

Notes on the Aggressiveness of Non-Breeding Adélie Penguins and Their Response to the Eggs

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アデリーペンギンの非繁殖個体の攻撃性と卵に対する反応についての考察

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要旨: アデリーペンギンの非繁殖個体19羽について、その攻撃性と、人為的に与えた擬卵に対する反応を調べた。

1. 攻撃性や擬卵に対する反応は個体により異なった。
2. 一部の個体は抱卵行動を示した。
3. 巣に擬卵を置くと、一部の個体の攻撃性は高まった。

非繁殖個体には、未成熟個体と繁殖失敗個体が含まれるが、本実験において両者を区別することはできなかった。

Abstract: The aggressiveness of the reoccupying non-breeding Adélie Penguins *Pygoscelis adeliae* and their response to the eggs placed artificially in their nests were investigated. 1) The aggressiveness and the response to the eggs varied with individuals. 2) Some individuals showed the ability to incubate eggs. 3) After receiving the dummy eggs, some individuals became more aggressive.

The annual cycle of the Adélie Penguin *Pygoscelis adeliae* has been reported in considerable detail (for example, SLADEN, 1958). The penguins in rookeries during the breeding season can be divided into three categories in terms of their breeding status: successful breeders, unsuccessful breeders and non-breeders. Successful breeders are those that are incubating eggs or guarding chicks: unsuccessful ones have laid eggs but lost them or chicks due to various causes: and non-breeders are those that have not laid eggs. Breeders and some non-breeders arrive at rookeries at the beginning of the breeding season (AINLEY and SCHLATTER, 1978). Females go to sea to feed a few days after laying eggs, leaving their male partners to incubate. Among non-breeders, females also depart but males remain for up to two more weeks (AINLEY and SCHLATTER, 1978). The number of birds within the colony reaches a peak during the earliest stage of the breeding season: this particular period lasts from the arrival of penguins till the departure of females, and is called the "occupation period".

The unsuccessful breeders and non-breeders return to the rookery in the later

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breeding season. So the number of birds reaches the second largest peak which is called the "reoccupation period". This period just coincides with the chick duration; the start corresponds to the egg-hatching and lasts almost to the end of the crèche period. The reoccupation peak is observed on some days before the first crèche formation. Among the reoccupied birds, pairs are formed and occupy the deserted or unused nests as their territories.

As for the significance of these non-breeding birds in the reoccupation period, MURPHY (1936) suggested that they took care of chicks in the crèche as proxies for the parents absent from the colony while catching food for chicks. However, SLADEN (1958) and LERESCHE and SLADEN (1970) suggested that they visit the colony to establish the future territories and pair-bonds, and have no adaptive significance for the chicks of other birds. They in fact disturbed the activities of breeding pairs by fighting with one another over the occupation of abandoned nests. In addition, some authors have suggested that they act partly as a defence force for the colony during the guard and crèche periods (SPURR, 1975, 1977; AOYANAGI and TAMIYA, 1982; TAMIYA and AOYANAGI, 1982).

We aimed to further ascertain the significance of non-breeding birds during the reoccupation period by observation and field experiments. These were carried out at the northern Cape Bird rookery on Ross Island, Antarctica, where about 70000 penguins breed. Four colonies were selected on the grounds that the number of the non-breeding birds staying inside them seemed a little larger than other colonies, and also the colonies were small or narrow enough to allow the experiments without disturbing breeding birds. Experiments were made on nineteen individuals: seventeen on 20 December, 1978, and the other two birds for another two or three days.

Dummy eggs were made from penguins' egg-shells which had been predated by the South Polar Skua *Catharacta maccormicki*. The egg-shells were only slightly damaged. We filled them with flour paste, and dried them slowly over a room-heating stove. A dummy egg was made to weigh just as much as a real penguin's egg, between 80 and 110 g.

In the early reoccupation period, a limited number of non-breeding birds defended their territories and none of the rest occupied one. Instead, they stood inside or in the periphery of the colony. Penguins that were neither incubating eggs nor guarding chicks but were sitting in their nests just as the breeders do, were selected for the examination. The change in their behavior before and after a dummy egg was placed in its nest was examined. Out of 63 non-breeding ones, there was a total of 19 nest-defending birds, which could be easily examined without disturbing other breeders.

From a point 10 m away from a nest-defending bird, the examiner started his approach at a constant walking velocity of about one step per second. If the bird remained to guard the nest till the examiner was one meter away, the examiner halted and squatted to continue the approach till he was 30 cm from the bird. The distance between the bird and the examiner when it stood up in the nest and when it finally left the nest was our measure of the strength of its defensive attitude. If the bird still guarded its nest, the examiner stretched his hand

forward to check the intensity of its pecking. Two types of behavior were observed: some left their nests, and others maintained their positions by pecking. In order to determine whether the former would change their behavior after eggs were placed in their nests, the same procedure was repeated after a dummy egg was placed in the nest. In these experiments, we did not know whether each non-breeding bird was an unsuccessful breeder or just a non-breeder, because we did not observe the colony during the occupation period.

Table 1 summarizes the behavior of each of the two groups. Some timid ones during the first approach of the examiner (about 40%) incubated eggs and became aggressive towards the examiner after eggs were given. On the other hand, most of the penguins which remained in the nest when the examiner checked its behavior before a dummy egg was placed (3 birds out of the 4), incubated an egg and showed aggressiveness. Thus, about one half of the non-breeding birds in this period incubated eggs if they found them in the nests. TAMIYA and AOYANAGI (1982) reported a few observations of such non-breeding birds really incubating eggs of breeders and standing proxies for parents. It is safe to say some (not all) of the birds have the ability to incubate eggs if they find them in an unoccupied nest.

In the first observation, 20% of the non-breeding birds (4 out of the 19)

Table 1. Comparison of the behavior of the nest-guarding non-breeding birds and the nest-leaving ones after they were given dummy eggs to be incubated.

Of the birds which defended the nests in the first observation—4 individuals,
1 pecked the egg violently and did not show any incubating posture, but showed strong aggressiveness.
3 incubated and defended the eggs perfectly.
1 sat in the nest and showed weak aggressiveness.
2 sat in the nests and showed strong aggressiveness.
Of the birds which left the nests in the first observation—15 individuals,
8 neither incubated nor guarded the eggs.
6 pecked the eggs when returned.
1 stood beside the nest and did not try to enter the nest.
1 did not return.
1 incubated but kicked the egg out of the nest probably due to lack of experience.
2 incubated the eggs but their defensive attitude for the nest did not increase.
1 incubated the egg and its defensive attitude for the nest increased slightly. This bird did not leave its nest till examiner approached nearer than before.
3 incubated and guarded the eggs perfectly.
1 sat in the nest and showed weak aggressiveness.
2 sat in the nests and showed strong aggressiveness.

guarded their territories against the examiner, while a few of real breeding birds in a similar situation were observed to leave their nests. Non-breeding birds also expelled skuas which landed at the colony-side. The egg-incubating or chick-guarding parents cannot leave their nests to expel skuas, thus the non-breeding birds which can freely leave their own territories can be assumed to play the role of defenders for the colonies.

The non-breeding birds showed more attachment to the nests after they received dummy eggs: three of the timid ones in the first observation came to guard the nests in the second observation, and one of the rest became more aggressive slightly. But still in the other 11 birds of the 15 any change of behavior could not be recognized.

Because the measured sample size (19 birds) was relatively small and the social status of the non-breeding birds could not be known, all these results must await further researches about the behavior of non-breeding birds.

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