

## Site fidelity in breeding Common Eider *Somateria mollissima* females

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We studied nest-site and post-nesting feeding site fidelity in a population of Common Eiders *Somateria mollissima* in North Norway during five consecutive breeding seasons (1986–90). Twenty-five per cent of the females that nested successfully and none of the unsuccessful females returned to the same nest. Whether females nested at the same site was independent of nesting variables other than total clutch loss. Similarly, nest-site fidelity did not result in nesting variables different from those of females which changed their nest-site. In contrast, fidelity to post-nesting feeding sites was very high (92%). Females that showed post-nesting feeding site fidelity did not have a higher rate of nest-site fidelity than other birds in the population. We therefore contend that in Common Eiders fidelity to a specific nest-site is less important than fidelity to the post-nesting feeding site. Going to areas where the female knows that sufficient food can be found is very important for both the female and her brood. In comparison to other duck species with more specific nest-site requirements (cavity-nesting ducks), Common Eiders have a low return rate to previous nest-sites, and we suggest that this reflects a difference in the availability of suitable sites.



### 1. Introduction

A *breeding site* normally refers to a given area (e.g. colony, island or wetland) (Gratto et al. 1985, Gauthier 1990), and homing to breeding sites is very frequent among waterfowl (Rohwer & Anderson 1988, Gauthier 1990, Lokemoen et al. 1990). Waterfowl have precocial young that leave the nest soon after hatching (Kear 1970), and the breeding site in these species includes

both the nest-site (here defined as the actual nest cup) and the area where the young are reared (post-nesting feeding site). For many waterfowl populations, e. g. those nesting on islands, post-nesting feeding sites are more or less separated from the nesting grounds by areas where the birds feed very little (Hildén 1964, Ahlén & Andersson 1970, Newton & Campbell 1975). Thus within a population, breeding site fidelity can be divided into nest-site and post-nesting

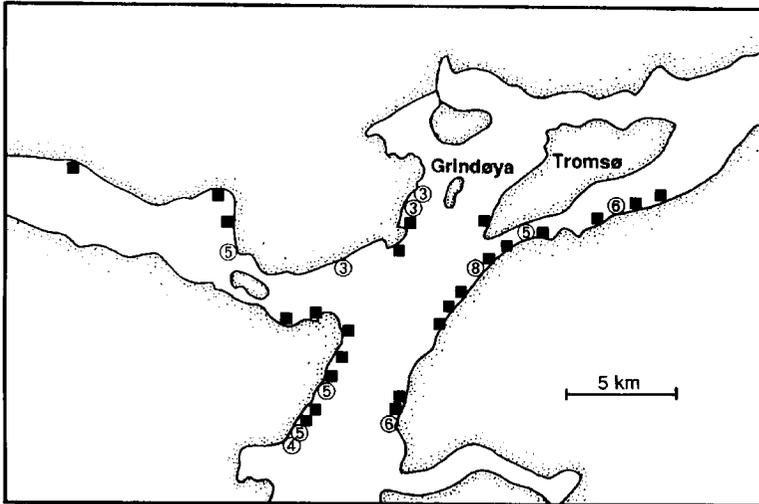


Fig. 1. Brood rearing areas of female Common Eiders nesting on Grindøya. ■ = sites where individual marked females were observed in one year with broods (additional points omitted). ○ = sites where individual females were observed in more than one year. Numbers indicate total number of observations for a female in all three years.

feeding site fidelity. Several studies have shown that waterfowl reuse the same nest-site (e.g. Doty & Lee 1974, Swennen 1976, Dow & Fredga 1983, Gauthier 1990, Majewski & Beszterda 1990), but we know of only one study that has shown some degree of fidelity to post-nesting feeding sites (Gollop 1959).

The aim of this study was to reveal the pattern of nest-site and post-nesting feeding site fidelity in the Common Eider *Somateria mollissima*, a duck which usually nests on islands. Some Eider females return to the same nest in successive years (Cooch 1965, Milne 1974, Reed 1975, Swennen 1976, 1990, Wakeley & Mendall 1976, Coulson 1984), but nothing is known about the post-nesting feeding site fidelity in this species.

## 2. Study area and methods

The study was carried out in an Eider colony (about 400 breeding pairs) on Grindøya, a small island (0.65 km<sup>2</sup>), and in the surrounding fjords near Tromsø (69°49'N, 18°15'E), North Norway from 1986 to 1990.

Eider broods/creches from Grindøya leave the nesting area shortly after hatching and swim to the post-nesting feeding sites situated on a few hundred metres up to 20 km away (Fig. 1).

Egg laying started in mid May, and most females left the colony in late June. We searched

the island for nests from the start of the breeding season, and caught the birds on their nest during late incubation. Females were marked with steel leg bands and patagial tags (1987–88) (Anderson 1963, Bustnes & Erikstad 1990) or nasal disks with individual codes (1989) (Sugden & Poston 1968).

Nests were plotted on maps and distances between the nests of individual females were measured to the nearest metre, in the field.

Laying dates were defined as the day the first egg in a clutch was laid, and were directly observed or estimated from hatching by back-dating, assuming an incubation period of 26 days, and a laying interval of one egg per day (Korschgen 1977). To reveal differences in laying dates between females returning to the same nest and females changing nest-sites, the dates of clutch initiation for each female were expressed as differences from the mean annual laying date in the colony.

During incubation, the nests were checked weekly, and during laying they were checked every two or three days. We recorded *clutch size* and *partial egg loss* (number of eggs disappearing from nests where at least one egg hatched). *The number of young leaving the nest* was counted in the nests before the brood left or estimated by subtracting the remaining eggs and dead young from the known clutch size shortly after hatching. In addition we recorded *total clutch loss* due to predation.

Since the females were caught late in incubation, the observed total clutch loss was less than the overall total clutch loss in the colony. Such a late inspection excluded nesters that failed during laying or shortly after. However, the two groups (females returning to the same nest ( $n = 15$ ) and females moving to a new nest ( $n = 60$ )) can be directly compared since they were under observation for similar time periods (means  $\pm$  SE of  $15.13 \pm 2.63$  vs.  $15.56 \pm 1.12$  days respectively,  $t = -0.168$ ,  $df = 73$ ,  $P = 0.87$ ).

Only females that were found nesting in consecutive seasons were included in our study, and each nesting attempt was treated independently in our statistical analyses. The sample consisted of 55 females. Of these 38 were found in two, 14 in three and three in four successive years; totalling 75 pairs of breeding attempts.

The most important egg predators on Grindøya were Crows *Corvus corone*. Herring Gulls *Larus argentatus* and Great Blackbacked Gulls *Larus marinus*.

*Post-nesting feeding sites* were defined as areas where individual females were observed in more than one season after a nesting attempt (successful or unsuccessful). Furthermore, each female had to be observed more than once at the site in at least one of the years. A female was defined to be in the same rearing site if it was found within 1 km of last seasons observation (Fig. 1).

### 3. Results

*Nest-site fidelity:* In 84% (63) of the nesting records, the first- and second-year nest of a female were within 100 m of each other. Fifteen

(20%) of the pairs of nesting records were females ( $n = 11$  that used the same nest cup more than once. Seven females used their previous nest twice, while four used it three times.

Females that lost their clutch to predators ( $n = 14$ ) did not return to the same nest the following year, while 15 (25%) of the successful nesters ( $n = 61$ ) returned. This is very close to a significant difference ( $P = 0.059$ ; Fisher's exact probability test). Failed nesters did not move farther away from the previous nest-site than did successful ones that changed site (Table 1).

Females that returned to the same nest-site after nesting successfully (at least one egg hatched) did not, in the first year, have nesting variables different from those that changed site. Nor were there differences between the nesting variables of females which returned and those of females that changed site the following year (Table 2).

*Post-nesting feeding site:* The females nesting on Grindøya dispersed from the island over a shoreline of 72 km. Twelve tagged females were observed in post-breeding feeding areas after nesting attempts in more than one year (Fig. 1). Eleven were seen in two years and one in three years. Only one female (8%) changed site between the years. After leaving with young, she was observed in one area, but returned to the colony after two weeks without young. Later in the autumn she was seen in the area which she used as a rearing site two years later. Females ( $n = 11$  that showed post-nesting feeding site fidelity did not show a higher rate of nest-site fidelity (3 (25%) out of 12 pairs of nesting attempts) than the rest of the population (12 (19%) out of 63 pairs of nesting attempts) ( $P = 0.697$ , Fisher's exact probability test). The rate of total

Table 1. Frequency of distances between successive nests of Common Eider females changing nest-site in relation to nesting success in the previous year. Data from Grindøya, North Norway 1986–90. Mann-Whitney  $U$ -test.

Previous nesting attempt	n	Distance in metres							Median	Range	P-value
		1–10 n (%)	10–20 n (%)	20–30 n (%)	30–40 n (%)	40–50 n (%)	50–100 n (%)	>100 n (%)			
Successful	46	5 (10.9)	11 (23.9)	6 (13)	3 (6.5)	3 (6.5)	8 (17.4)	10 (21.7)	30	1–526	0.67
Failure	14	2 (14.3)	3 (21.4)	0	3 (21.4)	3 (21.4)	1 (7.1)	2 (14.3)	30	1–120	

clutch loss the first year was also similar between these two groups (2 (17%) out of 12 and 12 (19%) out of 63 pairs of nesting attempts) ( $P = 1.000$ , Fisher's exact probability test).

#### 4. Discussion

In this study, 25% of the successful and none of the unsuccessful females returned to their previous nest. Similar return rates have been found in other studies of the Common Eider (Milne 1974, Reed 1975, Swennen 1976). Since the Common Eider nests on the ground in different habitats, the abundance of good nest-sites is high (Swennen 1990). Thus, even if females tend to show strong nesting area fidelity (Cooch 1965, Reed 1975, Swennen 1976, 1990, Wakeley & Mendhall 1976, Coulson 1984), the specific nest-site is probably of little reproductive value. Our findings that return rates were independent of nesting variables support this, even if some of our sample sizes were small. However, the nest-site provides safety for the female and her offspring, and females which lost their clutch in one year did not use the same nest the next year. Similar observations were made by Milne (1974) studying Eiders in Scotland. Concealment is important in reducing predation on Eider nests (Choate 1967, Gorman

1974, Milne & Reed 1974, Gerrell 1985) and predation pressure has been found to influence the choice of nesting habitats in some colonies (Grubb 1974, Gerrell 1985). Grubb (1974) showed that Eiders changed to a more concealed nesting habitat as nest predation by gulls increased. The fact that, in this study, victims of nest predation did not move farther away from their previous nests than birds that nested successfully and also changed site, may indicate that they changed habitat. This was not investigated.

However, since most of the successfully nesting females also changed site, other factors than nest predation must influence choice of nest-site. One possible factor is annual changes in vegetative cover (e.g. because of late snow melt) that prevent females from reusing their previous site.

Studies of other ducks have shown a varying degree of nest-site fidelity. In the Mallard *Anas platyrhynchos*, which nests in habitats similar to those of Common Eiders, Lokemoen et al. (1990) found that no females returned to previously used nest-sites, even though successful nesting females homed to the same breeding area. However, two other studies of Mallards nesting in man-made nest baskets have shown that 52% and 50% returned after hatching young while only 16% and 10% returned after a failure (Doty & Lee 1974,

Table 2. Nesting variables (mean  $\pm$  SE except for partial and total egg loss = number of nests) for successfully nesting female Common Eiders returning to the same nest compared to those for females changing nest-site. Sample size in parentheses. Date for each female adjusted for differences in mean laying date in the colony for each year, Mann-Whitney  $U$ -test except for total clutch loss and partial egg loss; Fisher's exact probability test.

Nesting variables	Using the same nest	Moving to a new nest	P-value
<i>First year</i>			
Date of clutch initiation	-0.85 $\pm$ 1.33 (14)	-1.64 $\pm$ 0.73 (37)	0.27
Clutch size	4.54 $\pm$ 0.29 (13)	4.40 $\pm$ 0.11 (45)	0.50
Partial egg loss	1 (11.1%) (9)	5 (15.6%) (37)	1.00
Number of young leaving the nest	4.37 $\pm$ 0.38 (8)	4.16 $\pm$ 0.15 (36)	0.62
<i>Second year</i>			
Date of clutch initiation	+ 1.17 $\pm$ 1.98 (9)	+1.61 $\pm$ 0.68 (50)	0.46
Clutch size	4.13 $\pm$ 0.22 (15)	4.29 $\pm$ 0.12 (42)	0.62
Partial egg loss	1 (33.3%) (3)	1 (4.5%) (22)	0.28
Number of young leaving the nest	3.75 $\pm$ 0.25 (4)	4.05 $\pm$ 0.19 (22)	0.43
Total clutch loss	1 (9.1%) (11)	1 (3.1%) (32)	0.47

Majewski & Beszterda 1990). The reason for these conflicting results is not known, but it may be differences in the availability of good nest-sites between areas.

Compared to ground nesters such as Eiders and Mallards, the cavity-nesting *Bucephala* species show a much higher rate of nest-site fidelity, ranging from 55–83% of successfully and 11–29% of unsuccessfully nesting females (Dow & Fredga 1983, Gauthier 1990, Savard & Eadie 1989). Cavities in trees and nest-boxes are rare compared to the amount of suitable nest-sites for ground nesters. Returning to a known site means that hole nesters can spend more time feeding, and start egg laying earlier. Both Common Goldeneye *B. clangula* (Dow & Fredga 1983) and Bufflehead *B. albeola* (Gauthier 1990) females returning to the same nest box laid eggs earlier and had larger clutches than those changing nest boxes. In addition, returning Goldeneyes had larger broods and higher nesting success than birds that moved to another site (Dow & Fredga 1983). Even if the chance of nest predation is higher at sites that have suffered predation in previous years (Dow & Fredga 1983, Blancher & Robertson 1985, Sonerud 1985), it may be an advantage to return, because the high reproductive output may outweigh the increased chance of total clutch loss.

*Post-nesting feeding site:* It is important for Common Eider females to find good feeding sites, because they are in poor body condition when the eggs hatch (Gorman & Milne 1971, Korschgen 1977, Parker & Holm 1991). The post-nesting feeding site should also provide enough food for the young, and Swennen (1989) showed that, in Common Eiders, food abundance was very important for the survival of the ducklings. We found that 11 of 12 (92%) females returned to the same post-nesting feeding site in successive years, a rate much higher than that for nest-site fidelity. One should, however, be cautious when comparing such rates, since different scales were used, but in this case the scale difference is justified since the potential post-nesting feeding area is much larger (72 km of shoreline in this study) than the potential nest-site areas. Thus, in the Common Eider, fidelity to post-nesting feeding sites seems to be more important reproductively than fidelity to the actual

nest-site. Our result that females which showed post-nesting feeding site fidelity did not show more nest-site fidelity than the rest of the population, supports this conclusion.

Very little is known about brood-rearing site fidelity in other duck species, but Gollop (1959) noted that 13 (46%) out of 28 Mallard females that were captured with ducklings had been banded on the same wetland. Some cavity nesters like the Bufflehead are territorial during brood rearing, and the territory is usually situated close to the nest-site (on average 208 m away) (Gauthier 1987). Thus, because of the high return rate to nest-sites, the post-nesting feeding site will be situated near the same place in more than one year.

In conclusion, the specific post-nesting feeding site is reproductively more important than the specific nest-site for a ground nester like the Common Eider, while the converse is probably true for hole-nesting species.

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## Selostus: Pesivien haahkanaaraiden paikkauskollisuus

Kirjoittajat tutkivat haahkan usollisuutta pesäpaikalleen ja pesinnän jälkeiselle ruokailualueelleen vuosina 1986–90 Pohjois-Norjassa. Neljännes pesinnässään onnistuneista naaraista palasi samaan pesään. Epäonnistujista ei yksikään palannut. Pesäpaikkauskolliset ja pesäpaikkaa vaihtaneet naaraat eivät eronneet toisistaan pesintään liittyvien tunnuslukujen suhteen. Haahkanaaraista 92% palasi edellisvuotiselle pesinnän jälkeiselle ruokailualueelleen. Tieto hyvistä ruokailualueista on erittäin tärkeää naaraille ja niiden poikueille.

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