BEAUFORTIA

SERIES OF MISCELLANEOUS PUBLICATIONS
INSTITUTE OF TAXONOMIC ZOOLOGY (ZOOLOGICAL MUSEUM)
UNIVERSITY OF AMSTERDAM

No. 328 Volume 25 April 29, 1977

Ecology of the Long-tailed Skua (*Stercorarius longicaudus* Vieillot, 1819) at Scoresby Sund, East Greenland. Report of the Nederlandse Groenland Expeditie Scoresbysund 1973, 1974 and 1975. Part one: Distribution and Density

J. DE KORTE

ABSTRACT

Territorial pair density and breeding density of long-tailed skuas at Scoresby Sund were studied in 1973 and 1974 at Kap Stewart and in 1975 at Kaerelv, Gåseelv and Ugleelv. Territorial pair density fluctuated from 0.2 pairs per km² at Kap Stewart in 1974 to 0.9 pairs per km² at Ugleelv in 1975. Breeding density fluctuated from 0 in all areas visited in 1974 to 0.6 pairs per km² at Ugleelv in 1975.

INTRODUCTION

The skuas Stercorariidae are represented in the Arctic by three species: *Stercorarius pomarinus* (Temminck, 1815), pomarine skua, *Stercorarius parasiticus* (Linnaeus, 1758), arctic skua and *Stercorarius longicaudus*, long-tailed skua. These species have a holarctic distribution. In the breeding season they live on the coast and on tundras. Outside the breeding season they lead a more or less pelagic life. Pomarine and long-tailed skuas breed in both High and Low Arctic. Their distribution and local occurrence seem to be correlated with the presence of the various species of lemmings, on which they feed. The arctic skua lives along boreal coasts of the Atlantic and along Arctic coasts, obtaining its food mainly by piracy. Locally on the tundra it occurs sympatrically with pomarine and long-tailed skua. Under these circumstances it mostly preys on small land birds (Maher, 1974). Recent distribution of skuas (Voous, 1960) and a comparison with the distributional history of other arctic species (Ploeger, 1968; Salomonsen, 1972) indicate possible refugia of pomarine and long-tailed skua in Beringia and northern

Received: December 22, 1976

Canada, respectively. A refugium for the arctic skua may have existed along ice-free coasts of the Atlantic, south of the glaciations.

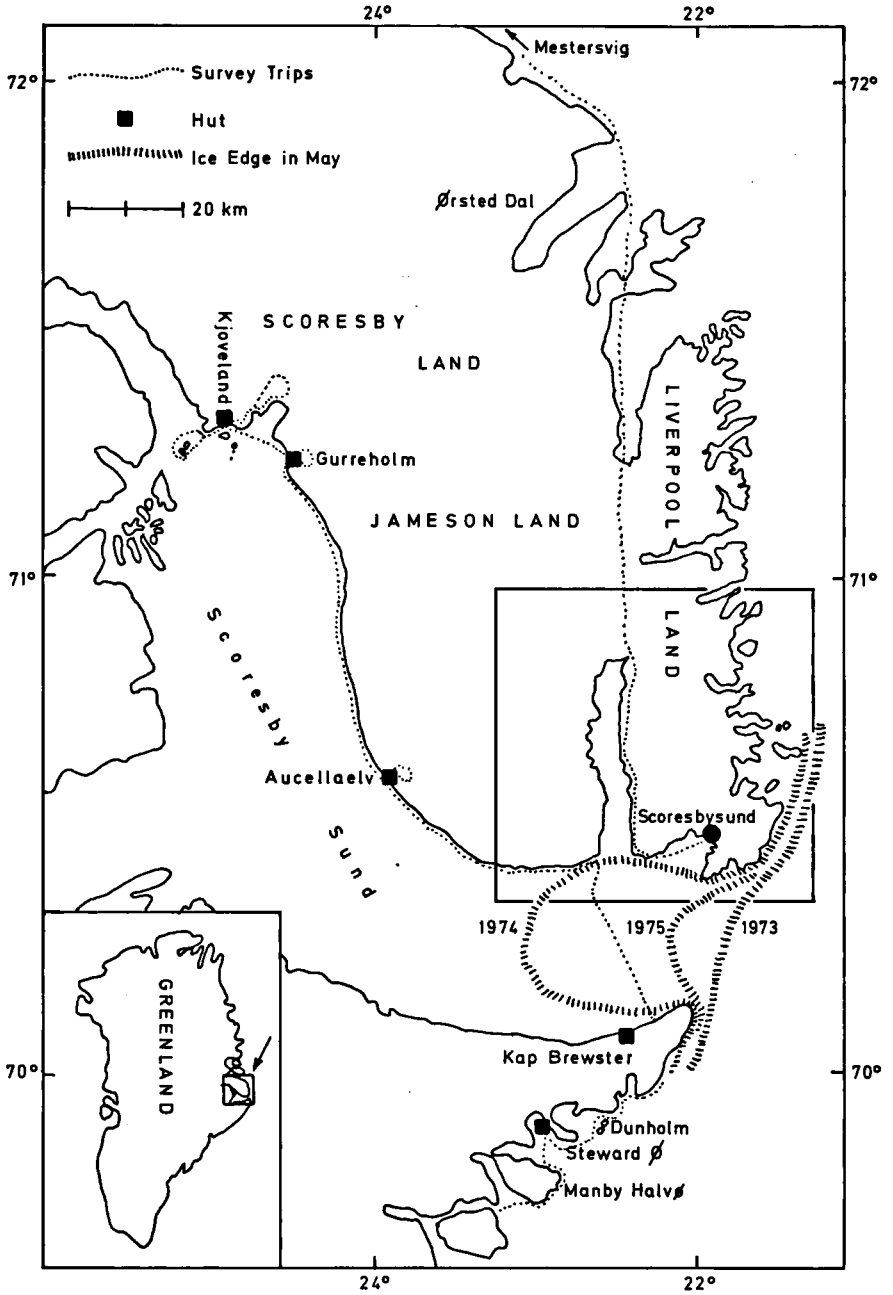

Fig. 1 Map of Scoresby Sund, with names referred to in this paper. The right rectangle indicates the main working area, which is shown in more detail in fig. 2.

Requirements for the occurrence of the species at present give indications as to the kind of refugia in which they could survive during Pleistocene. The question of which climatic and biotic conditions are required for the present occurrence of each of the skua species is an ecological problem with many facets. This study is an attempt to understand these conditions for the long-tailed skua. Much information about the ecology of the 3 skua species in northern North America (Maher, 1970a, 1970b, 1974) and of the long-tailed skua in Scandinavia (Andersson, 1971, 1976a, 1976b) has been published but only scattered observations are known from Greenland. Notes by Manniche (1910) on the long-tailed skua in Germania Land are the most extensive. What was known from Greenland until 1949 has been summarized by Salomonsen (1950). His paper deals primarily with the distribution and density of breeding populations.

We chose Scoresby Sund in East Greenland (figs. 1, 2) as a working area because it was known to harbour quite an extensive breeding population of long-tailed skuas (Pedersen, 1926, 1930). Moreover there is a Greenlandic

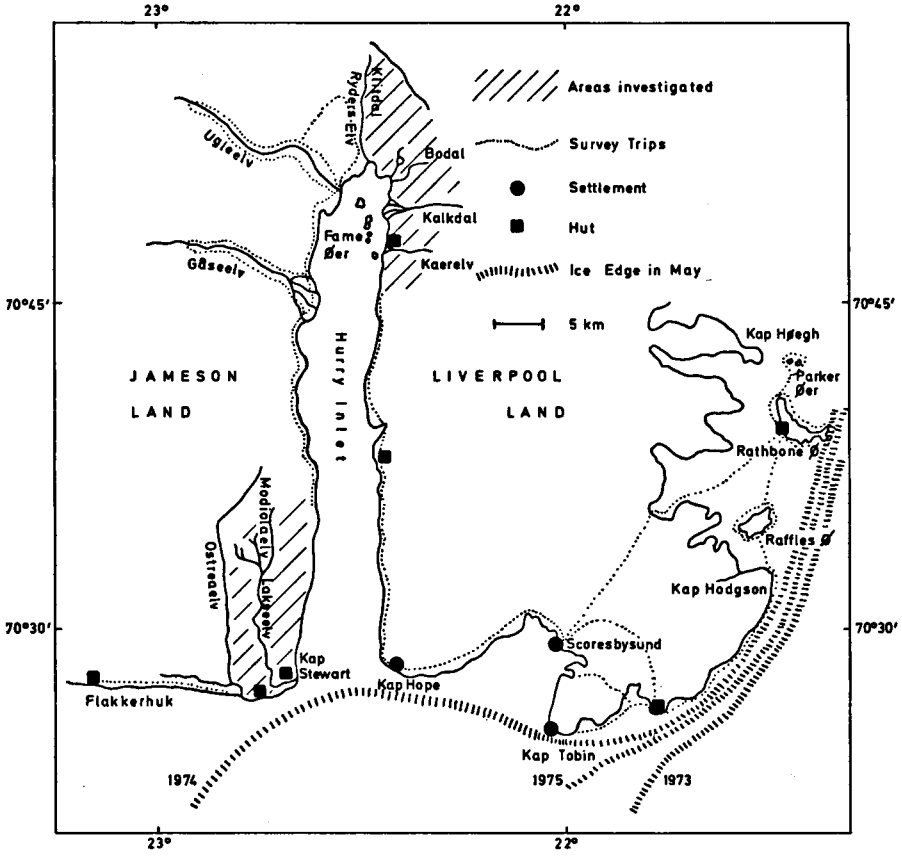

Fig. 2 Map of Scoresby Sund with areas investigated in 1973, 1974 and 1975.

settlement, Scoresbysund village, where we could order most of our expedition requirements and organize transport with the local people, making it relatively easy to reach the sites selected for our work.

Long-tailed skuas were studied in three successive seasons, 1973, 1974 and 1975. In 1973 I was assisted in the field by Mr. T. M. van Spanje, in 1974 by Miss D. G. Rebel and in 1975 by Miss C. A. W. Bosman. Our first main study area was near Kap Stewart, south east Jameson Land (13 June-30 August 1973, 22 May-24 July 1974). Before we travelled to Kap Stewart we were at Rathbone Ø from 1 May until 9 June 1973. In that year we made additional surveying trips into Hurry Inlet (15-20 July) and to Kjoveland (9-17 August). In 1974 we also surveyed the valley of Gåseelv (23-27 June). In 1973 and 1974 we obtained relatively few breeding data at Kap Stewart. Densities of territory-holding long-tailed skuas in 1974 proved to be greater in the Kaerelv area at the head of Hurry Inlet (25 July-2 September). This therefore seemed a place, where positive breeding data were easier to obtain than at Kap Stewart. Additional advantages were the facts that the hut at Kaerelv was much closer to the study area and that the weather was more favourable for field work. Although choosing another study area had the disadvantage that results obtained in different years are more difficult to compare. In 1975 we had our study area at Kaerelv (16 May-21 August); surveying trips to Ugleelv and Gåseelv were made in June and July.

Fig. 3 Clay-*Cassiope* habitat near Kap Stewart on 11 July 1974. In the background (looking south) is Scoresby Sund (fjord) with the ice edge. Photo J. de Korte.

Fig. 4 Valley of Modiolaelv on 30 May 1974, looking north-west. Photo J. de Korte.

STUDY AREAS

General description and habitats:

There were two main study areas: the south-eastern part of Jameson Land (Kap Stewart area) and the north-east coast of Hurry Inlet (Kaerelv) (fig. 2).

South-east Jameson Land is an extensive tundra region with low hills and heather clad ridges (fig. 3). From south to north the land rises gently from sea level to heights of 600 m at a distance of 16 km from the south coast. The east coast along Hurry Inlet consists of steep cliffs. In the higher parts the southward running rivers have created wide valleys (as is Modiolaelv at 350 m altitude, fig. 4) with on the mostly gentle slopes, quite a luxuriant vegetation. This vegetation is low and is mostly characterized by *Cassiope tetragona,* while in some places *Dryas octopetala* predominates. Areas kept wet during the whole summer by melting-water from the snow have locally a sufficient gras cover to provide grazing areas for Musk Oxen *(Ovibus moschatus).* In the southern part near Kap Stewart vegetation is sparser and extensive clay slopes and gravel plains occur. The richer vegetations are dominated by *Cassiope tetragona.* Marshy habitats are scattered over the whole area. These are mostly situated beneath snow fanes, which produce melting-water during summer. The area surveyed in 1973 and 1974 near Kap Stewart was about 30 km². It was bordered by the river Ostreaelv with a

tributary river, two tributary rivers to the river Lakseelv, the river Lakseelv and by the sea on the east and south coasts. The area surveyed in 1974 in the valley of Modiolaelv was about 16 km².

The north-east coast of Hurry Inlet is a strip of gently undulating tundra less than 100 m above sea level. This strip is bordered to the east by the steep mountains of Liverpool Land, which reach altitudes of over 1000 m (fig. 5). The vegetation is mostly denser and higher than near Kap Stewart and mainly characterized by *Dryas-Cassiope* associations mixed with stands of *Betula nana* and *Salix*. Marsh habitats are found in stream valleys and on slopes which are flooded during the spring melt and receive abundant moisture for most of the summer from streams and tundra ponds. Gravel is abundant along the larger rivers. The plant cover in this habitat is very sparse and low. In the north there are some small lakes. The area surveyed here was about 26 km² and was bordered by the sea and Ryders Elv in the west, by the contour line of 100 m in the east, by Kaerelv in the south and by an east west running rocky outcrop in the north.

The valleys of Gåseelv and Ugleelv (fig. 6) at the north west side of Hurry Inlet have a strip of gentle slopes of about 0.5 km width on both sides between the river and the bordering steep mountains. On this strip a rich vegetation of *Dryas-Cassiope* associations is found mixed with extensive grassy areas. Along Gåseelv we surveyed these strips up to about 11 km inland and along Ugleelv to about 9 km.

Fig. 5 Part of Kaerelv study area on 28 May 1975, looking north-east. That day long-tailed skuas arrived here on snow free patches. Photo J. de Korte.

Fig. 6 Valley of Ugleelv on 10 July 1975, looking south-west. Here long-tailed skuas were breeding on both sides of the river. Photo J. de Korte.

Climate

The climate of Scoresby Sund can be defined as high-arctic (Salomonsen & Freuchen, 1958; Böcher, Fristrup, Salomonsen, Vibe, 1971). The winters are long and cold, the monthly mean temperature is below 0° C from September until May. The summer is cool, with a July mean of below 5° C (Table I). Exact temperatures in this region are only available from Kap Tobin. It is known, however, that far inland July mean temperatures have been recorded of over 5° C (Meltofte, 1976b). The coasts are usually blocked with ice, which does not scatter until July and August. The border between the high-arctic and low-arctic regions runs south of Scoresby Sund but its position is depending on the extent of sea ice, the ice covering varying from one year to another (Vibe 1967, 1971).

Along the outer coast of Liverpool Land the climate has a maritime character, but inland the weather is also strongly influenced by the presence of the open sea, which may come close to land even in winter. When the wind comes from the east, moisture is brought to the land, resulting in heavy snow falls, rain and frequent fogs, which may last for days.

In 1973 the ice edge was relatively far from land (figs. 1, 2) and from January until April the country received less precipitation (192 mm at Kap Tobin) than in 1974 (262 mm) when the ice edge at Kap Stewart was about 30 km nearer and open water came to about 1 km from shore. In 1975 the ice

Table I. Monthly mean temperatures at Kap Tobin.

	April	May	June	July	August
Mean 1951—1970	— 11.9	— 4.1	0.5	2.6	2.8
1973	— 14.0	— 5.2	0.2	1.9	3.5
1974	— 9.0	— 2.6	0.5	3.1	3.0
1975	— 12.0	— 5.6	— 0.3	2.0	3.0

edge had a position more similar to that in 1973, the precipitation at Kap Tobin from January until April being 91 mm. In summer 1973 often a warm føhn wind was blowing from the west. This happened less in 1975 and was seldom the case in 1974. At Kap Stewart the frequency of fog in spring and summer 1974 differed much from that in 1973 and 1975. In 1974 fog brought about by easterly winds coming from the open sea was so frequent and heavy that in June and July we were not able to work on the tundra half of the time. In this way solar radiation did not penetrate to the snow cover and the melt of snow was retarded as compared to 1973 and 1975. Estimates of snow cover in different years and different areas are given in fig. 7. The disappearance of snow at Kap Stewart in June and July 1974 was about 1 week later than in 1973 though temperatures (as measured at Kap Tobin) were higher (Table I). Generally in summer temperature increases and precipitation decreases from the coast to the inland valleys and spring comes earlier inland than along the coast. The difference in snow cover between Kap Stewart at the coast and Modiolaelv at about 10 km inland is striking (fig. 7). Further inland the difference with coastal areas becomes even more pronounced (Pedersen, 1926, 1930; Meltofte, 1976b).

North-east Hurry Inlet has a more equable climate than Kap Stewart as it lies in the lee of the mountains of Liverpool Land and is farther from the open sea. Still the weather in 1974 was also very unstable, though it was sunnier than at Kap Stewart in the same year. In 1975 there was more sunshine. The snow at Kaerelv (fig. 5) disappeared about 3 weeks earlier than

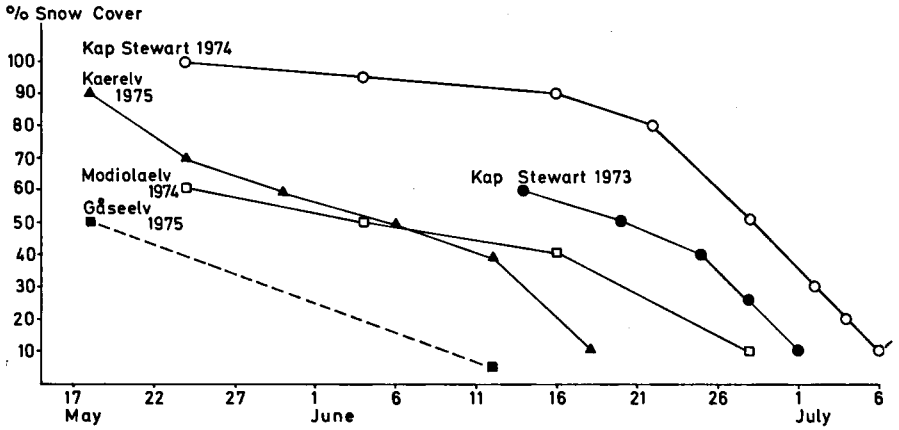

Fig. 7 Snow cover percentages near Kap Stewart in 1973, near Kap Stewart and near Modiolaelv in 1974 and near Kaerelv and Gåseelv in 1975.

in 1974 at Kap Stewart. At Kap Stewart 1974 the rivers started to run in the fourth week of May. At Kaerelv 1975 this happened in the third week of May and some shallow lakes were one third ice free on 21 May. These differences probably can be attributed to a more inland position of Kaerelv and a sunnier spring and summer of 1975.

Differences in weather from one year to another and from one place to another make local conditions quite variable, leading to corresponding variations in biological productivity on the tundra.

Methods

In June resident pairs of long-tailed skuas were counted in selected areas. Nests were searched for and found rather easily, as the birds are usually aggressive in defending the nest area. In 1975 at Kaerelv we determined the approximate boundary of territories by observing where pairs started to fight with neighbouring pairs in territorial disputes and started to attack non-breeding stragglers. Eggs were measured and weighed frequently with spring balances during incubation. Egg volume and weight were used as parameters to estimate age of the egg. Part of the breeding birds were trapped on the nest with a walk-in cage trap or a clap net, or caught in the air with a fleyg when they attacked in defence of their young. In three seasons a total of 35 adults (4 pairs 1973, 13½ pairs 1975) and 7 juveniles (1975) was ringed with metal rings of the Zoologisk Museum København and with plastic colour rings for individual recognition in the field. In 1975 one bird of each pair caught was dyed yellow, making it possible to distinguish mates when studying breeding, foraging and territorial habits. Some breeding pairs were studied for 24 hour periods from a hide. All birds caught were weighed and measured. Nest localities were marked on aerial photographs (obtained from the Geodaetisk Institut, Copenhagen) and inter-nest distances measured. For study of chick growth in 1975 nests were enclosed with a wire fence of 30 cm high and 3 m diameter. To reduce interference with their development some chicks were not fenced. Finding these chicks often required much time and only in one case did we succeed in weighing a free chick daily. Food habits were studied from field observations, from regurgitated pellets in nest enclosures and from stomach contents of collected birds. For a more extensive study of physical condition, gonads, food and plumage a total of 82 long-tailed skuas was collected in three seasons. Part of these were shot by Greenlandic hunters along the ice edge and at sea, part was collected by us outside our study areas, whereas nonbreeding immatures have also been collected within our study areas.

Results

Breeding range in East Greenland (fig. 8)

In Greenland the long-tailed skua has a high-arctic breeding range (Salomonsen, 1974), Gåseland in the inner part of Scoresby Sund being the

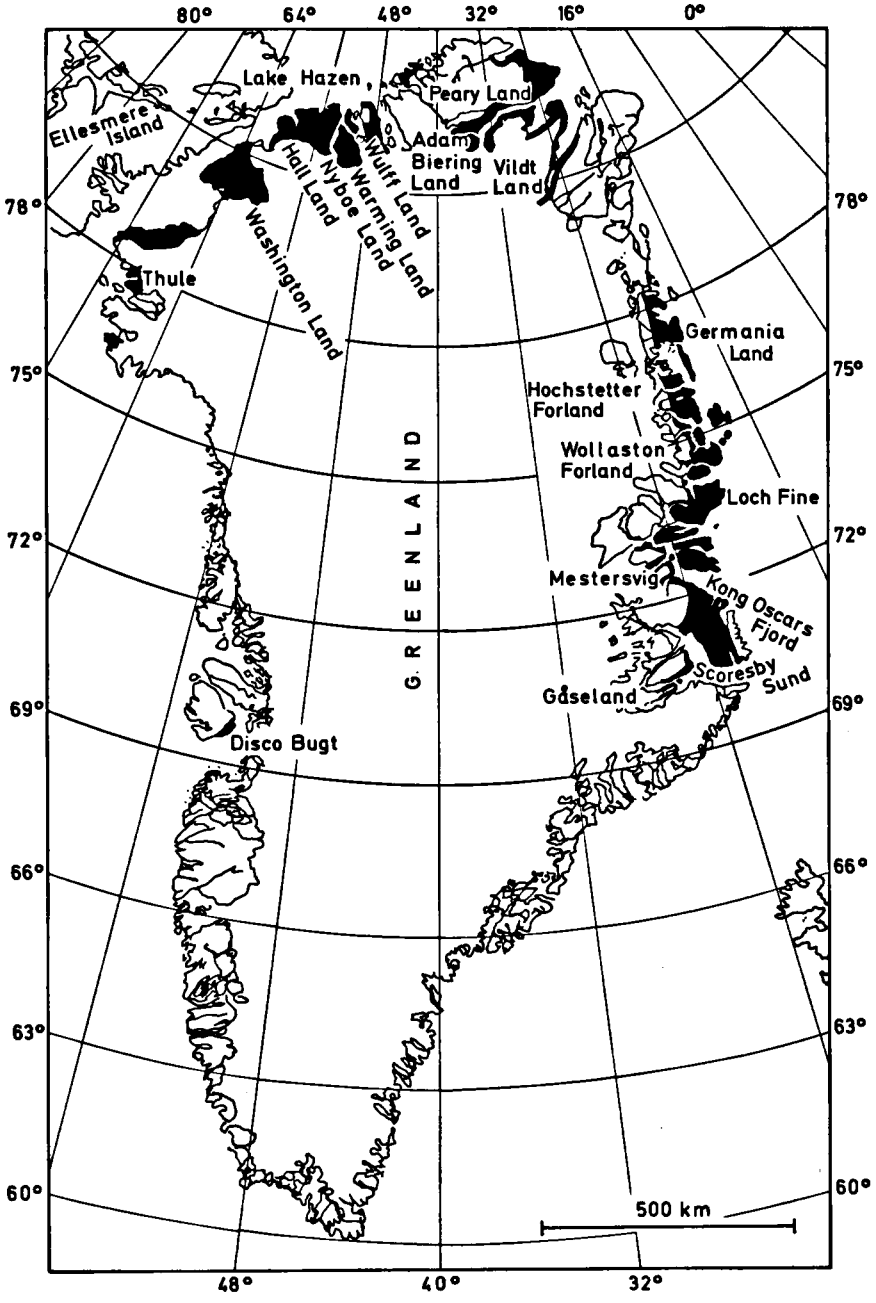

Fig. 8 Map of Greenland with distribution of long-tailed skua.

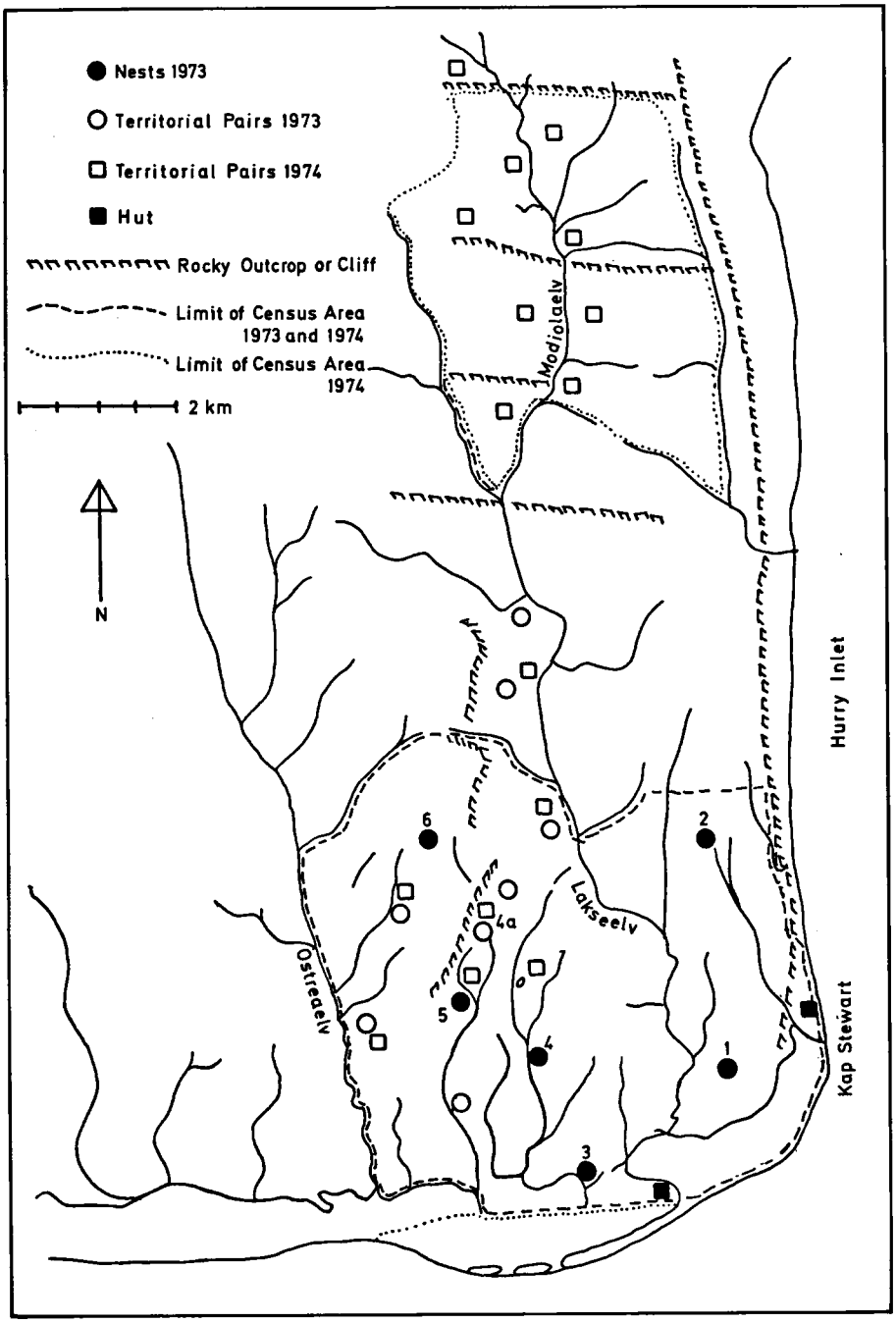

Fig. 9 Kap Stewart study area with distribution of long-tailed skua population in 1973 and 1974.

southernmost known breeding locality in East Greenland (personal communication from local people). It has been found breeding in many other places in the Scoresby Sund district and from here northward it is met in the lowland tundras. Generally it occurs here only below 200 m altitude, but in some places in Jameson Land we found pairs holding territories up to 300 m altitude. In Jameson Land (fig. 3), Hochstetter Forland and Germania Land tundras are extensive. Elsewhere narrower strips of tundra occur in river valleys (fig. 6) and on coastal plains between the mountains and the sea (fig. 5).

Population numbers at Kap Stewart (1973, 1974) and at Kaerelv (1975)

In 1973 12 pairs of long-tailed skuas had territories in the Kap Stewart study area (30 km²). Of these, 5 nests were found in June (numbered 1—5 in fig. 9) and 1 in July (6). The remaining 6 pairs apparently had not nested, which means that 50% of all territorial pairs had been nesting. Density of territory-holding pairs was 0.4 pairs per km²; breeding density 0.2 pairs per km². Distance between nests of nearest neighbours ranged from 1344 to 3136 m with a mean (n = 5) of 2007 m. Breeding was not synchronous and some pairs had not yet laid eggs while others had already given up breeding. The distances therefore do not refer to 6 pairs being nesting neighbours.

In 1974 there were 6 pairs with territories at Kap Stewart, or 0.2 pairs per km². In our census area near Modiolaelv (16 km²) there were 8 pairs with territories or 0.5 pairs per km². In this year we did not find any pairs with eggs at all.

In 1975 16 pairs had territories in the Kaerelv study area (26 km²). Of these 11 nests were located in June (numbered 1—11 in fig. 10). Three pairs (12, 13, 14) which had bred in the northern part of the area were not located until 15 July when they had chicks. Two non-breeding pairs (15, 16) were present in the area in June and July. Breeding was ascertained for 88% of territorial pairs. Distances between nests of nearest neighbours ranged from 640 to 1440 m with a mean (n = 7) of 987 m. On 15 June 1975 we found in the valley of Gåseelv 9 pairs with territories on 11 km², or 0.8 pairs per km². Two nests (1 and 2 in fig. 11) were located (fig. 12) but there may have been more as we did not visit all territories.

On 16 June 1975 we found in the valley of Ugleelv 8 pairs with territories on 9 km², or 0.9 pairs per km². Four nests (numbered 1—4 in fig. 13) were located on 16 June and an additional one (5) on 10 July. This gives a breeding density of 0.6 pairs per km². We ascertained breeding for 63% of territorial pairs. Distance to nearest neighbouring nests were 1690, 1760 and 2390 m (mean 1947 m).

Population numbers in other parts of Scoresby Sund

In 1925 Pedersen (1926) saw long-tailed skuas "everywhere" along the east coast of Hurry Inlet, in the southern part of Klitdal and in the inner parts of

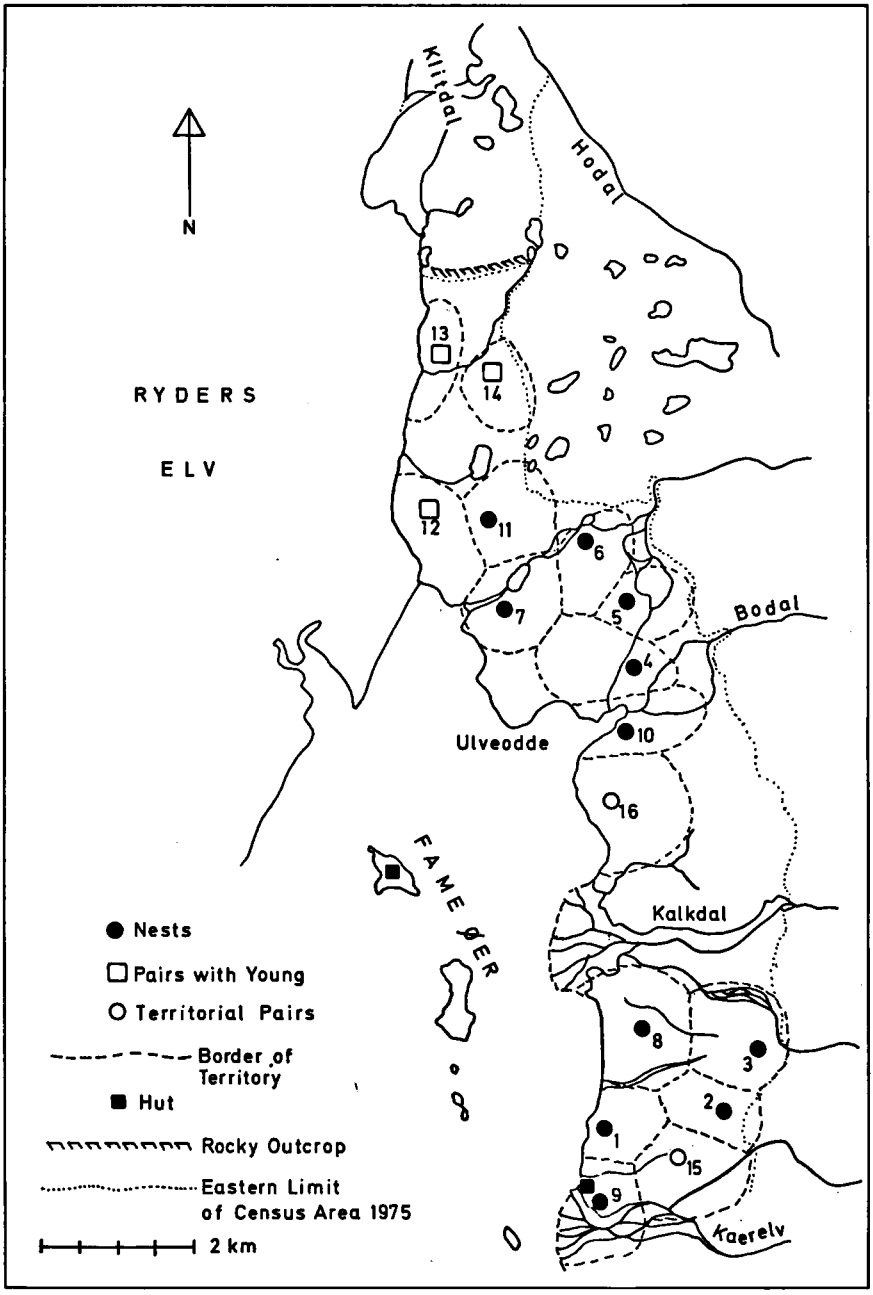

Fig. 10 Kaerelv study area with distribution of long-tailed skua population in 1975.

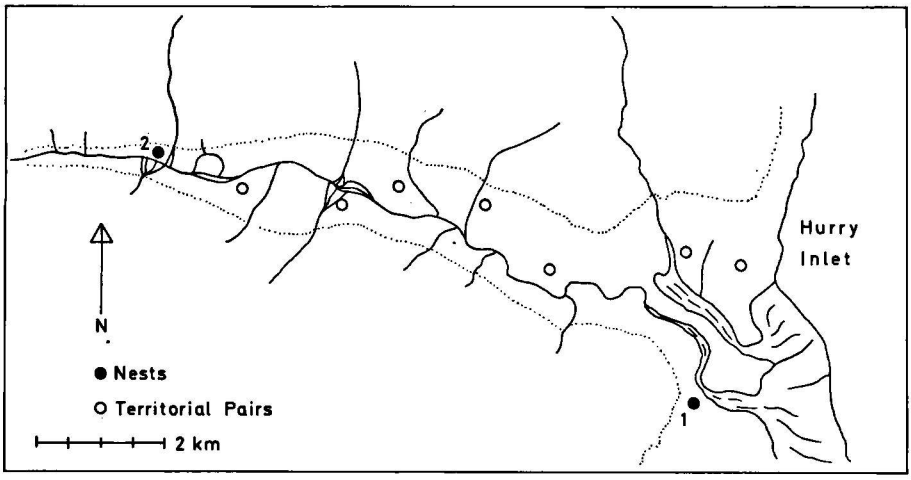

Fig. 11 Valley of Gåseelv with distribution of long-tailed skua population in 1975.

Fig. 12 Nesting place (no. 1 in fig. 11) of long-tailed skua in *Cassiope* tundra south of Gåseelv river on 15 June 1975. Photo J. de Korte.

Jameson Land; some nests were found. In 1928 they were breeding "everywhere" in the inner fjord regions, but in 1929 they did not breed at all (Pedersen, 1930). Marris and Ogilvie (1962) did not find them breeding in northern Jameson Land and Scoresby Land in 1961. Hall (1966) found them breeding in southern Scoresby Land in 1962, reporting at least 2 pairs on approximately 10 km², or 0.2 pairs per km². In Ørsted Dal there were 17 pairs with territories in 1963 (Hall & Waddingham, 1966). Of these 12 pairs definitely bred on an area of approximately 45 km², or 0.3 pairs per km². In 1974 long-tailed skuas were again present, but made no attempt to breed (Ferns & Mudge, 1976).

Population numbers in North-East Greenland

There are few detailed data on the breeding density of long-tailed skuas in North-East Greenland. Smart and O'Brian (1971) reported them breeding (3 nests) near Mestersvig in 1970, but no nests were found in 1972 (Green & Williams, 1973). In 1974 some were breeding on both sides of Kong Oscars Fjord (Green, Joint Biological Expedition to NE Greenland in litt.). Schaanning (1933) reports that they were "very common" between 72° and 75° N in 1928—1930. In the summer of 1930 Løppenthin (1932) likewise observed them in "very high numbers" on the flat forlands near Kap Stosch and Loch Fine, though there were few actual breeding cases. In the same place "many birds" were seen and one pair with a nest was found in 1973 (Hjort, 1976). Rosenberg et al. (1970) observed them nearly everywhere during June and July 1964 on Wollaston Forland. Locally they were present in numbers corresponding to 3—6 pairs per km², but only 3 nests were found. Pedersen (1934) found them "very numerous" in 1933 in Hochstetter Forland. He thought they were probably more numerous here than more southerly in East Greenland. Also they were numerous in this area in 1976 (Meltofte in litt.). Manniche (1910) describes them as "extremely" common breeding birds in Germania Land and adjacent large islands, being most thickly populated near Stormkap. Here, in August 1906, he counted some 30—40 pairs with young evenly distributed over an area of 23 km² corresponding to about 1.5 pairs per km². In 1907 there were no long-tailed skuas breeding in this area, but in 1908 there were again some 40 pairs nesting in the Stormkap region, corresponding to about 1.7 pairs per km². Meltofte (1975 and 1976 in litt.) describes long-tailed skuas as common and regularly distributed breeding birds all over Germania Land in 1970 and 1975. They did not breed, however, in 1969.

Population numbers in North Greenland

Freuchen (1915) reported breeding in southern Peary Land in 1912, but nests or young were not found. Around Jørgen Brønlund Fjord some long-tailed skuas were seen in several seasons (Johnsen, 1953; Røen, 1965; Just, 1967; Andersen, 1970; Meltofte, 1976). They have been reported to breed in

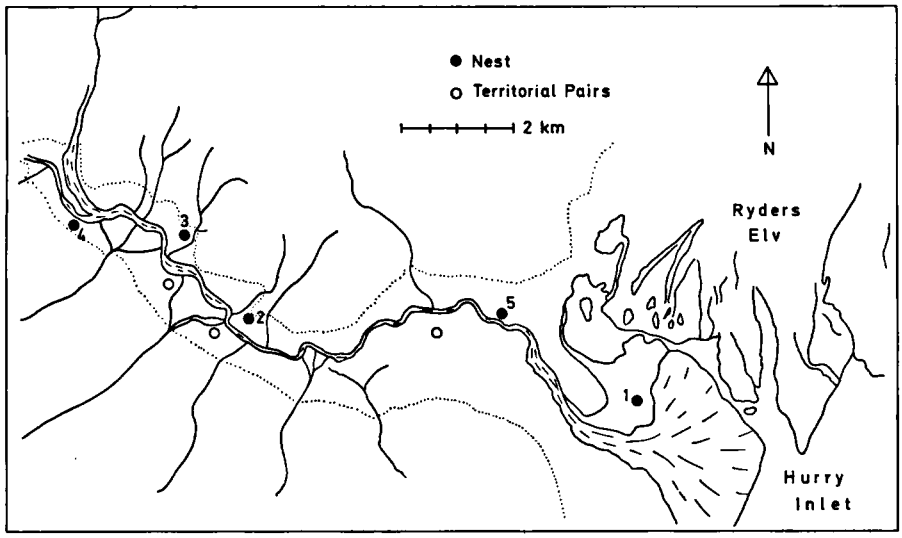

Fig. 13 Valley of Ugleelv with distribution of long-tailed skua population in 1975.

Vildt Land and Adam Biering Land by Freuchen (1915). They were rather common breeding birds in Wulff Land and Nyboe Land (L. Koch, 1926, Wulff, 1934), in Hall Land (Bessels, 1879; Hart, 1880) and in Washington Land (Vibe, 1948). Breeding near Thule has been reported among others by Vibe (1948). At times they also breed on the west coast of Greenland at Disko Bay (Salomonsen, 1950, 1967, 1974; Plantema, verbal communication, 1975).

Densities in northern North America and Lapland

In 1966 Maher (1970b) found at Lake Hazen Ellesmere Island a breeding density of 0.8 pairs per km², but in other years breeding densities were much lower. In 1957, 1958, 1959 and 1960 breeding densities at Kaolak River (Alaska) ranged from 0.3 to 0.5 pairs per km² and at Cape Sabine (Alaska) from 0.1 to 0.9 pairs per km² (Maher, 1974). In northern Sweden breeding densities varied from less than 0.04 pairs per km² in 1968, 1971 and 1972 to 0.5—0.6 pairs per km² in 1967, 1970 and 1974 (Andersson, 1976b).

Discussion of population numbers

It is obvious that in long-tailed skuas breeding densities differ considerably from one place to another and from one year to another. The annual variation makes it hard to estimate in which region breeding densities are highest. The maximal number of territorial pairs in years of abundance probably can be used as a measure of the carrying capacity of an area. In spite of annual variation a few ringing data indicate the occurrence of

permanent territories. In 1973 we ringed 4 pairs in the Kap Stewart study area with colour rings (3, 4, 5 and 6 in fig. 9). Two of these pairs (3, 6) were not seen again in 1974 and their territories remained unoccupied. One pair (5) returned to the same territory, whereas one female of a pair (4) of which the male was killed in 1973, was seen in another territory with an unringed male (4a). It seems that at least some pairs have permanent territories to which they return each year and on which they breed in years when conditions are acceptable. At Lake Hazen Maher (1970b) found a female in the same territory in 6 successive seasons. Andersson (1976b) gives evidence that a skua population of similar size and composition returned to the same area in Lapland each spring.

Highest breeding densities from Greenland are recorded by Manniche (1910) in part of Germania Land, 1.7 pairs per km². Highest breeding density found by us at Scoresby Sund was 0.6 pairs per km²; 0.9 territorial pairs per km². Highest densities given for northern North America by Maher (1970b, 1974) and for northern Sweden by Andersson (1976b) are similar to those found by us at Scoresby Sund.

References

Andersen, O. G. N.
1970 Ornithological Observations on the 5th Pearyland Expedition in the summer of 1968 (Danish, with English Summary). — Dansk orn. Foren. Tidsskr., **64** : 104—112.

Andersson, M.
1971 Breeding Behaviour of the Long-tailed Skua Stercorarius longicaudus, Vieillot. — Ornis Scand., **21** : 35—54.
1976a Population Ecology of the Long-tailed Skua (Stercorarius longicaudus Vieill.). — J. Anim. Ecol., **45** (2) : 537—559.
1976b Clutch size in the Long-tailed Skua (Stercorarius longicaudus): some field experiments. — Ibis, **118** (4) : 586—588.

Bessels, E.
1879 Die amerikanische Nordpol — Expedition : 1—647 (Leipzig).

Böcher, T. W., B. Fristrup, F. Salomonsen, C. Vibe et al.
1971 Grønland. — Danmarks Natur, **10** : 9—452 (Politikens Forlag, København).

Ferns, P. N. & G. P. Mudge
1976 Abundance and breeding success of birds in Ørsted Dal, East Greenland, 1974. — Dansk orn. Foren. Tidsskr., **70** : 21—33.

Freuchen, P.
1915 Report of the First Thule Expedition Scientific Work. — Medd. Grønland, **51** (12, Birds) : 406—411.

Green, G. H. & A. E. Williams
1973 The University of Dundee, North-East Greenland Expedition, 1972, Wading Bird Project. — Report to the British Trust for Ornithology : 1—22.

Hall, A. B.
1966 The Breeding Birds of an East Greenland Valley, 1962. — Dansk orn. Forenings Tidsskr., **60** : 186—197.

HALL, A. B. & R. N. WADDINGHAM
1966 The Breeding Birds of Orsteds Dal, East Greenland, 1963. — Dansk orn. Foren. Tidsskr., **60** : 186—197.

HART, H. C.
1880 Notes on the Ornithology of the British Polar Expedition 1875—76. — Zoologist, **3** (4) : 121—129, 204—214.

HJORT, C.
1976 Notes on the bird fauna of Hudson Land and Hold with Hope, Northeast Greenland, 1973. — Dansk orn. Foren. Tidsskr., **70** : 35—44.

JOHNSEN, P.
1953 Birds and Mammals in Peary Land in North Greenland. Including notes from Northeast Greenland. Dansk Pearyland Expedition 1947—50. — Medd. Grønland, **128** (6) : 1—140.

JUST, J.
1967 Ornithological Observations on the 4th Peary Land Expedition in the summer of 1966. — Dansk orn. Foren. Tidsskr., **61** : 133—137. (Danish with English Summary).

KOCH, L.
1926 Report on the Danish Bicentenary Jubilee Expedition North of Greenland 1920—23. — Medd. Grønland, **70** (1) : 1—232.

LØPPENTHIN, B.
1932 Die Vögel Nordostgrönlands zwischen 73°00′ und 75°30′ N. Br., samt Beobachtungsergebnisse von der dänische Godthaab-Expedition 1930. — Medd. Grønland, **91** (6) : 1—128.

MAHER, W. J.
1970a The Pomarine Jaeger as a Brown Lemming Predator in Northern Alaska. — Wilson Bull., **82** : 130—157.
1970b Ecology of the Long-tailed Jaeger at Lake Hazen, Ellesmere Island, Canada. — Arctic, **23** : 112—29.
1974 Ecology of Pomarine, Parasatic and Long-tailed Jaegers in Northern Alaska. — Pacific Coast Avifauna, **37** : 1—148.

MANNICHE, A. L. W.
1910 The terrestrial Mammals and Birds of North-East Greenland. Biological Observations. — Medd. Grønland, **45** (1) : 1—200.

MARRIS, R. & M. A. OGILVIE
1962 The Ringing of Barnacle Geese in Greenland in 1961. — Ann. Rep. Wildfowl Trust, **13** : 53—64.

MELTOFTE, H.
1975 Ornithological Observations in Northeast Greenland between 76°00′ and 78°00′ N. lat. 1969—1971. — Medd. Grønland, **191** (9) : 1—72.
1976a Ornithological Observations in Southern Peary Land North Greenland, 1973. — Medd. Grønland, **205** (1) : 1—57.
1976b Ornithologiske observationer in Scoresbysundområdet, Østgrønland, 1974. — Dansk orn. Foren. Tidsskr., in press. (With a summary in English).

PEDERSEN, A.
1926 Beiträge zur Kenntnis der Säugetier- und Vogelfauna der Ostküste Grönlands. — Medd. Grønland, **68** (3) : 149—258.
1930 Fortgesetzte Beiträge zur Kenntnis der Säugetier- und Vogelfauna der Ostküste Grönlands. — Medd. Grønland, **77** (5) : 341—508.

1934 Die Ornis des mittleren Teiles der Nordostküste Grönlands. — Medd. Grønland, **100** (11) : 1—35.

PLOEGER, P. L.
1968 Geographical Differentiation in Arctic Anatidae as a Result of Isolation during the last Glacial. — Ardea, **56** : 1—158.

ROSENBERG, N. T., N. HESSELBJERG CHRISTENSEN & B. GENSBØL
1970 Bird Observations in Northeast Greenland. — Medd. Grønland, **191** (1) : 1—87.

RØEN, U.
1965 Ornithological Observations on the 3rd Pearyland Expedition in the summer of 1964. — Dansk orn. Foren. Tidsskr., **59** : 85—91. (Danish, with English Summary).

SALOMONSEN, F.
1950 Grønlands Fugle (The Birds of Greenland): 1—609 (Ejnar Munksgaard, København).
1967 Fuglene på Grønland: 1—341 (Rhodos, København).
1972 Zoogeographical and ecological problems in arctic birds. — Proc. XVth Internat. Ornith. Congress, The Hague, 1970 : 25—77.

SALOMONSEN, F. & P. FREUCHEN
1958 The Arctic Year: 1—440 (Putnam's Sons, New York).

SALOMONSEN, F. & J. ROSING
1974 Fuglene i Menneskenes Land (tingmíssat Kalâtdlit-nunâne): 1—127 (Det Grønlandske Forlag, Godthaab).

SCHAANNING, H. TH. L.
1933 Zoological results of the Norwegian scientific expeditions to East-Greenland. — Skrifter Svalbard Ishavet, **49** : 1—34.

SMART, I. H. M. & R. O'BRIEN
1971 Report of the Dundee University Scoresbyland Expedition: 1—69.

VIBE, C.
1948 Langthen og nordpaa. Skildringer fra "Den danske Thule-og Ellesmerland Ekspedition 1939—40": 1—99 (København).
1967 Arctic animals in relation to climatic fluctuations. — Medd. Grønland, **170** (5) : 1—227.

VOOUS, K. H.
1960 Atlas van de europese vogels: 1—284 (Elsevier, Amsterdam - Brussel).

WULFF, T.
1934 Grönländska dagböcker (Axel Elvin, Stockholm).

J. DE KORTE
Institute of Taxonomic Zoology (Zoölogisch Museum)
University of Amsterdam
Plantage Middenlaan 53
Amsterdam 1004 - the Netherlands