DOES BLOOD SAMPLING DURING INCUBATION INDUCE NEST DESERTION IN THE FEMALE COMMON EIDER *SOMATERIA MOLLISSIMA*?

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SUMMARY

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The Common Eider *Somateria mollissima* is an appropriate species with which to study the physiology of fasting during reproduction, and particularly to follow how individual females incubate in natural conditions. However, it usually relies on invasive techniques including bird capture and blood sampling. Consequently, disturbance of birds can induce unusual behaviour and lead to nest desertion and spurious results. This note describes the effect of capture and blood sampling on incubating female eiders from Spitzbergen. Female eiders were either caught and bled or simply flushed from their nests. We found that nest desertion was linked with treatment and with the date of incubation. Birds were more likely to desert their nests when handled at the beginning of incubation. By contrast, no effect of disturbance (without capture) was detected. We suggest that capture of incubating eiders should be avoided during the critical initial incubation period.

Key words: Common Eider, *Somateria mollissima*, techniques

INTRODUCTION

The Common Eider *Somateria mollissima* is one of the most abundant colonial seabirds nesting in the Svalbard Archipelago during the Arctic summer. Females gather in nesting colonies, generally located on small islands, at the start of the breeding period (Prestrud & Mehlum 1991). During incubation, eiders show almost continuous nest attendance while fasting for 25 days (Korschgen 1977). Due to this noteworthy incubation strategy, Common Eiders have been used as a model in several field studies which often require frequent handling of the females and their clutches (Rahn *et al.* 1983, Swennen *et al.* 1993, Erikstad & Tveraa 1995), as well as blood sampling (Gabrielsen *et al.* 1991). However, few studies mention the effect of such experimentation either on eider behaviour or nest attendance, even though it is well known that intrusion in a colony and bird handling can have negative effects on the reproductive success of several bird species (Blokpoel 1981, Carney & Sydeman 1999). Since the scientific programme developed by our team required the capture of incubating female eiders, we evaluated the rate of nest desertion of incubating eiders in relation to capture and blood sampling.

METHODS

The study was performed during June and July 1999, on an eider population breeding close to the human settlement of Ny-Ålesund located in Kongsfjorden, on the western coast of the Svalbard Archipelago, north of Norway (78°55'N, 11°56'E). A total of 80 nests was inventoried in the study area (Fig. 1). The colony, which is located along a road commonly used between 08h00 and 17h00, was visited twice a day.

A first group of birds was captured on the nest using a bamboo pole with a nylon snare. Caught females were restrained by holding the neck while the body was supported (the bird stops struggling with this hold). The bird was moved about 10 m from the nest, where blood sampling was performed. Blood (2.5 ml) was collected from the brachial vein with a 5-ml non-heparinized syringe and a 21-gauge hypodermic needle. Blood was transferred to a 5-ml tube containing EDTA, and kept on ice until centrifugation. The eggs were covered with down immediately after catching the female. Capture and blood sampling lasted less than five minutes, and five additional minutes were required to take body mass and wing length measurements. The birds were subsequently released in the direction of the nest. Capture and blood sampling were always performed when human activity near the nests was minimal, between 17h00 and 00h00.

In a control group, females were flushed from the nest by one person walking straight to them. The duration of female absence was recorded, starting when the bird left the nest and ending when it came back and resumed incubation. Subsequent bird behaviour was observed from a hide by the experimenter once he had left the area.

Desertion or complete egg predation recorded within one hour after bird disturbance (handling or flushing) was assumed to be induced by the experiment. Clutch destruction or nest desertion

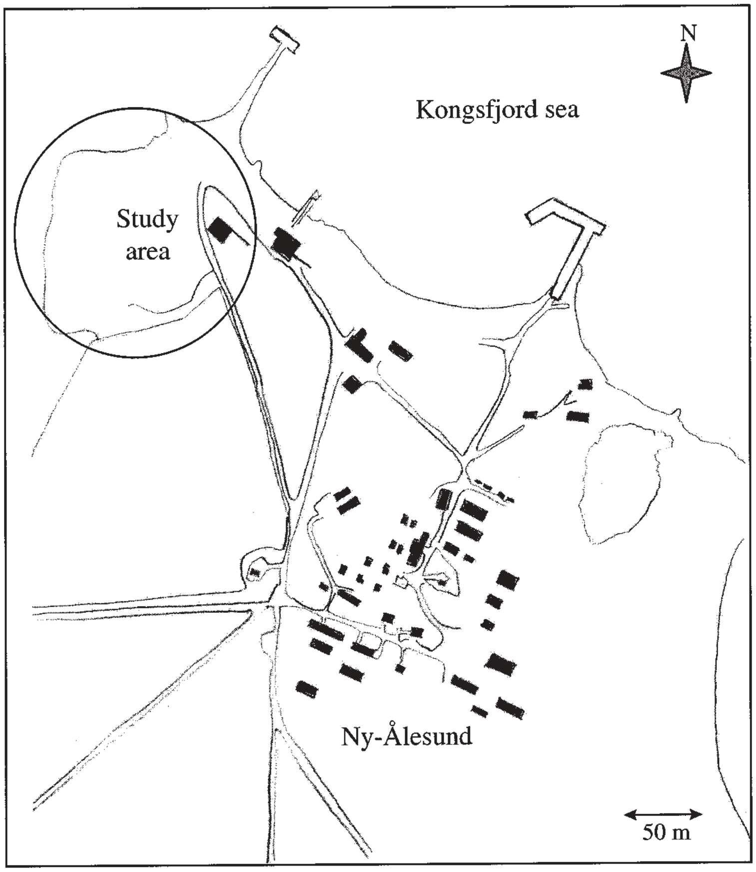

Fig. 1. *Map of the study area. The nesting area used in this study is close to the human settlement of Ny-Ålesund.*

which did not occur within one hour were considered to have occurred naturally, since usual recesses last less than 10 minutes (Criscuolo *et al*. 2000). The effect of clutch size, treatment (flushed or bled), the date of incubation and bird manipulation on nest desertion was determined by stepwise regression, after testing data for normality and autocorrelation. Pearson correlation was used to evaluate the relationship between absence duration and day of incubation in the control group. Intra- or inter-group comparisons were done with a Mann-Whitney test or Student's *t*-test, depending on the normality of the data. Data are expressed as mean ± SE.

RESULTS

During the experiment, 16 females were caught on the nest and sampled for blood. Six of these deserted the nest after manipulation (Fig. 2). By contrast, we observed no induced desertion of the nest in the control group when flushed the first time (n = 12), or during repeated experiments (n = 18, Fig. 3). Accordingly, the stepwise regression showed that nest desertion was significantly linked to treatment and day of incubation (abandon decision = 0.42 treatment – 0.03 day of incubation + 1.035, $r^2 = 0.34$, $F = 6.44$, $P = 0.006$, n = 28). The treatment and the day of manipulation explained 22% and 12% of the nest desertions, respectively. We found no significant effect of clutch size on nest desertion ($P > 0.05$).

The time taken by control females to come back to the nest did not differ significantly between the first week and the last part of the incubation (4.0 ± 1.1 vs. 2.7 ± 1.1 min, Mann-Whitney test, $Z = 52.5$, $P = 0.29$, $n_1 = 7$, $n_2 = 5$). There were also no significant differences between the absence durations of control and bled birds (3.5 ± 0.3 vs. 4.2 ± 1.0 min, $t = -0.62$, $P = 0.55$, $n_1 = 16$, $n_2 = 12$).

When released after blood sampling, eiders showed one of the following behaviours: (1) they flew to the nearest water pool to preen, (2) they walked back directly to the nest, or (3) they flew out of sight far from the nest. Birds flushed from the nest within the control group showed misleading (faking injury) or aggressive (ruffling of feathers and puffing noisily) behaviour. These latter observations were more frequent after the first week of incubation (four birds out of five vs. three birds out of seven), and we postulate that the presence of pipping eggs or young hatched ducklings is likely to favour such behaviour.

DISCUSSION

Data on manipulated incubating eiders showed that handling and blood sampling are more likely to induce nest desertion in incubating female eiders than flushing disturbance. Moreover, as previously suggested (Korschgen 1977), it appears that a bird's reaction to disturbance changes over the course of incubation, since nest desertion was not observed after the first week of incubation.

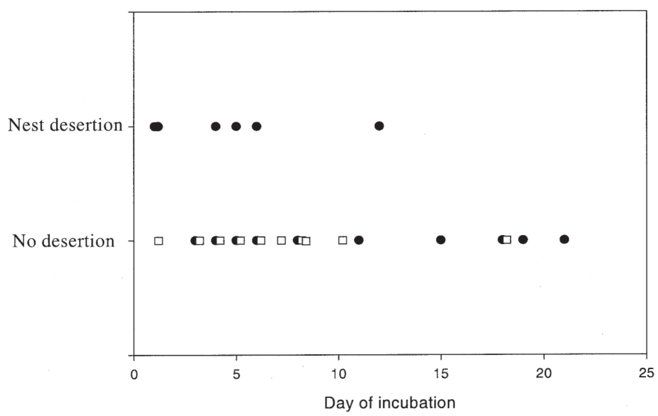

Fig. 2. *Effect of blood sampling (black circles) and bird flushing (white squares) on free incubating female eiders. The birds were manipulated and flushed at different dates of the incubation period.*

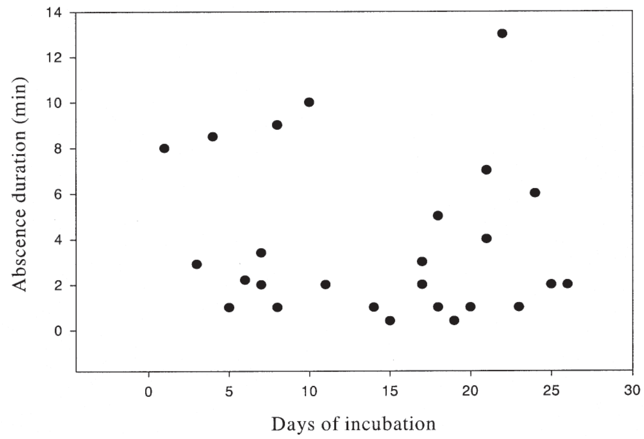

Fig. 3. *Change in absence duration of free incubating eiders after flushing by a human. Correlation between absence duration and day of incubation was not significant (r = -0.124, n = 30, P = 0.5).*

As a conclusion, and in accordance with previous observations made on Ring-billed Gulls *Larus delawarensis* (Brown 1995), eiders are most sensitive to disturbance early in incubation. This observation supports the theory of nest defence by waterfowl (Forbes *et al*. 1994). After this period, handling and blood sampling experiments did not induce a significant increase in nest desertion in our study. However, bird handling must be avoided in rainy or windy conditions, which can induce egg cooling and the death of the embryos (Giese 1996).

Still, our non-effect result has to be considered in the light of three characteristics of the breeding colony used in this study. First, breeding density is higher in 'natural' nesting sites in Kongsfjorden, like in the islands of Prins Heinrich or Storholmen (Criscuolo *et al*. 2000, Parker & Mehlum 1991). In our study, social interactions between birds were reduced and disturbance of one bird did not result in neighbouring females flying off their nests. Consequently, inducing the escape of one female could have more negative effects in island breeding areas. Second, eiders nesting on islands did not benefit from the relative protection of either human installations or Arctic Terns *Sterna paradisaea* which also breed around the town. Since eider egg predation is naturally high in Svalbard (Mehlum 1991), temporary nest desertion (even of only few minutes) could lead to predation by Glaucous Gulls *L. hyperboreus*. This threat is enhanced in the high Arctic environment by the absence of vegetation cover (Brown & Morris 1994), where nesting eiders are exposed to searching predators (Gotmark & Ahlund 1984). Normally eiders breed on offshore islands, where they generally face predation pressures from gulls, but also from Great Skua *Stercorarius skua*, a species which was never observed near the human settlement, our mainland study area. Thus, this study represents a best-case scenario for nesting eiders. Moreover, eiders used in this study could be habituated to humans. One can think that eiders from populations that are heavily hunted will flush at much higher distances and will stay off their nests for a longer time.

Birds' heart rate and body temperature increase when they are approached by an observer (Culik *et al.* 1990, Regel & Pütz 1997). For a bird like the Common Eider, which faces a concomitant stressful long-term fast during incubation (Gabrielsen *et al.* 1991), repeated disturbance can therefore lead to an increase in energy expenditure. Such an extra cost could induce premature depletion of body reserves, nest desertion, or female death (Korschgen 1977). Thus, independent of the immediate reaction of the incubating female to disturbance (potential desertion), other factors, which still need to be evaluated, may trigger nesting failure in late incubation. For the Svalbard eider population, which has not increased since the establishment of the bird sanctuaries in 1973 (Prestrud & Mehlum 1991), reducing disturbance would be important to consider when preparing a study on wild incubating eiders, especially during early incubation.

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