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Observations of Muskoxen (*Ovibos moschatus*) in Central East Greenland

By E. W. Born, Ø. Wiig, and P. B. Neve

Greenland Institute of Natural Resources, Copenhagen, Denmark, Norwegian Polar Institute and Zoological Museum, Oslo, Norway

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Abstract

Muskoxen (*Ovibos moschatus*) were counted in eastern Greenland both from a ship as well as during extensive aerial surveys conducted along the coasts between approximately 70° N and 76°20′ N during the ARK X/2 cruise of RV "Polarstern" from 22 August to 25 September 1994. A total of 820 muskoxen were observed. Highest densities were found on the large islands and in the eastern areas between 72° N and 74° N, and in the western parts of the Scoresby Sund fjord complex. Muskoxen have not to date been systematically counted in the latter area. The surveys confirmed earlier findings that muskoxen are scarce north of 74° N, whereas the population between 72° and 74° N appeared to have remained stable since 1982. Overall, calves born in the current year constituted at least 10.5% of the total population, indicating that 1994 was a year of good productivity.

Introduction

Muskoxen (*Ovibos moschatus*) are found in eastern Greenland between Scoresby Sund (approximately 70° N) and Nyeboes Land (82° N). The core of their distribution is, however, between Scoresby Sund and Ardencaple Fjord; figure 1 (Boertmann et al. 1992). They are thought to number between 9 500 and 12 500 in total, with highest densities in Jameson Land (Boertmann et al. 1992).

Although several studies have been conducted to determine the abundance of muskoxen in parts of their range in eastern Greenland (cf. Boertmann et al. 1992; Boertmann and Forchhammer 1992), only few studies have covered large areas systematically. Aerial surveys were conducted during spring between 1981 and 1990 to determine numbers of muskoxen on the peninsula of Jameson Land (e. g. Aastrup 1990; Aastrup and Mosbech 1988, 1993). In the spring of 1988 an aerial reconnaissance was flown over the coastal areas between Kong Oscars Fjord and Jøkel Bugt (78° N) to determine distribution and numbers of muskoxen (Bay and Boertmann 1988). In 1982 and 1984 Sittler (1988) counted muskoxen between 72° N and 74° N from rubber dinghies, terrestrial vantage points and, to a limited extent, also from a helicopter. Based on intensive helicopter reconnaissance and land-based observations, Stemmerik (1987) presented numbers of muskoxen in the Traill Ø, Geographical Society Ø and Ymer Ø areas.

During the ARK X/2 cruise of RV "Polarstern" to the central parts of eastern Greenland (17 August–7 October 1994) a study of the distribution and abundance of polar bears (*Ursus maritimus*) was conducted jointly by the Greenland Institute of Natural Resources and the Norwegian Polar Institute. During this study, which involved aerial surveys con-

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ducted over the coastal areas between Scoresby Sund and southern Dove Bugt (approximately 76°20′ N) to search for "land locked" polar bears, all observations of other wildlife were also recorded. Here we present information on the distribution, numbers and calving rate of muskoxen in central east Greenland in August and September 1994.

Material and methods

Between 22 August and 25 September 1994, a total of 39.6 hours of flying were spent surveying areas between approximately 70° N and 76°20′ N in eastern Greenland (Fig. 1).

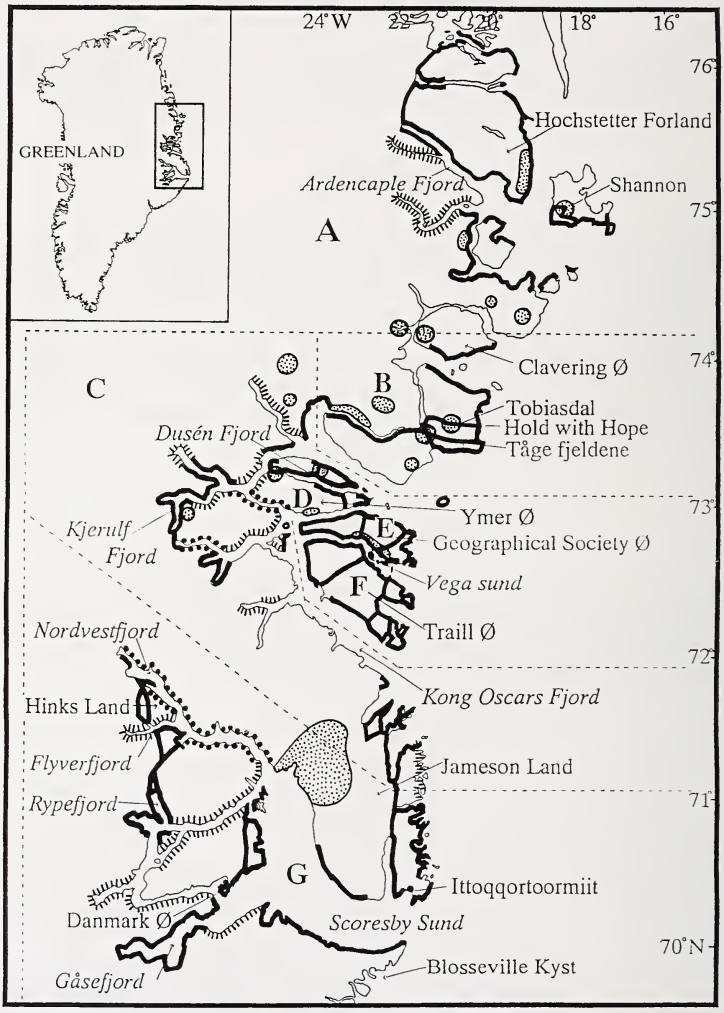

Fig. 1. Areas covered during ship-based and aerial surveys for muskoxen in the central parts of eastern Greenland, 22 August–25 September 1994. Legend: Thick lines = areas surveyed from aircraft; dotted line = surveyed from ship; - - - - - - - - - - = Borders of sub-areas; ////// = Areas where the mountain slopes are considered to be too steep to represent suitable muskox habitat; Stippled areas = wintering habitat according to Boertmann and Forchhammer (1992). Black dot = settlement of Ittoqqortoormiit/Scoresbysund.

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For analyses, the survey area was subsequently divided into a northern sub-area (A), central sub-areas (B to F), and a southern sub-area G (Fig. 1). Sub-areas B and C are continental: B is close to the Greenland Sea and has less steep mountain slopes than sub-area C which has alpine landscape dominated by deep fjords that in many places have very steep slopes. Sub-areas D, E and F represent the three major islands (Ymer Ø, Geographical Society Ø and Traill Ø) between 72° and 74° N. Sub-area G is the Scoresby Sund fjord complex. The hours allocated for surveying the different areas and the linear km flown are presented in table 1.

Table 1. Number of flying hours, linear distance (km) flown and observations of muskoxen per lin. km. flown over different areas of central east Greenland, 22 August–25 September 1994.

	Areas			Total
	North A	Central B C D E F	South G	
Hours	5.25	25.0	9.35	39.6
Linear km	972	4 600	1 725	7 297
N	34	472	314	820
N/linear km	0.035	0.103	0.182	

Aerial surveys were carried out over land with the flight track usually being placed between 200 and 500 m from the shore line, depending on the topography. This allowed one observer to scan the beaches and low-land, and the other observer to search the hills and mountain slopes up to about 300 m a. s. l. and out to a distance of approximately 1 000 m.

A B-105 helicopter equipped with a radar altimeter and a GPS navigation system was used. The surveys were flown between approximately 60 and 150 m (200 and 500 feet) altitude, depending on tracking conditions and topography. Indicated air-speeds varied between 167 km/h and 185 km/h (90 and 100 knots), but were usually 185 km/h. All observations of wildlife made by the front left and the rear right observer were recorded on data-sheets. The two observers kept the same position in the helicopter during all surveys. Muskoxen were only classified as either non-calves or 0-year-old calves, respectively. No attempt was made to approach the muskoxen to identify further group size or age and sex composition.

For the majority of the survey period, "Polarstern" cruised in the fjords between Gåsefjord (approximately 70° N) and Ardencaple Fjord. During cruising, the mountain slopes of some of the narrow fjords were searched from the crow's nest (25 m a. s. l.) using binoculars (8 and 10×50 Zeiss) and a KOWA SN-1 monocular telescope (20×) (Fig 1).

Although some areas were surveyed more than once, potential double-countings have been excluded from the presentation of results.

Results

Weather conditions were very good during all flights, usually with a 0 octas cloud covering. Starting on 31 August the northward facing mountain slopes were covered with new snow down to sea level. After a few days the slopes facing southward were free of snow below about 300 m. During the remainder of the study period, temperatures were usually below freezing, with periodical snowfall. This, presumably, implies that the muskoxen were attaining their winter distribution during the survey period.

Observations on muskoxen are indicated in figure 2. A total of 820 animals was observed. Of these, only five animals (= three groups) were observed from the ship. Areas of concentration were: Hold with Hope (Tobias Dal and Tågefjeldene), the northern coasts of Dusén Fjord and Vega Sund, Kjerulf Fjord, Hinks Land and Rypefjord. Generally, the muskoxen were found in snow-free areas with relatively lush vegetation. An exception was a part of Hinks Land, where some animals were observed between 300 and 1 200 m al-

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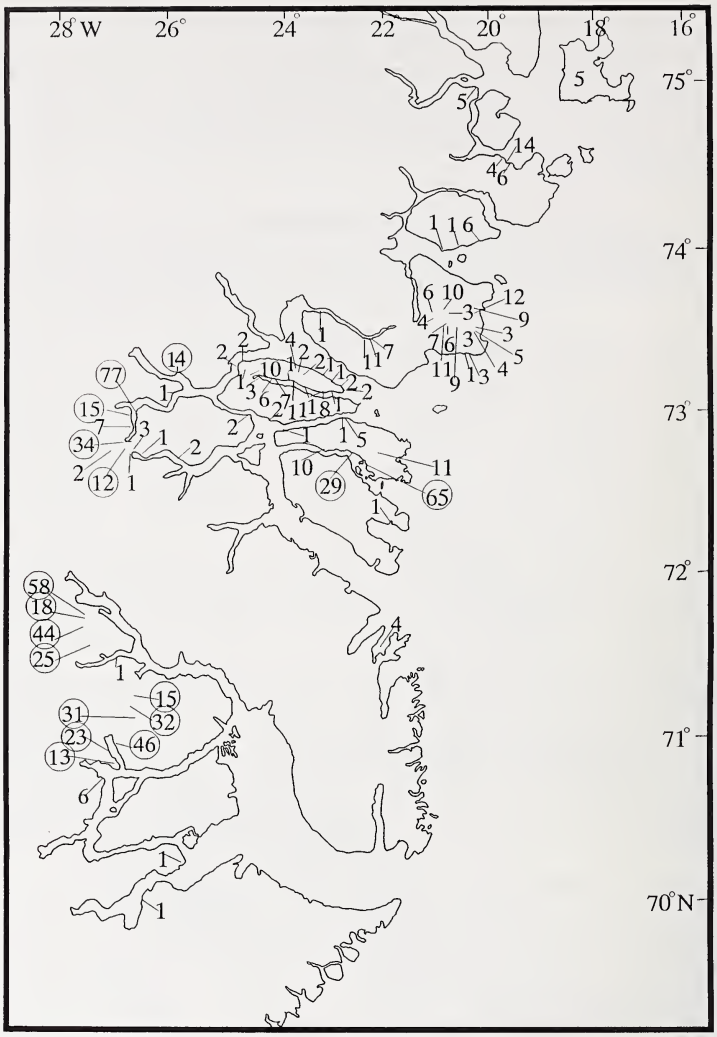

Fig. 2. Numbers of muskoxen observed during ship-based and aerial surveys in the central parts of eastern Greenland, 22 August–25 September 1994. In some cases (encircled) where densities were high, the groups have been pooled in the figure.

titude in areas covered with new snow. Tracks indicated that these animals apparently were in the process of moving across the mountain top from Nordvestfjord to the head of Flyverfjord. Counts of muskoxen in the different sub-areas are shown in table 2. Few muskoxen were seen in sub-area A (0.035 ind./linear km), whereas in the central areas (B–F) densities were nearly three times higher (0.103 ind./km). Highest densities (0.182 ind./km) were recorded in the western parts of the Scoresby Sund fjord complex (sub-area G), in areas where muskoxen have not previously been counted systematically.

The southernmost muskox recorded in this study was a single adult on the southern coast of Gåsefjord (70°10′ N–27°10′ W).

When all areas were combined, the proportion of calves averaged 10.5% of all observed muskoxen (68 calves/645 total). Overall, the mean group size was 3.4 (SD = 2.9; range: 1–17; n = 220; Tab. 2).

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Table 2. Total numbers, percentage of calves born in the current year to totals, and mean group size of muskoxen recorded during surveys in central east Greenland, 22 August–25 September 1994. For comparison, estimates of number of animals provided by Sittler (1988) and Stemmerik (1987) are presented.

	Sub-areas	Period	Observations						Sittler		Stemmerik
			Total	% Calves	Group size						
					Mean	SD	Range	N	1982	1984	1986
A	North of 74°20′ N	Aug 22–24	34	8.8	6.8	4.1	4–12	5	–	–	–
B	Clavering Ø – Hold with Hope	Aug 29	114	18.3	5.0	3.5	1–12	23	68	129	–
C	Mainland – west	Sep 1–16	175*	2.9*	2.4	1.7	1–8	46	169	83	–
D	Ymer Ø	Aug 29–Sep 9	60	10.0	2.9	2.6	1–10	21	99	78	137+
E	Geogr. Society Ø	Sep 1–17	122	11.4	4.1	4.0	1–17	30	84	53	63+
F	Traill Ø	Sep 1–17	1	0	1.0	–	–	1	23	23	95
G	Scoresby Sund	Sep 20–25	314	8.3	3.3	2.5	1–12	94	–	–	–
	Total		820	10.5*	3.4	2.9	1–17	220	443	366	295+

* Two congregations of a total of about 60 animals in Kjerulf Fjord (area C) were scattered over too large an area to allow closer inspection, and they are therefore not included in the calculations of age category, group size and overall ratio of calves born in the current year to non-calves.

Discussion

Boertmann and Forchhammer (1992) indicated that the southern limit of muskoxen in eastern Greenland is Danmark Ø. However, we observed muskoxen in Gåsefjord. During this survey Gåsefjord had lush vegetation on the northern and western shores, and also in some places on the southern shore. This indicates that this fjord is part of the muskoxen's normal range, as also reported by Vibe (1967) and Pedersen (1974). However, according to hunters from the settlements of Scoresby Sund, muskoxen are scarce in Gåsefjord (J. Brønlund, settlement of Ittoqqorttoormiit/Scoresbysund, pers. commn. 1995). Stray animals may even occur along the Blosseville Kyst, south of the entrance to Scoresby Sund (Vibe 1967). For example, 3–4 muskoxen were shot on Steward Ø (69°50′ N–22°30′ W) in the late 1960s (J. Brønlund pers. commn. 1995).

Boertmann and Forchhammer (1992) presented estimates of the number of muskoxen based on a variety of sources. From these data, which are heterogeneous in terms of survey techniques, survey platform used, and season, Boertmann and Forchhammer (1992) attempted to derive estimates of abundance for different areas. A comparison between the counts listed by Boertmann and Forchhammer (1992) for Ymer Ø, Geographical Society Ø and Traill Ø from the mid-1980s and our data indicates that there has been no major decline, except on Traill Ø, where, despite relative good coverage, only one muskox was recorded. The surveys of the northern area support indications of a decline in numbers on Shannon and Hochstetter Forland, as reported by Boertmann and Forchhammer (1992). The lack of observations of muskoxen in the vicinity of settlements at the entrance to Scoresby Sund also confirms a statement by Boertmann and Forchhammer (1992) that the muskoxen avoid these areas. Due to their basic heterogeneity, the data presented by Boertmann and Forchhammer (1992) are, however, difficult to interpret and are not readily comparable with data obtained during surveys which covered larger areas systematically within a relatively short period of time (i. e. Sittler 1988 and this study). Although the methods used by Sittler (1988) differed from those used in the pre-

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sent study, our surveys covered almost all the high concentration areas between 72° and 74° N identified by Sittler (1988). For those parts of the muskoxen's range where the same areas were surveyed systematically in 1982 and 1984 (Sittler 1988) and in 1986 (Stemmerik 1987) it appears that the populations have remained stable; with the exception of Traill Ø.

There is reason to believe that the population estimates are negatively biased, even in areas where we are confident that the surveys represented a good picture of the situation (good coverage, excellent survey conditions) as, for example, on Ymer Ø, Geographical Society Ø and Traill Ø. During aerial surveys conducted in late winter in Jameson Land, 25–30% of all muskoxen within a distance of about 1 000 m of the flight track were not observed by any of the observers (Aastrup and Mosbech 1993). Similar to Aastrup and Mosbech (1993) we may have missed an unknown proportion of muskoxen actually present within about 1 000 m from the flight track.

The surveys indicate that muskoxen can move relatively long distances (or out of the study area) within a short period of time. Kjerulf Fjord was surveyed under good survey conditions on 5 and 13 September, respectively. During the first survey, a total of 143 muskoxen was observed, whereas during the second survey only 34 animals were seen. Thus, surveys such as this one, which attempt to cover extensive areas during short periods of time, can be problematic in that it might be difficult to determine what proportion of the population is actually assessed.

Presuming that the muskoxen more or less occupied their wintering habitats, this survey represents a relatively good coverage of the area north of 72° N. However, we did not survey an important muskox wintering area on southwestern Jameson Land, where an estimated 3 000–3 600 animals are found (Boertmann et al. 1992).

In this study, the number of calves observed represented 10.5% of muskoxen observed. This appears to be the level of calf productivity in a stable muskox population (Freeman 1971; Ferns 1977). Ferns (1977) listed annual calf percentage recorded during the period 1954–1974 in the areas between 71° N and 74° N (eastern Greenland) ranging between 1.5% and 25%. The average "calf crop" was 11.7% per year (Ferns 1977). Average calf percentage recorded by Stemmerik (1987) on the large islands between 72° and 73°30′ N in eastern Greenland was 9.2. Calf percentage observed on Ellesmere Island ranged between 7 and 15% (Freemann 1971; Ferns 1977).

The calf to non-calf ratio obtained in this study is assumed to be reliable. There were, however, conditions that may have negatively biased the calf counts. We did not purposely approach groups for inspection, and therefore calves may have been missed in some distant groups. This may have also been the case where the animals moved into tight groups. However, the animals were usually counted before they had had a chance to form their characteristic tight defense position as a response to the noise of the helicopter. Therefore we cannot preclude that the estimated calf percentage was negatively biased, although the percentage obtained by Stemmerik (1987) using other methods of observations indicate that it is not.

The mean group size of 3.4 recorded in the present study does not differ significantly ($P > 0.05$) from the mean group size of 5.7 (1961) and 3.6 (1974) reported by Ferns (1977).

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Zusammenfassung

Beobachtungen von Moschusochsen (Ovibos moschatus) im zentralen Ost-Grönland

Zählungen von Moschusochsen (*Ovibus moschatus*) wurden im östlichen Grönland sowohl vom Schiff aus als auch während ausgedehnter Flugerkundungen entlang der Küste zwischen etwa 70° N und 76°20′ N durchgeführt. Diese Erkundungen fanden während der Expedition ARK X/2 von FS „Polarstern" vom 20. August bis zum 25. September 1994 statt. Ingesamt wurden 820 Moschusochsen beobachtet. Die größten Populationsdichten wurden auf den großen Inseln, in den östlichen, Gebieten zwischen 72° N und 74° N sowie in den westlichen Teilen des Fjordsystems am Scoreby Sund gefunden. Im letzteren Gebiet sind Moschusochsen nie zuvor systematisch gezählt worden. Die Untersuchungen bestätigen die frühere Erkenntnis, daß Moschusochsen nördlich von 74° selten sind, während die Population zwischen 72° N und 74° N seit 1982 stabil geblieben zu sein scheint. Insgesamt machten die Kälber des Jahres mindestens 10.5% der Gesamtpopulation aus, was zeigt, daß 1994 ein Jahr guter Reproduktion war.

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Authors' addresses: E. W. Born and P. B. Neve, Greenland Institute of Natural Resources (GINR), Copenhagen section, Tagensvej 135, DK-2200 Copenhagen N, Denmark, and Øystein Wiig, Zoological Museum, Sarsgate 1, N-0562 Oslo, Norway.

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