest sites at Store Beach showed signs of activity for the first time this season. Five former fledglings were recorded at nest sites during the 2007/08 season, two of which bred. One penguin, translocated to Store Beach from Lion Island as a fledgling in 2004 as part of a translocation trial, was also recorded breeding this season, the first such fledgling to return.

Comment [j1]: I thought it was one nest box and one nearby natural burrow? Certainly one nearby natural cavity had evidence of visitation when I went there with Nicholas one evening.

Comment [MSOffice2R1]: Yes, I think you are right. I wasn't making the distinction but we should.

Comment [MSOffice3]: Just changed this a bit, I had the impression that it was suggesting 60 would return, as it read.

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Definitions

The following is a list of abbreviations and definitions used within this report. Also included is a locality map (Figure 1) showing places named within the text.

ABBBS Australian Bird and Bat Banding Scheme.

Active nest Any nest site showing recent signs of activity: birds, faeces, feathers or nesting material during the breeding season.

AIPM Australian Institute of Police Management.

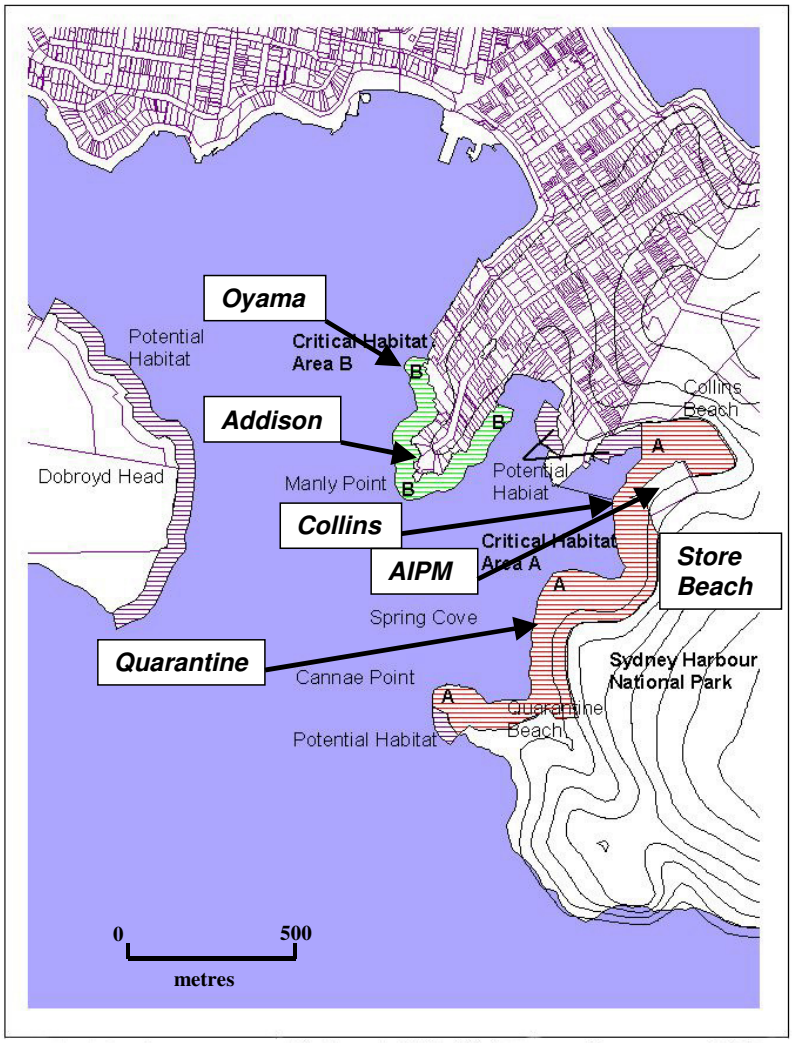
Breeding success the percentage of eggs that produce fledglings. Only nests with a complete visual history from before the laying of the first egg are used.

DECC Department of Environment and Climate Change (incorporating the NSW National Parks and Wildlife Service)

Double brooding where a second clutch of eggs is laid in the same nest following the hatching and rearing of a first clutch. Where the identity of the parents is unknown, it is assumed that all eggs within the nest belong to the same breeding pair.

Fledglings penguin young six weeks old or more, and over 600 grams.

Pullus penguin young that are partially or totally covered in downy feathers.



Little Penguin Critical Habitat Map

Figure 1: Locality map showing site names

1. Breeding season

Monitoring for the 2007/08 breeding season began on 3 July 2007. Monitoring ceased at the end of February 2008 when the last known pullus were ready to fledge. At this time the number of moulting adults within the colony was increasing.

The results for this period are presented in relation to five-year running means calculated using data from the 2002/03 season onwards. Monitoring over this period, undertaken in a consistent manner throughout, has shown that there is considerable natural variation in breeding results for the Manly Little Penguins. Against this range of variation it can be difficult to detect long term trends or changes in breeding results solely by viewing annual results. Instead, by comparing annual results against longer term mean figures, it will be easier to detect trends or changes without becoming distracted by the natural variation. Any dramatic variation in annual results will remain as obvious as it would have done previously, and longer term trends will be identified by changes in the long-term running mean.

A running mean is an average figure that is calculated over the same period, but at each annual calculation moves that period forward by a year. The running mean used here requires five years data, so can be calculated from seasons 2002/03 to 2006/07, and for 2003/04 to 2007/08 at this stage. Next year it will also be able to calculated for 2004/05 to 2008/09, and so on. The five year period was chosen because the extent of natural variation is such that this length of time was needed to be likely to encompass both poorer and better breeding seasons in the mean, and allow a balanced view of the long term trends in the penguin population.

This longer-term view will continue to be the focus of monitoring in future.

Data for all measured variables for each season from 2002/03 to the current season are shown by locality in Appendix 1.

2. Nest sites

The number of active nest sites recorded for each locality for this season are shown in relation to running means of five seasons data, from the 2002/03 to 2006/07 seasons, and from the 2003/04 to 2007/08 seasons (Table 1).

Table 1. Number of active nest sites at each locality in the 2007/08 season and five-year running means from the 2002/03 season.

	2007/08	Mean ±S.D. 2002-06	Mean ±S.D. 2003-07
Quarantine	22	18 ± 2	19 ± 3
Store Beach	4	0 ± 1	0 ± 1
Collins Flat	19	18 ± 4	18 ± 4
Addison Rd	30	24 ± 5	23 ± 5
Oyama Ave	23	24 ± 5	23 ± 5
Total	98	85 ± 12	86 ± 12

Between July and January each season all nest sites where breeding has been known to occur were checked at least fortnightly. All marked potential nest sites were checked every six weeks for penguin activity. Nest site activity was based on direct observations of birds or the presence of nesting material or fresh excrement in nest sites.

There was an increase in the number of nest sites showing activity in the 2007/08 season compared to the running means. This years figure was close to the range of variability that is considered normal relative to the mean, which is determined as one standard deviation either side of the mean. The standard deviation is indicated here by the ± 12 which follows the mean values of 85 for

2002-06 and 86 for 2003-07. This means that breeding pair numbers from 73 to 97 would be considered normal relative to the 2002-03 mean, and from 74 to 98 normal relative to the 2003-04 mean. In this case, a figure of 98 is just outside the range for 2002-06 and on the edge of the range for 2003-07. This suggests numbers for the year are close to or just above what is expected given previous numbers. It will be interesting to see if this trend continues in future years.

Three new nests were recorded during the 2007/08 breeding season, one at Quarantine Station, one at Oyama Ave, and one at Addison Rd. Each of these new nests successfully fledged a single clutch of eggs. One nest box and one nearby natural burrow at Store Beach showed signs of activity for the first time this season, although no breeding occurred. The birds using these nest sites were not seen or identified, but it is possible they were birds previously translocated to the site as chicks as part of an earlier trial, now returning for the first time as adults.

During this season, 15 of the 58 nest boxes (26%) were active, of which ten (17%) were used for breeding. This is a higher number and proportion of nest boxes used than in previous years (Appendix 1).

3. Breeding pairs

The number of known breeding pairs recorded at each locality for the 2007/08 season are shown in relation to running means of five seasons data, from the 2002/03 to 2006/07 seasons, and the 2003/04 to 2007/08 seasons (Table 2).

Breeding pair numbers were relatively higher this year than the five-year means, but the total number was within the range of variability that is considered normal relative to the mean (one standard deviation as indicated by the ± 7 which follows the mean values). In this case, a figure of 60 is well within the normal range.

Table 2: Number of breeding pairs at each locality in the 2007/08 season and five-year running means from the 2002/03 season.

	2007/08	Mean 2002-06	Mean 2003-07
Quarantine	14	10 ± 2	10 ± 2
Store Beach	-1	-	1
Collins Flat	11	12 ± 4	13 ± 3
Addison Rd	20	15 ± 2	16 ± 3
Oyama Ave	14	16 ± 1	15 ± 2
Total	60	54 ± 7	55 ± 7

By site, Quarantine Station and Addison Rd have this year shown relatively higher breeding pairs, and other sites are relatively normal. Oyama Ave has relatively fewer breeding pairs than normal relative to 2002-06, but pairs are within the range expected relative to 2003-07, so this does not indicate any cause for concern at this stage.

Monitoring was conducted at sites where there was observable breeding activity (the presence of eggs or chicks). These figures do not include possible nests, where the nest site could not be discovered or where activity within a nest could not be measured. It is likely that there were several additional nests undetected within the monitored sites. Totals do not include breeding pairs from Manly Wharf, Oceanworld Manly or sites where access to burrows on private property would invade people's privacy. The results presented are therefore an underestimate of the total number of breeding pairs, but provide a representative sample of the population.

In cases of inaccessible nest sites and laying of two clutches, the true number of adults involved could not be determined. As in previous years, it was assumed that any second clutch attempted in a burrow was by the same breeding pair (double brooding) after a first clutch had been raised. Five instances of double

brooding were established from banding records this season. Three of these were the same parents laying in the same nest and two were known parents double brooding in a nest different to their first clutch nest. A further ten nests appeared to have double brooding, but attending adults were not able to be identified. The assumption of probable double brooding is reasonable when it is considered that in all nests, in all years of monitoring, only one confirmed case of double brooding was found to have been due to different pairs.

4. Eggs

The number of eggs recorded laid in each locality for the 2007/08 season are shown in relation to running means of five seasons data, from the 2002/03 to 2006/07 seasons, and from the 2003/04 to 2007/08 seasons (Table 3).

Egg numbers are highly variable between years. It is important to note that the number of eggs at each locality is likely to be an underestimate. It is based on the number of observable eggs and a count back from pullus hatching from inaccessible or partially obscured nest sites. The numbers do not include nests where adults could be seen 'nesting' (lying in a prone position) but the contents could not be assessed and the eggs, if any, failed to hatch.

Table 3: Number of eggs at each locality in the 2007/08 season and five-year running means from the 2002/03 season.

	2007/08	Mean 2002-06	Mean 2003-07
Quarantine	37	26 ± 6	27 ± 8
Store Beach	1	-	-
Collins Flat	24	26 ± 8	27 ± 7
Addison Rd	42	40 ± 4	40 ± 4
Oyama Ave	26	40 ± 1	37 ± 6
Total	130	133 ± 17	133 ± 17

Egg numbers this year were within the range of variability that is considered normal relative to the mean (one standard deviation as indicated by the ± 17 shown beside the mean figures).

By site, Quarantine Station has this year shown relatively higher egg numbers, Oyama Ave relatively lower egg numbers, and other sites are relatively normal. Numbers are relatively higher at Quarantine Station sites despite development works at the Quarantine Station. There were no development activities within immediate range of penguin burrows at Oyama Ave which could explain poorer results at this site, although some boxes at this site were disturbed last year and some of the pairs nesting in those boxes at that time did not return to breed this year. As the results do not represent any consistent trend in overall egg numbers, and the total egg numbers are well within the expected range, this does not suggest cause for concern for the population.

5. Fledglings

The number of fledglings were estimated for the 2007/08 breeding season and shown in relation to running means of five seasons data, from the 2002/03 to 2006/07 seasons, and from the 2003/04 to 2007/08 seasons (Table 4).

Table 4: Number of fledglings at each locality in the 2007/08 season and five-year running means from the 2002/03 season.

	2007/08	Mean 2002-06	Mean 2003-07
Quarantine	30	19 ± 4	21 ± 6
Store Beach	1	-	-
Collins Flat	17	22 ± 7	21 ± 7
Addison Rd	35	32 ± 4	34 ± 4
Oyama Ave	21	32 ± 3	30 ± 6
Total	104	106 ± 12	106 ± 12

Numbers of fledglings this year were within the range of variability that is considered normal relative to the mean (one standard deviation as indicated by the ± 12 shown beside the mean figures).

By site, patterns for fledgling numbers were the same as for egg numbers. This indicates there were not any factors particularly effecting chick survivability by site.

Data are likely to be an underestimate of the total number of fledglings. Figures were based on the number of observable fledglings, plus a minimum of one fledgling for each inaccessible nest site that showed indirect evidence of the presence of well-developed pullus. Such indirect evidence included downy feathers at the entrance to deep nest sites and calling of young penguins from within their nesting cavity.

6. Breeding success

The breeding success was estimated for the 2007/08 breeding season, and is shown in relation to running means of five seasons data, from the 2002/03 to 2006/07 seasons, and from the 2003/04 to 2007/08 seasons (Table 5).

Average breeding success for the 2007/08 season was based on 29 nests, which produced 52 eggs. These were all of the nests where the number and fate of eggs could be determined from the beginning of incubation and followed through to fledging or prior loss. If any pair succeeded in double brooding, only the first clutch was used in calculations. The breeding success of this sub-sample is a reasonable estimate of the success for the population as a whole. Due to low sample sizes for each locality the breeding success figures for specific localities should be taken only as a guide.

Table 5: Breeding success at each locality in the 2007/08 season and five-year running means from the 2002/03 season*.

	2007/08	Mean 2002-06	Mean 2003-07
Quarantine	84% (19)	69 ± 7%	72 ± 9%
Store Beach	0	-	-
Collins Flat	50% (8)	75 ± 32%	65 ± 30%
Addison Rd	64% (11)	63 ± 12%	64 ± 12%
Oyama Ave	64% (14)	71 ± 14%	70 ± 14%
Average	69%	69 ± 9%	69 ± 9%

* Numbers in parentheses indicate the number of eggs used for calculations.

Breeding success numbers this year were exactly average relative to the running means over previous five-year periods. Quarantine Station has this year shown relatively higher breeding success numbers. So not only did more penguins breed at Quarantine Station sites this year, but they were more successful than normally expected at that site, despite development works at the Quarantine Station. Success at other sites was within the range normally expected.

Breeding success in nest boxes was lower than in the previous year but similar to that of two years ago, 45% at Quarantine Station (n = 6), 50% at AIPM (n = 1) and 100% at Oyama Ave (n = 3).

7. Recoveries and recruitment

Little penguins encountered as part of the monitoring in seasons up to and including the 2003/04 breeding season were banded with ABBBS bands. Since 2004 permanent marking of birds has been done using *Trovan* transponder microchips. Changes in the marking techniques applied to the Manly penguins is in line with directives from the Commonwealth Government. Unpublished data from studies of penguins on Phillip Island in Victoria indicate that birds fitted with metal flipper bands have reduced survival compared to penguins injected subcutaneously with a transponder microchip (Peter Dann pers. comm.).

This year 59 penguins (30 adults, 29 pullus) were banded as part of the monitoring program. A total of 476 birds have been banded since the commencement of the program, and 222 birds have been fitted with transponders since the 2004/05 breeding season.

This season, five Manly penguin fledglings returned to the colony, of which two bred. This result is similar to return rates of previous seasons (Appendix 1). A total of 25 fledglings have returned to Manly since the 1999/2000 season, of which 15 have bred. In addition, the first returning chick from the trial translocation program was found breeding this season. The bird, translocated as a fledgling from Lion Island in 2004, was found at the AIPM site. Unfortunately its breeding attempt was not successful this year.

Analysis of previous banding records of Little Penguins shows low rates of recapture of fledglings from the Manly population returning as adults, suggesting limited local recruitment to the population (Appendix 1). However, it is important to note that the number of nests where birds are accessible (to enable bands and tags to be read) limits recruitment estimates. Approximately 50% of all nest sites within the breeding localities are accessible.

8. Mortality

The death of one microchipped adult was recorded at Addison Rd during the 2007/08 season. Cause of death could not be determined for this bird due to its advanced state of decomposition. One Manly penguin was reported dead by Taronga Zoo this season. The bird died as a result of extensive injuries caused by a fishing hook. It had been banded breeding at Oyama Ave in 2004, and had also been seen this season breeding at Oyama Ave although the attempt had failed between 3 or 4 weeks prior to its death. There were 5 other unidentifiable

penguins brought to the zoo which subsequently died or were euthanased as a result of injury or illness.

A total of 104 eggs, from 53 nests, were known to have produced hatchlings. Eleven nests (21%), containing 18 eggs, produced no hatchlings. One nest (2%) with one hatchling produced no fledglings and 3 nests (6%) fledged just one of their two hatchlings. The chicks disappeared as young chicks from Quarantine Station (2), Collins Flat (1) and AIPM (1) nests. Two chicks disappeared from Collins Flat nests, and one at Oyama Ave prior to fledging as older chicks. These older chicks may have simply relocated to another nearby cavity, and still have successfully fledged.

9. Additional Sites

In addition to breeding at sites monitored as part of this program, Little Penguins also breed at other sites around Manly; Manly wharf and Oceanworld Manly. Extensive community wardening occurred this season at Manly wharf, organised by a volunteer co-ordinator under supervision of DECC staff. The use of wardens is intended to provide an important educational tool for beach users, and act as a deterrent to disturbance of penguins where necessary. For the most part, onlookers were respectful of the need to not disturb the penguins although a few incidents required intervention of council staff or police to deter unruly behaviour. The community warden co-ordinator reported that 6 breeding pairs at the wharf raised 8 fledglings. Two of these chicks were accepted by Taronga Zoo after desertion by their parents late in the season, and were released about 6 weeks later from nest boxes at Store Beach.

Taronga Zoo also released 2 wild caught penguins after rehabilitation from injury or illness, one of which was a bird previously banded on Lion Island and the other was a Manly penguin banded as a fledgling in 2006 from a Quarantine

Station nest site. In addition, 3 wild caught penguins were retained in the zoo collection after rehabilitation.

A survey of potential habitat at Dobroyd Head undertaken by DECC staff, James Dawson and Kathleen Hellman, in October 2007 found no evidence of breeding penguins. Given the potential habitat and proximity to the Manly penguin population, it is recommended that such a survey be undertaken regularly, probably in August-September each year.

10. Discussion

The number of active nest sites (98) and breeding pairs (60) in the 2007/08 breeding season was higher than average but within the range of what is considered normal given the five-year running means Total egg numbers (130) and number of chicks fledged (102) were just below the running five-year means but again within the range considered normal. The percentile Breeding Success (69%) equalled the running five-year means calculated for this and the previous season.

Quarantine Station has this year shown relatively higher breeding success. Not only did more penguins breed at Quarantine Station sites this year, but they were more successful than normally expected at that site, despite development works at the Quarantine Station. Success at other sites was within the range normally expected.

In summary this can be considered a successful season particularly when viewed against the natural variation shown in previous seasons.

Community volunteers (penguin wardens) concentrated their efforts this year at the Manly wharf, rather than Store Beach as in previous seasons. Wardening at Store Beach had aimed to enhance the protection of Store Beach by providing a

Comment [j4]: I don't think this actually happened this year at Store Beach – check with Andrew. Wardening was concentrated at Manly Wharf. Still leave this information in the report.

deterrent to the landing of dogs. It is hoped that the wardening program will increase awareness of the risks associated with the presence of dogs for penguins and ultimately increase the attractiveness of the Store Beach site for recolonisation by penguins. This season did see an increase in penguin activity at Store Beach so the long term prospect of Store Beach as a site is looking promising.

Activity at two nest sites, one nest box and one natural burrow, on Store Beach was a promising progression in the development of a colony at the site. This is the first time these boxes have been prospected since the translocation of Lion Island and captive bred fledglings to this site. The birds using these boxes were not seen or identified, but it is possible they were birds previously translocated to the site as chicks, now returning for the first time as adults. The Store Beach locality has considerable potential as a major penguin breeding site in Sydney Harbour.

The change in the permanent marking techniques from banding with ABBBS metal bands to inserting subcutaneously scanner-read *Trovan* transponders will have an increasing impact on the results of penguin monitoring. Reductions in the detection of known adults in the Manly colony and in reports of penguin mortality away from the study site is likely. Adults within the study sites that are unreachable in deep rock cavities, previously had the possibility of visual confirmation of their identity from their metal flipper-bands. With transponder-marked individuals in similar circumstances, the microchip reader often cannot be moved close enough to a bird for its identity to be determined. There may be a decline in reporting of dead penguins by the public, particularly away from the study area, as the presence of a transponder chip is not apparent, whereas flipper bands were highly visible.

Appendix 1

Table 1: Summary of breeding season results by year

	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	Mean ±S.D.
Total active nests	94	99	79	70	84	98	87 ± 12
Total breeding pairs	55	49	56	46	64	60	55 ± 7
Total eggs laid	133	118	138	118	158	130	133 ± 15
Total chicks fledged	102	100	101	99	127	104	106 ± 11
Breeding success *	70%	74%	61%	81%	59%	69%	69% ± 8
Total banded/chipped	118	96	80	32	51	56	
Adults	50	26	24	7	19	30	
Pullus	68	70	56	25	32	26	
Ratio of nest box use	11 of 16	9 of 40	9 of 43	7 of 59	8 of 58	10 of 58	

Table 2: Number of active nest sites at each locality by year

	2002/03	2003/04	2004-05	2005-06	2006/07	2007/08
Quarantine	19	22	16	17	18	22
Store Beach	-	-	3	2	2	4
Collins Flat	19	18	17	13	23	19
Addison Rd	31	27	22	18	20	30
Oyama Ave	25	32	21	20	21	23
Total	94	99	79	70	84	98

Table 3: Number of breeding pairs at each locality by year.

	2002/03	2003/04	2004-05	2005-06	2006/07	2007/08
Quarantine	14	9	10	8	11	14
Store Beach	-	-	1	0	1	1
Collins Flat	8	12	14	10	18	11
Addison Rd	17	13	16	13	16	20
Oyama Ave	16	15	15	15	18	14
Total	55	49	56	46	64	60

Table 4: Number of eggs at each locality by year.

	2002/03	2003/04	2004-05	2005-06	2006/07	2007/08
Quarantine	31	20	29	19	31	37
Store Beach	-	-	1	0	1	1
Collins Flat	18	19	28	26	39	24
Addison Rd	42	39	41	34	46	42
Oyama Ave	42	40	40	39	41	26
Total	133	118	139	118	158	130

Table 5: Number of fledglings at each locality by year

	2002/03	2003/04	2004-05	2005-06	2006/07	2007/08
Quarantine	22	16	19	15	25	30
Store Beach	-	-	1	0	1	1
Collins Flat	18	16	18	24	32	17
Addison Rd	29	32	30	31	40	35
Oyama Ave	33	36	33	29	29	21
Total	102	100	101	99	127	104

Table 6: Breeding success at each locality by year *

	2002/03	2003/04	2004-05	2005-06	2006/07	2007/08
Quarantine	69% (29)	69% (13)	66% (29)	80% (15)	63% (16)	84% (19)
Store Beach	-	-	100% (1)	0	0	0
Collins Flat	100% (8)	100% (4)	23% (14)	82% (11)	71% (17)	50% (8)
Addison Rd	60% (20)	65% (17)	55% (22)	83% (12)	54% (13)	64% (11)
Oyama Ave	70%(30)	79%(19)	78%(23)	80% (20)	47% (17)	64% (14)
Average	70%	74%	61%	81%	59%	69%

* Numbers in parentheses indicate the number of eggs used for calculations.

Table 7: Little Penguin banding and microchipping results by year

	2002/03	2003/04	2004-05	2005-06	2006/07	2007/08
No. adults	50	26	24	7	19	30
No. pullus	68	70	56	25	32	29
Total	118	96	80	32	51	59

Table 8: Recruitment by year

Year of banding	Number marked	Number returned by year (number breeding)								
		'99-'00	**'00-'01**	**'01-'02**	**'02-'03**	**'03-'04**	**'04-'05**	**'05-'06**	**'06-'07**	**'07-'08**
'98-'99	11	1	2 (1)	0	1 (1)	0	0	0	0	0
'99-'00	34		0	2 (2)	1 (1)	1 (1)	1 (1)	0	0	0
'00-'01	39			0	1 (1)	1 (0)	1 (1)	0	0	0
'01-'02	39				0	1 (1)	0	0	0	0
'02-'03	68					2 (2)	0	0	0	0
'03-'04	70						3 (0)	2 (2)	2 (2)	1 (1)
'04-'05	56							0	2 (2)	3 (2)
'05-'06	25								1 (0)	2 (0)
'06-'07										0
Total	**322**	**1 (0)**	**2 (1)**	**2 (2)**	**3 (3)**	**5 (4)**	**5 (2)**	**2 (2)**	**5 (4)**	**6 (3)**