

# A breeding association between Eiders and tethered huskies in North-east Greenland

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## Introduction

The Common Eider subspecies *Somateria m. borealis* is a frequent breeder along most of the coasts of Greenland, except where compact pack ice blocks the coasts during the breeding season. On the west coast the northern limit is Hall Land; on the east coast Germania Land (Figure 1) (Salomonsen 1967). On the north-west coast and in the Thule District large colonies are found (e.g. Joensen & Preuss 1972; Thing 1976), whereas those on the east coast are usually small. The species also breeds singly on skerries and on the mainland.

The population on the west coast has decreased considerably during the last century, probably due to human utilization (Salomonsen 1967) and climatic fluctuations (Vibe 1967).

Since 1955 a large colony has been established at Daneborg (74.18 N 20.10 W) in North-east Greenland. Here they breed near tethered sledge dogs. Since 1970 much information on the colony has been received from members of the Sirius military sledge patrol, and I paid short visits myself in 1972 and 1976. This paper is thus not the result of a systematic study, but of scattered observations.

## The colony on Sandøen

Until the colony at Daneborg was established, one of the largest Eider colonies in North-east Greenland was found on Sandøen, a sparsely vegetated sand and gravel island 0.3 km<sup>2</sup> in Young Sund just off the coast south of Daneborg (Figure 2). In 1930 Løppenthin (1932) found 30–40 nests, and estimated a population of 50–80 potentially breeding pairs. In 1932, Pedersen (1934) found 90 nests. Because of a breeding population of Sabine's Gull *Xema sabini*, Sandøen was protected by law in 1950, and all entry was prohibited. In 1964, Rosenberg *et al.* (1970) estimated there were 70 pairs of Eiders. During visits in late July or August 1972, 1973 and 1976, many nest cups were seen, but only a few were lined by down (Melfotte 1972; Jørgen Sjøe Westergaard *in litt.*)

## The colony at Daneborg

Before World War Two, Sandodden trap-

ping station was situated here. Daneborg Weather Station was established about 1944, and in 1951 the Sirius patrol base was added. Together they comprise about 25 wooden houses and smaller buildings, and are staffed by seven and twelve men, respectively. The weather station, which was closed down in 1974, had only 10–20 dogs. Sirius has 60–80 sledge dogs, which are tethered in rows throughout the summer.

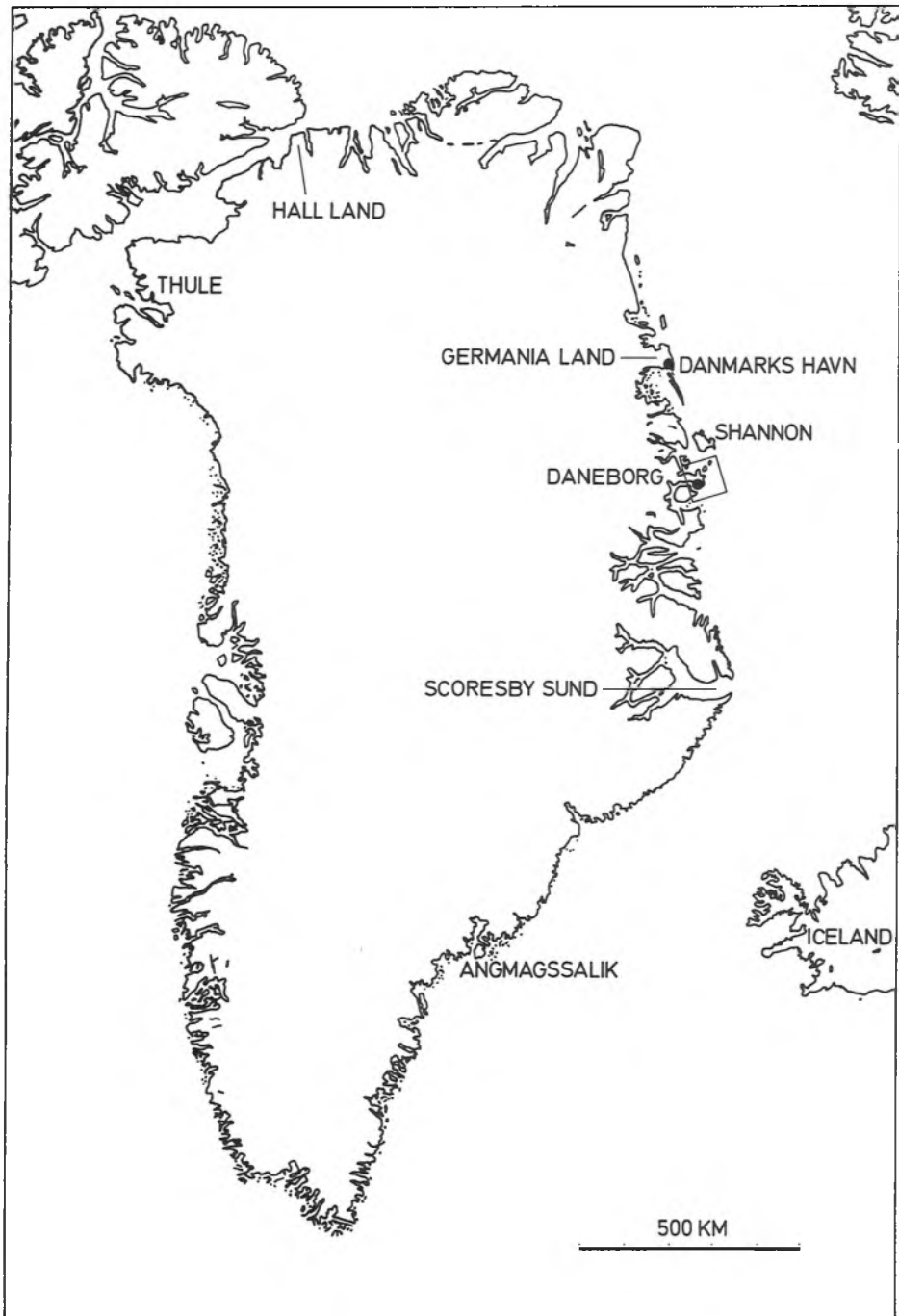
Conradsen (1957) mentions that two Eider females nested less than one hundred metres from the station in 1955. Both were destroyed, probably by an arctic fox *Alopex lagopus*. Leo Wolsing (pers. com.) reports that 2 or 3 females nested by the aerial masts in 1957. In 1964, the colony comprised 70 nests, and in 1965 at least 150 nests (Rosenberg *et al.* 1970). In 1970 the Sirius crew estimated the colony to hold 300 nests, and, in 1972, 500 nests (Melfotte 1972). On 12th July 1975 1,292 nests were counted by Sirius members (Figure 3).

## Causes of losses of eggs, young and adults

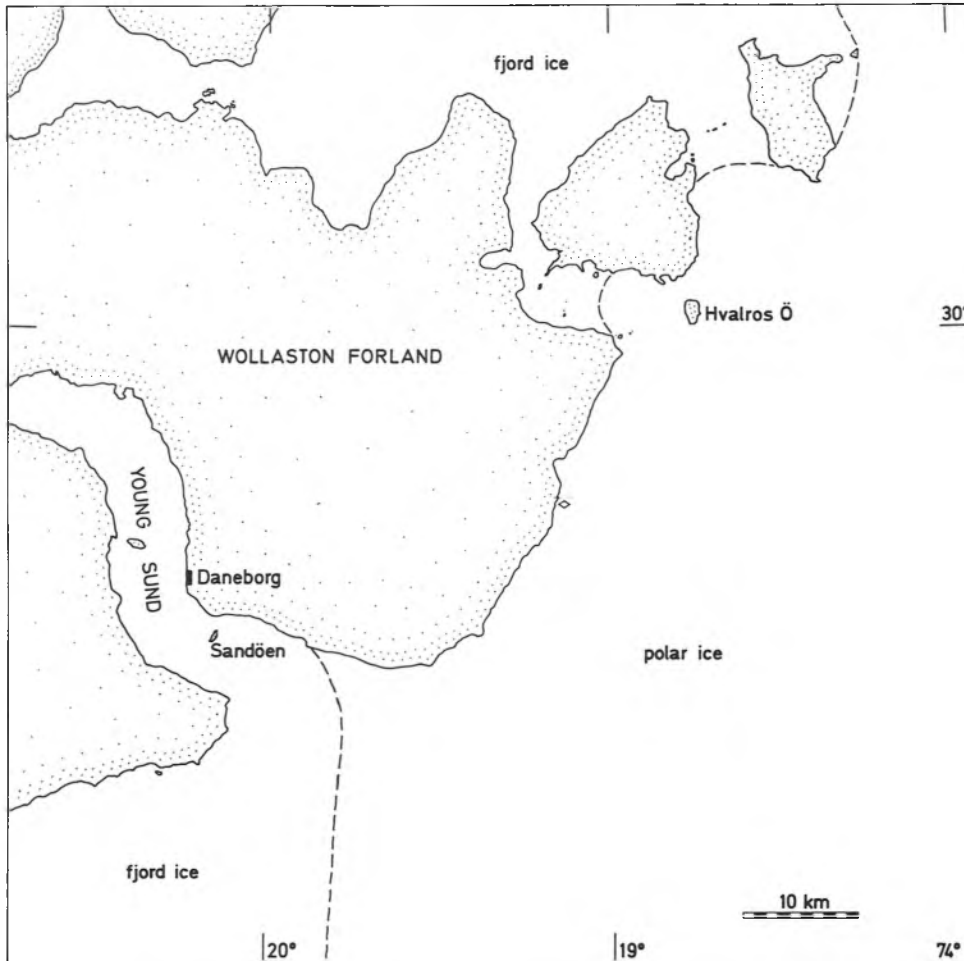
In 1964 most of the nests were situated near buildings or as close as five metres from rows of lively and noisy huskies (Figure 4). Two of the five nests destroyed (at least one by a fox) were up to 200 metres from the nearest building or dog-team (Rosenberg *et al.* 1970).

In 1972 the birds are nesting down to half a metre beyond the reach of the dogs, although 25 to 50 birds are taken annually by the dogs when flying low over the rows. Shortly after egg-laying, the nesting birds were covered by snow up to their necks. When the snow began melting, rain followed and many nests were flooded or washed out. A storm shortly after the hatching of the first young blew many of them away. Along the coast between Daneborg and Sandøen there were 11 males, 118 females, and 44 pulli on 25th July (Melfotte 1972).

In 1973 many Eider nests were flooded by a strong thaw and rain in June. About 1,000 deserted eggs were collected for dog food. The next year many nests were flooded during a sleet storm, but not as many as in 1973. Some eggs roll out of the nests when birds are flushed during feeding of the dogs, which then become active and noisy.



**Figure 1.** Map of Greenland showing localities mentioned in the text. The area covered by Figure 2 is framed.



**Figure 2.** Map of the area around Daneborg showing localities mentioned in the text. The edge of the unbroken fjord ice in the last days of May 1976 is dashed. Outside this edge the more or less dense icefloes and blocks of polar ice are drifting, and wide shore leads form here.

In 1975, 25–50 nests were flooded in late June. About 80 Eiders—both males and females—were taken by the dogs. The first eggs hatched on 13th July and the fjord ice in Young Sund broke on 18th July. The next year during a *föhn* storm on 7th July several nests were flooded. Many females were then still sitting around the colony, for part of the area was still covered with snow. The colony was much smaller than in 1975, and foxes took several eggs. Most young hatched in the middle of July, and by 31st July few females were incubating. The dogs took 39 males and 50 females. Usually no more than 5–10 Glaucous Gulls *Larus hyperboreus* are seen at Daneborg, and they take few eggs. By 16th to 18th August 1976 all females had finished incubation, but many of the nests

contained eggs—most of them only one or two, but several with whole clutches. Most of the 25 eggs investigated contained nearly fully developed embryos. Such desertion of nests may to some extent be due to the catching of birds for ringing, and to disturbances when single dogs get loose. Puppies are normally born in spring, and most Eiders have left the colony when they grow big enough to run around and do any harm. Most of the nests were situated among luxuriant grass tussocks below the dog rows, where the drinking water and excretions from the dogs irrigate and fertilize the vegetation.

On 17th August 1976, off the coast, between Daneborg and Sandøen, there were several flocks of Eiders present including:

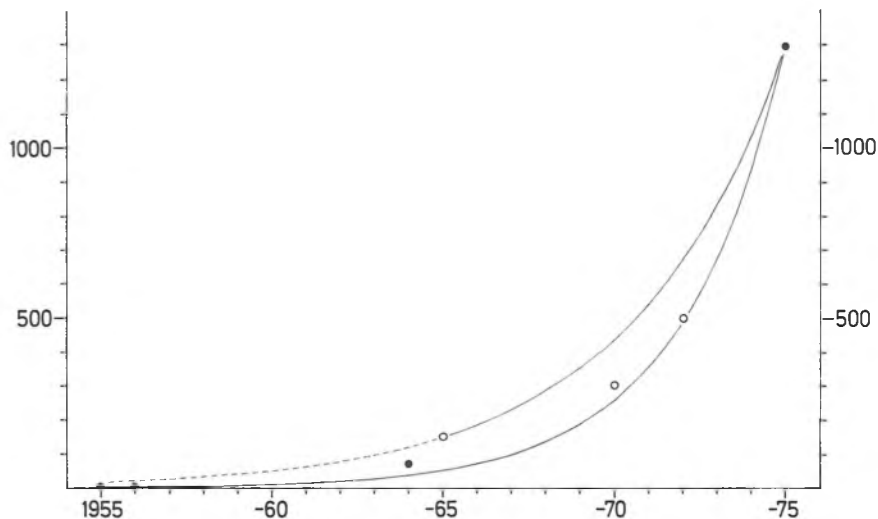


Figure 3. Graph showing counts (●) and estimates (○) of incubating females in the Daneborg colony 1955–1975. The two exponential curves indicate the estimated growth between 1955 and 1975, and between 1965 and 1975, respectively (backward extrapolation shown by dashes).

five females with 20 ducklings together with 28 females without young; nine females attending 25 young; 1 or 2 females attending no less than 80 ducklings; and another female with about 30. Two immature Glaucous Gulls and one immature Great Black-backed Gull *Larus marinus* (a rare visitor) stayed near the Eiders, but no attempts to take young were seen. Instead, the gulls tried to rob mussels and other food from the adult Eiders. Glaucous Gulls are not numerous in Young Sund and neither Arctic Skuas *Stercorarius parasiticus* nor Ravens *Corvus corax*, which both occur in small numbers at Daneborg, have been seen to prey upon the Eiders.

#### Nest site selection and onset of breeding in relation to mammalian predators

Several authors have discussed the association of breeding Eiders with terns or gulls. Recently, however, Ahlén & Andersson (1970) suggested that it is only a result of 'trial and error'. It does not serve the term 'sociability'. Eiders breeding at human habitations have been known for many years, e.g. in Iceland (Gudmundson 1932), Svalbard (Ogilvie & Taylor 1967), Northern Norway (e.g., Soot-Ryen 1941), and in the Baltic (Franzmann 1975). In Iceland and Northern Norway they are actively protected by man, against both avian and mammalian predators, because of the valuable nest-down. But Eiders breeding in

association with dogs have not been described earlier. (See Figure 4.)

Maybe, from an Eider's point of view, a tied dog is not a dog! To what extent 'motion' is an integral part of the image of a predator is perhaps best illustrated by ungulates grazing calmly when a lion is passing within a few hundred metres on his way from one place to another, in contrast to flying in panic when he is hunting kilometres away.

Perhaps Eiders have only a slight innate preference for breeding on islands. Several authors have described how the female, often followed by the male, walks around and sits down for a quarter or half an hour at several places. This behaviour is repeated several times in the days prior to egg laying, and besides the search for favourable nest sites, it gives the birds an opportunity to observe whether the site is visited by mammalian predators. To the Eiders, the area around the dogs at Daneborg may appear as a fox-free 'island'.

This exploratory behaviour at potential nest sites must not be confused with the fact that the Eiders in most colonies walk up from the sea instead of flying, at least at the beginning of the breeding season. This behaviour may be an adaption, the function of which might be to test the route that the young will later follow.

Many authors report Eider colonies being deserted before breeding, or egg laying or incubation being interrupted, because foxes

were present on, or had reached the islands (see, e.g., Freuchen 1935; Løvenskiold 1963). At Mývatn in Iceland, Fjeldsá (1975) has described how duck nest sites have changed in recent decades from islets to extensive, damp sedge meadows on the mainland, or to colonies of Black-headed Gulls *Larus ridibundus*, because of increasing numbers of mink *Mustela vison*. Large flocks of ducks remained on the water outside the traditional nesting areas as non-breeders or at least showed much delayed egg-laying.

The hypothesis, that nest site selection and onset of breeding to some extent is related to the presence of mammalian predators, may further account for some previously unexplained cases of non-breeding of e.g. King Eiders *Somateria spectabilis* and Long-tailed Ducks *Clangula hyemalis* in North-east Greenland in years not especially unfavourable, but with many foxes present after a lemming peak (Manniche 1910; Bird & Bird 1940, 1941; Meltofte *et al.*, in press). Marshall (1952) also mentions 'fear' as a reason for non-breeding.

#### Arrival and pre-breeding period

The Eiders of East Greenland are migratory, although few small flocks have been

observed during winter as far north as Wollaston Forland (Schaanning 1933). The cold East Greenland Current transports huge masses of polar ice throughout the year. But between the broad zone of drifting polar ice and the firm ice at the coast of North-east Greenland, wide leads may be formed at any time of the year. These are favoured by the first Eiders to arrive. At the mouth of the Scoresby Sund fjord, where strong tidal currents keep large areas ice free most of the year, the Eiders arrive in early April, and spring numbers peak during May (Meltofte 1976). At the island Hvalros Ø near Daneborg, where open water forms early too, the first Eiders were seen on 18th April 1870 (Finsch 1874), and up to 48 males and 10 females were counted here in early May 1964 (Rosenberg *et al.* 1970). In this area and along the outer coast of Wollaston Forland more than 3,000 Eiders *Somateria sp.* were observed from helicopter and from land on 27th to 29th May. About half of these were *mollissima* (Meltofte *et al.*, in press).

The fjord ice usually does not begin to break up until mid or late July, but open water often forms where currents are strong, from early June. After having spent a month at the outer coast, the Eiders at Daneborg arrive at such sites during the first half of

**Figure 4.** Part of the Eider colony at Daneborg in early July 1975. 16 Eider males are seen in the foreground. (Mogens Stenshøj.)



June (Conradsen 1957; Rosenberg *et al.* 1970). At Danmarks Havn (76°46' N 18°46' W), 300 km to the north, the first Eiders are normally seen in openings in the fjord ice close to the breeding sites in the middle of June, after having been present at the outer coast from early May (Meltofte 1975, 1977).

In 1973, the first Eiders were seen at Daneborg by 5th June. In 1975 three large flocks were present at Sandøen on 30th May, and two pairs were at Daneborg by 4th June. In 1976 many were seen at Sandøen (Kap Berghaus) on 28th May, and the next day five Eiders flew over Daneborg. The first birds stayed in the colony on 7th June.

### Egg laying

Egg laying on islands around Wollaston Forland normally takes place from about 10th June to early July, earliest on Hvalros Ø (Finch 1874; Pedersen 1934; Møhl-Hansen 1949; Johnsen 1953; Conradsen 1957). However, in late seasons, such as 1930, 1939, and 1964, most clutches were laid in July (Løppenthin 1932; Pedersen 1942; Rosenberg *et al.* 1970). On islands at Danmarks Havn, egg laying took place about 10th to 15th July 1969; in 1970, a late year, in the second half of July (Meltofte 1975). There was no breeding in 1907, probably due to late breaking up of the ice (Manniche 1910). This was probably also the case here in 1939 (Pedersen 1942).

In the colony at Daneborg, egg laying started on 7th June in 1976, on 13th June in

1965, on 27th June in 1964 (Rosenberg *et al.* 1970). This last date was about five days earlier than on Sandøen that year. In 1975 the first female was incubating on 16th June, and only seven were incubating on 20th June, the date when all were incubating in 1974.

### Clutch size

Table 1 shows counts of eggs and pulli in the Daneborg colony. In 1964, the average clutch size for broods initiated in July was slightly but not significantly smaller than for those initiated in June (cf. Milne 1974). Further, the clutch size had increased, again not significantly, when the colony was at its largest. In a colony growing so fast a large proportion would be first-time breeders, and thus the clutch size might be relatively low. This is, however, counteracted by increased dump-nesting.

The average size of the broods walking from the nest down to the fjord in 1976 is seen to be very close to the mean clutch size that year, indicating very low egg losses.

### Ringling

A total of 601 Eiders have been ringed in the Daneborg colony. Of 544 females, at least 265 have been controlled here later (Table 2). In the first years incubating females were taken by hand only, but later nets, and especially neck hooks, have been used to take them as well as males in attendance.

**Table 1. Distribution and mean of clutch size in years counted.** 1964 after Rosenberg *et al.* (1964). In 1975 the size distribution is unknown, but 523 clutches between 26th June and 3rd July had a mean of 4.9. For 1976 sizes of broods walking to the fjord were noted.

Year	1964	1973	1976	1976
Date	27/6-15/7	25-26/6	8/7	pulli
Clutch size				
1		4	4	1
2	1	5	18	1
3	7	9	58	4
4	19	17	98	11
5	25	12	86	10
6	4	8	59	7
7	2	3	30	1
8		3	25	4
9			9	
10			4	
11			2	
Number	58	61	393	39
Mean	4.52	4.30	4.94	4.87
S.D.	±0.98	±1.73	±1.80	±1.61

Table 2. Annual ringing and recovery totals.

Year	Ringed		Recaptures of ♀♀ ringed in:						
	♂♂	♀♀	1964	1970	1971	1972	1973	1974	1975
1964		30							
1970		64	?						
1971		50	?	?					
1972		18	0	4	5				
1973	11	70	2	14	11	3			
1974		149	1	11	12	6	11		
1975	22	78	2	9	7	4	31	34	
1976	24	85	1	10	7	4	20	28	9

Eleven ringed Eiders have so far been shot in the Scoresby Sund fjord mouth; two in May, seven in June, one in July and one in September. Three females have been recovered on the north coast of Iceland. They were found drowned in fishing nets on 2nd April, 13th May, and 17th May. All were ringed as incubating females one to three years earlier.

#### Migration

The Eiders of East Greenland are supposed to winter on the coast of South-west Greenland and around Iceland (Salomonsen 1967). But Schiøler (1926) suggested that the East Greenland population winters on Iceland, and the Iceland and East Greenland populations were considered a separate subspecies *S.m. islandica*. This is confirmed by the ringing results, at least concerning the North-east Greenland population. Three recoveries in Iceland does not seem much, but Eiders are totally protected by law in Iceland, while tens of thousands are shot annually in West Greenland. Yet not a single one has been recovered here or at Angmagssalik, the only shooting site in East Greenland, besides Scoresby Sund where eleven have been shot. The stated dates of recovery are not reliable, and it is most likely that all have been shot in April, May and early June. The recoveries only include females, which rest in the very favourable areas during the spring migration together with their mates. Only a few males have so far been ringed, and there are no recoveries.

Salomonsen (1968) states that in Greenland and Norway the flightless period is spent within the breeding range of the population. This is not valid for North-east Greenland populations. At Danmarks Havn and Daneborg most males leave during July, before the moulting period. A few are present

until mid August (Manniche 1910; Pedersen 1934; Meltofte 1972, 1975, 1977). At Scoresby Sund large flocks gather at favourable sites in July 1,000–1,400 in 1974. About 75% were males, and body moult had started about 1st July in some of them. Small flocks of flightless males have only been observed a few times at Scoresby Sund; 21–22 in full or partial eclipse on 4th August (Meltofte 1976). On Sandøen three speckled males were seen together with nine in unmoulted plumage on 28th July 1973 (Jørgen Søe Westergaard *in litt.*). At Daneborg and Sandøen on 16th to 18th August 1976, only one male was present; a flightless one in eclipse. Jennov (1945) reports an exceptionally large flock of Eider males a little north-east of Shannon Island, in late June or early July 1919.

These observations all together indicate that the males leave the breeding sites and gather in large flocks at favourable sites in July, which nearly all have left by August. Along the coast of South-east Greenland between Scoresby Sund and Angmagssalik small flocks of males and females were present at breeding sites in July, but in August only females were seen (Degerbøl & Møhl-Hansen 1935). It is most likely that the males of at least the North-east Greenland population perform moult migration to the waters off Iceland.

Probably most one-year-old immature males summer off Iceland, only a few being seen at Scoresby Sund (Meltofte 1976). Farther north a mottled male was seen at Danmarks Havn on 22nd July 1908 (Manniche 1910).

#### Population dynamics and controlling factors

Even though the data are few and not systematically collected, some calculations can be made on the population dynamics of

the Daneborg colony. The recoveries are too few to be of any use, but the many recaptures of incubating females presented in Table 2 form the basis for an estimate of the mortality rate. Only recaptures made in 1975 and 1976 were used. These two years are not mutually comparable, however, since not all of the Eiders bred in 1976 due to the large amount of snow. The actual figures have been corrected for variations in annual catching activity.

On the assumption that mortality is independent of age, and that the corrected number of recaptures from year  $i$  is proportional to the actual number of young from year  $i$  still present in the colony, the estimated mortality using recaptures (see formula in Andrewartha 1961) of birds ringed 1970–74 is 0.25 for recaptures in 1975 and 0.14 for recaptures in 1976. The average of 19.5% is quite close to annual mortality rates found elsewhere. Franzmann (1975) found 20% (S.D.  $\pm$  1%) in a Baltic population, and Reed (1975) estimated  $17.4 \pm 9.9\%$  in the St. Lawrence estuary, Canada.

Given the estimated mortality rate, a 1:1 sex ratio and female maturity at three years, and years of poor breeding, the production of flying juveniles per breeding female, necessary to account for the observed population increase, must be two or three times as high as that needed to maintain a constant population size.

The pronounced increase of the Daneborg colony from two pairs in 1955 to 1,292 in 1975, as well as the high nesting success in many years, suggests that conditions here are very favourable. Compared to other arctic Eider colonies, the average clutch size in the Daneborg colony is large (Bauer & Glutz 1969; Salomonsen 1950; Ahlén & Andersson 1970; Joensen & Preuss 1972; Schorger, in Palmer 1976). Ahlén & Andersson (1970) suggest that variation in clutch size from colony to colony mainly reflect the predation pressure by avian predators, notably by Glaucous Gulls (Campbell 1975). Hence there is probably a low predation on eggs in the Daneborg colony. Furthermore predation on ducklings is probably low here as compared with many temperate zone colonies, where especially Herring Gulls *Larus argentatus* and Great Black-backed Gulls take many ducklings on sea. Milne & Reed (1974) estimated that 24.5% of the ducklings that hatched survived to fledging in the St Lawrence estuary, Canada, twice as many as in Scotland (Milne 1974), but similar to Svalbard conditions. Apparently the Daneborg colony is well

protected by dogs and men, both against mammalian and avian predators.

Immigration, including some from the small Sandøen colony, has probably taken place. Such immigrants are most likely to be first-time breeders, as established female Eiders are very faithful to their chosen breeding site (see, e.g., Franzmann 1975; Reed 1975; Swennen 1977). The count of 70 nests from 1964 is a very precise total figure, but unfortunately this was an unfavourable year, when a part of the population may not have bred. The estimate of at least 150 nests in 1965 supports this. The actual mean growth rate therefore probably lies somewhere between the two exponential curves shown in Figure 3. The estimates from 1970 and 1972 are not very reliable. The 1975 figure was a one-time count, probably underrating the population.

Good protection is probably not the only reason for the population explosion in the Daneborg colony. Ice conditions at the outer coast, and thereby feeding conditions in the pre-breeding period, may be important in controlling onset of breeding in the Eiders (cf. Lack 1967; Spurr & Milne 1976; Milne 1976). The Eiders in the Daneborg colony do not have to wait for the fjord ice to break up before they can start to breed. Thus their young are hatching when the ice outside Daneborg is breaking up. The fjords freeze around the middle of September to early October, and the Eider broods are then forced out to the more exposed outer coast (cf. Meltofte 1975). According to Belopolskij (in Bauer & Glutz 1969) the fledging period of Eiders on Novaya Zembyla lasts 60 to 65 days.

The colony on Sandøen seems to have been given up completely; even in 1976 when many terns and Sabine's Gulls bred on the island, no Eiders were found. Possibly the fjord ice generally breaks up later now in North-east Greenland, than in the thirties (Rosenberg *et al.* 1970; Meltofte 1975).

The Daneborg colony is not likely to grow very much bigger. The colony is now so extensive that foxes and gulls are able to prey upon the marginal nests, and as North-east Greenland in 1974 was proclaimed a National Park, it will be illegal to kill predators.

Recently a similar colony has been established at Danmarkshavn Weather Station, 300 km farther north. In 1969–1971, Eiders were rarely seen in the little bay at the weather station, though an estimated total of 20 pairs bred on islands around the northern



outlet of Dove Bugt (based on broods observed), up to 12 km away. Here, open water is formed early due to strong tidal currents. In 1974 at least two Eider females nested at the weather station, close to the 30 sledge dogs, and in 1975 there were six within 250 m of the houses. They hatched in the period 30th July to 3rd August (Meltofte 1977).

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Cand. scient. Finn Dalberg Pedersen and Cand. scient. Thomas Kiørboe performed the population dynamics calculations and criticized early drafts of the manuscript. Dr Jon Fjeldså criticized the manuscript. I thank them all.

#### Summary

Since 1955 a colony of Eiders *Somateria*

*mollissima* has built up around 60–80 tethered sledge dogs at Daneborg in North-east Greenland, increasing from two nests in 1955 to at least 1,292 incubating females in 1975. Apparently, the tethered huskies do not appear to the Eiders as potential predators, but, on the contrary, provide a fox-free island. Some suggestions are made concerning the selection of nest site and onset of breeding by waterfowl in relation to presence of mammalian predators.

The average clutch size in the colony is high. This suggests a very low avian predation on eggs. The good protection is not the only reason for the population explosion. The Eiders here do not have to wait for the ice to break up around the islands, but are able to start egg laying when other factors are optimal.

Recently, a similar colony has begun to develop at Danmarkshavn Weather Station 300 km farther north, the northernmost known breeding site in East Greenland.

So far, a total of 601 Eiders have been ringed. It is concluded that the Eiders of North-east Greenland winter off Iceland. It is further suggested that the males of this population perform moult migration to Iceland, and that most immature males summer here.

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