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Granite Island
Little Penguin *Eudyptula minor*
Breeding Monitoring
Study 1995/96

Report for the
Greater Granite Island Development Co Pty Ltd

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EXECUTIVE SUMMARY

BACKGROUND

This report represents the third year of data collection. Previous collections were undertaken in 1990/91 and 1991/92.

The study was funded by the Greater Granite Island Development Company under their obligations under the indenture agreement and planning approval, and was conducted with the assistance of the Department of Environment and Natural Resources, Victor Harbor.

The study was undertaken to ascertain the level of disturbance to the breeding colony due to construction of Stage 1 Granite Island Development and ongoing disturbance by the public.

For this study, comparisons were made between the North Shore breeding activity and that on the Southern side of the island.

Penguin Burrows were surveyed for eggs, chicks, weights and condition of birds. Monitoring began mid-breeding season September 1995 and was carried through to February 1996.

RESULTS

There were no clear indications between areas in relation to failed clutches and numbers of chicks fledged. The North Shore had 47% of chicks born surviving to fledgling stage whilst the southern side of the island recorded 52%. This was consistent with the previous seasons studied (1990-1992).

The 1995/96 breeding season compared favourably with previous years studied, with significantly more chicks being produced than in 1991/92.

The first year of development does not appear to have had a significant impact on the penguin colony.

Monitoring should continue over future years to identify population trends before they become obvious and to determine the success of the burrows created within the development area.

CHRIS HALSTEAD
DISTRICT RANGER FLEURIEU
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

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INTRODUCTION

The 1995/1996 Granite Island Little Penguin breeding study represents the third year of data collection. The study began during the middle of the breeding season, the purpose being to monitor the impact of development works which had already begun on the north shore of Granite Island. The methodology was based on that used for the 1990 - 1992 studies (Brandle 1991 & 1992).

Findings from the previous studies indicated that penguin breeding success was lower on Granite Island than on nearby West Island. This was attributed to the high levels of disturbance on Granite Island from the public, and probable regular predation of untended chicks by the native Water Rats (*Hydromys chrysogaster*). The Granite Island penguin population has also periodically suffered from predation by foxes and dogs. On Granite Island the breeding success was marginally greater for the sheltered (but more highly disturbed) north shore when compared with the southern part of the island.

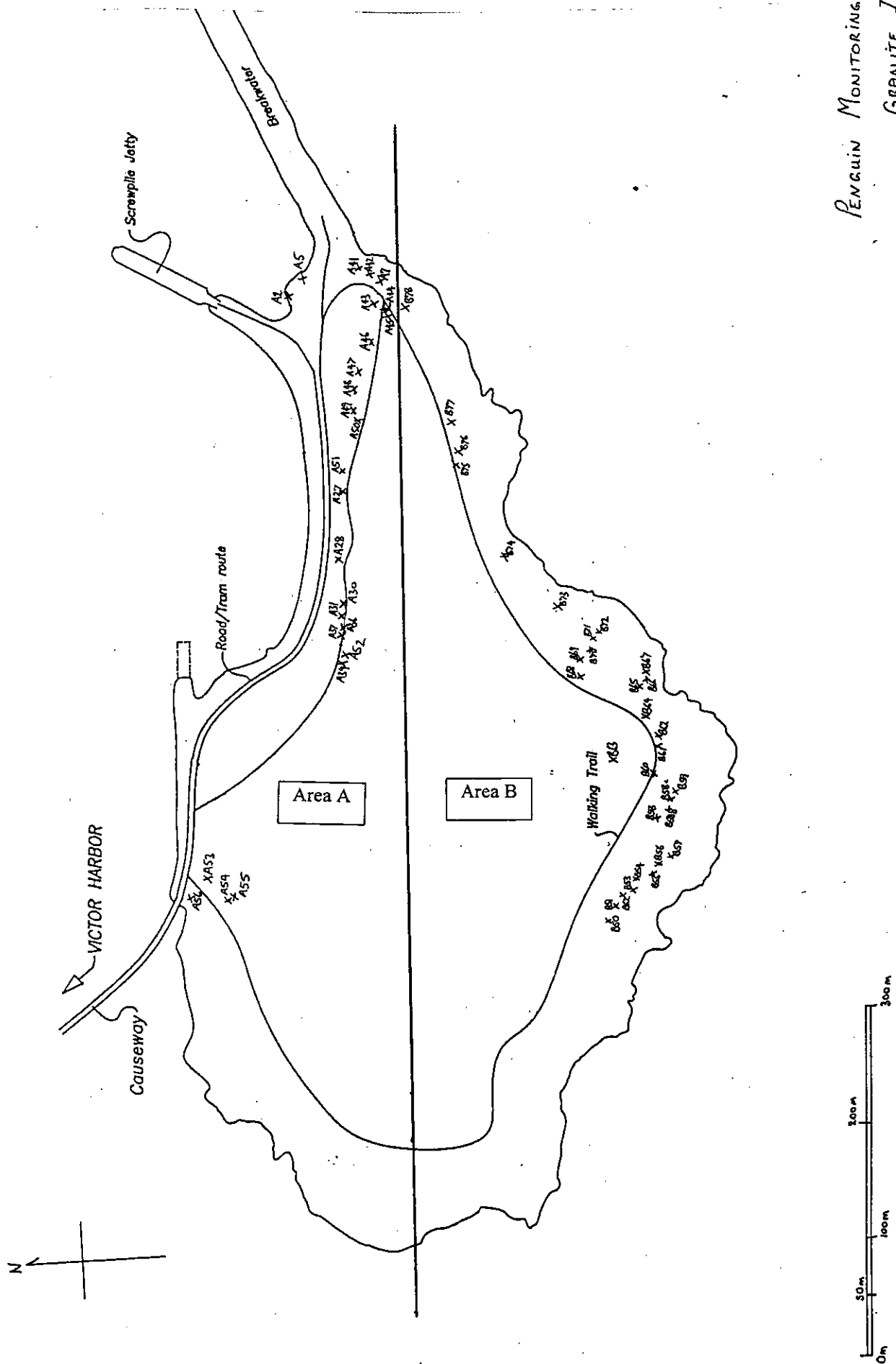
For the current study the north shore of Granite Island (Area A) was compared with the southern parts of the island (Area B) to monitor the impact of the tourist development activity on this area. It was not possible to find 40 active burrows that could be effectively monitored in the north shore area because of changes to many burrows over time, and also to the loss of some burrows due to the development activity. Thus a total of 26 burrows were monitored in Area A and 31 in Area B. (Refer to Map 1).

METHODS

Penguin breeding burrows were selected on the basis of: presence of eggs, chicks or adult penguins; and the practicality of an observer being able to reach into a burrow to retrieve penguins in order to weigh and identify individuals. Each fortnight, the selected burrows were monitored. Burrows sampled during the previous studies were resampled if they met these conditions. Details recorded included: number of eggs, chicks and adult birds; weight of adults and chicks; bill depth measurements of adults; bill length measurements of chicks; and comments on condition of birds (eg fully fledged, died, etc.). Monitoring began mid breeding season during September 1995 and was carried through to February 1996. All information was recorded on data sheets (see sample in Appendix 1) and incorporated into the Granite Island Monitoring Study database. This database has now been transferred to a Microsoft Access computer program and copies will be held by the Victor Harbor Department of Environment and Natural Resources office and the Greater Granite Island Syndicate.

MAP 1. Location of monitored burrows on Granite Island

PENGUIN MONITORING PROGRAM
GRANITE ISLAND.
NPWS 1995-96



RESULTS

All monitoring data are stored on a Microsoft Access database called PENGUIN.MDB with the results from the 1991 and 1992 studies. This year's data are presented in Appendix 2 and 3.

OCCUPANCY STATUS OF BURROWS

The following figures show the number of adults, chicks and eggs, using the monitored burrows for both areas during the monitoring sessions.

Figure 1.

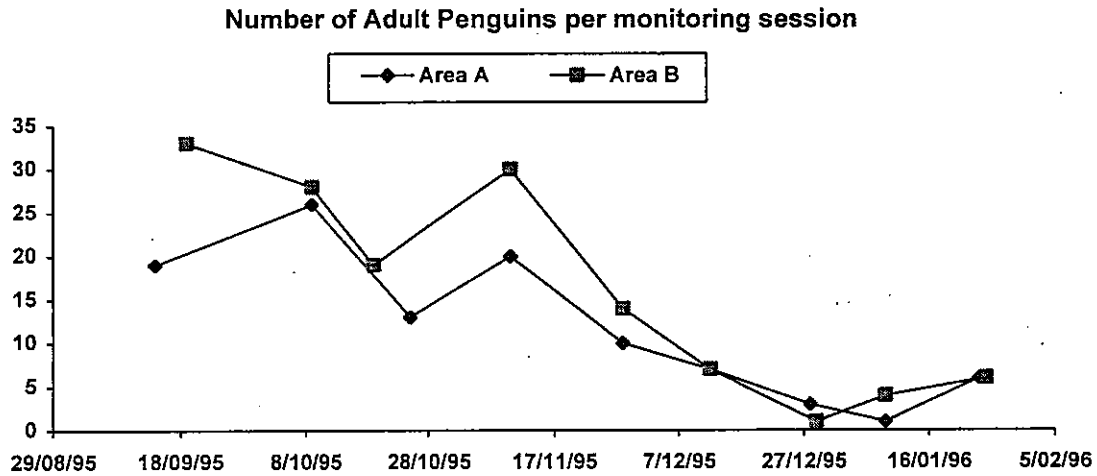


Figure 2.

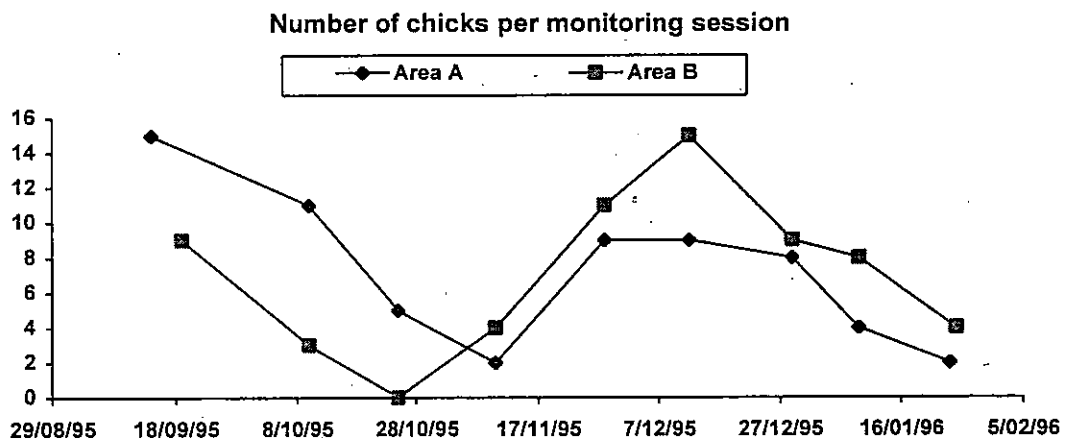
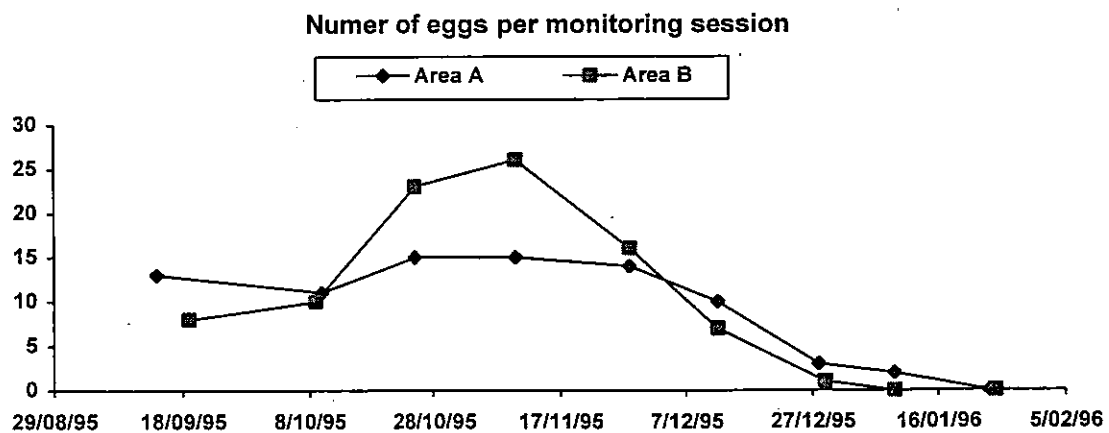


Figure 3.



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The observable peaks and troughs in the above figures reflect breeding season cycles. At least one adult is always present in the nest after both eggs have been laid. This vigil is maintained through the five week incubation period and the next three weeks of chick development. While adults are preparing nests both are sometimes present during the day. For the last 5 weeks of the chicks development there are no adults present during the day, as both need to gather food for the chicks. This pattern is reflected in the figures which imply that there were bursts of egg laying which produced two cohorts of chicks during the monitored period. Chicks from the first cohort were already mostly fledged when monitoring started (Figure 2). This was followed by second clutches being laid in October and November (Figure 3). The second peak in Figure 2 reflects the hatching of this second clutch. The slight rise in Figure 1 during January reflects the return of adults to moult.

BREEDING RESULTS

Table 1 summarises the breeding results as a comparison between A and B. Firstly, in relation to activity within the burrows monitored, and then in terms of the number of clutches and absolute numbers of eggs and chicks.

Penguin Breeding Summary 1995/96		
	AREA A	AREA B
Number of burrows monitored	26	31
Number of burrows with eggs	17	23
Number of burrows without eggs	10	8
Number of burrows with chicks	18	16
Number of burrows without chicks	9	14
Number of burrows containing one or more clutches	23	23
Number of burrows with 1 clutch only	17	16
Number of burrows with 2 clutches	6	7
Number of burrows not used for breeding	3	8
Number of breeding pairs	25	25
Number of clutches	30	30
Number of clutches with 1 egg only	2	1
Number of clutches with 2 eggs	18	22
Number of clutches with chicks but no eggs recorded*	9	7
Number of clutches with 1 chick only	7	9
with fledglings & number fledged	2	5

Penguin Breeding Summary 1995/96		
	AREA A	AREA B
Number of clutches with 2 chicks	14	12
with fledglings	9	7
number fledged	15	12
Number of clutches with 3 chicks	1	0
with fledglings	1	
number fledged	1	
Total Clutches with at least one fledgling	12 (40%)	13 (43%)
Total of failed clutches	18	17
Total Number of Eggs recorded	38	45
Total Number of Chicks recorded	38	33
Clutches with 1 EGG - 0 CHICK	1	1
Clutches with 2 EGG - 0 CHICK	7	8
Clutches with 1 EGG - 1 CHICK	1	0
Clutches with 2 EGG - 1 CHICK	2	4
Clutches with 2 EGG - 2 CHICK	9	10
Clutches with 0 EGG - CHICKS *	9 (15)	7 (9)
Percentage of eggs producing fledglings*	34%	31%
NUMBER OF CHICKS FLEDGED (percentage of number of chicks recorded)	18 (47%)	17 (52%)

* As monitoring started mid season, it was not possible to record eggs for chicks already hatched. This leads to an underestimation of the total number of eggs laid, creating a positive bias in hatching rates from eggs.

The number of chicks fledged refers to those chicks reared to an age where they shed their down for adult plumage.

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Table 2. COMPARISON OF BREEDING SUCCESS WITH THE 1990-1992 STUDIES

GRANITE ISLAND PENGUIN STUDY COMPARISONS 1990/1991/1995	AREA A			AREA B		
	1990	1991	1995	1990	1991	1995
number of burrows monitored	40	40	26	40	40	31
number of burrows used for breeding	29	26	23	32	34	23
number of clutches produced	30	36	30	32	50	30
number of burrows with chicks	18	15	18	12	17	16
number of eggs recorded	24*	69	38*	40*	86	45*
number of chicks recorded	30	43	38	19	33	33
number of chicks fledged	18 (60)%	13 (30)%	18 (47)%	15 (79)%	8 (24)%	17 (52)%
% of eggs producing fledglings	21%*	19%	34%*	9%*	9%	31%*
number of clutches producing at least one fledgling	12 (40)%	10 (28)%	12 (40)%	11 (34)%	7 (14)%	13 (43)%
number of failed clutches	18 (60)%	26 (72)%	18 (60)%	21 (66)%	43 (86)%	17 (57)%

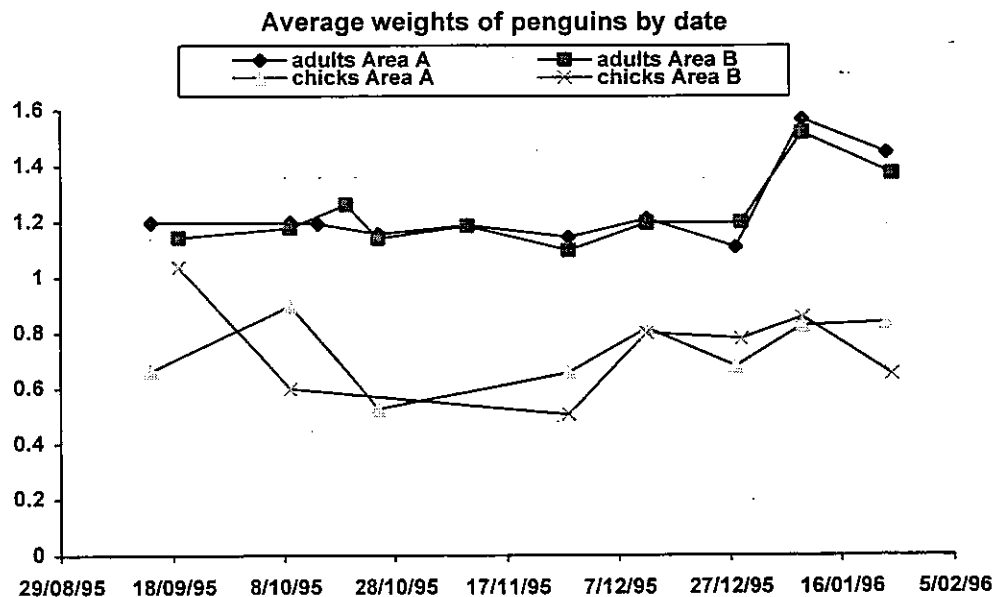
* refer to comment under Table 1.

Whilst there were significant differences in chicks fledged to chicks failed between years (Area A $P=0.03$; Area B $P=0.0004$), there were no significant differences between areas A and B during the three years studied. The between Area statistics for number of clutches, eggs, chicks etc during 1995 are not significantly different. Observed differences in numbers of clutches producing fledglings between Areas A and B for each year was also not significant.

PENGUIN WEIGHTS

The weights of adult penguins fluctuate between 0.9 kg to 1.3 kg during the breeding season. Throughout the breeding season (September to December) the average weights ranged between 1 and 1.2 kg (see figure 4). This implies that food supplies were sufficient to maintain body weight and should not have been responsible for any declines in breeding activity. The gain in adult average weight during January reflects the beginning of the moult when penguins double their body weight to sustain their three week stay on the island.

Figure 4.



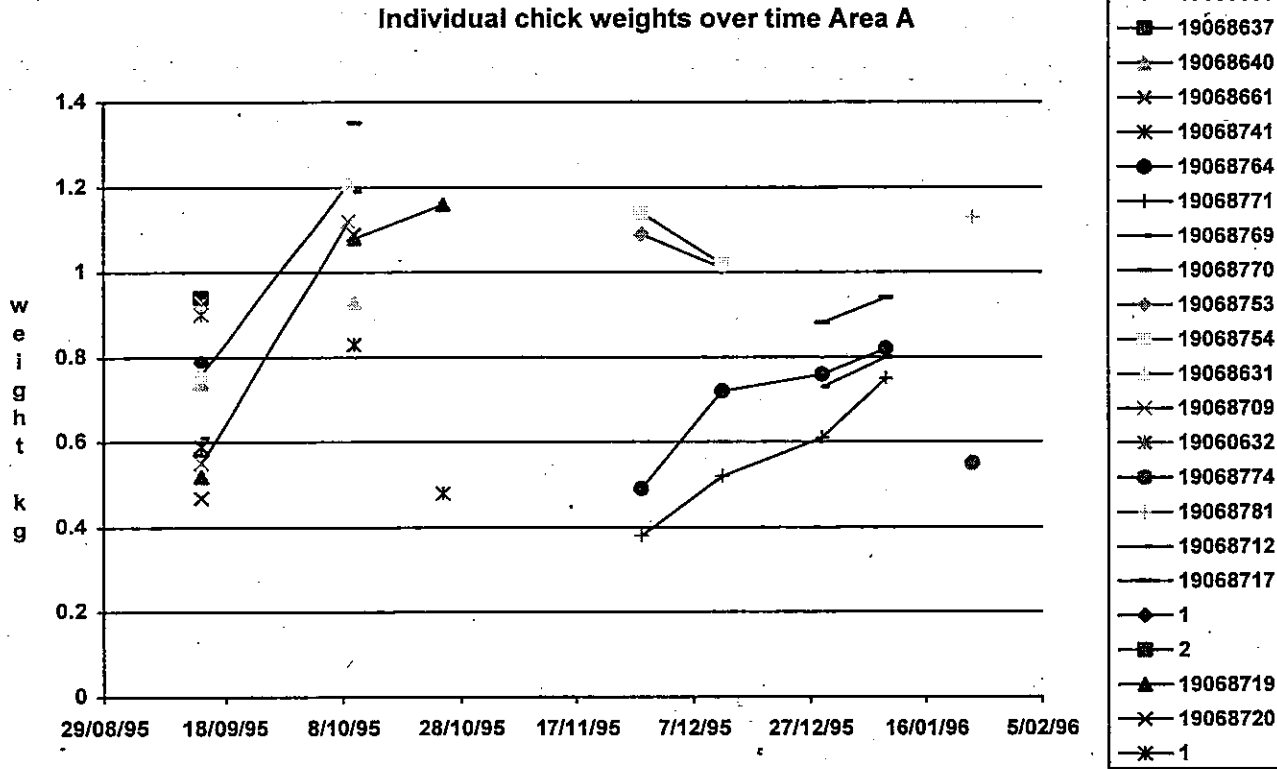
CHICK GROWTH

Chick growth kg/day - 1995

95% confidence limits 0-30 days = 0.018 0.027 ave=0.023
 31-60 days = -0.009 0.015 ave=0.012

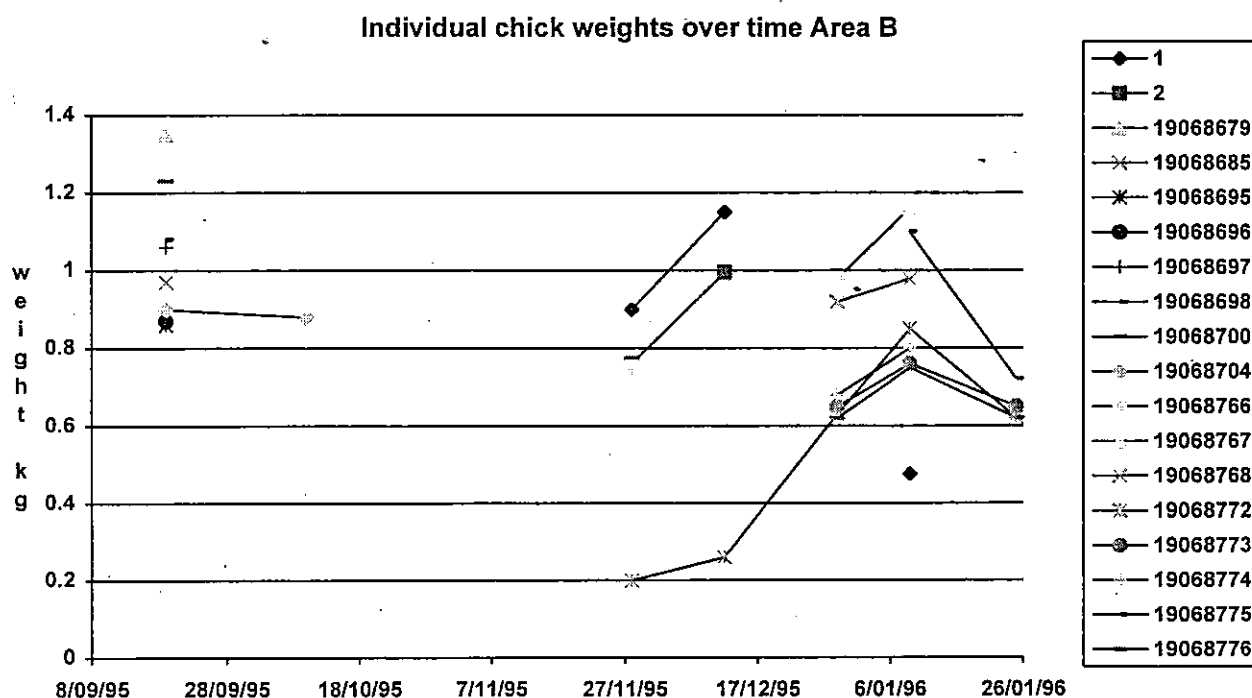
Chick growth rates were again highly variable though on average appeared lower than for 1991 (c 0.023 and 0.012 kg/day in 1995 cf. 0.028 and 0.018 kg/day in 1991). This may also be an artefact of only partial sampling during 1995.

Figure 5.



The two cohorts or pulses of clutches are apparent. Chick growth rates appear to be higher for chicks born mid season than those hatched later. The gaps in the growth curves for some chicks result from weights not being measured. Newly hatched chicks were often not weighed to minimise stress on them and their parents.

Figure 6.



As for Area A there appeared to be two cohorts of chicks (cf Figure 2). The first cohort was largely fledged by the time of sampling and appeared to have good fledging weights. The second cohort appeared to develop at a reasonable rate until the end of the season when many were losing weight.

DISCUSSION

The monitoring program has shown that the development of the north-shore area of Granite Island Area A did not appear to have a significant impact on the breeding success and use of burrows when compared with the undeveloped part of the island Area B. This is reflected in the proportion of burrows in which breeding activity took place and the number of clutches produced (88% of burrows in area A and 74% in Area B contained eggs, chicks or both). Whilst there were slight differences in the numbers of eggs and chicks produced, the number of eggs or chicks born growing to fledgling age is more important for considering impacts on colony survival. In this regard the construction phase of the development does not appear to have had significant impact, despite the destruction of three nest burrows and the loss of two clutches attributable to the development. This may be a biased picture as monitoring should have begun at the start of the breeding season in May, before any development took place, not during the middle of both as was the case.

However the trend with chick development over time in both areas supports the general findings of minimal impact. Mid season chicks in both areas appeared to do well, with weights well over 1 kg (figures 5 & 6). Chicks which matured towards the end of season, (as during 1991) appeared to suffer food shortages and could not achieve adequate fledging weights. This may be related to the parents' need to moult at this time of the year. It is probable that most of these chicks would have died after leaving the burrows.

Whilst penguin breeding activity was not significantly impacted by the development, a slight trend was noticed in comparison with the first two years of monitoring. In 1991 and 1992 there appeared to be a trend favouring Area A as the better location to rear chicks. That is, the percentage of eggs producing fledglings and the number of successful clutches were higher (refer to table 2). Brandle 1991 postulated that this may have resulted from the north shore being a more sheltered area despite the confounding affects of high visitation/disturbance and the presence of the omnivorous native Water Rat. During 1995 this trend was not evident. This trend may reappear in the absence of the high levels of disturbance resulting from digging of trenches and building work next year. Continued monitoring is important to establish that the recent changes through increases in visitor traffic in the north shore area, particularly at night, do not pose a problem to breeding success. Such problems if they arise can thus be detected and managed. The north shore

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penguin population has the potential to greatly increase over the next 10 years with the provision of more breeding burrows and appropriate visitor and predator management.

CONCLUSIONS & RECOMMENDATIONS

The 1995 penguin breeding monitoring program has not found a significant difference in penguin breeding success between the development area and the unaffected southern coast of Granite Island.

A total of 26 and 31 burrows were monitored on the north shore and the southern coast of Granite Island respectively. Twenty-five breeding pairs laid 30 clutches of eggs in both areas. From these, 12 and 13 (Areas A & B) clutches produced 18 and 17 chicks to an age where they could leave their burrows. These results compare favourably with monitoring during 1990 and 1991.

Provision of burrows on the north shore area should gradually increase breeding activity and penguin numbers in this area, provided that the burrows are well insulated from extremes of climate and protected from interference.

Monitoring should be continued on the island to determine that the recent changes on the north shore are not disadvantaging the colony. This would also enable management to determine the success of the replacement and extra burrows which were provided in the development area.

REFERENCES

- Brandle R (1991) *Encounter Bay Penguin Study 1990/91*. Unpublished report Dpt Env & Plg.
(1992) *Encounter Bay Penguin Study 1991/92*. Unpublished report Dpt Env & Plg.
Stahel C & Gales R (1987) *Little Penguins: Fairy Penguins in Australia*. University of NSW Press, Sydney.

APPENDIX 1 - SAMPLE DATA SHEET

GRANITE ISLAND PENGUIN MONITORING DATASHEET

BURROW NUMBER: A48

Details of burrow location (include direction and distance from marked points): CLIFF

OPPOSITE SCREWPILE - CLIFF CORNER 'A' 5m STR EAST

ADULT PENGUINS

DATE	TAG #1 190 68738	TAG #2 19068739	TAG #3 190	TAG #4 190	TAG #5 190	TAG #6 190
11/10	BD=125 WT 1190g	BD=14mm WT 1310g				
28/11		WT 1220				
12/12		WT 1250				
29/12		WT = 1160				
9/1		-				
24/1		-				
9/2	1475	1550				
22/2	-	-				

PENGUIN CHICKS

DATE	TAG #1 190 68631	TAG #2 190 68709	TAG #3 190	TAG #4 190	TAG #5 190	TAG #6 190
14/9	W = 760g Gape 35.7	W = 550g Gape 32.0				
9/10	W 1210 Gape 48.0	W 1120 Gape 37				
25/10	-	-				
10/11			EGG	EGG		
28/11			EGG	EGG		
12/12			EGG Gape 34. WT = 320	EGG Gape WT = 400.		
29/12						
9/1			-	-		

APPENDIX 2 - PENGUIN DATABASE

BURROW	DATE RECORDED	BAND NUMBER	SEX/AGE	WEIGHT (KG)	BILL DEPTH (MM)	COMMENTS 1	COMMENTS 2	COMMENTS 3
AZ	DATE	BAND	SEX	WT	BL			
A2	14/09/95	19068614	M	1	14.4	E		
A2	10/10/95							SITE DESTROYED BY PLUMBER
A27	14/09/95	19068634	F	1.1	12			
A27	10/10/95	19068634	F	1.08				
A27	10/10/95	19068713		1.09	13			
A27	25/10/95							
A27	10/11/95							
A27	28/11/95	19068755	F	0.99	12			
A27	12/12/95					E		
A27	29/12/95	19068713		0.94		E		
A27	9/01/96					E		
A27	24/01/96							
A28	14/09/95	19068635	F	1.03	12.8	E		
A28	10/10/95	19049686	M	1.26	13.5			
A28	10/10/95	19068635	F	1.37				
A28	25/10/95	19068635		0.97		E		
A28	10/11/95	19068635		1.19		E		
A28	28/11/95					E		
A28	12/12/95							
A28	29/12/95					E		
A28	9/01/96							
A28	24/01/96							
A30	14/09/95					C		
A30	10/10/95							
A30	25/10/95							
A30	10/11/95							
A30	28/11/95							
A30	12/12/95	1				ADULT		
A30	29/12/95							
A30	9/01/96							
A30	24/01/96	1				ADULT		
A31	14/09/95	19060044	M	1.42	14.6			
A31	14/09/95	19068638	F	1.3	12.8			
A31	10/10/95							NOT SAMPLED
A31	25/10/95	19068638		1.21				
A31	10/11/95	19068638		1.17		E		
A31	28/11/95	19060044		1.34		C		
A31	12/12/95	19068638		1.07		C		
A31	29/12/95							
A31	9/01/96							
A31	24/01/96							
A34	14/09/95							NOT SAMPLED
A34	10/10/95	19068715		1.51	15			
A34	10/10/95	19068716		1.09	12			
A36	10/10/95					C		
A36	14/10/95					C		
A36	25/10/95							
A36	10/11/95	19055410	F	1.35	12.5	E		
A36	10/11/95	19068742	M	1.2	14	E		
A36	28/11/95	19068742		0.96		E		
A36	12/12/95					E		
A36	29/12/95							
A36	9/01/96							
A36	24/01/96							
A37	10/10/95	19049680	M	1.31	15			
A37	10/10/95	19055544	F	1.25	12.5			
A37	25/10/95	19049680	M	1.3				
A37	25/10/95	19055544	F	1.35				
A37	10/11/95							
A37	28/11/95							
A37	12/12/95							
A37	29/12/95							
A37	9/01/96							
A37	24/01/96							
A39	10/10/95	19060507		1.05	14	E		
A39	14/10/95	19068662		1.2	13	E		
A39	25/10/95	19068662		0.99		E		
A39	10/11/95	19068662		1.02		E		
A39	28/11/95					C		
A39	12/12/95					C		
A39	29/12/95					C		
A39	9/01/96					C		
A39	24/01/96							
A41	14/09/95	19068622		1.17	13.8	E		
A41	25/10/95							
A41	10/11/95							
A41	28/11/95							
A41	12/12/95							
A41	29/12/95							
A41	9/01/96							
A41	24/01/96							
A42	14/09/95	19068623	F	1.03	11.2			BURROW EMPTY
A42	10/10/95							
A42	25/10/95							
A42	10/11/95	19068622	M	1.3	14.5			
A42	28/11/95							
A42	12/12/95							
A42	29/12/95							
A42	9/01/96							
A42	24/01/96	19068622		1.45				
A43	14/09/95	19068625	M	1.22	14			
A43	14/09/95	19068626	F	1.3	11			
A43	9/10/95	19068625	M	1.28	14			
A43	9/10/95	19068626	F	1.207	11			
A43	25/10/95	19068625		1.27		E		
A43	10/11/95	19068626		1.09		E		
A43	28/11/95	19068625		1.14		C		
A43	12/12/95					C		
A43	29/12/95					C		
A43	9/01/96					C		
A43	24/01/96							
A44	14/09/95					C		
A44	9/10/95							BURROW EMPTY
A44	25/10/95							
A44	10/11/95							
A44	28/11/95							

APPENDIX 2 - PENGUIN DATABASE

BURROW	DATE RECORDED	BAND NUMBER	SEX (M/F)	WEIGHT (KG)	BILL DEPTH (MM)	COMMENTS 1	COMMENTS 2	COMMENTS 3
A44	12/12/95							
A44	29/12/95							
A44	9/01/96							
A44	24/01/96						BIRD PRESENT	
A45	14/09/95	19068627	M	1.31	14.6			
A45	9/10/95	19068627		1.32				
A45	25/10/95	19068732		1.14	13.5	E		
A45	10/11/95	19068732		1.07		C		
A45	28/11/95					C		
A45	12/12/95							
A45	29/12/95							
A45	9/01/96						BURROW CLOSED	
A46	14/09/95	19068628	M	1.14	13.7			
A46	9/10/95	19068708	F	1.15	12.1	E		
A46	25/10/95	19068628		1.05		E		
A46	10/11/95	19068628		1.07		E		
A46	28/11/95	19068628		1.1		E		
A46	12/12/95							
A46	29/12/95							
A46	9/01/96							
A46	24/01/96						DEAD UNMARKED	
A47	14/09/95	19068629	F	1.13	12.5			
A47	14/09/95	19068630	M	1.33	14			
A47	9/10/95	19068629	F	1.08	12.5	E		
A47	9/10/95	19068630	M	1.17	14	E		
A47	25/10/95	19068629		1.08		E		
A47	10/11/95	19068630		1.12		E		
A47	28/11/95					C		
A47	12/12/95							
A47	29/12/95							
A47	9/01/96							
A47	24/01/96							
A48	14/09/95					C		
A48	9/10/95					C		
A48	25/10/95							
A48	10/11/95	19068738	F	1.19	12.5	E		
A48	10/11/95	19068739	M	1.31	14	E		
A48	28/11/95	19068739		1.22		E		
A48	12/12/95	19068739		1.25		E		
A48	28/12/95	19068739		1.16		C		
A48	9/01/96							
A48	24/01/96							
A49	14/09/95					C		
A49	10/10/95	19068710	F	1.13	12.5			
A49	10/10/95	19068711	M	1.29	14.5			
A49	25/10/95							
A49	10/11/95							
A49	28/11/95							
A49	12/12/95							
A49	29/12/95							
A49	9/01/96							
A49	24/01/96							
A5	14/09/95	19068621		1.28	13.5	E		
A5	10/10/95	19068707		1.19	13.5	E C		
A5	25/10/95							
A5	10/11/95	19068707		1.2	13.5	E		
A5	28/11/95	19068707		1.32		E		
A5	12/12/95	19068621		1.26		C		
A5	29/12/95							
A5	9/01/96							
A5	25/01/96							
A50	14/09/95	19068633	M	1.23	14.9	E		
A50	10/10/95	19068633	M	1.52		E		
A50	25/10/95	19068633		1.3		C		
A50	10/11/95	19068740	F	1.17	12			
A50	10/11/95	19068741	M	1.15	14			
A50	28/11/95							
A50	12/12/95							
A50	29/12/95							
A50	9/01/96							
A50	24/01/96							
A51	14/09/95					C		
A51	10/10/95					C		
A51	25/10/95							
A51	10/11/95							
A51	28/11/95							
A51	12/12/95							
A51	29/12/95							
A51	9/01/96							
A51	24/01/96							
A52	10/10/95	19068718	M	1.15	14.6	C		
A52	14/10/95					C		
A52	25/10/95							
A52	10/11/95	19068718		1.29				
A52	28/11/95	19068756	F	1.05	12	E		
A52	12/12/95	19068756		1.3		E		
A52	29/12/95							
A52	9/01/96							
A52	24/01/96	19068756		1.85			MOULT	
A53	10/10/95							
A53	14/10/95	19068663		1.19	12			
A53	25/10/95							
A53	10/11/95							
A53	28/11/95							
A53	12/12/95							
A53	29/12/95							
A53	9/01/96							
A53	24/01/96							
A54	14/09/95	19068664	M	1.33	15	C		
A54	14/09/95	19068665	F	1.17	12.3	C		
A54	10/10/95	19068665		0.95		E		
A54	25/10/95	19068665		0.99		E		
A54	10/11/95	19068664		1.19		C		
A54	28/11/95							
A54	12/12/95	19068743	M	1.38	15			
A54	29/12/95							
A54	9/01/96							

APPENDIX 2 - PENGUIN DATABASE

BURROW	DATE RECORDED	BAND NUMBER	SEX/AGE	WEIGHT (KG)	BILL DEPTH (MM)	COMMENTS 1	COMMENTS 2	COMMENTS 3
A54	24/01/96							
A55	14/09/95					C		
A55	10/10/95							
A55	25/10/95					C		
A55	10/11/95	19068743	M	1.23	14.5			
A55	10/11/95	19068744	F	1.11	13			
A55	28/11/95							
A55	12/12/95							
A55	29/12/95							
A55	9/01/96							
A55	25/01/96	19068743		1.41				
A55	25/01/96	19068744		1.21				
A56	10/10/95	19068721	M	1.25	14	C		
A56	14/10/95					E		
A56	25/10/95	19068721		1.1		C		
A56	10/11/95	19068721		1.39				
A56	28/11/95	19068757	F	1.21	12.5	E		
A56	12/12/95							
A56	29/12/95							
A56	9/01/96	19068777	F	1.57	11		MOULT	
A56	25/01/96	19068777		0.9			MOULT	
A7	14/09/95	19055408	F	1.04	13.1			
A7	14/09/95	19068624	M	1.24	13.7			
A7	9/10/95	19055408		1.16	13.1			
A7	9/10/95	19068624		1.17	13.7			
A7	25/10/95	19068624		1.3				
A7	10/11/95							
A7	28/11/95	19068624		1.13		E		
A7	12/12/95	19055408		1.01		E		
A7	29/12/95	19055408		1.2		C		
A7	9/01/96							
A7	24/01/96							
B50	19/09/95	19068666		1.43	13	E		
B50	9/10/95	19068666		0.94				
B50	25/10/95	19068666		1.1		E		
B50	10/11/95	19068745	M	1.14	14.5	E		
B50	28/11/95	19068758		1.3	13.5			
B50	12/12/95							
B50	29/12/95							
B50	9/01/96	19068667	M	1.89	14.5		MOULT	
B50	25/01/96	19068758		2.02			MOULT	
B51	9/10/95	19068667		1.46				
B51	19/10/95	19068667	M	1.38	14.5			
B51	19/10/95	19068668	F	1.16	13			
B51	25/10/95							
B51	10/11/95							
B51	28/11/95							
B51	12/12/95							
B51	29/12/95							
B51	9/01/96							
B51	25/01/96							
B52	9/10/95	19068722	F	0.86	13			
B52	19/10/95	19068669	M	1.25	14.5			
B52	25/10/95					E		
B52	10/11/95	19068722		1.02		C		
B52	28/11/95	19068759	F	1.06	11	C		
B52	28/11/95	19068761	F	0.99	11	C		
B52	12/12/95							
B52	29/12/95							
B52	9/01/96	19068761		1.16				
B52	25/01/96							
B53	19/09/95	19068670		1.25	13			
B53	9/10/95	19068670		1.17				
B53	25/10/95	19068670		1.17		E		
B53	10/11/95	19068670		1.23		C		
B53	28/11/95							
B53	12/12/95							
B53	29/12/95							
B53	9/01/96							
B53	25/01/96							
B54	19/09/95	19068671	F	0.9	12			
B54	9/10/95	19068723	M	1.27	14.5			
B54	25/10/95							
B54	10/11/95	19068723		1.33				
B54	28/11/95							
B54	12/12/95							
B54	29/12/95							
B54	9/01/96							
B54	25/01/96							
B55	19/09/95	19055463	M	1.05	14.5			
B55	9/10/95	19068725	F	1.15	12			
B55	19/10/95	19055463					NOT WEIGHED	
B55	25/10/95							
B55	10/11/95							
B55	28/11/95							
B55	12/12/95							
B55	29/12/95							
B55	9/01/96							
B55	25/01/96							
B56	19/09/95	19068672	M	1.26	14			
B56	9/10/95	19068672	M	1.35	14			
B56	9/10/95	19068724		1.07	13			
B56	25/10/95							
B56	10/11/95	19068724		0.92		E		
B56	28/11/95	19068724		0.84		E		
B56	12/12/95							
B56	29/12/95							
B56	9/01/96							
B56	25/01/96							
B57	19/09/95	19068673		1.13	13.5			
B57	19/09/95	19068674		1.07	13			
B57	9/10/95							
B57	25/10/95							
B57	10/11/95	19068673		1.15				
B57	28/11/95							
B57	12/12/95							
B57	29/12/95							

APPENDIX 2 - PENGUIN DATABASE

BURROW	DATE RECORDED	BAND NUMBER	SEX (M/F)	WEIGHT (KG)	BILL DEPTH (MM)	COMMENTS 1	COMMENTS 2	COMMENTS 3
B57	9/01/96							
B57	25/01/96							
B58	19/09/95	19068675		1.03	13			
B58	19/09/95	19068676		1.07	13			
B58	9/10/95	19068676		1.16				
B58	25/10/95	19068676		1.09		E		
B58	10/11/95	19068676		1.31		E		
B58	28/11/95	19068676		1.09		C		
B58	12/12/95							
B58	29/12/95							
B58	9/01/96							
B58	25/01/96							
B59	19/09/95	19068677	F	1.25	11.5			
B59	19/09/95	19068678	M	1.17	15			
B59	9/10/95	19068678	M	1.1				
B59	25/10/95							
B59	10/11/95							
B59	28/11/95							
B59	12/12/95							
B59	29/12/95							
B59	9/01/96							
B59	25/01/96							
B60	19/09/95						C	
B60	9/10/95	19068726	M	1.4	14			
B60	25/10/95							
B60	10/11/95	19068747	F	1.15	12.5	E		
B60	28/11/95	19068726		1.1		E		
B60	12/12/95	19068726		1.19		C		
B60	29/12/95							
B60	9/01/96							
B60	25/01/96							
B61	19/09/95	19068690	F	1.12	12	E/C		
B61	9/10/95							BURROW NOT MONITORED
B61	25/10/95	19068690		1.35				
B61	10/11/95	19068690		1.06		E		
B61	28/11/95	19068690		1.12		E		
B61	12/12/95	19068762	M	1.17	13.5	C		
B61	29/12/95							
B61	9/01/96							
B61	25/01/96							
B62	19/09/95	19068681	F	0.98	10.5			
B62	19/09/95	19068682	M	1.14	14			
B62	9/10/95	19068681	F	1.01				
B62	9/10/95	19068682	M	1.16				
B62	25/10/95							
B62	10/11/95	19068683	F	0.99	13			
B62	10/11/95	19068684	M	1.09	13.5			
B62	28/11/95							
B62	12/12/95							
B62	29/12/95							
B62	9/01/96							
B62	25/01/96							
B63	19/09/95	19068683		1.18	13			
B63	19/09/95	19068684		1.14	13.5			
B63	10/10/95							
B63	25/10/95	19068735	F	1.25	12			
B63	10/11/95	19068735		1.36				
B63	10/11/95	19068748	M	1.1	14.5			
B63	28/11/95					E		
B63	12/12/95					m		
B63	29/12/95					m		
B63	9/01/96							
B63	25/01/96							
B64	19/09/95	19068686	F	1.07	12			
B64	10/10/95							
B64	25/10/95							
B64	10/11/95							
B64	28/11/95							
B64	12/12/95							
B64	29/12/95							
B64	9/01/96							
B64	25/01/96							
B65	19/09/95	19068687	M	1.07	13.5			
B65	19/09/95	19068688	F	0.98	10			
B65	10/10/95	19068727	M	1.18	15			
B65	10/10/95	19068728	F	1.28	12.5			
B65	25/10/95							
B65	10/11/95	19068727	M	1.18	15			
B65	10/11/95	19068728	F	1.28	12.5			
B65	28/11/95							
B65	12/12/95	19068765	M	1.83	16		MOULT	
B65	29/12/95							
B65	9/01/96	19068727		1.96			MOULT	
B65	25/01/96	19068778	M	1.32	14			
B66	19/09/95	19068689	M	1.22	15			
B66	19/09/95	19068690	F	1.07	12			
B66	10/10/95	19068689	M	1.22				
B66	10/10/95	19068690	F	1.1				
B66	25/10/95							
B66	10/11/95							
B66	28/11/95							
B66	12/12/95							
B66	29/12/95							
B66	9/01/96							
B66	25/01/96							
B67	19/09/95	19068691	M	1.09	13.5			
B67	19/09/95	19068692	F	1.16	12			
B67	10/10/95	19068691	M	1.22				
B67	10/10/95	19068692	F	1.26				
B67	25/10/95	19068692	F	0.8	12	E		
B67	10/11/95	19068691		1.17		E		
B67	28/11/95					E		
B67	12/12/95					E		
B67	29/12/95							
B67	9/01/96							
B67	25/01/96	19068692		1.09				
B68	19/09/95	19068693	F	0.97	12			

APPENDIX 2 - PENGUIN DATABASE

BURROWS	DATE RECORDED	BAND NUMBER	SEX (M/F)	WEIGHT (KG)	BILL DEPTH (MM)	COMMENTS 1	COMMENTS 2	COMMENTS 3
B68	19/09/95	19068694	M	1.18	14			
B68	10/10/95							
B68	25/10/95	19068736	F	1.1	11.5	E		
B68	10/11/95	19068736		1.21		E		
B68	28/11/95	19068736		1.06		E		
B68	12/12/95	19068736		0.98		C		
B68	29/12/95					C		
B68	9/01/96					C		
B68	25/01/96					C		
B69	19/09/95					C		
B69	10/10/95							
B69	25/10/95							
B69	10/11/95	19068749		1.2	14			
B69	10/11/95	19068750		1.45	14			
B69	28/11/95	19068749		1.24				
B69	12/12/95	19068750		1.05		E		
B69	29/12/95	19068750		1.2		C		
B69	9/01/96	19068749		1.07		C		
B69	25/01/96							
B70	19/09/95					C		
B70	10/10/95							
B70	25/10/95							
B70	10/11/95	19068751	M	1.19	14	E		
B70	10/11/95	19068752	F	1.15	12.5	E		
B70	28/11/95	19068752		1.04		E		
B70	12/12/95	19068752		1.03		E		
B70	29/12/95							
B70	9/01/96							
B70	25/01/96							
B71	19/09/95	19068699	M	1.37	16			
B71	10/10/95	19068729	F	1.1	12	E		
B71	25/10/95	19068699		1.4		E		
B71	10/11/95							
B71	10/11/95							
B71	28/11/95							
B71	12/12/95							
B71	29/12/95							
B71	9/01/96							
B71	25/01/96	19068729		1.5			MOULT	
B72	19/09/95					C		
B72	10/10/95							
B72	25/10/95	19068737	F	1.1	12	E		
B72	10/11/95	19068737		1.26		E		
B72	28/11/95	19068737		1.17		E		
B72	12/12/95	19068763	M	1.13	14	E/C		
B72	29/12/95							
B72	9/01/96					C		
B72	25/01/96					C		
B73	19/09/95	19068701	F	1.1	13			
B73	19/09/95	19068702	M	1.49	16			
B73	10/10/95	19068701	F	1.22				
B73	10/10/95	19068702	M	1.54				
B73	25/10/95							
B73	10/11/95	19068702		1.35				
B73	28/11/95							
B73	12/12/95							
B73	29/12/95							
B73	9/01/96							
B73	25/01/96	19068779	F	1.27	12.5			
B74	19/09/95	19068703		1.08	13	E		
B74	10/10/95	19068730	M	1.32	14.5			
B74	10/10/95	19068731	F	1.14	12			
B74	25/10/95							
B74	10/11/95	19068731		1.12				
B74	28/11/95							
B74	12/12/95							
B74	29/12/95							
B74	9/01/96							
B74	25/01/96							
B75	19/09/95	19060552	M	1.33	14			
B75	10/10/95	19060662	F	1.06	12.5			
B75	25/10/95	19060552		1.29		E		
B75	10/11/95	19060552		1.31		C		
B75	28/11/95	19060552		1.28		C		
B75	12/12/95					C		
B75	29/12/95					C		
B75	9/01/96							
B75	25/01/96							
B76	19/09/95					C		
B76	10/10/95					C		
B76	25/10/95	19055520	M	1.2	14	E		
B76	10/11/95	19055520		1.17		E		
B76	28/11/95	19055520		1.27		C		
B76	12/12/95					C		
B76	29/12/95					C		
B76	9/01/96					C		
B76	25/01/96							
B77	19/09/95	19060061	M	1.17	16			
B77	19/09/95	19068705		1.13	14			
B77	10/10/95	19060061	M	1.23				
B77	10/10/95	19068705		1.3				
B77	25/10/95	19068705	M	0.95	14	E		
B77	10/11/95	19068705		1.04		E		
B77	28/11/95					C		
B77	12/12/95					C		
B77	29/12/95					C		
B77	9/01/96					C		
B77	25/01/96	19068790	F	1.05	11	C		
B78	19/09/95	19068706		1.13	14			
B78	10/10/95	19068706		1.25				
B78	25/10/95	19068706		1.17				
B78	10/11/95							
B78	28/11/95							
B78	12/12/95							
B78	29/12/95							
B78	9/01/96							
B78	25/01/96							

APPENDIX 2 - PENGUIN DATABASE

BURROW	DATE RECORDED	BAND NUMBER	SEX(M/F)	WEIGHT(KG)	BILL DEPTH (MM)	COMMENTS 1	COMMENTS 2	COMMENTS 3
B79	25/10/95	19068734	F	1.1	13	E		
B79	10/11/95	19068734		1.19		E		
B79	10/11/95	19068746	M	1.3	14.6	E		
B79	28/11/95							
B79	12/12/95							
B79	29/12/95							
B79	9/01/96							
B79	25/01/96							
B80	25/10/95	19068733	M	1.06	15	E		
B80	10/11/95	19068733		1.18		E		
B80	28/11/95	19068760	F	0.82	11.5	C		
B80	12/12/95					C		
B80	29/12/95					C		
B80	9/01/96					C		
B80	25/01/96					C		

APPENDIX 3 - CLUTCH DATABASE

BURROW	DATE	BER OF E	ER OF C	AND NUMB	WEIGHT(KG)	BILL DEPTH(MM)	BILL LENGTH	COMMENTS	COMMENTS 2
A43	9/01/96	0	2	19068770	0.94		52		
A43	24/01/96	0	0						
A44	14/09/95	0	1		0.43		35.2		
A44	9/10/95	0	0						CHICK LOST
A44	25/10/95	0	1		0.43		35		
A44	10/11/95	0	0						
A44	28/11/95	0	0						
A44	12/12/95	0	0						
A44	29/12/95	0	0						
A44	9/01/96	0	0						
A44	24/01/96	0	0						
A45	14/09/95	0	0						
A45	9/10/95	0	0						
A45	25/10/95	2	0						
A45	28/11/95	0	2	19068753	1.09	43			
A45	28/11/95	0	2	19068754	1.14	42			
A45	12/12/95	0	2	19068753	1.01				
A45	12/12/95	0	2	19068754	1.02				
A45	29/12/95	0	2						
A45	9/01/96	0	2						
A46	14/09/95	0	0						
A46	9/10/95	2	0						
A46	25/10/95	2	0						
A46	10/11/95	2	0						
A46	28/11/95	2	0						
A46	12/12/95	0	0						
A46	29/12/95	0	0						
A46	9/01/96	0	0						
A46	24/01/96	0	0						
A47	14/09/95	0	0						
A47	9/10/95	1	0						
A47	25/10/95	2	0						
A47	10/11/95	2	0						
A47	28/11/95	0	2		0.49		33		
A47	28/11/95	0	2		0.36		30		
A47	12/12/95	0	0						
A47	29/12/95	0	0						
A47	9/01/96	0	0						
A47	24/01/96	0	0						
A48	14/09/95	0	2	19068631	0.76		35.7		
A48	14/09/95	0	2	19068709	0.55		32		
A48	9/10/95	0	2	19068631	1.21		48		
A48	9/10/95	0	2	19068709	1.12		37		
A48	25/10/95	0	0						
A48	10/11/95	2	0						
A48	28/11/95	2	0						
A48	12/12/95	2	0						
A48	28/12/95	0	2		0.32		34		
A48	28/12/95	0	2		0.4				
A48	9/01/96	0	0						
A48	24/01/96	0	0						
A49	14/09/95	0	1	19060632	0.9		45.2		STILL DOWNY PROBABLY FLEDGED
A49	10/10/95	0	0						
A49	25/10/95	0	0						
A49	10/11/95	0	0						
A49	28/11/95	0	0						
A49	12/12/95	0	0						
A49	29/12/95	0	0						
A49	9/01/96	0	0						
A49	24/01/96	0	0						
A5	14/09/95	2	0						
A5	10/10/95	1	1		0.24		24		
A5	25/10/95	0	0						
A5	10/11/95	2	0						
A5	28/11/95	2	0						
A5	12/12/95	0	2						
A5	29/12/95	0	0						
A5	9/01/96	0	0						
A5	24/01/96	0	2	19068774	0.55	9			
A5	24/01/96	0	2	19068781	1.13		52		
A50	14/09/95	2	0						
A50	10/10/95	2	0						
A50	25/10/95	0	2		0.3				
A50	25/10/95	0	2		0.27				
A50	10/11/95	0	0						
A50	28/11/95	0	0						
A50	12/12/95	0	0						
A50	29/12/95	0	0						
A50	9/01/96	0	0						
A50	24/01/96	0	0						
A51	14/09/95	0	2	19068712	0.61		36.5		
A51	14/09/95	0	2		0.49		32		
A51	10/10/95	0	2	19068712	1.19		46		
A51	10/10/95	0	2						CHICK DEAD IN BURROW
A51	25/10/95	0	0						
A51	10/11/95	0	0						
A51	28/11/95	0	0						
A51	12/12/95	0	0						
A51	29/12/95	0	0						
A51	9/01/96	0	0						
A51	24/01/96	0	0						
A52	14/09/95	0	1	19068717	0.57				
A52	10/10/95	0	1	19068717	1.35		44		
A52	25/10/95	0	0						
A52	10/11/95	0	0						
A52	28/11/95	2	0						
A52	12/12/95	2	0						
A52	29/12/95	0	0						
A52	9/01/96	0	0						
A52	24/01/96	0	0						
A53	14/09/95	0	0						
A53	10/10/95	0	0						

APPENDIX 3 - CLUTCH DATABASE

BURROW	DATE	BER OF E	EB OF C	AND NUMB	WEIGHT(KG)	BILE DEPTH(MM)	BILE LENGTH	COMMENTS	COMMENTS
A53	25/10/95	0	0						
A53	10/11/95	0	0						
A53	28/11/95	0	0						
A53	12/12/95	0	0						
A53	29/12/95	0	0						
A53	9/01/96	0	0						
A53	24/01/96	0	0						
A54	14/09/95	0	1						DRIED UP 2 WEEK OLD CHICK
A54	10/10/95	2	0						
A54	25/10/95	2	0						
A54	10/11/95	0	2	1				29	
A54	10/11/95	0	2	2				37	
A54	28/11/95	0	0						
A54	12/12/95	0	0						
A54	29/12/95	0	0						
A54	9/01/96	0	0						
A54	24/01/96	0	0						
A55	14/09/95	0	2	19068719	0.52			35	
A55	14/09/95	0	2	19068720	0.47			33.5	
A55	10/10/95	0	2	19068719	1.08			43	SUCCESSFUL
A55	10/10/95	0	2	19068720	1.09			41	SUCCESSFUL
A55	25/10/95	0	1	19068719	1.16	12		48	
A55	10/11/95	0	0						
A55	28/11/95	0	0						
A55	12/12/95	0	0						
A55	29/12/95	0	0						
A55	9/01/96	0	0						
A55	25/01/96	0	0						
A56	14/09/95	2	0						
A56	10/10/95	1	1		0.4				JUST HATCHING
A56	25/10/95	0	1	1	0.48				
A56	10/11/95	0	0						
A56	28/11/95	2	0						
A56	12/12/95	0	0						
A56	29/12/95	0	0						
A56	9/01/96	0	0						
A56	25/01/96	0	0						
A7	14/09/95	0	0						
A7	9/10/95	0	0						
A7	25/10/95	0	0						
A7	10/11/95	0	0						
A7	28/11/95	2	0						
A7	12/12/95	2	0						
A7	29/12/95	0	2						
A7	9/01/96	0	0						
A7	24/01/96	0	0						
B50	19/09/95	0	0						
B50	9/10/95	2	0						
B50	25/10/95	2	0						
B50	10/11/95	2	0						
B50	28/11/95	0	0						
B50	12/12/95	0	0						
B50	29/12/95	0	0						
B50	9/01/96	0	0						
B50	25/01/96	0	0						
B51	19/09/95	0	0						
B51	9/10/95	0	0						
B51	25/10/95	0	0						
B51	10/11/95	0	0						
B51	28/11/95	0	0						
B51	12/12/95	0	0						
B51	29/12/95	0	0						
B51	9/01/96	0	0						
B51	25/01/96	0	0						
B52	19/09/95	0	0						
B52	9/10/95	2	0						
B52	9/10/95	2	0						
B52	25/10/95	2	0						
B52	10/11/95	0	2	1				30	
B52	10/11/95	0	2	2				30	
B52	28/11/95	0	2	1	0.9			46	
B52	28/11/95	0	2	2	0.76			42	
B52	12/12/95	0	0	1	1.15			46	
B52	12/12/95	0	0	2	0.995			46	
B52	29/12/95	0	0						
B52	9/01/96	0	0						
B52	25/01/96	0	0						
B53	19/09/95	0	0						
B53	19/09/95	1	0						
B53	9/10/95	2	0						
B53	25/10/95	2	0						
B53	10/11/95	1	1	1				28	
B53	28/11/95	0	0						
B53	12/12/95	0	0						
B53	29/12/95	0	0						
B53	9/01/96	0	0						
B53	25/01/96	0	0						
B54	19/09/95	2	0						
B54	9/10/95	1	0						
B54	25/10/95	0	0						
B54	10/11/95	0	0						
B54	28/11/95	0	0						
B54	12/12/95	0	0						
B54	29/12/95	0	0						
B54	9/01/96	0	0						
B54	25/01/96	0	0						
B55	19/09/95	2	0						
B55	19/09/95	0	1						CHICK NOT WEIGHED BUT JUST HATCHED..OTHER EGG
B55	9/10/95	1	1		35				
B55	25/10/95	0	0						
B55	10/11/95	0	0						
B55	28/11/95	0	0						

APPENDIX 3 - CLUTCH DATABASE

BURROW	DATE	BER OF E	ER OF C	AND NUMB	WEIGHT (KG)	BILL DEPTH (MM)	BILL LENGTH	COMMENTS	COMMENTS
B55	12/12/95	0	0						
B55	29/12/95	0	0						
B55	9/01/96	0	0						
B55	25/01/96	0	0						
B56	19/09/95	0	0						
B56	9/10/95	0	0						
B56	25/10/95	0	0						
B56	10/11/95	2	0						
B56	28/11/95	2	0						
B56	12/12/95	0	0						
B56	29/12/95	0	0						
B56	9/01/96	0	0						
B56	25/01/96	0	0						
B57	19/09/95	0	0						
B57	25/10/95	0	0						
B57	10/11/95	0	0						
B57	28/11/95	0	0						
B57	12/12/95	0	0						
B57	29/12/95	0	0						
B57	9/01/96	0	0						
B57	25/01/96	0	0						
B58	19/09/95	0	0						
B58	25/10/95	2	0						
B58	10/11/95	2	0						
B58	28/11/95	0	2	1	0.34			29	
B58	28/11/95	0	2	2	0.34			28	
B58	12/12/95	0	0						
B58	29/12/95	0	0						
B58	9/01/96	0	0						
B58	25/01/96	0	0						
B59	19/09/95	0	0						
B59	9/10/95	2	0						
B59	25/10/95	0	0						
B59	10/11/95	0	0						
B59	28/11/95	0	0						
B59	12/12/95	0	0						
B59	29/12/95	0	0						
B59	9/01/96	0	0						
B59	25/01/96	0	0						
B60	19/09/95	0	1	19068679	1.35			46	SUCCESSFUL
B60	25/10/95	0	0						
B60	10/11/95	2	0						
B60	28/11/95	2	0						
B60	12/12/95	0	2	1				19	
B60	12/12/95	0	2	2				16	
B60	29/12/95	0	0						
B60	9/01/96	0	0						
B60	25/01/96	0	0						
B61	19/09/95	1	1						CHICK NOT WIEGHED OR
B61	9/10/95	0	0						
B61	25/10/95	0	0						
B61	10/11/95	2	0						
B61	28/11/95	2	0						
B61	12/12/95	0	2	1				29	
B61	12/12/95	0	2	2				29	
B61	29/12/95	0	0						
B61	9/01/96	0	0						
B61	25/01/96	0	0						
B62	19/09/95	0	0						
B62	9/10/95	0	0						
B62	25/10/95	0	0						
B62	10/11/95	0	0						
B62	28/11/95	0	0						
B62	12/12/95	0	0						
B62	29/12/95	0	0						
B62	9/01/96	0	0						
B62	25/01/96	0	0						
B63	19/09/95	0	1	19068685	0.97			47	SUCCESSFUL
B63	10/10/95	0	0						
B63	25/10/95	0	0						
B63	10/11/95	0	0						
B63	28/11/95	2	0						
B63	12/12/95	2	0						
B63	29/12/95	1	0						
B63	9/01/96	0	0						
B63	25/01/96	0	0						
B64	19/09/95	0	0						
B64	10/10/95	0	0						
B64	25/10/95	0	0						
B64	10/11/95	0	0						
B64	28/11/95	0	0						
B64	12/12/95	0	0						
B64	29/12/95	0	0						
B64	9/01/96	0	0						
B64	25/01/96	0	0						
B65	19/09/95	0	0						
B65	10/10/95	0	0						
B65	25/10/95	0	0						
B65	10/11/95	0	0						
B65	28/11/95	0	0						
B65	12/12/95	0	0						
B65	29/12/95	0	0						
B65	9/01/96	0	0						
B65	25/01/96	0	0						
B66	19/09/95	0	0						
B66	10/10/95	0	0						
B66	25/10/95	0	0						
B66	10/11/95	0	0						
B66	28/11/95	0	0						
B66	12/12/95	0	0						
B66	29/12/95	0	0						
B66	9/01/96	0	0						

APPENDIX 3 - CLUTCH DATABASE

BURROW	DATE	BER. OF E	ER. OF C	AND NUMB	WEIGHT (KG)	BILL DEPTH (MM)	BILL LENGTH	COMMENTS	COMMENTS
B66	25/01/96	0	0						
B67	19/09/95	1	0						
B67	10/10/95	0	0						
B67	25/10/95	2	0						
B67	10/11/95	2	0						
B67	28/11/95	2	0						
B67	12/12/95	0	0						
B67	29/12/95	0	0						
B67	9/01/96	0	0						
B67	25/01/96	0	0						
B68	19/09/95	0	0						
B68	10/10/95	0	0						
B68	25/10/95	1	0						
B68	10/11/95	2	0						
B68	28/11/95	2	0						
B68	12/12/95	0	2	19068773			29		
B68	12/12/95	0	2	19068774			33		
B68	29/12/95	0	2	19068773	0.65		42		
B68	29/12/95	0	2	19068774	0.68		38.5		
B68	9/01/96	0	2	19068773	0.76		47		
B68	9/01/96	0	2	19068774	0.8		50		
B69	25/01/96	0	1	19068773	0.65		45		
B69	19/09/95	0	2	19068695	0.86		43		SUCCESSFUL
B69	19/09/95	0	2	19068696	0.87		43		SUCCESSFUL
B69	10/10/95	0	0						
B69	25/10/95	0	0						
B69	10/11/95	0	0						
B69	28/11/95	0	0						
B69	12/12/95	2	0						
B69	29/12/95	0	2						
B69	9/01/96	0	1	1	0.475		33		NO DETAILS
B69	25/01/96	0	0						
B70	19/09/95	0	2	19068697	1.06		45		SUCCESSFUL
B70	19/09/95	0	2	19068698	1.08		46		SUCCESSFUL
B70	10/10/95	0	0						
B70	25/10/95	0	0						
B70	10/11/95	1	0						
B70	28/11/95	2	0						
B70	12/12/95	2	0						
B70	29/12/95	0	0						
B70	9/01/96	0	0						
B70	25/01/96	0	0						
B71	19/09/95	0	0						
B71	10/10/95	1	0						
B71	25/10/95	1	0						
B71	10/11/95	0	0						
B71	28/11/95	0	0						
B71	12/12/95	0	0						
B71	29/12/95	0	0						
B71	9/01/96	0	0						
B71	25/01/96	0	0						
B72	19/09/95	0	1	19068700	1.23		41		SUCCESSFUL
B72	10/10/95	0	0						
B72	25/10/95	1	0						
B72	10/11/95	2	0						
B72	28/11/95	2	0						
B72	12/12/95	1	1	19068775			28		
B72	29/12/95	0	0						
B72	9/01/96	0	1	19068775	1.1		45		
B72	25/01/96	0	1	19068775	0.72		45		
B73	19/09/95	0	0						
B73	10/10/95	0	0						
B73	25/10/95	0	0						
B73	10/11/95	0	0						
B73	28/11/95	0	0						
B73	12/12/95	0	0						
B73	29/12/95	0	0						
B73	9/01/96	0	0						
B73	25/01/96	0	0						
B74	19/09/95	2	0						
B74	10/10/95	0	0						
B74	25/10/95	0	0						
B74	10/11/95	0	0						
B74	28/11/95	0	0						
B74	12/12/95	0	0						
B74	29/12/95	0	0						
B74	9/01/96	0	0						
B74	25/01/96	0	0						
B75	19/09/95	0	0						
B75	10/10/95	0	0						
B75	25/10/95	2	0						
B75	10/11/95	0	1	19068766			25		
B75	28/11/95	0	1	19068766	0.75		42		
B75	12/12/95	0	1	19068766					
B75	29/12/95	0	1	19068766	0.98	10			
B75	9/01/96	0	0						
B75	25/01/96	0	0						
B76	19/09/95	1	0	19068704	0.9		45		
B76	10/10/95	1	0	19068704	0.88		46		
B76	25/10/95	2	0						
B76	10/11/95	2	0						
B76	28/11/95	0	2						
B76	12/12/95	0	2	1			32		
B76	12/12/95	0	2	19068767			33		
B76	29/12/95	0	1	19068767	0.98		46		
B76	9/01/96	0	1	19068767	1.16		49		
B76	25/01/96	0	0						
B77	19/09/95	0	0						
B77	10/10/95	0	0						
B77	25/10/95	2	0						
B77	10/11/95	2	0						
B77	28/11/95	0	2	19068768			25		

APPENDIX 3 - CLUTCH DATABASE

BURROW	DATE	BER OF E	ER OF C	AND NUMB	WEIGHT(KG)	BILL DEPTH(MM)	BILL LENGTH	COMMENTS	COMMENTS 2
B77	28/11/95	0	2	19068776			27		
B77	12/12/95	0	2	19068768			36		
B77	12/12/95	0	2	19068776			37		
B77	29/12/95	0	2	19068768	0.92		50		
B77	29/12/95	0	2	19068776	0.62		42		
B77	9/01/96	0	2	19068768	0.98		50		
B77	9/01/96	0	2	19068776	0.75		41		
B77	25/01/96	0	1	19068776	0.62		51		
B78	19/09/95	0	0						
B78	10/10/95	0	0						
B78	25/10/95	0	0						
B78	10/11/95	0	0						
B78	28/11/95	0	0						
B78	12/12/95	0	0						
B78	29/12/95	0	0						
B78	9/01/96	0	0						
B78	25/01/96	0	0						
B79	25/10/95	2	0						
B79	10/11/95	2	0						
B79	28/11/95	0	0						
B79	12/12/95	0	0						
B79	29/12/95	0	0						
B79	9/01/96	0	0						
B79	25/01/96	0	0						
B80	25/10/95	2	0						
B80	10/11/95	2	0						
B80	28/11/95	0	2	1	0.26		29		
B80	28/11/95	0	2	19068772	0.2		30		
B80	12/12/95	0	1	19068772	0.26		33		
B80	29/12/95	0	1	19068772	0.63		45		
B80	9/01/96	0	1	19068772	0.85		49		
B80	25/01/96	0	1	19068772	0.62		57		