King Eider (Somateria spectabilis) Nesting in Association with Long-tailed Skua (Stercorarius longicaudus)

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ABSTRACT. In High Arctic Northeast Greenland King Eiders (Somateria spectabilis) were found nesting in association with solitarily breeding Long-tailed Skuas (Stercorarius longicaudus). The association is demonstrated using spatial statistics analyses and timing of clutch initiations. Long-tailed Skuas’ nests were evenly spaced in the 6.1 km² census area, whereas nine out of ten King Eider nests were located close to five different nests of Long-tailed Skua. It is suggested that the association may be a state of commensalism.

Key words: nest site selection, nesting association, spatial distribution pattern, commensalism, King Eider (Somateria spectabilis), Long-tailed Skua (Stercorarius longicaudus), Greenland, High Arctic

INTRODUCTION

The phenomenon of ducks nesting in association with colonially breeding hosts, such as gulls and terns, has long been recognized (Stefánsson, 1919:461; Bent, 1921:172; Bailey, 1925; Nyström, 1927). The first specific studies appeared in the 1930s (Fabricius, 1937; von Haartman, 1937; Bergman, 1939), and since then this phenomenon has been reported in, among other places, the Holarctic region for a number of duck species breeding in different habitats. Ducks associating with bird colonies having efficient anti-predator defense have reportedly had increased nesting success (Bergman, 1939; Olsson, 1951; Ahlén and Andersson, 1970; Bengtson, 1972; Dwernychuk and Boag, 1972; Newton and Campbell, 1975; Schamel, 1977; Gerell, 1985; Young and Titman, 1986; Götmark and Ahlund, 1988). Related cases of ducks associating with human settlements have also been described (Hagelund and Norderhaug, 1975; Meltote, 1978).

Breeding ducks associating with solitary hosts, on the other hand, have been discussed thoroughly only by Giroux (1981) and mentioned briefly by other authors (Turner, 1886:136; Bent, 1925:82; Schiermann, 1927; Buturlin, 1931:67; Kessel et al., 1964:42; Uspenski, 1965:128; Williams, 1967:122; Long, 1970:90-91; Fabricius, 1983a:31-33, 1983b:215-216). On Hold with Hope in Northeast Greenland, we discovered a spatial nest distribution pattern of King Eiders (Somateria spectabilis) and solitarily breeding Long-tailed Skuas (Stercorarius longicaudus), which we interpret as a case of nesting association. The inference is based on spatial statistical analyses and the timing of clutch initiations.

STUDY AREA

The field data were collected during the Swedish Northeast Greenland Expedition — Myggbukta 1979. The study area is located in the High Arctic, on Hold with Hope near Myggbukta (73°29'N, 21°34'W), a former Norwegian radio station and weather observatory in Northeast Greenland (Fig. 1). The cen...
sus area at the head of Mackenzie Bugt comprises 6.1 km² of flat coastal plain below 50 m a.s.l. (Fig. 2). The surface drainage is interrupted by a well-preserved Quaternary beach-ridge system, forming some 200 small and shallow, permanent or temporary, water bodies. The absence of concealing vegetation and the relatively flat topography facilitated the surveying of birds and nests.

The only small rodent in the area, the collared lemming (Dicrostonyx groenlandicus), was abundant in 1979. Lemming predators, such as Long-tailed Skua, Snowy Owl (Nyctea scandiaca) and arctic fox (Alopex lagopus), occurred frequently. The arctic fox, the most prominent predator, feeds not only on lemmings, but often also on eggs and birds (cf. Meltofte et al., 1981; Quinlan and Lehnhausen, 1982). The carcass of a female King Eider, leg ringed on her nest a few days earlier, was found at an inhabited fox den in the census area (Elander and Blomqvist, 1986). Other mammalian predators, such as stoat (Mustela erminea) (Rosenberg et al., 1970; Meltofte et al., 1981) and wolf (Canis lupus) (Dawes et al., 1986), appear less frequently in this part of Greenland and were not observed during the study. A detailed description of the study area and the expedition is found in Elander and Blomqvist (1986).

FIELD DATA AND STATISTICS

Six pairs of Long-tailed Skua nested in the census area (Fig. 3). The regularity of the spread of their nest sites was measured using the G statistic of Brown and Rothery (1978). Our G value of 0.90 demonstrates an even distribution of nests and suggests the operation of a nest spacing mechanism resulting from territorial behaviour (see Maher, 1974; Andersson, 1976; Kampp, 1982).

The Long-tailed Skua defends its eggs and young by mobbing potential predators and, at the same time, a predator of the eggs of other birds (Andersson, 1971; Maher, 1974; Meltofte et al., 1981; Kampp, 1982; Elander and Blomqvist, 1986). Superimposing the spatial nest distribution of the King Eider around Myggbukta on that of the Long-tailed Skua, we found most King Eider nest sites to be located in the vicinity of skua's nests. Out of ten King Eider nests, nine were found in proximity to five different nests of Long-tailed Skua (Fig. 3). The distance between nests ranged from 18.5 to 304 m, with an arithmetic mean of 153 m and a median of 133 m. The randomness of the distribution pattern of eiders' nests was tested by a nearest neighbour analysis (Clark and Evans, 1954; combined with

FIG. 2. Southward view across the census area. Some 200 tarns and ponds of the coastal plain are dammed by a well-preserved beach-ridge system. (Photo: M. Elander.)
to minimize clutch predation. The presence of Long-tailed Skuas may in fact act as a cue in nest site selection by King Eiders (cf. Bergman, 1957; Koskimies, 1957). By selecting a nest site in close proximity to that of a Long-tailed Skua, King Eider may benefit from the skua’s general defense of its own clutch against predators such as the arctic fox. Moreover, during laying, when eggs are particularly vulnerable, King Eiders always conceal their eggs with ripped-off vegetation and later also with down whenever the female leaves them unattended (Lamothe, 1973; pers. obs.). The hazards of avian predation during laying are illustrated by our finding the fragments of a pecked first egg in the nest cup of one eider. Bird predators peck eggs, whereas arctic foxes typically carry them away or completely break them (McEwen, 1958; Lamothe, 1973; Quintan and Lehnhausen, 1982). We have never observed a Long-tailed Skua flush an eider off her nest once she had started to incubate. The behaviour developed by the King Eider appears to be an intricate trade-off between the possibility of having the clutch predated by the host pair of Long-tailed Skua and being defended by the host against other skuas and other predators, such as the arctic fox.

In general, nesting associations of bird species that utilize only passive protection of their eggs with hosts exerting an active and efficient anti-predator defense may be viewed as commensalism. Initially, individuals of the associating species select nest sites within the area defended by the host, thereby benefiting from indirect protection. Associated commensals, as the King Eiders in the present case, may consequently be regarded as scroungers. With an increasing degree of association (more associates and shorter distances), the probability of detection and predation on the host and its nest increases (cf. Curio, 1976). Thus, the host can be expected to show antagonism toward the associates, in addition to the common predator-prey relationship (cf. Dawkins and Krebs, 1979).

Female King Eiders were actually attacked by Long-tailed Skuas when prospecting potential nest sites by foot or when

**INTERPRETATION AND DISCUSSION**

We propose that the clustered nest distribution of the King Eider (Fig. 3) and the timing of clutch initiation (Fig. 4) are not incidental but adaptive. A suggestive parallel involving a wader is reported from northern Alaska, where Bar-tailed Godwit (*Limosa lapponica*) were found to associate with solitary breeding Long-tailed Skuas (Maher, 1959).

Successful reproduction for female King Eiders in an area containing several egg predators requires elaborate mechanisms

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**FIG. 3.** Relative location of nests of Long-tailed Skua (*Stercorarius longicaudus*) (▼; ▼ indicates location of newly hatched pulli) and King Eider (*Somateria spectabilis*) (▲). Associated nests are connected with a solid line or located within guide circles. An occupied den of arctic fox (*Alopex lagopus*) (★) is indicated.

Rohlf and Sokal, 1981: Table 11), and a high statistical significance for non-random clustering was found (R = 0.37, c = 3.06, p<0.0004). The flat topography and general uniformity of the study area justify the statistical method used (cf. also Ripley, 1979). Microhabitat differences were assumed to be negligible for the nest site selection, particularly since the melt-off of snow was essentially finished well before clutch initiation.

The timing of clutch initiation for associating King Eiders was compared with that of their respective Long-tailed Skua host (Fig. 4) to determine whether the association was consistent with an active choice on the part of the eider and therefore part of a true association. Of the nine eider pairs associated with skuas, it was possible to determine or estimate clutch initiation of six, either by direct observation or through back calculation from hatching dates. An incubation period of 23 days was chosen from a reported range of 22-24 days (Johnstone, 1961; Parmelee et al., 1967; Norderhaug, 1977). The initiation of the skua’s egg laying was estimated from hatching dates, using an incubation period of 25 days (Maher, 1974). A laying interval of one egg per day was assumed for both species. All six eider clutches were shown to have been initiated after or concurrently with their respective Long-tailed Skua (Fig. 4). Female King Eiders may in principle be able to associate even before the clutch initiation by the host, since the Long-tailed Skuas show aggression toward heterospecific intruders within their territories even prior to laying of their first egg. A muskox (*Ovibos moschatus*) was on one occasion fiercely mobbed by a pair of skuas when grazing near the future nest site.

**FIG. 4.** Timing of events in the census area. Shown to the left is the course of spring arrival of Long-tailed Skua (*Stercorarius longicaudus*) (▼) and King Eider (*Somateria spectabilis*) (▲) expressed as percent of respective final breeding population. Shown to the right is clutch initiation for individual pairs of the two species, with associated King Eider nests connected to their respective host. Letters and numerals correspond to Figure 3.
returning by foot to their nests. Similar mobbing harassment has previously been observed elsewhere in Northeast Greenland (pers. obs. on, Hochstetter Forland; Meltofte et al., 1981) and is also reported from eastern Canada involving breeding Arctic Terns (Sterna paradisaea) and associating Red-breasted Mergansers (Mergus serrator) (Young and Titman, 1986:2340). Assuming, however, that female eiders can withstand agnostic behaviours of the skuas and that the reproductive output, at least sometimes, is higher for associating individuals, a state of commensalism may be maintained.

The simplicity of the habitat and of the avian community described in this study is seldom met with outside of the Arctic. Nesting associations of ducks with solitarily breeding hosts having an efficient predatory deterring defense may therefore be an overlooked phenomenon. Nesting association with solitary hosts may influence spatial distribution patterns more than hereto adopted, with implications for theories on habitat use and nest site selection of birds in general (cf., e.g., Hildén, 1965; Klopfer and Hailman, 1965; Fretwell, 1972:115-165; Cody, 1985).

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