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THE SCORESBY SOUND COMMITTEE'S 2ND EAST GREENLAND
EXPEDITION IN 1932 TO KING CHRISTIAN IX'S LAND

LEADER: EJNAR MIKKELSEN

A CONTRIBUTION TO THE
INVESTIGATION OF THE FAUNA OF THE
BLOSSEVILLE COAST, EAST GREENLAND,
WITH SPECIAL REFERENCE TO ZOOGEOGRAPHY

BY

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WITH ONE FIGURE IN THE TEXT AND ONE PLATE

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INTRODUCTION

The object of the Scoresby Sound Committee's 2nd East Greenland Expedition, under the leadership of Captain EJNAR MIKKELSEN, was i. a. an investigation of the Blosseville Coast, which was until then practically uninvestigated from a zoological point of view. Before that time only one expedition, under the leadership of Vice-Admiral G. C. AMDRUP (1900), had passed this coast throughout its entire length, but this expedition, which was undertaken in a rowing-boat along the coast, had to contend against great difficulties caused by the ice, and besides it had quite other tasks than the collection of zoological specimens. Later, in 1930, the English Watkins-Expedition spent a few days in Kangerdlugssuaq and undertook some investigations regarding birds.

It is obvious that under these conditions the object of the 2nd Scoresby Sound Expedition, in this direction, was first and foremost to make as extensive collections both of vertebrates and invertebrates, as conditions and time permitted. The zoological investigations were directed by the writer, and in the acquisition and preserving of mammals and birds the conservator U. MØHL-HANSEN proved an excellent assistant.

Working with a dredge in these East Greenland fjords often presents great difficulties. The bottom frequently consists of mud or fine clay, intermixed with large stones, which have been carried there by the ice. Dredging in the generally accepted sense of the word is, therefore, as a rule out of the question. When the dredge, the net of which was secured by iron chains, reached the bottom, it was filled with mud and stones and must, consequently, be pulled up very soon after having been let down. Thus the dredge came to serve more or less as a grab, to which must be added that along part of the coast, *viz.* Søkongen's Bay and Wiedemann's Fjord¹⁾ ice conditions were of such a nature that it was

¹⁾ The fjord between Cape Ravn and Cape Johnstrup. In previous publications on this expedition it has been called Ravn's Fjord, and also on the labels attached to the material collected here this is the name given to it. It was not until later that it was named Wiedemann's Fjord.

impossible to undertake dredging. It was not until we reached Kangerdlugssuaq that we were able to work more extensively with the dredge, particularly in the shallow straits, Uttental's Sound, where it was possible to dredge from a motor-boat.

The work of the expedition was greatly facilitated by the fact that sailing conditions in 1932 were particularly favourable, which enabled us to make land at Cape Dalton as early as July 10th. In this manner we not only got more time to carry out our investigations — we left the Kangerdlugssuaq area in September — but we got ashore at a time when the flowers were in full bloom, which in its turn was naturally of decisive importance for such investigations as for instance the life of the insects.

It is a matter of course that an exhaustive investigation of the distance Cape Dalton — Kangerdlugssuaq, the chief field of activity of the expedition, cannot be undertaken in the course of one summer. But as it is the first time that collections of most of the animal forms found have been made in these regions, the zoological material provided will always be particularly valuable. While referring the reader to the other treatises (*Meddelelser om Grønland*, vol. 104, Nos. 10—18) on special branches of the zoological work of the expedition, I shall briefly report on some of the more general results and, first of all, those relating to

ZOOGEOGRAPHY

It has been proved that the country between Angmagssalik and Scoresby Sound is a boundary area, containing a number of zoogeographical boundaries, where a number of northern and southern fauna elements meet. Several northern animal forms which had, until then, only been recorded as far as Scoresby Sound, have now been proved to extend farther south, while conversely a number of southern forms, which in a northerly direction had only been traced as far as Angmagssalik, have now been found farther north. The region near Wiedemann's Fjord (lat. $68^{\circ}30'$) in particular seems to contain several zoogeographical boundaries.

There are undoubtedly various reasons for so many zoogeographical boundaries passing through the Blosseville Coast, one of the most important being the climate. Within the said area there is a transition from the continental, dry, high-arctic Northeast Greenland climate to the oceanic, subarctic, Southeast Angmagssalik climate. Other natural conditions of decisive importance to the composition of the fauna are the character of the flora, the nature of the soil, which along the Blosseville Coast consists of basalt, and the many large glaciers which here come right down to the sea; to this must further be added that the country

Table 1. Mean temperature for the months.

	January	February	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
Danmark's Harbour.	— 21.9	— 27.4	— 22.4	— 19.5	— 7.3	1.1	4.4	2.2	— 4.0	— 14.4	— 20.4	— 20.9
Scoresby Sound	— 17.9	— 19.6	— 17.3	— 12.9	— 4.6	1.8	4.1	3.2	— 0.7	— 6.9	— 12.4	— 15.6
Angmagssalik	— 8.5	— 10.0	— 7.8	— 4.5	0.8	4.9	6.6	5.8	3.0	— 1.3	— 5.3	— 7.0
Nanortalik	— 5.1	— 5.0	— 3.1	— 0.8	2.9	5.0	5.9	5.9	4.2	1.5	— 1.6	— 3.6
Ivigtût.....	— 7.6	— 7.3	— 4.9	— 0.5	4.5	8.0	9.7	8.4	4.9	1.0	— 3.0	— 6.0

Table 2. Mean precipitation, mm.

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	The year
Danmark's Harbour.....	30	17	18	3	4	6	1	8	7	7	26	19	146
Scoresby Sound	45	43	14	38	7	25	14	11	27	28	26	39	317
Angmagssalik	83	51	62	61	61	53	49	60	94	144	84	70	872
Ivigtût	89	70	91	61	109	80	83	89	150	143	112	90	1167

rises steeply from the sea, that there are no large areas of level ground and no islands to shield the continent from the pack-ice.

Let us look more closely at some of these factors and particularly at the climate. Very little is known about the climate of the region in question, but as mentioned above it turns out that there is a particularly great difference between climatic conditions north and south of this place, that is, in the Scoresby Sound and the Angmagssalik regions, respectively. Tables 1 and 2 show the average monthly temperatures and amounts of precipitation within these two areas, and from this it appears that the temperature all the year round is lower in the Scoresby Sound than in the Angmagssalik area. The summer temperature is here of greatest importance, being in the month of July $2\frac{1}{2}^{\circ}$ C. higher at Angmagssalik than at Scoresby Sound, that is 4.1 and 6.6°, respectively. It must be borne in mind, as a factor of the greatest significance, that the July isotherm for 4—5° C. is an important temperature boundary, it being according to the geographers (cf. i. a. VAHL and HATT 1922) the boundary between "a high arctic and a low arctic zone", or between the central arctic climate province and the north-atlantic climate province, or between the arctic climate proper and the boreo-arctic climate.

But where then lies this boundary in the area under discussion? If we reckon with fairly even transitions, the very figures indicate that the boundary passes through the Blosseville Coast, and this is also borne out by other facts. Through the Danmark-Strait a submarine ridge extends from Iceland to the said coast, and this ridge is a continuation of the North-Atlantic ridge, which extends from Iceland across the Faroes to western Norway. According to the experiences made in the course of the 2nd Scoresby Sound Expedition this ridge seems most pronounced off Cape Stephensen and Cape Ravn. Here, along a line off the coast, lay a row of large icebergs which had evidently run aground on the said ridge and formed a barrier stopping the drift of the sea-ice in a southern direction. Also the expedition-vessel was stopped at this place, and for several days we sailed through the channels in the ice, which now opened and now closed up before us, until we succeeded in getting into Wiedemann's Fjord between Cape Ravn and Cape Johnstrup.

It is undoubtedly also only south of this ridge that the Irminger Current, a branch of the Gulf-Stream, can still make itself faintly felt (THOR IVERSEN 1936). Therefore there will, beyond doubt, often be a great difference between the ice-cover north and south of this barrier. But the very presence or absence of widely extended pack-ice will be of great importance to the climate. At any rate we had particularly calm and fine weather in July north of this boundary, where the pack-ice lay close, generally with sun, now and then also with fog, but with not

a single day of rain. It must, however, be said of this fog that it did not extend very high. Time after time we experienced that the sun shone in all its splendour, when we ascended the mountain sides, while the surface of the fjord with the expedition-vessel was shrouded in fog. And this, in the case of several animal forms, for instance such pronounced heliophile insects as butterflies, is of no mean importance.

This also has some bearing upon the enormous difference between the sunny and shady sides of this area. Everywhere in the fjords this difference was very pronounced; the sunlit side facing south made a comparatively fertile impression, whereas the other side of the fjord lay waste, mostly covered with snow and productive glaciers. On these warm sides facing south the temperature near the surface is at times surprisingly high, as exemplified by the fact that on July 26th I measured in Wiedemann's Fjord no less than 24° C. between moist moss- and *Alchemilla*-vegetation. This is naturally of the greatest importance for the animal life among the plants or in the surface of the ground.

South of this barrier we found open sea, unsettled weather and much rain. It must, however, be emphasized that our stay there occurred a month later, in the month of August, but otherwise this agrees very well with the conditions of precipitation recorded from Scoresby Sound and Angmagssalik, respectively (Table 2). The amount of precipitation in Angmagssalik is nearly three times greater than in Scoresby Sound, that is 872 and 317 mm, respectively. That the amount of precipitation can be very considerable, at any rate in the southern part of the Blossville Coast, appears from the fact that for instance at the end of August, from 25th to 31st, we were for several days exposed to violent precipitation, the rain only ceasing once or twice in the afternoon. The last days the rain was mixed with thawy snow, though the temperature of the air remained high, and on August 26th at 10 p. m. was 8.5° C., During one day and night of incessant rain the precipitation was measured at 64 mm. On that occasion the rain filled all the old dry river beds, and a great number of new ones were formed, while the water everywhere poured down from the mountains.

On the last day which we spent in Miki's Fjord the temperature rose very much in consequence of a storm of a föhn-like character. On August 31st at 9 p. m. there was a rather sudden rise to 13° ; in the forenoon of September 1st the temperature recorded was the same, but shortly afterwards it fell to 11° , and now in the course of a few minutes it fell from 11° to 9° , while I stood looking at the thermometer and could actually see the quicksilver falling. As a result of this dry wind the new snow on the mountains melted, while the many water-courses dried up. Upon the whole it must be borne in mind that the climate, as well as the ice-cover, can vary greatly, so that the coast one year may be blocked and the following year almost free of ice.

It is a matter of course that these climatic conditions will be of decisive importance as regards the composition of the fauna. Everything considered, the climate must be said to be extremely inclement, and together with the fact that the area, as mentioned above, essentially consists of very steep basalt rocks, which are rather of the nature of promontories and divided by a large number of productive glaciers, this naturally makes the conditions of the soil particularly unpropitious to rich animal life. The inland ice comes comparatively close to the shore, and as distinguished from Northeast Greenland there are no extensive planes where edible material can form, and if only for this reason there are extensive areas along this coast, where great land mammals as e. g. the musk-ox cannot find sufficient food.

In the above conditions the explanation is to be found why only a very sparse fauna can subsist along the Blosseville Coast, and this poverty of species is particularly striking, when compared with conditions in other near-lying areas, as e. g. West Greenland or Iceland which are situated opposite to it.

Only a couple of animal groups, land mammals and butterflies, are more widely represented in East Greenland, though it must be borne in mind that also conditions of migration may play a part in this connection, but as far as other groups are concerned, for instance in the case of the rest of the insects, the poverty of species is very marked. With regard to *Coleoptera* it may thus e. g. be mentioned that 26 species have been recorded from West Greenland, 8 from East Greenland and 144 from Iceland, as contrasting with 3 species on the Blosseville Coast. For further particulars see publications by J. C. NIELSEN (1907), AD. S. JENSEN (1928), LINDROTH (1931) and K. L. HENRIKSEN (1935). In this connection attention should, however, be called to the fact that the poverty of species in East Greenland may, to a certain extent, be explained by the insufficient investigations of this country. Thus the 2nd Scoresby Sound Expedition proved the occurrence in this place of 5 species (4 moths, viz. *Agrotis westermanni*, *Hadena sommeri*, *Plusia gamma* and *Plusia interrogationis*, and 1 diptera viz. *Blepharoptera inscripta*) which until then had not been recorded on the east coast. This will undoubtedly also prove the case, when further collections have been made by other expeditions, but even then the insect fauna of East Greenland will remain relatively poor.

It seems beyond doubt that this great difference in the number of species between the insect faunas of Greenland and Iceland is determined by the climate. Iceland lies somewhat farther south, and its southwestern and northwestern coasts are washed by a branch of the Gulf-Stream, which in its turn accounts for the fact of the average summer temperature being no less than 2—4 degrees higher than that of the Blosseville Coast, or in other words, we are now outside the arctic area proper.

In spite of this, Greenland is, at any rate for one group of insects, more favorably placed than Iceland, seeing that butterflies (*Rhapalocera*) are entirely lacking in this island, while even along the Blosseville Coast they are represented by several species.

This proves that the temperature alone is not all decisive, but that other factors too may make themselves felt, in this case the conditions of migration. The butterflies here share the fate of the land mammals. Both of these groups belong to the forms which have a northerly distribution in Greenland, and the boundaries of which on the east coast for several species pass through the Blosseville Coast, the principal field of investigation of the expedition. We will look somewhat more closely at these two groups.

In Europe the number of species of butterflies decreases in the direction east to west, being surprisingly small in the British Isles. The explanation of this has been sought in the decreasing summer temperature, and more particularly in the amount of precipitation. LINDROTH (1931), however, maintains, and undoubtedly rightly, that these two factors alone cannot explain the absence of *Rhapalocera* in Iceland, as both *Noctuæ* and *Geometræ* are fairly well represented in this island. The main reason is to be looked for in the lack of sunshine: "Eben diejenigen Tagfalter, die wir auf Island am ehesten hätten erwarten können, Arten der Gattungen *Colias*, *Argynnis*, *Lycæna*, sind ausgeprägt heliophile Tiere, welche immer nur im Sonnenschein fliegen. Auf Island kommen tatsächlich Sommer mit so wenigen sonnigen Tagen vor (s. z. B. STAUDINGER 1857, p. 211), dass solche Tiere wegen mangelnder Gelegenheit zur Nahrungsaufnahme und Paarung hätten zu Grunde gehen müssen." (LINDROTH, p. 393).

The foregoing is emphasized by conditions in East Greenland, as in spite of the temperature being lower than in Iceland the group is nevertheless represented here.

Along the Blosseville Coast we proved the existence of 3 species of butterflies, viz. *Argynnis chariclea* SCHNEID, *Argynnis polaris* BOISD, and *Colias hecla* LEFEB. whereas the fourth butterfly occurring in Greenland, viz. *Lycæna orbitalis* PRUN. is known from the northeast coast and in a southern direction as far as the Scoresby Sound region.

As already mentioned, all these butterflies have a northerly distribution and appear most numerous towards north. *Argynnis polaris* is not known from the west coast proper, or at any rate only from the very northernmost part of it (lat. $81^{\circ}20'$ — $81^{\circ}50'$), in fact, the north coast. On the east coast it is of rather common occurrence as far as the Scoresby Sound region. On the Blosseville Coast only one specimen was taken on July 15th at d'Aunay Bay (lat. 69°), and here we have, beyond doubt, reached the southern boundary of the distribution of this

species, in any case its continuous area of distribution. It is true that a single specimen has been taken as far south as lat. $64^{\circ}20'$, but this must be regarded as a casual occurrence. Pastor ROSING of Angmagssalik, when directly questioned by me, said that he had never, or perhaps only once, seen *Argynnis* butterflies in the Angmagssalik District.

Argynnis chariclea is much more widely distributed, occurring throughout the west coast all the way from Igaliko Fjord in the south to Port Foulke in the north. On the east coast it has hitherto been known from lat. $68^{\circ}40'$ as far as the Scoresby Sound region, as well as in the southernmost regions (lat. $60^{\circ}19'$), but there it had migrated from West Greenland, round the southern point of the country. Along the Blosseville Coast we found it of rather common occurrence, all the way from Henry Land in the north to Kangerdlugssuaq in the south. In the latter area the last specimen was taken on August 16th. The autumn was then setting in, and therefore the chance of tracing this butterfly farther south was gone (cf. what has been said above of the *Argynnis*-species at Angmagssalik).

Colias hecla, the largest butterfly of Greenland, has like *Argynnis polaris* a pronouncedly northern distribution. In West Greenland it is recorded from Egedesminde in the south (lat. 68°) as far as Polaris Bay on the north coast (lat. $81^{\circ}30'$); on the east coast, where in several localities it is of rather frequent occurrence, it was proved to occur from lat. $76^{\circ}46'$ as far as the Scoresby Sound region. This southern boundary has now been pushed farther south, one specimen being taken in Søkongen's Bay, Cape Daussy (lat. $68^{\circ}45'$) at a height of about 200 m.

What then is the reason of this northern distribution? The theory has been set forth that it is due to facts bearing upon the history of the migration. Thus AD. S. JENSEN writes (1928) in his "Grønlands Fauna" (p. 13): "It seems evident that these butterflies must have come to Greenland from arctic America, which in the north is only divided from northern Greenland by narrow sounds, and that from here they have spread more or less along the west coast, also — perhaps in the warmer post-glacial period mentioned above, when conditions were more favorable along the northern side than at present — to the east coast, where they have not reached farther than Scoresby Sound".

It is possible that these conditions of distribution in Greenland are partly due to causes bearing upon the history of the migration, but I am of opinion that they are rather owing to climatic factors and, more particularly, to the number of hours of sunshine and the nature, amount and distribution of precipitation.

Our investigations along the Blosseville Coast have proved that the boundary for the distribution towards south is not at Scoresby Sound,

but somewhat farther south, viz. that of *Colias hecla* at Cape Daussy, of *Argynnis polaris* at Cape d'Aunay and of *Argynnis chariclea* at Kangerdlugssuaq. Add to this that the number of individuals seems essentially greater in the north, i. e. in regions with little precipitation and much sunshine. The farther south we get, the greater is as mentioned above the amount of precipitation, Angmagssalik being the station in Greenland which has the greatest number of rainy days and, after Ivigtût, also the greatest amount of precipitation. We have also mentioned above that the boundary between the northern and southern climatic areas must be placed approximately in the region round Wiedemann's Fjord.

On the west coast conditions are more or less the same, the amount of precipitation being considerable in the south and the quantity of sunshine small, though not as small as at Angmagssalik.

The importance of sunshine also appears from the vertical distribution of the animals. LUNDBECK (1893) it is true, maintains that no insects in Greenland live exclusively in the mountains or have a downward limit, below which they do not occur. Species which in southern countries appear as alpine, can here be met from the very surface of the sea to high up in the mountains, even though the height at which the individual forms are found naturally vary. As an example of other animal groups the ptarmigan (*Lagopus mutus* MONT.) may be quoted; in Europe it only occurs in the high mountains above the timber line, in Greenland right down to the surface of the sea.

Also along the Blosseville Coast this so far holds good, as e. g. *Argynnis chariclea* has been caught from the very surface of the sea to a height of 1000 m; a specimen of this species was taken at d'Aunay Bay by Captain EJNAR MIKKELSEN. It was frozen into the new ice in a small pool of water, but it was not more exhausted than to flutter off after having been thawed.

In this connection it must, however, be borne in mind that, in any case along the Blosseville Coast with its steep mountains, the distance from the tops of those to the surface of the sea does not cover particularly large areas, so that animals which normally live at a certain level can easily get outside it.

At any rate along the coast here investigated this should not be taken in the sense that it is entirely due to chance at what heights the animals live, or how they are distributed on the land. Many species live by preference at a particular height, as for instance the two *Plusia* species (*Plusia gamma* L. and *Plusia interrogationis* L.) which were taken at Wiedemann's Fjord and Søkongen's Bay and were first observed at a height of about 300 m. Though the country below has been carefully investigated, we had not observed these animals, until we reached the height mentioned above and saw them fluttering about in rather great numbers.

The reason of this must, beyond doubt, also be the sunshine. As already mentioned one can find the fjord enveloped in fog, whereas along the sides of the mountains, at a height of a couple of hundred metres, butterflies may be seen fluttering in the sunshine. The vegetation at this height has also had a certain bearing upon the frequency of occurrence; upon the whole, mountain slopes facing south, but still more those facing southwest have the most propitious microclimate and the most fertile vegetation at this height. On the very slopes at Søkongen's Bay where *Plusia interrogationis* was taken, there was a comparatively luxurious vegetation. About this the botanist of the expedition, TYGE BÖCHER, wrote in the following manner: "There was here a luxuriant heath on the mountain slope, frequently interspersed with a number of more southern species. On these southern slopes oases of heat appear" (1933 b. p. 110), and of a similar southern character was also the vegetation on the slopes at Wiedemann's Fjord. "The herb field here attained a development and a wealth of species as nowhere else on the coast, and comprised a very large contingent of southern species" (BÖCHER 1933 b. p. 9).

The very terrace formation in these basalt mountains cause a rather considerable rise of temperature, owing to the vertical walls between the individual terraces, which are struck by the rays of the sun.

Also as far as other species are concerned, there is a similar connection between their occurrence and the lay of the land at this height, viz. *Otiorrhynchus arcticus* O. FABR., *Bembidion grapei* GYLL. and the snail *Vitrina angelicæ* (BECK) MØLLER.

Also most of the land mammals of East Greenland have, as mentioned above, a northerly distribution. In East Greenland, north of Scoresby Sound, there are 7 species of land mammals: Collared lemming (*Dicrostonyx groenlandicus* TRAILL), polar hare (*Lepus arcticus groenlandicus* RHOADS), ermine (*Mustela arctica* MERR.), polar wolf (*Canis lupus tundrarum* MILLER), polar fox (*Alopex lagopus* (L.)), musk-ox (*Ovibos moschatus wardi* LYD.) and polar bear (*Ursus maritimus* PHIPPS), the latter however being a kind of amphibium which rather prefers the ice and the water. Until 1900 also reindeer (*Rangifer tarandus* (L.)) were found in the area north of Scoresby Sound, but since then they have disappeared from the east coast.

Only 2 of these species are known from Angmagssalik, viz. polar fox and polar bear, proving that the remaining 5 species must have their southern boundary somewhere in the interjacent area.

It has now become evident that only collared lemming and polar hare can be traced for some distance south of Cape Dalton to d'Aunay Bay (lat. 69°) and Søkongen's Bay at Cape Daussy (lat. 68°45'), respectively.

The polar hare (*Lepus arcticus groenlandicus* RHOADS). At Cape

Dalton one hare was observed in July 1900 by SØREN JENSEN, the zoologist of the Amdrup-Expedition, whereas we did not find any living hare in this locality, which we visited on July 10th—12th, though in several places we found excrements of hares and in one place a tuft of hare wool. Neither did we observe any living hares farther south, although in several places excrements of hares were found, *viz.* at Cape Ewarts (July 12th), at Barclay Bay (July 13th—14th), at Søkongen's Bay (July 20th). The latter bay between Cape Tupinier and Cape Daussy (lat. 68°45') is thus the most southerly locality where the polar hare has been found up to the present.

None of the hare excrements found were fresh, but they show that hares must have been so far south, at any rate as stray visitors. The information obtained shows polar hare to be of very rare occurrence along the coast, and this is further emphasized by a comparison with the region north of Scoresby Sound, where the hare is of such frequent occurrence that living animals are everywhere in evidence.

Apart from this, the hare is known from the north and the west coast. In the southern part of the east coast it was not found by GRAAH and VAHL (1829—30), nor has it been observed by other travellers along this coast. The 6th and 7th Thule-Expedition (1932—33) did not observe the hare, and this in spite of the fact that special attention was paid to the occurrence or non-occurrence of this animal, and that a look-out was kept for it or reminders of it. (Information kindly communicated to me by Mr. BØGVAD M. sc.)

The collared lemming (*Dicrostonyx groenlandicus* TRAILL). Also this animal has, until now, been unknown farther south than Cape Dalton, where SØREN JENSEN in July 1900 caught 2 specimens. In the course of the 2nd Scoresby Sound Expedition we saw no living animals here, but many excrements, and although we searched with great energy, we could not trace them farther south than d'Aunay Bay; in fertile localities, particularly where willow grew thickly and formed a layer of mould, we also found many excrements and passages.

As to musk-ox (*Ovibos moschatus wardi* LYD.), ermine (*Mustela arctica* MERR.) and wolf (*Canis lupus tundrarum* MILLER) we found no traces whatsoever, nor is there any hinterland, through which the musk-ox can have migrated in a southern direction. In 1900 SØREN JENSEN saw traces of musk-oxen at Cape Dalton, and ALWIN PEDERSEN, who in 1928 traversed the coast stretch Cape Brewster—Cape Dalton, found foot-prints of these animals in two places. This apparently marks the southern boundary of the distribution of the musk-ox and, as also observed by ALWIN PEDERSEN, these animals were beyond doubt only stray steers, while flocks in general do not seem to have crossed the actual fjord at Scoresby Sound.

Traces of ermine were also observed by ALWIN PEDERSEN on his voyage to Cape Dalton, 1928, *viz.* on Turner Island and on the ice off Stewart Island. In 1900 SØREN JENSEN observed 8 ermines at Turner Sound. As the collared lemming makes the chief food of the ermine, it is quite possible that the latter may have followed the collared lemming for some distance towards the south, but in 1932 we found no traces of them.

Also traces of polar wolves were observed by SØREN JENSEN at Cape Dalton (1900).

The polar fox (*Alopex lagopus* L.) occurs all along the Blossville coast, its excrements being found in a number of localities: Cape Dalton, Cape Ewarts and d'Aunay Bay. The entire skeleton of a polar fox, pure and white, was found at the head of Wiedemann's Fjord. In Miki's Fjord the foot-prints of two foxes were seen on the morning of August 23d at ebb-tide in the sand on the shore, the two animal having passed in the same direction along the coast. At flood-tide the marks were wiped out, but they showed that these foxes must have passed by the place in the course of the night. At the head of the same fjord, in a delta where many birds of passage had gathered, we saw on the morning of August 31st a young animal, white with a bluish tinge along the back.

That there were also in former times polar foxes on this coast appears from a number of fox-traps found in Miki's Fjord and Kangerdlugssuaq, which traps had been put up at the time when the Eskimos lived there, and in the same manner various skeletal parts of foxes were found in the house ruins from that time, *viz.* that of the Inugssuk culture.

The polar bear (*Ursus maritimus* PHIPPS). Wherever we came ashore, we found traces of the polar bear, excrements or foot-prints, and very often we also saw the animal itself.

At Cape Dalton and Cape Ewarts we saw foot-prints and excrements, the latter essentially consisting of remains of plants. At Barclay Bay we met the first living polar bear, a young she-bear wandering along the shore, from the head of the fjord towards the coast (July 13th). We came quite close to it in a motor-boat, but it was not afraid — only looked at us with curiosity and continued on its way, undaunted. It was evident that in these regions the polar bear looked upon itself as the lord of creation.

At d'Aunay Bay were found excrements of polar bear, and at Søkongen's Bay we observed, on July 19th, a living animal wandering along the shore.

Off Cape Stephensen where the pack-ice lay so close that the "Søkongen" was enclosed, several bears passed by on the ice. On July 22nd about 8 a. m. we saw a she-bear with two cubs. A little later we saw a

he-bear, not quite adult, and they all moved calmly away from the vessel, without apparently paying any attention to it.

At 9 p. m. a young animal passed. When it saw the vessel, it made for it at full speed, and only stopped 3 metres from us, where there was open water.

At 11,30 the same evening we saw another bear, the sixth. This animal behaved quite differently from the others, being very cautious and avoiding the open ice while moving forwards behind ice-ridges and the like.

The following day, July 23d, when we were still stuck in the pack-ice, another she-bear with two cubs passed the vessel.

During our stay in Wiedemann's Fjord, July 25th—August 2nd, we saw traces of polar-bear, and about 100 metres above sea-level we saw the skeleton of forearm of a polar bear.

On August 2nd, off Cape Rink, a large polar bear was observed about 10 km from the shore and lying in the water behind a hummock of ice. When the vessel turned towards it, it swam off, and from the speed which the vessel must make in order to follow, it was proved that the animal swam at 8—9 km an hour.

During our stay in Kangerdlugssuaq, August 9th—21st, we saw several polar bears in the region round Skærgaards Peninsula and on Kræmer's Island. Between Watkins' Fjord and Miki's Fjord, where the shortest passage is between the two fjord-systems, there was a regular "bear-path". The polar-bears evidently followed this route when wandering towards north along the coast, thereby sparing themselves a considerable détour. That polar bears have also formerly been of common occurrence along this coast appears from the many finds of teeth and other skeletal parts in the house ruins.

The reason why only a single species of the land mammals proper occurs on the Blosseville Coast throughout the whole of its extent, must undoubtedly be looked for in the wretched means of subsistence in this extremely poor country with its scarcity of edible material. Even at Cape Dalton the country is comparatively fertile, and also in a few other localities conditions are rather favorable, but these oases are divided by large stretches which are practically quite bare and full of large glaciers. I have, therefore, arrived at the conclusion that the Blosseville Coast is so bare and devoid of means of subsistence that perhaps not even collared lemming, which must also have a fairly thick layer of mould to burrow in, and polar hare are able to pass it throughout the whole of its extent. If, on the other hand, these animals should have reached farther south, for instance as far as Miki's Fjord, the vegetation there is so abundant that it would, beyond doubt, be possible for a small number of them to live there.

Another factor of decisive importance is, however, the climate. It must be considered extremely improbable that musk-ox, at any rate, should be able to spread along this coast. More so than in the case of any of the other mammals, a dry continental climate is what agrees best with this species, like the climate north of Scoresby Sound, and it will hardly be able to thrive in the moist oceanic climate of Angmagssalik.

When passing to the other land vertebrates with a northerly area of distribution a few birds may be mentioned, *viz.* pinkfooted goose and dunlin.

The pinkfooted goose (*Anser brachyrhynchus* BAILL.) is a rather common breeding bird in East Greenland, north of Scoresby Sound, where the first incontestable proof of its breeding was given by the Ryder-Expedition, 1891—92 (BAY 1896, p. 32). In the course of the 2nd Scoresby Sound Expedition we found the species breeding farther south; on August 6th 1 ♂ ad and 3 young birds were killed in Miki's Fjord. Pinkfooted goose has a northeasterly distribution and is not recorded from West Greenland; a couple of years ago it was, however, found breeding in Iceland (TIMMERMANN 1933); it is also a common breeding bird on Spitzbergen and, it is to be presumed, on Franz Joseph's Land.

Also the dunlin (*Calidris alpina arctica* SCHIÖLER) has been proved to occur as a breeding bird in East Greenland, where it was quite common at Scoresby Sound. The first proof of this was given by the Ryder-Expedition, 1891—92 (BAY 1896, p. 29), and we found it breeding somewhat farther south at Cape Dalton. There is every probability that this species, as well as several other wading birds (*Arenaria interpres* (L), *Calidris canutus canutus* (L), *Crocetia alba* (PALL), which breed at Scoresby Sound, but are only known from Angmagssalik as birds of passage or stray visitors, also breed farther south on the Blosseville Coast. It must, however, be taken into account that the greater part of this coast lacks the low sand-beach on which these birds live. Not until in Miki's Fjord did we find the natural conditions which might favour their life there, but here we arrived so late that the numerous waders found were birds of passage, many of which had beyond doubt come from other localities. Of northern species which we did not find on this coast and which probably had their southern boundary here, we may further, according to FINN SALOMONSEN (1936, p. 34), mention: *Branta leucopsis* (BECHST.), *Phalaropus fulicarius jourdaini* IREDALE, *Stercorarius longicaudus pallescens* LØPP. and *Nyctea scandiaca* (L). Upon the whole, it may be said of the bird life along this coast that most of the birds which are living there belong to the most hardy species in Greenland. Among the 26 species identified no less than 21 are known from the north coast, being taken from Cape York to Navy Cliff.

There may still be reason to mention a few species with a northerly

distribution, viz. a couple of diptera: *Rhamphomyia nigrita* ZETT. and *Chortophila icterica* HOLMGR. On the west coast the former species is of common occurrence north of lat. 68°; on the east coast it is recorded from Hekla Harbour (lat. 70°27') and Hold-with-Hope (lat. 73°30'), and in the course of the 2nd Scoresby Sound Expedition we took one specimen at Wiedemann's Fjord (July 26th). This species is unknown outside Greenland.

Chortophila icterica is on the west coast only represented by a few specimens. On the east coast it had hitherto only been taken at Hekla Harbour, but now it was found at Cape Dalton (July 11th) and d'Aunay Bay (July 15th), which thus is its most southerly place of occurrence hitherto known on the east coast. This species is also unknown outside Greenland.

We now pass to the *boreo-arctic group*, the other large group of animals with a southern distribution and their northern boundary on the Blosseville Coast.

In order to proceed systematically, it should be mentioned at once that there are no land mammals in this group, which on the other hand comprises several birds, among which the Greenland redpoll (*Carduelis flammea rostrata* (COUES), which was found breeding at Wiedemann's Fjord. At Angmagssalik *rostrata* is of common occurrence as a breeding bird, but at Scoresby Sound it only occurs as a stray visitor, whereas ALWIN PEDERSEN found the subspecies *Carduelis flammea hornemanni*, breeding there. On the west coast it occurs as far north as at Umanak in lat. 71° (BERTELSEN, 1923).

About the same holds good of the ptarmigan (*Lagopus mutus*). According to FINN SALOMONSEN (1936, p. 33) the boundary line between the southern race *Lagopus mutus rupestris* (GMELIN.) and the northern one, *Lagopus mutus captus* PETERS passes through the Blosseville Coast approximately in lat. 68°.

The boreo-arctic group comprises a rather considerable number of land evertebrates. To this belongs the only land snail *Vitrina angelicæ* (BECK) MØLLER, which occurs on this coast and is recorded (POSSELT 1899, p. 266) to be of rather common occurrence throughout the coast of West Greenland, until rather far north, where it is known to occur from Svartenhuk (lat. 71°40'). Here it lives in moist places, in moss, *Alchemilla* leaves and the like, but it does not particularly seek the *Archangelica* as the name might seem to suggest.

On the east coast it was hitherto known from latitude 65°40' N., but now it was taken at Wiedemann's Fjord (July 26th—30th), Miki's Fjord (August 5th) and Tugtulik (September 3d). Here it occurred rather frequently, living at a height of 200—300 m under stones; but somewhat higher up, 300—400 metres, where the soil was moister, it was found crawling on the vegetation, viz. moss, *Alchemilla* and willow.

In the course of the 2nd Scoresby Sound Expedition this snail was,

however, taken somewhat higher north, *viz.* near a hot spring at Knighton Bay (lat. 69°20'). The cartographers, who found this spring, brought me some moss from it, which I investigated in order to find animals, and I discovered a single shell of this snail, but as we had to go on immediately afterwards, we were unable to undertake further investigation. It cannot be said with certainty, how hot the water was in this spring, as the cartographers had not brought a thermometer, but they said that the water was "so hot that they could not hold their hands in it", and the outflow was rather considerable.

It is difficult to say for certain, whether the latter locality indicates the actual northern boundary of a continuous distribution or only an isolated northerly occurrence, but the investigations already undertaken seem to support the latter theory.

In the localities which we investigated, *Vitrina angelicæ* was connected with the fresh and moist *Alchemilla*-association, the northern boundary of which on the coast is found in this very place, Wiedemann's Fjord (BÖCHER). It is true that *Alchemilla glomerulans* extends farther north, but in this place it recedes from the coast and is found inland, in the interior of Scoresby Sound. We do not know, whether this may also hold good of some animal species, but it is hardly probable that *Vitrina angelicæ* should follow the plant into the drier interior. The first locality on the east coast where *Archangelica* itself is found, is the Angmagssalik area. It is possible that this snail represents a form, which in the post-glacial warm period had a more northerly distribution than it has now, and even then it has only been possible for it to live there under special conditions, for instance near a hot spring.

Outside Greenland *Vitrina angelicæ* is only known from Iceland.

Also the only 3 species of beetles (*Bembidion grapei* GYLL., *Otiorrhynchus arcticus* O. FABR. and *Byrrhus faciatus* FORST.), which are known from this coast, have undoubtedly their northern boundary on the distance Wiedemann's Fjord—Miki's Fjord (lat. 68°30'—68°05'). At any rate, although we had taken great pains to find beetles all the way from Cape Dalton, we only succeeded at Wiedemann's Fjord, where the two former species were taken under stones at a height of about 300 m on the northern side facing south and directly exposed to the rays of the sun.

The ground-beetle (*Bembidion grapei*) occurs in the southern part of West Greenland between latitudes 60 and 70 N., being however only of common occurrence in the southern part. On the east coast it had until now only been taken in the very southernmost area at Ikerasaussaq (60°02'), where two individuals were found under stones (NIELSEN). The northern boundary of this species is, beyond doubt, at Wiedemann's Fjord.

The weevil (*Otiorrhynchus arcticus*) is also known from the west coast, as far as lat. 65 N., being of most common occurrence in the southern

part. In East Greenland it was taken at Tasiussaq (lat. $65^{\circ}37'$), and like the form mentioned above, it seems to have its northern boundary at Wiedemann's Fjord, where it occurs rather commonly under stones.

It was not until in Miki's Fjord, when digging in the thick layer of earth, which contained the ruins of Eskimo houses, that we found the small pill-beetle (*Byrrhus fasciatus*). In West Greenland this species has a southern distribution, and its northern boundary seems to fall between lat. 69° and 70° ; it is of most common occurrence in the south, rarer in the north. In East Greenland it had hitherto been taken at Tasiussaq and Smalsund (lat. $65^{\circ}37'$ and $65^{\circ}59'$), but the more recent finds prove that this form, at any rate, extends as far as lat. $68^{\circ}05'$.

Besides the 3 *Coleoptera* species mentioned above, there are a few more on the east coast, viz. the Staphylinid species: *Micralymma brevilingue* SCHÖDTE and *Enicmus minutus* L, which are possibly also to be found on the Blosseville Coast; in any case, they have been taken both north and south of this locality. *Micralymma* appears to be common at Hekla Harbour (lat. $70^{\circ}27'$) and Smalsund (lat. $65^{\circ}59'$), where it lives under stones on the foreshore and is covered by water at flood-tide. As already mentioned, conditions for animals living on the shore are not particularly favourable along the Blosseville Coast.

Only two specimens of *Enicmus* were taken in East Greenland, viz. in Hekla Harbour and Tasiussaq respectively, but it is not uncommon in southwestern Greenland.

Butterflies have already been dealt with in the preceding pages; they all belong to the northern group.

As far as *Noctuidæ* are concerned, the distribution of their various forms are not particularly well-known in East Greenland. This first and foremost applies to the 4 species, which have already been mentioned as having for the first time been identified on the east coast, viz. *Agrotis westermanni* STAUD., *Hadena sommeri* LEFEB., *Plusia gamma* L. and *Plusia interrogationis* L.

Agrotis westermanni was taken in one specimen, on August 6th, in Miki's Fjord. It is extremely rare in Greenland, being with this exception only represented by two finds from West Greenland, one from the southern part, Igaliko Fjord, and one without date and without locality from older times.

Also *Hadena sommeri* was first found at Miki's Fjord. Only one specimen was taken, being before then observed fluttering across a layer of sand and gravel near the shore. This *noctua* had been taken in West Greenland between lat. $60^{\circ}43'$ and $68^{\circ}47'$.

Plusia gamma was hitherto only represented by a few specimens taken in southern West Greenland, Igaliko Fjord and Kvane Fjord (lat. $60^{\circ}49'$ — 62°). Now it was taken on the east coast as far north as

Wiedemann's Fjord and Miki's Fjord. In the former locality it was, as mentioned above, of rather common occurrence at a level of 300—400 m.

Plusia interrogationis is only represented by one specimen, taken at Søkongen's Bay near Cape Daussy, and also from the west coast it is very sparsely represented, the few specimens being taken in the southernmost part, lat. $60^{\circ}43'$ — $61^{\circ}41'$. Northeast Greenland north of Scoresby Sound is now so carefully investigated that it must be regarded as unlikely that the forms mentioned here can have been overlooked, so there is hardly any doubt that what we have recorded must be their northern boundary.

Closely connected with these forms are a number of Lepidoptera, viz. *Hadena exulis* LEFEB., *Eupithecia gelidata* MÖSCHL., *Botys torvalis* MÖSCHL., *Pempelia fusca* Hw., and *Plutella seniella* ZETT., which on the east coast had formerly only been known north of the Blossville Coast, but which we now found represented also on this coast, where we identified their hitherto known southern boundary. As these forms on the west coast have a pronounced southerly distribution, this must also be presumed to be the case on the east coast.

Hadena exulis, which was hitherto only known on the east coast in a few specimens, taken on the stretch lat. $70^{\circ}25'$ — $74^{\circ}15'$, was now taken at Miki's Fjord (lat. $68^{\circ}05'$). On the west coast it is known from the most southerly parts as far north as Upernavik (lat. $72^{\circ}47'$).

Eupithecia gelidata was hitherto only known on the east coast from Hekla Harbour (lat. $70^{\circ}27'$) and Gaaseland (lat. $70^{\circ}05'$), but now it was taken at d'Aunay Bay, July 15th, and Wiedemann's Fjord, July 26th. From West Greenland the species is known from $60^{\circ}43'$ to $68^{\circ}10'$.

Botys torvalis was known from large areas of East Greenland (lat. $70^{\circ}27'$ — $76^{\circ}46'$). A couple of specimens were now taken at Barclay Bay, July 14th, which thus marks the most southerly locality hitherto known. On the west coast, however, the species extends as far south as lat. $62^{\circ}40'$ from lat. $76^{\circ}06'$.

Pempelia (Salebria) fusca was hitherto only known on the east coast along the distance lat. $68^{\circ}24'$ — $70^{\circ}30'$, but now it was taken at Søkongen's Bay (Cape Daussy) lat. $68^{\circ}42'$. On the west coast it is known from lat. $60^{\circ}43'$ — $71^{\circ}15'$.

Plutella seniella. This small Tineid was hitherto only known from East Greenland in one specimen, found at Hekla Harbour (lat. $70^{\circ}27'$), but was now taken at Barclay Bay, July 14th, Søkongen's Bay, July 20th, and Wiedemann's Fjord, July 31st, its occurrence being thus established as far south as $68^{\circ}30'$. In West Greenland the species is only known from the regions farthest south (lat. $60^{\circ}53'$ — $61^{\circ}13'$).

The Hemiptera-species: *Nysius groenlandicus*, ZETT., and the 2 Acarina species: *Podothrombium bicolor* var. *curtipalpe* S. THOR and *Erythræus phalangioides* var. *gracilipes* KRAM. have a similar distribution.

Nysius groenlandicus was hitherto only known on the east coast from lat. $76^{\circ}46'$, where it had been taken by the Danmark-Expedition. It was now taken at Wiedemann's Fjord, where it was frequently seen running about on the open land in the sunshine, at a height of a couple of hundred metres. On the west coast it is only recorded from lat. $59^{\circ}55'$ to $70^{\circ}25'$.

Podothrombidium bicolor was hitherto only known on the east coast from Storm Cape (lat. $76^{\circ}14'$) and from Hekla Harbour (lat. $70^{\circ}27'$); now it was taken at Wiedemann's Fjord (July 31st). In West Greenland it is known from lat. $60^{\circ}07'$ — $69^{\circ}44'$.

Erythræus phalangioides was taken for the first time in East Greenland by the 2nd Scoresby Sound Expedition at Wiedemann's Fjord, but it has later been identified from Ella Island (lat. $72^{\circ}50'$) and Nord Fjord ($72^{\circ}40'$) (MARIE JØRGENSEN, 1934). On West Greenland it is known from lat. 61° — $70^{\circ}35'$.

It will be observed that the distribution boundaries of the species in the last mentioned group on the east coast are situated much farther north, but, as far as is known, not nearly so far towards the south, as is the case on the west coast. See the table below:

	West coast	East coast
<i>Hadena exulis</i>	60° — $72^{\circ}47'$	$68^{\circ}05'$ — $74^{\circ}15'$
<i>Eupithecia gelidata</i>	$60^{\circ}43'$ — $68^{\circ}10'$	$68^{\circ}30'$ — $70^{\circ}27'$
<i>Pempelia fusca</i>	$60^{\circ}43'$ — $71^{\circ}15'$	$68^{\circ}42'$ — $70^{\circ}30'$
<i>Plutella seniella</i>	$60^{\circ}53'$ — $61^{\circ}31'$	$68^{\circ}30'$ — $70^{\circ}27'$
<i>Nysius groenlandicus</i>	$59^{\circ}55'$ — $70^{\circ}25'$	$68^{\circ}30'$ — $76^{\circ}46'$
<i>Podothrombidium bicolor</i>	$60^{\circ}07'$ — $69^{\circ}44'$	$68^{\circ}30'$ — $76^{\circ}14'$
<i>Erythræus phalangioides</i>	61° — $70^{\circ}35'$	$68^{\circ}30'$ — $73^{\circ}40'$

Here we may also mention *Plusia gamma* which on the west coast was taken in lat. $60^{\circ}49'$ — 62° , on the east coast from $68^{\circ}0'$ to $68^{\circ}30'$, *Plusia interrogationis*, taken on the west coast at $60^{\circ}43'$ and on the east coast at $68^{\circ}45'$, and *Agrotis westermanni*, taken at $60^{\circ}49'$ on the west coast and at $68^{\circ}5'$ on the east coast.

It is difficult to give an explanation of this on the strength of our present knowledge, but considering the climatic conditions of the east coast it is to be presumed that the limit is set in the south by the amount and character of the precipitation, whereas the greater quantity of sunshine in the north makes it possible for the animals to spread.

We have hitherto only spoken of conditions ashore. Owing to the difficult natural conditions it was, as mentioned above, not until we reached the Kangerdlugssuaq area that we were able to investigate the waters more closely. From these investigations it seems to appear that

the marine animal life rather resembles that farther north. Regarding the mollusc fauna, for instance, THORSON writes (1934): "The mollusc fauna along the greater part of the coastal stretch (at least Kangerdlugssuaq and all the localities to the north of it) and its composition is closely allied with the fauna in the Scoresby Sound district and the more northerly Franz Joseph Fjord complex, whereas it rather deviates from the mollusc fauna at Angmagssalik."

The animal communities, however, seem to have another composition than those farther north. Upon the whole it must be said, as also appears from the relatively great number of species new to East-Greenland, which were found in the course of the 2nd Scoresby Sound Expedition, that the life of marine animals along the east coast of Greenland and, more particularly, south of the area investigated is at present too little known to permit of the laying down of zoogeographical boundaries.

HEDING (1935) is of the opinion, on the strength of his investigations of Echinoderms, that the animal life in Miki's Fjord "differs rather much from conditions in Kangerdlugssuaq in being more pronouncedly arctic".

It was not until we had reached a little north of Angmagssalik that we observed a more pronounced boundary, at any rate regarding the littoral fauna, and here we found for the first time such species as *Mytilus edulis*, *Littorina rudis* and *Balanus balanoides*.

Neither do the marine mammals living along this coast point towards boundaries of distribution in the sea, coinciding with those identified on land. Everywhere along the coast we saw ringed seals (*Phoca hispida* SCHREB.) which lay scattered on the ice or frequently dived out of the water, looking with great curiosity at the strange guests. In all the places where we got ashore, we also found the bleached bones of this species, which thus, beyond doubt, occurs all along the coast.

These remains were often found at a great distance from the sea and at a height of several hundred metres. Mr. WAGER, the English geologist of the expedition, even found them on a peak 1000 metres in height. I suppose they had been dragged there by polar foxes, but particularly by ravens. It is to be supposed that the bones found there are of seals which have been caught by polar bears, foxes and ravens having afterwards feasted on the remains. That the raven is omnivorous is a well-known fact, and that it also devours the remains of seal appears from the fact that front teeth of a ringed seal were found in the stomach of a raven, shot in Wiedemann's Fjord on July 28th. — This species of seal occurs along all the coasts of Greenland, even the most northerly.

The harp seal (*Phoca groenlandica* O. FABR.) was observed at Kangerdlugssuaq, where we spent the time from August 9th—August 21st. This seal occurred in rather large flocks, more than fifty individuals in each, very rarely singly or a few together, and it happened not infre-

quently that several flocks were observed from the vessel at the same time. Even in the interior of the fjord, at Notched Point, we observed on August 20th a flock of harp seals. It was not till later that we saw harp seals in Miki's Fjord.

The manner in which the harp seal swims around is most entertaining. As if at a word of command the whole flock emerges at once, swimming forwards in a broad frontline, all more or less in a row; only a few of them are somewhat ahead of the others. When the flock emerges, all the dark heads appear almost simultaneously, then the light-coloured necks, and most of the animals rise so high above the surface that the dark "saddle" on the side becomes visible. They shoot out of the sea with great speed in a oblique direction and then sink down again, while the water splashes around them, and in a moment the same performance is repeated. A few of the animals even move with such speed as to jump right out of the water in an elegant curve. In this manner they swim around on the surface for a minute or half a minute, and then, again as if at a word of command, they disappear simultaneously.

The food of these animals mostly consists of fish, but the fact that they also devour crustaceans in great quantities is illustrated by the contents of the stomach of a seal which we killed. It was practically lined with *Rhoda inermis* (KRÖYER), the same crustaceans which during the months of January and February constitute the food of the large finbacks in the Norwegian waters. These crustaceans are presumed to have lain so thick as to form a kind of pulp in the water, as the seals would otherwise not have been able to catch them in such quantities, and that they do not originate from fish devoured appears from the fact that the stomachs contained no such remains, and that all the crustaceans were well preserved, not at all digested.

That ringed seal as well as harp seal were also in former times commonly found along this coast is shown by the frequent occurrence of the bones of these animals in house ruins and kitchen middens from early Eskimo settlements.

At the present day the harp seal does not seem to occur farther north than Scoresby Sound. However, a few bones of this seal which must then, at any rate in former times, have lived so far north are known through archæological excavations from the King Oscar Fjord region and Clavering Island.

While speaking of small seals we may mention that harbour seal (*Phoca vitulina* L.) has *not* been met with in the area investigated, neither observed alive while the expedition-vessel cruised along the coast, nor traced in the material of bones from earlier Eskimo settlements. Its area of distribution is farther south; on the east coast it occurs off Angmagssalik, on the west coast hardly farther north than Upernavik.

The bearded seal (*Erignathus barbatus* O. FABR.) was seen in isolated specimens along the coast. Not until in Miki's Fjord and Kangerdlugssuaq did it occur with any frequency, either singly or in pairs, often quite close to the coast or among the floes of ice out in the fjord.

Only in the Kangerdlugssuaq area did we observe specimens of walrus (*Odobenus rosmarus* L.), lying singly on small floes of ice.

In Kangerdlugssuaq we saw flocks of narwhal (*Monodon monoceros* L.), and in the Angmagssalik Fjord, between Cape Dan and Kûngmiut (September, 6th) a small flock of fin whales consisting of six individuals.

The marine mammals thus seem to show a more "northern" tendency. On the other hand, attention should be called to the fact, that *Phoca groenlandica* at the present time does not occur farther north than Scoresby Sound and *Phoca vitulina* not reaching farther north than Angmagssalik.

From this summary it will appear that the species belonging to several animal groups, viz. land mammals, butterflies and beetles, with one exception, have their boundaries of distribution on East Greenland passing through the Blosseville Coast. In the case of land mammals and butterflies these boundaries are southerly, in the case of beetles and the only known land snail *Vitrina angilicæ*, northerly. But also in other groups, distributed north and south of this coast, there are several species, whose boundaries of distribution pass through the Blosseville Coast, in particular in the neighbourhood of Wiedemann's Fjord (lat. 68°30').

Similar boundaries are even more pronounced in the case of the vegetation, as has already been proved by TYGE BÖCHER, in his publication (1933 a and 1933 b). BÖCHER sums up his results in the following way (1933 a p. 63): "These species are distributed within the area in such a manner that by computing the floristic decline in a northerly and southerly direction one arrives at the result that there is a pronounced floristic boundary on Blosseville's Coast in about 68°43'—68°48'."

It seems as if most of the zoogeographical boundaries are somewhat more southerly than the phytogeographical ones, though at the present time nothing can be said for certain. It is possible that future investigations can shift these boundaries somewhat, but it is a fact that the Blosseville Coast contains a number of important zoogeographical and phytogeographical boundaries.

Some Remarks on the History of Migration.

With regard to the geographical situation of Greenland, according to which this country towards northwest is only divided from arctic North-America by narrow and frequently ice-covered straits (Robeson Channel, Kennedy Channel and Smith Sound), whereas towards east it is divided from Europe by broad seas, it seems rather a foregone conclusion that the land and freshwater fauna of Greenland must in the

main be of American origin. This view is also set forth by AD. S. JENSEN, the last writer who has given a complete survey of this subject. According to him only a few of the lower, most hardy animal forms can possibly be of preglacial origin and have survived the glacial period in those parts of the country which rose above the inland ice. In this connection no attention can be paid to the animal forms which have been imported by man, more particularly the Norsemen, who from 980, for a few centuries, inhabited southern West Greenland. In AD. S. JENSEN's opinion this concerned a rather considerable number of species.

AD. S. JENSEN is thus inclined to hold the view which was formerly set forth by K. STEPHENSEN (1921), and he is also in agreement with the botanist C. H. OSTENFELD, who in his treatise from 1928 maintains that also the flowering plants of Greenland are chiefly of American origin.

Other authors, however, hold a different opinion, such as J. C. NIELSEN (1907) and HENRIKSEN and LUNDBECK (1918), who maintain that the Greenland insect fauna for the greater part is of European origin. Of recent years they have been supported in this by the Swedish scientist LINDROTH (1931), who on the strength of exhaustive investigations of the insects of Iceland has arrived at the result that the insect fauna of this island is of a pronouncedly European origin, having probably migrated there by an interglacial land-bridge and then survived the last glacial epoch in Iceland in non-glaciated areas. Towards west this European-Icelandic land-connection must be supposed to have extended to Greenland, and it is a matter of course that in the estimation of the value of such a land-bridge to the migration of the Greenland fauna, conditions on the Blosseville Coast, the land nearest to Iceland and that to which the hypothetical land-bridge extended, must be of special interest.

In the course of the 2nd Scoresby Sound Expedition such animal forms — and for that matter plant forms — were brought to light that there is reason for a renewed discussion of the problem of the origin of the land fauna of Greenland.

There can hardly be any doubt that many forms i. a. most land mammals — several of which have probably only migrated to Greenland at a very late period — originate from America. This is borne out by several facts. Compared with that of North-America the land mammals fauna of Greenland is rather poor, consisting, as already mentioned, of 8 species. Particularly with regard to South Greenland, the natural conditions must be said to be of such a character that means of subsistence are at hand for more species than occur there. The explanation of this non-occurrence is that the migration road for land animals lay across Northwest Greenland, over the narrow sounds already mentioned, and that only the species which have survived this process of selection have got through. Several American species of mammals which rather favour the

cold and could undoubtedly live in Greenland, such as *Gulo*, *Lemmus* and *Citellus*, have after the glacial epoch been unable to spread so far north and have therefore not reached Greenland (DEGERBØL 1935).

In this connection it should be remembered that none of the Greenland land mammals surmount the hardships of the season by hibernating, but are in full strength throughout the winter; thus, they also have possibilities of distribution, when rivers and waters, which are otherwise obstacles in the way of migration, are covered by ice. As to the above-mentioned 3 American species one of them, *Citellus parryi*, hibernates.

The conditions under which the distribution of certain species takes place at the present time are also of such a kind as directly to suggest their having migrated from northwest. Musk-ox, collared lemming, wolf and ermine only occur along the north and the northeastern coast; the boundaries of their distribution have already been dealt with, as also the fact that their existence is partly climatically determined. All of these forms, as also polar hare and polar fox, have their nearest relatives in North America, in which respect the reindeer forms an exception. On the other hand, attention should be called to the fact that, with the exception of the polar fox, these species are lacking in Iceland, which they must have passed, if they had come to Greenland across an interglacial Icelandic-Faroe land-bridge from Europe, nor have they in all probability been able to survive a glacial period in Greenland. The occurrence of the polar fox in Iceland is undoubtedly due to the fact that it has been carried there with the drift-ice from East Greenland.

Add to this that one species, the polar wolf, for historical reasons must be presumed to have migrated to East Greenland in quite recent years. In this connection it may also be mentioned that the Eskimos, the present native inhabitants of Greenland, are known to have come from America along this northwestern route of migration about the year 1000 (TH. MATHIASSEN 1936). It is now ascertained that they spread from here, both along the west coast round the southern point of Greenland to the east coast, north of Scoresby Sound, and along the north coast to the same region where the two currents of migration then met.

The musk-ox also has been regarded as having immigrated into Greenland, at any rate along the east coast, at a very late date. The argument for this is that neither WM. SCORESBY nor his son saw musk-oxen, living or dead, when in 1822 they investigated the country round the fjord named after them. This was also the case, when in the following year Sabine and Clavering passed the country farther north, round Sabine and Clavering Island, where no traces whatsoever of musk-oxen were found. The first time that living musk-oxen were observed on the east coast of Greenland, was when in 1869 this coast was visited by the Germania-Expedition under the leadership of KOLDEWEY, while on the

other hand the Danish expedition under RYDER (1891) and the Swedish one under NATHORST (1899) observed a considerable number of musk-oxen in the Scoresby Sound and Franz Joseph Fjord area. This led NATHORST to set forth the hypothesis that, at any rate south of lat. 75°, the immigration of musk-oxen had taken place after 1822—23.

Nevertheless the excavations of Eskimo house ruins undertaken by HELGE LARSEN in Clavering Island brought to light some skeleton parts of musk-oxen, which were discovered in one of the oldest houses dating from about 1600, and the conditions under which they were found were of such a nature as to exclude the possibility of later intermixture. This find then seems to prove that the musk-ox, at any rate, reached Clavering Island about 1600, but the comparatively small number of bones might seem to suggest that the animal was of rather rare occurrence. Also the fact that the East Greenland musk-ox belongs to a special race, *Ovibos moschatus wardi* LYD., points towards its occurrence in East Greenland as dating rather far back. In the North-American islands the *wardi*-form seems to intergrade with that belonging to the American Continent, *Ovibos moschatus moschatus* ZIMM., which shows the American origin of the Greenland musk-ox (DEGERBØL 1935, p. 60).

Neither was the polar wolf discovered by the above-mentioned first explorers of East Greenland, the elder and younger SCORESBY, CLAVERING and SABINE, and not even the Germania-Expedition, which spent the winter 1869—70 along this coast, saw any traces of this animal. Its occurrence on the east coast was first ascertained by the Nathorst-Expedition 1899, but already in the winter 1868—69 two white wolves were observed on the west coast near the outpost Igdlorssuit in the northwestern district of Umanak, which proves that the animal had before then strayed across to Greenland. One of these two wolves was shot, and its skin and skeleton are now to be found in the Zoological Museum of Copenhagen, being the only specimen which up to the present has been killed on the west coast.

Also the Greenland collared lemming (*Dicrostonyx groenlandicus groenlandicus* TRAILL) is closely associated with America, which appears from the fact that on the Melville Peninsula it intergrades with the American form, *Dicrostonyx groenlandicus richardsoni* MERR. (DEGERBØL 1935 p. 16).

The ermine undoubtedly followed the trail of the collared lemming, its existence evidently being dependent upon that of the latter animal.

There are two subspecies of Greenland polar hare, the North Greenland one, *Lepus arcticus groenlandicus* RHOADS which occurs on the east coast as far as Cape Daussy, and from there spreads to the northern part of the west coast, the region round Disco Bay, and the South Greenland *Lepus arcticus porsildi* NELSON, which intergrades with

the North Greenland subspecies. *Lepus arcticus groenlandicus* which is distinguished from other living hares by having protruding (proodont) upper front teeth, also occurs on Ellesmere Land and the adjacent islands and intergrades towards south, on the American Continent, with *Lepus arcticus arcticus* Ross, which has normal (orthodont) upper front teeth. The latter form is only slightly distinguished from *Lepus arcticus por-sildi*, but the gradual transition of this subspecies to *Lepus arcticus groenlandicus* shows that it has not directly immigrated into Greenland across the Davis Strait, quite apart from the fact that the width of the strait and other natural conditions would seem to disprove an immigration of this kind. Thus also the Greenland hares have come there from America, along the North Greenland immigration route (DEGERBØL and WIMPFEN BRÆSTRUP 1934).

The polar foxes of Greenland, are like the hares, closely associated with those of America. Across Smith Sound there is a constant migration of polar foxes from the American side to Greenland (P. FREUCHEN 1935, p. 124).

It appears from these facts, and not least from recent investigations of the geographical variation of the animals, that most of the land mammals *Ovibos*, *Canis lupus*, *Alopex*, *Mustela*, *Dicrostonyx* and *Lepus* must have immigrated into Greenland from America.

It is somewhat more difficult to arrive at a satisfactory solution of the problem regarding the reindeer (*Rangifer tarandus*). According to JACOBI's great monograph (1931), the latest disquisition on the subject, the Greenland reindeer belong to the European species, being only classed as a special subspecies *Rangifer tarandus groenlandicus* Gm. because of its lighter winter skin.

The reindeer living in Europe during and immediately after the Ice-Age, was in the opinion of several writers the Barren Ground Caribou (*Rangifer arcticus* RICH.). In explanation of this JACOBI quotes the theory of WEGENER, according to which North America and Europe were continuous areas, as late as the Ice-Age. In the late-glacial period when the climate grew warmer, *Rangifer arcticus* became extinct in Europe, from which it was now unable to emigrate owing to the changes in the distribution of land and water; towards the west the Atlantic had formed, in the north a strait extended across Central Sweden, and in the east there was a belt of inland seas, from the Ponto Caspian depression in the south, to the transgression of the Polar Sea towards north.

It was not until this eastern obstacle to distribution vanished that the second species, *Rangifer tarandus*, was able to emigrate from Siberia in the east. It spread all over northern Europe and as far as Greenland, in the case of the latter area following a northeastern route. "Als solcher brauchen keine Landbrücken erdacht zu werden, die eigens quer durch

den damaligen Ozean nach jenen Polarländern geführt hätten, vielmehr gibt auch hier die WEGENER'sche Theorie mit ihrem einheitlichen Bilde der damaligen Festländer die Antwort. Sie benutzt jene weit unter dem heutigen Meeresspiegel vorgeschobenen Kontinentalsockel oder Schelfe, um wahrscheinlich zu machen, dass der Zusammenhang zwischen den polnahen Küsten von Nordeuropa, Spitzbergen und Ostgrönland noch lange nach der Eiszeit bestanden hat, weil die Aufreissung des Atlantik erst ganz allmählich von Süden nach Norden erfolgt ist. "Zwischen Scoresbysund und Hammerfest sind 1300 km, zwischen den Schelfrändern von Nordostgrönland und Spitzbergen wohl nur etwa 2—300 km (WEGENER)". — Hiernach würde der Überwanderung des Rentiers über die jetzige europäische Eismeerküste hinaus eine zusammenhängende Fläche Festland zur Verfügung gestanden haben." (JACOBI, p. 144.)

The occurrence on Ellesmere Land of a deviating species, *Rangifer pearyi* ALLEN, which is distinguished from the rest by its small stature and its almost entirely white skin is another fact pointing in the direction of the Greenland reindeer *not* being of American origin. This species occurs as a kind of stop on the route of migration between America and Greenland, and shows the difference between *Rangifer arcticus* in the western areas and *Rangifer tarandus* in Greenland.

Regarding the birds whose existence has been proved on the Blosseville Coast, there are species with a circumpolar as well as with an easterly and westerly distribution. As examples of a pronouncedly eastern form may be mentioned: pinkfootedgoose (*Anser brachyrhynchus* BAILL) which breed in Spitzbergen and Iceland; but also other forms, such as *Somateria mollissima islandica* BREHM, *Arenaria interpres* (L), *Calidris alpina arctica* (SCHIÖLER) and *Phalaropus lobatus* L are eastern species or subspecies.

According to the most recent investigations undertaken by FINN SALOMONSEN (1936) the western forms are represented e. g. by *Lagopus mutus rupestris* (GMELIN). This ptarmigan occurs along the east coast of Greenland, in the north as far as about lat. 68°, throughout West Greenland and in large areas of northern America (Ellesmere Land, Baffin Land, Labrador, Barren Ground and in the west as far as British Columbia). *Lagopus mutus captus* PETERS occurs north of the above-mentioned boundary on the east coast, and is restricted to Northeast Greenland. "No doubt the Spitzbergen ptarmigan originates from Northeast Greenland, just as probably also the Icelandic form (*islandorum*) has emigrated from Southeast Greenland" (FINN SALOMONSEN 1936, p. 33). Also the Greenland raven (*Corvus corax principalis* RIDG.) is the American subspecies.

As it is comparatively easy for birds to range about widely, these conditions of distribution are perhaps not of such great importance to

the understanding of the route of migration, the ptarmigan in this connection being perhaps the most important. They do not normally fly across large water areas, as is shown by the actual occurrence of two different races in Iceland and East Greenland respectively.

The insects which are of importance towards the understanding of the history of immigration are, more particularly, such forms as e. g. the beetles, which move rather slowly and are more or less earth-bound, and whose distribution in other geographical areas is comparatively well known. On the Blosseville Coast there were, as mentioned above, 3 species of beetles, viz. *Otiorrhynchus arcticus*, *Bembidion grapei* and *Byrrhus fasciatus*.

The most interesting of these is the *Otiorrhynchus*. As this small weevil cannot fly, it is very surprising to find it as high up as on the Blosseville Coast near Wiedemann's Fjord (lat. 68°30').

Otiorrhynchus arcticus is by AD. S. JENSEN (1928, p. 15) classed with a group of animals "which only occur in southwestern Greenland, in the regions where the Norsemen settled in former times, the same species also being found in Iceland", and therefore he is of the opinion that these insects have been imported by human agency into Greenland.

As this beetle now has been found so far to the north this theory must undoubtedly be abandoned.

How then it is to be explained that this animal, which is unable to fly, occurs in an area so difficult of access, one might nearly say isolated as the Blosseville Coast?

Otiorrhynchus arcticus is otherwise only known from Europe, from the Alps and the mountains of Central Europe, as well as from the coast regions of western Europe, towards the north as far as Kola and Kanin, and besides it is known from the Faroes and Iceland. In the latter place it is one of the most commonly occurring insects, being distributed all over the island and belonging to its character animals. It is found in all the types or formations of landscape and vegetation, which are set up by LINDROTH, from the very surface of the sea to high-alpine heaths, even so high up in the mountains as the occurrence of insects has been proved (c: < 615 m above sea-level), and above 500 metres it is the only constantly occurring species.

This adaptability to all kinds of countries and temperatures must be regarded as the explanation, why this apterous insect has also been able to live on the inclement Blosseville Coast and this naturally applies to all the boreo-arctic species, which occur both on this coast and in Iceland. Only the Icelandic species, which have a wide oecological amplitude, have been able to live under the extreme conditions on the Blosseville Coast.

Also on the Faroes *Otiorrhynchus arcticus* belongs to the most commonly occurring insects.

Here then we have a species which is of rather common occurrence on the Blosseville Coast (Wiedemann's Fjord, Miki's Fjord) and also on Iceland, the Faroes, the Shetland Islands, and in Scotland and Norway, but which is unknown on the American side of the strait, and so we may regard this species as being of European origin.

As already mentioned, the new finds made on the Blosseville Coast decidedly give the impression that the species cannot have been imported there by man, and therefore a new explanation of the manner of immigration must be found. In my opinion these conditions decidedly point towards the existence of a former land-connection with Europe. It is along such an inter-glacial land-connection, passing where at present the North-Atlantic ridge is to be found that LINDROTH imagines this species to have come to Iceland, and there in an ice-free area to have survived the latest glacial period. From Iceland it must be presumed to have passed on, all the way to East Greenland, and to have survived there in the same manner. But has there been any possibility of such a survival during the latest glacial period in East Greenland? As shown by GELTING in his summary (1934, fig. 25) it has been possible to prove the existence of several areas, which must be presumed not to have been glaciated during the latest glacial period, i. a. at Scoresby Sound and Angmagssalik, and it is extremely likely that there have also been such areas on the Blosseville Coast¹).

It is a much discussed question what groups, whether of plants or animals, have been able to survive the latest Ice-Age in such ice-free areas in an otherwise glaciated country, and opinions vary greatly. The authors who most recently have written on this subject, *viz.* LINDROTH, BÖCHER and GELTING, are however of the opinion that comparatively many and comparatively highly developed species have been able to survive. Thus LINDROTH calculated that most of the insects of Iceland (apart from those which have been brought by man) have been able to survive the latest glacial period on this island, and GELTING (1934, p. 273) thinks that the same was more or less the case with the plants on the east coast of Greenland, where no less than about 60 per cent of the vegetation in the area between lat. 73°15'—76°20' must be supposed to have lived there during the latest period of glaciation. BÖCHER also takes it for granted that many plants on the Blosseville Coast have been able to survive the latest glacial period there.

¹) On inquiry Mr. L. WAGER writes about this problem (April 15th 1937): "There is evidence in Kangerdlugssuaq that the ice in the main fjord reached a height of 3000 ft above sea level and that the peaks stuck out above this. The actual level of the ice would naturally vary in different places but I regard it as certain that the tops of many of the coastal mountains were not covered by ice during the glacial maximum which half filled Kangerdlugssuaq. For a long period of time nunataks must have existed at Kangerdlugssuaq and along the adjacent coast."

After my experiences on the Blosseville Coast, where a comparatively abundant plant and animal life may be seen in the immediate vicinity of the Inland Ice, I have arrived at the same conclusion as the above-mentioned authors. The nearness of the Inland Ice does not exclude a plant and animal life, whereas the question of sunshine or the lack of it becomes of considerable importance.

Another possibility of explanation is connected with WEGENER's theory. According to this Greenland during the latest glacial period, was situated essentially farther east than now, whereas the approximate situation of the North Pole was that of the present-day Central Greenland (cf. fig. 36, in KÖPPEN und WEGENER, 1924). This being the case, the climate of East Greenland must at that time have been comparatively favourable, at any rate more favourable than in West Greenland, which lay nearer the Pole.

As far as the other beetles (*Bembidion grapei* and *Byrrhus fasciatus*) are concerned, they are found both on the American side and in Europe, and both also occur in Iceland.

A somewhat similar case as *Otiorrhynchus arcticus* is that of the scale insect *Orthezia cataphracta* OLAFS. which is also unable to fly and leads an extremely earth-bound existence on the roots of various plants. It is a matter of course that such an animal moves with excessive slowness, and that it must have taken enormous ages for it to spread over the Blosseville Coast, where it was found to be of common occurrence at Wiedemann's Fjord (lat. 68°30'). In Greenland this species has also a southern distribution. On the west coast it is found as far north as 70°, but it most frequently occurs towards south. On the east coast it extends as far as the most southern part (North Bræfjord, lat. 60°19'), but is besides known from Gaaseland, lat. 70°05'. Outside Greenland it is known from Iceland, the Faroes, Scotland, Norway and other parts of northern and western Europe, and also as an alpine species in Central Europe.

Most Greenland species of butterflies are to be found both in Europe and America, and these are not the least interesting, in that they emphasize the zoogeographical community, which exists between northern or northeastern America, Greenland and Europe, and suggests a closer connection between these areas in former times.

One species *Plutella seniella* ZETT. only occurs in Europe, viz. in Iceland, the Faroes, the British Isles, Scandinavia and the mountains of Central Europe, whereas a couple of species are of American origin, viz. *Agrotis westermanni* STAUD. and *Eupithecia gelidata* MÖSCHL., both of them being known from Labrador.

The distance between Labrador and Greenland is so great that it is difficult to imagine how the animals, under the now prevailing geographical conditions, should have been able to pass all the way across the sea, even though living insects have been observed to be carried far

out to sea, either having actually flown out or being blown there by the wind. Another explanation has been given by AD. S. JENSEN (1928, p. 14), according to whom the fact is possibly "that these butterflies in the warm (*Zirphæa*) period have reached farther north, having been carried across the narrow sounds to Greenland where they spread towards the south, and then later on becoming extinct farther north, when the cold period set in."

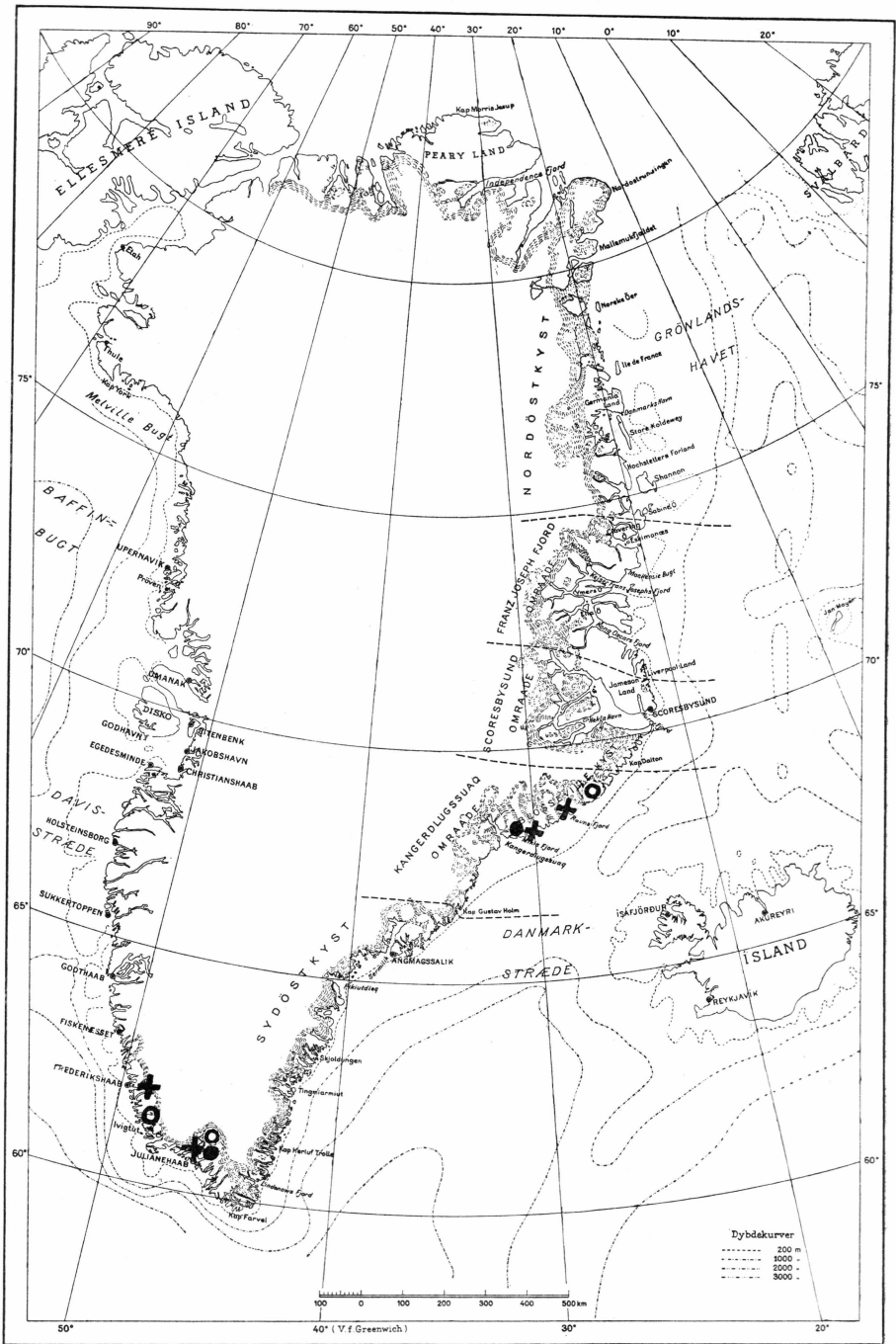
This explanation sounds very plausible, and the post-glacial warm period is also of importance in the estimation of the dicentric distribution of many of the formerly mentioned species, for instance *Lepidoptera*, which occur in southern West Greenland and on the Blossville Coast, but which, as far as is known, are lacking on the southern part of the east coast. Special importance must be attached to this warm period, if one shares the opinion of W. F. REINIG (1937) that there must have been a refuge in South Greenland during the glacial period. REINIG states his view in the following manner (p. 105): "Durch die Annahme einer Polverschiebung gelingt es auch, die Entstehung der grönländischen Mischfauna unserem Verständnis näher zu bringen. Im Süden dieser Insel kann sehr wohl noch gegen Ende des Diluvium, als die Kreisbewegung des Poles in Nordamerika ihren Abschluss fand, ein älteres Tundrenrefugium bestanden haben. In dieser Zeit des Heranrückens der letzten amerikanischen Vereisung, die allerdings wohl nur den höchsten Norden dieses Kontinents betroffen haben dürfte, fanden auf dem amerikanischen Kontinent Abwanderungen der Tundra nach Osten und Süden statt. Dabei werden vermutlich Teile der amerikanischen Tundra nach Grönland abgedrängt worden sein, so dass die grönländische Tundra ausser holarktischen Bestandteilen spezifisch nordamerikanische hinzu erhielt."

It is, however, perhaps more likely that these dicentric species must be regarded as interglacial survivors (Fig. 1).

In conclusion, mention should only be made of *Vitrina angelicæ*, which outside Greenland is also known from Iceland, being thus a further example of the rather considerable number of animals which are to be found both in Iceland and in East Greenland.

It will appear from the above remarks that the East Greenland fauna is of a rather mixed character. No inconsiderable number of species are in common both with Europe and America, and this strongly emphasizes the zoogeographical community existing between these two areas, which therefore already at an early date have been joined into a common zoogeographical area: Holarctis.

It seems that more mobile forms, such as land mammals and possibly butterflies, have immigrated into Greenland at a comparatively late post-glacial period, when the distribution of land and sea was as at the present time; in this case they must have come from arctic America.



The Distribution within Greenland of *Agrotis westermanni* (●),
Plusia gamma (+) and *Plusia interrogationis* (○).

It is true, that there must be very cogent reasons for supposing the existence, in former times, of another land-connection than the present one, be it in the shape of a vanished land-bridge or other connection — possibly, according to WEGENER's theory of the shifting of the Continent, connected with a movement of the Pole. The early Norse settlers who carried with them domestic animals, provender and possibly even soil from their own country have, beyond doubt, imported a great number of insects into Greenland, but this cannot account for such forms as have now been proved to occur on the almost inaccessible Blossesville Coast. On this coast forms occur, for instance, the wingless *Otiorrhynchus arcticus* which must be presumed to spread very slowly, and which undoubtedly have lived here since a very early period. The occurrence of these forms, which are of European origin, cannot possibly be explained except by supposing an earlier and then probably interglacial land-connection with Europa.

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