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SURVIVAL RATE OF YELLOW-EYED PENGUIN EGGS AND CHICKS ON THE OTAGO PENINSULA

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ABSTRACT

Egg-and-chick survival frequency in the Yellow-eyed Penguin was followed for nineteen nests in three breeding areas on the Otago Peninsula. Observations were made through the tenth post-hatching week for each nest. Survival rate was substantially worse than that reported by Richdale in 1957. There were also differences in survival rate among the three breeding areas within the sample. It is suggested that human and farm-animal activity is responsible for the relatively poor survival rates.

INTRODUCTION

Harrow (1971) has reported a substantial population of Yellow-eyed Penguins *(Megadyptes antipodes)* breeding on Banks Peninsula, probably beginning about 1965. This is noteworthy because the northernmost point in this bird's breeding range has been taken to be near Oamaru, some 200 miles (320 km) south of Banks Peninsula (see OSNZ Annotated Checklist 1970). According to Harrow, the increase in numbers of Yellow-eyed Penguins on Banks Peninsula has been rapid and he plausibly suggests that this may be the result of human interference on the breeding grounds of the Otago coast which are adjacent to sizeable cities and towns. Similarly, Richdale (1957) pointed to human and dog interference as responsible for breeding area shifts by Yellow-eyeds on the Otago Peninsula. In light of Harrow's report it would seem important to know whether the population of Yellow-eyed Penguins is declining all along its Otago breeding grounds as it is said to have done at Cape Wanbrow, Oamaru (Harrow 1971). The answer to this question will presumably require systematic observations over a period of several years.

With increase in human activity along the Otago coast and Peninsula since Richdale's extensive work, it is also important to know something about the survival rate of Yellow-eyed chicks in these areas hatched by parents which do nest there. This matter

TABLE 1 Yellow-eyed Penguin Egg-and-Chick Survival Percentages

	Source	Eggs Hatched	Eggs Addled	Eggs Missing	Chicks Missing	10th-week Chick Surviving as % of Eggs laid	10th-week Chick Surviving as % of Eggs hatched
	1971-72	78.9	15.7	5.2	26.3	52.6	66.6
Richdale	Mean	78.1[1]	17.2[2]	1.1[3]	18.2[4]	66.2[5]	78.4[6]
	Range	57-100			4.1-40.3	41.9-82.3	50.9-94.7

1 Based on 16 years for which a range is calculable : 1936-37 to 1949-53, excluding 1950-51 in which Richdale made no observations; 1073 eggs. Richdale's figure for 18 years and 1475 eggs is 79%; no range available.

2 Based on 18 years and 1475 eggs; no range available.

3 Based on 18 years and 1475 eggs; no range available. A remaining 39 (2.6%) of Richdale's 1475 eggs were found out of the nest, broken in the nest, crushed by rockfalls, or deserted by parents.

4 Based on six years for which data are available : 1936-37 to 1940-41 and 1942-43; 269 eggs. If 1938-39 is excluded the mean is 11.5% and the range, 4.2% to 37.5%.

5 Based on six years for which data are available : 1936-37 to 1940-41 and 1942-43; 269 eggs. If 1938-39 is excluded the mean is 73.4% and the range, 62.5% to 82.3%.

6 Based on six years for which data are available : 1936-37 to 1940-41 and 1942-43; 227 eggs. If 1938-39 is excluded the mean is 86.3% and the range, 62.8% to 94.7%.

was the object of the present investigation. We simply followed the mortality frequency of eggs and chicks with time in a sample of nests and compared the frequencies with similar counts from Richdale's findings reported fully in 1957.

RESULTS

Three breeding areas on the Otago Peninsula were chosen for observation. Area 1, that least frequented by people, is a coastal sheep farm located at 45°51'39" S. Areas 2 and 3, the east ends of Sandfly Bay and Boulder Beach, respectively, lie at approximately 45°54' S. They are more commonly visited, especially Area 2, by people in both small and large groups. The egg-and-chick mortality of 19 nests in these areas was observed. Four nests were located in Area 1, six in Area 2, and nine in Area 3. The distance of the nests from the sea, at highwater,ranged from 12 to 203 metres measured over the shortest discernible routes. Each nest was visited at one-to-two week intervals from the last week in September 1971 through to the tenth week after hatching in each nest.

The main observations on egg-and-chick survival in this 1971-72 sample are summarized in Tables 1 and 2. Comparisons with Richdale's data are also shown in Table 1, footnotes showing for which years it was possible to make comparisons with his data. The tenth-week data of the present study are compared with Richdale's weeks 8-11.

TABLE 2

Yellow-eyed Penguin Egg-and-Chick Survival in Terms of Breeding Area.

Condition	Area 1	Area 2	Area 3	Total
Eggs laid	8	12	18	38
Eggs hatched	6	8	16	30
Eggs addled	2	2	2	6
Eggs missing	0	2	0	2
Chicks missing	4	3	3	10
Chicks surviving 10th week	2	5	13	20
10th-week chicks surviving as % of eggs laid	25.0%	41.6%	72.2%	52.6%
10th-week chicks surviving as % of eggs hatched	33.3%	62.5%	81.2%	66.6%

Clearly, the survival percentages for the 1971-72 sample are substantially worse than Richdale's means, even though the hatching and addling percentages approximate his figures closely. In fact, over a 16-year period of Richdale's work there were only two years in which the percentage of hatched young *reared* was lower than the present sample's 66.6% of hatched young alive in the tenth week (Richdale 1957; Table 67). The present data and, presumably, Richdale's are both conservative. For example, the fact that a chick was noted missing from a nest does not establish its death. However, when a chick's absence was noted, a careful search of the surrounding area was made, and on subsequent visits as well, before it was concluded that the chick was indeed dead.

It is, of course, possible that 1971-72 was a bad year similar to 1938-39, described by Richdale and attributed to a shortage of food. A look at survival rates in terms of the three breeding areas as shown in Table 2 indicates, however, that this was in no way the case. The three areas differed markedly in penguin survival rate, although Areas 2 and 3 are similar physical environments and share the same fishing grounds. The two areas do differ in density of human traffic. On visits to Area 2 we almost always encountered other people, often in groups of five to fifteen and often in the very breeding area. On the other hand, on visits to Area 3 other people were rarely seen, and never in large groups or in the breeding area. Two of the six nests of Area 2 lay immediately next a lateral trail shared by penguins, people and a few sheep. From the first of these

two nests the eggs disappeared; by the nest was found an empty beer bottle. From the other nest, nearby, both chicks subsequently disappeared. Thus both of these nests were total losses. Three nests had one surviving chick in the tenth week and only one had two chicks at that time for a 41.6% survival rate. The much-less-frequented Area 3 had a tenth-week survival rate of 72.2% and no total nest losses. One nest, in a hollow at the base of a bluff, in which only one chick survived showed, however, the clear imprints of sheep hooves. The comparison of Areas 2 and 3 then plausibly suggest that egg-and-chick survival is favoured by "lesser visibility," i.e., fewer people. Area 1, with the highest mortality, is, however, that area least frequented by people. We never saw anyone in this area. The mortality can be accounted for, we think, by the substantial population of sheep, dogs, and cattle. In one of two nests in Area 1 where only one chick survived, cattle grazing at the very entrance to the nest, which was in Lupins *(Lupinus arboreous)* at the edge of a meadow, might easily have trodden on a chick. A third nest, high on an open slope, was readily accessible to dogs. Both chicks disappeared from this nest during the first post-hatching week and no adult penguins were seen in the vicinity of this nest on subsequent visits. In the fourth nest both eggs became addled but here two adult penguins, presumably the parents, were frequently seen in the nest location up to 99 days after the first egg was laid.

CONCLUSIONS

It is our view that Yellow-eyed Penguin egg-and-chick survival on the Otago Peninsula is clearly being adversely affected by farm-animal and human interference. This view is consistent with both the tabled data and the other observations made in the breeding areas sampled. It is, nonetheless, a hypothesis. However, the fact that Areas 2 and 3 are very similar in every apparent way, except for the frequency of human visitors, makes this hypothesis tenable.

The small number of nest areas and nests followed in the present study is, of course, too limited to allow confident conclusions about Yellow-eye survival rates. But the data surely are not encouraging and indicate the need for a long-term population study over a larger number of nest areas which represent both the geographical distribution of the Yellow-eyed Penguin and the variables which may affect the survival of this unique New Zealand bird.

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SHORT NOTE

SPOTTED SHAGS NEST AT WELLINGTON

During the summer of 1972, an unusually large number of Spotted Shags *(Stictocarbo punctatus)* were observed feeding and roosting in several coastal situations around Wellington.

On 21 October 1972, Mr Tudor Atkinson of York Bay was passing a small island on the south side of Somes Island in his boat when he noticed a colony of Spotted Shags on a cliff face. Seven were sitting on nests. On 27 October, I visited the colony with Mr Atkinson and on this occasion 13 birds were present and three nests contained chicks a few weeks old. It was not possible to determine whether the four remaining nests contained eggs or chicks, as the parent birds were sitting too closely.

This is the first time that Spotted Shags have been known to breed in the Wellington area and it is to be hoped that the colony will become permanently established and will not be interfered with by people passing it in boats.

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