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Analysis on Adélie Penguin Breeding Success at Stranger Point, King George Island from 1987 to 1992

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The adélie penguin, perhaps the most numerous of any penguins, breeds at rookeries scattered along the Antarctic coast and on islands south of latitude 60° S. Stranger Point is located in King George Island (62°14′ S, 58°30′ W). There can be found one of the bigger adélie penguin colony of this island. To advice about variability on adélie penguin breeding success at Stranger Point from 1987 to 1992 and its usefulness as indicator of food availability and environmental changes this work has been carried out. The goal was to improve the methods of analysis to better understanding changes observed during the period under study.

Key words: analysis, adélie penguin, breeding success, Stranger Point

INTRODUCTION

The community of seabird, seal and whale top predators in the Antarctic marine system is probably the most abundant numerically and the most significant in terms of energy flux of any in the world (Croxall, 1992).

Considering seabirds, the most important of them, in term of biomass are the penguins. The adélie penguin, perhaps is the most numerous of any penguins, breeds at rookeries scattered along the Antarctic coast and on islands south of latitude 60° S (Watson *et al.*, 1971). The breeding biology of the adélie penguins has been described by Taylor (1962), Sladen (1958), Sapin (1960), Penney (1968), Reid (1968), Tenaza (1971), Spurr (1975) and Ainley *et al.* (1983).

Stranger Point is located in King George Island (25 de Mayo, 62°14′ S, 58°30′ W). According to Jablonski (1984), there can be found one of the bigger adélie penguin colony of this island.

In the last 50 years an intensive increase in penguin populations was observed in Antarctica (Sladen, 1964; Conroy, 1975; Muller and Muller, 1975). Simultaneously great fluctuations in the number of penguins were observed in various breeding seasons (Jablonski, 1983; Wilson, 1990; Trivelpiece *et al.*, 1990).

To advice about variability on adélie penguin breeding success at Stranger Point from 1987 to 1992 and its usefulness as indicator of food availability and environmental changes this work has been carried out. Its goal was to improve the methods of analysis to better understanding changes observed during the period under study.

METHODS AND RESULTS

To determine breeding success, transect containing 140 nests in 1987, 113 in 1988 and 100 nests from 1989 to 1992 were observed each five days according to the Ecosystem Monitoring Program (CEMP) from Convention of the Conservation Antarctic Marine Living Resources (CCAMLR) methods. Number of eggs, chicks and chicks at creches were recorded. Data from 1987 and 1988 were referred to one hundred nests to standardize the method.

Work hypothesis was that the number of nests with two eggs and two chicks, called here "double nests", is more sensitive than the number of total eggs and chicks in detecting environmental

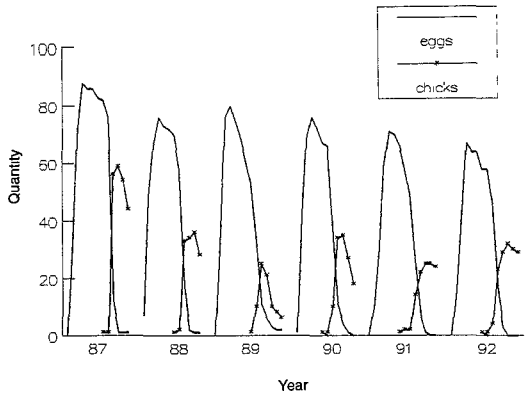

Fig. 1. Double nest counts at Stranger Point from 1987 to 1992.

Table 1. Maximum total number of eggs (A), chicks (B) and chicks at creche (C) at Stranger Point, King George Island from 1987 to 1992

Year	A	B	C
87	182	138	105
88	166	104	91
89	170	60	31
90	164	93	62
91	164	80	79
92	150	93	90

changes.

For the analysis, maximum number of eggs, chicks and chicks at creche were used. Statistical test applied in data from Table 1, indicated that 1987 was significantly different from all other years ($F = 3.844$, $P < 0.05$). Table 2 includes number of "double nests" when maximum number of eggs and chicks occurs, frequency pattern of these nests is shown in Fig. 1. The analysis of this data indicated that 1987 was significantly different from all other years ($F = 5.346$, $P < 0.05$) but there are differences between 1988:1989, 1991 and 1989: 1990, 1992. Two ways ANOVA test and Duncan's New Multiple Range Test (DNMRT) were used in both cases.

In this way we can conclude that changes observed in the number of double nests were a negative declining between 1987-1989, followed by an increase between 1989-1990 (Fig. 2). From 1990 to 1992 trend remains stable but it has not come back to the original situation of 1987.

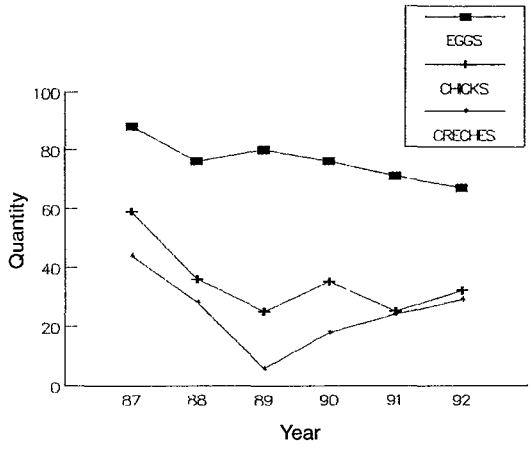

Fig. 2. Double nest monitoring (%) at Stranger Point from 1987 to 1992.

Table 2. Maximum number (%) of double nests with eggs (A), chicks (B) and chicks at creche (C) at Stranger Point, King George Island from 1987 to 1992

Year	A	B	C
87	88	59	44
88	76	36	28
89	80	25	6
90	76	35	18
91	71	25	24
92	67	32	29

DISCUSSION

The advantage of analyzing counts of double nest instead of total nests is showed by the possibility of identifying a negative trend among 1987-89, a recovery of it between 89-90 and a stable period during 91-92 but without increase. The analysis of total nest counts stated that 1987 was different only.

Changes in population processes of top predators reflect the direct, indirect and interlinked influences of biological and physical environmental variables. At Stranger Point has been described a possible relationship between El Nino Southern Oscillation (ENSO) in 1982-1983 and 1987 with elephant seal population's fluctuation, another top predator of the Antarctic ecosystem (Vergani and Stanganelli, 1990). Simultaneously a declining in

adélie penguin breeding success in 1982/83 was found by Trivelpiece *et al.* (1990) at Admiralty Bay, a place located very close to Stranger Point.

The declining observed on adélie penguin breeding success in 1982/83 at Admiralty Bay by Trivelpiece *et al.* (1990) and in 1987-1989 period at Stranger Point for us could be related to ENSO, but we need further analysis on physical data to confirm this hypothesis.

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