MEDDELELSER OM GRØNLAND

UDGIVNE AF

KOMMISSIONEN FOR VIDENSKABELIGE UNDERSØGELSER I GRØNLAND

Bd. 150 · Nr. 6

DEN DANSKE THULE OG ELLESMERE LAND
EKSPEDITION 1939-41

Leader: James van Hauen

THE MARINE MAMMALS

AND THE MARINE FAUNA IN THE THULE DISTRICT (NORTHWEST GREENLAND) WITH OBSERVATIONS ON ICE CONDITIONS IN 1939-41

BY

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WITH 35 FIGURES IN THE TEXT

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1950

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PREFACE

"The Danish Thule- and Ellesmere Land Expedition" was sent out in 1939 by the expedition committee appointed for that purpose. With Dr. MAGNUS DEGERBØL (Zoological Museum) as president and leader the committee further consisted of the following members: Prof. Dr. R. SPÄRCK (Zoological Museum), Dr. O. HAGERUP (Botanical Museum) and Prof. CHR. POULSEN (Mineralogical Museum). The purpose of the expedition was to carry out zoological, botanical and geological investigations of the northern Thule district in Greenland and Ellesmere Island in arctic Canada, to such an extent as permitted by the working conditions.

The expedition left Copenhagen on June 24th 1939 with Mr. JAMES VAN HAUEN as the practical leader, accompanied by the scientists cand. mag. G. THORLAKSSON (botanist), mag. scient. JOH. TROELSEN (geologist), mag. scient. CHR. VIBE (zoologist) and film photographer NIELS CHR. RASMUSSEN. According to the original plan Marshall Bugt on Inglefield Land had been chosen for head basis, but as the ice in the summer of 1939 prevented the ship from getting there, the head quarters were placed at the Eskimo settlement Neqe in Murchison Sund, whence journeys were made in the summer from open motor boat in the Inglefield area, and in the winter and spring travels were undertaken northwards to Inglefield Land and Washington Land in Greenland and Ellesmere Island and Axel Heiberg's Land in Arctic Canada. According to plan the expedition was to last for one year, but on account of the War it came to last for two years as far as TROELSEN, RASMUSSEN and the present author were concerned. These three members only got back to Denmark after the end of the War.

Among the many persons who both during the preparations and the expedition work proper and in preparing the present paper have rendered me invaluable help, I wish in the first place to extend my sincerest thanks to Dr. MAGNUS DEGERBØL, to Prof. R. SPÄRCK, to the practical leader of the Expedition and to the rest of the members, as well as to "Grønlands Styrelse", to the manager HANS NIELSEN of Thule and to our Eskimo travelling companions. In the determination and

verification of the different animal groups a number of specialists of the Zoological Museum of Copenhagen have willingly given me invaluable help and support, thus the late Dr. K. STEPHENSEN as regards the *Crustacea*, Dr. G. THORSON for the *Mollusca*, mag. scient. Mrs. E. WESENBERG-LUND for the *Polychæta*, mag. scient. J. R. PFAFF for the *Pisces*, and mag. scient. F. JENSENIUS MADSEN for the *Echinodermata*. The translation into English was done by Mrs. AGNETE VOLSØE. For this valuable help I beg all the above mentioned specialists to accept my most cordial thanks. Maps and diagrams are drawn by GRETE VIBE.

Last but not least I wish to thank Carlsbergfondet and Thuborgfondet for waluable financial help during the working out of the collected material.

INTRODUCTION

An investigation on the biology of the marine mammals in Greenland has long been wanted, for which reason it became one of my tasks as the zoologist of the expedition to initiate a preliminary investigation in this field in the Thule district. The marine mammals were previously the only basis of existence of the Eskimoes, but after the civilization has introduced modern weapons to Greenland and the number of the native population has advanced considerably, the marine mammals have receded to a very great extent in the last decades, so that the majority of the south and north Greenland population has been compelled to seek new trades within sheep farming and fishery.

At present seal hunting is however still the principal trade of a great part of the population in north western Greenland, notably in the Thule district. This district at present is inhabited by about 300 people, to all of whom this trade is the sole possibility of maintenance. The district is still rich in Seals, Walruses, White Whales and Narwhals, and there is no immediate danger that the stock will be reduced in the near future.

In the following the different species of marine mammals will be discussed separately. Special stress has been laid on the investigation on the nutrition biology of the Walrus in correlation with a qualitative and quantitative examination of the bottom fauna of the feeding banks. For the sea bottom investigations I had at my disposal a small open motor boat. The gear used was the C. G. Johs. Petersen grab, the Petersen grab, which in each sample took $^1/_{10}$ sq.m of the sea bottom with the animals occurring there. The procedure was the same as that described in my previous paper: "Preliminary investigations on shallow water animal communities in the Upernavik- and Thule-districts" in Meddelelser om Grønland vol. 124, no. 2.

The sea bottom investigations were commenced at once on our arrival in the middle of August to the wintering quarters Neqe, which is situated in the most important Walrus area of the district. These investigations were continued in the winter from the ice and concluded early in spring, before the long sledge journeys began. In February-

March the great Walrus catches took place from the ice edge out on the banks, where the walruses were caught, when they came up to the surface to breathe during the foraging. Then their stomachs were always filled, and they could easily be secured. At the same time Bearded Seal and occasionally Ringed Seal were hunted. In this case it was also important to be present during the hunting in order to secure material for the investigation.

Towards the end of March the expedition left the winter quarters, and the sledge journeys to Inglefield Land and Ellesmere Land began and were concluded at the end of May. Everywhere observations were made to elucidate the living conditions and northern distribution of the marine mammals.

When we returned from these travels we received information of the occupation of Denmark by the invasion of the German troops on April 9th 1940, a communication which made it necessary immediately to travel to Thule to orientate ourselves with regard to the new situation which had arisen for the expedition. Therefore further planned marine biological investigations had to be stopped temporarily, and when during another wintering at Neqe in 1940—41 they could be resumed it could only be to a limited extent owing to lack of petrol for the motor boat. I therefore embarked on other zoological problems which could be solved with smaller means, notably freshwater biology and the land fauna.

Altogether, it must however be said that the material brought home has proved sufficient to throw some light on the nutrition biology of the marine mammals in this northern area, and all the observations in connection with the records of the Polar Eskimoes of their game animals essentially contribute to complete the more scientific investigations.

The present paper also contains a list of the animals of the marine invertebrate fauna brought home, of which several species are new to the district and some of these new to Greenland, both to the polar and the boreal areas. It cannot be decided yet if these discoveries are due to new immigration or lack of sufficient investigations, but there are at any rate many indications of a thorough change of the climate which may create possibilities for immigration of more southern species and which at the same time force typical higharctic species farther north. The winter climate has become more unsettled, the ice often breaks throughout the winter and becomes fast later. This circumstance also seems to manifest itself in the littoral zone, in which a typical species like the Common Mussel (*Mytilus edulis*) has now also been found north of Melville Bugt.

Since the travels to Inglefield Land and Washington Land in Greenland and to Ellesmere Land and Axel Heibergs Land in Arctic Canada were undertaken in the winter months March—May, there was only

slight occasion to make marine investigations, but a few species were nevertheless brought home from here, taken with dredge through cracks in the ice or with plankton nets through the breathing holes of the seals. The greater part of entire Arctic Canada and the whole north coast of Greenland are still completely unknown in a marine biological respect.

The investigations on the land mammals, birds, insects and freshwater biology in the same areas will be published in later papers of "Meddelelser om Grønland".

Observations on ice conditions.

The change of the climate which in the last thirty years has manifested itself along West Greenland, and even throughout the polar area, has also been noticeable in the Thule district, and has influenced the daily life of the Polar Eskimoes. Before 1864, when the last immigration took place from Baffin Land, the kayak was not known. Its use had simply been forgotten. The sledge was the only means of conveyance and the sea ice the road of communication, and in the summer the Eskimoes subsisted on the bird cliffs. All hunting of marine animals could only take place in the winter months, when the ice was safer, and passable farther out from the coasts than is the case in our days.

The Carey Øer which in the present time are situated about 50 km outside the winter ice limit and are no longer visited by the Polar Eskimoes, were previously inhabited by Eskimoes, whose fox traps and tent rings are still found out there. Probably these islands previously had connection with land across the sea ice, but it is so long ago that the now living Polar Eskimoes no longer have any tradition hereof. The ice never becomes fast so far out at sea.

About thirty years ago the settlements between Neqe and Kap Alexander: Igdlorssuaq, Pitorâvik and Serfalik were frequently inhabited in winter, likewise the islands Northumberland Ø and Saunders Ø, but now the ice-breaking which became more and more frequent throughout the winter has compelled the population to give up these settlements. Only at Neqe do they still hold out, but also here the late freezing and the frequent breaking up of the ice make the communication with the settlement Siorapaluk difficult, on whose shop the people are extremely dependent, so every year they speak about leaving this famous settlement which would then be frequently visited only in the spring months as a snow house camp so long as the Walrus hunting lasts.

Likewise the ice foot round Kap Alexander and Kap Parry was passable occasionally for sledge driving about 30 years ago. Now, on the other hand, all sledging must take place across the glaciers within

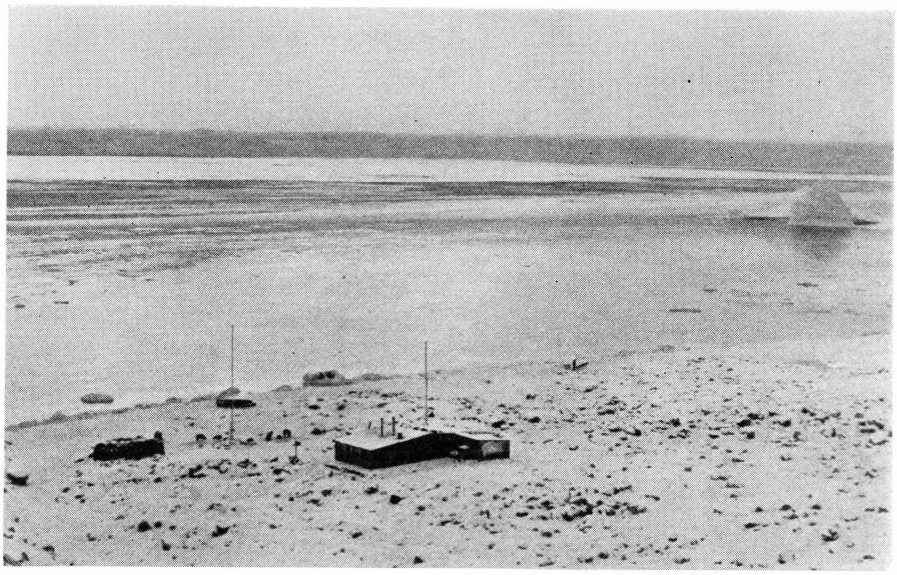


Fig. 1. The young ice is four days old and can now carry a man. In the background is seen the preceding ice cover which during a gale has drifted away from the coast. October 1939. In the foreground the headquarters of the expedition.

these two promontories. Outside Kap Alexander there will no longer be any fast ice, and only seldom outside Kap Parry. In the early spring of 1941 a single sledge however came round Kap Parry, but this is absolutely an exception.

In the following is given a survey of the ice conditions as we encountered them during our two winterings at Neqe in 1939—41.

The winter of 1939—40.

During the voyage in the beginning of August we met almost no ice, either in Melville Bugt or northwards to Kap Alexander. The schooner "Sværdfisken" without hindrances proceeded up to Kap Inglefield on Inglefield Land, but here ran into unimpenetrable drift ice, which made it impossible for us to reach Marshall Bugt that summer, for which reason we turned back and placed the head quarters of the expedition at Neqe. It is true that the ice in Kane Bassin had broken up, but unfavourable weather conditions had prevented it from drifting out, which frequently happens.

At Neqe we encountered the first young ice about the middle of October, but it did not become fast. It would spread rapidly again by the lightest wind, and not until November 11th could we travel by sledge across the interior of Neqe Fjord. The 15th November the ice

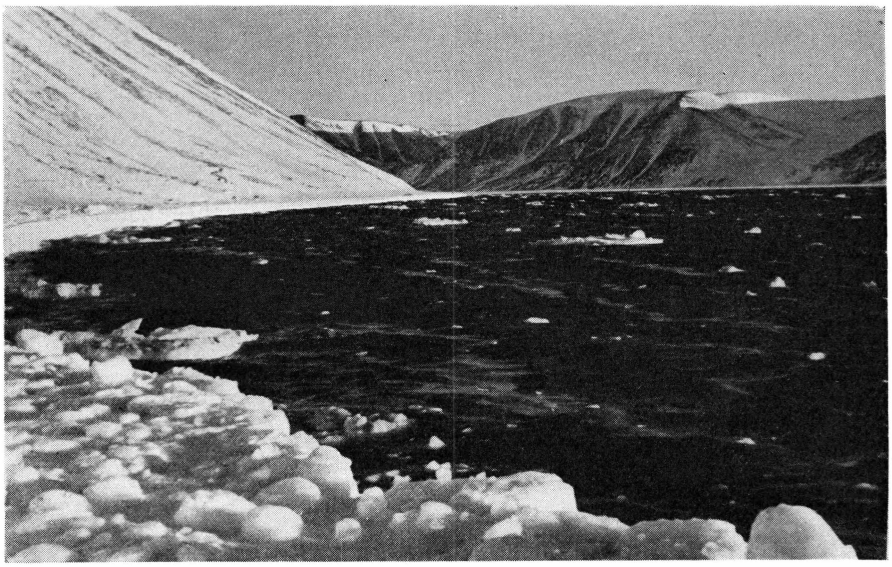


Fig. 2. After the ice has drifted away completely, the sea is now quite black. Along the coast the ice foot is left as a safe sledge road. February 28th 1940.

extended to the middle of the fjord—it became fast shortly after, broke up again, and not until December 7th could we go by sledge on sea ice round Tuloriak. A small distance outside the coast the open water however extended through Murchison Sund right to off Red Cliff and through Hvalsund right to Qânâq and Kangeq. Inside Qânâq the ice was passable across Inglefield Bredning from the end of November.

In the first days of January 1940 the ice broke up again during strong gales of long duration right to Red Cliff and Kangeq at the entrance to Olrik Fjord. It also broke up right to Thule in Wolstenholme Fjord, which had not happened at that season within the memory of man, despite the most heavy gales. At the same time the ice also broke at Kap York and Savigsivik.

New Ice rapidly formed, but it broke up again in the middle of January. On January 23rd we could for the first time go by sledge across Inglefield Bredning between Itivdleq and Qânâq, but at Neqe and Siorapaluk the ice again broke in the end of January, formed afresh, and again broke on 1st February, and only at that time was it fairly safe in Murchison Sund right out to the iceberg grounds, where the hunters a few days before the reappearance of the sun, the 14th February, could start on the first Walrus hunting of the winter.

But the ice was not yet safe. It broke up again during a gale on 21st February, became fast again, and then broke up on February 28th to into the middle of Neqe Fjord. Only after that time became the ice

fast right to the islands: Herberts Ø and Northumberland Ø with a fairly fast edge of ice from Kap Alexander to Agparssuit, while northwards and southwards it extended as indicated on the map: the limit for the maximum extension of the fast ice early in spring till the breaking sets in in the summer.

As the ice had become fast unusually late in the winter of 1939—40 it did not attain its maximum winter thickness and consequently broke earlier in the summer. At Neqe this happened as early as May 28th, at the head of Inglefield Bredning and Wolstenholme Fjord late in July.

The winter of 1940—41.

The summer of 1940 was poor in ice. There was open water far north, and a ship could easily have proceeded to Marshall Bugt on Inglefield Land. Probably Kane Bassin and the sounds to the north could also have been passed.

In the autumn the first formations of ice appeared at Neqe at the end of October, but not until November 5th could sledges cross the interior Neqe Fjord. A few days later the ice floated out, came back again and then disappeared on November 11th. Only on 23rd November could sledges drive on the sea ice across the head of the fjord, and the 27th November we could drive round Tuloriak. On November 28th the ice broke again at Neqe to the middle of the fjord. It became fast again in the first days of December, and then broke during heavy New Year gales in the first days of January. On January 10th the ice again became passable round Tuloriak and now covered a good distance outwards, but it broke again during a gale on January 20th. After that time it became fairly fast some distance out, but broke again at Tuloriak on February 22nd, whereupon it became fast out to the iceberg grounds and across to Northumberland Ø.

Explanation of map page 13.

Ice conditions north of Baffins Bugt.

Usually unbroken winter ice from October–November to June–July.

Extreme limit of winter ice, often broken during November–February, but usually unbroken from March to the middle of May.

Occasional drift ice, formed by broken land ice, moving southwards.

Banks with grounded icebergs.

Open water owing to currents early in spring, also often at new and full moon throughout the winter.

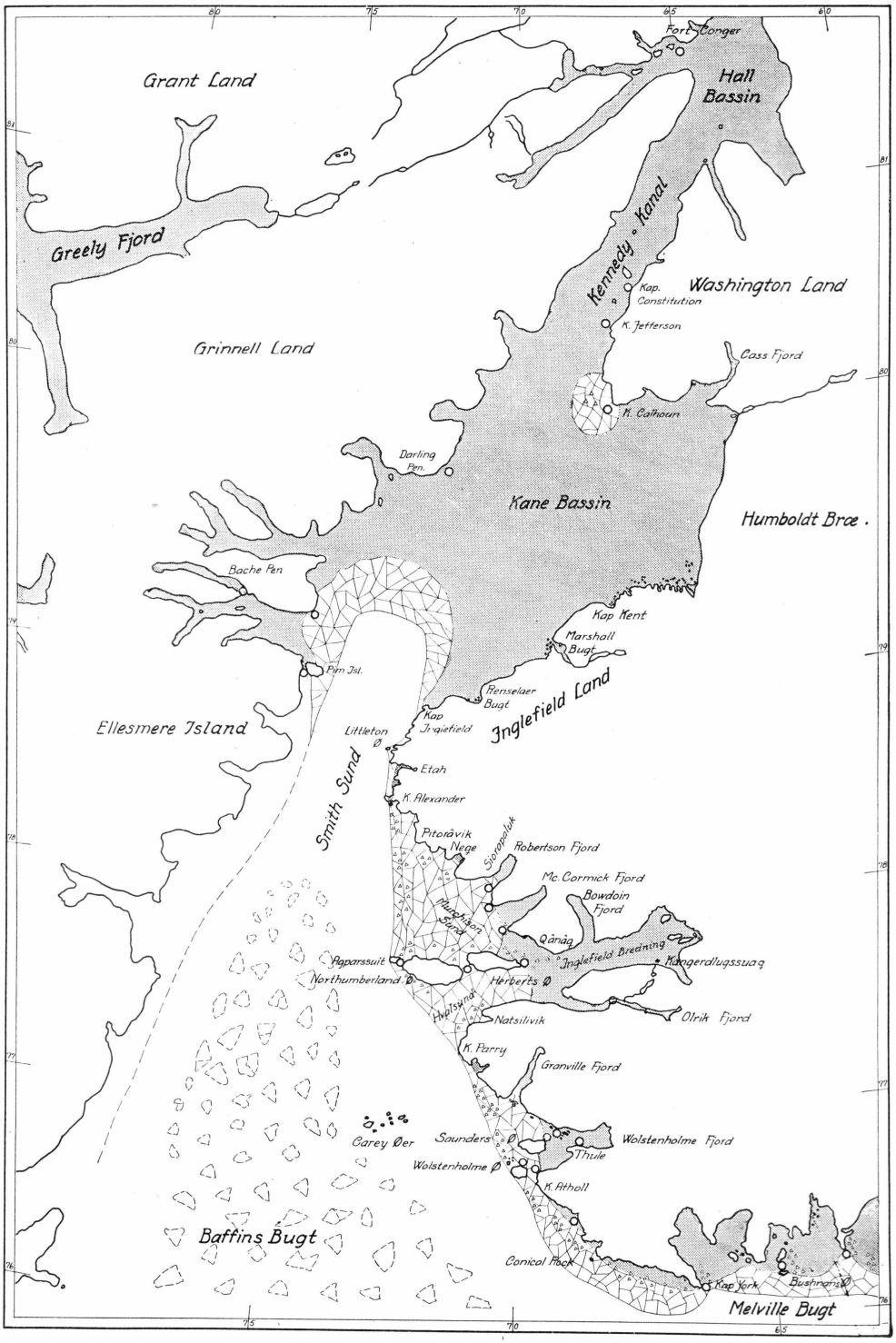


Fig. 3. Ice conditions north of Baffins-Bugt, (see explanation of figures on the preceding page).

The sledge route across Inglefield Bredning this year was passable about the middle of November, and since that time the ice was fast in here.

At Thule the ice this year broke during the New Year gales to a little inside Saunders Ø, but soon became fast again.

In the summer of 1941 the ice remained much longer than the preceding year. During continuous gales in the first half of May the ice however broke right to Pitorâvik, but from here the ice edge proceeded only slowly inwards and reached Neqe about the 1st of July and Siorapaluk July 15th. On July 20th the ice broke throughout Robertson Fjord. On July 24th the ice edge lay across the mouth of McCormick Fjord and across Inglefield Bredning a little inside Herberts Ø. After that time the ice began to drift out of Inglefield Bredning through Hvalsund, which for nearly a fortnight was filled with drift ice which floated about to and fro round Kap Parry for a long time. Still in the first half of August great masses of drift ice were said to occur in Melville Bugt being forced towards the coast by south westerly winds, but after the middle of August only scattered drift ice was left.

On May 24th the ice edge was lying along the coast of Inglefield Land about one mile off Refuge Harbour, whence it extended in a direct line northwards. At Kap Inglefield the open sea went right in to the coast, but from here and eastwards the ice was fast.

Across Kane Bassin from Kap Wood to Wright Bay the ice lay unbroken till June 15th, at which time broad cracks began to form off the glaciers, which could however easily be crossed by sledges. The ice on Kane Bassin is said to be safe for sledge driving till the first days of July, as the cracks generally close at short intervals.

Round Kap Calhoun on Washington Land there is a place with open water owing to currents even throughout the winter. On June 8th 1941 this place had open water to Kap Madison and extended from the ice foot some miles from the shore to the west and the south. The open water in south and west was bounded by a broad belt of drift ice, which floated to and fro owing to currents and winds. This place is a safe locality for hunting Ringed Seal and Bearded Seal throughout the year.

We follow the map from south to north. In Melville Bugt the ice will often break in the outermost zone throughout the winter, and the ice will drift out at sea, but it may return at intervals. It therefore often happens that the Polar Eskimos voluntarily let themselves drift with the ice on their hunting trips, as they are always sure, sooner or later, to drift in again.

In De dødes Fjord inside Kap York the ice used to remain fast throughout the summer, but in recent years this has not been the case, and the fjord has been free of ice in August. Larger areas with sea ice

remaining in summer is now found only in Kane Bassin and northwards. Along the rest of the coast from Melville Bugt to Refuge Harbour all the ice will float out in the course of the summer, latest in July-August.

Outside the boundary for the maximum extension of the land ice drawn on the map ice will form throughout the winter it is true, but the young ice will constantly be carried out in the sea by currents and wind. In Smith Sund the open water extends northwards on level with Bache Peninsula. The sound proper is never covered with ice. If one wishes to pass Smith Sund by sledge, one has to travel a good day's journey from Kap Inglefield to the north, and in March-April the ice edge can be followed without any risk, whereas in May one has to go still farther north and follow the limit for the one year old ice which the last summer has drifted down from the north. The western part of Kane Bassin and the sounds northwards will probably never become completely free of ice, as the pack ice from the Polar Sea is carried down here continuously. It has however been possible twice to take a ship right up to Cape Sheridan on Grant Land, Peary in 1905—06 and in 1908—09. This could presumably be done more easily in our days when the ice conditions everywhere are considerably more favourable than 40 years ago.

I have no direct observations of the ice conditions along the east coast of Ellesmere Land from Bache Peninsula and southwards, but according to the Polar Eskimoes the ice here extends "far out at sea" in March-April, and there are generally larger or smaller masses of drift ice here throughout the summer.

In the fjords and sounds west of Ellesmere Island, Greely Fjord, Heureka Sound, Bays Fjord, Bauman Fjord and Norwegian Bay the ice is no doubt fast from it forms till it breaks. In 1939 most of the ice here seemed to have broken and drifted out. In the spring of 1940 we found only a few isolated areas here and there with one year old ice.

Iceberg grounds.

Only in a few places in Thule district is there deep water right in to the outer coast, as the depth in many places far away from the coast does not exceed 40—80 metres. As the largest icebergs are still deeper, they will run aground and gather on the banks which thus will always be recognizable by a number of stranded icebergs, and the depth above the banks can generally be estimated from the size of the icebergs.

These iceberg grounds of which the most important ones are marked on the map of the Thule district, no doubt contribute to the rapid scattering of the ice in spring, since the tide will always keep the water open round them, and often they will float about and move with the

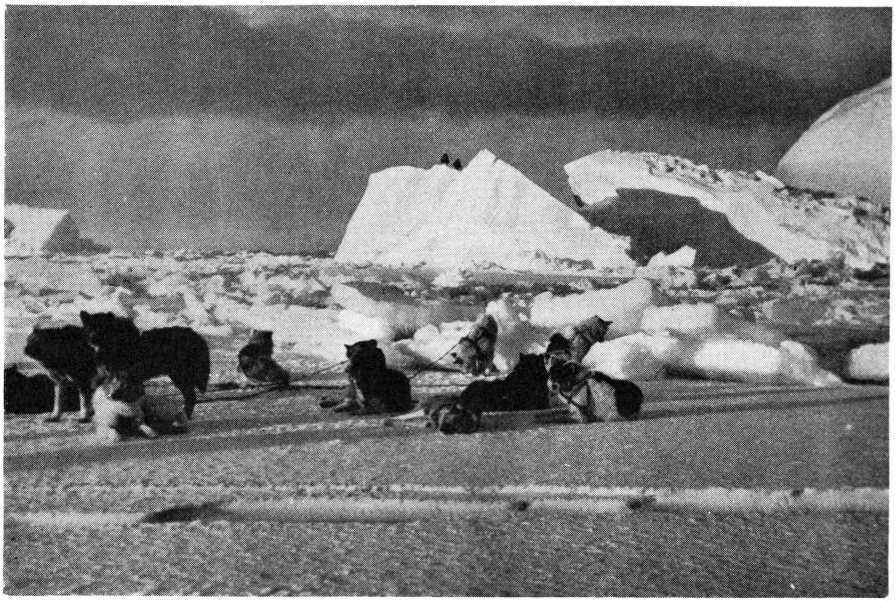


Fig. 4. On the lookout for walruses on the iceberg grounds between Agparssuit and Kap Alexander in Murchison Sund. The icebergs are stranded, the depth is 70 m.

current, whereby they churn the ice up round them. In the winter the tidal cracks round the stranded icebergs are filled with seals, often also walruses, which here always have natural breathing holes. The icebergs may remain on the grounds for several years, until the currents have worn them so much below that they can get loose and drift away.

Open water owing to currents.

Waters kept open throughout the winter are comparatively rare. Between Agparssuit and Northumberland Ø fast ice will never be found, and between Northumberland Ø and Herberts Ø a fairly large area with open water is found almost the whole winter, mainly owing to drifting icebergs being carried to and fro by currents and ploughing up the ice. The same is the case near Kap Calhoun on Washington Land, where even without any icebergs, there is open water all the year round, providing, therefore, a good hunting place where travelling Polar Eskimos can always go and be sure of prey if they have been unlucky in other places. West of Ellesmere Island a similar place with open water and good hunting all the year round is known, namely in Hell Gate, the strait between Kent Island and Ellesmere Island.

The other type of open water areas are places which have only open water at full and new moon. They are open for a couple of days

Fig. 5. Ice cut by the current and icefoot formed by pressure ice round Kap Inglefield in the eastern part of Smith Sund, March 1940.

and seal hunting can be anticipated without failure. Such areas are found right south of Kap York, including the often broad cracks which may form at spring tides off large promontories in many places in the district. Even if young ice will rapidly form on these cracks, both the Bearded Seal and the Ringed Seal prefer to have their breathing holes in such places. On Ellesmere Island the best known spring tide place is found at the entrance to Flaggler Fjord right west of the abolished Bache Peninsula police station. The same is the case off Bache Peninsula, off Darling Peninsula and south of Ft. Conger.

A third type of open water places is formed in spring from about the beginning of May when the sun begins to get more power. The ice then begins to crack off the promontories, and open places will rapidly form which will not get time to close again. Such places are found south of Kap Melville, between Savigsivik and Bushnan Ø, off Parker Snow Glacier, north and east of Wolstenholme Ø, northeast of Saunders Ø, at Qeqertarssuit and west of Uvdle in Wolstenholme Fjord, in Lower Narrows in Olrik Fjord, east of Herberts Ø, off Red Cliff and in two places at Kangeq in Robertson Fjord. Moreover, also at Kap Constitution and Kap Jefferson on Washington Land and in Rice Strait inside Pim Island at Ellesmere Island. All these places are however only of slight importance as hunting areas, as the seals will have appeared on the ice before that time, but the sledge traveller should be on the lookout for them.

The ice foot.

The formation of the ice foot is dependent on the tide. In a freshwater lake the ice is level and uniform throughout the winter, being frozen fast to the shores of the lake, since the level of the water generally does not change during the winter. At sea, however, the level of the water will rise and fall with the tide. Here the ice will also freeze fast to the shores, but is constantly broken by the tide. Therefore there will always be a stretch of open water round the coasts so that the sea ice is free to rise and fall. The belt of ice that forms along the shore by the accumulation of snow and freezing of water is called the ice foot. At any high-water it will be flooded by the seawater, whereby another layer of ice will form, until the ice foot in January-February will have attained its maximum height corresponding to the highest level at spring tide. Then it has a completely level surface and a vertical side towards the sea, the height of which depends on the size of the tide. At Neqe on February 28th 1940 this height was from the uppermost edge of the ice foot to the level of the sea at lowest ebb 4.50 m. At Kap Calhoun on 8th of June 1941 the height of the ice foot measured 3.80 m. In the fjords and sounds west of Ellesmere Island there seems to be a considerably smaller difference between ebb and flood, since the ice foot here passes almost evenly into the sea ice without involving any difficulties to sledge driving from and to land.

The ice foot may remain and be a good sledge road long after the sea ice has gone. It will gradually be worn away by the sea and the melting snow. North of Renselaer Bugt the ice foot is said to remain throughout the summer, except off river discharges and large promontories. (The formation of the ice foot its thawing and summering in North Greenland have been described in detail by LAUGE KOCH, 1928).

The influence of the ice on the marine fauna.

As will be seen from the preceding the ice conditions in Thule district are widely different from those in corresponding and more southern latitudes on the east coast of Greenland. On the east coast the big ice extends far out from the coast throughout the year, and the cold polar current coming from the north gives the animal life a poor arctic stamp right to south of the Blosseville coast. The winter ice forms earlier and breaks later, and even in summer the areas free of ice are very limited. The plankton production starts late and has a short period of vegetation.

On the northwest coast of Greenland where Davisstræde and Baffins Bugt are open and nearly free of ice right to the outer coast in the

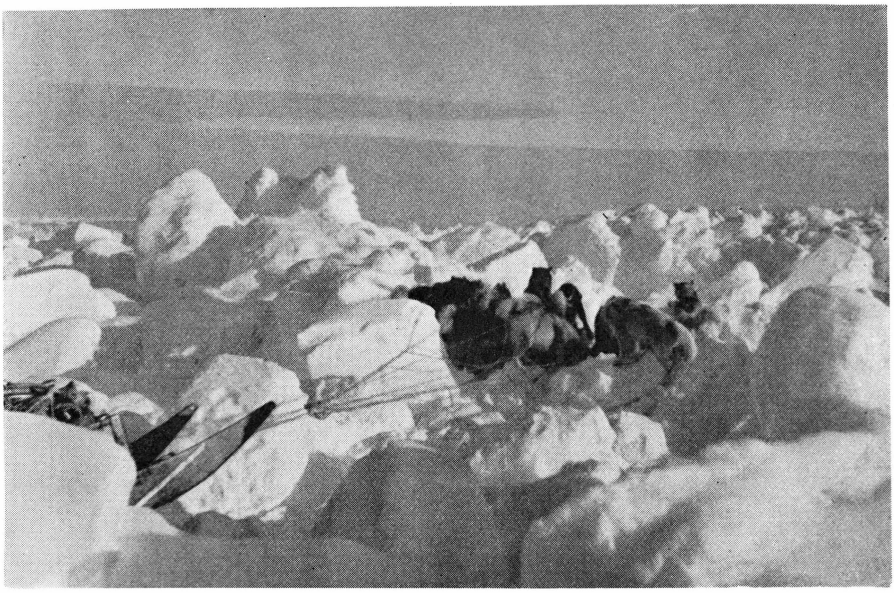


Fig. 6. Pressure ice in the western part of Smith Sund off Bache Peninsula. The current coming from the north carries the ice with it from the Polar sea.

greater part of the year, conditions are entirely different. Only Melville Bugt must be regarded as an isolated arctic area, which is still poorly examined, while the coast stretches south of and northwards from Kap York right up to Kap Inglefield on Inglefield Land harbour a much richer marine fauna with a more pronounced subarctic stamp, bearing a distinct impression of the close vicinity of the open sea.

The starting of the plankton production here is not dependent on the dispersal and breaking up of the ice. It may commence as soon as the sunlight begins to make its influence felt. The salinity of the sea is not lowered in any considerable degree by the melting ice, which here does not get time enough to thaw, but is carried away long before by current and wind. The numerous glaciers in this district which every year carry great quantities of erosion material out into the sea, at the same time discharge into the sea rich quantities of inorganic nutrient salts for the plankton production, and finally, the cold Polar current coming from the north does not go down along the coast of Greenland, but goes west of Baffins Bugt along the east coast of America. Along Thule district the current goes north to Smith Sund.

When all these conditions are considered it will easily be understood that the Thule district offers far better circumstances for a rich marine animal life than does the northeast coast of Greenland and no doubt also the northeast coast of America.

Marine invertebrates with a pelagic larval development therefore have a double advantage in the Thule district in comparison with North-east Greenland, since new larvae may be carried with the current from south, at the same time as the close vicinity of the open sea enjoys the early influence of the sun for a vigorous production of phytoplankton, which again may serve as nourishment for the zooplankton. The animal life of the sea bottom does not seem to be directly influenced by the longer or shorter duration of the surface ice, but nothing definite can be said as yet, so long as the food conditions of these animals have not been cleared up.

A special circumstance should be mentioned here, although its importance still awaits a closer investigation. The numerous icebergs which every year detach from the glaciers and float out at sea like small centres of cold, may possibly favour both a special phytoplankton and zooplankton-production in their vicinity, carrying it along to far more southern latitudes than the original area of distribution. Moreover, the icebergs over smaller depths will grate on the bottom, ploughing it up over vast areas. Thereby part of the in-fauna will be crushed and killed at the same time as the sea bottom is renewed as growth substratum for younger individuals or may be other species. Likewise the same process will release a good deal of bottom material which by the current may be carried over extensive areas, so that partly new nourishment will hereby be supplied to the bottom animals, partly a further washing out of settled nutrient salts. A closer investigation of these problems may throw new light on the ecology in arctic regions. The northern part of Melville Bugt and the northeastern part of Kane Bassin would here be well suited areas of investigation.

As regards the ordinary animal life in the sea which is not subjected to seasonal variation, it can at present only be said that it continues irrespective of the ice formation on the surface. Bottom samples taken in winter and in summer do not differ from each other. Nor has the light in summer any influence down here. But to the marine mammals conditions are different. They are dependent on free access to the surface of the sea for breathing, and must either migrate or in different ways find access to the air.

The only two whales which are still common here, the White Whale and the Narwhal, migrate, as far as the majority is concerned, southwards when ice begins to form, and do not return in spring until the ice begins to disperse. The same holds good of the Harp Seal and the Bladdernose, while the Ringed Seal, the Bearded Seal and the Walrus remain in the district throughout the winter. These three species each has a way to subsist. The Ringed Seal is stationary even at the head of the fjords, where the ice is thickest and lasts longest. It will at once

make breathing holes in the ice and keep them open throughout the winter by means of the claws of its fore-flippers. The Bearded Seal in winter leaves the fjords and remains near the ice edge where it can keep its breathing holes open in the young ice. The Walrus is primarily attached to definite depths with special animal communities, the Walrus banks, which in Thule district are situated just along the ice edge. Where the ice edge extends beyond these banks, the Walrus must retire. Where the ice edge runs across the banks, the Walrus may feed both outside and inside the ice edge, since with its forehead it can make breathing holes through the thinner ice. Such are the conditions for the Walrus from Hakluyt Ø to some distance north of Etah, and here a considerable number of Walruses spend the winter every year, while they leave the other walrus banks of Thule district due to the extension of the ice, beyond the feeding grounds. These conditions will be further discussed later.

As regards the birds, it goes without saying that the marine birds in winter must leave the ice covered areas, and the majority also leave the district. Small flocks of Common Eider and Black Guillemot may however winter near the ice edge. The situation of the breeding areas also depend on the extension of the ice, since egg laying, during which the birds are attached to the vicinity of the breeding grounds, begins before the ice floats out of the fjords. Therefore big bird cliffs are not to be found in the interior of the fjords. Both the Little Auk cliffs and the Guillemot cliffs are situated near the outer coasts, and such bird cliffs are completely missing north of Kap Inglefield, where the ice will remain during the greater part of the summer.

Also to the Blue Arctic fox the open water along the outer coast is of indirect importance, since by far the greater part of the foxes feeding on bird cliffs are blue, while the foxes at the head of the fjords or inland are mainly white. These conditions will be further discussed in special papers on the avian and mammalian fauna of the Thule district.

The extension and duration of the sea ice play a special part to the marine littoral fauna, since such a fauna only occurs near the outer coast, having its northern limit here. This will be further discussed later in the present paper.

The Walrus.

(*Odobenus rosmarus*).

From the old times the Walrus has been indigenous in the Thule district. The first historic account originates from the discoverer of Baffins Bugt, William Baffin, who in 1616 discovered the land situated

north of the bay named after him, and he gave the first scanty description of the rich animal life of the waters. As he did not meet anybody on the newly discovered coasts, his particulars originate from his own observations. On his return he strongly recomended an exploitation of the hunting possibilities of the new waters maintaining that hunting of the Greenland whale, Narwhal, Walruses and Seals would give a great yield; this whaling was however never started, as his far reaching discoveries unfortunately were forgotten during the next 200 years.

Not until 1818 was Baffins Bugt rediscovered by JOHN ROSS at the same time as the big whaling fleets found their way across Melville Bugt and began to hunt the Greenland whales in the ice-free areas west of Thule. JOHN ROSS was the first white man to get into touch with the Polar Eskimos, and like BAFFIN he noticed the rich animal life in the northern sounds. On his return he proposed that a trade with the Polar Eskimos was initiated in order to secure tusks of Walruses and Narwhals in exchange for cheap utensils.

An exploitation of the hunting possibilities of the districts beyond the whaling was however still out of the question. The whalers carried on some trade with the Polar Eskimos, buying skins and tusks of Walrus and Narwhal, but they did not themselves carry on any noteworthy hunting of these animals. Only when ROBERT PEARY, the arctic explorer, arrived at the district in 1891 were Walruses hunted in a noteworthy degree. PEARY needed meat for his sledge dogs and therefore from his ships carried on a considerable hunting of Walruses which might amount to a few hundreds annually in the years when, at intervals, he visited the district until 1909. It is true that the Polar Eskimos themselves had hunted walruses, but owing to the primitive weapons which they had at that time hunting never became exhausting. Not until modern weapons were introduced was there any danger of exhausting the stock.

In return, the use of modern hunting gear, as e. g. motor boat and guns, have given the Walrus stock increased value and use in the household of the population. Together with the Ringed Seal the Walrus is now one of the most important game animals of the Thule district, whose importance is extremely great since in the winter months February-March in which meat is very scanty, the Walrus catches culminate as far as the north district is concerned, while the Thule area proper has its greatest Walrus catches in September-October, immediately before the dark time with scanty supplies of meat in this area.

In order to avert the danger of exhausting hunting, by using modern weapons, KNUD RASMUSSEN in 1929 introduced an indirect protection of the Walruses, it being prohibited by law to shoot walruses with rifle without preceding harpooning, thereby preventing that a disproportionately great number of animals were uselessly killed. This law is strictly

enforced in the district, and no doubt accounts for the fact that the Walrus stock is constant and no decrease can be ascertained.

It is true that the walruses in Thule district have receded from certain regions where they were previously common, but it is not certain that this is due to persecution; it may also be a question of nutrition. On the other hand, the walruses have in recent years sought feeding places where they have not been met with before. As an example of the former case can be mentioned Uvdle in Wolstenholme Fjord and the head and entrance of McCormick Fjord near Inglefield Bredning. As an example of the latter case the coasts round Tuloriak at Neqe can be mentioned. Both cases reported by old Polar Eskimos.

The Walrus can still be designated as abundant in the Thule district. It is still possible to observe flocks of several hundred animals scattered over one of the big feeding grounds near Saunders Ø or south or north of Kap Alexander. Small flocks which may be seen throughout the outer districts however seldom amount to more than from ten to twenty animals. It is such flocks which in summer frequently go quite close to the coasts and here are hunted from kayaks, partly during feeding, partly when drifting along sleeping on ice floes. The total annual catch in the whole district hardly exceeds about 200 individuals.

Distribution area and migration.

The walrus is stationary in the Thule district where it feeds, breeds and winters. But every spring there is a considerable migration of walruses across Melville Bugt which join the permanent walrus stock of the district. Likewise there is from the Thule district a migration of walruses north- and westwards in the spring and summer months and a southgoing migration in the autumn months before the ice covering. The actual population of the district may be replaced in this way, a circumstance which might be cleared up by marking experiments of the wintering walruses.

Let us try to follow the survey map on page 25 of the migration and feeding grounds of the Walrus from south to north. The fat line shows the maximum extension of the land ice early in spring. The hatched areas are the feeding grounds in the district, and the arrows indicate the directions of the summer migration.

From the beginning of June to a little into July a fairly considerable northgoing walrus migration may be observed every year along the ice edge across the northern part of Melville Bugt. Here the ice edge extends rather far outwards and approaches land only south of Bushnans Ø and south of Kap York. The migration comprises both males and females, but according to the statement of the Polar Eskimos the females

are in surplus. The walruses are poor in blubber after the long migration with nearly no food intake. They are continuously migrating northwards and also do not feed in Melville Bugt, partly because the depths here are too great, and partly because the sea bottom does not offer suitable nutriment. A good deal of walruses are killed along the ice edge, but they have always empty stomachs. Only in a few cases pieces of seal skin and fat show that the Walruses, other food being absent, have fed on Ringed seals.

Up along the Kap York land the ice edge is still lying off the banks. Only north of Conical Rock has the ice edge receded over the banks so that the Walruses can reach the sea bottom and take their first meals. From here they migrate slowly northwards, eagerly foraging between Conical Rock and Kap Atholl along the ice edge, gradually as this recedes inwards. The ice however here remains at some distance out at sea to some time into July, so only when the walruses have reached the waters round Wolstenholme Ø and Saunders Ø where the ice in June has receded inside Saunders Ø, have they reached the actual Walrus grounds which offer possibilities for a longer stay.

Now a segregation of males and females seems to occur. While the migration across Melville Bugt had a surplus of females, males are predominant on the Saunders Ø banks. The females continue to migrate northwards in order to reach the Neqe banks and here join the wintering walruses of which the majority are also females.

From the end of July till the middle of September walruses again become rare on the Saunders Ø banks while throughout the summer they are common on the Neqe banks between Northumberland Ø and Kap Alexander and also on the Etah banks between Kap Alexander and Kap Inglefield. These two areas are the actual Walrus regions of the Thule district, where they can also be met with throughout the year, but they are mostly females.

At the same time the migration goes further north, gradually as the north coast of Inglefield Land becomes free of ice. There are no actual foraging banks along this coast, but the Walruses will then remain at the smaller depths along the shore. This migration extends to Marshall Bugt in August, having its northern limit near Kap Kent. Here the walruses disappear and again travel westwards. The migration does not go more easterly than Kap Kent which is due to the fact that the land areas to the east consist of gneiss, where the deposits have been worn away by the ice cap so that the coasts outside are smooth rocky coasts without the deposits which form the substratum of growth for the food elements of the Walrus.

According to the Polar Eskimos the walruses previously occurred in August round Kap Calhoun on Washington Land, but as it is now

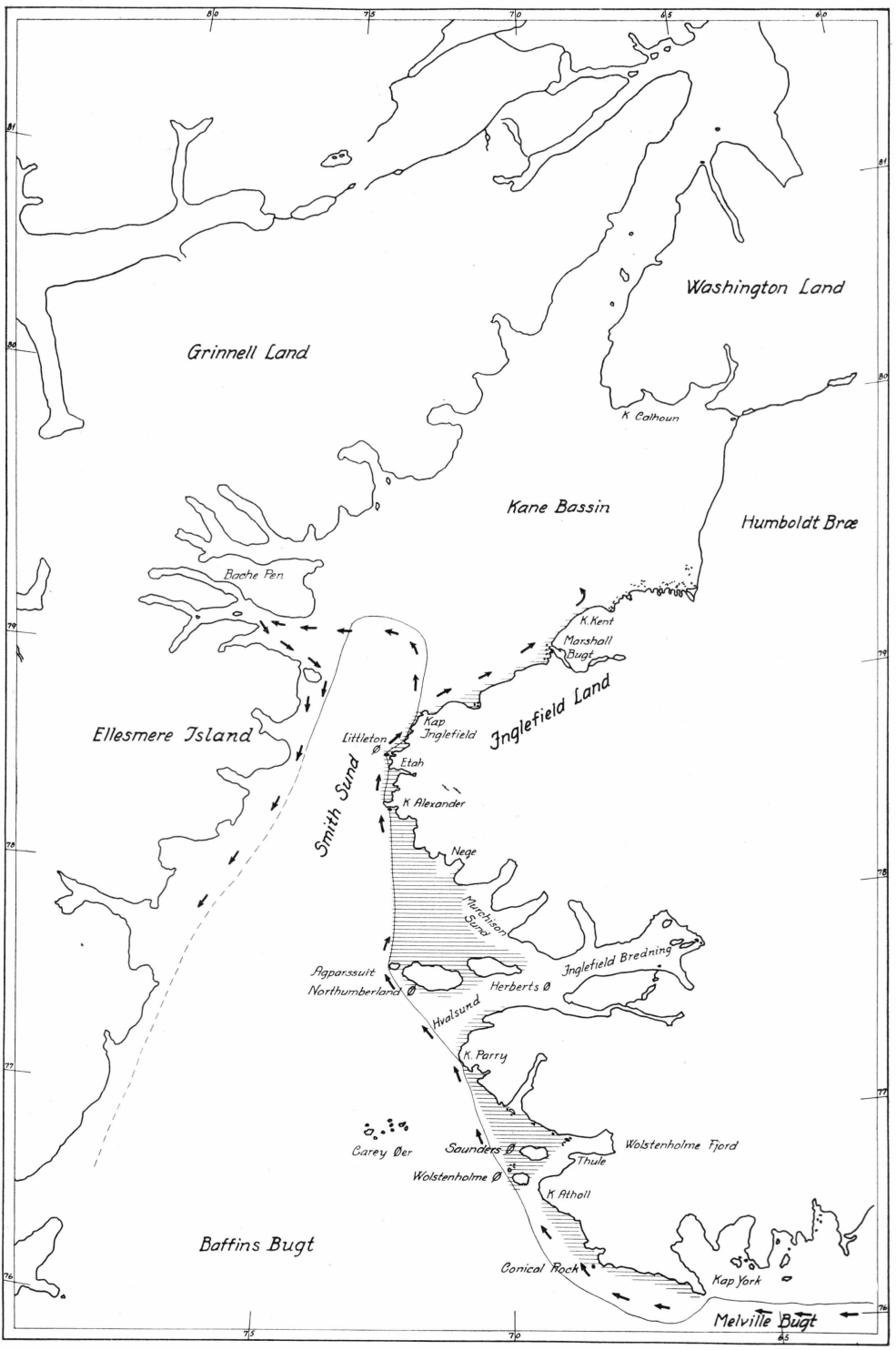


Fig. 7. Spring migration and foraging grounds of the Walrus in the Thule district.

rather long ago since anybody stayed up there throughout the summer, no recent accounts are available hereof.

Besides the migration along the north coast of Inglefield Land a number of Walruses also migrate westwards, following the ice edge to Bache Peninsula. This migration I observed myself on May 25th 1940, when in the middle of Smith Sund we met three walruses at the ice edge heading west. In the summer months this migration goes into Buchanan Bay, where extensive foraging grounds are found, stretching southwards down along the east coast of Ellesmere Island. Walruses, therefore, can be met with on these coasts in the summer months, but they do not winter here, and the migration probably goes evenly southwards following the current and the drift ice.

Simultaneously with this southgoing migration along Ellesmere Island, there is also a southgoing migration down along the Thule district. After the walruses have been absent from the Saunders Ø banks in the greater part of July-August, they return to them about the middle of September, but mostly old males with a small number of females among them. They may now occur here in large flocks and are eagerly hunted from motor boats from Thule. Likewise the walruses occur at the same season in large flocks down along the Kap York land, eagerly foraging on the banks along the coast, until they are forced to retire in the last part of October and the beginning of November owing to the ice. This autumn migration can only be observed on the stretch from Kap Parry to Kap York, and in contrast to the spring migration the walruses are now rich in blubber and are foraging for a longer period of time down along the coast. No migration is observed south and east of Kap York. The walruses simply disappear at Kap York. They may cross Melville Bugt out at sea, since in the autumn they are not observed in the interior part of Melville Bugt, but often occur in October round Ryders Øer in the southern part of Melville Bugt (PETER FREUCHEN, 1921), and in December between Holms Ø and Kraulshavn (HANS NIELSEN).

As to the further course of the migration only suggestions can be made. The Polar Eskimos tell that not seldom do they catch Walruses in the Thule district which have harpoons or rifle balls in them which originate from the Baffin Island Eskimos, and over there harpoons and rifle balls originating from the Thule district are also found. Greenland harpoons and rifle balls deriving from the Upernavik district are found in Walruses caught in the Thule district. PETER FREUCHEN gives the same statement. According to this author the migration continues down along Baffin Island to Cumberland Peninsula, where the Walruses suddenly disappear from the coast. At the same time the Walruses begin to occur in great numbers on the drift ice out in Davisstræde,

and from here they gradually go to Greenland between Holsteinsborg and Egedesminde, where the migration again goes northwards.

Here it is hardly a question of a migration whose cycle is completed in the course of a single year. The Walruses possibly winter several times on the way. It is a matter of fact that Walruses winter in large numbers in the Thule district between Northumberland Ø and Etah. Another fixed wintering place with stationary Walruses is found in the outer half of Jones Sound. A third fixed wintering locality is in the region between Holsteinsborg and Egedesminde. In all these places there are extensive areas with depths less than a hundred metres suitable as foraging places for Walruses.

We again return to Thule district, where we shall investigate the foraging grounds of the Walruses more closely.

Foraging grounds.

The Walrus has not been observed foraging at depths greater than about 80 m. The depth over the sea bottom therefore must not be greater than 80 m. An investigation also shows that just in the Thule district there are extensive sea areas where the depths rule between 40 and 80 m. Here the bottom consists of old lowerings of the land covered with moraine material which forms a favourable substratum for a rich zoovegetation. Thus they are not typical deposits from the sea with strictly sorted material, as we find it on the Danish coasts. Such deposits are rare in Greenland at small depths.

It is natural that the Walrus prefers as small depths as possible in order to get at the food with the least trouble. That is why it seeks the coasts in the summer months to feed at the smaller depths in here. It will come in at flood and go out again at ebb, though I have not been able to find any explanation of this dependence on the tide. Thus small flocks of Walruses will come in at Tuloriak at Neqe at flood, staying there for a couple of hours, and go out again at ebb.

The sea bottom areas with the feeding grounds of the Walruses mentioned here are marked on the map page 25. Everywhere they are characterized by numerous stranded icebergs from whose size the depth can often be estimated. Suitable depths however are not solely responsible for the presence of the Walruses. As will be shown later the composition of the bottom fauna plays a decisive part. In the eastern part of Melville Bugt and the northern part of Kane Bassin there are thus extensive areas with many stranded icebergs at smaller depths, but Walruses are never observed here, simply because the sea bottom does not offer suitable food elements in a sufficient quantity, which I shall demonstrate later. (See also map page 13).

The actual walrus banks do not begin until at Kap York and extend into a belt up to Kap Atholl some miles out from land. The belt is discontinued by Wolstenholme Fjord, the southern entrance of which has greater depths. Only in North Star Bugt and the bay at Uvdle there are smaller depths, where Walruses were found previously, at Uvdle they even went ashore in order to sleep, but they have disappeared now or are seen only rarely, which presumably is due to persecution on the part of the ever increasing Thule population.

From the coasts round Wolstenholme Ø and Saunders Ø towards the coast in the north up to Kap Parry and a little north hereof, the next large Walrus area extends. The depths here do not exceed 40—60 m. The sea bottom consists of very mixed material, partly areas with morainal deposits, partly rocke bottom with larger or smaller depressions filled with morainal deposits. The Walruses occurring here, like those in the Kap York Land, are not stationary. They will stay here for one month on their northward spring migration and again on their southward autumn migration. They may occur in great numbers and are eagerly hunted by the Thule population.

Again the belt is discontinued by Whale Sund and Inglefield Bredning with the very great depths. But from Northumberland Ø and Herberts Ø another Walrus area extends across Murchison Sund to the coast from Neqe up towards Kap Alexander. The depths here rule between 40 and 80 m. The bottom consists of morainal material, stones and gravel mixed with sand and clay. There is a rich zoovegetation with an abundance of food elements for Walruses. The area is of a considerable extension, the winter ice often breaks, and even during its maximum extension it does not go beyond the banks. About 50 years ago the Walruses also penetrated into the shallow McCormick Fjord, but they have now retired from there. The Neqe banks constitute the proper Walrus region in the Thule district, here they are stationary throughout the year and here they breed. For this reason they are also hunted throughout the year except in the darkest winter months, December and January, and here the famous ice catches take place in spring with Neqe as the head basis.

The next Walrus area extends from Kap Alexander to Kap Inglefield, a narrow stretch some few nautical miles out from the coast. Here we find the same favourable conditions as on the Neqe grounds, and the depths presumably are somewhat smaller. Continuous breaking of the ice will keep the belt open in the greater part of the winter, and they are almost completely undisturbed throughout the year, as the coast is not inhabited. Therefore, in a comparatively small area, very big flocks of Walruses may be met with which sometimes may number more than 500 individuals, mainly females, young animals, and calves.

In this area we also find the only place where the Walruses will go ashore a single time in order to sleep, viz Littleton Ø. Previously, this also happened at Uvdle and on a small island in Parker Snow Bugt.

The last Walrus area is the north coast of Inglefield Land between Kap Inglefield and Kap Kent. Here the Walruses only come on their summer migration and forage occasionally along the coast. Only off Marshall Bugt do they stay for some time in the last days of July to well into August, foraging on the banks among the small islands there. The migration stops at Kap Kent, where they again proceed westwards. It happens frequently that a few Eskimo families winter at Marshall Bugt and in the course of the summer carry on some Walrus hunting. Here the northern limit of the Walruses has been reached. A previous occurrence at Kap Calhoun on Washington Land has not been confirmed in recent time.

Diet.

In order to clarify the question of the diet of the Walruses it is of primary importance through stomach analyses to find out the most important food elements and then to examine the distribution of the food animals and their quantitative occurrence in the district. It was important, therefore, to be present at the catches and secure the stomach contents. It was not always an easy matter to get the stomachs, since the content is eaten as a great delicacy by the Polar Eskimos. But for love and money, a few krones per stomach, I succeeded however in getting hold of 15 Walrus stomachs in all for examination and preservation, and I was also allowed to look at the stomach contents of all the Walruses at whose catch I was present. In that way I succeeded in examining stomachs from different localities and at different seasons.

It was however not all the Walrus stomachs which were appreciated by the Polar Eskimos, the content being different. It now proved that that which was the greatest delicacy was the feet of the bivalve *Cardium groenlandicum*, and that Walruses caught in definite localities nearly exclusively had these in their stomachs. Other stomachs were mainly filled with the siphons of the bivalves *Mya truncata* and *Saxicava arctica*, and these were by far not so tasty. Other things found in the stomachs apparently played an inferior rôle in the diet of the Walruses.

By measuring the depths in the localities where the Walruses were caught it appeared that those with principally *Cardium groenlandicum* and *Cardium ciliatum* in their stomachs had foraged near the shore at depths from 15 to 35 m, while Walruses with a majority of *Mya truncata* and *Saxicava arctica* in their stomachs had fed at depths between about 40 m and 80 m. All these investigations were made at the Neqe banks. Apart from this varying frequency percentage for the different bivalves,

dependent on the depth, the content of the stomachs was very uniform. Only a few species were represented, and almost exclusively mussels. Smaller lamellibranchs like *Astarte borealis* and *Macoma calcaria* were of slight importance both regarding number and weight, although remains of these often occurred.

The table below will give a clear picture of the distribution of species in the Walrus stomachs at the different depths. The material collected during the expedition was preserved in alcohol for later treatment at home. However, on account of the war, the material had to stand for six years without inspection, whereby part of it was destroyed by the easily deteriorating stomach contents. The five samples listed below were still well preserved and therefore form the basis for a more detailed treatment.

Stomach content of Walrus	Tuloriaq 35 m	Pitorâvik 45 m	Thorups Banke 75 m	Thorups Banke 75 m	Thorups Banke 80 m
	17-6-1940	10-3-1940	17-2-1940	17-2-1940	20-2-1940
Cardium groenlandicum	795	459	21	18	9
— *ciliatum*					
Mya truncata	54	1074	1101	846	1170
Saxicava arctica	21	54	708	1029	1881
Macoma calcaria	228	129	186	12	6
Astarte borealis	27	66	216	174	51
— *banksi*					
Priapulus caudatus	6	6	9	21	6
Rossia	3	3	..	..	..
Psolus phantopus	..	..	..	..	3
Cucumaria frondosa	..	..	..	..	1
Small stones	474	357	216	147	284

As will be seen from the table the *Cardium* lamellibranchs in the Walrus stomachs decrease in number from the shallow depths and outwards. (It should however be noted here that it is not possible to distinguish between *Cardium groenlandicum* and *Cardium ciliatum* on the remains found in the stomach content). The number of *Mya truncata* increases in the stomach content from the shallower depths outwards and dominate already from about 45 m. *Saxicava arctica* likewise increases in the stomach content from the smaller depths outwards, being predominant at the greatest depths round 80 m. *Macoma calcaria*, *Astarte borealis* and *Astarte banksi* are regularly found in the Walrus stomachs, as well as the gephyrean *Priapulus caudatus*, but they only play a minor rôle, and different other species of bottom animals can only be considered accidental. The comparatively large amount of

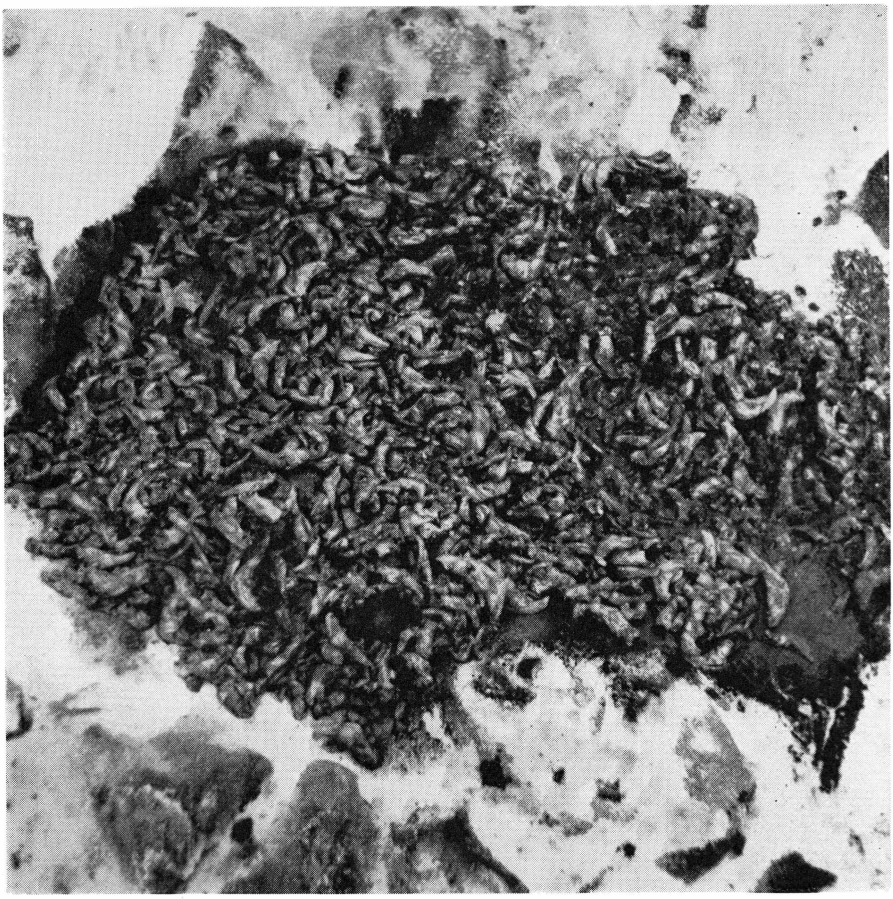


Fig. 8. The content of a Walrus stomach poured out on the snow. It contained exclusively the feet of the bivalves *Cardium groenlandicum* and *Cardium ciliatum*. This walrus has foraged near the coast.

pebbles occurring in all Walrus stomachs may play a part during the treatment of the food, but it may also be possible that their presence is accidental during the feeding.

Since the lamellibranchs *Mya truncata* and *Saxicava*, as we shall see later, also are common in the bottom fauna at smaller depths, the Walrus here presumably undertakes a selection, because it prefers the big *Cardium* bivales rich in nourishment and therefore feed almost exclusively on these at smaller depths, while farther out it has to be content with the species which are both of a smaller size and sit deeper down in the sea bottom, on account of their long siphons.

We shall now consider the stomach content more closely. Of *Cardium* only the fleshy feet are found, torn off right under the mantle. Only a single time the gills of a single *Cardium* and in a few cases a

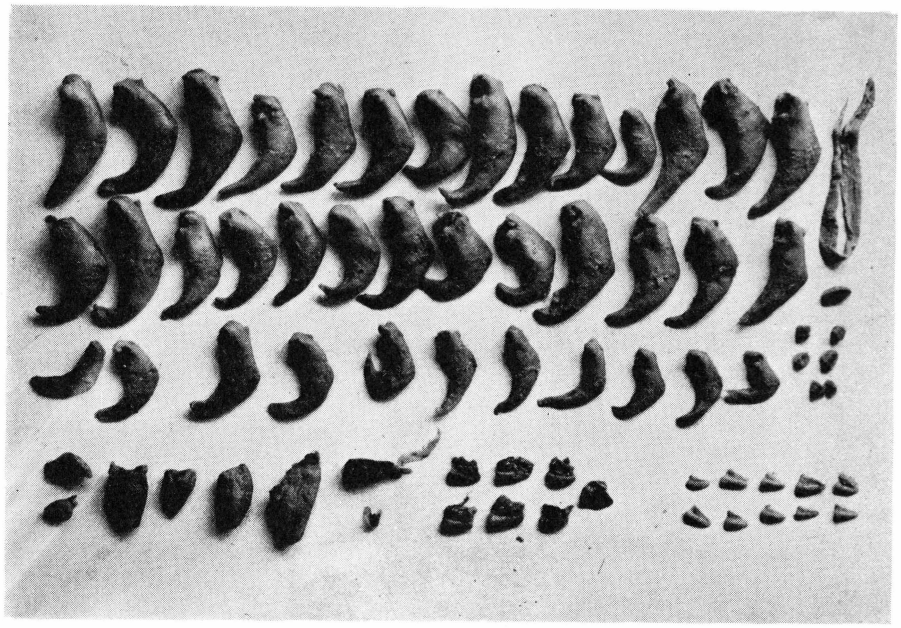


Fig. 9. A small part of a Walrus stomach. This Walrus has foraged at a smaller depth near the coast. The three uppermost rows are *Cardium groenlandicum* or *C. ciliatum* + 1 gill and a few adductor muscles of the same species. Generally only the feet are represented. Below 2 siphons of *Saxicava arctica*, 4 of *Mya truncata*, 1 *Priapulus caudatus*, 1 beak of *Rossia*, 7 feet of *Astarte* and 10 feet of *Macoma calcaria*.

couple of closing muscles have been found. In the latter case the entire lamellibranch must have been crushed and devoured, but this does not generally seem to be the case. Of *Mya* and *Saxicava* only the fleshy siphons torn off close to the mantle are found. Here also crushing of the mussels does not seem to take place. Of *Macoma* and *Astarte* only the feet are present, torn off under the mantle. Here the shells may have been crushed, but neither of these nor of the other mussels are remains of the shells to be found in the stomach. In a single case a piece of a *Cardium* shell adhering to the torn off foot has been found, but otherwise shell remains do not occur. Nor can there be any question of a decomposition of so great quantities in the acid of the gastric juice. In that case semi-decomposed shells must occur in the otherwise fresh stomach content, together with mantles and other interior parts of the mussels. As far as the thin-shelled *Macoma* mussels are concerned a decomposition of shell remains cannot however be completely disregarded, since these lamellibranchs are easily crushed, and small parts of dissolved lime may be found precipitated in the preserved material. But there is no question of a decomposition of great quantities of shells.

Fig. 10. A small section of a Walrus stomach. This Walrus has foraged at 70—80 m depth. 5 uppermost rows are siphons of *Saxicava arctica*, 4 next of *Mya truncata*, 1 foot of *Cardium groenlandicum*, 2 of *Macoma calcaria*, 10 of *Astarte borealis*, 1 *Cucumaria*, 1 *Priapulus* and 1 *Psolus*.

The question then remains how the Walruses manage to avoid getting the mussel shells into their stomachs. Dr. Poul Hansen has told me that in Walruses there is a dilatation of the oesophagus, a kind of crop, so the possibility exists that the Walrus places the mussels here in order to force them to open, whereupon the content will glide into the stomach, and the shells can be discharged. The organ has not yet been examined anatomically, but nevertheless I doubt that it can be used in that way. In the first place, the Polar Eskimos, who are very familiar with the anatomy of their game animals, would know of such function, and if they had found mussel shells in this "crop" they would have mentioned it, since we have many times discussed the question of the intake of the food of Walruses and the absence of the shells in the stomach content. Even if the Walrus during the catch is able to regurgitate the content in the crop, one would however occasionally find something in the crop, and as far as I am aware this never happened. Secondly, more than the feet and the siphons would occur in the stomach and this also does not happen.

The solution of the problem is presumably that the Walrus simply bite off the parts which normally project from the mussel when it is buried into the bottom. The Walrus with its lips will examine the stirred up material, standing on its head over the sea bottom, and presumably moving forwards. What it here meets on its way of *Cardium* feet or *Mya* and *Saxicava* siphons it will simply tear off without paying attention to the rest of the lamellibranchs. As far as the two last mentioned species are concerned the mussel as a rule is concealed in cracks or so far down into the bottom among stones and gravel that it would be too difficult to pull it out. Since mussels which have lost parts of their siphons are often able to regenerate these (Okada 1927) it is possible that they can regenerate also in this case. Otherwise the Walrus is liable for a considerable wasting of the mussel population, since it only feeds on about half of their digestible parts.

The possibility however cannot be excluded that the Walruses do take part of the dug out mussels into their mouth, since spit out mussels may often occur at the breathing holes of Walruses, either uncrushed or, as a rule, only the empty shells, always intact and connected. The possibility therefore also exists that the Walrus takes the mussel into its mouth or between the lips, sucking out the firm portions, whereupon the rest of the mussel is spit out again. Both *Saxicava* and *Mya* are open at the ends, so there is no great vacuum to conquer. It is the general opinion among the Polar Eskimos that the Walruses in this way suck out the mussel, spitting out the shells.

But now we have to face the question as to the use of the tusks of the Walrus, which in some way or other have a relation to the intake of the food. The canines in old animals may be heavily worn on the front side and may often be worn down to half their original size. The root is open, so that they are able to grow throughout its life time. The strong wear no doubt arises by the Walrus using them to stir up the sea bottom to find the mussels, and since its foraging area does not consist of a soft bottom, but of gravel and clay mixed with stones with unsorted morainal material, this involves a strong wear of the canines. Also the stiff bristles on the upper lip are strongly worn on the front side. The powerful canines must be supposed to stir up the bottom, whereupon the material is sorted by means of the bristles on the upper lip.

The incisors of the Walrus are only present in very young animals, but soon disappear. The molars are small tubercular teeth always strongly worn. It is easy to suggest that their most important function is to crush the shells, but still we have no confirmation hereof. Nor does the stomach content bear any indication of having been treated by molars, feet and siphons always being intact. Therefore nothing definite can be said as yet of the cause of the strong wear of the molars.

It is a well known fact that the Walrus may attack and partly devour Ringed Seals, and this happens occasionally. Of about one hundred Walruses caught near Neqe in 1939—41 two of them had remains of the Ringed Seal in their stomachs, no flesh and no bone remains, only strips or pieces of skin and fat as big as a fist. All seemed to indicate that the Seals had been caught by the Walrus and torn to pieces with its canines, whereupon the pieces had been swallowed whole. It must however be considered an exception that the Walrus attacks the Seals in this district, in which other food is abundant, but during its long migrations across the sea without any foraging grounds it will presumably eagerly hunt the Seals which it meets on its way, thus during the summer migration across Melville Bugt. A number of these migrating animals are killed every year at the ice edge south of Savigsivik, and these either have empty stomachs or the stomach may be filled with skin and fat of the Ringed Seal.

As will be seen from the above, the diet of the Walrus in the Thule district mainly consists of four species of lamellibranchs, viz. *Cardium groenlandicum*, *Cardium ciliatum*, *Mya truncata* and *Saxicava arctica*. In the summer when the coasts are accessible, the Walruses prefer to go in here at flood in order to feed on the easily accessible *Cardium* communities, and these are predominant in the stomachs. After having foraged for 4—6 hours at depths between 15 m and 35 m, they have filled their stomachs, and again retire at ebb, either to continue foraging at greater depths, or to go to sleep on a drifting ice floe. In winter, when the ice blocks the coasts, the Walruses occur at the greater depths near the ice edge and then have to resort exclusively to the *Mya* and *Saxicava* communities at a depth of 70—80 m.

It now remains to study the quantitative occurrence of the food elements on the sea bottom and examine which animal community occurs on the foraging grounds of the Walruses.

The animal communities of the Walrus banks.

A qualitative and quantitative determination of the animal communities of the sea bottom can be made with Petersen's grab as previously described. In 1936 I made the first investigation of that kind in the Thule district, partly in North Star Bugt, partly off Savigsivik. At Savigsivik in Melville Bugt there was a *Chiridothea sabini* community with nearly no mussels, and this clearly shows that there are no foraging possibilities for Walruses, and they have also never been observed feeding in this area.

In North Star Bugt a *Macoma calcaria* community occurred, comprising e. g. the mussels typical in the Walrus stomachs, only except

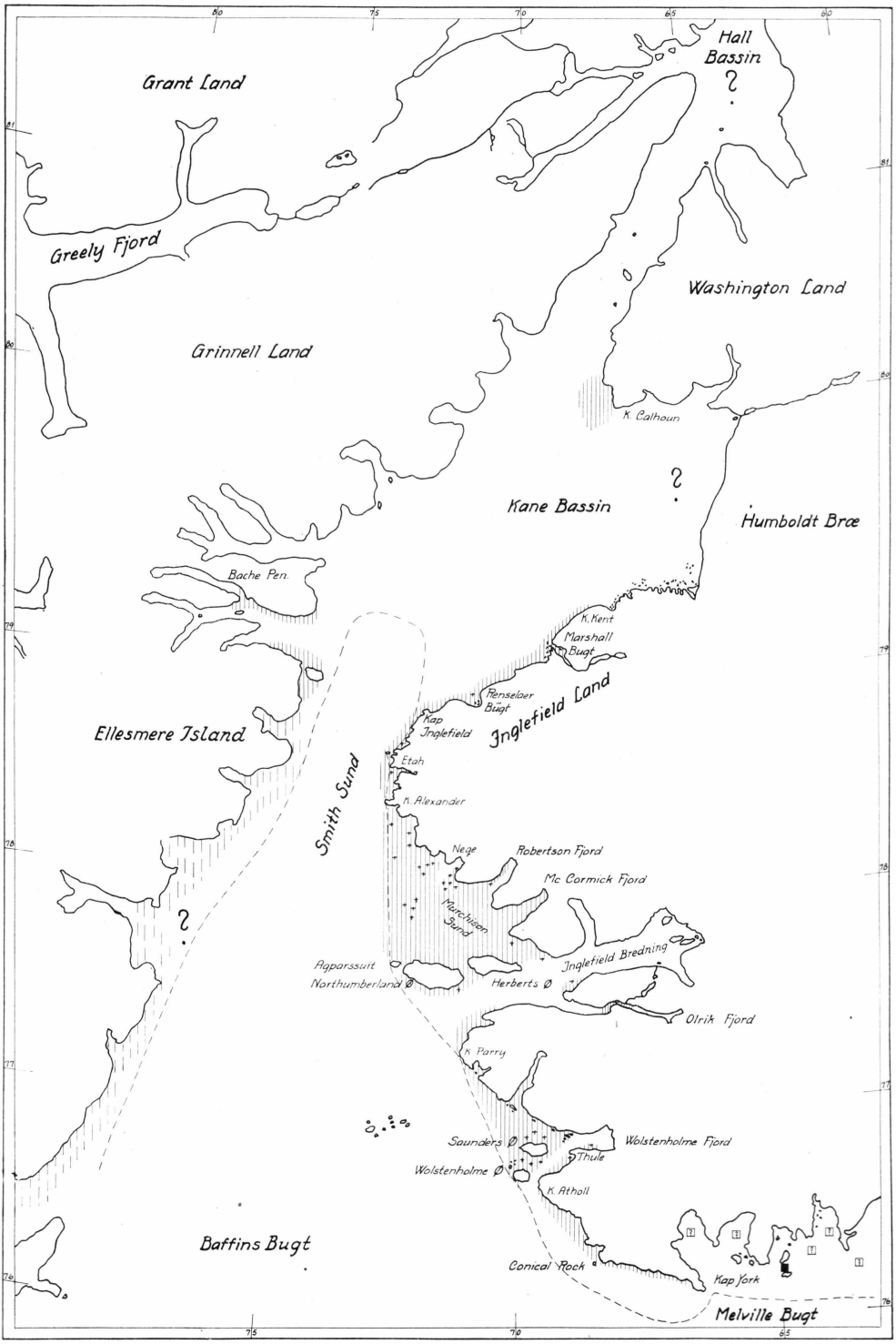


Fig. 11. Probable distribution of the *Macoma calcaria* community in the Thule district (vertical hatching). + indicates where this community has been demonstrated. In Melville Bugt the *Chiridothea sabini* community has been found in the place marked with ■.

Saxicava arctica, which, strangely enough, did not occur in the ten samples which were all taken at 14 m depth. The reason presumably is that the samples were taken on pure clayey bottom, *Saxicava* otherwise being one of the most common mussels in the district, and notably on the Walrus banks. Previously Walruses have often foraged here.

In the summer of 1939 a number of samples were taken on the areas previously visited by Walruses at Uvdle in Wolstenholme Fjord. The typical animals here occurring at 12—45 m depth proved to be the same as in North Star Bugt plus *Saxicava arctica*, thus again the *Macoma calcaria* community with good feeding possibilities for Walruses. The samples are listed on p. 38 (A_1—A_7).

Likewise in the summer of 1939 we tried to take a number of bottom samples on the Walrus banks round Saunders Ø, but here it was not possible to get a clear picture of the quantitative composition of the animal community. The bottom here is mostly rocky with greater or smaller depressions filled with morainal matter or holes filled with stones, gravel or clay. The bottom sampler works with great difficulty on such a bottom, since it will partly touch the rocky bottom, partly big stones and it does not penetrate sufficiently far down into the gravel-filled bottom. None of the samples from this locality therefore can be designated as complete, and it is not surprising that both *Mya truncata* and *Saxicava arctica* are completely absent in the samples, since these animals are buried deep into the bottom and generally hiding among stones and in deep holes. The other typical animals are present in the samples, and this community no doubt is also a common *Macoma calcaria* community where both *Mya* and *Saxicava* are richly represented, only inaccessible to the bottom sampler. Some of the best samples from this place are listed on p. 39 (B_1—B_5).

A more correct picture of the composition of the community no the Walrus banks we get for the Neqe banks.

Here the bottom consists of gravel mixed with clay over extensive areas of even bottom, where, although with difficulty, it was possible to work with the bottom sampler; despite several technical difficulties and unsuccessful attempts we succeeded in getting 20 good samples, each of $^1/_{10}$ sq.m bottom area, scattered over depths between 40 m and 54 m. The samples which were taken two together are listed on p. 40—42.

As will be seen the community on the Neqe banks is a very typical *Macoma calcaria* community with *Macoma* occurring in all the samples. All the mussels found in the Walrus stomachs were also common in the bottom samples, which can only be considered minimum values. The yield of the sea bottom here on the Neqe banks will at least be twice as great as the values found here. Primarily, large icebergs often pass the bottom ploughing it up, whereby many animals perish, and

Table A—B. The Macoma calcaria commmunity

	A 1		A 2		A 3		A 4		A 5	
Station	Uvdle		Uvdle		Uvdle		Uvdle		Uvdle	
Depth	12 m		18 m		20 m		30 m		30 m	
Biotope	Clay with gravel		Clay with gravel		Clay with gravel		Clay with gravel		Clay with gravel	
Sq. m	1/10		1/10		1/10		1/10		1/10	
Date	30-7-1939		30-7-1939		30-7-1939		30-7-1939		30-7-1939	
Name of species	Number	Weight	N	W	N	W	N	W	N	W
Macoma calcaria	86	29.5	28	18.2	38	19.6	..	..	6	2.8
Saxicava arctica	4	1.0	1	0.1	..	..	5	6.0	4	1.4
Mya truncata	31	11.2	4	2.2	10	1.8	..	..	..	..
Astarte banksi	..	..	4	2.2	..	..	1	..	1	0.2
Astarte eliptica	..	..	..	..	..	..	..	..	..	..
Astarte borealis	..	..	2	12.5	..	..	..	..	..	..
Cardium groenlandicum	4	1.0	..	..	..	..	..	..	..	..
Cardium ciliatum	1	14.0	..	..	..	..	..	..	..	..
Cardium elegantulum	..	..	..	..	..	..	..	..	..	..
Modiolaria nigra	..	..	..	..	..	..	..	..	..	..
Modiolaria laevigata	..	..	2	3.8	..	..	2	1.2	1	0.1
Leda minuta	..	..	..	..	..	..	..	..	..	..
Thyasira flexuosa	9	0.1	1	..	1	..	1	..	..	..
Buccinum hydrophanum	..	..	..	..	..	..	..	..	..	..
Trichotropis borealis	..	..	3	0.6	4	0.4	..	..	..	..
Velutina laevigata	..	..	..	..	..	..	..	..	1	0.6
Margarita	..	..	..	..	..	..	..	..	..	..
Sipho turritus	..	..	..	..	..	..	..	..	..	..
Bela violacea	..	..	1	..	1	..	..	..	..	..
Balanus balanus	1	0.5	1	0.4	..	..	57	310.0	51	216.0
Bybbis gaimardi Kr.	7	..	..	..	5	..	..	..	..	..
Pontoporeia femorata	3	..	..	..	1	..	..	..	..	..
Haploops tubicola	..	..	..	..	..	..	..	..	..	..
Ceradocus torelli	..	..	..	..	1	0.3	..	..	..	..
Oediceridae	1	..	..	..	..	..	..	..	..	..
Diastylis sp.	..	..	1	..	..	..	..	..	..	..
Philomedes globosus	..	..	..	..	..	..	..	..	..	..
Eudorellopsis deformis	..	..	..	..	..	..	..	..	..	..
Amphipodae sp.	5	0.1	..	..	2	..	..	..	..	..
Spirontocaris turgida	..	..	..	..	..	..	..	..	1	0.2
Ascidiae	..	..	..	..	..	..	3	1.2	3	0.2
Strongylocentrotus droebachiensis	..	..	1	23.0	..	..	..	..	1	14.0
Ophiura sarsi	..	..	..	..	..	..	..	..	..	..
Ophiura robusta	..	..	..	..	..	..	..	..	1	0.1
Priapulus caudatus	1	0.1	..	..	..	..	..	..	..	..
Pectinaria granulata	3	3.8	4	3.2	1	1.0	..	..	1	0.3
Terebellides stroemi	28	3.2	7	0.2	5	0.4	..	..	2	0.1
Harmothoe imbricata	..	..	..	..	..	..	..	..	1	0.1
Nereis zonata	..	..	..	..	..	..	..	..	1	0.4
Nephthys ciliata	2	0.2	2	0.4	7	1.0	..	..	5	0.3
Axiothella catenata	5	0.2	..	..	..	..	..	..	..	..
Gattyana cirrosa	..	..	3	1.2	2	0.1	3	0.2	..	..
Phyllodoce groenlandica	..	..	1	0.1	..	..	..	..	..	..
Onuphis conchylega	..	..	..	..	..	..	..	..	..	..
Myriochele heeri	..	..	..	..	..	..	..	..	1	0.1
Scione flexuosa	..	..	..	..	..	..	..	..	..	..
Ampharete grubei	..	..	..	..	..	..	..	..	..	..
Ammotrypane aulogaster	..	..	..	..	..	..	..	..	..	..
Nemertini	..	..	..	..	1	0.1	..	..	..	..

of Uvdle and Saunders Ö, Wolstenholme Fjord.

A 6 Uvdle 32 m Clay with gravel 1/10 30-7-1939		A 7 Uvdle 45 m Clay with gravel 1/10 30-7-1939		B 1 North of Saunders Ö 33 m Clay with gravel 1/10 31-7-1939		B 2 North of Saunders Ö 35 m Clay with gravel 1/10 31-7-1939		B 3 North of Saunders Ö 38 m Clay with gravel 1/10 31-7-1939		B 4 North of Saunders Ö 43 m Clay with gravel 1/10 31-7-1939		B 5 North of Saunders Ö 45 m Clay with gravel 1/10 31-7-1939		Average number and weight pr 1 sq. m		Per cent of the average total weight
N	W	N	W	N	W	N	W	N	W	N	W	N	W			
10	14.2	25	18.5	1	0.2	8	2.2	..	..	1	0.1	1	1.2	170.0	88.8	11.0
..	..	1	0.1	?	..	?	..	?	..	?	..	?	..	12.5	7.2	0.9
1	0.8	..	..	?	..	?	..	?	..	?	..	?	..	38.3	13.3	1.6
2	2.2	..	..	10	10.1	26	20.2	2	5.0	12	8.6	..	..	48.3	40.4	5.0
..	..	..	..	..	..	..	..	..	..	..	..	1	0.3	0.8	0.3	..
..	..	..	..	1	3.0	3	26.8	1	8.2	..	..	..	..	5.8	42.1	5.2
..	..	..	..	..	..	..	..	..	..	4	..	..	..	6.7	0.8	..
..	..	..	..	..	..	..	..	1	7.8	..	..	..	..	1.7	18.2	2.2
..	..	..	..	..	..	7	1.5	..	..	2	0.2	..	..	7.5	1.4	..
..	..	..	..	1	1.2	..	..	..	..	..	..	..	..	0.8	1.0	..
..	..	1	..	3	7.5	..	..	2	4.8	1	0.2	..	..	10.0	14.7	1.8
..	..	..	..	2	0.3	5	1.4	..	..	1	0.1	..	..	6.7	1.5	..
..	..	..	..	1	..	..	..	..	..	..	..	1	..	11.7	0.1	..
..	..	..	..	1	1.4	1	1.0	..	..	..	..	2	1.8	3.3	3.5	..
1	0.1	2	0.1	..	..	..	..	..	..	..	..	..	..	8.3	1.0	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.8	0.5	..
..	..	1	..	..	..	..	..	..	..	..	..	..	..	0.8	..	..
..	..	..	..	..	..	2	1.0	..	..	..	..	..	..	1.7	0.8	..
..	..	..	..	..	..	..	..	..	..	1	..	..	..	2.5	..	..
3	27.4	..	..	..	..	..	..	1	9.8	..	..	..	..	95.0	470.1	58.0
3	..	1	..	..	..	..	..	..	..	..	..	..	..	13.3	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	3.3	..	..
1	0.1	..	..	..	..	..	..	..	..	..	..	..	..	0.8	0.1	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.8	0.3	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
1	..	3	..	..	..	2	..	..	..	2	..	..	..	7.5	..	..
16	0.1	142	0.6	..	..	..	..	..	..	6	..	1	..	137,5	0.6	..
..	..	1	..	..	..	..	..	..	..	..	..	..	..	0.8	..	..
..	..	..	..	..	..	27	1.2	1	..	66	1.2	6	0.1	89.2	2.2	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.8	0.2	..
1	0.1	..	..	10	22.50	..	..	4	10.2	..	..	..	..	17.5	28.5	3.5
..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.7	30.8	3.8
..	..	..	..	..	..	1	11.2	..	..	..	..	..	..	0.8	9.3	1.1
..	..	..	..	..	..	2	1.6	..	..	..	..	..	..	2.5	1.4	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.8	0.1	..
2	0.8	..	..	4	3.0	..	..	1	0.8	..	..	..	..	13.3	10.8	1.3
..	..	..	..	..	..	..	..	..	..	..	..	..	..	35.0	3.3	..
..	..	..	..	4	0.3	..	..	..	..	..	..	..	..	4.2	3.3	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.8	0.3	..
1	0.6	1	0.6	..	..	..	..	..	..	..	..	2	0.4	16.7	2.9	..
..	..	..	..	..	..	..	..	..	..	..	..	4	0.2	7.5	0.3	..
1	0.1	1	0.1	..	..	1	0.2	..	..	..	..	..	..	9.2	1.6	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.8	0.1	..
6	0.6	6	0.6	..	..	..	..	..	..	..	..	..	..	10.0	1.0	..
6	0.7	8	0.9	..	..	..	..	..	..	..	..	..	..	12.5	1.4	..
..	..	..	..	..	..	..	..	..	..	9	11.2	..	..	7.5	9.3	1.1
..	..	..	..	..	..	..	..	..	..	..	..	1	0.1	0.8	0.1	..
..	..	..	..	..	..	..	..	..	..	..	..	1	0.4	0.8	0.3	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.8	0.1	..

Total number and "alcohol-weight" per 1 sq. m	830.4	814.0
Total number and normal-weight per 1sq. m	830.4	895.4g

Table C. The Macoma calcaria community

	C 1		C 2		C 3		C 4	
Station	Off Tuloriak		Off Tuloriak		Off Tuloriak		Off Tuloriak	
Depth	40 m		40 m		40 m		40 m	
Biotope	Clay with gravel		Clay with gravel		Clay with gravel		Clay with gravel	
Sq. m	$2 \times 1/10$		$2 \times 1/10$		$2 \times 1/10$		$2 \times 1/10$	
Date	11-12-1939		11-12-1939		11-12-1939		11-12-1939	
Name of species	Number	Weight	N	W	N	W	N	W
Macoma calcaria	5	0.8	8	3.0	7	1.2	32	13.6
Saxicava arctica	?	..	1	2.6	2	11.4	?	..
Mya truncata	?	..	1	2.6	?	..	3	0.8
Astarte banksi	..	..	..	..	..	..	1	0.4
Astarte borealis	..	..	..	..	..	..	..	..
Cardium groenlandicum	1	23.4	1	1.0	..	..	..	..
Cardium ciliatum	..	..	1	15.6	1	10.4	..	..
Cardium elegantulum	..	..	..	..	..	..	..	..
Modiolaria nigra	..	..	..	..	2	5.0	..	..
Modiolaria laevigata	..	..	1	0.3	1	0.2	12	8.2
Leda minuta	3	0.3	9	1.2	12	1.2	6	2.0
Leda pernula	5	1.2	10	2.8	8	1.8	3	2.2
Thyasira flexuosa	..	..	..	..	..	..	..	..
Nucula tenuis	4	1.0	5	0.5	4	0.2	5	1.2
Total Lamellibranchiata...	..	..	..	..	..	..	..	..
Buccinum groenlandicum	1	0.6	..	..	..	..	..	..
Neptunea despecta	..	..	..	..	..	..	..	..
Velutina laevigata	..	..	..	..	..	..	..	..
Sipho turritus	1	0.6	..	..	..	..	..	..
Bela violacea	1	..	..	..	..	..	..	..
Bela nobilis	..	..	1	0.4	..	..	..	..
Lepeta coeca	..	..	..	..	..	..	..	..
Cylichna, sp	..	..	1	0.1	..	..	..	..
Total Gastropoda...	..	..	..	..	..	..	..	..
Balanus balanus	..	..	..	..	..	..	..	..
Arcturus baffini	..	..	..	..	..	..	3	2.2
Nerocila acuminata	..	..	..	..	..	..	..	..
Bybbis gaimardi	..	..	..	..	1	..	..	..
Orchomenella groenlandica	..	..	..	..	..	..	..	..
Nototropis smitti	..	..	1	..	..	..	..	..
Ampelisca eschrichti	..	..	1	..	1	..	..	..
Anonyx nugax	..	..	..	..	..	..	16	..
Amphipodae	..	..	2	0.1	2	0.1	16	4.8
Philomedes globosus	..	..	..	..	..	..	11	0.1
Synalpheus fritmülleri	..	..	..	..	..	..	..	..
Total Crustacea...	..	..	..	..	..	..	..	..
Strongylocentrotus droebachiensis	..	..	2	1.2	1	64.8	..	..
Ophiopholis aculeata	..	..	..	..	..	..	..	..
Ophiura robusta	3	0.2	16	2.0	2	0.1	..	..
Ophiura sarsi	..	..	..	..	1	4.0	1	2.4
Ophiocten sericeum	..	..	..	..	2	0.1	..	..
Ophiocantha bidentata	..	..	..	..	..	..	..	..
Total Echinoderma...	..	..	..	..	..	..	..	..
Pectinaria granulata	..	..	..	..	..	..	5	4.0
Polychæta sp.	..	..	4	0.6	11	2.6	15	4.0
Priapulus caudatus	..	..	..	..	..	..	..	..
Gephyrea sp.	..	..	1	4.8	..	..	..	..
Total Annelida...	..	..	..	..	..	..	..	..
Brachiopoda	..	..	..	..	..	..	..	..
Ascidia	..	..	..	..	..	..	..	..
Capnella glomerata	..	..	..	..	..	..	..	..
Gersemina rubiformis	..	..	..	..	..	..	..	..

C 5 Off Tuloriak 45 m Clay with gravel 2 × 1/10 11-12-1939		C 6 Off Pitorâvik 45 m Clay with gravel 2 × 1/10 13-3-1940		C 7 Off Tuloriak 50 m Clay with gravel 2 × 1/10 11-12-1939		C 8 Murchison Sund 52 m Clay with gravel 2 × 1/10 2-10-1939		C 9 Murchison Sund 52 m Clay with gravel 2 × 1/10 17-3-1940		C 10 Off Tuloriak 54 m Clay with gravel 2 × 1/10 11-12-1939		Average number and weight per 1 sq. m		Per cent of the average total weight
N	W	N	W	N	W	N	W	N	W	N	W			
5	1.6	28	14.4	14	6.2	40	31.0	42	34.6	16	8.0	98.5	57.2	14.0
1	8.2	3	5.2	25	77.6	2	8.1	3	6.2	11	45.2	2.4	82.3	20.1
?	..	3	4.6	3	1.0	?	..	2	3.4	5	1.8	8.5	7.1	1.7
..	..	12	17.8	11	5.2	1	0.2	1	1.0	6	8.2	16.0	16.4	4.0
..	..	4	26.2	2	6.2	2	4.2	..	..	..	..	4.0	18.3	4.5
..	..	..	..	..	..	..	..	1	0.6	..	..	1.5	12.5	3.0
..	..	1	12.2	1	4.4	1	4.0	..	..	..	..	2.5	23.3	5.7
..	..	1	0.6	..	..	..	..	..	..	..	..	0.5	0.3	..
..	..	..	..	..	..	..	..	..	..	..	..	1.0	2.5	0.6
..	..	2	0.6	6	2.3	..	..	..	..	1	2.0	11.5	6.8	1.6
..	..	5	0.4	4	0.2	..	..	3	0.3	..	..	21.0	2.8	0.7
2	0.4	1	0.2	..	..	1	0.2	2	0.4	7	1.5	19.5	5.4	1.3
..	..	..	..	2	0.1	..	..	1	0.1	1	0.1	4.0	0.2	..
..	..	2	0.1	3	0.2	1	0.1	3	0.4	6	0.8	16.5	2.3	0.6
..	..	..	..	..	..	..	..	..	..	..	..	227.0	237.4	57.9
..	..	..	..	..	..	..	..	..	..	..	..	0.5	0.3	..
..	..	..	..	1	15.8	..	..	..	..	..	..	0.5	7.9	..
..	..	..	..	1	0.2	..	..	..	..	..	..	0.5	0.1	..
..	..	..	..	..	..	..	..	..	..	..	..	0.5	0.3	..
..	..	..	..	..	..	..	..	..	..	..	..	0.5	..	..
..	..	..	..	..	..	..	..	..	..	..	..	0.5	0.2	..
..	..	..	..	..	..	..	..	..	..	3	0.2	1.5	0.1	..
..	..	..	..	..	..	..	..	..	..	..	..	0.5	0.1	..
..	..	..	..	..	..	..	..	..	..	..	..	5.0	9.0	2.2
..	..	2	4.2	15	60.2	..	..	..	..	15	85.5	16.0	75.0	18.3
3	1.5	..	..	1	0.2	..	..	..	..	..	..	3.5	2.0	0.5
..	..	..	..	..	..	..	..	..	..	1	0.1	0.5	0.1	..
1	..	..	..	2	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..
..	..	..	..	..	..	..	..	..	..	1	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	1	..	..	..	..	..	..
1	0.1	..	..	2	0.1	..	..	1	0.8	2	0.1	13.0	2.6	0.6
..	..	..	..	..	..	..	..	3	..	..	..	7.0	0.1	..
..	..	..	..	..	..	..	..	..	..	1	0.1	0.5	0.1	..
..	..	..	..	..	..	..	..	..	..	..	..	40.5	79.9	19.5
..	..	..	..	..	..	..	..	1	27.0	2	1.6	3.0	47.3	11.5
..	..	1	0.2	1	0.1	..	..	..	..	..	..	1.0	0.2	..
2	0.3	3	0.1	44	3.0	..	..	..	..	32	1.4	51.0	3.6	0.9
..	..	..	..	1	2.0	..	..	..	..	..	..	1.5	4.2	1.2
..	..	..	..	..	..	..	..	..	..	..	..	1.0	0.1	..
..	..	..	..	1	0.1	..	..	..	..	..	..	0.5	0.1	..
..	..	..	..	..	..	..	..	..	..	..	..	58.0	55.5	13.5
..	..	..	..	..	..	1	1.4	4	1.2	..	..	5.0	3.3	0.8
1	0.1	14	9.2	9	15.4	4	1.1	2	0.6	6	2.1	33.0	17.9	4.4
..	..	..	..	..	..	..	..	..	..	1	0.2	0.5	0.1	..
..	..	..	..	..	..	..	..	..	..	..	..	0.5	2.5	0.6
..	..	..	..	..	..	..	..	..	..	..	..	39.0	23.8	5.8
..	..	..	..	1	0.1	..	..	..	..	3	2.5	2.0	1.3	0.3
..	..	..	..	2	0.6	..	..	..	..	4	2.4	3.0	1.5	0.4
..	..	..	..	2	0.2	..	..	..	..	..	..	1.0	0.1	..
..	..	..	..	3	1.2	..	..	..	..	..	..	1.5	0.6	0.1
		Total number and "alcohol-weight" per 1sq. m										388.0	409.1	
		Total number and normal-weight per 1 sq. m										388.0	450.0g.	

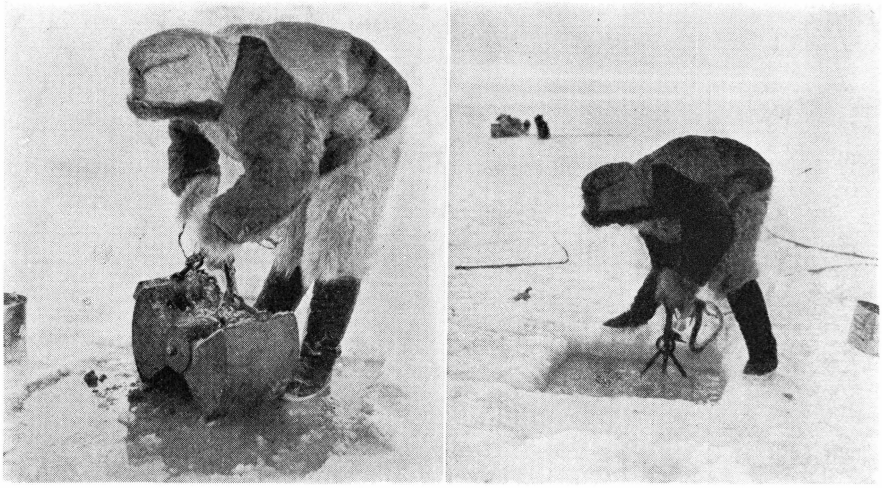


Fig. 13—15. During the winter the sea bottom was investigated through the ice. On the photographs the bottom sampler is made ready and lowered,

furthermore foraging Walruses were constantly present in the places where the bottom samples were taken, and when the Walruses immediately before have sorted out the majority of the big *Cardium*, *Mya* and *Saxicava* mussels, these will only be sparsely represented in the samples, even if they are abundant in the intact sea bottom. The absence of *Saxicava* and *Mya* in part of the samples is presumably among other things due to the fact that the bottom sampler does not penetrate sufficiently far down into the bottom, and therefore does not collect all the individuals.

As however both the presence of the Walruses and the icebergs on the banks are factors normally to be reckoned with, the picture given by the bottom samples should be taken as normal for the bottom in question.

It appears that the total weight of the bottom animals amounts to 450 g per sq.m, a considerable weight which approximately corresponds to the weight in far more southerly waters. By way of comparison it can be mentioned that at Upernavik a value of 388 g per sq.m (VIBE 1939) has been found, round Iceland 455 g per sq.m (R. SPÄRCK 1937) and in the Faroes 384 g per sq.m (R. SPÄRCK 1929). At Prøven, a little south of Upernavik, I found however in 1936 the same community as at Thule, but with a weight of 1482 g per sq.m (VIBE 1939), with *Macoma*, *Mya*, *Saxicava* and *Cardium* very predominant, but at present this must be considered an isolated case as long as West Greenland has been so sparsely investigated.

If we consider the animals in the bottom samples which are of the greatest importance to the Walruses, the Neqe banks have altogether

whereupon the dogs haul it up again with bottom material.

yielded 14 species of *Lamellibranchiata* with a total of 227 individuals with a weight of 261 g per sq.m, which is 57.9 % of the aggregate weight of 450 g per sq.m. These are distributed as showen in the table p. 43, computed into "normal weight" by adding 10 %.

The smaller mussels can be left out of consideration at once. Then

The Lamellibanchiata of the Macoma community at Neqe.	Number per sq. m.	»Normal weight« per sq. m. in g.	Per cent of the average total weight
Macoma calcaria	98.5	62.9	14.0
Saxicava arctica	24	90.5	20.1
Mya truncata	8.5	7.8	1.7
Astarte banksi	16	18.0	4.0
— *borealis*	4	20.1	4.5
Cardium groenlandicum	1.5	13.8	3.0
— *ciliatum*	2.5	25.6	5.7
— *elegantulum*	0.5	0.3	..
Modiolaria nigra	1	2.8	0.6
— *laevigata*	11.5	7.5	1.6
Leda minuta	21	3.1	0.7
— *pernula*	19.5	5.9	1.3
Thyasira flexuosa	2	0.2	..
Nucula tenuis	16.5	2.5	0.6
	227	261	57.9

there remain the first mentioned seven species which were all found in the Walrus stomachs, but of which only the four species constitute the principal elements in the diet of the Walrus, viz.: *Saxicava arctica*, *Mya truncata*, *Cardium groenlandicum* and *Cardium ciliatum*. These four species occur in a number of 36.5 individuals per sq.m with a total weight of 137.7 g per sq.m, representing 30.5 % of the aggregate weight. These figures are absolute minimum figures, since the two first mentioned mussels most easily escape the bottom sampler.

A question then arises: How large a part of the sea bottom must the Walrus search during each meal in order to fill its stomach. If we consider the *Cardium* mussels which do not escape the bottom sampler so easily as the other species buried more deeply into the bottom, we find a number of four per sq.m. A Walrus which had foraged at 35 m depth here had filled its stomach with altogether 795 feet of *Cardium groenlandicum* and *Cardium ciliatum*. This means that the Walrus in question had to search about 200 sq.m of the sea bottom to be satisfied by means of *Cardium* mussels at 35 m depth.

If we regard another Walrus which at 80 m depth has filled its stomach with 1881 siphons of *Saxicava arctica*, which out here occur in a number of about 44 per sq.m (this figure is from an average depth of 50 m and is perhaps a little larger at 80 m), this Walrus has searched about 43 sq.m of the bottom in order to get hold of these mussels.

In view of the fact that the Walrus is a mammal which at short intervals, about ten minutes, has to go to the surface in order to breathe, it can easily be understood that it is more expedient for it to search a bigger area at 35 m depth than one at 80 m depth. At the lower depths the Walrus will select the big, fat and no doubt delicious *Cardium* mussels of which it eats the fleshy foot, while, being forced out at greater depths, it has no time for selection, the more so as *Cardium* mussels are rare out here. The Walrus then will gather the siphons of *Mya truncata* and *Saxicava arctica* which are abundant here.

It will appear from the above that the Walrus is associated with the *Macoma calcaria* community and therefore has no feeding possibilities in areas where this community does not occur. Fig. 11 shows the distribution of this community in the Thule district, as far as it has been examined at present. It corresponds fairly well with the distribution of the Walrus in the district. In Melville Bugt I found in 1936 a *Chiridothea sabini* community, which might prove to occur throughout the northern part of Melville Bugt, which closer investigations however must prove. In Wolstenholme Fjord and Inglefield Bredning the depths are too great for the *Macoma* community to exist here, and the same is the case in Baffins Bugt proper and Smith Sund. From Kane Bassin and northwards conditions are unknown. Here they are supposed to deviate con-

siderably from the more narrow area of the Thule district proper. The current is the cold Polar current coming from the north from the Polar Sea proper, and the areas are never completely free of ice. Probably the *Macoma* community here merges into other communities with fewer species and a smaller total weight per sq.m. An investigation of this area will be of the greatest interest.

If the development is continued according to its course in the last 30 years two things will happen in the Thule district: the climate will improve slowly and favour an immigration of other species from the south—and the Walruses will gradually disappear owing to the exhausting catches in West Greenland, if strict protection regulations are not introduced. An investigation of the Neqe banks then might give quite different results, since the large Walrus populations at present must be considered a regulating factor of considerable importance to the stock of Lamellibranchs.

Wintering of the Walruses.

When ice begins to form along the coasts at the end of October the Walruses will nevertheless remain as close to the shores as possible, so long they are able with their forehead to make breathing holes in the young ice, but as soon as this becomes more than 10—15 cm thick, the Walruses no longer go up through it, but retire outwards to greater depth. Nor do they go through ice covered with snow.

Gradually as the ice edge proceeds outwards the Walruses will follow it, and at every breaking of the ice, they will again come in near the coasts. But when the ice is fast and has reached its maximum limit in February, the Walruses are forced to forage on the outermost banks with the great depths. They will then go so far in under the ice that they can break it, as the ice along the edge is constantly broken and forms again as young ice. In this way, e. g. at the Neqe banks, there will be a belt of about the breadth of one nautical mile where during the rest of the winter Walrus breathing holes can be found, likewise in the area off Etah and west of Wolstenholme Ø.

As far as the other Walrus banks are concerned the ice forms outside the banks proper and from here the Walruses must retire as soon as the ice covers the sea. The only places in Thule district where Walruses can winter are, therefore, the Neqe and Etah banks and the banks west of Wolstenholme Ø. The wintering Walruses as well as those aestivating are, on the two northern banks, principally females, very often followed by one year old young animals or with nearly mature foetus or both. Also young males are often met with, older ones rarely. In the Wolstenholme area males are however in surplus. A couple of years ago a similar

ice hunting as that carried on at Neqe took place off Wolstenholme Ø, but it has ceased after ice conditions have grown more unsafe out here (HANS NIELSEN).

Sleep.

In previous times, before the rifle was introduced, the Walruses, according to statements by the Polar Eskimos, often went ashore in order to sleep; this regularly happened at Uvdle and on a small island near Ivssugigsoq. Also on Littleton Ø the Walruses previously went ashore in order to sleep in large flocks. Now this is observed only rarely.

On the other hand, Walruses are often found sleeping on drifting ice floes or on small floes throughout the summer. In winter single Walruses may lie down on the fast ice in order to sleep, even in the most severe cold. Often the skin may be so hard frozen that it is impossible to thrust a harpoon into it. They may be so fast asleep that a man can go quite near them without awakening them.

But in general the Walrus will sleep in openings in the ice during winter. They will then float at the surface and lift their heads at intervals of a few minutes, breathing a few times and lower the head again. Often they float with the belly up, often with the back above water. In the latter case they resemble a camel which lifts and lowers the head, as two humps are seen above the surface of the water. Only with the lungs filled with air can the Walrus float, a killed Walrus will sink to the bottom immediately.

If a Walrus is killed just after it has filled its lungs with air, the head will sink downwards, so that the air cannot slip out again and therefore keeps the Walrus floating. Therefore, it is important to anchor the animal before the head is raised, since the air in that case will pass out and the Walrus immediately sink to the bottom. About 24 hours after a killed Walrus has sunk it will come up again to the surface owing to inflation of the abdominal cavity. The Polar Eskimos often succeed in refinding such a Walrus and it then belongs to the finder.

A common sleeping position is also the vertical position, in which the Walrus will fill the "crop" with air in order to keep floating. Mr. HANS NIELSEN, the settlement manager, with whom I have discussed this question in detail is of the opinion that this is the proper use of the "crop". Walruses sleeping in this way have their necks strongly inflated and keep themselves floating without difficulty. Some specimens which Dr. PAUL HANSEN and Dr. LAURENT CHRISTENSEN have brought home from Greenland show a considerable dilatation of the upper part of the oesophagus which is, in addition, very muscular and can be considerably dilated. The organ is found both in males and females. The Polar Eskimos use it for drumheads.

Besides in openings the Walrus may also sleep floating in the water right under its breathing hole. It can then be seen to stick its head up through the breathing hole in order to breathe, lower it and let it hang limpless down and then raise it again and take some few breaths.

When the Walrus breathes at its breathing hole it will place its tusks on the ice in order to keep fast. It may use the same breathing hole a couple of times, but in the case of very thin ice it will generally make a new hole every time it has been down at the bottom to feed. As soon as the ice has become 10—15 cm thick, it will leave the breathing hole and recede farther outwards. The breathing hole will then freeze, or it might for some time be kept open by the Bearded Seal.

At Kap Alexander on 1st of April 1941 after a period of very severe frost Walrus breathing holes were observed which had been used for a longer period of time, although the ice had become thicker than usual round the breathing holes, and now had even accumulated on the ice. During the repeated use ice cupolas one meter broad had formed round the breathing holes, as is normally seen round the breathing holes of the Bearded Seal, but which have never been observed for the Walrus. Here the ice had formed outside the bank so that the Walruses had the choice either to leave this foraging ground or try to keep their breathing holes open so long as possible. The ice usually remained only a few days so far outside its normal limit, so that the Walruses would run no risk of being icebound.

It may however often happen that a single Walrus or some few are cut off a good distance behind the ice edge, and they will then seek to the cracks made by the tide round the stranded icebergs where they can subsist for long periods with the tidal crack as a constantly open breathing hole. At rare times a Walrus may also remain at a tidal crack near land throughout the winter, but as a rule it will sooner or later try to get out into the open water by wandering across the ice.

Breeding conditions.

The Neqe and Etah banks are the actual areas of occurrence in the Thule district of the Walruses, and here we also find their natural breeding place. If one goes by ship in July north of Etah round Littleton Ø one may have the chance to meet with flocks of Walruses numbering hundreds of individuals, by far the majority being females, and many of these with one or two small young ones, as a rule only one. Parturition occurs in the last days of May or maybe in the course of June.

The Polar Eskimos are of the opinion that pairing generally takes place in one of the summer months, but it is alleged that the Walrus does not have any definite breeding time, since small calves are said

to occur throughout the year, but it is most common that the young are born in summer, and the present author has not seen small calves at other seasons.

The female Walruses which at Neqe were caught in the last part of September might often have small foetuses measuring 10—20 cm, while the females which were caught early in spring in February-March often had large well developed foetuses of the size of a small seal. A Walrus caught on March 6th 1941 thus had a foetus of 0.98 m, a female. The gestation period is thus less than twelve months, perhaps about ten months.

It is not a rare occurrence in spring during the hunting on the ice to catch Walrus females accompanied by a one year old calf, while at the same time it has a nearly mature foetus. On March 7th 1940 I was myself present when we caught a Walrus female off Neqe. The female was accompanied by a large calf, a male, which was also caught, and whose canines were already a few cm long. It was probably nearly twelve months old and had its stomach filled with the same food elements as the mother. The calf kept close to its mother, even after she had been harpooned and therefore was caught shortly after. In the uterus of the female a well developed foetus about 1 m long was found. On the same day still another female was caught with a similar foetus, but not accompanied by a calf. Likewise a third female was secured, but without foetus or calf.

Probably, the Walrus is able to produce one calf every year, but this is not always the case. It is more common that it bears one every second year. The Polar Eskimos are of the opinion that the Walrus is fully grown and sexually mature at an age of four years. According to PETER FREUCHEN it has been proved that the Walrus can be at least 16 years old, probably it even gets older.

Hunting.

The Walrus is one of the most important game animals of the Thule district and it has been pursued by the Polar Eskimos both in historic and prehistoric times, and the methods of catching have not changed in any considerable degree. In our days the Walrus in the Thule district is still caught by harpooning, in summer from kayak, in winter on the young ice. The only difference is that instead of killing the harpooned Walrus with lances it is now killed with a rifle shot. On the other hand, it is prohibited to shoot at a Walrus which has not first been harpooned, since the Walrus in that case will sink to the bottom immediately and be lost. Infringement of this regulation means a fine of 30 krones.

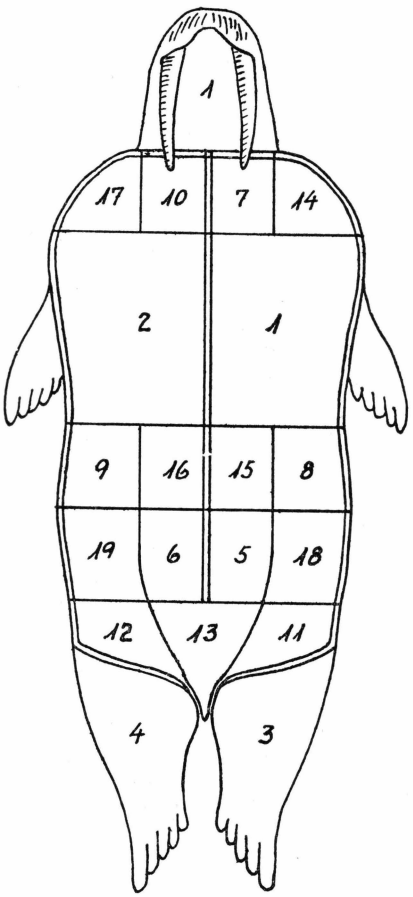
Fig. 16. Walrus flensing on the coast, where the meat is placed in caches in order, to be fetched home on sledges in winter.

The law however contains a paragraph to the effect that it is allowed to shoot at a Walrus in places which it only passes on migration or as a straggler. Thus the Walrus may be shot with rifle when in summer it travels along the ice edge on the north-going migration south of Savigsivik, or when during the summer migration it reaches right to Inuarfigssuaq at Marshall Bugt on Inglefield Land, and also if a straggler appears at the head of Inglefield Bredning, where it does not occur normally.

Also Walruses which are met with sleeping on ice floes where they cannot be harpooned, it is allowed to kill with rifle. All these exceptional cases however occur only rarely, since the principal hunting takes place from kayaks or on the young ice.

At Neqe people are always at the lookout for Walruses. The kayaks are ready on the beach and at the first outcry the hunters went out, generally 3 or 4 men, never less than two as Walrus hunting may be dangerous, and only the most able hunters will hunt from kayak, since the Walruses nearly always occur in flocks. The hunters now rapidly approach the flock. Their companions wait with their kayaks at a small distance, while the chief hunter rows up to the flock and throws his harpoon at the moment the selected Walrus dives. It often happens that the Walrus does not dive, but instead attacks the kayak, and then

the hunter must get away quickly. In such cases it is also allowed to shoot. If the hunter is not quick enough the Walrus will attack the kayak and tear it to pieces with its tusks. This often happens and then it is a good thing to have companions nearby so that they can attack



No. 1. Left fore-body, head and intestines
- 2. Right fore-body.
- 3. Left hind flipper.
- 4. Right hind flipper.
- 5. Left part of back with kidney.
- 6. Right part of back with kidney.
- 7. 1/4 of neck.
- 8. 1/4 of lowermost costal part.
- 9. 1/4 of lowermost costal part.
- 10. 1/4 of neck.
- 11. 1/4 of abdominal wall.
- 12. 1/4 of abdominal wall.
- 13. Rump with pelvis.
- 14. 1/4 of neck.
- 15. 1/4 of lowermost costal part.
- 16. 1/4 of lowermost costal part.
- 17. 1/4 of neck.
- 19. 1/4 of abdominal wall.

Fig. 17. The figure shows the distribution of the portions due to the hunters if 19 hunters have participated in the capture.

it with their rifles and kill it if possible, thus saving the unfortunate hunter and take him into their kayaks by forming a kayak fleet or by keeping the wrecked kayak between them.

If the Walrus has been harpooned it will generally dive at once, but it is checked in its flight by the inflated bladder and the sea anchor which are both fastened to the line. When after a short while it is again forced to go up to the surface in order to breathe the bladder first becomes visible, the hunters will steer after it and rapidly point their rifles at the Walrus trying to kill it with a shot in the back part of the

head, which is not always easy. Such a pursuit of a harpooned Walrus may very well last for one hour before the animal is exhausted and becomes an easy prey. For the sake of security two or more harpoons are generally placed in it, as the first one may go loose or the line may be severed by the shot.

The killed Walrus is kept floating by means of the bladders, or some air is blown into the abdominal cavity. It is now towed to the nearest shore, and the kayaks participating in the hunt proceed, one fixed to the other, in a straight line. When they arrive at the coast they await the flood in order to have the Walrus come as far up as possible. Here it is attached to a stone, and only when the sea has lowered considerably, flensing commences. This takes place according to very definite rules, which have been maintained through centuries. All persons present at the flensing or who arrive before it is finished, have a right to a part of the animal. The only condition is that the person concerned has touched the animal or during the hunt injured it with his harpoon, lance or by rifle shot, and that he or she has his own dog team or is a breadwinner. In this way measures have been taken that everybody will get something and nobody will suffer. The size of the flensing part depends on the sequence in which the prey has been injured or touched, or on the number of hunters present (see fig. 17).

In the northern district some twenty Walruses are caught in summer from kayak. Here there is no motor boat to take the hunters out to the hunting grounds—and it is not advisable to travel too far from the outposts in kayak. At Thule, on the other hand, hunting takes place from the motor boat of the station and it takes the kayak hunters out to the hunting places near Saunders Ø and tows the Walruses to the flensing places. In September and the whole of October upwards of 100 Walruses may be caught before the ice compels the Walruses to disappear from the Saunders Ø banks. Likewise, there is a great deal of hunting in these months on the banks along Kap York Land from private motor boats.

As soon as the first ice has formed the Walrus hunting commences on the young ice on the banks near land, until the ice grows too thick or snow accumulates on it. Here the Walrus is harpooned through its breathing hole or in small openings when it comes up in order to breathe. The harpoon line is at once fastened into the ice by means of an ice anchor whereupon the Walrus is killed by shots or with lances. This hunting is fairly undangerous and is performed by most of the hunters even if they are not expert Walrus hunters. Unfortunately, the young ice rapidly becomes unsuitable along the coasts, and so long as the season of obscuration with its constant ice breakings lasts the hunters dare not go out to the ice edge. Only when the light begins to come

Fig. 18. The Walrus has been harpooned through its breathing hole, and the line made fast in the ice by toker iron. The hunter now is killing the animal with his lance when it comes to the surface in order to breathe.

back in February the actual ice hunting commences along the ice edge out over the banks between Kap Alexander and Hakluyt Ø. Out here the young ice breaks continuously and forms again, or broad cracks with young ice will form through which the Walrus can penetrate. This hunting is continued throughout spring to well into May when the ice edge begins to wear away towards land. The sledge travels out to the hunting places from the settlements Siorapaluk or Neqe are long and troublesome. Every journey takes almost 24 hours, often the men have to sleep on the sledge in order not to make the dogs too tired. The temperature of the air at that time of the year rules round —40°C.

Close to the ice edge three important iceberg banks are situated in an almost straight line between Kap Alexander and Hakluyt Ø. In the hunting period these play a double rôle. In the first place there will always be open water or young ice in the tidal cracks round the icebergs where the Walruses generally occur, even if the ice edge lies farther out. Secondly, the icebergs will remain on the ground even if the sea ice might suddenly be broken by gales and float out at sea. The hunters can then seek refuge on the icebergs if they are cut off from land. In this way they have often saved both themselves, their sledges, dogs and prey. A few days after young ice will form again and the hunting can go on at the place where it was interrupted. It has become the general rule, therefore, only to approach the ice edge round these iceberg

banks. The depth here is 60—70 m, between the banks about 80 m. The Walruses however occur along the whole ice edge. In the north district about 50 Walruses are caught every spring in this hunt.

Importance of the Walrus to the economy of the Polar Eskimos.

Being one of the most important game animals of the district the Walrus plays a great rôle in the economy of the Polar Eskimos. The meat is used both as human food and especially as dog food. It is excellent for both purposes. It is always eaten boiled, since the Polar Eskimos were never accustomed to fry their food. The meat is however both coarser and more tough than seal meat, and the latter is to be preferred when one has for some time subsisted on Walrus meat. The liver is generally eaten raw or frozen and is a favoured eating. This as well as the meat are excellent for frying, the blubber should only be completely removed, since it gives a bad smell in the oven.

The blubber is mostly used as food for the dogs, as well as the skin. It may also be used for oil lamps, but a lamp with blubber will soot much, so for the lamps blubber of Narwhal or seal is preferable. Blubber is not sold to the shops in Thule district, since the population cannot be without it as a reserve for their lamps or as food for their dogs.

The tusks of the Walrus is a good commodity, but the majority of them are used by the hunters themselves for making tools.

The Walrus hunting in the spring is always looked forward to with great expectation. The winter supplies have been eaten up shortly after Xmas, and then there are often some weeks in the coldest time when people starve and freeze until the Walrus hunting can begin. Much meat means strong dogs, and with a good and well-fed dog team they can get far about hunting foxes, and in April start on the long travels to Washington Land or Ellesmere Island hunting bears which are of great importance in the daily life of the Polar Eskimos.

It was also the Walrus hunting which made our expedition journeys to Ellesmere Island possible. The spring of 1940 yielded exceedingly good catches so that we could start our journeys with the best dog teams which could be imagined, and the same was true of our companions. Walrus meat was carried on the sledges for the first week for ourselves, and for the whole of the journey for the auxiliary sledges. After that time we had pemmican.

Measurements of Walrus.

Neqe 17-6-1940, ♀, length from nose to vent 236 cm
Neqe 17-6-1940, ♂, — — — - — 308 cm.

The Bearded Seal.

(*Erignathus barbatus.*)

Range of distribution.

The Bearded Seal is common throughout the Thule district. Thus it has a far greater range than the Walrus, since it also penetrates into the fjords, into Melville Bugt and into Kane Bassin right up through Kennedy Kanal to Ft. Conger. In all places where Walruses are met with one can be sure to find the Bearded Seal.

Explanation of the map of the range of distribution of the Bearded Seal.

The range of distribution of the Bearded Seal has been marked on the map p. 55 on which the density of the hatching indicates its frequency. The horizontal hatching shows its occurrence in summer, the vertical one its occurrence in winter. We shall now follow the map from south to north.

In Melville Bugt the Bearded Seal is not numerous, if anything scarce, which presumably is correlated with the poor feeding possibilities; for although the Bearded Seal is omnivorous, the bottom fauna nevertheless plays a considerable rôle in its diet. This question will be further discussed under nutrition.

From Kap York and northwards, on the other hand, the Bearded Seal is very common, and likewise throughout the Saunders Ø area, the outer districts of the Inglefield Bredning area and its northern tributary fjords, whereas it is more rare at the head of Inglefield Bredning and the interior parts of Olrik Fjord. This presumably is also due to the exigence of the Bearded Seal for an extremely diversified diet.

The Bearded Seal is regularly met with throughout the summer along the north coast of Inglefield Land, and likewise along the coasts of Washington Land right up to Hall Bassin and along the east coast of Ellesmere Island from Ft. Conger and southwards, probably the whole distance, but it is most abundant in the region north and south of Bache Peninsula. In the fjords and sounds west of Ellesmere Island the Bearded Seal has not been met with as far as is known.

Migration and wintering.

The Bearded Seal is not supposed to have any definite migration. It is stationary in Thule district, but in summer it straggles far about. According to the Polar Eskimos it often happens that Bearded Seals

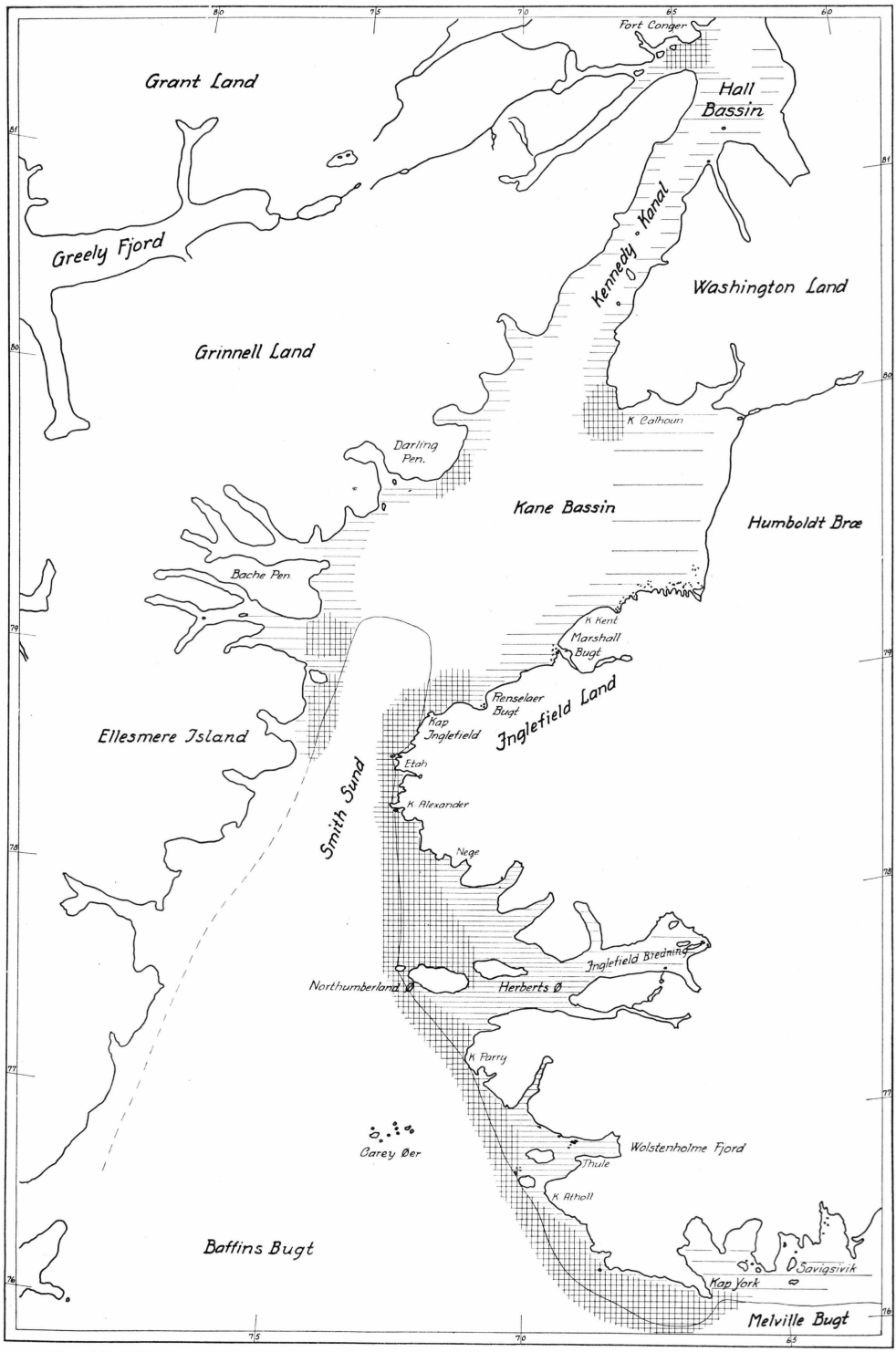


Fig. 19. Map of distribution of Bearded Seal in the Thule district. Horizontal hatching occurrence in summer, vertical hatching occurrence in winter.

and Walruses are caught on the south coast of Ellesmere Island with harpoons or rifle balls in them deriving from the Thule district, and the opposite may also be the case. According to Nukagpiánguaq there is, simultaneously with a beginning scattering of the ice in spring, a northwards migration of Bearded Seal along the ice edge at the east coast of Ellesmere Island, but this presumably is connected with a general return to the ice-free waters which takes place every spring when the ice breaks.

The ice compels the Bearded Seal to recede from all the inner coasts and fjords, where there are no water kept open by currents. It will then follow the ice edge outwards and keep close to it, but it will go much farther in under the ice than does the Walrus, since, like the Ringed Seals, it is able to keep its breathing hole open with the claws of its foreflippers. The Bearded Seal however dislikes a too thick ice, and seldom occurs in places where the ice is more than 20—30 cm thick. In many cases its breathing holes are found in cracks with young ice or in the abandoned breathing holes of Walruses.

In localities at which the current keep the water open throughout the winter or in periods interrupted by intervals of young ice the Bearded Seal does not hesitate to winter, even if these places may be situated several hundred km from the ice edge. Thus the Bearded Seal can be met with throughout the winter in places with open water owing to currents round Bache Peninsula, round Darling Peninsula and in Lady Franklin Bay south of Ft. Conger, all situated on Ellesmere Island, and at the extensive open water round Kap Calhoun on Washington Land. These places for the same reason are secure catching places throughout the winter, and Polar Eskimos in distress or travellers are recommended as quickly as possible to go to such places which are kept open by the currents, if the catch should fail in other places.

At Kap Calhoun I myself observed the Bearded Seal on June 7th 1941 at a time when the total Kane Bassin was still icebound. In the same open water also great numbers of Ringed Seal were seen. Some twenty years ago a settlement in the vicinity, Nunatami, was inhabited both summer and winter due to this open water, and the Polar Eskimos going on their bear hunts early in spring use to go to this place in order to hunt, and even wintering families on Inglefield Land take refuge to this place in the middle of the winter in case of unsuccessful catches.

The Bearded Seal comes to Inuarfigssuaq on Inglefield Land in the middle of June. At that time there are sufficient cracks in the ice for it to leave the open water in Smith Sund and travel eastwards. It again leaves Inuarfigssuaq, Marshall Bugt, well into August and after that time it is not met with up here throughout the winter.

The breathing hole of the Bearded Seal is easily distinguishable from that of the Ringed Seal. It is considerably larger, 6—8 cm in diameter, and a glassy ice cupola will rapidly form round it, the surface of which is squirted with water and is formed again every time the Bearded Seal comes up to breathe. It can be seen at a great distance, since the ice cupola reflects the sun or moon light. Like the Ringed Seal it has generally 2 or 3 breathing holes within a radius of some few hundred meters which it uses alternatingly. Also the tidal cracks round grounded icebergs are often visited by the Bearded Seal for breathing.

The whole area along the ice edge from Kap Inglefield to Kap York is a safe habitat for the Bearded Seal throughout the winter and in spring there is a good deal of hunting here, especially the north coast of Northumberland Ø is said to be a good place for hunting Bearded Seal.

The Bearded Seal never goes on land, and in contrast to the Ringed Seal it seldom goes up through its breathing hole to sleep on the ice. On the other hand, it may in spring crawl up on the ice through cracks and lie down to sleep, but always near open water. Most often it will however go up on detached ice floes outside the ice edge, but during the scattering of the ice in summer it may be met with on the drift ice far out at sea, both in Baffin Bugt and Davisstræde.

It has been observed occasionally that a single Bearded Seal has wintered at its breathing hole near the glacier in Wolstenholme Fjord, but it is not a common occurrence. In spring the Bearded Seal occurs on the ice earlier than the Ringed Seal. Previously, when the ice west of Kap Atholl and Wolstenholme Ø extended farther out Bearded Seals could be killed here as early as in April when they were sleeping on the ice, and this is still done in winters when the ice is fast sufficiently far out at sea.

Diet.

As regards its food the Bearded Seal is not particular, it is almost omnivorous; it will however mainly stick to the fauna in or just above the sea bottom, where it can get down at it, but if the depths are too great, it will be content with Polar Cod. It does not select its food elements, but seems to feed indiscriminately on all kinds of food which accidentally is found within its habitat.

There is however no competition between the Bearded Seal and the Walrus, since the former never feeds on mussels, but principally live on the other large groups of molluscs, the gastropods, with a special preference for *Buccinum*. This gastropod is found in a great number of the stomachs of the Bearded Seal, but never the shells which are discharged in some way or other. On the other hand, numerous shelly plates (operculum) often occur in the stomachs. These adhere to the foot and

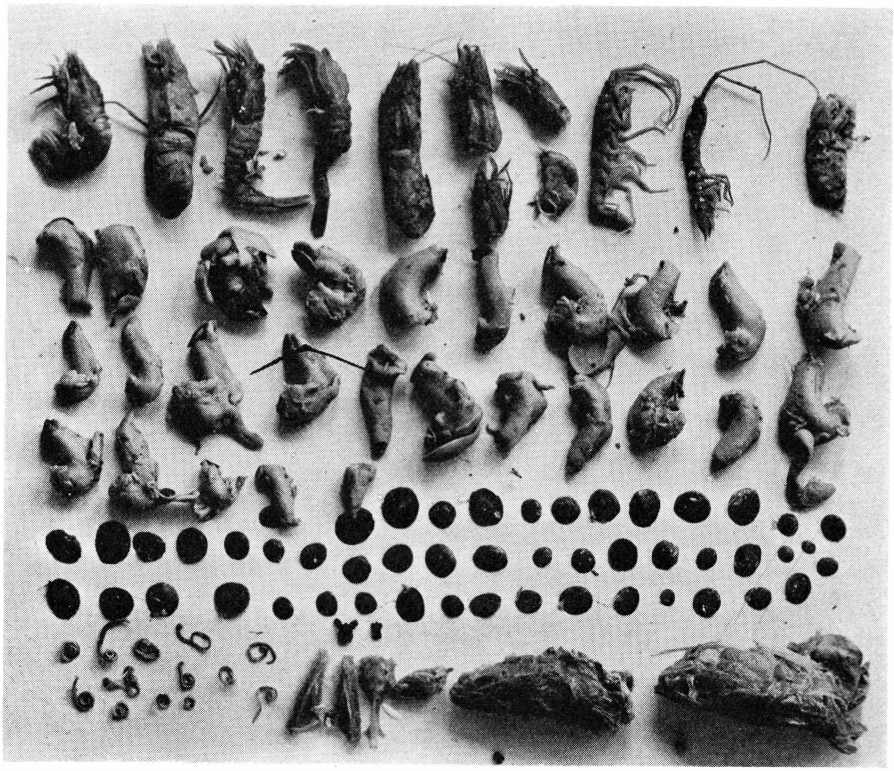


Fig. 20. Stomach content of a Bearded Seal from Neqe. At top to the left are seen 8 *Decapoda*, 1 *Anonyx nugax*, 1 *Neohelia maxima*, 1 *Arcturus baffini*, 1 *Rossia*, 26 *Buccinum* sp., 49 shell lids of *Buccinum* sp., some intestinal parasites, parts of 1 *Gadus saida*, 2 beaks of *Rossia*, 2 otoliths of *Gadus saida*, 3 *Lycodes* sp. See also the table on p. 59 no. 4.

therefore cannot be removed with the shell; nor do they seem to be dissolved by the acid of gastric juice.

It is a puzzle how the Walrus gets rid of the mussel shells, and the same is the case with the Bearded Seal as far as the gastropod shells are concerned. In this case too I am inclined to believe that the Bearded Seal sucks out the gastropod of its shell leaving the shell. The teeth of the Bearded Seal are much reduced and do not seem fit for crushing, and in that case shell remains might no doubt pass into the stomach occasionally together with the small stones often found here. It is also peculiar that the Bearded Seal seems to feed exclusively on *Buccinum* avoiding the other big gastropods as e. g. *Neptunea* and *Sipho* which have not been found in the stomachs, though they are very common on the sea bottom. The explanation may be that *Buccinum* has a thinner shell which is often open at the top and therefore can be sucked out more easily.

The one shell of *Saxicava arctica* and the one specimen which was quite small and intact were no doubt swallowed together with the small stones and do not form part of the normal diet of the Bearded Seal. All the other animals found in the stomach content of the seven Bearded Seals mentioned below are however typical food elements in these. The Bearded Seal thus devours equally willingly fish,

Stomach content of Bearded Seal	Neqe No. 1 26-2	Neqe Nr. 2 4-3	Neqe No. 3 17-3	Neqe No. 4 19-7	Neqe No. 5 19-7	Neqe Nr. 6 19-9	Neqe No. 7 20-9
Eggs of *Scorpaenidae*	abt. 200	..	..	..	..	..	..
Lycodes sp.	3	..	2	3	4	..	..
Gadus saida	..	..	..	1	..	12	8
Ear stones of *Gadus saida*	..	..	..	2	..	..	..
Buccinum sp.	33	26	61	26	4	..	..
Operculum of *Buccinum* sp.	107	162	86	49	33	..	..
— of *Natica plausa*	..	1	..	..	..	..	..
Labinea septemcarinata	..	..	4	6	13	..	..
Spirontocaris spinus	2	..	..	1	4	..	..
— *polaris*	..	2	..	1	..	..	..
— *furgida*	..	2	..	..	..	..	..
— sp.	..	5	..	..	..	..	..
Arcturus baffini	3	..	..	1	..	..	..
Anonyx nugax	..	..	..	1	..	..	..
Neohelia maxima	..	..	..	1	..	..	..
Cucumaria frondosa	1	27	..	..	1	..	..
Priapulus	5	..	..	..	..	..	..
Rossia	..	1	..	1	..	..	..
Beak of *Rossia*	1	1	11	2	..	..	..
Setae of *Polychaeta* sp.	+	+	+	+	+	..	..
Saxicava arctica	..	shell	1	..	..	..	..
Small stones	11	23	..	4	..	..	..

crustaceans, gastropods, holothurians, gephyreans, cephalopods and polychaetes.

In the cases when Polar Cod has exclusively been found in their stomachs the Bearded Seals have been caught at the head of Neqe Fjord at a depth of more than hundred meters, and here they have presumably not been able to reach the bottom. Otherwise all the other food elements have been fetched from the bottom or right over it. When in summer the Bearded Seal seeks to the head of the fjords it feeds mainly on Polar Cod, at Thule also on *Cottus*, and here it will compete slightly with the Ringed Seal which also feeds eagerly on Polar Cod. In McCormick Fjord, Hvalsund and at Kap York the Greenland Halibut is not seldom found in the stomach of the Bearded Seal, which thus

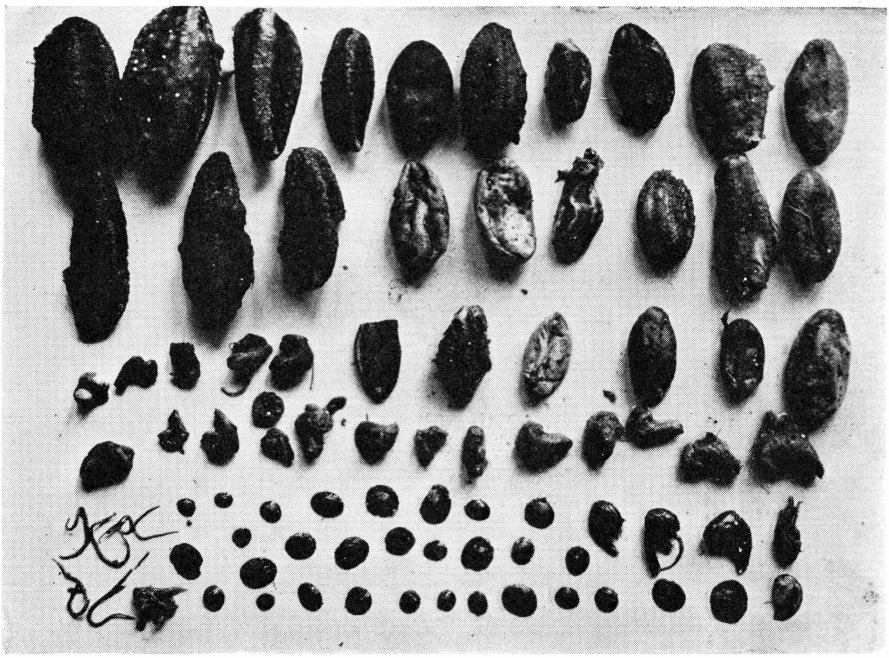


Fig. 21. Stomach content of a Bearded Seal from Neqe. From top to the left are seen 25 *Cucumaria frondosa*, 19 *Buccinum* sp., some intestinal parasites, 30 shell lids of *Buccinum* sp., 1 shell lid of *Natica plausa*, 4 *Decapoda*.

competes with the Narwhal and the White Whale, just as shrimps are also eaten by Narwhal and Ringed Seal.

On the other hand, *Buccinum* and *Cucumaria* are exclusively eaten by the Bearded Seal, and of these notably *Buccinum* seems to represent the major part in the diet in the outer districts.

In contradistinction to the Walrus the Bearded Seal does not waste anything of its food, since all food elements are swallowed whole, also *Buccinum* with the exception of the shell. The Bearded Seal thus is economic and cannot be said in any way to exhaust the animal population; for even if it eats everything on its way, the fauna is so rich that it does not matter, and it plays in return an important part in the economy of the inhabitants.

Breeding conditions.

The Bearded Seal is commonly breeding in the Thule district. A new-born cub has however only been observed a single time by Nukagpiánguaq, who, when the ice began to scatter in spring, found a Bearded Seal with its cub in a cavity formed by pressure of the ice. Young ice covered the bottom of the cavity and here the Bearded Seal had gone

up in order to bear its young. In general parturition is presumed to take place both in the water and on ice floes or near the ice edge, like in the Walrus. The Bearded Seal has never been met with in any snow den on the ice round the breathing hole as may be the case in the Ringed Seal.

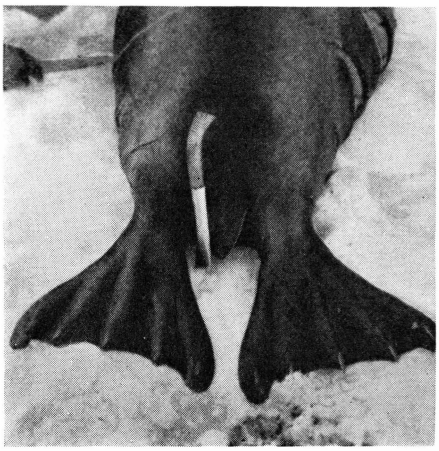
Mating occurs in summer. In November the Bearded Seal may have a foetus about 20 cm long. In spring the foetus is fully grown. At Neqe on March 17th 1941 a Bearded Seal with a fully developed foetus measuring 112 cm from snout to tip of tail was found. Neither mating nor parturition have been directly observed.

Hunting.

The Bearded Seal is extremely wary and hunting of this Seal is therefore regarded as the finest sport of the Eskimos. The annual catch hardly exceeds some fifty animals throughout the district, in spite of the fact that the Bearded Seal is considered just as numerous as the Walrus, of which animal upwards of 200 specimens are caught every year. Nevertheless, the Bearded Seal is of vital importance, since it yields the indispensable lines, soles for their boots, whip lashes, dog shafts, straps etc. If no succesful Bearded Seal catch, no travels and bear hunting, say the Polar Eskimos, and also no Walrus hunting.

In summer hunting takes place almost exclusively from kayak, partly by harpooning, partly by shots in head nor neck when it comes up to the surface to breathe. The prey, as in the case of the Walrus, is taken to the nearest shore to be flensed and divided into portions according to the same rules as apply in Walrus hunting. The skin is however divided in a special way, being taken off in belts to be cut up into straps later on. Each hunter will get his part. The skin however is not divided into more pieces than a suitable strap can be made out of each piece. The part between the fore flippers, which is not suitable for straps, are used for soles for their boots. If the hunter declares that he wishes to use the entire skin for tent skin, he has a right to do so, but in that case he is obliged to cut the skin round the belly in its entire length.

In winter the Bearded Seals are caught in their breathing holes. The hunter drives out on the ice, preferably with a companion on the sledge. The dogs are trained to scent the breathing holes at a certain cry from the sledge driver which sounds as: lä, lä, lä, lä, lä, lä, lä, lä, lä, lä, lä quickly repeated. The dogs are then allowed to steer the course themselves and walk in great bends across the ice, turning now right, now left. If they scent a breathing hole they will suddenly increase the speed, thereby arousing the attention of the hunter. He now grasps his



Figs. 22—23. The powerful hind flippers of the Bearded Seal. The skin of the Bearded Seal is removed in rings, and is later cut up into catching lines, dog shafts etc.

harpoon, give the whip to his companion, and alights from the sledge while the dogs are directed in a bend away from him. The hunter now places himself a few steps from the breathing hole with this face towards it and against the wind waiting calmly without moving until the Bearded Seal appears in order to breathe. Meanwhile his companion drives in a circle of 200 m or 300 m radius round the breathing hole in order to scare away the Bearded Seal from other breathing holes, if any, in the vicinity, and if he finds these he covers them with snow or spoils them in other ways so that the Bearded Seal will not seek them again but will be forced back to its first breathing hole where the hunter has placed himself.

The hunter will wait for 5—10 minutes persistently watching the water level of the breathing hole. If the surface becomes unsettled, the Bearded Seal will be just below and at the next moment will show its snout and blow. Now follow a number of jerky inspirations and expirations, during which the hunter rapidly goes one step forwards and then thrusts the harpoon into the nose of the Bearded Seal. If the neck or throat is hit, the harpoon will easily slip.

The Bearded Seal will now react most vigorously for which reason it is of no use to fasten the line into the ice like during Walrus hunting, the harpoon in that case will be pulled out at once. For the same reason Bearded Seals are never killed with rifle through the breathing hole as in the case of the Ringed Seal, as the Bearded Seal even if it is killed at once will react so violently that there is no time left for fastening the harpoon into it before it has gone away from the breathing hole and will be lost. On the contrary, the hunter will keep the line in his hand supporting it on the hip. It is now important to check the violent

jerks which will gradually tire out the Bearded Seal so that it must again return to the breathing hole in order to breathe. It can then be killed with a lense or rifle shot. The hunter should take care not to wind the line round his hand or fingers. A hunter once had his little finger torn off in this way during the violent jerks of the Bearded Seal of the line. The catch, therefore, may be dangerous, and is only carried out by skilled hunters. When the Bearded Seal has finally been killed, the ice round the breathing hole is cut up so that the Seal can be pulled out of the water and flensed.

In winter in moonshine or in spring in sunshine they used to go to the breathing holes of the Bearded Seal, driving over the ice with the moon or the sun from the side, constantly watching the ice right in the streak of light. If now a breathing hole is passed, it will be visible at a great distance, since the glassy ice cupola will reflect the light. If, on the other hand, there is snow on the ice, the dogs will have to find the breathing holes by scent.

Economic importance of the Bearded Seal to the Polar Eskimos.

The meat of the Bearded Seal is well fit for human food since it is good both for frying and boiling. The blubber is excellent for the oil lamps, a little better than Walrus blubber. The skin can be used for several purposes, primarily for lines and straps. These are elastic and strong and cannot be torn by Walruses or a full dog team. They may be wet, freeze or dry up entirely without losing their strength. Therefore, they are well suited for dog shafts, whip latches, straps etc. and everywhere where strong straps of a certain elasticity are needed.

The skin of neck, shoulders and breast are used for boot soles after having been dried in the frost and after a special treatment. These soles are extremely durable and can easily be worn a whole winter without being worn out. Since time immemorial the small intestine of the Bearded Seal has been used for window panes in the peat soil houses of the Polar Eskimos. The fresh intestine is inflated and dried, whereupon it is cut open. The villi and the outermost muscle layer are scraped off and only the innermost muscle layer is used. Several pieces may be sown together to a large pane. Such a pane is not transparent but diffused light can penetrate it. If other sinew thread is not available the intestine may also be used and the same holds good of the oesophagus of the Ringed Seal. Besides, the small intestine of the Bearded Seal is considered a great delicacy either frozen or boiled.

The liver of the Bearded Seal is not eaten by man, like bear liver, and for the dogs it is only used in frozen condition. Raw or boiled liver

of the Bearded Seal may cause great nausea although the cause of the illness is unknown.

Measurements of Bearded Seals.

Neqe 19-7-1941, ♀,	length	from	snout	to	vent	193	cm,	circumference	140	cm
Neqe 19-7-1941, ♂,	—	—	—	-	—	198	-	—	142	—
Neqe 12-6-1940, ♂,	—	—	—	-	—	238	-	—	?	
Neqe 17-3-1941, foetus		—	—	-	—	112	-	—	?	
Inuarfigssuak about 1-11-1939, foetus				-	—	5	-			

The fully grown female of the Bearded Seal, in contrast to the Walrus and the Ringed Seal, is always bigger than the male. In fully grown individuals there may be up to 50 cm difference in the length of female and male (HANS NIELSEN).

The Harp Seal.

(*Phoca groenlandica.*)

The Harp Seal is a fairly common summer visitor in the Thule district. It comes from the south in June and can be met with until well into October. It is rare along the north coast of Inglefield Land, but it has been observed at Marshall Bugt in August 1939.

Harp Seals are generally seen in flocks of upwards of some ten individuals or more. Such a flock will tumble through the water in a way which reminds of dolphins, since at short intervals they will break the surface rising half over it and fling themselves down again beating the water round them, when migrating into or out of the fjords, of which they seem especially to prefer Robertson Fjord.

In winter the Harp Seal does not occur in the Thule district, they all leave when the first ice is formed. A single Harp Seal was however caught in a net under the ice at Qânâq in Inglefield Bredning in the winter of 1930, and in the winter of 1933—34 two individuals probably wintered near Kangerdlugssuaq of which the one was shot sleeping on the ice in spring. These Harp Seals are supposed to have been caught by a quick ice cover in the autumn and have not been able to get out to open water, for which reason they have had to subsist by keeping the breathing holes open, or they may have used the breathing holes of the Ringed Seal.

Their diet presumably consist mainly of Polar cod, which is suggested by their occurrence in the deep fjords. On July 23rd 1941 a Harp Seal was caught at Siorapaluk. The stomach content consisted exclusively of Polar Cod, which according to the Polar Eskimos is said to be its principal diet. When it arrives at Thule in June its stomach content is said to consist principally of fish fry.

The Harp Seal does not breed in the Thule district. It has no foetus when it arrives from the south, but when it leaves the district again in October it is common to find a foetus, 10—12 cm long, in it. Its breading area presumably is situated round New Foundland, where Harp Seals are met with, breeding by thousands on the drift ice.

The Harped Seal is hunted from kayak, and shot with rifle or harpooned. The catch is not overwhelmingly large, some 50 animals every summer. The meat is excellent as food for man. The skin is used for boots, and may in case of emergency be used for soles, it is excellent for tent skin and kayak skin. The kayak of a Polar Eskimo is generally made from five skins of the Ringed Seal and one skin of the Harp Seal. This latter skin is placed round the fore-end of the kayak to protect it against ice or wear against skerries and rocks, since it is both thicker, larger and stronger than the skin of the Ringed Seal.

The Bladdernose.

(*Cystophora cristata.*)

The Bladdernose is a very rare summer guest in the Thule district, but normally its summer migration reaches to Kap York where it is common in July-August. Bladdernoses met with more northerly can only be regarded as stragglers. At Natsilivik a Bladdernose was harpooned from kayak by the Polar Eskimo Kûtsikitsoq in 1935. Twice it pulled out the harpoon with its teeth and eventually escaped. The same is said to have happened to other hunters. The Bladdernose is a dangerous guest to attack. In South Greenland stories are often told about Bladdernoses attacking their persecutors.

The statement by the Polar Eskimos that the Bladdernose in summer is common round Kap Calhoun on Washington Land sounds rather strange. According to Nukagpiánguaq there is in summer a migration of Bladdernose up along the east coast of Ellesmere Island, and it must be offshoots from here which reach the coasts of Washington Land. According to Greely a Bladdernose was killed in the middle of Kane Bassin on September 20th 1883. Besides, one or two specimens were seen.

The Bladdernose does not winter in the Thule district, but it might happen that it is icebound by an early ice cover and does not get away in time. Thus tradition has it that a Bladdernose some 60 years ago was caught at a breathing hole near Qânâq in Inglefield Bredning in winter, and it is also said to have been caught when walking across the ice in the same place.

It does not breed in the district.

The main reason why the Bladdernose generally does not penetrate into Wolstenholme Fjord and Inglefield Bredning is presumably, in contrast to the other seals, its preference for the great depths near the open sea. At Kap York it is always taken off the iceberg bank, and previously it was generally caught off Natsilivik at the great depths near the entrance to Hvalsund.

The Spotted Seal.

(*Phoca vitulina.*)

Normally the Spotted Seal is not met with in the Thule district. A few individuals are however presumed to have been observed in a single summer about 1935 when they came in with the tide to the island of Igánapaluk in Booth Sund south of Kap Parry. The seals went ashore in order to sleep which Ringed Seals will never do.

The Ringed Seal.

(*Phoca hispida.*)

Range of distribution.

The Ringed Seal is extremely common both in the Thule district proper and along the rest of North Greenland as well as on both sides of Ellesmere Island and Axel Heiberg's Land. It is not bound to definite depths, to the bottom fauna or to certain ice conditions, and may be met with, therefore, equally often at the head of deep fjords, near the glaciers, along the coasts, in the fjord entrances and out over the Walrus banks and far out at sea, both under ice several metres thick, and under young ice and along the ice edge, in the dark season as well as in the light season.

It is most abundant in Melville Bugt from Kap York and eastwards. In spring it may be seen here in large flocks along the cracks in the ice or in small flocks round the breathing holes. The principal hunting down here, therefore, is almost exclusively seal hunting at all the seasons. Here it has one of its great breeding areas in the extensive and desolate districts in the innermost part of Melville Bugt.

From Kap York to Kap Inglefield the Ringed Seal has an even occurrence and is hunted all the year round.

From Kap Inglefield and along the ice edge to Ellesmere Island the Ringed Seal again becomes numerous which also holds good of the north coast of Inglefield Land, Kane Bassin and the coasts of Washington

Land. Normally, these areas are not inhabited so that peace reigns throughout the year, apart from straggling Polar Bears. On a sledge journey across Smith Sund in the spring of 1940 we counted on May 23rd in a single place 54 seals lying on the ice round the horizon, in another place 65 seals. Often some ten were seen round a single breathing hole. During a journey along Inglefield Land and across Kane Bassin to Washington Land in the spring of 1941 we saw seals everywhere on the ice, so that for nearly two months we could travel without provisions relying on sufficient seal hunting which never failed.

West of Ellesmere Island we met with seals everywhere in the spring of 1940, notably in Bays Fjord, Heureka Sound and the mouth of Baumanns Fjord. Along the south coast of Axel Heibergs Land the Ringed Seal seemed to be less abundant (in the last part of April). Presumably the sea is here very shallow at a distance far out from the coast, which the many closings in of ice and the low coast land seemed to indicate. West of Kap Southwest the seals again became less abundant.

Wintering.

The Ringed Seals in the Thule district and northwards are all stationary. In summer they are most abundant at the head of the fjords near the glaciers, and here they are also numerous on the first young ice in the autumn. But gradually as the ice moves outwards and increases in thickness the seals are more evenly distributed and they have their breathing holes both in the young ice and in the older ice.

The breathing hole of the Ringed Seal in the young ice is almost circular measuring about 4—6 cm in diameter. In older ice the opening above is often smaller, and then an ice cupola will have formed over the breathing hole with a small opening above.

If the ice has reached a thickness of 3—4 cm the Ringed Seal will seldom make new breathing holes. It either leaves the place or it keeps open some of its old breathing holes by constantly removing the young ice with its fore-flippers. It is easy to get an opportunity to see how the Seal works energetically at its breathing hole to keep it open so that it is not narrowed. If this nevertheless happens by ice forming on the sides of the hole the Seal might stick in its own breathing hole and be suffocated, freeze or die from starvation. It will then be an easy prey to straggling foxes which will burrow their way through the ice down to it.

A single Seal generally has several breathing holes which it uses alternatingly and keeps open throughout the winter. Often several Seals may have breathing holes in common and help each other to keep them open.

Fig. 24. The tidal crack between the ice foot and the sea ice, where the seals often go in order to breathe. (N. C. RASMUSSEN phot.).

In the first part of the winter when the ice has not yet become fast cracks will often form off promonteries and icebergs. In the young ice over such cracks the breathing holes of the Ringed Seal can always be found. It thus seems to prefer the young ice to older ice. These cracks will often break again at spring tide so that as a rule one can be sure to meet with seals here; it is also in such places that the seal nets are placed under the ice. The places kept open by currents and mentioned under "ice conditions" usually are safe refuges for Ringed Seals. In addition, this seal may also occur regularly round the tidal cracks along the coasts and stranded icebergs.

Whenever the ice breaks Ringed Seals can be met with along the new ice edge where the Polar Eskimos will then go hunting.

In places where the ice forms early, without disturbances and lies fast throughout the winter, e. g. at the head of the fjords, a thick layer of snow will accumulate regularly with larger or smaller heaps of snow behind ice-floes and icebergs. The seals will usually go up on the ice under such heaps of snow early in winter. They will then make dens to the sides round the breathing holes where they will sleep and bear their cubs later on. A single Seal may have up to five dens round a single breathing hole. The breathing hole is in the centre with the snow dens round it. From the den there may be a breathing hole up through the snow, but this may also be missing. Bears are very clever at scenting

these seal dens, dig very quickly through the snow in order to catch the Seal or its cub, before they can escape down through the breathing hole. West of Ellesmere Island we once followed a bear's track for a couple of kilometers. The bear had visited many seal's dens all of which it had dug out, but only in a single one had it been successful.

Sleep.

Very little is known about the sleep of the Ringed Seal in winter. It is only possible for it to sleep for short periods of time at its breathing hole. In spring and summer, on the other hand, the Seal sleeps much. When it crawls on to the ice, its spleen is large, whereas this gland decreases in size when it has had little sleep. The Polar Eskimos are aware of this circumstance and call this gland "sinik" which means "sleep".

When in spring the suns begins to warm, the Seals will appear on the ice in order to sleep, breaking the ice cupola over their breathing hole and crawl up through it. They will then lie down on the ice near the breathing hole with their snout turned towards it ready to jump into the water at the slightest disturbance. In April, May and June so long the ice is fast great numbers of Seals may be seen scattered on the ice in the warm hours in the middle of the day when the weather is calm. In April they may be met with sleeping from about 10 a.m. to 3 p.m., while they forage the rest of the day and night. Later in spring it will sleep longer and may be found sleeping at all times of the day and night. Along the north coast of Inglefield Land Seals were seen sleeping on the ice in snowstorms and fogs. On the 3rd of June 1941 in Dallas Bugt we had a snowstorm for some days and a dense fog with a temperature about zero. Nevertheless, many Seals were sleeping on the ice. We shot three at midnight. They were easy to approach and they were fast asleep.

In Heureka Sound between Ellesmere Island and Axel Heibergs Land we saw, in 1940, the first Seal sleeping on the ice on April 10th, and later on we often observed Seals on the ice about noon, but only at the beginning of May did we see them in great numbers. In 1941 at Neqe the first Seal was observed sleeping on the ice on April 5th. At the head of Inglefield Bredning the Seals may appear still earlier, as also in Melville Bugt and round Kap York. The young Seals are the first to appear, the older ones come some ten days later.

In spring the breathing hole is a vertical tube down the ice, so broad that the Seal can just get up through it. At Siorapaluk in the Inglefield Bredning area the sea ice seldom exceeded 1.25 m in thickness. At Marshall Bugt seldom 2 m. In Heureka Sound west of Ellesmere Island

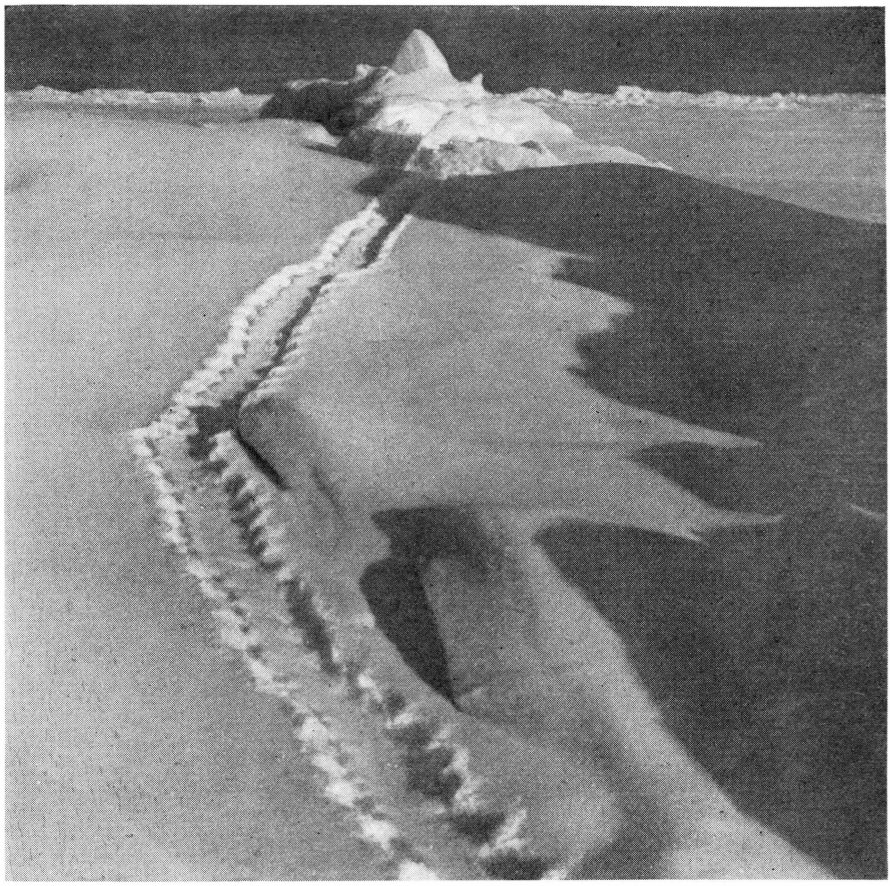


Fig. 25. A seal has gone to sleep at an open crack, has woken up and found the crack closed, whereupon it has begun to walk over the ice in order to find another crack. Only young seals are so careless.

the ice however gets considerably thicker. At a breathing hole on April 12th 1940 a thickness of 2.60 m was measured, besides another 20 cm snow on the ice. This means that the Seal had to work its way up through the ice twice its own length and keep this hole free of ice throughout the winter.

Later in summer when the ice has drifted out at sea the Seals may still be found sleeping on drifting ice floes. Nor is it unusual to meet Ringed Seals sleeping when floating at the surface of the water. Then they will be an easy prey to the kayak hunter.

When the Seal is shot sleeping on the ice or ice floes its stomach will always be empty. This is presumably due to the fact that a Seal which has just crawled up on the ice in order to sleep is difficult to get within shooting range, only when it has been there for some time will

calm fall upon it. In the Thule district proper it is of rare occurrence to meet with Seals which are fast asleep. They are always watchful, will sleep for a couple of minutes, whereupon they lift the head looking up, then lowers it again and sleep another couple of minutes in order to lift the head again. In regions, on the other hand, where human beings seldom come, e. g. in Kane Bassin, the Seals often sleep so fast that we could pass them at close quarters on sledge without awakening them.

It happens sometimes that the Ringed Seal will lie down to sleep on the ice near a newly formed crack and that this closes again before the Seal awakens. The Seal is then forced to seek another opening in the ice to slip down into the water again. Sometimes the track of the migrating Seal may be followed through the snow over long stretches. The Seal is then at the mercy of its enemy, the Polar Bear or the Polar Eskimo. It is said to be young Seals only which are met with migrating across the ice. The old ones are more experienced and will not lie down to sleep near a crack so long the ice is in movement.

Diet.

The food elements of the Ringed Seal vary a good deal according to its habitat. Unfortunately, the expedition did not succeed in collecting any large material for elucidating the diet of the Ringed Seal, since Seal hunting in summer took place from kayaks, and the prey was deposited on the nearest coast. Though during the spring months we caught lots of Seals when these were sleeping on the ice, they had always empty stomachs. A few stomach analyses from Neqe however showed that the Ringed Seal, almost exclusively, feed on Polar cod, but according to the Polar Eskimos the Seal equally often feeds on amphipods and decapods. The Polar Cod is the principal food in places where the Seal forages at great depths, while amphipods and decapods are the principal food elements near the coasts. Cottus are taken only exceptionally, and in that case the meat of the Seal is said to be less tasteful.

It would however be of great interest to examine the diet of the Ringed Seal in Melville Bugt and Kane Bassin, since in that way a good knowledge of the composition of the fauna in these very little known areas could be gained.

Breeding conditions.

Also here I have only a sparse material, since I had not myself occasion to make direct observations. According to statements by the Polar Eskimos the Ringed Seal normally bears only one cub, exceptionally two like the other marine mammals. The cub is born in the

above mentioned snow dens round the breathing hole towards the end of March or at the beginning of April. It is supposed to be able to go into the water immediately after the birth.

Hunting.

Through centuries the hunting of the Ringed Seal has been so important to the Polar Eskimos that a great number of hunting methods have developed in the course of time. Here will only be mentioned the most important ones which can be used by any hunter which is on the whole able to hunt.

Seal hunting in summer takes place from kayaks. The Seal is killed with a rifle through its head when it comes up in order to breathe. The best is to kill it immediately and then harpoon it at once as it will otherwise sink and be lost. Throughout the summer the Seal is poor in blubber and will sink, while in winter it is rich in blubber and will keep afloat after having been killed. More rarely the Seal is harpooned at once, but only young Seals can be approached at so close quarters. The strong persecution has made the Seals more wary than it was in older time when only harpoons were used.

When the first ice has formed hunting on smooth ice, which is both exciting and often remunerative, begins. But the hunting depends on the proper ice cover without snow and in completely calm weather. If snow has accumulated on the ice, the Seal can hear the steps when the hunter approaches the breathing hole, and if it is windy the breath of the seal guiding the hunter cannot be heard.

This hunting takes place in the following way: the hunter is furnished with harpoon, rifle, flensing knife and bear skin soles which are fastened to his boots the hairs downwards so that he can move stealthily across the ice. Now he walks on to the young ice which may be only a few days old, stops at small intervals and listens if he can hear a Seal breathe. It is very important to be as quite as a mouse without the slightest movement, since even the faintest noise will be intensified and can be heard far down below the ice. One has to stand still for about 15 minutes. If there is still no sound the hunter again walks a hundred steps forwards and listens again. When walking on the ice one should lift one's feet right up and place them right down again and take care not to tread on pieces of ice or the like. In this way one continues until a Seal is heard breathing at its hole. Then a protracted sucking sound is heard when the Seal inhales and a short breadth when it exhales. The Seal will breathe about 20—30 times, whereupon it will dive in order to forage. After about 10 minutes it will come back again to the same breathing hole to breathe again. In that time one must be quite still and only move when the

Fig. 26. The gun is lashed to the shooting sledge with the canvas stretched over it.

Seal is up to breathe, since its own respiration will prevent it from hearing one's steps. One may walk quickly, but will have to stop immediately when respiration ceases. If there is a slight wind one must approach the Seal against the wind.

If the hunter in this way has succeeded in getting quite close to the breathing hole he lifts his rifle carefully and shoots down through the ice just in front of the breathing hole, and immediately after he throws his harpoon to secure the killed Seal before it is carried away with the current. Instead of shooting the Seal may also be harpooned direct through the breathing hole. The killed Seal is then pulled on to the ice where it is skinned at once, however so that it keeps the blubber on. Thereby it will not freeze so hard to the ice. The skin is folded and placed at the side with the blubber side towards the ice to prevent it from freezing fast. The hunter must mark the place so that he can find the Seal again when the prey is fetched later on by the sledge. In spite of the fact that this hunting nearly always takes place in the dark season, the hunters have such pronounced power of orientation that they can find their Seals again even if they have a great number spread over a vast fjord area. Immediately after they have skinned their Seals, they hurry on and in the course of a few hours they may succeed in getting three or four Seals or more.

The smooth ice hunting goes on throughout the winter any time there is young ice, but in the case of snowfall or hoar frost on the ice

hunting is over. In that case Seals may still be caught at their breathing holes in the same way as described for the Bearded Seal, in the way that a man places himself in front of the breathing hole, while one or several sledges drive in a circle round him at some distance in order to force the Seal back to the particular breathing hole.

Where there are openings in the ice there will always be Seals, and these are shot with rifle from the edge and fished out of the water when the current carries them to the ice edge. In the dark season the Seal is very fat and will not sink.

During the great ice breakings Seals can always be met with along the new ice edge. The hunters then drive out on the ice with their kayak on the sledge. The hunters now place themselves along the ice edge at a distance of a few hundred meters between them in order to shoot the Seals which may come up to breathe. The Seal is killed with rifle shot through neck or head and brought ashore on the kayak. In that way many Seals are shot, notably at the beginning of the light season, when the ice is not yet fast right out to the final ice boundary, but constantly drifts out during the strong gales blowing from land.

Catching by nets has gradually become of great importance in the Thule district, particularly in the dark season. The Seal nets are set near the coast at right angles to promonteries or off stranded icebergs in the places which are often passed by the Seals or where they go in order to breathe. These Seal nets should be attended to every day or every other day, since a caught Seal will soon be attacked by amphipods which in the course of an astonishingly short time can spoil the skin and eat large parts of the meat. Catching by nets has become of great importance to the Polar Eskimos, since it is carried on at a time when other hunting is almost impossible. Great experience regarding the proper placing and handling of the nets is required. A clever hunter may have 5—6 nets which he makes himself. The costs of a single net rules round 5 kr. The net is 6 m long, 2 m high with a size of mesh of about 15 cm.

In spring when the Seals begin to appear on the ice hunting by shooting screens takes its beginning. This is the easiest form for Seal hunting, and gives a great yield throughout spring, i. e. in April, May and June, until the ice drifts out completely. At that time all hunters will carry shooting screens with them on the sledges. The screen is stretched over a little sledge with a support for the gun which the hunter pushes before him across the ice, he himself crawling after it concealed by the screen. The Seal lies sleeping on the ice in front of its breathing hole, but incessantly lifts its head at intervals of $^1/_2$ to 1 minute constantly on the look-out. The head is lowered again, and the Seal goes on sleeping. Only on very hot days can the Seal sleep fast and uninterruptedly for

hours without awakening, and then it is of course easy to get within rifle range.

At the moments when the Seal lies with its head lowered, the hunter will crawl closer behind his shooting screen which to the Seal looks like an ice floe. Any time the Seal lifts its head he has to lie quite still. At a distance of 100—200 m the shot will be fired and the Seal should, if possible, be killed on the spot, otherwise it will disappear through its breathing hole. The Polar Eskimos are very skilful at this mode of hunting and seldom are unsuccessful in hunting "ûtoq" as they call the sleeping Seal.

Economic importance of the Ringed Seal to the Polar Eskimos.

Of all game animals in the Thule district the Seal is no doubt the most important in the daily householding of the Polar Eskimos. Seal

Measurements of Ringed Seal.

Locality	Date	Sex	Length from snout to vent	Round measurement largest circumference
Heureka Sound, Axel Heibergs L.	12-4-1940	♂	152 cm	132 cm
Baumann Fjord, Ellesmere Isl...	7-5-1940	♂	141 -	122 -
— — ..	—	♀	137 -	128 -
— — ..	—	♀	125 -	125 -
Smith Sund	23-5-1940	♂	120 -	..
—	—	♂	132 -	..
—	24-5-1940	♂	115 -	..
Marshall Bugt, Inglefield L.	26-5-1941	♂	135 -	..
— —	—	♂	121 -	..
— —	28-5-1941	♀	118 -	..
— —	—	♀	117 -	..
— —	—	♂	115 -	..
— —	—	♂	128 -	..
— —	30-5-1941	♂	139 -	..
— —	21-6-1941	♀	92 -	..
— —	25-6-1941	♀	104 -	..
— —	—	♀	100 -	..
Dallas Bugt	3-6-1941	♀	130 -	..
—	—	♀	125 -	..
—	—	♀	117 -	..
Kane Bassin	4-6-1941	♀	122 -	..
—	—	♀	137 -	..
Washington L.	9-6-1941	♀	128 -	..
—	—	♂	140 -	118 -
—	—	♀	142 -	128 -
—	14-6-1941	♀	143 -	..
—	17-6-1941	♂	147 -	..

Fig. 27. West of Ellesmere Island the seals are generally big and old.

meat is tasteful and nutritious. One may get tired of all other kinds of meat, but never of Seal meat, either it is eaten boiled, dried, frozen or raw. Boiling Seal meat in the proper way is an art which it is not easy to learn from the Polar Eskimos. The best way is absolutely to boil the meat slowly over the oil lamp; it will then be juicy, soft and tasty, keeping the juices in it, while Seal meat boiled on a primus stove or an ordinary stove will easily become tough and tasteless.

The blubber is used for the oil lamps and is better for this purpose than Walrus blubber although not so good as Narwhal blubber. Part of it is eaten boiled, raw or frozen, or it is used as food for the dogs in winter, while in summer it is often cut away and left. The small intestine either boiled or frozen is considered a great delicacy. The liver is very tasteful raw or frozen.

The skin can be prepared in many ways and is extensively used for bootlegs, winter anoraks, woollen mittens, dog harness, kayak skins, bladders, lashes, tent skins etc. If it is to be used for tent skins the hairs are removed in hot water, whereupon the skin is stretched and dried in the sun so that the fat can be removed and the skin become transparent.

The Ringed Seal as well as the other Seals except the Bearded Seal is not divided among the hunters. The Seal belongs to the man who killed it or injured it first.

According to the Polar Eskimos the Ringed Seals caught west of Ellesmere Island are very large on average, far larger than is normal

in the Inglefield Bredning area. The Seals from Ellesmere Island of which the measurements are given above are said to have been comparatively small.

There is also said to be a great difference between the Ringed Seals from the fjords and those from the open sea. The latter attain a considerably larger size.

The Narwhal.

(Monodon monoceros.)

Occurrence and migration.

Still before the winter ice has drifted out of Inglefield Bredning and its tributary fjords, the Narwhal appears in the Thule district. Occasionally, in the last days of May, but generally in the beginning of June it is common along the ice edge and is hunted from kayaks. Gradually as the ice floats out of the fjords, the Narwhal will seek into them and here it can be met with throughout the summer, until, at the first ice cover, it will leave the district.

It seems as if the Narwhal is always migrating out and in of the fjords. Only at the head of Inglefield Bredning does it seem to have a permanent occurrence. Otherwise small schools of some ten animals can be seen migrating along the coasts into the fjord when the tide rises. One herd will succeed another, all of them following the same route. Thus several hundred Narwhals can be seen passing in the course of an hour. Some ten hours later foraging in the head of the fjord is over, and the migration will again go outwards. At Neqe these Narwhal migrations could be observed throughout the summer.

On September 7th 1939 I witnessed at Kangeq at the entrance to Olrik Fjord a large-scale Narwhal migration. The whales came from Hvalsund on their way into Inglefield Bredning passing the ness closely. Flocks of some twenty animals, males and females together, were seen passing closely at intervals of a few minutes. It was an impressing sight. The single flocks emerged and remained at the surface of the water for a little while in order to breathe a few times, whereupon they again dived and emerged a hundred metres farther ahead. Often they would stay for a long time at the surface or would swim just below it with their backs visible. If the flock came to the surface, first the upper part of the head became visible, then followed the whole back, while one never saw the tail. The whole migration lasted for an hour and then about 1000 Narwhals had passed by. The next day still another migration was observed, this time hardly more then 200 Narwhals, which likewise followed the same route into Inglefield Bredning.

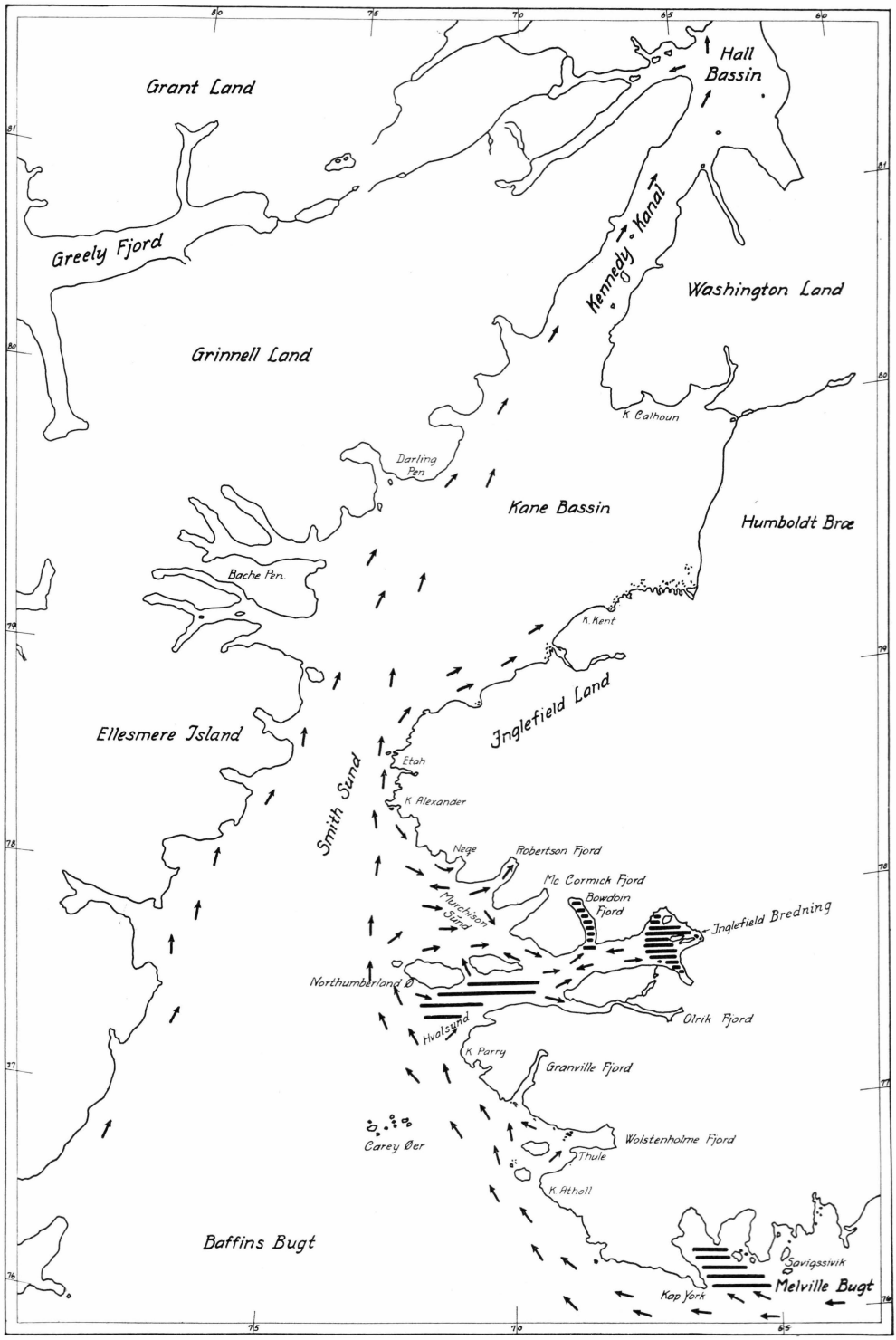


Fig. 28. Spring migration and foraging areas of the Narwhal. The horizontal hatching indicates places where Greenland Halibut occurs in the stomach content of the Narhwal.

At Savigsivik in the northern part of Melville Bugt the Narwhal is only seen on its migration north along the ice edge in June, while it does not occur here in summer. Likewise in spring a considerable Narwhal migration can be observed along the ice edge at Ellesmere Island. This migration sends out offshoots right up to Ft. Conger, where the Narwhal is common throughout the summer. It may however also be met with farther north and probably goes right to the Polar Sea.

Along the north coast of Inglefield Land only few Narwhals are seen in summer and the same is the case in Kane Bassin. The Inglefield Bredning area, on the other hand, is the actual habitat of the Narwhals in Thule district, both the main fjord and its tributary fjords.

Near the small island Qeqertat at the head of Inglefield Bredning there is a place at the south side of the island where the Narwhals go right in at the shore and can be met with regularly throughout the summer. The Polar Eskimos generally stay here in the summer months and get a good catch of Narwhals, mostly females. In the summer of 1940 20 Narwhals were caught here by two hunters. All the animals caught were females. At the head of Inglefield Bredning about 100 Narwhals are caught annually, nearly always females, while in the outermost districts about 25 animals are caught annually, mostly males. This is said to be due to the fact that the Narwhals breed at the head of Inglefield Bredning, where the females therefore are often accompanied by their calves and consequently more frequently than the males get up at the surface where they are more exposed to harpooning. In the outer districts, on the other hand, where the Narwhals are always on migration out of and into the fjords, thus appearing at the surface rather frequently, the hunters will select the males for the sake of the tusks. Therefore, mostly males are caught out here.

Breeding conditions.

The Narwhal is commonly breeding in the Thule district. Pairing has been observed only a single time at Kap Seddon in Melville Bugt by a Polar Eskimo. The whales copulated standing vertically in the water with their bellies turned towards each other. Unfortunately, I have no statement of the season. But in August the Narwhal often has a foetus 20—30 cm long, and when in June it comes back after the winter, the females generally have foetuses of about $1^1/_2$ m. Settlement manager Hans Nielsen once saw a newly born calf in a flock of Narwhals in June. A female with a foetus about 40 cm long was caught in the same flock. The Narwhal is not supposed to have any definite breeding season.

Parturition has not been observed, but occurs shortly after the arrival of the Narwhals at the district, in June or July, after which

time Narwhals accompanied by one, more rarely two, calves are occasionally met with. The calf will always follow its mother closely and will not leave her if she is harpooned or killed, for which reason the calf is always an easy prey. How long the young will follow its mother is not known, but presumably it leaves her in the course of the winter, since in spring the females are not followed by their young. The Narwhals are supposed to have young every second year.

Diet.

The principal diet of the Narwhal is no doubt Polar cod, *Gadus saida*, of which remains are regularly found in the stomach. But also the Greenland Halibut, *Rheinhardtius hippoglossoides*, is regularly taken by the Narwhal in the area of occurrence of this fish. Besides these two fishes the Narwhal eats great numbers of shrimps, *Decapoda*, which seem to play an equally important part in its diet.

It is very difficult to give a clear picture of its diet on the basis of the stomach content, since the Narwhal always empties its stomach during the hunt, so that it is devoid of food before it is killed. Therefore, only sparse remains are left in the stomach or the pharynx, and in the cases when I witnessed the catch they always consisted of Polar cod and shrimps. But at Kap York, in Hvalsund, Bowdoin Fjord and the head of Inglefield Bredning remains of the Greenland Halibut are equally often found in the stomach; in these places the Greenland Halibut is also caught by the Polar Eskimos. The Greenland Halibut areas mentioned here are marked by dense hatching on the map p. 79 of the range of distribution of the Narwhal in the Thule district.

In the years from 1920 to about 1935, probably also in the preceding years, the Narwhals frequently came into Wolstenholme Fjord near Thule. In recent years the Polar Cod has become sparse in this fjord owing to the early ice breakings, which involved that the Narwhal is now a rare guest here. Bearded Seals and Ringed Seals still occur here, but their diet now consists principally of *Cottus* and *Amphipoda*.

On the other hand, the Narwhal has become abundant in summer in De dødes Fjord inside Kap York in recent years. This is due to the fact that in the last few years the ice has broken completely in this fjord, so that the Narwhal can get in here and exploit the large population of Polar Cod occurring here.

These two changes in the occurrence of the Narwhal is no doubt due to the change of the climate in the last few decades which has driven away the Polar Cod from certain areas and, in return, made it possible for it to immigrate to new areas.

Hunting.

Narwhal hunting takes place nearly exclusively from kayak, in rare cases from the ice edge in spring or in openings in the ice. Kayak hunting is carried out throughout the summer. Two or more hunters will go out in the kayaks as soon as Narwhals are observed on the fjord or migrating along the coast. The kayaks will wait in the places where the Narwhals are known to pass on migration and appear at the surface. As soon as this happens, one kayak will shoot towards the herd, quick as lightning, always approaching it from behind, and throw the harpoon with line, bladder and sea anchor.

At the moment when a Narwhal has been hit, the whole herd will disappear from the surface setting the course out of the fjord. The harpooned whale of course cannot follow, because its speed is checked by the bladder and sea anchor. A quarter of an hour later it will emerge again in order to breathe and then have got some hundred metres away from the place of harpooning. The hunters again approach the place which is marked by the bladder, now trying to kill the whale with rifle shots. Generally the whale will dive several times still before they succeed in killing it, but at last it will no longer come up to the surface and is killed, the inflated bladder marking the place where the killed whale is to be found. The whale is now pulled up to the surface and as many bladders are attached to it as possible to keep it floating and more easy to tow to the nearest coast for flensing. Portions of the prey are distributed as in the case of Walrus and Bearded Seal, so that each hunter will get his share.

In spring when the Narwhal comes to the district, the ice has not yet gone in the inner fjords. The Narwhal then will not proceed farther in under the ice than it can get back to the ice edge in order to blow. In certain cases the harpoon may be thrown successfully from the ice edge proper, or the Narwhal can be shot from here without being harpooned.

In rare cases a school of Narwhals may be shut in from the open sea and will have to go to an opening in the ice to breathe. Gradually as the opening freezes and becomes smaller and smaller, there will be a terrible fight among the shut in animals to get air. Their bellowing can be heard far away summoning the hunters, and the shut in animals now become an easy prey since they have no possibilities of flight and are constantly forced back to the same opening. Sometimes there can be several hundred animals. Such a "savssat" is rare in the Thule district, but has occurred now and then in Melville Bugt, more generally, on the other hand, north of Upernavik and round Disko.

Such a Narwhal trap is a very great event to the people who are so lucky to live in the neighbourhood, but even from distant settlements

people will come rushing when hearing the news. Thus on March 16th 1943 a Narwhal trap was discovered in Vajgat between Qutdligssat and Ujarasugssuk. The hunters came rushing from near and distant settlements, even from Godhavn 22 sledges came. The catch yielded 340 Narwhals and White Whales. The hunting lasted about a week, whereupon the rest of the school escaped. 54 per cent of the killed animals were Narwhals, the rest White Whales. A witness described this wholesale catch in "Grønlandsposten" 1943 p. 145, from which the following is cited.

"We may have been driving for about one hour when a glimpse in the night showed that we were approaching the front. There were flashes ahead and to both sides. We drove on until a volley of guns just to the left made us stop. We ran to the place and found that three men with raised rifles were staring fixedly at the black glassy surface of an opening in the water as large as the site of a Greenlander's house. Everything was calm and motionless. Then the smooth surface was suddenly broken by black shadows and white animals which in elegant curves came up and disappeared—Narwhals and White Whales by the score. Side by side they emerged so close to each other that some of them would be lifted on the backs of the others and turned a somersault with the handsome tail wawing in the air. First rows of Narwhals, then White Whales and then again Narwhals—each species separately. It seethed, blobbed and splashed in the opening. With a hollow, whistling sound they inhaled the air as if sucking it in through long iron tubes. The water was greatly disturbed, shots cracked and the waves washed far in over the ice. Then all was calm again. The black smooth surface was there again as suddenly as it had just disappeared. A single dead White Whale was floating at the surface. The animal was now harpooned and made fast to the ice edge to be pulled out of the water and flensed on occasion."

The Narwhal will leave Thule district as early as at the first ice cover by the end of October, at the same time as the sun disappears. The ice cover always begins at the head of the fjords and bays, for which reason lagoons with open water are rarely formed far from the ice edge thus creating Narwhal traps. Such Narwhal traps may form in the northern part of Kane Bassin, round Kap Calhoun, but the ice is moving here so long after the ice cover that Narwhals can escape under the ice down to Smith Sund.

Importance of the Narhwal to the economy of the Polar Eskimos.

The whole existence of the Polar Eskimos depends on the catch of this animal, since they get all their necessaries of life from it. Petroleum can be had in the shops only in small quantities and only for travels.

Coal is bought only in very small amounts and peat is very little used. The blubber lamp is the only source of warmth and light in the earthen hut, and whale blubber is by far the best for lamps. With Narwhal blubber the lamp will give nearly no smoke, it will burn with a clear yellow flame and give a considerable amount of warmth sufficient for heating the house, boiling the meat and drying the clothes.

Since the blubber thus is of vital importance to the population it is not bought and sold in the shop thus preventing that the Eskimos are tempted to buy goods in the shop at the sacrifice of warm houses, hot meals and dry clothes in winter. There has been some dissatisfaction among the population at this regulation, because part of the blubber will melt and run out of the meat pits in the hot summer months to no use, and then they do not understand why they are not allowed to sell the blubber in the shop. The latter would be dangerous since larger quantities than can easily be used in winter for heating, food and food for the dogs are not caught, and it cannot be expected that the Polar Eskimos will be wise enough to save sufficient quantities for the winter when the blubber in summer can be sold at good prices and changed into tea, coffee and tobacco. It would be much better to furnish the shops with cheap casks or metal barrels which the Eskimos then could buy and use for storing the blubber in the summer months. If towards the end of the winter there might be a surplus of blubber left, this could without any risk be sold in the shop but it should not be allowed to deal with blubber later than about August 1st.

The meat of the Narwhal is very dark, almost black. It is excellent for human food, both boiled, dried and frozen. Likewise it is excellent for food for the dogs. Of the viscera liver and heart are eaten by man, the rest is good for food for the dogs. The tusks are a good merchandise, but are unsuitable for making tools owing to the many cracks and their liability to split.

The sinews of the back of the Narwhal are of great importance; they are split, dried and used for the so-called sinew-thread, ivalo. Sinew thread is used for sowing boots, harness for the dogs, lashing tools for catching and everywhere where strong thread is needed and not influenced by cold or water. Since sinews are not elastic and do not expand in water, the sinew thread is excellent for sowing all kinds of bootwear, outdoor clothes, kayaks, skin tents and all other kinds of skin work.

A favoured delicacy is the skin of the Narwhal, the mattak, which is eaten with a thin layer of blubber, preferably raw and fresh, but also frozen and boiled. It is very tasteful, also to white men, the taste is almost like fresh hazelnuts. Practically the whole skin is used for human food, also tail and flippers which are cut into small cubes, chewed and swallowed whole. It is very common that Polar

Eskimos start on long travels only taking with them pieces of mattak, fresh or frozen, and it is possible for a fairly long time to live on this without the addition of other food. Besides carbohydrates the mattak contains different vitamins, and everywhere it is considered wholesome and nutritious.

Measurements of Narwhals.

Siorapaluk, 22-8-1939, length from snout to tail cleft 460 cm, breadth of tail 110 cm, length of tusk 165 cm. ♂.

Inglefield Bredning 30-8-1939, length 440 cm, largest circumference 270 cm, length of tusk 170 cm. ♂.

The White Whale.

(*Delphinapterus leucas*).

What has been said in the above of the Narwhal in most cases also applies to the White Whale. This whale is very often seen together with the Narwhal in the outer districts, but in spring and summer it does not travel to the head of the fjords and does not occur, therefore, at Kangerdlugssuaq in summer. It comes to the district together with the Narwhal, and shortly after it can be seen with a litle calf, generally one, more seldom two.

Even if the Narwhal and the White Whale leave the inner regions of Thule district in winter, both whales are however supposed to winter in small numbers in Baffins Bugt. Settlement manager HANS NIELSEN who has spent more than twenty years in Thule thus tells that on February 6th 1923 he saw a herd of White Whales at a fairly great distance at sea west of Kap Parry, where there is ice cover only exceptionally. A White Whale was shot and contained a foetus about 2 m long. Mr. HANS NIELSEN presumes that both the Narwhal and the White Whale normally stay at sea in smaller numbers throughout the winter.

As to its diet the White Whale differs somewhat from the Narwhal. Thus it does not eat crustaceans, but in the Thule district seems to feed exclusively on Polar Cod and Greenland Halibut, in places where these occur. In summer it goes into Inglefield Bredning to Qânâq where it is scarce, but in the autumn on its migration south it follows the coast and then comes right into Kangerdlugssuaq and Thule. On October 27th 1939 some White Whales were still seen at Neqe. Young ice had formed in several places and it was the day before the beginning of the dark season. The White Whales were seen in flocks of about ten coming from the north and following the coast and the ice edge near the surface.

The White Whale is more shy than the Narwhal. It is considered impossible to harpoon a flock of three or four animals from kayak, as the White Whales by their penetrating "whistle" below the water warn each other. Therefore, far more Narwhals than White Whales are caught in the district. The White Whale is of the same economic importance to the population as the Narwhal.

Survey of the distribution of the most important food elements on Walrus, Bearded Seal, Ringed Seal, Narwhal and White Whale in the Thule district.

	Cardium	Walrus
	Mya	Walrus
	Saxicava	Walrus
	Macoma	Walrus
	Astarte	Walrus
	Buccinum	Bearded Seal
	Cucumaria	Bearded Seal
	Psolus	Bearded Seal
	Rossia	Bearded Seal
	Lycodidae	Bearded Seal
	Cottidae	Bearded Seal
Ringed Seal	*Amphipodae*	Narwhal
Ringed Seal	*Decapodae*	Narwhal
Ringed Seal	*Gadus saida*	Narwhal
White Whale	*Reinhardtius hippoglossoides*	Narwhal

As it will appear from the above table the Walrus is the only one feeding on bivalves, which practically are its only food source. The Bearded Seal feeds on everything except just mussels, so that these two important animals do not compete. The Bearded Seal, on the other hand, is the only one eating the big *Buccinum* gastropods which represent part of its most important food items. The Ringed Seal will feed equally often on amphipods, shrimps and Polar Cod, according to its place of occurrence. The Narwhal feeds on shrimps, Polar Cod and Greenland Halibut, and the White Whale is satisfied with the two last mentioned species.

This table should of course only be regarded as a survey from which greater or smaller deviations can take place, according to season

and locality, but in broad features it gives a true picture of the distribution.

Finally, I wish once more to attract the attention to conditions in the northern part of Melville Bugt, which area I did not succeed this time to include in my investigations, but my experiences from 1936 seem to indicate that there the isopods play a greater rôle in the bottom fauna, notably *Chiridotea sabini*, which might also have some influence on the diet of the Ringed Seal down here; the absence of large bivalves and gastropods may also account for the fact that the Walrus and the Bearded Seal do not forage here.

Conditions in the northern part of Kane Bassin and along the Greenland coast farther north need thorough investigations. No doubt greater deviations from the actual Thule district will be found to exist here, since a much richer marine fauna, both as regards quality and quantity, is found here.

The littoral fauna.

A pronounced littoral fauna as that known from South Greenland does not occur in the Thule district. In the most favourable cases the coasts are only free of ice in two of the 12 months of the year, so that circumstance alone does not allow the development and subsistence in winter of any special littoral fauna. *Balanus balanoides* has not been found north of Melville Bugt, but it would be too rash to conclude that it is absolutely absent. *Mytilus edulis* also has not previously been known north of Melville Bugt, but during a thorough investigation it was found to be common at Thule, where at full and new moon it was dry at ebb, thus making an attempt to conquer the littoral zone, from which it is kept back, undoubtedly alone by the ice foot. Likewise I found *Balanus crenatus* to be common in the tidal zone at Etah, where it was dry at the lowest ebb. Many specimens of this species had frozen to death in winter so only the empty shells were found, but a number of large-sized specimens sat alive on the stones together with large colonies of quite small individuals.

Fig. 29 shows a schematic cross section of the tidal zone on a rocky coast at Thule in May-June. To the left is the ice foot fast frozen to the rock. During the different spring tides throughout the winter it has reached its maximum height and is level above with a vertical side down towards the sea. The sea ice lowers and rises with ebb and flood, but near the ice foot it is churned to pieces under the enormous pressure during the tidal wave. At lowest ebb, as shown in the table, the innermost ice floes rest on the naked littoral zone forming a protecting layer

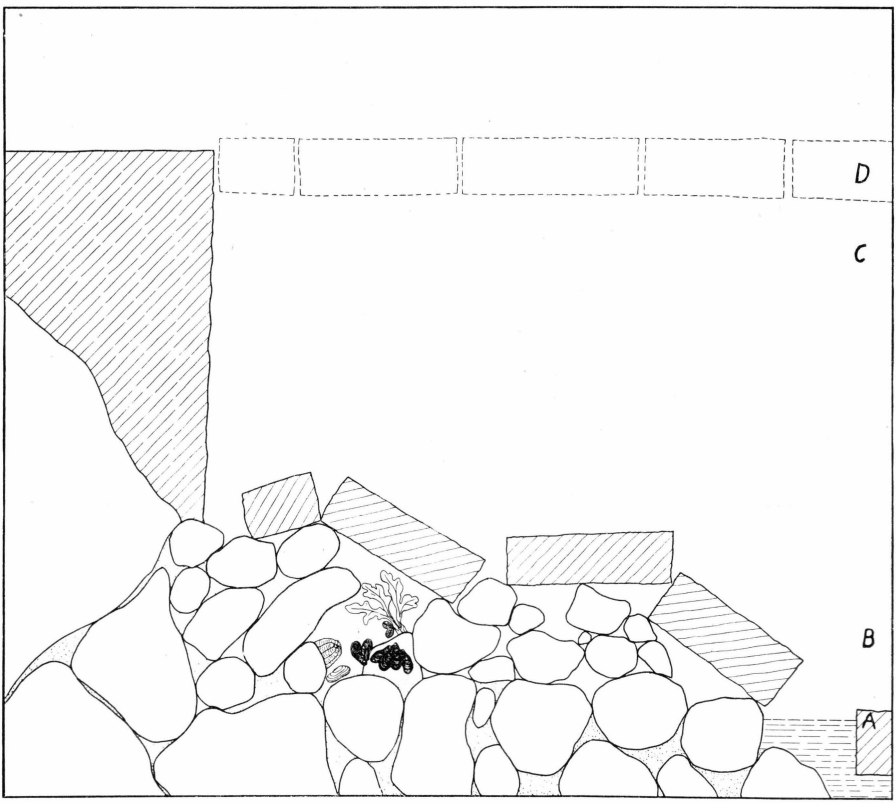


Fig. 29. Schematic cross section of the tidal zone when covered with ice near Thule. The animals shown are Mytilus edulis, Modiolaria faba, Zaxicava and the actinarian Buodactis stella.

over cracks and fissures and natural cavities among the stones, where the sands have been washed away, while the firm ice continuously rests on the water. (A) is the surface of the sea at lowest ebb at new or full moon. (B) is the surface of the sea at ordinary ebb. (C) the surface of the sea at ordinary high water, and (D) the surface of the sea at spring tide.

Between (A) and (B) it is still possible for a limited littoral animal life to thrive and subsist throughout the winter. Here *Mytilus edulis* is found at Thule and in the same zone *Balanus crenatus* at Etah.

Regarding the find of *Mytilus edulis* at Thule I made the following note.

September 1st 1940: It is the day before spring tide. The surface of the water over the skerries in North Star Bugt lowers at normal ebb. When crawling round on the skerries I found two specimens of *Mytilus edulis* well hidden under Fucus in deep fissures where they will not be

crushed by the ice and about 20 cm above lowest ebb. The one specimen can only be pulled out by crushing the shell. It is 6—8 years old judging from the growth rings. These for the first years may be a little indistinct, but otherwise are clear with sharp edges. Besides the following species occur under similar conditions: *Margarita helicina*, *Modiolaria laevigata*, *Saxicava arctica* and *Mya truncata*.

September 3rd 1940: It is the day after the spring tide. Today I also found *Mytilus edulis* in the zone left bare at lowest ebb among the small isles at the settlement Ûmánaq; there were many large and well developed specimens. They are all well hidden under gravel and Fucus in "cauldrons" among large stones. All the small stones in "the cauldron" are cemented together with the byssus threads of this mussel. In a single "cauldron", each side measuring 30 cm, there are thus 3 big specimens of *Mytilus edulis*, several specimens of *Mya truncata*, *Saxicava arctica*, *Modiolaria faba*, *Modiolaria laevigata*, *Margarita helicina*, the amphipods *Gammarus locusta*, *Pseudalibrotus littoralis*, the actinarian *Bunodactis stella*, the bryozoan *Alcyonidium albidum* and a single polychaete *Harmothoe imbricata*. All the said species were hidden down in the "cauldron" among the small stones or under the fucus which at lowest ebb were lying about 20 cm above the sea level.

The same day several very large specimens of *Mytilus edulis* were found at lowest ebb on the dry sea bottom between the outpost and the Ûmánaq mountain. The largest specimen measured 93 mm and presumably is more then 15 years old. The mussels in this latter place were lying more naked, but still down among the stones and always under fucus growth.

Eleven specimens of *Mytilus edulis* from the littoral zone at Thule show the following measurements and probable age:

29 mm ..... 5 years	51 mm ..... 6 years	58 mm ..... 7 years
38 - ..... 7 —	51 - ..... 7 —	59 - ..... 7 —
44 - ..... 4 —	54 - ..... 7 —	93 - ..... 15 —
46 - ..... 8 —	56 - ..... 7 —	

The last mentioned specimen is however presumably older than 15 years, as the oldest growth zones are a little difficult to determine. When in the above table there is no permanent ratio between length and age this is no doubt due to the fact that the mussels were taken at three different localities with varying conditions of growth. A mussel which sits hidden at the bottom of a "cauldron" among several other detritus eaters will thus meet with greater competition than mussels sitting singly and more freely. *Mytilus edulis* at Thule attains a considerable size, since the largest specimen brought home from Upernavik only

measures 72 mm (H. MADSEN 1940) and from Angmagssalik 84 mm (AD. S. JENSEN 1905).

Hitherto *Mytilus* has only been found in the said places in the Thule district. Here the ice breaks up from the beginning of July till the beginning of August, varying according to the character of the winter. The ice foot proper may however remain after the sea ice has drifted out, but long before that time the sea will wear on the ice foot releasing the lowest littoral zone which is immediately occupied by *Pseudalibrotus littoralis* and *Gammarus locusta*. Under the fast frozen ice foot proper I have, on the other hand, never found any trace of animal life.

In his paper (1940) H. MADSEN comes to the result that *Mytilus edulis* is able to winter frozen in the ice. I will not contest this supposition, but I also have not been able to confirm it, since the specimens of *Mytilus* as well as other animals found in the "cauldrons" near Thule might not necessarily have been frozen. Normally the level of the water will not sink below line (B) at ordinary ebb, and when at new and full moon it sinks to line (A) there will hardly be more than an hour during which time this "semi-littoral zone" is dry, and not even then will it be completely naked, since the algal vegetation and the ice with the accumulated snow will cover it and protect it against the cold air which in winter may be 40°—50° C. below zero. In addition, the animals will close their shells with water between them, which will also prevent freezing in the short period of time which might be involved.

No matter whether *Mytilus* and *Balanus* are able to winter frozen in the ice foot or not, it must be a condition for their presence in the littoral zone that the coast is accessible at the time when the small planktonic larvae cease to be pelagic and settle on the coast. If H. MADSEN is right in his supposition that *Mytilus edulis* spawns in October in northern Greenland the larvae have little possibility to conquer the upper littoral zone which in Thule district will freeze as early as in September-October.

According to VANHÖFFEN, 1897, the plankton maximum for mussel larves begins in September and ends in November. VANHÖFFEN however does not mention any species, but it is highly probable that just *Mytilus* plays a very important rôle in this maximum (THORSON 1936).

Apart from the favourable conditions which seem to prevail in Thule proper, the fauna of the littoral zone in Thule district, both on the outer coasts and in the fjords, is poor, and we can hardly speak of a special littoral fauna. Animals like *Mya truncata*, *Saxicava arctica*, *Modiolaria laevigata*, *Margarita helicina*, *Gammarus locusta* and *Pseuda-*

librotus littoralis will however always occur in the littoral zone right to Renselaer Bugt on Inglefield Land and probably still farther north in places where the ice foot is washed into the sea in the course of the summer. But north of Renselaer Bugt the ice foot will remain standing over great distances throughout the summer and in that case animal life will only exist in the lower littoral zone.

The marine animal life in the fjords west of Ellesmere Island.

Unfortunately, only in the months April and May 1940 had I occasion to make observations in the fjords west of Ellesmere Island, where, together with cand. mag. THORLAKSSON and three Polar Eskimos, I travelled in Bay's Fjord, Heureka Sound, the coast of Norske Bugt along Axel Heiberg's Land, the entrance to Baumann Fjord and the north and west coasts of Bjørnekapland. The ice was fast everywhere so that only occasionally was it possible to form any idea of the animal life below the ice.

On April 10th the first seal, *Phoca hispida*, was seen sleeping on the ice at its breathing hole in Heureka Sound. It was shot on April 12th. The thickness of the ice in the breathing hole was 2.60 m ice plus 0.20 m snow. Swimming about in the breathing hole were a number of amphipods which were collected and proved to be *Pseudalibrotus nanseni* G. O. Sars.

Along the entire south coast of Axel Heiberg's Land no Seals were seen. Here the water is shallow with sand banks or skerries in many places. Near Kap Sydvest another breathing hole was seen where a Bear had recently caught a Seal.

Off the northwestern point of Bjørnekapland one or more small isles or skerries are situated, where on May 7th we found a number of empty shells of *Buccinum tenue*, *Margarita helicina*, *Trichotropis borealis*, *Chiton marmoreus*, *Saxicava arctica*, *Astarte borealis* and *Mya truncata*. Parts of Bjørnekapland are raised sea bottom. Shells of *Saxicava* and *Astarte* may be found widely spread over the lowland.

About 2 miles north of Bjørnekapland a depth of 45 m was registered through a breathing hole of a Seal. The bottom material consisted of gravel mixed with clay. A weak current could be traced in a north-easterly direction. In the breathing hole some specimens of *Pseudalibrotus glacialis* G. O. Sars were found.

On May 4th a dozen Seals were seen on the ice north of Bjørnekapland of which one was killed.

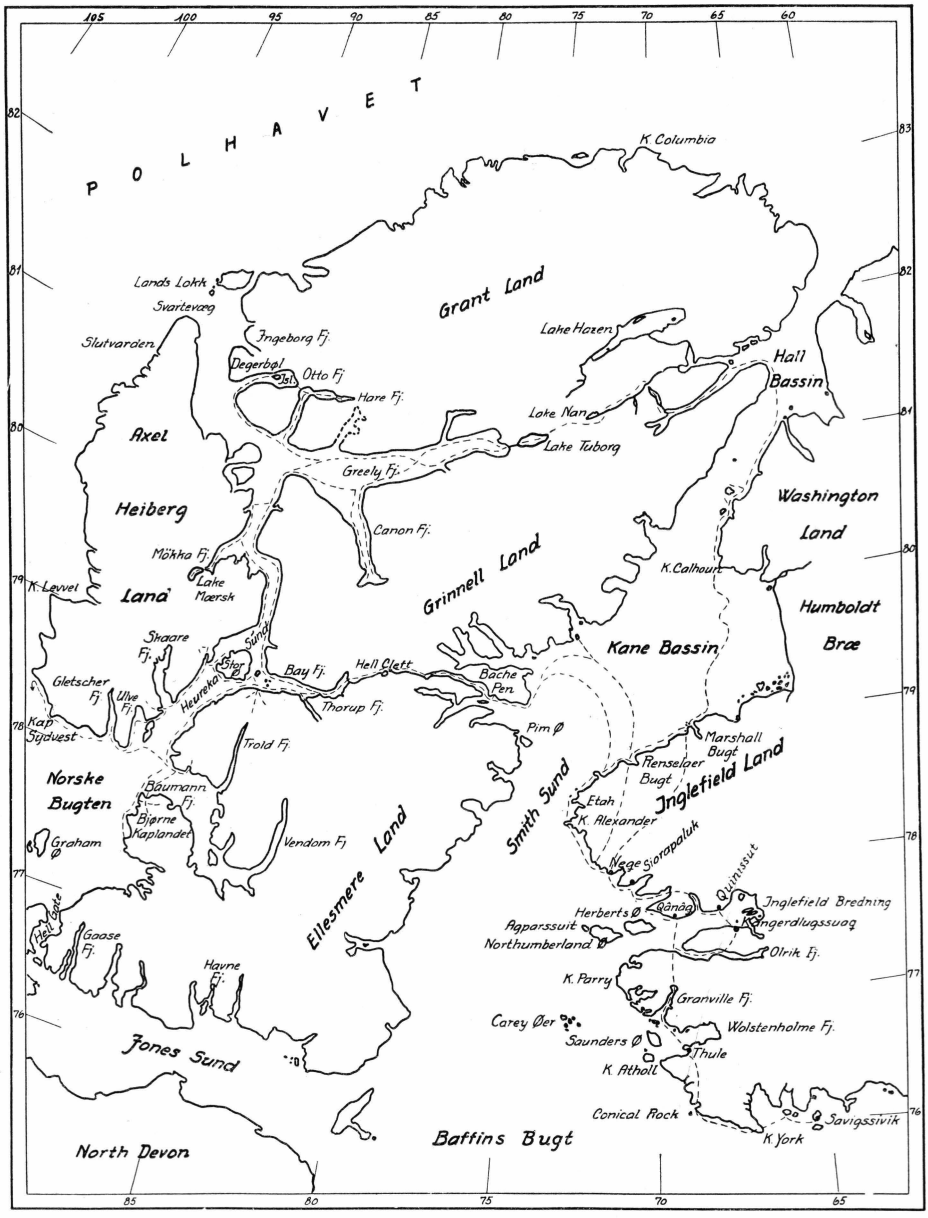


Fig. 30. Map of the travelling route of the expedition in Greenland and Ellesmere Island.

On May 12th the first crack was seen in the ice on the south side of Bay's Fjord near Heureka Sound. About 100 m off the coast a depth of 35 m was registered. The bottom consisted of stones. In the dredge were found 3 *Spirontocaris polaris* (Sabine), 1 *Caprella septentrionalis*

Fig. 31. Shore lines on the south coast of Bays Fjord, Ellesmere Land.

Fig. 32. The shell layer about 40 m above sea level, Bays Fjord, off Storøen, May 1940.

Kr., 1 *Æginina longicornis* Kr., 3 *Pseudalibrotus littoralis* (Kr.), 4 *Strongylocentrotus droebachiensis* (O. F. M.) and 1 *Lagisca extenuata* (Grube) and the hydroid *Eudendrium carium.*

On the south side of Bays Fjord the land seems to be constantly rising. On the rather sloping coast there were dense layers of well preserved mussel shells right up to about 40 m above sea level or more. The superficial layer of the ground is, however, in a constant downward movement so that it is difficult to determine the uppermost limit of the shell layer. At the top great quantities of *Saxicava arctica*, *Astarte banksi*, *Mya truncata* and a few *Macoma calcaria* and *Cardium groenlandicum* were found, while *Astarte borealis* was particularly abundant in the lower layers from about 20 m and downwards.

On the same stretch of the coast inside the Gretha Islands 14—15 old beach lines are distinct. The land presumably has been in constant rise since the indland ice receded. Probably the raised land here corresponds to the beach lines in Renselaer Bugt on Inglefieldland in Greenland.

At a nest of *Larus glaucus* we found on May 14th a number of otholits and bones of *Gadus saida.*

On the north side of Bays Fjord near its head there was, on May 14th, a long crack in the ice out from the coast. Here the bottom, at a depth of 75 m, consisted of fine clay. We dredged a number of ophiurids, *Ophiocten sericeum* (Forbes) and two empty shells of *Macoma calcaria* (Ch.). We tried to dredge again in a new crack, but found only the same ophiurid, one specimen in each haul.

Plankton hauls in the same place from the bottom to the surface yielded *Calanus hyperboreus* Kr., *Calanus finmarchicus* Kr., *Aglantha*

digitale O. F. M., *Sagitta elegans* and 3 larvae of *Gadus saida*? At the surface of the crack we got one swimming specimen of the medusa *Ptychogastria polaris* Allman and 1 specimen of the ctenophore *Beroë cucumis* Fabr.

The marine fauna in the fjords and sounds west of Ellesmere Island thus does not seem to deviate from the marine fauna of the Thule district as regards the species found. But it is reasonable to suppose that the fauna here misses the subarctic stamp of the Thule district owing to the direct connection with the Polar Sea, the great distance from the open sea, the constant ice cover throughout the winter, and a main current, probably coming from the north.

Trichinosis in arctic mammals.

In the last few years a number of investigations on the distribution of trichinosis in man and mammals in arctic regions have been published (THORBORG, TULINIUS, ROTH, CONNELL etc.). Diseases in the native population which were previously ascribed to other causes proved to be due to infection by *Trichinella spiralis*, for which reason large-scale investigations were initiated by scientists in Denmark, Canada and the U. S. A. in order to clear up the distribution of trichinae in those arctic mammals from which it might be thought to affect man.

These investigations which have not yet been concluded show as a preliminary result that trichinosis has been found in Polar Bear, Arctic Fox, Dog and Bearded Seal. Besides, Dr. ROTH who made most of the finds of *Trichinella* in arctic mammals has kindly allowed me to mention still two of his still unpublished finds of *Trichinella* in a Fjord Seal from Northeast Greenland, and in Walrus from West Greenland.

These preliminary investigations tend to show that the marine mammals which are of vital importance to the Polar Eskimoes: Walrus, Ringed Seal, Greenland Seal, Narwhal and White Whale may all, in exceptional cases, be infected with trichinae, although only in a very small percentage.

Although trichinosis has not been frequently occurring in the Thule district it may occasionally have affected this district, without anybody having realized the nature of the disease. The Polar eskimoes live exclusively on meat, and generally eat it boiled over a blubber stove, sometimes only dried, raw or frozen.

If the meat is eaten raw it will, however, generally have been frozen, and this fact presumably explains why trichinosis never got any fatal distribution among the population.

According to GOULD and KAASA's investigations (1949) trichina larvae are killed quickly at low temperatures. "The following tempera-

tures maintained for the designated periods, in the central portions of pork, are believed to be effective in killing all trichina larvae which may be present: — 27° C. maintained for 36 hours; — 30° C. maintained for 24 hours; — 33° C. maintained for 10 hours; — 35° C. maintained for 40 minutes; — 37° C. maintained for 2 minutes."

This means that all meat which has been kept for a comparatively short period of time in a meat cave in the winter months will be sterilized owing to the very low temperatures in winter in Thule district. It is very seldom that the hunters in winter succeed in bringing home their catches from the hunting place on the ice before these have got frozen during the transport. Conditions are different on the catching place where flensing takes place. Here it often happens that one will swallow a piece of raw meat or on the long way back to the settlement will regale on the meat on the sledge which is only slightly frozen as yet. Small-sized seals are always taken home whole, while Bearded Seal and Walrus are parted and distributed on several sledges. The risk of infection by raw meat in the winter months thus should be greater to men than to women and children who stay at home at the settlement and only get the meat when it has been frozen during the long transport.

The sledge dogs will always get a substantial feeding with raw meat or entrails immediately after the capture on the ice. The risk of infection thus should be greatest for the dogs in case the prey is infected. Foxes will often haunt the catching places in order to eat remains from flensing, but these will generally be frozen before the foxes arrive. In summer, on the other hand, when flensing takes place on the nearest coast, foxes are very exposed to trichinosis, provided that the flensed animal had trichinosis. Also to man the risk of infection through the prey animals is greatest in summer, but the craving for raw meat is perceptibly smaller in summer than in winter, and it is preferred that the meat has been lightly frozen before it is eaten raw. In by far the most cases the meat is, however, boiled before it is eaten, possibly more or less imperfectly for killing the trichinae, if any.

But altogether the Polar Eskimoes have ample opportunity to become infected through raw meat of sea mammals, if these have trichinosis. The fact that trichinosis is nevertheless rare in the district, is due to the very small percentage of their prey animals being infected, and Dogs and Polar Bears are generally cooked before the meat is eaten; Foxes are cooked for a long time, since imperfectly cooked fox meat has an abominable taste.

To the zoologist the question now arises: From where did the arctic mammals originally get the trichinae, and from where do they constantly get them?

Most probably trichinosis has existed in the Arctic for a very long period of time without having been discovered. It is then easy to suggest that it was introduced by the first expeditions and whalers who often carried with them large quantities of salted meat and sometimes also live dogs and rats. The life cycle of the parasite has gone through the Greenland Dogs to the sea mammals, the Polar Bears, Foxes etc. If the cycle had once been started it has not been possible to stop it again, and the disease has spread more and more in the course of time.

According to Dr. Roth's investigations and those made by other scientists trichinosis is most frequent in Dogs and Polar Bears, Carnivora which live directly on raw meat from other mammals. These animals must have raw meat daily, and the risk of infection sooner or later is therefore very great. The Foxes to a great extent live on birds, fish and invertebrates, so they are presumably less exposed to infection than are Bear and Dog. It seems evident that Bear and Dog are also the most important sources of infection to each other and to sea mammals and man.

The big bear hunting takes place on the sea ice from March to May, as far as the Polar Eskimoes are concerned principally in the northern part of Melville Bugt, in Kane Bassin and along the coasts of Ellesmere Island. Here about 10—20 Polar Bears are killed yearly, sometimes more. The killed bears are skinned and parted on the spot. The dogs are allowed to satisfy themselves with raw bear meat, the hunters generally cook it on the stove—and some remains are left on the ice which will be eaten by foxes. In early spring these remains will rapidly freeze, whereby the parasites are killed, but well into May when the heat from the sun is considerable they will retain their power of infection for a very long period of time; they will gradually fall through the melting sea ice and be devoured by amphipods on the bottom of the sea, and these amphipods are again eaten by Ringed and Bearded Seal.

In some rare cases Polar Bears are shot in summer. The meat is not exposed to frost and consequently is still more dangerous to the animals eating it.

As regards the dogs it happens every year that dogs perish on the long sledge journeys; they are then left on the sea ice and their bodies will be eaten by Polar Bears, Foxes and Wolves. It may also happen that whole dog teams drift out to sea with the ice and disappear without any trace. In summer it is not uncommon both in the Thule district and the rest of Greenland that dead dogs are thrown into the sea where they float about until they sink to the bottom and are eaten by amphipods. Here is in my opinion the greatest danger of infection of the sea mammals. A dead dog which sinks to the bottom will very rapidly be met by swarms of amphipods which immediately will separate it

and devour the carcass, amphipods are eaten in huge numbers by Ringed Seal and to some extent also by Bearded Seal. A seal, therefore, when finding such a dog carcass swarmed by amphipods, will immediately rush at it, eating as many amphipods as possible and at the same time doubtless get some of the half decayed dog meat into its stomach, whereupon the trichinae cycle will start in the seal. The seal is eaten by man, Polar Bears, Dogs and sometimes also by Walrus—and maybe by Killer Whales.

The older a seal is the greater is the risk of infection. Most of the seals caught in the fjords round the settlements are young, while the older seals seem to be in majority north of Smith Sund and round Ellesmere Island. In the last mentioned places the number of seals infected with trichinae will probably be greatest, though the percentage is very small, may be between 1 % and 1 ‰ or less.

Of the Walruses, which I have examined, about 1 % had remains of Ringed Seal in their stomachs, but it cannot be excluded that Walruses exceptionally attack other mammals too. It is a well known fact that Walruses attack kayak hunters and tear their kayaks to pieces, sometimes also the hunter if he does not escape in time. It happens occasionally that a hunter disappears without a trace with his dog team during hunting on the ice for Walrus in spring. The possibility, therefore, cannot be excluded that the Walrus separate men and dogs and devour pieces of them like they do with seals.

According to the above the following table of probable sources of infection can be given:

1)				
Dogs left dead on the ice or the shore. Flensing remains of Bear, Walrus, Seal left on the ice.	eaten by	Dog Bear Wolf Fox Wolverine	eaten by	Man Dog
2)				
Dog or other infected mammals are drowned or thrown dead into the sea, where they are separated and eaten by amphipods.	Seal and Bearded Seal come to eat the amphipods, whereby they get at the same time some of the infected carcass in their stomachs.		eaten by	Walrus Bear Man Dog Fox etc.

As far as Seals and Walruses are concerned the percentage of infected animals is probably very small, but one of a thousand will be sufficient to start an epidemic and continue the cycle.

At any rate, we know that dogs are strongly infected. It should be prevented therefore that dead dogs are thrown into the sea. In summer they can be buried, and in winter they can be left to freeze for some time, before they are thrown into the tidal crack. Further, serious warning must be given against feeding dogs with fresh dog or bear meat, before it has been frozen at at least — 27° C. or more for at least 36 hours.

Two (sub)tropical crustaceans found north of Thule.

(After K. STEPHENSEN's notes made immediately before his death).

Among the crustaceans which mag. sc. CHR. VIBE brought home from Greenland the shrimp *Synalpheus fritzmülleri* Coutière and the isopod *Nerocila acuminata* Sch. & Mein. were found, one specimen of each and both taken with the bottom sampler at Neqe on December 11th 1939 at a depth of 54 m. Not alone were these species hitherto unknown to Greenland, but the same holds good of the families to which they belong.

The distribution hitherto known for these two species is almost the same: The east coast of North America from about 35°—40° N. to the Mexican Bay or more southwards, and the West Indies, and both species probably occur in the Pacific off California. Since the new locality at Neqe is about 40 degrees of latitude north of the hitherto known nearest locality, one cannot help asking if there is not some mistake, but as far as it has been possible to ascertain this is absolutely excluded. No dirty glass tubes with remains of old material have been used: nor have these species adhered to the bottom sampler, and the total collection of Mr. VIBE has not been near any other material before I got it at the Zoological Museum for determination. Nor is it likely that the animals have been introduced to Thule by an American ship, at any rate such a ship has not been reported to have been in North Greenland so early as December 1939, and besides, it would be almost a miracle if the bottom sampler was lowered just in the place where a ship might have dropped them.

These finds are however not unique. Dr. H. LEMCHE has kindly called my attention to the fact that an opistobranch gastropod of the family Aplysiidae, *Dolabrifera holbølli* R. Bergh, has been taken twice in West Greenland (one find at Sukkertoppen; the other locality can not be stated with certainty (H. LEMCHE, Medd. om Grønl., vol. 80 no. 7, 1941). The family is subtropical and tropical, and the nearest finding place for a species of the same genus (*D. ascifera* (Lang.)) is St. Thomas in the West Indies.

Taking all these facts into consideration there does not seem to be the slightest doubt that these two crustaceans have actually been living at the place where they were collected. The finds must therefore be considered a most earnest inducement to investigate the West Greenland (and American) waters by means of the bottom sampler, since such investigations hitherto practically have not been made.

Decapoda.

Alpheidæ.

Synalpheus fritzmülleri Coutière, Proc. U. S. Nat. Mus. 36, 1909, pp. 35, figs.
— Verrill, Trans. Conn. Acad. Arts & Sci. 26, 1922, 97, figs.
— Waldo L. Schmitt, Sci. Survey Porto Rico and the Virgin Islands, New York Acad. Sci., 15, part 2, 1935, 148.

Locality. Neqe, gravel with clay, 54 m. Petersen grab 11. December 1939. CHR. VIBE, 1 spec., ca. 11 mm.

Remarks. The specimen agrees well with COUTIÈRE l. c.; the large chela is lost.

COUTIÈRE (l. c. pp. 6, 37) has also established a subspecies *elongatus*, and VERRILL (l. c.) describes two new varieties, viz. *carolinensis* and var. *caribæa*. The specimen belongs probably to *S. fritzmülleri* sens. str., for the spine on the antennal plate is in length equal to the peduncle of ant. 2 (in subsp. *elongatus* much longer; COUTIÈRE (l. c. 19); VERRILL's two varieties are not very clearly described. I give drawings of some of the appendages., fig. 33.

Distribution. From North Carolina (var. *carolinensis*) and Florida to Desterro, Brazil, including Porto Rico, Virgin Islands and Barbados. Also Lower California.

The northern limit of Alphæidæ.

The Atlantic.

1a) Europe. *Athanas nitescens* (Mont.) as far as SW. Norway (APPELLÖF, Meeresfauna v. Bergen. Heft 2—3, 1906, p. 117).

Alpheus ruber H. M.-Edw.
— *macrocheles* (Hailstone)
} as far as S. England (STANLEY KEMP, Fish. Ireland, Sci. Invest. 1908, I (1910), pp. 120 & 121).

1b) America. No spec. known from Canada or northern U.S.A.: M. RATHBUN: Rep. Canad. Arct. Exped. 1913—18, vol. 7,

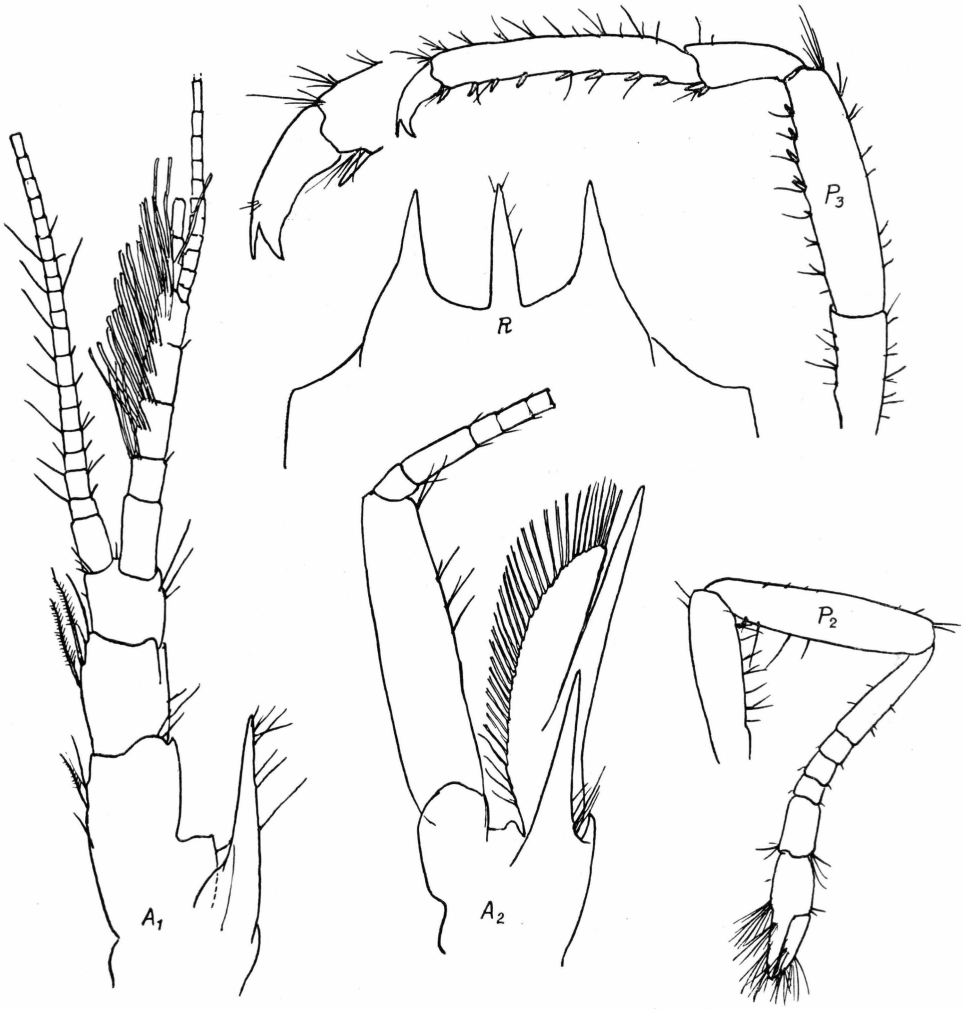


Fig. 33. *Synalpheus fritzmülleri.* Neqe. (Drawing by K. Stephensen).

part A, Ottawa 1919; M. Rathbun: Canadian Atlantic Fauna, part 10m, St. Andrews, N.B., Canada, 1929; M. Rathbun: Occ. Papers, Boston Soc. Nat. Hist., vol. 7, 1905.

2) North Pacific. No species known north of Carolina or corresponding regions of Asia: M. Rathbun, in: Harriman Alaska Exped., vol. 10, New York 1904, table pp. 10—11, but some species (3 genera) known from California: Waldo L. Schmitt, in Univ. Calif. Publ. Zool., vol. 23, Berkeley 1921, pp. 73 seq.

Isopoda Flabellifera.

Cymothoidæ. Cymothoinæ.

Nerocila acuminata Schiödte & Meinert, Naturhist. Tidsskr. (3) (13, 1881—83, p. 48, pl. 3, figs. 5—6.

— H. Richardson, Bull. U. S. Nat. Mus. 54, 1905, pp. 219, 220 (lit.), figs.

According to TH. MONOD 1931 (Rev. Zool. Bot. Afric., 21, p. 7, foot note, *N. acuminata* Sch. M. et N. *californica* Sch. M. "sont très voisins si non identiques".

Nerocila californica Sch. & M., l. c., p. 72, pl. 5, figs. 12—15, pl. 6, figs. 1—2.

— H. Rich., l. c., pp. 219, 221 (lit.), figs.

— Gurjanova, Faune del' URSS, n. ser., no. 6 (Crust., vol. 7, no. 3), 1936, p. 83, figs. (no new records).

Locality. Neqe, Thule, gravel with clay, 54 m. Petersen grab, 11. December 1939. CHR. VIBE, 1 spec. Length 18.5 mm, breadth 7.5 mm.

Remarks. The specimen is probably a young female, for there are neither marsupium nor penis. The narrow forepart indicates that the specimen is moulting; this forepart of the body has not yet shed the old cuticle.

It agrees so well with Sch. & M.'s original description of the species that the identification may be considered quite certain; a few remarks should, however, be made. The length is nearly $2^1/_2$ times the breadth (S. & M.: over twice the breadth; RICH.: "a little more than one and a half times longer"). The epimera of the three posterior mesosome segments are longer than shown in S. & M. fig. (pl. 3, fig. 6 = RICH. fig. 222b), especially the two posterior are much longer, and the terminal segment is not so markedly acuminate as in S. & M.'s fig. (pl. 3, fig. 5 = RICH. fig. 222a). Ant. 1 has lost the apex; ant. 2 has 10 joints (S. & M.: 11, RICH.: 9 joints). The oral parts were not dissected out. Periopods 1—5 have probably no spines (S. & M., and RICH. say nothing about this character in figs. 1—6). Periopod 7 is in the distal joints (excl. of *dactylus*) much more spinose than shown in RICH. fig. 223e, and the spines are placed in two parallel series; also periopod 6 is spinose, but not so much as periopod 7. The distal process on the peduncle of the urop. is half as long as the inner ramus which has the distal corner of the inner margin more prominent than in S. & M.'s fig., and the outer margin is irregularly dentate (in S. & M.'s fig. quite smooth).

The Greenland specimens was compared with one of S. & M.'s type specimens (the sole we possess); a young female with marsup., but no eggs, 25 mm in length, from Belox i (mouth of Mississippi). This type specimen agrees well with S. & M.'s description and figures; it has no

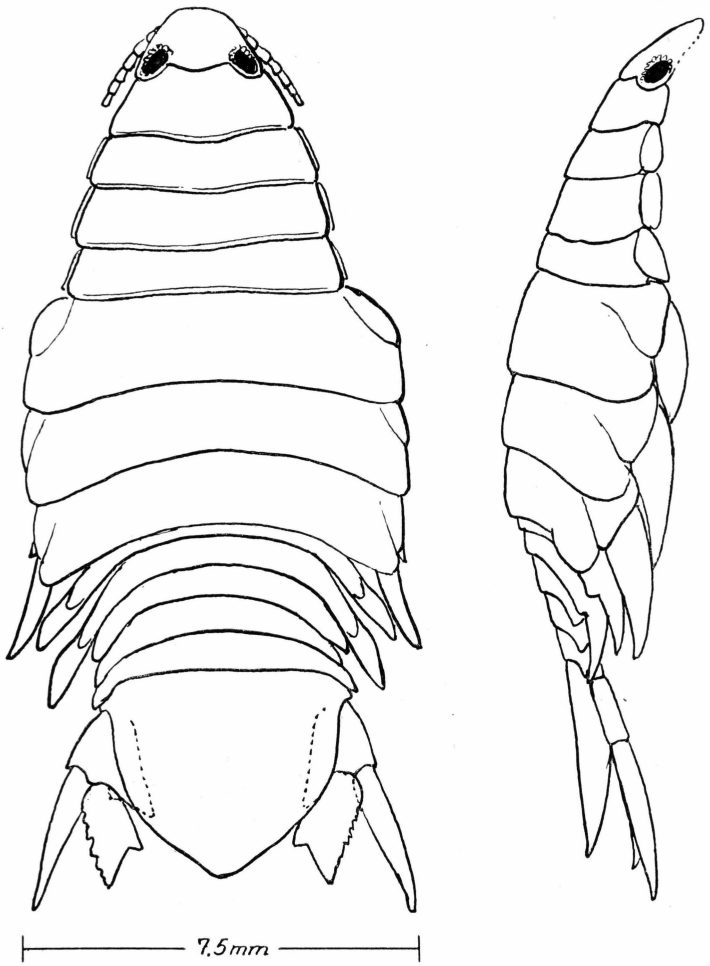


Fig. 34. *Nerocila acuminata.* Neqe. (Drawing by K. Stephensen).

perp. 6, and the number of spines on perp. 7 seems (without dissection) to agree with Rich.'s fig. 223e.

According to the above the Greenland specimen seems to differ from the original description only in one rather important character, viz. the serration on the inner ramus of the uropods, also the spinose armature of perp. 6 (not that of perp. 7) is possibly of a certain im-

portance. The other differences (the very long epimera on 5th—7th segments, the less acuminate terminal segment, the greater number of spines on perp. 7) are probably characters which may vary to a certain degree according to age.

After all I feel not much doubt when referring the Greenland specimen to the species *N. acuminata*.

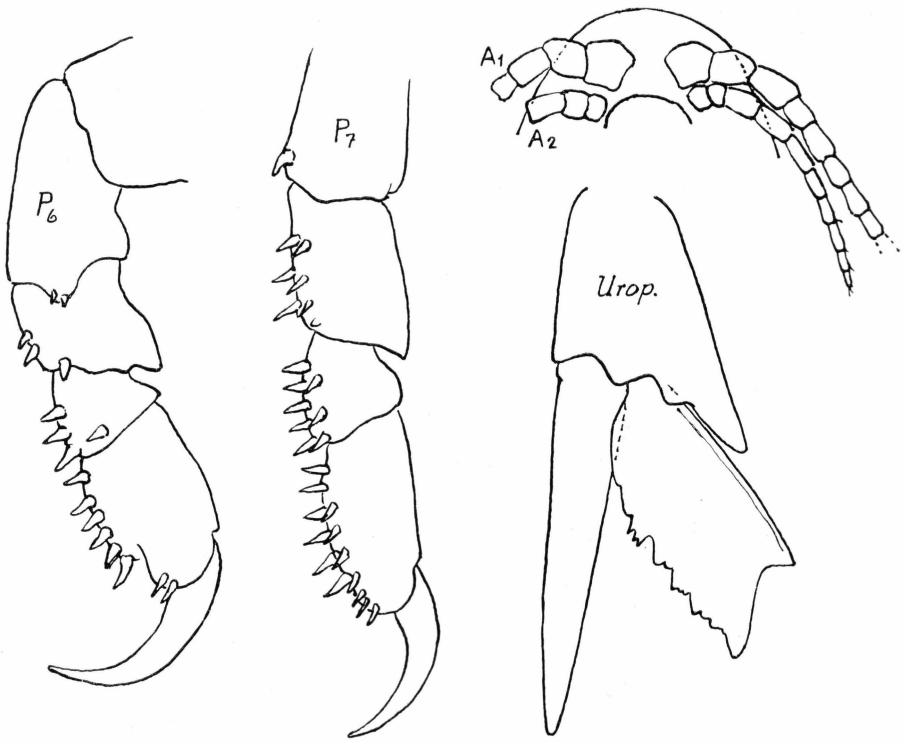


Fig. 35. *Nerocila acuminata*, Neqe. (Drawing by K. STEPHENSEN).

Further remarks. MONOD 1931 (see above) considers *N. acuminata* S. & M. and *N. californica* S. & M. probably synonymous. We still possess one of the type specimen of *N. californica* (male (penis well developed), from San Diego, California). This specimen agrees well with the original description, but the apex of the terminal segment and the uropods are somewhat damaged; perp. 6 has probably no spines, the spinose armature of perp. 7 agrees with RICH.'s fig. 223e.

Distribution (*N. acuminata*). Atlantic coast of the U.S.A., from Virginia to Mississippi, also Bermuda. It is parasitic on several fishes (see RICH. l. c.).

N. californica is known from several fishes from the Pacific Ocean, from Panama Bay to California.

List of marine species collected by the author on "Den danske Thule- og Ellesmere Island Ekspedition" 1939—41.

Octactiniaria.

Gersemina rubiformis (Ehrbg.).
Neqe 11-12-1939, 50 m.
Capnella glomerata (Verrill).
Neqe 11-12-1939, 50 m.

Hydroida.

Monobrachium parasitum Mereschk.
Uvdle, Thule 31-7-1939, 42 m.
Eudendrium caricum Jäd.
Bays Fjord, Ellesmere Island, 12-5-1940, 35 m.
Cuspidella procumbens Kramp.
Refuge Harbor 11-8-1939, 10—30 m.
Halecium muricatum (Ell. & Sol.).
Refuge Harbor 11-8-1939, 10—30 m.

Medusæ.

Sarsia princeps Haeckel.
Siorapaluk 24-7-1941.
Bougainvillia superciliaris L. Ag.
Herberts Ø 12-8-1941.
Ptychogastria polaris Allman.
Bays Fjord, Ellesmere Island, 14-5-1940.
Aglantha digitalis (O. F. M.).
Siorapaluk 23-8-1939. Bays Fjord, Ellesmere Island, 14-5-1940.
Æginopsis laurentii Brandt.
Siorapaluk 23-8-1939. Kap Jackson 7-6-1941.

Actiniaria.

Bunodactis stella (Verr.).
Thule 3-9-1947.
Actinostola spitzbergensis Carlgr.
Kangerdlugssuaq 28-8-1939, 10—20 m.

Ctenophora.

Beroe cucumis (Fabr.).
Herberts Ø 9-8-1941. Mc. Cormick Fjord 26-8-1941.
Bays Fjord, Ellesmere Island, 14-5-1940.

Polychaeta.

Harmothoë imbricata (L.).
Uvdle 30-7-1939, 30 m. Saunders Ø 31-7-1939, 33 m. Refuge Harbor 11-8-1939, 10—30 m. Neqe 12-10-1939, 25—40 m.
Gathyana cirrosa (Pallas).
Uvdle 30-7-1939, 18—45 m. Saunders Ø 31-7-1939, 35 m. Neqe 11-12-1939, 40 m.
Lagisca extenuata (Grube).
Bays Fjord, West Ellesmere Island, 12-5-1940, 15—35 m.
Phyllodoce groenlandica Oerst. New north of 74°36′
Uvdle 30-7-1939, 18 m.
Nephthys ciliata (O. F. M.).
Uvdle 30-7-1939, 12—45 m.
Nephthys coeca (O. Fabr.) *var ciliata* Mc'Int.
Uvdle 30-7-1939, 30 m.
Nereis zonata Mgrn.
Uvdle 30-7-1939, 30 m.
Onuphis conchylega M. Sars.
Uvdle 30-7-1939, 32—45 m.
Brada villosa (Rathke). Qânâq 25-8-1939, ca. 20 m.
Olrik Fjord 2-9-1939, 4 m.
Ammotrypane aulogaster Rathke. New north of 70°30′.
Saunders Ø 31-7-1939, 45 m.
Myriochele heeri Mgrn.
Uvdle 30-7-1939, 30 m. Neqe 12-10-1939, 40 m.
Axiothella catenata (Mgrn.). New north of 72°33′.
Uvdle 30-7-1939, 12 m. Saunders Ø 31-7-1939, 45 m.
Pectinaria granulata L. New north of 70°40′.
Uvdle 30-7-1939, 12—32 m. Saunders Ø 31-7-1939, 38 m. Qânâq 25-8-1939, 5—20 m. Olrik Fjord 2-9-1939, 4—30 m.
Ampharete grubei Mgrn. New north of 69°.
Saunders Ø 31-7-1939, 45 m.
Scione flexuosa O. F. M.
Saunders Ø 31-7-1939, 43 m. Neqe 12-10-1939, 25—40 m.
Terebellides strømi M. Sars. New north of 74°37′.
Uvdle 30-7-1939, 12—30 m.

Gephyrea.

Priapulus caudatus Lam.
Olrik Fjord 2-9-1939, 10—30 m. Neqe 11-12-1939, 54 m.
Phascolosoma margaritaceum (Sars)
Olrik Fjord 2-9-1939, 4 m.

Nemertini.

Nemertini sp.
Uvdle 30-7-1939, 20 m.

Crustacea.

Sclerocrangon boreas (Phipps)
Kangerdlugssuaq 28-8-1939, 10—20 m. Neqe 12-10-1939, 25—40 m.
Nectocrangon lar (Orven).
Neqe 12-10-1939, 25—40 m.
Sabinea septemcarinata (Sab.).
Neqe 26-2-1940, in stomach of Erignathus barbatus.
Spirontocaris fabricii (Kr.). New north of $72^1/_2°$.
Saunders Ø 31-7-1939, 40 m.
Spirontocaris gaimardii (H. M. E.) *forma gibba* (Kr.).
Inglefield Bredning 28-8-1939, in stomach of Monodon monoceros.
Spirontocaris spinus (Sorv.).
Neqe 26-2-1940, in stomach of Erignathus barbatus.
Spirontocaris turgida Kr.
Uvdle 30-8-1939, 30 m. Neqe 12-10-1939, 25—40 m.
Spirontocaris polaris (Sabine).
Neqe 26-2-1940, in stomach of Erignathus barbatus. Kangerdlugssaq 28-8-1939. Refuge Harbor 11-8-1939, 10—30 m.
Bays Fjord, Ellesmere Island, 12-5-1940, 15—35 m.
Spirontocaris groenlandica (J. C. Fabr.).
Olrik Fjord 1-9-1939, 10—30 m.
Pandalus bonnieri Caull. New to Greenland.
Inglefield Bredning 28-8-1939, in stomach of Monodon monoceros.
Synalpheus fritzmülleri Coutiére. New to Greenland.
Neqe 11-12-1939, 54 m.
Hymenodora gracilis Smith. New north of 62°19′.
Inglefield Bredning 28-8-1939, in stomach of Monodon monoceros.

Boreomysis arctica (Kr.). New north of 71°.
Inglefield Bredning 28-8-1939, in stomach of Monodon monoceros.
Mysis oculata O. Fabr.
Neqe 28-2-1940, 1 m.
Eudorellopsis deformis Kr.
Uvdle 30-7-1939, 45 m.
Diastylis (*scorpioides* (Lep)?) New north of 72°.
Olrik Fjord 2-9-1939.
Themisto libellula (Mandt).
Neqe 22-3-1941. Smith Sund 25-5-1940.
Socarnes bidenticulatus Bate.
Olrik Fjord 2-9-1939, 4 m.
Anonyx nugax, Phipps.
Neqe 6-3-1940, 3 m. Kap Jackson 7-6-1941, 4 m. Olrik Fjord 2-9-1939. Qânâq 25-8-1939, 5—20 m.
Tmetonyx cicada O. Fabr.
Neqe 6-3-1940, 3 m.
Pseudalibrotus littoralis (Kr.).
Neqe 6-3-1940, 3 m. Kap Jackson 7-6-1941. Olrik Fjord 2-9-1939. Bays Fjord, Ellesmere Island, 12-5-1940, 15—35 m.
Pseudalibrotus nanseni G. O. Sars. New north of 66°.
Heureka Sound, Ellesmere Island, 11-4-1940.
Pseudalibrotus glacialis, G. O. Sars.
Kane Bassin 6-6-1941, Neqe 28-2-1940, 1 m. Olrik Fjord 2-9-1939, 4 m. Baumanns Fjord, Ellesmere Island, 5-5-1940, 3 m.
Orchomenella minuta Kr.
Kap Alexander 4-4-1941, 5 m. Olrik Fjord 2-9-1939, 4 m. Qânâq 25-8-1939, 5—20 m. Saunders Ø 31-7-1939, 40 m.
Pontoporeia femorata Kr.
Uvdle 30-7-1939, 18 og 30 m.
Harpinia serrata G. O. Sars. New to West Greenland.
Saunders Ø 31-7-1939, 40 m.
Oediceros borealis Boeck. New north of Disco.
Saunders Ø 31-7-1939, 40 m.
Paroediceros lynceus (M. Sars).
Saunders Ø 31-7-1939, 40 m.
Monoculodes sp.
Olrik Fjord 3-9-1939, 4 m.
Halimedon megalops (G. O. Sars)? New north of 71°.
Saunders Ø 31-7-1939, 40 m.
Nototropis smitti (Goës).
Neqe 11-12-1939, 54 m.

Atylus carinatus (Fabr.).
Olrik Fjord 2-9-1939. Qânâq 25-8-1939, 5—20 m.
Pontogeneia inermis (Kr.).
Kap Alexander 4-4-1941, 5 m. Neqe 28-2-1940, 1 m.
Ceradocus torelli (Goës). New north of 67°.
Uvdle 30-7-1939, 30 m.
Gammarus locusta (L.).
Neqe 28-2-1940, 1 m. Itivdlit 9-8-1941, 0 m.
Etah 9-8-1939, 0 m. Olrik Fjord 1-9-1939, 0 m.
Gammarus (*locusta* L.) *setosus* Dement.
Uvdle 30-7-1939, in the tidal-zone.
Melita dentata (Kr.).
Olrik Fjord 2-9-1939, 10—30 m.
Gammarellus homori (Fabr.)?
Olrik Fjord 2-9-1939, 4 m.
Ampelisca (*macrocephala* Lilljb?).
Olrik Fjord 2-9-1939, 10—30 m.
Ampelisca eschrichti Kr. New north of 72°.
Neqe 11-12-1939, 40 m.
Haploops tubicola Lilljb. New north of 73°.
Uvdle 30-7-1939, 32 m. Saunders Ø 31-7-1939, 33 m.
Byblis gaimardi (Kr.).
Uvdle 30-7-1939, 10 og 30 m. Saunders Ø 31-7-1939, 45 m.
Neqe 11-12-1939, 50 m.
Ischyrocerus anquipes, Kr., ♀.
Saunders Ø 31-7-1939, 40 m.
Neohela maxima K. Steph ♀. Former only recorded from 71°21′N, 54°29′W.
Neqe 26-2-1940, in stomach of Erignathus barbatus.
Æginina longicornis (Kr.).
Bays Fjord, Ellesmere Island, 12-5-1940, 15—35 m.
Caprella septentrionalis Kr.
Bays Fjord, Ellesmere Island, 12-5-1940, 15—35 m.
Arcturus baffini Sabine.
Olrik Fjord 2-9-1939, 10—30 m. Neqe 11-12-1939, 40 m.
Nerocila acuminata Sch. og Mein. New to Greenland.
Neqe 11-12-1939, 54 m.
Nebalia bipes (O. Fabr.).
Olrik Fjord 2-9-1939, 4 m.
Philomedes globosus Lilljb.
Uvdle 30-7-1939, 45 m.
Calanus finmarchicus (Gunner).
Kane Bassin 6-6-1941. Kap Alexander 4-4-1941, 4 m.
Bays Fjord, Ellesmere Island, 12-5-1940.

Calanus hyperboreus Kr.
Kane Bassin 6-6-1941. Bays Fjord, Ellesmere Island, 12-5-1940.
Balanus balanus (L).
Uvdle 30-7-1939, 30 m. Neqe 11-12-1939, 54 m.
Balanus crenatus Brug.
Etah 12-7-1941, 0 m.
Chætonynephon hirtipes (Bell).
Neqe 12-10-1939, 25—40 m.

Gastropoda.

Lepeta coeca (Müller).
Neqe 12-10-1939, 25—54 m.
Margarita groenlandica (Chemnitz).
Olrik Fjord 2-9-1939, 4—30 m. Neqe 12-10-1939, 25—40 m.
Refuge Harbor 11-8-1939, 10—30 m. Qânâq 25-8-1939, 5—20 m.
Margarita helicina (Phipps).
Qânâq 25-8-1939, 5—20 m. Refuge Harbor 11-8-1939, 10—30 m.
Uvdle 30-7-1939, 45 m.
Trichotropis borealis Brod. et. Low.
Uvdle 30-7-1939, 12 m. Qânâq 25-8-1939, 20 m.
Natica clausa sive affinis.
Olrik Fjord 2-9-1939, 10—30 m.
Neqe 1940 (Operculum in stomach of Erignathus barbatus).
Velutina zonata (Gould).
Neqe 12-10-1939, 25—40 m.
Velutina laevigata (Pennant) New north of 72°47′.
Uvdle 30-7-1939, 30 m. Neqe 12-10-1939, 25—40 m.
Qânâq 25-8-1939, 5—20 m.
Sipho holbøllii (Møller). New north of 69°13′.
Olrik Fjord 2-9-1939, 4—30 m.
Sipho islandicus (Chemnitz). New north of 72°47′.
Kangerdlugssuaq 29-8-1939, 10 m.
Sipho turritus M. Sars. New to West Greenland.
Neqe 11-12-1939, 40 m. Saunders Ø 31-7-1939, 35 m.
Neptunea despecta (Linné) New north of 68°40′.
Neqe 12-10-1939, 25—40 m.
Buccinum groenlandicum Chemnitz.
Neqe 12-10-1939, 25—40 m. Kangerdlugssuaq 28-8-1939, 20 m.
Qânâq 25-8-1939, 5—20 m. Olrik Fjord 2-9-1939, 4—30 m.
Buccinum groenlandicum var *coerulea.*
Neqe 12-10-1939, 25—40 m.

Buccinum hydrophanum Hancock. New north of 62°33′.
Neqe 12-10-1939, 25—40 m. Olrik Fjord 2-9-1939, 4—30 m.
Saunders Ø 31-7-1939, 33—43 m. Kangerdlugssuaq 29-8-1939, 10 m.
Buccinum finmarchianum Verkrüzen.
Kangerdlugssuaq 28-8-1939, 10—20 m. Neqe 12-10-1939, 40 m.
Refuge Harbor 11-8-1939, 10—30 m.
Buccinum tenue Gray. New north of 76°.
Olrik Fjord 2-9-1939, 4—30 m. Uvdle 30-7-1939, 20—30 m.
Admete viridula (Fabricius) New north of 71°
Olrik Fjord 2-9-1939, 4—30 m.
Bela nobilis (Møller) New north of 76°.
Neqe 11-12-1939, 40 m.
Bela violacea (Mighels).
Uvdle 30-7-1939, 18 m.. Neqe 11-12-1939, 40 m.
Saunders Ø 31-7-1939, 43 m.
Bela tenuicostata (M. Sars) New north of 60°63′.
Qânâq 25-8-1939, 5—20 m.
Cylichna sp.
Olrik Fjord 1-9-1939, 10—30 m. Neqe 11-12-1939, 40 m.
Clione limacina (Phipps).
Inglefield Bredning 8-8-1941.
Limacina helicina (Phipps).
Inglefield Bredning 8-8-1941.

Lamellibranchiata.

Pecten islandicus, Müller.
Neqe 12-10-1939, 25—40 m. Emty shells in dredge haul.
Mytilus edulis, Linné. New north of Melville Bugt.
Thule harbour 15-7-1940, sublittoral.
Modiolaria faba, (Müller). New north of Melville Bugt.
Thule 3-9-1940, sublittoral.
Modiolaria laevigata (Gray) Torell.
Thule 3-9-1940, 0 m. Uvdle 30-7-1939, 45 m. Olrik Fjord 2-9-1939, 30 m. Refuge Harbor 11-8-1939, 30 m. Saunders Ø 31-7-1939, 43 m. Neqe 11-12-1939, 54 m.
Modiolaria nigra (Gray) Torell. New north of 72°23′.
Saundres Ø 31-7-1939, 35 m. Neqe 11-12-1939, 40 m.
Yoldia hyperborea (Lovén) Torell. New north of 72°23′.
Olrik Fjord 2-9-1939, 30 m.
Leda minuta (Müller).
Olrik Fjord 2-9-1939, 4—30 m. Saunders Ø 31-7-1939, 43 m.
Neqe 11-12-1939, 40 m.

Leda pernula (Müller).
Olrik Fjord 2-9-1939, 4—30 m. Neqe 11-12-1939, 40—54 m.
Nucula tenuis (Montagu).
Olrik Fjord 2-9-1939, 4—30 m. Neqe 11-12-1939, 54 m.
Cardium groenlandicum, Chemnitz.
Uvdle 30-7-1939, 12 m. Kangerdlugssuaq 28-8-1939, 10—20 m.
Olrik Fjord 2-9-1939, 4—30 m. Qânâq 25-8-1939, 5—20 m.
Neqe 11-12-1939, 40—52 m. Saunders Ø 31-7-1939, 43 m.
Cardium elegantulum (Beck) Møller. New north 72°47′.
Olrik Fjord 2-9-1939, 4—30 m. Saunders Ø 31-7-1939, 43 m.
Neqe 13-3-1940, 45 m.
Cardium ciliatum, Fabricius.
Uvdle 30-7-1939, 12 m. Saunders Ø 31-7-1939, 38 m.
Neqe 11-12-1939, 40—52 m.
Astarte borealis (Chemnitz).
Neqe 11-12-1939, 50 m. Uvdle 30-7-1939, 40 m.
Saunders Ø 31-7-1939, 38 m.
Astarte banksii (Leach).
Saunders Ø 31-7-1939, 40 m. Olrik Fjord 2-9-1939, 30 m.
Neqe 11-12-1939, 40—54 m.
Astarte elliptica, Brown. New north of Melville Bugt.
Qânâq 25-8-1939, 5—20 m. Uvdle 30-7-1939, 10 m.
Saunders Ø 31-7-1939, 43 m.
Axinus flexuosus (Montagu).
Uvdle 30-7-1939, 12 m. Olrik Fjord 2-9-1939, 4—30 m.
Qânâq 25-8-1939, 5—20 m. Neqe 11-12-1939, 50—54 m.
Macoma calcaria, Chemnitz.
Uvdle 30-7-1939, 12—45 m. Olrik Fjord 2-9-1939, 4—30 m.
Neqe 11-12-1939, 40—54 m. Saunders Ø 31-7-1939, 45 m.
Lyonsia arenosa (Møller).
Olrik Fjord 2-9-1939, 4—30 m.
Saxicava arctica (Linné).
Uvdle 30-7-1939, 12—45 m. Refuge Harbor 11-8-1939, 10—30 m.
Neqe 11-12-1939, 40—54 m. Etah 9-8-1939, 20 m.
Mya truncata, Linné.
Qânâq 25-8-1939, 5—20 m. Neqe 11-12-1939, 40—54 m.
Uvdle 30-7-1939, 32 m.

Bryozoa.

Crisia denticulata (Lm.).
Refuge Harbour 11-8-1939, 10—30 m.
Lichenopora verrucaria (Fabr.).
Refuge Harbour 11-8-1939, 10—30 m.

Plyriozoum subgracile d'Orb.
Refuge Harbour 11-8-1939, 10—30 m.
Alcyonidium albidum Aldn.
Thule 3-9-1940.
Cellepora ventricosa L. v. Lorenz.
Neqe 11-12-1939, 50 m.

Brachiopoda.

Hemithyris psittacea (Gml).
Neqe 11-12-1939.

Echinoderma.

Myriotrochus rinkii Steenstrup.
Neqe 12-10-1939, 25—40 m. Qânâq 25-8-1939, 10—20 m.
Cucumaria frondosa (Gunnerus).
Neqe 4-3-1941, (In stomach of Erignathus barbatus).
Psolus phantapus (Strussenfeldt).
Neqe 1940 (In stomach of Erignathus barbatus).
Urasterias Lincki (Müller et Troschel).
Uvdle 30-7-1939, 30 m.
Leptasterias sp. cf. *groenlandica* Stp.
Thule 29-8-1940, 3—5 m. Olrik Fjord 2-9-1939, 10—30 m.
Neqe 12-10-1039, 25—40 m. Qânâq 25-8-1939, 10—20 m.
Refuge Harbor 11-8-1939, 10—30 m.
Ophiura sarsi Lütken.
Ethah 9-8-1939, 30 m. Siorapaluk 13-8-1939, 10—60 m.
Neqe 11-12-1939, 40 m.
Ophiura robusta Ayres.
Neqe 12-10-1939, 25—40 m. Refuge Harbor 11-8-1939, 10—30 m.
Uvdle 30-7-1939, 30 m. Qânâq 25-8-1939, 10—20 m.
Saunders Ø 31-7-1939, 40 m. Etah 9-8-1939, 30 m.
Ophiocten sericeum (Forbes).
Siorapaluk 23-8-1939, 8 m. Qânâq 25-8-1939, 10—20 m.
Uvdle 30-8-1939, 45 m. Bays Fjord, Ellesmere Island, 14-5-1940, 75 m. Etah 9-8-1939, 30 m.
Ophiopholis aculeata (Linné).
Neqe 11-12-1939, 50 m.
Ophiacantha bidentata (Retzius).
Refuge Harbor 11-8-1939, 30 m. Olrik Fjord 2-9-1939, 4—30 m.
Strongylocentrotus droebachiensis (O. F. Müller).
Siorapaluk 23-8-1939, 10—60 m. Etah 9-8-1939, 30 m.

Refuge Harbor 11-8-1939, 10—30 m. Bays Fjord, Ellesmere Island, 12-5-1940, 35 m.

Heliometra glacialis (Leach).

Siorapaluk 23-8-1939, 60 m. Neqe 12-10-1939, 40 m.

Chaetognata.

Sagitta elegans.

Bays Fjord, Ellesmere Island, 12-5-1940. Siorapaluk 23-8-1939.

Tunicata (pelagic).

Oikopleura vanhoeffeni Lohm.

Siorapaluk 23-8-1939.

Summary.

On the first pages of the present paper a survey is given of the ice conditions in the Thule district in the years 1939—41, and the map on p. 13 shows the extension of the sea ice and the different phases of the ice covering. In the last 30 years the limit of the permanent winter ice has come nearer land, because the ice forms later and breaks earlier. The ice limit of the winter across the Walrus banks makes it possible for the Walruses to winter in the district.

The nutrition biology and migration of the Walrus are discussed in detail on basis of stomach analyses and the animal communities on the Walrus banks. At depths of upwards of 36 m the Walrus feeds principally on the bivalves *Cardium groenlandicum* and *Cardium ciliatum*. At greater depths down to about 80 m its principal diet consists of the mussels *Mya truncata* and *Saxicava arctica*. Other species play only an inferior rôle in the diet of the Walrus.

In the same way an account is given of the distribution and nutrition biology of the Bearded Seal in the district. This Seal is almost omnivorous. At the great depths it feeds on Polar Cod, while at smaller depths, below 80 m, it seems to prefer the epifauna of the sea bottom, notably the gastropod *Buccinum*, but also other animals as e. g. *Cucumaria*, *Amphipodae*, *Decapodae*, *Cottidae*, *Lycotidae*, *Psolus* and *Rossia* etc.

The occurrence and distribution of the Harp Seal, Bladdernose, Spotted Seal, Ringed Seal, Narwhal and White Whale are briefly discussed, and features of the biology of these animals in the district are discussed.

The littoral fauna of the Thule district is treated in detail. *Mytilus edulis* is demonstrated in the littoral zone at Thule.

Observations of the marine animal life in the fjords west of Ellesmere Island are reported.

Trichinosis in arctic mammals is discused page 93.

Much surprising is the find of two (sub)tropical crustaceans north of Thule, viz. *Synalpheus fritzmülleri* and *Nerocila acuminata*, since the northern limit hitherto known for these animals was about 40 degrees of latitude more southerly.

A list is given of all marine invertebrates found during the expedition. Many of them are new to the Thule district, two species (*Harpinia serrata* and *Sipho turritus*) are new to West Greenland, and 3 species (*Pandalus bonnieri*, *Nerocila acuminata* and *Synalpheus fritzmülleri*) are new to Greenland.

LITERATURE

ALLEN, JOEL ASAPH: History of North American Pinnipeds. Washington 1880.

BERTELSEN, 1937: Contributions to the animal ecology of the fjords of Angmagssalik and Kangerdlugssuaq in East Greenland. (Medd. om Grønland, Bd. 108, Nr. 3, Copenhagen).

BLEGVAD, H., 1924: Om Dødeligheden hos Littoralregionens Dyr under Isvintre. Beretning fra den danske biologiske Station XXXV. Kbhvn.

BRÆSTRUP, F. W., 1941: A study on the arctic fox in Greenland. (Medd. om Grønland, Bd. 131, Nr. 4, Copenhagen).

CONNELL, FR. H., 1949: Trichinosis in the Arctic: A Rewiew. Arctic. Journ. of the Arct. Inst. of N. A. vol. 2, n. 2.

DEGERBØL, M. og NIELSEN, N. L., 1930: Biologiske Iagttagelser over og Maalinger af Hvidhvalen (Delphinopterus leucas (Pall.)) og dens Fostre. (Medd. om Grønland, Bd. 77, No. 3).

DEGERBØL, M., 1935: Mammals, Report of the fifth Thule Expedition. 1921—24, Vol. 2, No. 4.

DUNBAR, M. J., 1941: On the food of Seals in the Canadian Eastern Arctic. Canadian Journal of Research, Vol. 19, Nr. 5. Ottawa.

FREUCHEN, PETER, 1915: Report on the first Thule Expedition. (Medd. om Grønland, Bd. 51, Nr. 12. Copenhagen).

— 1921: Om hvalrossernes forekomst og vandringer ved Grønlands vestkyst. Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening i København, Bd. 72.

— 1935: Mammels. Report of the fifth Thule Expedition 1921—24, Vol. 2, No. 5. Copenhagen.

GOULD, S. E., and KAASA, L. J.: „Low temperature treatment of pork: Effect of certain low temperatures on variability of Trichina larvae". Am. J. Hyg. 49 (1949) pp. 17—24.

GRØNLAND i TOHUNDREDAARET for Hans Egedes Landing. 1921. Copenhagen.

HJORT, JOH., KNIPOWITSCH, N. und WOLLEBÆK, ALF, 1907: Bericht über die Lebensverhältnisse und den Fang der nordischen Seehunde. Conseil permanent international pour l'exploration de la mer. Rapports et procès-verbaux, Vol.VIII.

JENSEN, AD. S., 1928: Grønlands Fauna. København.

— 1939: Concerning a change of climate during recent decades in the arctic and subarctic regions, from Greenland in the west of Eurasia in the east, and contemporary biological and geophysical changes. Det Kgl. Danske Videnskabernes Selskab. Biol. Medd. XIV, 8.

— 1942: Two new West Greenland localities for deposits from the ice age and the post-glacial warm period. Ibidem XVII, 4.

KOCH, LAUGE, 1928: Contributions to the Glaciology of North Greenland. (Medd. om Grønland, LXV. Copenhagen).

MADSEN, H., 1936: Investigations on the shore fauna of East Greenland with a survey of the shores of other arctic regions. (Medd. om Grønland, Bd. 100, No. 8. Copenhagen).

— 1940: A study of the littoral fauna of Northwest Greenland. (Medd. om Grønland, Bd. 124, No. 3. Copenhagen).

MOSSOP, BESSIE K. E., 1922: The rate of growth of the Sea Mussel (Mytilus edulis L.). Transactions of the Royal Canadian Institute No. 31, Vol. XIV, Part I, 1922. Toronto.

OKADA, Y. K.: Régénération du siphon des mollusques Lamellibranches. Bull. Soc. Zool. de France, vol. 52, pp. 92—95. Paris 1927.

RASMUSSEN, KNUD, 1915: The first Thule Expedition 1912. (Medd. om Grønland, Bd. 51. Copenhagen).

— 1928: Report of the II. Thule Expedition 1916—18. (Medd. om Grønland, Bd. 81, No. 1. Copenhagen).

ROTH, H.: "Trichinosis in arctic animals". Nature 163 (1949) pp. 805—806.

SPÄRCK, R., 1933: Contributions on the animal ecology of the Franz Joseph Fjord and adjacent waters I—II. (Medd. om Grønland, Bd. 100, No. 1, Copenhagen).

THE GODTHAAB EXPEDITION 1928: Medd. om Grønland, Bd. 79—81. Copenhagen.

THORBORG, N. B., TULINIUS, S. and ROTH, H.: "Trichinosis in Greenland". Acta Path. et Microbiol. Scane. 25 (1948) pp. 778—794.

THORSON, G., 1933: Investigations on shallow water animal communities in the Franz Joseph Fjord (East Greenland) and adjacent waters. (Medd. om Grønland, Bd. 100, No. 2. Copenhagen).

— 1934: Contributions to the animal ecology of the Scoresby Sound fjord complex (East Greenland), Hydrography by H. USSING. Medd. om Grønland, Bd. 100, No. 3. Copenhagen).

— 1936: The larval development, growth and metabolism of Arctic marine bottom invertebrates compared with those of other seas. (Medd. om Grønland, Bd.100, No. 6. Copenhagen).

— 1946: Technique and Future Work in Arctic Animal Ecology. (Medd. om Grønland, Bd. 144, No. 4. Copenhagen).

USSING, H., 1938: The biology of some important plankton animals in the fjords of East Greenland. (Medd. om Grønland, Bd. 100, No. 7. Copenhagen).

VANHÖFFEN, E., 1997: Die Fauna und Flora Grönlands. Grönlands-Expedition der Gesellschaft für Erdkunde zu Berlin. 1891—93. Berlin 1897.

VIBE, CHR., 1939: Preliminary investigation on shallow water animal communities in the Upernavik- and Thule-districts (Northwest Greenland). (Medd. om Grønland, Bd. 124, No. 2. Copenhagen).

WIBORG, KR. FR., 1946: Undersøkelser over oskjellet (Modiola modiolus (L.)). (Fiskeridirektoratets Skrifter, Vol. VIII, No. 5. Bergen).

ZALKIN, V. E., 1937: Materials on the Biology of the Walrus of the Franz Joseph Archipelago. (Bulletin de la Société des Naturalistes de Moscou. Sect. Biol. 46. Moscou).

Færdig fra trykkeriet den 30. maj 1950.

Cardium groenlandicum

Cardium ciliatum

Mya truncata

Saxicava arctica

Astarte borealis

Astarte banksi

Modiolaria laevigata

Modiolaria nigra

Macoma calcaria

Nucula tenuis

Leda pernula

Leda minuta

Brachiopoda

Strongylocentrotus droebachiensis

Ascidia

Ascturus baffini

Amphipodae

Balanus balanus

Ophiura sarsi

Ophiura robusta

Polychæta sp,

Pectinaria granulata

Explanation of Fig. 12.

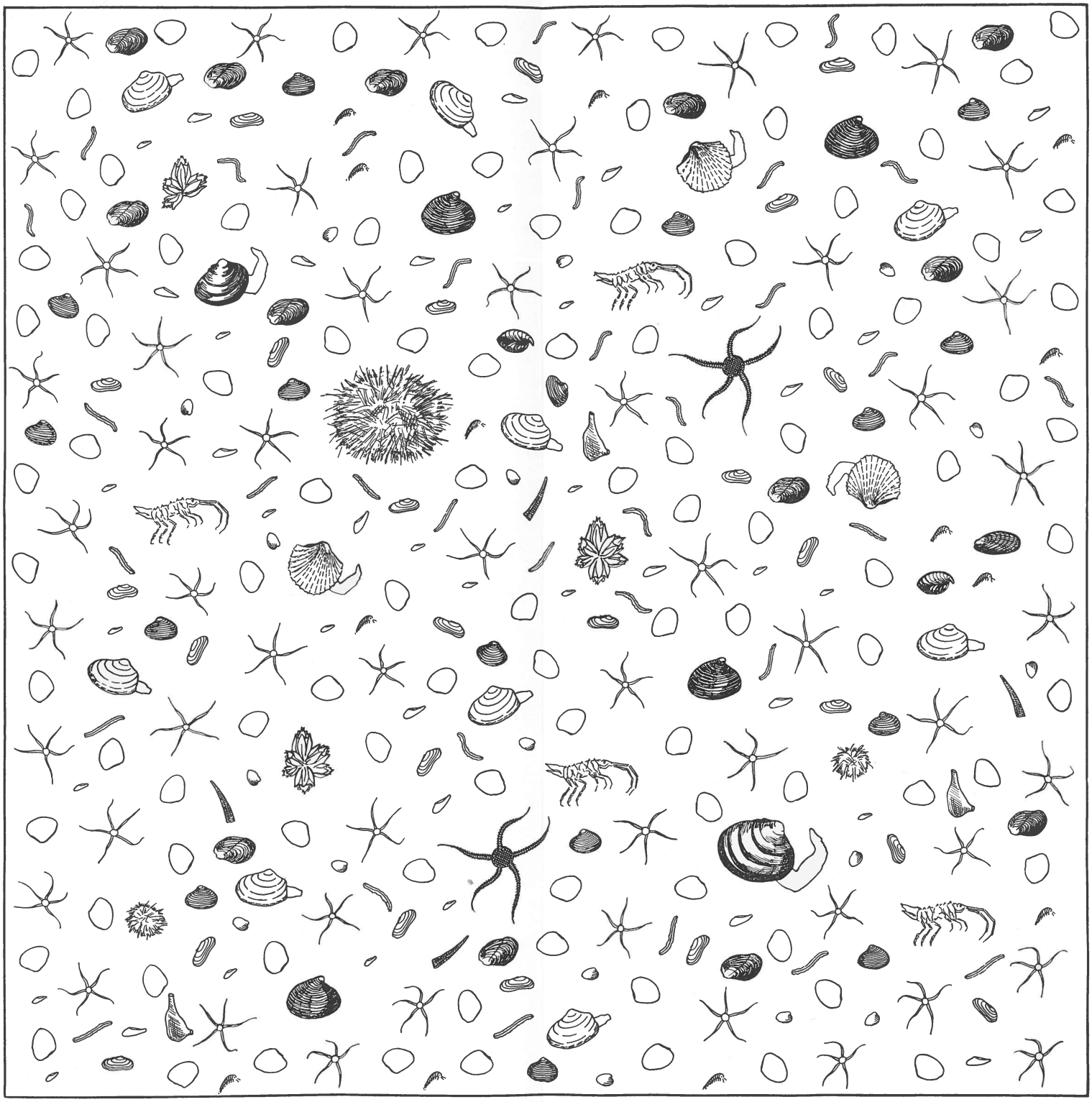


Fig. 12. Diagram showing the number of differentin vertebrates inhabiting *1 sq. m.* of the *Macoma calcaria* community on the Walrus grounds off Neqe, wright 450 g.