

# Penguin Study Group — Third Report

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The Penguin Study Group (VORG) has now maintained its study of the Little Penguin *Eudyptula minor* on Phillip Island, Victoria, for three consecutive years, with visits at weekly intervals over most of the period. Since April 1971, visits are being made only once every four weeks in order to reduce interference with the birds. It is proposed to extend banding of chicks to colonies other than those at Phillip Island and to search for banded birds which may be breeding elsewhere. This report covers the twelve months ended 30 June 1971.

From 24 February 1968 to 30 June 1971, 1,254 penguins have been banded; the details are set out in Table 1. Of the total of 159 adult birds of unknown age banded in the study area since August 1968, eight are known to be dead. During 1970-71, 108 of the remaining 151 were handled. It is suspected that some of the 43 birds not handled may have been merely casual visitors to the study area when they were banded. Birds which have not been sighted regularly are occasionally found on the surface at night outside the study area.

So far, no bird banded as a chick has bred in the study area. A male (190-00257), banded 11.1.69, is the only bird banded as a chick that has been seen there again after going to sea. It was found five times between August and October 1970, twice by itself, on one occasion with an unbanded female and on the last two occasions with another unbanded female. It has not been seen subsequently.

### Breeding Success

The following comparison between breeding figures for the 1970-71 season and those for the two previous years indicates a much higher percentage of success for this year. Although fewer birds were found breeding in the study area, more chicks were banded per pair. These chicks were heavier than those handled in previous years which may reflect a greater abundance of food. This may have been the reason for the higher breeding success during 1970-71.

TABLE 1

Details of Little Penguins banded on Phillip Island since February 1968.

Location	Status	24.2.68 to 30.6.69	1.7.69 to 30.6.70	1.7.70 to 30.6.71	Total
Summerland Study Area	Adults	115	16	28	159
	Chicks	35	26	30	91
Summerland —Other Areas	Adults	10	1		11
	Chicks	54	257	47	358
Other Areas of Phillip I.	Adults	62			62
	Chicks	6	218	349	573
Total		282	518	454	1,254

	1968-69	1969-70	1970-71
Non-breeders	20	33	48
Breeding adults	90	70	47
Eggs laid	122	87	69
Eggs failed	50	32	20
Chicks failed	37	29	19
Chicks banded	35	26	30
Eggs laid per pair	2.71	2.49	2.87
Eggs failed per pair	1.11	0.91	0.83
Chicks failed per pair	0.82	0.83	0.79
Chicks banded per pair	0.78	0.74	1.25

### Multiple Clutches

Eleven pairs were responsible for two clutches each. Only one of these pairs was successful with both clutches, rearing one chick from the first and two chicks from the second. Six pairs succeeded with their second clutch after failing with the first, and four pairs failed with both clutches. There were no attempts at a third clutch.

Because there was an attempt at a third clutch in 1969-70, we have made an analysis of the interval between laying of the clutches for that season rather than for the 1970-71 season. This shows the intervals to be 7-8½ weeks for four pairs; though the intervals between failure of the first clutch and the laying of the second were in one case two weeks, in another two and a half weeks, and in two cases four weeks.

A fifth pair attempted three clutches, all in the same burrow, and all three failed:

- Clutch 1 (2 eggs) disappeared after 1 week.
- Clutch 2 (2 eggs) laid five weeks after failure of the first clutch, disappeared after one week.
- Clutch 3 (1 egg) laid four weeks after failure of the second clutch, was incubated for four weeks. At the estimated time of hatching (fifth week), a broken eggshell was found at the burrow entrance, both adults being absent.

### Pair Bond and Burrow Allegiance

Seven pairs bred together in all three seasons. Two pairs bred together in the last two seasons. Two pairs bred together in the first and third seasons, but were non-breeders in the second as far as is known.

The burrows were the same or close to those previously used, except in two instances when they were up to 90 feet apart.

### Breeding Season

The first pair of eggs was found on 12 July 1970 and the last chick was seen on 13 March 1971, a span of eight months.

In occasional early clutches in the Summerland Reserve, one egg was undersized. The dimensions of two found in the study area were 37.8 x 30.0 mm and 40.8 x 35.6 mm, whereas the mean is 54.6 x 42.0 mm. Mortality was high from these early clutches. There may have been a food shortage at that time of the year, for frequent checks in areas other than Summerland indicated similar conditions.

The other two seasons studied lasted eight and a half months and six months respectively, but the reasons for these variations are not known.

### Dispersal of Young

In our previous report we stated that of 596 chicks banded since the study began, 22 had been recovered away from Phillip Island, 19 of them within two months of banding. All recoveries had been to westward of Phillip Island. Five more of these chicks were recovered, all to the west, during the period covered by this report. The most interesting of these have appeared in Recovery Round-Up of this Journal.

During this season, 426 chicks were banded but only two were recovered away from Phillip Island, again perhaps reflecting an abundance of food as suggested in the discussion of breeding success.

190-01256 was found dead 16 days later 113 km (70 miles) west at Kennett River, Vic.

190-02458 was found dead 10 weeks later 269 km (167 miles) south near West Point, Tasmania.

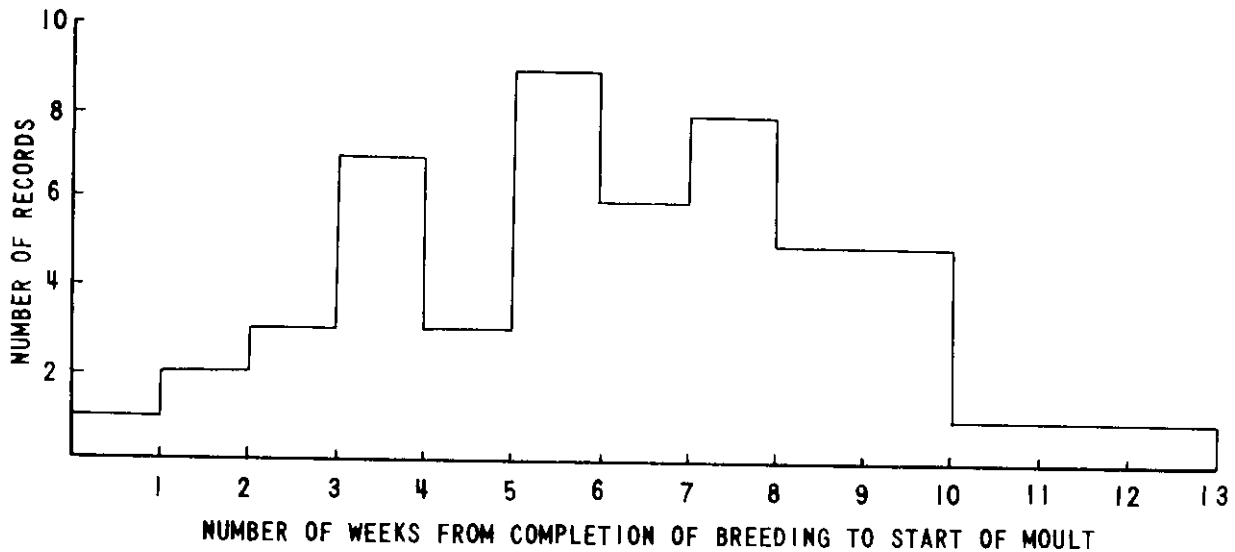
The change from all previous westward movement to this southward movement of the second chick was particularly interesting in conjunction with:

1. The recovery of a chick from the previous season, 190-00529 banded 20.12.69, found dead on 27.7.70 (about 9 months old) on King Island, 193 km (120 miles) south-west; and
2. The recovery near Port Fairy, western Victoria, of two Little Penguins from southern Tasmania. These were banded during 1959-60 by the Tasmanian Museum, Hobart, for an ecological study of this species in southern Tasmania (Phillips, 1960; Guiler, 1962).

### Grid and Artificial Burrows

For reasons explained in our previous report, a grid measuring 20 x 14 metres was laid down in the most densely populated part of the study area. It was marked off in 2 metre squares with coloured plastic tapes. All burrows within the grid are checked on each visit as well as those pegged burrows outside which are still operative.

In April 1971, following the end of the moulting season when few birds were ashore, all natural burrows inside the grid that were unoc-



• Figure 1. Histogram from 52 records of moult involving 29 individuals. Four records are not included where the elapsed time before moult was 4-7 months.

cupied were deliberately collapsed, and artificial burrows (as described in our last report) inside the grid were filled with sand leaving a small tunnel entrance. The reasons for this were two-fold. First, it was hoped to entice returning penguins to use artificial burrows, which in fact they did. Secondly, in the grooves of the thick polystyrene lids which fitted over the "chimneys" of the artificial burrows, Red-backed Spiders had woven webs, as well as inside the burrows themselves. By eliminating the dark recesses preferred by this spider and replacing the lids with sand-filled fibre-glass sacks, this hazard was reduced.

Artificial burrows, have proved successful and 35 had been installed by 30 June 1971, all but two within the grid. Further artificial burrows will be placed in position as new burrows are dug by the birds. They facilitate burrow checking and so reduce disturbance to the birds.

### Chick Marking

Further experiments were carried out in an attempt to mark chicks too young to be banded but old enough to wander into other burrows. The most successful was a Hortico product "Spraymark", a spray used for marking sheep. Red was found more effective than other colours. Even so, the chicks needed respraying weekly,

as the fast-growing down erupting into feathers, particularly on the upper surface, rapidly obscured the colour.

Chicks were sprayed on one or more of certain positions, indicated for ease of reference on a dummy penguin made for the purpose. A spot on the breast meant 1, belly 2, right flipper 4, left flipper 8, top of head 16 and rump 32, giving 63 combinations in all. By this means we were generally confident of the origin of chicks banded in the study area.

### Moult

In the three seasons analysed, the time elapsing between cessation of breeding and start of moult is variable as shown by the histogram (Fig. 1). Also, there does not appear to be any consistent pattern in the time at which individuals moulted in successive years; in some cases it coincided and in others it overlapped. The time of moult does not seem to be affected necessarily by success or otherwise in breeding as shown by the following examples:

- Male 190-00125.  
31.5.69. Molt beginning; had bred successfully (twice) finishing 12.4.69. Elapsed time before moult 7 weeks.

21.2.70. Moulting begun; had bred unsuccessfully, producing a chick last seen when 10 days old on 5.1.70. Elapsed time before moult 6 weeks.

27.2.71. Moulting nearly completed; had bred successfully finishing 20.12.70. Elapsed time before moult 8 weeks.

This male moulted at almost the same time in 1970 and in 1971, despite the difference in breeding success. In all three years 6-8 weeks elapsed from cessation of attendance on young until moult. It was paired with a different female in each of the three years and the females did not moult at the same time as the male.

• Female 190-00166.

23.3.69. Moulting beginning; had bred unsuccessfully finishing 2.2.69. Elapsed time before moult 7 weeks.

21.2.70. Moulting begun; had bred successfully finishing 10.1.70. Elapsed time before moult 6 weeks.

27.3.71. Moulting begun; had bred successfully (twice) finishing 13.3.71. Elapsed time before moult 1-2 weeks.

This female moulted at the same time in 1969 and in 1971, despite the difference in breeding success. The male of the pair was not seen to moult in the 1969 season, but its moult occurred at the same time as that of the female in the other two years.

Pairs do not always moult together, nor does a bird necessarily moult in its breeding burrow. On several occasions, moulting birds have been found in burrows with young not their own. This could have led to the incorrect assumption that a parent was in moult before the fledging of its chicks, had the moulting bird not been banded.

Even so, it sometimes happens that a bird will go into moult immediately after the young have fledged as with male 190-00134 in 1970. Its single chick was ready to leave the colony on 31 January and the next weekend the male was in moult. The female to which it was paired was not found again that season.

### Sex Determination

We have not had the opportunity of sexing penguins by post-mortem examination. However, many birds have been examined at the time of egg-laying and frequently one (and never more than one) of a pair has had a distended cloaca. We have regarded this as valid ground for

considering that bird a female. This method is adapted from the method of sexing petrels described by Serventy (1956).

Furthermore, where such a bird has often been found in the company of another bird which has never been seen to have a distended cloaca, that has been regarded as a valid ground for treating the other bird as a male.

Often enough, one of a pair sexed in this way has subsequently been found in the company of another bird and that other bird has therefore been treated as being of the opposite sex to its companion. Confirmation of that treatment has often been possible by tracing previous or subsequent records of the bird and finding other occasions when it or its companion was capable of being sexed by cloacal examination.

In this way, we have fixed, with what we regard as sufficient certainty, the sex of most of the banded population in the study area.

Kinsky (1960, p. 153) stated that the sex of adult penguins of this species can be distinguished in most cases in the field. He said "The beak of the male is stouter and the upper and lower profiles are more nearly parallel than that of the female. The upper mandible terminates in a well-developed hook".

In this study, when two adult penguins were found together in the same burrow, almost invariably the bill of one of them was visibly and appreciably deeper than that of the other. By treating the bird with the deeper bill as a male and its companion as a female, determinations of sex by this method accord with determinations made by the method of cloacal examination.

Consequently, we confirm Kinsky's observations and are confident of the validity of the sex attributed to individual birds. When we have found two adult penguins together in the same burrow, they have never been of the same sex.

In some cases we have been unable to sex birds by either of the methods mentioned and therefore they have been recorded as 'sex doubtful'. It is possible that these birds had not yet matured to breeding status.

### Bill Depth

In view of the foregoing, the following figures on bill depths for adult penguins are provided.

We have selected 25 males and 23 females (sexed in the manner just described), the depths of whose bills had been measured on at least

five occasions. The measurements for an individual bird often varied somewhat, and the variations are attributed to "experimental error"; i.e. variations arising from the use of measuring equipment on different occasions by different operators. We have therefore adopted an average of the measurements for each individual.

The mean bill depths and the standard deviations, both in millimetres, were: males 14.7, 0.7; females 12.5, 0.6. From this it can be seen that the bill depths of the males were mostly greater than those of the females but that there was some overlap.

### Muttonbird versus Penguin

An analysis of 25 pegged burrows in which muttonbirds (Short-tailed Shearwater, *Puffinus tenuirostris*), were found during the 1970 influx, showed that 10 of the burrows had previously been empty of penguins. In one of the other burrows, circumstantial evidence suggests that muttonbirds were responsible for a clutch of penguin eggs being broken, although the penguin pair laid a second clutch there which was reared successfully. Another burrow occupied by muttonbirds during the pre-egg laying absence of the penguins was successfully reclaimed by the penguins on their return.

The other 13 burrows in which muttonbirds were found had previously contained penguins suspected of being pre-breeders, or pairs of penguins whose clutches had already failed before the arrival of the muttonbirds.

In one such burrow, a muttonbird was recorded over a number of visits as incubating its egg. On the next visit, the egg was hatching in that burrow and it was being guarded by a female penguin, whose two chicks had fledged from an adjacent burrow four weeks earlier. The following week, the same penguin was guarding a small thin muttonbird chick. The following night the penguin was still there with the chick now dead.

### Discussion

As from the middle of April 1971, teams have been amalgamated so that trips are now made at four-weekly intervals. It was felt that the declining number of pairs breeding in the study area might have been the result of weekly interference. We believe we are correct in this assumption as the numbers increased quite noticeably on the next two visits.

Burrows are now being examined in the daytime and again in the evening of the same day. Often one bird of a pair is found by day and the other by night and so more information is obtained on the one extended visit.

Measurements and weights are no longer taken except in the case of newly banded birds or where there is some doubt as to sex or age. This means a minimum of handling and perhaps reduces the likelihood of the birds moving elsewhere.

The following day, unless further information is sought, such as laying of the second egg, the time is devoted to searching for banded birds which may have moved elsewhere; to repairs to artificial burrows; to banding chicks in other colonies; and to viewing the penguin breeding areas as a whole.

Trips were also arranged to coincide with the full moon in the hope that night observations would be facilitated, but this was not found to be the case. Where burrows were exposed to full moonlight, the birds remained underground. Penguin song and the sound of display could be heard there but surface activity was confined to burrows in the shelter of the vegetation.

The study will continue indefinitely. It is proposed to band chicks in other colonies in an attempt to find out more about movement and possible interchange between colonies.

Previous reports on this study are Reilly and Balmford, 1969 and 1971.

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