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A NEW ORDOVICIAN FAUNA
FROM WASHINGTON LAND, NORTH
GREENLAND

BY

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WITH 7 PLATES

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INTRODUCTION

In 1919, the late Rear-Admiral GODFRED HANSEN started on an expedition (Third Thule Expedition) to North Greenland and Grant Land, for the purpose of laying out provisions for ROALD AMUNDSEN, who at that time was on his well-known expedition in the Northeast passage. It was AMUNDSEN'S original plan to go adrift with the polar ice near the Siberian coast, and he was prepared for the possibility that the expedition ship would be carried by the ice across the polar sea. This plan was changed, however, and AMUNDSEN returned through Bering Strait. The depot laid out by Rear-Admiral HANSEN on the north coast of Grant Land has thus never been used. Rear-Admiral HANSEN published a programme of the expedition before he left, and a short record of his travels after his return (G. HANSEN 1920, 1922). It appears from his report (1922, p. 28) that he spent some time in April 1920 at Cape Webster, on the south coast of Washington Land, North Greenland, on his way towards the north, and he secured a number of fossil specimens which are labelled as being derived from this locality. The fossils, which proved to be very interesting, will be described in the present report.

When I studied this collection and discussed the characters of the fauna with Dr. CHR. POULSEN, he kindly called my attention to a fossiliferous limestone specimen contained in the collections of the Mineralogical and Geological Museum of Copenhagen. This specimen had been picked up by the late Mr. J. NOE-NYGAARD, a member of the Danish Jubilee Expedition to North Greenland, 1920—1923, and it is accompanied by a label which indicates that it was collected "in the southern part of Washington Land, perhaps at Cape Calhoun". As Mr. NOE-NYGAARD has not visited other places of Washington Land than the western part of its south coast between Cape Calhoun and Cape Webster (see *Meddelelser om Grønland*, 70, 1926, plate 8), the specimen must have come from a locality between these two points. As its fauna is entirely foreign to that known from Cape Calhoun, it is unlikely, that the specimen has been collected in this place. It was at once evident that this specimen must be from the same horizon as

one of the limestone specimens from Rear-Admiral HANSEN's collections, and the description of its fauna is, therefore, included in the present paper, since it adds a number of interesting forms to the list of the fossil faunas of northern Greenland. These two limestone specimens alone have furnished twenty-three species, constituting a fauna which hitherto has been unknown from Greenland. In addition, Rear-Admiral HANSEN collected a number of loose fossils, which are also partly new species and which will be described below.

For comparison a number of rocks from Cape Calhoun, collected by Dr. KOCH and Mr. J. NOE-NYGAARD, have been searched for ostracods. The fossils of the Cape Calhoun series were described by TROEDSSON in 1926 and 1928, but the smaller ostracods were not included in these monographs. Owing to lack of time, no attempt can be made in the present paper to give a complete review of the content of ostracods of the Cape Calhoun series. References to and descriptions of a few species will, however, be found below.

I am under obligation to Professor O. B. BØGGILD, the Director of the Mineralogical and Geological Museum of the University of Copenhagen, who has placed the facilities of the Museum at my disposal, and to Dr. CHR. POULSEN, Curator of the same institution, who has contributed help and advice in various ways. I am also indebted to Dr. A. HEINTZ and to Dr. L. STØRMER of the Paleontological Museum of the University of Oslo, who have kindly sent me specimens from Norman Lockyer Island which proved to be valuable for comparative studies. Finally, I wish to express my thanks to Dr. M. G. KAY, Columbia University, for valuable suggestions and constructive criticism.

The illustrations shown on Plates 1 to 6 have been prepared by Mrs. GERTRUD TEICHERT.

For localities mentioned in the text the reader is referred to the map on Plate 7.

Copenhagen, August 1937.

THE COMPOSITION OF THE NEW FAUNA

The majority of the fossils to be described in the second part of the present report, constitute a fauna which is new for Greenland, and consist almost entirely of new species. If the few fossils from Cape Calhoun and from Norman Lockyer Island, which have been described for the purpose of comparison, are excepted, the fossils may be divided into three lots:

One lot is derived from a small limestone specimen picked up by J. NOE-NYGAARD on the south coast of Washington Land, at an unknown locality between Cape Calhoun and Cape Webster. This specimen has furnished the following species:

- Strophomena regularis* n. sp.
- Leptaena costata* n. sp.
- Lophospira* sp.
- Goldillaenus peculiaris* n. sp.
- Thaleops borealis* n. sp.
- Amphilichas? pulcher* n. sp.
- Anisochilina undulata* n. sp.
- Eurychilina punctata* n. sp.
- Monoceratella obliqua* n. sp.
- Bythocypris subangularis* n. sp.
- Basslerites hanseni* TEICHERT

In addition, this limestone specimen contains crinoid stems, as well as indeterminable remains of one trilobite species and one pelecypod species.

Another lot is derived from a small limestone specimen in the GODFRED HANSEN collection labelled "Cape Webster". This rock specimen has furnished the following species of fossils:

- Strophomena* sp.
- Rafinesquina pygmaea* n. sp.
- Rafinesquina elongata* n. sp.
- Richardsonoceras multicameratum* n. sp.

Bumastus sp.
Thaleops borealis n. sp.
Leperditia groenlandica n. sp.
Aparchites ellipticus Ulrich
Primitiella washingtoniana n. sp.
Hallatia parallela n. sp.
Monoceratella obliqua n. sp.
Aechmina acuminata n. sp.
Macronotella elongata n. sp.
Basslerites hansenii TEICHERT
Barychilina ordoviciana n. sp.

In addition, this limestone specimen contains crinoid stems and indeterminable remains of the following groups:

Bryozoa — one species
 Brachiopods — one species
 Gastropods — two species
 Cephalopods — two species
 Ostracods — three species

A third lot of fossils is a collection of loose specimens, likewise from the GODFRED HANSEN collection which is also labelled "Cape Webster":

Actinoceras böggildi n. sp.
Actinoceras websterense n. sp.
Kochoceras groenlandicum TROEDSSON?
Leurorthoceras? groenlandicum n. sp.
Gonioceras cf. *G. groenlandicum* TROEDSSON
Richardsonoceras? sp.

The matrix in the living chamber of the specimen which is here described as *Leurorthoceras? groenlandicum* contained specimens of the following ostracod species:

Bythocypris subangularis n. sp.
Basslerites hansenii TEICHERT

In regard to the stratigraphical relationships of these faunal assemblages the following conclusions may be drawn: The first two lots mentioned above have the species *Thaleops borealis*, *Monoceratella obliqua*, and *Basslerites hansenii* in common. This is not a very high percentage, but the limestone specimens from which the fossils were obtained are very small, and, as the lithologic similarity between the two specimens is great, it may be confidently assumed that both rock specimens came from one and the same stratigraphic horizon. Among the fossils of the

third lot, *Leurorthoceras? groenlandicum* is associated with ostracods which appear in the first two groups and may, therefore, be referred to the same formation. *Richardsonoceras? sp.* belongs perhaps to the same formation, though this is less certain. Accordingly, the horizon which is mainly characterized by the fossils of lots 1 and 2 has furnished at least twentyfour, perhaps twentyfive, recognizable forms, of which twentyone can be described specifically. In addition, there is evidence of the existence of at least ten more species of different groups of fossils, which, however, are only represented by specimens not recognizable generically. This makes the total of the species at least thirtyfour, perhaps thirtyfive.

If it is remembered that these species with two exceptions were found in two limestone specimens which, put together, hardly attained the size of a hand, it will be evident that we are probably confronted with one of the most fossiliferous horizons in Greenland which certainly will yield a still richer fauna when discovered in the field and systematically searched for fossils. For the sake of convenience, and in harmony with recent usage in Greenland stratigraphy, the name *Wright Bay formation* may be proposed for this richly fossiliferous horizon, because it must be assumed that it has its main geographic distribution north of Cape Webster along the coasts of Wright Bay on the south coast of Washington Land. A synoptic list of the known fauna of the Wright Bay formation comprises the following species:

- Strophomena regularis* n. sp.
- Strophomena* sp.
- Rafinesquina pygmaea* n. sp.
- Rafinesquina elongata* n. sp.
- Leptaena costata* n. sp.
- Lophospira* sp.
- Leurorthoceras? groenlandicum* n. sp.
- Richardsonoceras multicameratum* n. sp.
- ?*Richardsonoceras? sp.*
- Goldillaenus peculiaris* n. sp.
- Bumastus* sp.
- Thaleops borealis* n. sp.
- Amphilichas? pulcher* n. sp.
- Leperditia groenlandica* n. sp.
- Anisochilina undulata* n. sp.
- Aparchites ellipticus* ULRICH
- Primitiella washingtoniana* n. sp.
- Hallatia parallela* n. sp.
- Eurychilina punctata* n. sp.

- Monoceratella obliqua* n. sp.
Aechmina acuminata n. sp.
Bythocypris subangularis n. sp.
Macronotella elongata n. sp.
Basslerites hansenii TEICHERT
Barychilina ordoviciana n. sp.

The position and relationships of the remaining four species of lot 3 are still uncertain. *Kochoceras groenlandicum* and *Gonioceras groenlandicum* have been described from Cape Calhoun, about 35 kilometres west of Cape Webster, but it is uncertain whether the specimens which have been compared with these species are strictly conspecific. The specimens, particularly that described as the holotype of *Actinoceras websterense*, are in such a state of preservation that it seems impossible to assume that they have been transported over any considerable distance. None of the genera is stratigraphically diagnostic. *Actinoceras* and *Gonioceras* occur as early as in the Chazy, whereas *Kochoceras* does not seem to be known below the Trenton. As it cannot be proved whether these fossils are derived from the Wright Bay formation or from another horizon, they will receive only little attention in the following paragraphs.

CORRELATION OF THE FAUNA

Correlation with North America.

A specimen identified as *Aparchites ellipticus* ULRICH seems to represent the only species known outside of Greenland. It has originally been described from the *Rhinidictya* bed (basal member) of the Decorah formation of Minnesota. According to KAY (1937, p. 294) the Decorah formation of Minnesota is now regarded as an equivalent of the lower Trenton, and the *Rhinidictya* bed is correlated with the lower Rockland of the Ontario-New York standard section. The occurrence of *Aparchites ellipticus* in the Wright Bay formation would suggest a similar age, but the writer does not attribute too much importance to the identification of a species which lacks distinctive characters; the evidence presented by this specific identification alone should, therefore, not be overestimated, but it may be used as an indication.

The rest of the fauna consists of new species and the genera are not characteristic of any special division of the Ordovician. Two of them are new; two other genera have not been previously recognized in rocks of Ordovician age (*Goldillaenus*, *Barychilina*). It is, therefore, not possible to compare the fauna of the Wright Bay formation directly with the succession of Ordovician strata on the North American continent.

Correlation with Melville Peninsula.

However, in the Ordovician strata of Melville Peninsula, on the west coast of Foxe Basin, there occurs a fauna which is reminiscent of the fauna of the Wright Bay formation (TEICHERT, 1937). *Goldillaenus peculiaris* has been found at Ignertoq on Melville Peninsula, and the ostracod fauna brought together from different localities of this region contains a number of species closely similar to species from the Wright Bay formation:

Melville Peninsula.
Goldillaenus peculiaris n. sp.
Anisochilina punctulifera TEICHERT
Eurychilina tuberculata TEICHERT

Wright Bay formation.
Goldillaenus peculiaris n. sp.
Anisochilina undulata n. sp.
Eurychilina punctata n. sp.

Melville Peninsula.	Wright Bay formation.
<i>Monoceratella teres</i> TEICHERT	<i>Monoceratella obliqua</i> n. sp.
<i>Macronotella tenuis</i> TEICHERT	<i>Macronotella elongata</i> n. sp.
<i>Basslerites canadensis</i> TEICHERT	<i>Basslerites hanseni</i> TEICHERT

The common occurrence of the characteristic *Goldillaenus peculiaris* in both regions suggests a correlation of the Wright Bay formation with the horizon on Melville Peninsula from which this species was obtained. Although there are no specific identities between the ostracod faunules, the occurrence of nearly related species of such rare genera as *Monoceratella*, *Macronotella*, and *Basslerites* may not be without significance.

Outside the Arctic regions *Monoceratella* is probably represented by *Isochilina armata* var. *pygmaea* RUEDEMANN (1901) from the Trenton Rysedorf conglomerate of New York, where it occurs associated with fossils which are also known from the upper part of the Chambersburg limestone of Virginia (RUEDEMANN, 1930, p. 107—108). This part of the formation has formerly been regarded as Black River, but it is now correlated by KAY (1937, p. 276) with the lowest Trenton. The same species occurs also in a group of pebbles regarded by RUEDEMANN (1930, p. 110) as being younger than the Chambersburg equivalent and correlated by him with the lower Trenton. To this latter group also belong pebbles carrying *Rafinesquina deltoidea*, *Zygospira recurvirostris*, *Trochomena umbilicatum*, *Iliaenus americanus*, *Thaleops ovata*, *Eurychilina subradiata*, and other species which have representatives or close relatives in the Ordovician of Melville Peninsula and Washington Land.

The fauna accompanying the ostracods and *Goldillaenus* on Melville Peninsula has a typical Trenton aspect, and there is little doubt that upper Trenton is prevailing there. The question of the age of the ostracod-bearing strata will be considered in a following paragraph.

Remarks on the Fauna of Norman Lockyer Island (Grinnell Land) and on the Age of the Goniceras Bay Limestone (Washington Land)

An equivalent of the Wright Bay formation is represented on Norman Lockyer Island, on the Canadian side of Kane Basin at the entrance to Princess Mary Bay. Collections on this island were made by P. SCHEI, the geologist of the Second Norwegian Arctic expedition in the Fram (1898—1902), and preliminary determinations of the fossils were published by HOLTEDAHL (1913, p. 9—11). The fauna was also discussed in more recent literature (FOERSTE, 1924, p. 16) and Cox records *Calapoecia canadensis* var. *anticostiensis* (1936, p. 31) and *Holophragma? scheii* (1937, p. 15) from this locality. According to Cox,

C. canadensis var. *anticostiensis* has not been found elsewhere below the top of the Trenton, but it is certainly premature to conclude the post-Trenton age of the strata on the island, because the collections from this place were not necessarily taken from strata of one and the same age. The specimen described by Cox as *Holophragma? scheii* does not belong to this genus, but is congeneric with *Streptelasma? oppletum* from Washington Land and Melville Peninsula and with *Streptelasma? latum* from Cockburn Land (TEICHERT, 1937, p. 52—53).

Owing to lack of time, it has not been possible to restudy the entire fauna of Norman Lockyer Island; but among the fossils from this locality kindly sent me by the Paleontological Museum in Oslo, I recognized the following species:

- Strophomena* sp.
- Rafinesquina* cf. *R. elongata* n. sp.
- Armenoceras* n. sp.
- Gonioceras holtedahli* TROEDSSON
- Thaleops borealis* n. sp.
- Leperditia* cf. *L. fabulites* CONRAD
- Monoceratella punctata* n. sp.
- Bythocypris subangularis* n. sp.

The specimen determined as *Strophomena* sp. seems to be conspecific with a specimen described below as *Strophomena* sp. from the Wright Bay formation. The cephalopod determined as *Armenoceras* n. sp. has an exceedingly large siphuncle and does not belong to any of the species of this genus known from Washington Land. Several large specimens of *Leperditia* agree with *L. fabulites* in size and shape, but differ in the number and arrangement of the pits along the ventral side of the right valve. This form does not belong to any of the species of *Leperditia* described from Washington Land. *Rafinesquina elongata*, *Thaleops borealis*, and *Bythocypris subangularis* are characteristic species of the Wright Bay formation, and *Monoceratella punctata* is nearly related to *Monoceratella obliqua* from the Wright Bay formation as well as to *M. teres* from Melville Peninsula. The most interesting fact is the occurrence of typical *Gonioceras holtedahli* in this faunal assemblage, and it is worthy of note that this species has been found associated in one limestone specimen with *Monoceratella punctata*, a species which in another specimen from the same locality was found associated with *Thaleops borealis* and *Bythocypris subangularis*. *Gonioceras holtedahli* is the only representative of this genus in the fauna collected at Gonioceras Bay on the south coast of Washington Land. The occurrence of this species on Norman Lockyer Island suggests that the Gonioceras Bay limestone must be represented here, and the occurrence of *Thaleops*

borealis and *Bythocypris subangularis* suggests the occurrence of equivalents of the Wright Bay formation in the same locality¹).

Three alternative conclusions may be drawn from these facts:

- 1) The specimens of *Gonioceras holtedahli* from Gonioceras Bay may actually be from the Wright Bay formation, or
- 2) the Gonioceras Bay limestone and the Wright Bay formation may be one and the same formation, or
- 3) they may represent two different faunal zones which are closely related in age.

The last explanation is probably the most plausible one, as none of the species collected at Gonioceras Bay have been recognized among the faunas described in the present paper. The only possible exception is a specimen which has been identified as *Thaleops* cf. *T. ovata* by TROEDSSON and which may belong to *Thaleops borealis* from the Wright Bay formation. TROEDSSON's *T.* cf. *T. ovata* does not seem to come from Gonioceras Bay; it is labelled "Wright Bay", but the rock to which the specimen is attached does not contain ostracods. The first alternative is contradicted by the observation that none of the specimens of *Gonioceras holtedahli* collected at Gonioceras Bay seems to contain any ostracods comparable to those of the Wright Bay formation.

If the fauna of the Wright Bay formation is closely related to the Gonioceras Bay fauna, as there is no reason to doubt, the question of the age of the latter gains importance and must be briefly considered.

Gonioceras Bay is one of the few places in Washington Land where Ordovician fossils were collected by the Danish Jubilee Expedition. This "Gonioceras Bay fauna" comprises a number of species described by TROEDSSON in 1926 and 1928. Assuming that at least most of the fossils collected in this place came from one horizon, TROEDSSON introduced the name Gonioceras Bay limestone, but it is not known exactly just which of the specimens collected at Gonioceras Bay came from the "Gonioceras Bay limestone" and which came from other horizons. Here, as in other places in northern Greenland, the faunas from different horizons have not been kept separate, and any discussion about the stratigraphy and correlation of the Palaeozoic of Washington Land is fruitless if the reader does not keep this fact in mind.

Mainly on the basis of the evidence presented by the occurrence of *Batostoma magnopora* and *Bumastus milleri*, TROEDSSON, in 1926, determined the age of the fauna from Gonioceras Bay as Black River. The rest of the fauna is practically of no use for correlation, and the

¹) This does not, of course, exclude the possibility of younger strata also being represented on Norman Lockyer Island.

occurrence of *Maclurina* cf. *M. manitobensis* shows that probably fossils from younger horizons were also mixed up in the collection. The fauna was tentatively referred to the Lowville (TROEDSSON, 1926, p. 111). At that time TROEDSSON believed that the collections from Cape Calhoun, although the greater part of them were younger than most of the Gonioceras Bay fauna, also contained species which indicated the presence of Black River among the horizons from which the fossils were taken. In 1928, TROEDSSON (p. 157) transferred the basal part of the so-called "Cape Calhoun series" to the Trenton, without, however, stating any particular reasons. KOCH, in 1929 (p. 27), proposed the name "Troedsson Cliff formation" for this oldest part of the collections, but this name is without practical value, as it is unknown which of the fossils collected at Cape Calhoun came from the "Troedsson Cliff formation" and which came from other horizons. The Gonioceras Bay fauna was retained in the Black River by TROEDSSON in 1928, but he did not attempt any correlation with any of the subdivisions of this series.

Bumastus milleri, one of the species quoted as indicative of a Black River age of the Gonioceras Bay fauna¹) is reported from the Guttenberg member of the Decorah formation of Illinois by KAY (1929, p. 659), which is correlated with the basal Trenton (Rockland) in a later publication by the same author, (KAY, 1934, p. 329); but the species occurs also in strata of older age. *Batostoma magnopora* has been described from the *Rhinidictya* bed of the Decorah formation of Minnesota, which is an equivalent of the lower Guttenberg and, according to KAY (1937, p. 294), likewise to be correlated with the basal Trenton. *Endoceras* cf. *E. proteiforme*, also found at Gonioceras Bay, suggests Trenton; the rest of the fauna is undiagnostic. The evidence, however poor it may be, is thus more in favour of the assumption of a low Trenton than of a Black River age of the Gonioceras Bay fauna.

The question then arises as to the age of the oldest constituents of the fauna collected at Cape Calhoun, which can hardly be older than the fauna from Gonioceras Bay. Although TROEDSSON, in 1928, in his correlation table on p. 157, correlated even the oldest part of the Cape Calhoun fauna with the Trenton, he described in the same and in the foregoing monograph (1926) a number of species from this locality which in the faunal lists (1926, p. 113; 1928, pp. 152—153) are quoted as indicative of Black River. The value of the identification of several specimens of "*Vaginoceras*" may be doubted; moreover, HUME (1925,

¹) The cranidium of *B. milleri* from Gonioceras Bay does not agree so closely with the American specimens of the species as it would seem after TROEDSSON'S description (1928, p. 46—47). When compared with RAYMOND and NARRAWAY'S figure of the species (1908, plate 52, fig. 3), the cranidium from Gonioceras Bay has more prominent palpebral lobes and is not so strongly curved lengthwise.

p. 19) has listed *Vaginoceras multitubulatum* from the Liskeard of the Lake Timiskaming area. In addition, TROEDSSON lists four species of bryozoans as indicative of a Black River age of a part of the fauna, but of these only *Arthrostylus obliquus* ULRICH is unknown from beds that are unquestionably younger than Black River. It has been described from the *Stictoporella* bed of Minnesota. *Escharopora subrecta* is known from the *Rhinidictya* bed (*Escharopora* cf. *E. subrecta* is listed from the Upper Rockland by KAY [1933, p. 4]), *Homotrypa minnesotensis* from the Fucoid and *Phyllopora* bed, but also from the Black River (*Stictoporella* bed and Spechts Ferry member of Platteville). *Nicholsonella ponderosa* is a Platteville species, but occurs possibly also in the *Stictoporella* bed and in the *Rhinidictya* bed of Minnesota (see WINCHELL and ULRICH, 1897, p. CXIV). It may, therefore, be concluded that the evidence presented by the bryozoans is dubious, though probably mostly in favour of the assumption that the fauna from Cape Calhoun does not represent horizons of an older age than early Trenton; and the same is true if those species with "Black River" affinities are considered which have been questionably referred to known species. *Palaeacmaea humilis* is known from the *Ctenodonta* bed of Minnesota (= Rockland, according to KAY, 1937, p. 294). *Hormotoma salteri canadensis* has been described from the limestone at the Paquette Rapids which, according to KAY (1937, p. 252), also is of lower Trenton age, and *Thaleops ovata* is reported from the Guttenberg member of the Decorah of Illinois (KAY, 1929, p. 659). According to oral communication by Dr. KAY, both *Thaleops ovata* and *Bumastus milleri* are frequent Rockland and Hull species in New York and Ontario.

This brief review of the fauna from Gonioceras Bay and of the oldest members of the fauna from Cape Calhoun does not seem to make it likely that deposits of an earlier age than lowest Trenton are represented in any of these places.

It may be profitable to include here a few remarks on the age of the rest of the Cape Calhoun fauna, as this question has not been equally well understood by recent writers on Arctic Palaeozoic stratigraphy.

BRIEF REMARKS ON THE AGE OF THE CAPE CALHOUN FAUNA

When dealing with the age of the Cape Calhoun fauna it must be remembered, just as in the case of the Goniceras Bay fauna, that it is not representative of a single horizon or unit, but that its species are derived from a number of different horizons which must be of different age, and that TROEDSSON (1928, p. 157) found a detailed correlation of different faunal units with KOCH's stratigraphical table difficult and uncertain. If, therefore, a list of all species collected at Cape Calhoun is compiled indiscriminately, and the fauna thus obtained is designated as referable "with some certainty" to the Richmond (KOCH, 1929, pp. 30—37), the reader will get an altogether misleading conception of the distribution of the faunas within the Ordovician section of Washington Land.

It has been shown above that those species from Cape Calhoun which were thought to be indicative of the presence of Black River horizons in this locality, more probably are of early Trenton age. As early as in 1926 TROEDSSON recognized that Richmond elements must also be represented in the Cape Calhoun collections, and in 1928 he seems to be inclined to regard a greater part of this fauna, and in consequence a greater part of the complex series which has been termed "Cape Calhoun series", as being of Richmondian age. In consequence, the Richmond age of the "Cape Calhoun series" has been regarded as an almost established fact in part of the recent stratigraphical literature.

This, however, is not the case; at least, the evidence is less conclusive, and the Richmond portion of the fauna certainly smaller, than has been suspected. In 1926, TROEDSSON regarded the greater part of the cephalopod fauna from the Cape Calhoun series as indicative of Richmond, viz. the following genera: *Dawsonoceras*, *Apsidoceras*, *Charactoceras*, *Lambeoceras*, *Armenoceras*, *Huronia*, *Cyrtogomphoceras*, and *Diestoceras*, to which the following genera were added with reservation: *Narthecoceras*, *Kochoceras*, *Sactoceras*, *Eskimoceras*, and *Danoceras*. In 1928, TROEDSSON recognized that a number of these genera also were represented in the so-called Trenton of Manitoba, that is in the same

formation which later on was termed *Red River formation* by FOERSTE (1929), and the cephalopods of which were fully described by this author in 1929. The age of these strata has been repeatedly discussed by FOERSTE and other authors, and, as their age is subject to controversy, they are of little use for purposes of correlation.

In regard to the cephalopod genera listed above, it may now be stated that only three of them, viz. *Apsidoceras*, *Huronia*, and *Danoceras* (of which *Hyperoceras* TWENHOFEL from the Richmond of Anticosti is a synonym) are unknown from rocks that are older than Richmond. The species determined as *Dawsonoceras* is now referred to *Spyroceras* (FOERSTE, 1929, pp. 162—163). *Charactoceras* and *Lambeoceras* are known to occur in the Stewartville fauna of Minnesota. *Armenoceras* occurs as early as in late Trenton time (FOERSTE and TEICHERT, 1930, p. 271), and on Norman Lockyer Island, the genus is probably associated with a still older fauna. *Cyrtogomphoceras* has been described from the basal part of the Fremont of Colorado, which is regarded as an equivalent of the Kimmswick (FOERSTE, 1935, p. 77), and species of *Diestoceras* are known from the Black River (FOERSTE, 1928, July, p. 209) as well as from the Trenton (FOERSTE, 1933, p. 145). *Nartheoceras* is listed from the Liskeard formation of Trenton age in the Lake Timiskaming area (HUME, 1925, p. 25), *Kochoceras* occurs associated with Trenton species (*Zygospira recurvirostris*, *Maclurites crassus* and others) on Melville Peninsula and Iglulik Island (TEICHERT, 1937), and the species described as *Sactoceras* by TROEDSSON are now referred to the genus *Troedssonoceras* FOERSTE (FOERSTE, 1928, p. 40—41), the genotype of which comes from the Maysville. *Eskimoceras* has not yet been found in areas outside North Greenland. Correlation by genera may lead to serious mistakes, as FOERSTE repeatedly has pointed out, and even genera such as *Huronia* and *Apsidoceras* may be less suggestive than it is generally assumed, although it is conceivable that these genera occur in a limited zone at the top of the Ordovician of Washington Land.

Among the other groups of fossils there are corals which were thought to indicate a Richmond age for a large portion of the Cape Calhoun fauna (TROEDSSON, 1928, pp. 154—155). "*Streptelasma rusticum*" and "*S. robustum*" cease to be of any value for correlation, since COX (1937) has shown that the specimens thus identified belong partly to *S. foerstei* and partly to *S. poulsenii*, two species which have not yet been met with outside of Washington Land; nor is the genus *Calapoecia* more indicative, even if, according to COX (1936), it is highly characteristic of post-Trenton and Richmond strata of the Arctic regions. *Halysites gracilis* has been reported from the Stewartville of Minnesota (KAY, 1935), *Plasmopora lambei* is a Trenton form which occurs on Iglulik Island

(TEICHERT, 1937) and in the Liskeard formation of the Lake Timiskaming area (HUME, 1925), and the quotation of *Columnaria* (*Paleophyllum*) *stokesi* is due to a misidentification¹). Consequently none of the corals can be said to be indicative of the occurrence of Richmond at Cape Calhoun.

Furthermore, *Rhynchotrema capax* is no longer an index fossil of the Richmond (FOERSTE, 1932, p. 56; KAY, 1935, p. 588), which may explain the find of this species at Wright Bay (TROEDSSON, 1928, p. 157), where it apparently occurs low down in the Trenton.

Thus the only species of the Cape Calhoun fauna which have not yet been met with below the Richmond are *Ptilodictya flagellata*, *Monticulipora parasitica* var. *plana*, *Rhombotrypa subquadrata*, *Strophomena planodorsata*, *S. fluctuosa*, *Homotelus graciosus*, and *Ceraurinus icarus*, and a number of additional trilobites also show relationships to Richmond forms.

The ostracod fauna of Cape Calhoun is altogether different from that of the Wright Bay formation. In the present paper the following species are described, all of them coming from limestone specimens collected at Cape Calhoun:

Leperditella calhounensis n. sp.

Schmidtella magna n. sp.

Dilobella marginata n. sp.

Bythocypris minuta n. sp.

TROEDSSON described *Leperditia ulrichi*²) and *Ctenobolbina* sp. (cf. *C. fulcrata* ULRICH) from the same locality. In addition, many limestone specimens from Cape Calhoun contain specimens of *Basslerites* TEICHERT, probably belonging to two different species; but it has not been possible to obtain specimens well enough preserved to determine or describe them specifically.

Bythocypris minuta is very different from *B. subangularis* of the Wright Bay formation, and *Basslerites* seems to be the only constituent of the Cape Calhoun ostracod fauna reminiscent of earlier faunas in the Washington Land section. Specimens of *Basslerites* have been found associated with "*Sowerbyella sericea*", *Leperditia ulrichi* (specimen figured by TROEDSSON 1928, pl. 19, fig. 25) and *Isotelus* sp. ind.,

¹) *vide* DR. CHR. POULSEN, who has kindly informed me that the specimens described by TROEDSSON under this name belong to a new species and are undoubtedly derived from the Silurian Offley Island formation.

²) According to ULRICH (see BASSLER and KELLETT, 1934, p. 381), *Leperditia cabotensis* (*nomen nudum*, see WILLIAMS, 1919, p. 37) is supposed to be identical with *L. ulrichi* Troedsson. However, the former species is listed among the fauna of the Dyer Bay dolomite of the Medina-Cataract formation, and the latter species is undoubtedly Ordovician.

and *Bythocypris minuta* was attached to the same limestone specimen as the pygidium of *Ceraurus pleurexanthemus* GREEN? figured by TROEDSSON in 1928 (plate 16, fig. 20)¹).

It has been shown elsewhere (TEICHERT, 1937, p. 38) that the Cape Calhoun fauna has a number of species in common with the fauna from Iglulik Island, and that the strata in the latter locality apparently correspond to a part of the complex series which is called "Cape Calhoun series". Another part of the Cape Calhoun collection corresponds probably to the upper part of the section on Akpatok Island, which is apparently younger and more likely to be correlated with the Richmond. However, the mutual relation of the Richmond and of the Trenton portion of the Washington Land section, as well as their thickness and exact faunal composition, is still unknown to us. It may be concluded that early Trenton, late Trenton and Richmond are represented around Cape Calhoun, but the unravelling of the stratigraphical conditions can only be expected by future work which should be carried out in the field by a trained geologist and stratigrapher.

¹) According to Dr. E. O. ULRICH (oral communication), none of the specimens determined as *C. pleurexanthemus* by TROEDSSON does actually belong to this species.

THE AGE OF THE FAUNA AND ITS PROBABLE POSITION WITHIN THE SEQUENCE OF STRATA ON WASHINGTON LAND

Most of the specimens of the Wright Bay formation are labelled as being collected at Cape Webster (GODFRED HANSEN collection), and a smaller portion is from an unknown locality between Cape Webster and Cape Calhoun. The succession of strata at Cape Webster and their fossil contents were described by POULSEN (1927, p. 241, 246) on the basis of collections and observations made by KOCH. According to this information the following sequence is exposed in this locality:

Upper Canadian	Nunatami formation	Ostracod limestone Gastropod limestone Angustifolius limestone Bifidus shale
Upper Ozarkian	Cape Clay formation	
	Cass Fjord formation	

According to the same account the Upper Canadian Nunatami formation prevails at Cape Webster; however, KOCH writes (1929, p. 18) that "unfortunately, it has not been possible to collect stratigraphically in all the strata, by far the greater number of the fossils secured have been collected in down-fallen material", and POULSEN calls attention to the fact (1927, p. 246) that "the limits of the four zones of the Nunatami formation are not yet fixed". Thus, it will be seen that the stratigraphy around Cape Webster is only known in a rather superficial way, and the presence of other horizons than those indicated in KOCH's reports cannot be surprising. As the fauna of the Wright Bay formation is decidedly younger than that of the uppermost zone of the Nunatami formation which contains genera as *Ellesmereoceras*, *Gonotelus*, *Bathyu-rellus*, *Bolbocephalus* and others, the stratigraphic position of the former must be above the latter.

Proceeding along the coast from Cape Webster toward Wright Bay in a northwesterly direction one passes, according to KOCH's description, into beds of younger age. On top of the Nunatami formation a formation of yellow limestone, 290 m thick, interbedded with thin strata of shale is said to follow, being described by KOCH in the following way (1929, p. 23—24): "The lowermost strata consist of light limestone with limy gravel and still contain a few ostracods. Throughout the remainder of the series, strata of light yellow compact limestone alternate with dark shales. The thickness of the strata of shales ranges from a couple of centimeters to about two meters. Limestone conglomerates occur occasionally, but always in very thin bands (about 2 or 3 centimeters).

"In contrast to the other series this rock does not present steep cliffs, and the coast north of Nunatami, where these strata reach sea-level, is therefore flat and girdled by a broad ice foot. The yellow limestone is very hard, but the intervening shales are easily eroded, so the slopes are generally covered with plates of yellow limestone. Thus minor sections are only occasionally exposed. The best example was noticed in a river bed 9 kilometers northwest of Nunatami.

"Between Wright Bay and Nygaard Bay this series plays a prominent part in the building up of the coast. On the plateau north of Cape Webster the strata rest upon the Nunatami formation at an altitude of 200 to 300 meters. Towards Nygaard Bay the yellow limestones lie unprotected, and form irregular flat eminences on the plateau, which thus gets an aspect not unlike that of a moraine landscape. Farther westward, north of Nunatami, the strata are concealed by a protecting cover of hard dark limestone. In Goniceras Bay they reach sea level, and can be traced in the coast some distance towards the interior of Wright Bay, where they gradually disappear.

"Fossils are very rare. In some strata crinoid stems occur in fairly great numbers, but apart from these I only found a badly preserved cephalopod."

This cephalopod was originally described by TROEDSSON (1926, p. 31) as *Protocycloceras lamarcki* (BILLINGS)?; the occurrence of crinoid stems, however, in the same strata is indicative of a post-Canadian age of the limestone (TROEDSSON, 1928, p. 147—148), and TROEDSSON admitted that he had probably misidentified the cephalopod in 1926. The present writer compared the same specimen with some equally poorly preserved cephalopod remains from Iglulik Island which were referred to with every reservation as *Spyroceras* cf. *S. geronticum* FOERSTE and SAVAGE (TEICHERT 1937). But even this attempt at an identification is without much value to the exact determination of the age of the strata from which the specimen was derived.

This limestone formation with the indeterminable cephalopod was

later on termed "Cape Webster formation" by KOCH (1929, p. 22). Unfortunately, the ostracods mentioned by KOCH in the lower part of this series were not secured.

The age of the Cape Webster formation is unknown. POULSEN has recently pointed out (1937) that we may expect to find equivalents of the East Greenland Cape Weber formation in the Washington Land section on top of the Nunatami formation. This formation is a characteristic member of the Palaeozoic section of East Greenland and is of Upper Canadian age. POULSEN has recognized characteristic species of this formation in collections from the east side of Grinnell Land and, therefore, thinks it highly probably that equivalents of the same formation will also be found in Washington Land, where they may be expected in the lower part of the so-called Cape Webster formation.

The upper boundary of the Cape Webster formation and the strata resting on top of it are described by KOCH in the following words (1929, p. 25—26): "It has been mentioned that the yellow limestone and the shales of the Cape Webster formation are overlain by a hard dark limestone. The boundary is sharply defined. The unweathered limestone is very hard and reddish brown, but the action of the frost splits it into fragments, which show no stratification.

"During my stay in Washington Land in the late summer of 1921, I noted that the yellow limestone was overlain by a series, 110 meters thick, of dark reddish-brown limestone, which I named the *Receptaculites* limestone. In my diary I wrote as follows about these beds:

"The limestone tends to form steep cliffs and plays a prominent part in the building up of the coast. It overlies the Cape Webster formation just north of Nunatami, where the lower edge of the strata lies at a height of 330 meters above sea-level. Here only the lowermost 30 meters of the hard limestone are preserved. The strata descend towards the northwest, but at the head of Wright Bay their lower boundary is still at a height of about 50 meters. From this point to Cape Jackson the coast is made up of these beds, but they slope gradually downward so that their upper surface at the cape lies at a height of 60 meters above sea-level, at Cape Calhoun the height is only 30 meters, in the headland north of the small bay at Cape Calhoun they descend below sea-level, but appear again in the coast a short distance farther northward.

"The lower strata contain a great many *Orthoceras*, but only few other fossils. Higher up in the series *Goniceras* is very common, and in about the same strata *Receptaculites* occurs. The uppermost strata contain numerous specimens of a large well preserved *Maclurites*. *Trilobites* also occur, but sparsely."

Unfortunately, of the great number of *Orthoceras* mentioned by KOCH in the lower part of the series, none has been collected. Although

Koch's statements do not throw much light on the stratigraphy of these strata, it seems that in his opinion most of the fossils collected at Gonioceras Bay are derived from the limestone horizon immediately above the Cape Webster formation; but, as has been indicated in a previous paragraph (p. 18), it is rather obvious that the collections from Gonioceras Bay contain fossils from horizons of different age. In the lowermost strata above the Cape Webster formation, however, *Plectoceras? foerstei* TROEDSSON seems to occur and *Gonioceras holtedahli* TROEDSSON is probably also characteristic of this lower part, for which the designation "Gonioceras Bay limestone" has been proposed by TROEDSSON (1926).

A superficial study of KOCH's various accounts of the geology of Washington Land might make us believe that the Ordovician stratigraphy of this country is better known than actually is the case, and in the stratigraphic succession described by KOCH no room is left for the placing of the richly fossiliferous horizon described in the present report. Apparently, its place cannot be in the yellow limestone series ("Cape Webster formation"), because the limestone of the Wright Bay formation is of a dark colour. It may therefore be concluded that the Wright Bay formation forms a part of the series above the Cape Webster formation, and that it must be supposed to form a stratum either above or below or within the "Gonioceras Bay limestone"; no closer determination can be made, however, before this latter formation has been actually defined, its boundaries fixed, and its content of fossils exactly determined.

It has been pointed out above that the age of the fauna of the Wright Bay formation cannot be very different from the age of the fossils that constitute a part (probably the older part) of the collections from Gonioceras Bay, and that it is highly probable that this collection is not composed of any constituents older than lowest Trenton. The fauna of the Wright Bay formation has no more "Black River" affinities than any portion of the collections from Gonioceras Bay or from Cape Calhoun. Until evidence to the contrary is produced it may, therefore, be suggested that the Wright Bay formation also forms part of the basal Trenton series of North Greenland.

If this conclusion is correct, it would probably mean that strata of similar age are also represented on Melville Peninsula.

DESCRIPTION OF THE FOSSILS

Class *BRACHIOPODA*

Order *PROTREMATA*.

Suborder *Strophomenoidea*.

Superfamily *STROPHOMENACEA* SCHUCHERT.

Family *STROPHOMENIDAE* KING.

This family is represented in the collections by a number of specimens belonging to different species of *Strophomena*, *Leptaena*, and *Rafinesquina*. No interiors of valves are, however, available and the specific descriptions given below are, therefore, incomplete and can only be supplemented when new material from the type localities is available by renewed collecting. The species are, however, of such a peculiar type and so different from other species of the same genera, that they will be easily recognizable.

Subfamily *Orthotetinae* WAAGEN.

Genus *STROPHOMENA* RAFINESQUE.

Strophomena regularis n. sp.

Plate 1. Figs. 1—3.

Description: The holotype and only specimen available is a ventral valve, which is 17 mm wide along the hinge-line and 13.5 mm long. The valve is widest along the hinge-line. The lateral angles are rectangular. The valve is convex for a distance of about 6 mm from the beak, when measured along the longitudinal median line, and then becomes strongly concave. Lateral and anterior margins are regularly rounded. The ornamentation consists of radial ribs and faintly indicated concentric growth lines. The primary ribs which start at the beak are smooth and the surface between them is finely crenulated. The number of the ribs is increased by regular intercalation of new ribs. The intercalation of the second set of ribs takes place at a short distance from the beak, and these ribs grow almost as strong as the primary ribs. New ribs are intercalated regularly between each pair of older ribs, and each new set of ribs is somewhat weaker than the foregoing set. In this

way the ornamentation has an unusually regular appearance. The concentric growth lines are fine and very regular.

Horizon: Wright Bay formation, Ordovician.

Locality: South coast of Washington Land, between Cape Calhoun and Cape Webster. Coll. J. NOE-NYGAARD.

Remarks: Although the dorsal valve of this species is not yet known, the species is easily recognizable by its extremely regular ornamentation. It is apparently closely related to *Strophomena planumbona* (HALL) from the Richmond, but its surface and the striation are still more regular than in that species. In general, any comparison between closely related species of *Strophomena* is difficult without access to the type material. *S. delicatula* FENTON from the Decorah formation of Missouri also seems to be similar to *S. regularis* (FENTON 1928, p. 155).

Strophomena sp.

Plate 1. Fig. 10.

One ventral valve represents another species of the genus *Strophomena*, which, however, cannot be described adequately. The original width of the valve has been 6 mm, its length is 4.5 mm. The valve is slightly convex for a short distance from the beak, only very slightly concave in the middle portion and equally slightly convex marginally. The surface is covered with numerous radial ribs and only faintly indicated, rather regular, concentric wrinkles. Along the margin there are probably about 28 stronger ribs with two or three weaker ribs between each two of them.

The features of this specimen are not sufficiently distinctive to permit of a comparison with other species of the genus.

Horizon: Wright Bay formation, Ordovician.

Locality: Cape Webster, south coast of Washington Land. Coll. GODFRED HANSEN.

Remarks: A specimen which is very probably conspecific with the specimen described above has been found in the collections from Norman Lockyer Island (plate I, fig. 11). This is a larger specimen, but the surface ornamentation in both specimens is very similar. However, more and better preserved specimens must be secured before the species can be described adequately.

Subfamily Rafinesquininae SCHUCHERT.

Genus *RAFINESQUINA* HALL and CLARKE.

Rafinesquina pygmaea n. sp.

Plate 1. Figs. 4, 5.

One ventral and one dorsal valve, very probably belonging to one specimen, are available for study, and the ventral valve is selected as the holotype.

Description of holotype: The holotype (ventral valve) is 8 mm wide along the hinge-line and 5.5 mm long. The greatest width corresponds to the length of the hinge-line. The lateral angles are almost rectangular; lateral and anterior margins are evenly rounded. The valve is rather strongly convex, with the greatest elevation in the centre of the valve. The surface is covered with numerous, fine, and somewhat irregular radii and a few costae, which are not very prominent but more so than the radii. In addition, there are rather faintly indicated concentric lines of growth.

Dorsal valve: This valve is 8 mm wide and 4.5 mm long. The greatest width is along the hinge-line; the lateral angles are slightly acute. The greater part of the valve is flat, but near the margin it is convex and rather steeply deflected. Along the front margin this marginal sloping area is about 1 mm high. Laterally the convexity becomes less distinct. The radial ornamentation is the same as that of the ventral valve described above. In addition there are distinct, irregular, concentric rugae, which are so low that they are barely visible to the naked eye.

Horizon: Wright Bay formation, Ordovician.

Locality: Cape Webster, south coast of Washington Land. Coll. GODFRED HANSEN.

Remarks: This species is characterized by its small size and by its peculiar surface ornamentation of a few costae and numerous subequal radii. This type of ornamentation is reminiscent of that of the genus *Sowerbyella* JONES, but the species of this genus have regularly convex dorsal valves, whereas the dorsal valve of the species described above is flat, with the exception of the deflected marginal rim. Moreover the radial ornaments of *Sowerbyella* are more regular than those of *Rafinesquina pygmaea*.

Rafinesquina elongata n. sp.

Plate 1. Figs. 7, 8.

Description: The holotype and only specimen available is a ventral valve. The original length of the valve along the hinge-line has been 27 mm, the length is 17.5 mm. The greatest length is along the hinge-line; the lateral angles are acute. The lateral margins are directed obliquely forward and rather straight, the anterior outline is only slightly convex. The valve is evenly and moderately convex from the beak to the anterior margin, the lateral extremities are more flat. The beak is slightly produced over the hinge-line. The surface is ornamented by fine and stronger radial striae. The number of the stronger striae is probably slightly more than 50 and there are one to three finer striae between each two of the stronger ones. On the whole the striation is not very prominent. Between the beak and the lateral extremities the surface is covered with low wrinkles which are almost rectangular to

the hinge-line. Toward the lateral angles these wrinkles become less distinct.

Horizon: Wright Bay formation, Ordovician.

Locality: Cape Webster, south coast of Washington Land, northern Greenland. Coll. GODFRED HANSEN.

Remarks: This species is characterized by its elongate form and by its fine surface ornamentation. It is highly reminiscent of *Strophomena lenta* TROEDSSON from the Cape Calhoun series, but in this species the convex (dorsal) valve is always distinctly flattened near the beak and can thus always be distinguished from the regularly convex (ventral) valve of *Rafinesquina elongata*. Moreover, the surface ornamentation is coarser in *Strophomena lenta* than in *Rafinesquina elongata*. The Lorraine species *R. mucronata* FOERSTE is apparently similar to *R. elongata* (see FOERSTE 1924, p. 115), but there is no evidence that the striation of *R. elongata* along the median line is more conspicuous than the rest, which is one of the distinguishing features of *R. mucronata*.

Genus *LEPTAENA* DALMAN.

Leptaena costata n. sp.

Plate I. Fig. 6.

Description: The holotype is an almost flat dorsal valve, which is 10.5 mm wide along the hinge-line and 7.5 mm long. The valve attains its greatest width along the hinge-line. The lateral angles are rectangular; lateral and anterior outlines are regularly curved. The valve is slightly concave around the beak for a distance of about 1.5 mm from the latter. The rest of the valve is almost flat except for the extreme marginal part, which is slightly convex for a width of about 1 mm. The surface is ornamented by comparatively coarse, irregularly concentric rugae. In addition there is a radial ornamentation, consisting of seven fine, but rather distinct costae at irregular interspaces, and of a large number of very fine, subequal radii between the costae.

Horizon: Wright Bay formation, Ordovician.

Locality: South coast of Washington Land, between Cape Calhoun and Cape Webster. Coll. J. NOE-NYGAARD.

Remarks: This species is most nearly related to *Leptaena charlottae* WINCHELL and SCHUCHERT from the Decorah formation of the Trenton of Minnesota (WINCHELL and SCHUCHERT 1893, p. 410), which is also characterized by an almost flat dorsal valve. *L. costata* differs from this species by the more regular ornamentation.

Another species which is very similar to the one here described, is *Rafinesquina rugosa* WILSON (1921, p. 51). This species occurs in the lower Trenton of Ottawa and it may also be referable to *Leptaena* rather than to *Rafinesquina*. WILSON has already pointed out the relationships

of this species with *Leptaena charlottae*. There are, however, some differences in the ornamentation of *Rafinesquina rugosa* when compared with that of *Leptaena costata*. The concentric rugae of the dorsal valve of the former species are less conspicuous, and the number of the more prominent costae seems to be larger. Size and shape of the dorsal valves of both species are very similar.

Class **GASTROPODA**.

Order **ASPIDOBANCHIA**.

Family **PLEUROTOMARIIDAE** d'ORBIGNY.

Genus **LOPHOSPIRA** WHITFIELD.

Lophospira sp.

Plate 2. Fig. 5.

An external cast of a specimen represents a type of *Lophospira* hitherto not recorded from Greenland or neighbouring Arctic regions. This is possibly a cast of only the upper part of a larger specimen. It is characterized by a strongly elevated keel and it is in this respect similar to certain species of *Eunema*. On the upper surface of the whorls there is a revolving carina which is not greatly elevated. The surface is ornamented by slightly recurved, fine radial ribs at regular distances of about 1 mm.

A rather similar form has been described as *Lophospira* sp. from the Ordovician rocks of Smøla Island, in the Trondheim district of Norway (STRAND, 1932, p. 359), but it is of course difficult to draw any reliable comparison on the basis of the insufficient material at hand. Hitherto no species of *Lophospira* with a distinctly elevated keel have been recorded from Greenland.

Horizon: Wright Bay formation, Ordovician.

Locality: South coast of Washington Land, somewhere between Cape Calhoun and Cape Webster. Coll. J. NOE-NYGAARD.

Class **CEPHALOPODA**.

Order **ACTINOCEROIDEA**.

Family **ACTINOCERATIDAE** SAEMANN.

Genus **ACTINOCERAS** BRONN.

Actinoceras böggildi n. sp.

Plate 3. Figs. 1—3.

Description: The holotype is a specimen which represents the apical part of a phragmocone, consisting of ten partly preserved segments of the siphuncle with corresponding parts of the camerae. The segments are almost circular in cross-section. The diameter of the first, only

partially preserved segment is about 15 mm; this is probably the initial segment. The diameter of the next following segment is 18 mm, and the diameters increase gradually to 23.5 mm in the seventh segment. The diameter of the remaining three segments cannot be measured. The height of the segments averages 5 to 5.5 mm except for the initial segment, which was probably not higher than 3 to 3.5 mm. The septal necks are longer on the dorsal side than on the ventral side of the siphuncle. Here they are usually sharply recurved as in *Armenoceras*, whereas on the dorsal side they are 1 to 1.5 mm long. The adnation surface is 3.5 mm wide on the ventral side, but probably not more than 2 mm on the dorsal side; on both sides it is steeply inclined.

The interior of the siphuncle shows the usual endosiphuncular system. The location of the endosiphuncular canal is rather eccentric. Its distance from the ventral side of the larger siphuncular segments is 15 mm. It is greatly expanded in the initial segment. The radial canals are only slightly curved.

The location of the siphuncle is submarginal. Its distance from the ventral wall of the conch is about 1.5 mm. The position of the segments is somewhat oblique to the longitudinal axis of the siphuncle; they rise slowly in a dorsal direction. At a distance of 30 mm from the apical end the lateral diameter of the phragmocone has been approximately 40 mm; only one half of the phragmocone is now preserved. The dorso-ventral diameter of the phragmocone cannot be determined, but it is probable that the conch has been slightly depressed dorso-ventrally.

The sutures describe a shallow sinus along the ventral side, the depth of which corresponds approximately to the length of one camera. The septa are covered by episeptal deposits with circumsiphuncular ridges.

Locality: Cape Webster, south coast of Washington Land, North Greenland. Coll. G. HANSEN.

Remarks: *Actinoceras glencoense* FOERSTE and TEICHERT (1930, p. 241) from the Platteville of Wisconsin is very similar, but has higher siphuncular segments. *Actinoceras caneyense* FOERSTE and TEICHERT resembles *A. böggildi* in the height of the segments and in the shortness of the septal necks, but the segments are not as wide as in this species. In the shortness of the septal necks the new species resembles the group of *Actinoceras centrale*, from which it differs in the decidedly sub-ventran location of the siphuncle. *A. böggildi* is interesting from the point of view that species of true *Actinoceras* with subventran siphuncles are not at all common in Arctic deposits of Ordovician age; other actinoceroid genera such as *Kochoceras* and *Lambeoceras* are far more numerous.

Actinoceras websterense n. sp.

Plate 3. Fig. 14.

Description: The holotype is a portion of a phragmocone which is 11 mm long and consists of 14 camerae with the corresponding siphuncular segments. The lateral diameter of the conch increases from 40 to 53 mm. The first segment preserved in this specimen is probably the initial segment; it is 30 mm. The second segment is 33 mm wide. The width of the succeeding segments decreases slowly but constantly to 28.5 mm in the adoral part of the specimen. The average height of the camerae is 7 mm, but in the adoral part of the specimen it increases 9 mm. The average length of the septal necks is 1.5 to 1.7 mm. The adnation surface of the connecting rings is not more than 3 mm wide. In the adapical portion of the phragmocone the septa are covered with hyoseptal and episeptal deposits; the latter develop circumsiphuncular ridges. Adorally the deposits decrease in thickness and disappear in the adoral portion of the specimen.

The siphuncle is nowhere in contact with the wall of the conch. Its location is almost central. Unfortunately, the rather fragile state of preservation of the specimen did not permit of its being prepared properly, and no study of the interior structure of the siphuncle has been possible.

Locality: Cape Webster, south coast of Washington Land, North Greenland. Coll. G. HANSEN.

Remarks: This species belongs to the group of *Actinoceras centrale* FOERSTE; closely related species of this group are *A. calhounense* TROEDSSON and *A. ursinum* FOERSTE. The distinguishing features of this group are the shortness of the septal necks and the subcentral location of the siphuncle. *A. websterense* is characterized by its heavy siphuncle, which is wider than that of *A. centrale* (see FOERSTE and TEICHERT, 1930, p. 238). It is distinguished from *A. calhounense* (TROEDSSON, 1926, p. 57) on account of the fact that the siphuncle decreases adorally at a much slower rate.

Genus *KOCHOCERAS* TROEDSSON.*Kochoceras groenlandicum* TROEDSSON?

Fragments of a specimen of *Kochoceras* are doubtfully referred to *K. groenlandicum*. The lateral diameter of the siphuncular segments probably slightly exceeds 45 mm. Their height is 12.5 mm. In typical specimens of this species the lateral diameter of the siphuncle varies between 45 and 55 mm. In the lateral section the septal necks are between 2 and 2.5 mm long. Ventrally the siphuncle is in contact with the wall of the conch along almost the entire length of the camerae. In a lateral direction the contact surface between the siphuncle and the

ventral wall of the conch measures 40 mm. The ventral side of the conch is very flattened.

On account of the fragmentary state of preservation of the specimen some reservation in its identification must be made.

Locality: Cape Webster, south coast of Washington Land, North Greenland. Coll. GODFRED HANSEN.

Genus *LEURORTHOCERAS* FOERSTE.

Leurorthoceras? groenlandicum n. sp.

Plate 2. Figs. 1, 2.

Description: The holotype of this species consists of the adoral portion of a phragmocone and of a large part of the living chamber. The entire specimen is 150 mm long, 85 mm being occupied by the living chamber, the rest by the adoral portion of the phragmocone, which consists of seven camerae. The conch is much depressed dorso-ventrally. At the apical end of the specimen the lateral diameter is 74 mm, the corresponding dorso-ventral diameter measuring approximately 50 mm. The conch attains its greatest width at the base of the living chamber, where the lateral diameter is 81 mm. The width of the living chamber remains constant throughout its length. The average length of the camerae is 10 mm with the exception of the last two camerae, which are only 7 mm long. The sutures describe broad and shallow lobes about 6 mm deep along the ventral side of the conch. The course of the sutures along the dorsal side cannot be determined. The septal foramen is 5 mm wide and is located at a distance of 8 mm from the ventral wall of the conch. The siphuncular segments are only inconsiderably expanded between the septa. The structure of the septal necks is orthochoanitic.

Horizon: Wright Bay formation, Ordovician.

Locality: Cape Webster, south coast of Washington Land, North Greenland. Coll. G. HANSEN. Two species of ostracods have been found in the matrix of this specimen, viz. *Bythocypris subangularis* n. sp. and *Basslerites hansenii* TEICHERT.

Remarks: This species is provisionally referred to *Leurorthoceras* and the reader is referred to the writer's previous discussion on this genus (TEICHERT, 1934, p. 21—23). It will be seen that *L. altopontense* FOERSTE and TEICHERT similarly has siphuncular segments which are only inconsiderably expanded between the septa in the adoral part of the phragmocone. A comparable species, though still larger than *L.? groenlandicum*, is *L. husseyi* FOERSTE (1933, p. 30); this species is derived from the Trenton of Michigan. All the species described by FOERSTE and TEICHERT (1930) are of Black River age.

Family GONIOCERATIDAE FOERSTE and TEICHERT.Genus *GONIOCERAS* HALL.*Gonioceras* cf. *G. groenlandicum* TROEDSSON.

Plate 1. Fig. 9.

cf. *Gonioceras groenlandicum*, G. T. TROEDSSON, Upp. Ordov. Faun. N. Greenl. I, 1926, p. 86—88, pl. 48, fig. 3; pl. 53, figs. 1, 2; pl. 54, fig. 1; pl. 65.

Description: Two fragments of probably one and the same specimen belonging to the genus *Gonioceras*, resemble *G. groenlandicum* in the length of the camerae. Only one of the fragments has some of the lateral saddles of the septa preserved, which are similar to the saddles of *G. groenlandicum* in their broad curvature. It differs, however, from this species, in having deeper ventral lobes of the sutures. Both specimens are too incompletely preserved to permit of closer description and determination.

Locality: Cape Webster, south coast of Washington Land, North Greenland.

Remarks: The holotype and a number of additional specimens of this and other species of *Gonioceras* were collected at Cape Calhoun in the Cape Calhoun series, though one specimen of *G. groenlandicum* was collected on the coast east of Cape Calhoun (TROEDSSON 1926, p. 88).

Uncertain Family.Genus *RICHARDSONOCERAS* FOERSTE.*Richardsonoceras multicameratum* n. sp.

Plate 3. Figs. 4, 5.

Description: The holotype and only specimen of this species is an internal mould of a phragmocone and part of the living chamber. The conch is strongly curved lengthwise and describes almost a semicircle. The cross-section of the conch is ovate, slightly more narrowly rounded dorsally than ventrally. At a distance of 7 mm from the apex the dorso-ventral diameter of the conch is 6.5 mm, the lateral diameter 5 mm. Both diameters increase gradually adorally. At the base of the living chamber the dorso-ventral diameter is 12 mm, the lateral diameter 10 mm. There are seven camerae at a distance equal to the dorso-ventral diameter of the conch when measured along the median part of the lateral sides. The distance between succeeding septa in the adoral part of the specimen is 1 mm measured along the dorsal outline of the conch, and approximately 2 mm measured along the ventral outline. The sutures are straight across the dorsal side; they form shallow lobes on the lateral sides and rise steeply adorally towards the ventral side, where they form distinct saddles.

Unfortunately, the living chamber is only insufficiently preserved, but it seems evident that there is no marked gibbosity of the ventral outline along the adoral part of the phragmocone and the basal part of the living chamber. The preserved portion of the latter is 12 mm long. It is possible that the living chamber narrows slowly towards the aperture, but better material must be obtained in order to clear up this question.

No trace of the siphuncle is preserved. In typical *Richardsonoceras* the siphuncle has a subventran location.

Horizon: Wright Bay formation, Ordovician.

Locality: Cape Webster, south coast of Washington Land, North Greenland. Coll. GODFRED HANSEN.

Remarks: In the curvature of the conch this species resembles *Richardsonoceras simplex* (BILLINGS) from the Black River of Ontario (see FOERSTE 1932, plate 26, figs. 1—3), but it has much shorter camerae. Species with shorter camerae are *R.?* *scofieldi* (CLARKE) and *R.?* *clarkei* FOERSTE (FOERSTE 1932, plate 26, fig. 8; plate 37, fig. 5), but neither of these species is so strongly curved lengthwise as *R. multicameratum*. *Beloitoceras* is characterized by a marked gibbosity of the dorsal outline of the conch along the adoral part of the phragmocone and the basal part of the living chamber. Therefore, the species described above is referred to *Richardsonoceras* rather than to *Beloitoceras*.

Richardsonoceras? sp.

Plate 2. Figs. 3, 4.

Description: This is a fragment of a cyrtconic cephalopod consisting of fifteen camerae, some of which are only partly preserved. Within a distance of nine septa in the middle portion of the specimen the dorso-ventral diameter of the conch increases from 35 mm to 41.5 mm, the lateral diameter from 27 to 33 mm in the same distance. The cross-section of the conch is ovate and the ventral outline is more narrowly rounded than the dorsal one.

There are five camerae in a length of 30 mm, counted along the median part of the lateral sides. The sutures describe slight saddles dorsally, but are strongly curved adorally towards the ventral side and cross the venter in sharp, almost acute saddles. The distance between the sutures averages 3.5 mm measured along the dorsal side, and 7 mm to 8 mm measured along the ventral outline.

Horizon: Perhaps in the Wright Bay formation, Ordovician.

Locality: Cape Webster, south coast of Washington Land, North Greenland. Coll. GODFRED HANSEN.

Remarks: The exact relationships of this specimen cannot be cleared up, because nothing is known as to the living chamber, the shape of

which is rather important diagnostically. The species of *Richardsonoceras* from the Black River which FOERSTE described in 1933 are smaller, but in 1935 FOERSTE referred two larger species to the same genus: *R. wyomingense* from the Lander sandstone of Wyoming, and *R.?* *subcuneatum* from the Freemont formation of Colorado.

Class CRUSTACEA.

Subclass Trilobita

Order OPISTHOPARIA.

Family ILLAENIDAE CORDA.

Genus GOLDILLAENUS SCHINDEWOLF.

The genus *Goldillaenus* was established by SCHINDEWOLF in 1924 (p. 201—206) for species which in many respects occupy an intermediate position between *Illaenus* DALMAN and *Scutellum* PUSCH (= *Goldius* DE KONINCK). The cephalon of *Goldillaenus* is described by SCHINDEWOLF as follows:

More or less strongly convex; dorsal furrows always extending to the anterior margin, even if they are only slightly marked in the anterior third of their length, strongly diverging anteriorly, semicircular. Glabella, therefore, completely divided from the fixed cheeks, narrowing distinctly in the middle part, hour-glass shaped, without glabellar furrows. Without occipital furrow or occipital ring.

It appears from SCHINDEWOLF'S further discussion of this genus that the facial sutures are rather simple; they start from the dorsal margin in a slightly outward direction, then swing inwards in a semicircle, surrounding the eyes, swing outward again and approach the anterior margin in a broad arch.

SCHINDEWOLF referred two species from the Orthoceratite limestone of Elbersreuth in Germany to this genus, viz. *G. otarion* (MÜNSTER) and *G. nilsoni* (MÜNSTER). Both had previously been referred to the genus "*Bronteus*" (= *Scutellum*) by BARRANDE. According to SCHINDEWOLF (1924, p. 194) the Elbersreuth limestone is of younger Silurian age (Downtonian), corresponding to the stage E» (= Ee₂ of BARRANDE), and its fauna is akin to the Bohemian faunal province. It is, therefore, unexpected to find forms that are generically not distinguishable from *Goldillaenus* in Arctic Ordovician faunas. It is another question whether the *Goldillaenus* from the Elbersreuth Silurian and the *Goldillaenus* from the Ordovician of Washington Land and Melville Peninsula are really related, or they are homeomorphic forms that have developed out of different roots. The latter seems to be the more probable explanation.

Goldillaenus peculiaris n. sp.

Plate 4. Figs. 1—3.

Description: The holotype is a cranidium which is 9.5 mm long and about 12.5 mm wide. It is evenly, but not strongly convex, steepest near the anterior and posterior margins. The front margin of the cranidium is only slightly convex. The dorsal furrows start posterior to the eyes and run inwards, parallel to the posterior margin of the cranidium, then turn forwards and pass almost in a semicircle, first inwards and then outwards, until they disappear at a distance of a little less than 1 mm from the front margin. At the point where the furrows turn forwards they are met by a short furrow connecting them directly with the posterior margin. The posterior ends of the dorsal furrows thus have a bifurcate appearance. The palpebral lobes are not well preserved; they are rather large and situated near the posterior margin. The facial sutures curve outwards in front of the palpebral lobes, but not so far as the palpebral lobes themselves. They approach the front margin in a shallow arch. The glabella is not elevated above the fixed cheeks; it attains its greatest width anteriorly, where it is 9 mm wide; in the middle portion of the cranidium the glabella is only 4 mm wide.

Another specimen of this species, found on Melville Peninsula, west coast of Foxe Basin, Arctic Canada, has better preserved palpebral lobes. This specimen has been described in another publication (TEICHERT 1937).

Horizon: Wright Bay formation, Ordovician.

Localities: South coast of Washington Land, somewhere between Cape Calhoun and Cape Webster (holotype); coll. J. NOE-NYGAARD. A conspecific specimen comes from Ignertoq, east coast of Melville Peninsula, Arctic Canada.

Remarks: Illaenidae with semicircular dorsal furrows strongly diverging anteriorly, have been described as *Bumastus indeterminatus* (WALCOTT) from the Black River, *B. limbatus* RAYMOND from the Chazyan, and as *B. fronto* TROEDSSON from the Cape Calhoun series (see RAYMOND and NARRAWAY 1908, p. 253; RAYMOND 1905, p. 347, 1910, p. 71; TROEDSSON 1928, p. 42). These species, together with the Silurian *Bumastus carinatus* SALTER, belong to a division of *Bumastus* which is characterized by long and distinct furrows ending abruptly, sometimes producing deep circular depressions on the internal mould at their anterior ends. The species of this group resemble *Goldillaenus* in the semicircular course of their dorsal furrows, but these are distinctly shorter than those of *Goldillaenus*. Whereas in this genus, including *G. peculiaris*, the dorsal furrows gradually become less distinct anteriorly and disappear near the anterior margin, the dorsal furrows of the *Bumastus indeterminatus* group terminate abruptly at some distance from

the anterior margin. Moreover, the course of the facial sutures is different. In the group of *B. indeterminatus* the palpebral lobes are much more pronounced, the sutures are strongly diverging anteriorly, and the posterior end of the fixed cheeks is drawn out into rather long genal spines, which is not the case in *Goldillaenus*. Thus it may be stated that the group of *B. indeterminatus* may be related with the genus *Goldillaenus*, but it is certainly not congeneric with the latter.

In his discussion of *Goldillaenus* SCHINDEWOLF (1924, p. 205—206) called attention to other species of the Illaenidae with strongly prolonged dorsal furrows. These are *Illaenus oblongatus* HOLM which, however, has a glabella that is only inconsiderably contracted in the middle, and some Bohemian species, described by BARRANDE (1852), viz. *I. distinctus*, *I. salteri*, and *I. panderi*. The Bohemian species have dorsal furrows which converge anteriorly and are thus altogether different from *Goldillaenus*. To the group of *I. oblongatus* with long and almost straight dorsal furrows belongs also *I. centrotus* (DALMAN) (see HOLM 1882, p. 99). It is apparent that all these species are rather different from the group of *B. indeterminatus* as well as from *Goldillaenus*.

Goldillaenus peculiaris differs from the Elbersreuth species of this genus in the broader outline of the cranidium, which is more elongate and more convex anteriorly in the German forms.

Genus *BUMASTUS* MURCHISON.

Bumastus n. sp.

Plate 4. Fig. 4.

One fragment of a cranidium belongs to the group of *Bumastus indeterminatus* discussed above in the remarks on *Goldillaenus peculiaris*. It differs from the other species of this group, including *Bumastus fronto* TROEDSSON from the Cape Calhoun series (?) in having a much less convex front margin. The right dorsal furrow is well preserved. It terminates abruptly at a distance of about 2 mm from the front margin. The cranidium is widest in front, where it has been about 11 or 12 mm wide. The fixed cheek of the left side and the posterior part of the cranidium are not preserved.

Horizon: Wright Bay formation, Ordovician.

Locality: Cape Webster, south coast of Washington Land. Coll. GODFRED HANSEN.

Genus *THALEOPS* CONRAD.

Thaleops borealis n. sp.

Plate 3. Figs. 6—13.

1913. *Thaleops ovata* CONRAD, O. HOLTEDAHL, Camb.-Ord. Bache Penins., p. 10 (partim).

?1928. *Thaleops* cf. *ovatus* CONRAD, G. T. TROEDSSON, Upp. Ord. Faunas N. Greenl. II, p. 48—49, pl. 14, fig. 8.

Description: The holotype is an internal mould of a cranidium, of which the right fixed cheek is not preserved. The original width of the cranidium has been about 23 mm, its length is 15 mm. The outline of the glabella in the longitudinal section is strongly convex and almost semicircular. The anterior margin is only slightly convex. There is a very distinct ring and a broad and shallow furrow in front of it at the posterior end of the glabella¹). Neither ring nor furrow continue on the fixed cheeks. The dorsal furrows are deep and broad. They start at the posterior end of the glabella, and are here 7.5 mm distance from each other. They run almost parallel on the posterior third of the cranidium. Anteriorly they are strongly deflected outwardly and become less distinct until they disappear at a distance of only 2.5 mm from the anterior margin. The glabella is here approximately 13 mm wide. At a distance of 5 mm from the posterior margin the glabella bears two low nodes. The glabella is rather flat in the longitudinal section. In its posterior part it is elevated about 2 mm above the fixed cheeks. Compared with the glabella the fixed cheeks are rather small. The posterior margin is drawn out into a genal angle, but only the left of these is partly preserved. However, the exact course of the facial sutures near the posterior margin cannot be determined accurately. From the genal angle the suture runs obliquely forwards in an almost straight line towards the anterior margin.

Additional specimens: The GODFRED HANSEN collection contains two cranidia of young specimens of the same species. The smaller one is only 3.5 mm wide along its posterior margin. In this specimen the dorsal furrows have the same course and the glabella has the shape that is characteristic of the holotype of the species. Also, the curvature of the glabella is the same. It can be seen that for a short distance the facial suture runs outwards near the posterior margin of the head until it reaches the surface of the genal angle, which is not yet so pronounced in the young stage as in the adult. Then the suture turns inwards and runs obliquely forwards in a rather straight line as in the full-grown specimen.

Another cranidium from the same piece of rock is somewhat larger. It is 6 mm wide, but it is very imperfectly preserved.

Horizon: Wright Bay formation, Ordovician.

Localities in Greenland: South coast of Washington Land, between Cape Calhoun and Cape Webster (holotype), coll. J. NOE-NYGAARD; Cape Webster, south coast of Washington Land (two young specimens), coll. GODFRED HANSEN.

¹) This feature, however, is much less distinct on the outer surface of the shell; see description of specimen from Norman Lockyer Island below.

Specimen from Norman Lockyer Island, Grinnell Land: The collections of the late P. SCHEI, the geologist of the Second Norwegian Arctic Expedition in the "Fram", 1898—1902, which are now kept in the Paleontological Museum at Oslo, contain remains of *Thaleops* which HOLTEDAHL referred to *Thaleops ovata* (1913, p. 10). These fossils were collected on Norman Lockyer Island, at the north side of the entrance to Princess Mary Bay. One fragmentary cranidium belongs to *Th. borealis*, since it agrees very closely with the holotype of this species. Both the fixed cheeks of this specimen are destroyed, but the form of the glabella is identical with that of the holotype of *Th. borealis*. The shell is preserved on the posterior portion of the glabella of this specimen. It is covered with convex wrinkles and it is punctate. There is no distinct posterior furrow and ring on the outer surface of the glabella, only a low, indistinct swelling along its posterior margin.

Remarks: This species is very similar to *Thaleops ovata* CONRAD. The best pictures of it were published by RAYMOND and NARRAWAY (1908) and, compared with the specimens described by these authors, *Th. borealis* is characterized by more strongly diverging and longer dorsal furrows and by a higher glabella.

The species described by TROEDSSON as *Th. cf. ovata* consists of thorax and pygidium. The head belonging to this specimen must have been somewhat larger than the head here described as the holotype of *Th. borealis*. TROEDSSON pointed out some differences between his specimens and typical *Th. ovata*, but as long as no complete specimens have been found, it cannot be determined with certainty whether TROEDSSON'S specimen really belongs to *Th. borealis*, although this assumption is rather probable. TROEDSSON states that his specimen was collected at "Wright Bay, 5 kilometers E. of Cape Calhoun", but the west side of Wright Bay is situated 18 kilometres east of Cape Calhoun.

Family LICHADIDAE CORDA.

Genus AMPHILICHAS RAYMOND.

Amphilichas? pulcher n. sp.

Plate 4. Fig. 5—8.

Description: The holotype is a rather well preserved hypostome of which only the left side and part of the posterior margin are destroyed. The hypostome is widest along the posterior margin, the original length of which has been about 22 mm. The length of the hypostome measures 11 mm. It is only slightly convex in the lateral cross-section and almost flat in the longitudinal section. Parallel to the posterior margin is a ring and a narrow furrow. The width of the furrow is 1 mm, but the original width of the ring cannot be determined. The lateral furrows start from the ring in a obliquely anterior direction; at

their posterior end they are 9.5 mm distant from each other. They are straight and directed outwards at an angle of about 45 degrees towards the posterior margin. They are 6 mm long and reach to the lateral margin of the hypostome. At a distance of about 1.5 mm from the posterior furrow, a pair of short furrows branches off from the oblique lateral furrows, one furrow on each side, which are directed slightly oblique and point towards the anterior. These furrows are rather well marked and slightly more than 3 mm long.

The outline of the hypostome is subtrapezoidal. The lateral margins are fairly straight and directed obliquely forwards, and the front-margin is slightly convex.

Only a part of the shell is preserved, covering the surface around the lateral. Here the shell is ornamented by fine striae running parallel to the furrows. Moreover, the shell is covered with small, shallow pits. These measure about 0.1 mm and are situated at an average distance of about 0.5 mm.

Associated with the hypostome is a rather large genal spine, which probably does not belong to the same specimen as the hypostome described above, but may belong to another specimen of the same species. This spine is 35 mm long and 13.5 mm wide, where it is widest. Its lower surface is ornamented by fine longitudinal striae, but is otherwise smooth. The upper surface is pitted in the same way as the shell of the hypostome described above, and in addition there are fine undulating transverse striae on the posterior half of the spine. The small pits have the same size and the same distance from each other as those of the hypostome and on the basis of this evidence it is assumed that the hypostome and the spine are parts of two specimens belonging to one and the same species. None of the other trilobite remains derived from the same slab has a similar surface ornamentation.

Horizon: Wright Bay formation, Ordovician.

Locality: South coast of Washington Land, between Cape Calhoun and Cape Webster. Coll. J. NOE-NYGAARD.

Remarks: The hypostome of this species reminds very much of the hypostome of the genus *Amphilichas* RAYMOND. Attention is particularly drawn to *Amphilichas dalecarlicus* ANGELIN (see WARBURG, 1925, plate 7 fig. 20). The reason why the hypostome in question has not been referred to this genus without some doubt is the fact that the spine which has been described above almost certainly belongs to the same species as the hypostome on reasons which have been pointed out above, but it deviates considerably from the spines of other species of *Amphilichas*. This genus has usually a well defined free cheek, whereas it is not possible in the specimen under consideration to state exactly where the free cheeks ends and the spine begins. It is quite

possible, that we are here concerned with a new genus of the Lichadidae, but more material, especially a more complete cephalon, should be available, before this question can be decided.

Dr. M. G. KAY, who along with Dr. CHR. POULSEN has contributed valuable suggestions for the interpretation of these specimens which have puzzled the author for a long while, states that similar hypostomes are frequent in the lower Trenton of New York.

Class *EUCRUSTACEA*

Order *OSTRACODA*.

Superfamily *LEPERDITIACEA* BASSLER and KELLETT.

Family *LEPERDITIIDAE* JONES.

Genus *LEPERDITIA* ROUAULT.

Leperditia groenlandica n. sp.

Plate 4. Fig. 9—11.

Description: The holotype and only specimen available is a right valve which is 10.5 mm long and 6.2 mm high. Dorsal margin straight, approximately 7 mm long. The anterior outline is more narrowly rounded than the posterior outline, and the ventral outline is broadly convex and oblique to the dorsal margin, which gives the valve the characteristic backward swing of the genus. Dorsal extremities obtusely angular, but not produced. The valve is equally and rather strongly convex laterally, with the greatest elevation slightly behind the middle. The ventral side is rather flattened, particularly in its posterior portion. Antero-ventrally the lateral side bends gradually towards the ventral side, but in the posterior half there is a marked angularity at the transition from the lateral to the ventral surface. In the anterior part of the ventral edge there is a slight furrow, 1.5 mm long, with seven small grooves. A corresponding furrow with grooves is to be seen on the posterior part of the ventral edge, but it is less well preserved here. The surface of the valve is densely pitted, except for the posterior portion of the ventral side, where the pits are obsolete. There is a very small and low eye tubercle near the antero-dorsal edge of the valve.

Horizon: Wright Bay formation, Ordovician.

Locality: Cape Webster, south coast of Washington Land, North Greenland. Coll. GODFRED HANSEN.

Remarks: This species is related to *Leperditia fabulites* (CONRAD), *L. linneyi* ULRICH and *L. catheyensis* KIRK. *L. fabulites* is very similar to *L. groenlandica*, but its right valve has an evenly rounded ventral side, whereas the ventral side of *L. groenlandica* is distinctly more flattened and forms an angle with the lateral side in the posterior half of the valve. In this respect it is similar to *L. linneyi* (ULRICH 1891, p. 174)

which, however, is shorter and more oblique. *L. catheyensis* (KIRK 1928, p. 416) has a carapace that is more flattened toward the anterior and posterior margin. *L. groenlandica*, *L. fabulites* and *L. catheyensis* are also similar in having rows of small pits or grooves near the ventral edge of the right valve. This feature is most pronounced in *L. fabulites* (see ULRICH 1897, p. 635). The number of pits is only three in *L. catheyensis*, and *L. groenlandica* has one row of closely spaced pits in the anterior part and another one in the posterior part of the ventral edge. According to ULRICH (1897, p. 635) "the purpose of these papillae evidently was to prevent undue overlapping of the valves by presenting an obstacle to the entering of the ventral edge of the left valve."

Genus *ANISOCHILINA* TEICHERT.

This genus has been established for Leperditiiidae which externally are like *Isochilina*, but which interiorly are very asymmetrical. Interiorly there is a large dorsally sloping area of the left valve, as in *Leperditia*, which is overlapped by the right valve. However, the right valve does not overlap beyond the ventral margin of the left valve (TEICHERT 1937).

Anisochilina undulata n. sp.

Plate 5. Figs. 1, 2.

Description: The holotype and only specimen available is a left valve which is 2.7 mm long and 1.7 mm high. The dorsal line is straight and 2.1 mm long. The greatest height is attained slightly behind the middle of the valve. Anterior margin evenly rounded and slightly protruded over the anterior end of the hinge-line; posterior margin more strongly protruded over the hinge-line, but also evenly rounded. Ventral margin broadly rounded and oblique. The valve is moderately curved dorso-ventrally, with the greatest gibbosity in a slightly elevated area somewhat ventrad of the middle. In the dorsal part there is an oblique depression starting near the middle of the dorsal margin and running obliquely downward and backward. Dorsal angles conspicuous. Valve slightly inflated along the middle portion of the hinge-line.

Along the ventral margin the valve is abruptly incurved and near its mid-length the valve is produced in a dorsally and outwardly directed lap. A very fine and sharp line which follows the ventral margin indicates the position of the right valve and shows that the right valve did not overlap the left side of the carapace.

The surface of the valve is covered with small, widely spaced pits. Low eye-spot at a distance equalling one third of the length of the valve from the anterior margin. No muscle-spot visible.

Horizon: Wright Bay formation, Ordovician.

Locality: Southern part of Washington Land, between Cape Calhoun and Cape Webster. Coll. J. NOE-NYGAARD.

Remarks: The holotype of *Anisochilina*, *A. punctulifera*, has been described from the Trenton of Melville Peninsula (TEICHERT 1937). The species described above differs in the more rounded ventral margin, in the irregular, somewhat undulating surface, and in the surface ornamentation.

Family LEPERDITELLIDAE ULRICH and BASSLER.

Genus *APARCHITES* JONES.

BOUČEK has recently called attention to the fact (1936, p. 37) that the genus *Aparchites*, in the sense generally adopted, comprises two groups of carapaces. One group is typified by the genotype *A. whiteavesi* and has obtusely angular dorsal angles and another group has rounded dorsal angles. For the latter group BOUCEK proposed the subgeneric name *Neoaparchites* with the subgenotype *Aparchites obsoletus* JONES and HOLL (1865, p. 423). This choice, however, is rather unfortunate, because this species apparently does not belong to the Leperditellidae. JONES and HOLL described it as a *Primitia*, but later on it was transferred to *Aparchites* by JONES (1889, p. 384). Doubts as to the generic position of this species have already been expressed by KRAUSE (1891, explanation of plate 30) and more emphatically by MOBERG and GRÖNWALL (1909, p. 53—54). ULRICH, on the other hand (1894, p. 640), included the species in the genus *Schmidtella*, and KUMMEROW (1924, p. 425) referred it to *Primitiopsis*. However, in 1933 (p. 46) KUMMEROW was less certain about this question and stated that the species (together with *P. oblonga*) could only be referred with some doubt to the genus *Primitiopsis*. BASSLER and KELLETT (1934, p. 465) enumerate the species as *Primitiopsis*. ULRICH, MOBERG and GRÖNWALL, and KUMMEROW have pointed out the close relationships of this species with *Primitia oblonga* JONES and HOLL (1865, p. 423), a species which was likewise transferred by JONES (1889, p. 384) to *Aparchites*, but which also has been referred to *Primitiopsis* by KUMMEROW and by BASSLER and KELLETT. The latter species has been discussed more recently by SWARTZ (1936, p. 555) in connection with his general discussion of the genus *Primitiopsis* and the establishment of the family Primitiopsidae. According to SWARTZ, *Primitiopsis oblonga* will have to be placed in a separate genus. As there can be little doubt that *P. oblonga* and *P. obsoleta* are actually congeneric, the former species will also have to be placed in the genus *Neoaparchites* BOUČEK, and this genus becomes a member of the family Primitiopsidae SWARTZ. Thus defined the genus *Neoaparchites* includes Primitiopsidae, which differ from *Primitiopsis* JONES in their smooth surface and the absence of the submedian pit. They agree with this genus in the existence of the dimorphic posterior flanges.

This leaves the group of *Aparchites*, which is characterized by

rounded dorsal angles, without a valid name. In the present paper these forms are retained in the genus *Aparchites* s. str., because it is uncertain how much importance can be attributed to the angularity or roundedness of the dorsal angles.

Aparchites ellipticus ULRICH.

Plate 5. Fig. 15.

One right valve is so similar to the holotype of *A. ellipticus*, as figured and described by ULRICH, that it cannot be distinguished from this species. Its appearance corresponds to ULRICH's description with the exception that the hinge-line is slightly longer.

Horizon: Wright Bay formation, Ordovician.

Locality: Cape Webster, south coast of Washington Land, northern Greenland. Coll. GODFRED HANSEN.

Remarks: The holotype of the species comes from the *Rhinidictya* bed of the Decorah formation of Minnesota.

Genus *LEPERDITELLA* ULRICH.

Leperditella calhounensis n. sp.

Plate 5. Figs. 3—6.

Description: The holotype and only specimen available is a complete carapace, which is 1.65 mm long and 1.2 mm high. Hinge-line short and straight, 1.0 mm long. Dorsal angles acute. Outline leperditoid, with the anterior margin somewhat more narrowly rounded than the posterior margin and a broadly curved ventral margin. Greatest height of the carapace in the posterior part. The left valve is inconsiderably larger than the right valve. Both valves normally and equally convex. The ventral margin of the right valve is very finely crenulated. On the left side of the crenulated margin the valve slopes a little dorsally and the right valve covers this smooth dorsally sloping marginal rim, but does not overlap over the ventral margin of the left valve. Surface of both valves smooth and regular.

Locality: Cape Calhoun, Washington Land. The specimen was found associated with *Strophomena lenta* TROEDSSON and *Basslerites* sp. and is derived from the same rock specimen as Nos. 588, 599, and 602 in TROEDSSON's paper of 1928. Coll. L. KOCH—J. NOE-NYGAARD.

Remarks: This species belongs with great probability to the group of *Leperditella* which lacks the undefined depression present in the dorsal half of the valve of most species. This group is very hard to distinguish from *Aparchites* JONES. The present species is referred to *Leperditella* rather than to *Aparchites*, because the left valve is slightly larger than the right valve. The fine crenulation of the ventral margin of the right

valve is reminiscent of the conditions in *Aparchites granilabiatus* as illustrated by ULRICH (1892, plate 9, fig. 32). *L. calhounensis* is apparently most nearly related to *L. tumida* (ULRICH) and *L. labellosa* (JONES) (see ULRICH, 1892, p. 264, and JONES, 1891, p. 96). It differs from the former species in its smooth surface. In the latter species the ventral edges of both valves are slightly inflated.

Genus *SCHMIDTELLA* ULRICH.

Schmidtella magna n. sp.

Plate 5. Figs. 7—9.

Description: The holotype and only specimen available is a left valve which is 3.0 mm long and 1.9 mm high. However, the distance between the hinge-line and the ventral margin in the highest part of the valve is only 1.7 mm, but the umbonal dorsal part of the valve is protruded about 0.2 mm over the hinge-line. The hinge-line is straight and about 2.4 mm long. The dorsal angles are rounded. Anterior margin evenly rounded and protruded over the anterior end of the dorsal line. Ventral margin broadly convex, oblique to the dorsal line, so that the valve attains its greatest height in the posterior part. Posterior margin evenly rounded. The dorsal part of the valve slightly behind the middle is elevated in a distinct hump which protrudes over the hinge-line, sloping gradually towards the ventral margin and more so on its anterior and posterior sides. In the anterior part of the valve, immediately behind the anterior dorsal angle, there is a slight and narrow sulcus which runs parallel to the anterior margin for a short distance.

Locality: Cape Calhoun, Washington Land; this specimen has been found associated with one of the crinoid stems (No. 494) mentioned by TROEDSSON (1928, p. 107). Coll. L. KOCH—J. NOE-NYGAARD.

Remarks: With the exception of the doubtful *Schmidtella? belgica* JONES, this genus is limited to the Ordovician. *Schmidtella magna* differs from the known species of this genus in its larger size and in its elongate outline with the slightly oblique backward swing of the ventral margin, which is not so pronounced in other species.

Superfamily *BEYRICHIACEA* BASSLER and KELLETT.

Family *PRIMITIIDAE* ULRICH and BASSLER.

Subfamily *Primitiinae* BASSLER and KELLETT.

The range of this subfamily, which in BASSLER and KELLETT's Index of 1934 includes twenty genera, has been considerably restricted in more recent years. BOUČEK separated from this subfamily the Boliinae and the Aechmininae which will be discussed below, but retained in it the ventrally horned forms such as *Acronotella* ULRICH and BASSLER,

Tricornina BOUČEK and others. The latter group has been included in the family Acronotellidae, which will also be discussed in a following paragraph. The subfamily name Primitiinae BASSLER and KELLETT is here applied in a still more restricted sense than that applied by BOUČEK and this group now includes *Primitiella* ULRICH, *Haploprimitia* ULRICH and BASSLER, *Primitia* JONES and HOLL, *Laccoprimitia* ULRICH and BASSLER, *Euprimitia* ULRICH and BASSLER, *Halliella* ULRICH *Hallatia* KAY, *Pyxiprimitia* SWARTZ, and *Milleratia* SWARTZ. Thus delimited the subfamily Primitiinae coincides with the family Primitiidae as emended by SWARTZ in 1936 (b, p. 549).

Genus *PRIMITIELLA* ULRICH.

Primitiella washingtoniana n. sp.

Plate 5. Figs. 10—11.

Description: The holotype and only specimen available is a valve which is 1.1 mm long and 0.6 mm high. This is probably a left valve, although it is not possible to determine this with desirable certainty. The hinge-line is straight and slightly shorter than the greatest length of the valve. Anterior and posterior margins are equally and evenly rounded, ventral margin straight and parallel to the dorsal margin. The valve is moderately convex and slightly thicker in what is regarded as the posterior half than in the anterior half. The margin of the valve is depressed; the depressed zone is broadest anteriorly and posteriorly and more indefinite and narrow ventrally. In the dorsal half of the valve there is a slight and indefinite depression which starts approximately in the middle of the dorsal margin and is directed obliquely forwards and downwards. The surface of the valve is smooth.

Horizon: Wright Bay formation, Ordovician.

Locality: Cape Webster, south coast of Washington Land, northern Greenland. Coll. GODFRED HANSEN.

Remarks: The species is most nearly related to the Trenton species *Primitiella constricta* ULRICH (ULRICH 1894, p. 647), but the latter species has an oblique posterior margin, whereas that of *P. washingtoniana* is evenly rounded. Moreover, the depressed margin of the former species is of a more constant width around the anterior, ventral and posterior sides. *P. limbata* ULRICH (1894, p. 648) is also similar, but has a depressed dorsal margin.

Genus *HALLATIA* KAY.

This genus was established by KAY (1934, p. 335) with the following definition:

“Valves small, seemingly equal. Outline suboval, hinge line relatively long. Surface smooth, relatively plane with sharp borders, particularly

on ventral and posterior; with distinct median sulcus, and depressed posterior and postero-ventral."

The genotype is *H. healeyensis* from the Hull formation of the Trenton of Ontario. The genotype "differs from the genus *Primitia* in its sharply defined median sulcus, and particularly the truncation of the generally elevated surface toward the posterior, that part of the valve being depressed". In addition to the genotype, KAY described another Trenton species of this genus, viz. *H. particylindrica*, from the Ion member of the Decorah formation of Iowa.

Hallatia parallela n. sp.

Plate 5. Figs. 16—18.

Description: The holotype and only specimen available is a right valve which is 1.2 mm long and 0.7 mm high. Dorsal angles are obtuse, hinge-line straight, slightly shorter than the greatest length of the valve. Anterior outline broadly rounded, ventral outline slightly convex and subparallel to the dorsal margin, posterior outline obliquely rounded. The valve is strongly convex with the greatest gibbosity in the ventral part. Ventral side slopes steeply towards the ventral margin. In a longitudinal direction the valve is broadly convex with a depressed posterior margin. On the dorsal slope of the valve, starting from the dorsal margin, there is a deep, well defined sulcus, slightly anterior of the middle of the dorsal margin, extending almost to the middle of the valve. On both sides of the sulcus there are low nodes near the dorsal margin. Surface of the valve smooth.

Horizon: Wright Bay formation, Ordovician.

Locality: Cape Webster, south coast of Washington Land. Coll. GODFRED HANSEN.

Remarks: This species differs from the representatives of the genus described by KAY in the more gradual transition from the general elevation of the valve to the depressed posterior margin. In *H. healeyensis* and *H. particylindrica* there is a rather steep slope of the valve toward the depressed posterior rim. As there is no corresponding depressed rim ventrally and anteriorly, the species cannot be referred to *Primitia*.

Subfamily *Eurychilinae* ULRICH and BASSLER.

This subfamily includes "large Primitiidae with a broad frill along the free edge of the valves" (BASSLER and KELLET 1934, p. 20). SWARTZ (1936b, p. 545) proposed to remove *Eurychilina* and related genera from the Primitiidae and to incorporate them into the Beyrichiidae. For reasons which have been explained elsewhere (TEICHERT 1937) the Eurychilinae are regarded by the present writer as a subfamily of the

Primitiidae. SWARTZ has mainly called attention to the existence of brood pouches in the females of *Chilobolbina* ULRICH and BASSLER and *Apatobolbina* ULRICH and BASSLER. *Craspedobolbina* KUMMEROV is not mentioned by SWARTZ, but it has brood pouches too. BOUČEK thought that *Dibolbina* ULRICH and BASSLER should also be transferred to the Eurychilinae. It is, however, doubtful whether these pouch-bearing genera really can be united with the pouchless forms such as *Eurychilina*, *Apatochilina*, *Coelochilina*, *Mirochilina*, and *Neochilina*. Apparently we have to do with two groups of frilled ostracod genera, the one with female brood pouches, the other without. The frill is probably a genetic feature of secondary importance, and the two groups mentioned above may not be related at all. It may be mentioned that a frill is also developed in a genus that is referred to the Kloedenellidae, viz. in *Beyrichiopsis* JONES and KIRKBY, and also in the genus *Allostraca* ULRICH and BASSLER of the family Kirkbyidae.

Genus *EURYCHILINA* ULRICH.

Eurychilina punctata n. sp.

Plate 5. Fig. 14.

Description: The holotype and only specimen available is a left valve which is 1.3 mm long and 0.7 mm high, including the frill, hinge-line straight, slightly shorter than the greatest length of the valve. Anterior dorsal angle approximately rectangular, posterior slightly obtuse. Ventral margin gently curved, with a conspicuous backward swing. Valve moderately convex dorso-ventrally. There is a deep narrow sulcus posterior to the middle of the valve, extending from the dorsal margin about half-way across the valve. The ventral half of the sulcus is surrounded by a curved lobe that is somewhat reminiscent of *Mastigobolbina* Ulrich and Bassler. Posteriorly of the sulcus it is round and low and continues ventrally of the sulcus in a narrow ridge, bounding the ventral termination of the sulcus; then it continues as a very low and hardly distinguishable extension first forwards and upwards, then backwards toward the sulcus. The marginal frill is concave and has a constant width of about 0.2 mm. Its surface is marked by densely spaced low radial ridges. The greater part of the surface of the valve is ornamented with small pits, but the dorsal slope of the valve is covered with low tubercles.

Horizon: Wright Bay formation, Ordovician.

Locality: Southern part of Washington Land, between Cape Calhoun and Cape Webster. Coll. J. NOE-NYGAARD.

Remarks: Several species which are rather similar to the one described above are known from the Ordovician rocks of North America.

Eurychilina manitobensis ULRICH from the Stony Mountain formation of Manitoba (ULRICH 1889, p. 53) differs mainly in its smooth surface, whereas *E. tuberculata* TEICHERT (1937) has a tuberculated valve surface and *E. reticulata* ULRICH (1889, p. 52) has a reticulate surface. The former species is known from the Trenton of Melville Peninsula, the latter from the Platteville and Decorah formation of Minnesota and from the Ryse-dorph Hill conglomerate of New York. The most nearly related species is probably *E. subradiata* ULRICH (1894, p. 126), widely distributed in the Black River, which, however, has a convex marginal frill and a broader sulcus.

Family DREPANELLIDAE SWARTZ.

In 1936, SWARTZ placed the genera *Drepanella* ULRICH, *Scofieldia* ULRICH and BASSLER, *Jonesella* ULRICH, and *Bollia* JONES and HOLL in the new family Drepanellidae. He tentatively included the genera *Ulrichia* JONES and *Polyzygia* GÜRICH in the same group. *Drepanella*, *Scofieldia*, and *Polyzygia* were formerly included in the subfamily Drepanellinae ULRICH and BASSLER of the family Zygobolbidae ULRICH and BASSLER, and *Jonesella*, *Bollia* and *Ulrichia* have been regarded as members of the family Primitiidae. Almost contemporaneously with SWARTZ's publication it had been pointed out by BOUČEK (1936, p. 40) that the Primitiidae in the arrangement of ULRICH and BASSLER included a number of rather different genera which apparently did not show any genetic relationships. Among the subfamilies proposed by BOUČEK is the new subfamily Bolliinae, which was established for the genera *Bollia* JONES and HOLL, *Placentula* JONES and HOLL, *Jonesella* ULRICH, and *Bolbibollia* ULRICH and BASSLER. In addition, BOUČEK considered the relationships of *Dilobella* JONES and HOLL to this subfamily. It will be obvious that BOUČEK's arrangement differs widely from that proposed by SWARTZ, who attributed considerable significance to the swellings near the dorso-median sulcus, which in some genera may connect ventrally to form a U-shaped ridge (SWARTZ 1936b, p. 552). For the present the arrangement proposed by SWARTZ may be adopted, although some changes will probably be necessary in the future.

The genus *Dilobella* ULRICH which was placed in the family Tetradellidae by SWARTZ, will be regarded here as a member of the family Drepanellidae, because its two nodes or ridges seem to be more reminiscent of the nodes of *Drepanella* than of the ornamentation of *Tetradella*. However, it must be admitted that it is probably possible to draw lines of development from *Dilobella* to the Drepanellidae as well as to the Tetradellidae. *Dilobella* is doubtless an intermediate genus and may be near the common root of both families.

Genus *DILOBELLA* ULRICH.*Dilobella marginata* n. sp.

Plate 6. Fig. 20.

Description: The holotype and only specimen available is a left valve which is about 2.0 mm long and 1.1 mm high. Unfortunately, the postero-dorsal extremity of the specimen is destroyed, but with this exception it is possible to give a fairly accurate description of the species. The dorsal line is straight and is probably only slightly shorter than the greatest length of the valve; the anterior dorsal angle is approximately rectangular. Anterior margin slightly convex and only slightly protruded over the anterior end of the dorsal margin. Ventral margin broadly convex. Valve strongly convex dorso-ventrally, with a steep ventral slope and a very narrow, depressed margin along the anterior and ventral side and probably also along the posterior side. On the dorsal side of the valve, approximately in the middle, there are two elevated ridges which are slightly convex towards the anterior. The anterior ridge is the more prominent one; its length equals approximately two thirds of the height of the valve; it is strongly curved backward at its ventral end, but does not unite with the posterior ridge. The latter is somewhat lower and shorter. There is a faintly indicated, hardly perceptible depression in front of the anterior sulcus.

Locality: Cape Calhoun, Washington Land. The specimen has been found associated with crinoid stems and other indeterminable fragments (No. 492). Coll. L. KOCH—J. NOE-NYGAARD.

Remarks: *Dilobella marginata* differs from other species of the genus in its elongate outline and in the possession of a slightly indicated, narrow, depressed margin. It exhibits features which are reminiscent of the Tetradellidae as well as of the Drepanellidae. The well marked longitudinal nodes or ridges are similar to those of *Drepanella*, but the species lacks the sickle-shaped marginal ridge which is characteristic of this genus. On the other hand, the slight depression in front of the anterior ridge may be an indication of beginning sulcation, leading to forms which belong to the Tetradellidae. Forms like *Dilobella marginata* may have given rise to both the Tetradellidae and the Drepanellidae, which are evidently two closely related groups of fossils.

Family ACRONOTELLIDAE SWARTZ.

Genera "with a strong laterally projecting spine in the lower part of each valve" have been removed from the Primitiidae by SWARTZ (1936a, 1936b, p. 554) and the family Acronotellidae has been established for them. In this family SWARTZ includes the genera *Acronotella* ULRICH and BASSLER, *Eoconchoecia* MOBERG, *Monoceratina* ROTH, and *Mooreina*

Harlton. More recently two additional genera exhibiting the same morphological features have been described as *Tricornina* by BOUČEK from the Ludlow rocks of Bohemian (BOUČEK 1936), and as *Monoceratella* by the present writer from rocks of Trenton age on Melville Peninsula (TEICHERT 1937). SWARTZ has pointed out that there is no intergradation between the Acronotellidae and the dorsally spined Aechminidae, but the spine of *Aechmina acuminata*, which will be described below, is situated somewhat lower than in other species of the same genus. Consequently the species in some way resembles *Monoceratella* more than other species of *Aechmina*.

In another publication (1937) I have called attention to a few facts that make it seem probable that the Acronotellidae, as defined by SWARTZ, are a rather heterogeneous assemblage of externally somewhat similar forms. As I have pointed out, *Acronotella* has a deep sulcus in the anterior part of the valves, the spine of *Mooreina* is located near the posterior end of the valve, *Eoconchoecia* is an aberrant genus which was formerly included in the Beyrichiidae, *Tricornina* with its long anterior and posterior dorsal spines has little in common with any other genus of this group, and the species which have been referred to *Monoceratina* are widely different from one another.

It is thus difficult to follow SWARTZ when (1936b, p. 555) he ascribes "considerable genetic significance" to the existence of ventral projections. It appears that the genera possessing a ventral spine or flange differ in nearly every respect. This fact would seem to make more plausible the assumption that the genera of this "family" are derived from different stocks and do not represent a natural assemblage of genetically related forms.

It has also been pointed out previously that ventral projections may develop from very different stocks, and that this is shown by such forms as *Leperditia tuberculata* KOLMODIN (1879, p. 135) and *Isochilina armata* WALCOTT (1884, p. 213). The former species resembles the typical *Leperditia* in size and form and in the presence of the conspicuous eye-spot and muscle-spot, but it differs in having a thick laterally projecting spine of unknown length. This species should certainly be made the type of a separate genus, in which case another genus very dissimilar to all of the remaining genera would be added to the Acronotellidae. *Isochilina armata* is not congeneric with *Leperditia tuberculata*, nor does it belong to the genus *Isochilina*.

On the basis of this evidence the writer prefers to maintain the reservation which SWARTZ himself made in a preliminary report on his studies (1936a), where he designated the family Acronotellidae as provisional. It would probably be better to distribute the genera discussed above in other genera and to regard the development of a ventral spine as a recurrent homeomorphic feature.

Genus *MONOCERATELLA* TEICHERT.

This genus has been established (TEICHERT 1937) for smooth, small ostracodes with a straight hinge-line and lateral horizontally projecting spine in the ventral part of each valve. The genotype is *Monoceratina teres* TEICHERT from strata of Trenton age on Melville Peninsula, Arctic Canada. In addition to the diagnosis which has been given previously, it may now be added that in this genus the right valve slightly overlaps the left valve along the anterior, ventral and posterior margins, and that the dorsal margin is slightly swollen in the posterior part of the valves.

Monoceratella is closely related to *Monoceratina* ROTH. However, with regard to this latter genus, considerations similar to those set forth above in the discussion of the family Aconotellidae SWARTZ have been applied. Species from the Devonian and Carboniferous as well as from the Cretaceous have been referred to *Monoceratina*, and they are not at all closely similar. *Monoceratina ardmorensis* (HARLTON) has in the dorso-posterior half of the valve a "wing-like projection" which points downwards and backwards (HARLTON 1929, p. 270). *Monoceratina ventrale* ROTH and *M. tennesseense* (ULRICH and BASSLER) have a flat projection directed ventrally and outwards. *M. casei* WARTHIN has a short and thick spine pointing in the same direction. The numerous species from the Cretaceous of Texas and Holland which have been referred to *Monoceratina* by ALEXANDER (1934) and VAN VEEN (1936) are rather different from the Palaeozoic species. Most of them have other ornamentation in addition to the characteristic spine. The differences in shape and in location and direction of the ventral spine as well as in ornamentation of the valves, together with the fact that the species occur in widely different horizons and localities, suggest that *Monoceratina* as now interpreted is merely an assemblage of polyphyletic forms showing some conspicuous external similarities, but nevertheless derived from different stocks.

A species which probably should be referred to *Monoceratella* occurs in the Rysedorph conglomerate of New York and has been described by RUEDEMANN (1901) as *Isochilina armata* var. *pygmaea*. These fossils do not seem to be related to *Isochilina armata* WALCOTT, which is a large species and, as stated above, does not belong to the genus *Isochilina*. The smooth surface of RUEDEMANN's variety *pygmaea* suggests a relationship with *Monoceratella*, the dorsally directed spine is reminiscent of *Monoceratina*, and the short anterior and posterior dorsal spines are not dissimilar to those of the Silurian genus *Tricornina* BOUČEK, but the similarity is closest with *Monoceratella*.

Monoceratella obliqua n. sp.

Plate 6. Figs. 1—4.

Description of holotype (right valve): The valve is 1.5 mm long and 0.8 mm high, the hinge-line is straight and it is very slightly shorter than the greatest length of the valve. Dorsal angles are approximately rectangular. Anterior margin curves very slightly forwards. The antero-ventral margin is oblique and almost straight. In the middle the ventral margin is only slightly oblique to the dorsal margin, and the posterior margin is broadly rounded. Posterior dorsal angle is slightly produced.

The valve is strongly curved in a dorso-ventral direction (with the greatest gibbosity in the ventral part) and it slopes almost at a right angle towards the ventral margin. From the ventral part below the middle of the valve, a spine, which has a rather broad base, projects laterally and horizontally. In the holotype the spine itself is broken away, but other specimens of the same species show that the length of this spine probably exceeds 0.5 mm.

Additional specimens: The left valve of the species corresponds in every respect to the right valve. The valve that has been selected as the holotype is among the largest found, and, therefore, almost certainly represents a mature specimen. Numerous specimens of different size, some of them considerably smaller than the holotype, have been found in the same piece of rock.

Horizon: Wright Bay formation, Ordovician.

Localities: The holotype and a number of additional specimens have been found in a limestone specimen from Cape Webster, south coast of Washington Land, coll. GODFRED HANSEN. Additional specimens occur in a limestone specimen from an unknown locality between Cape Webster and Cape Calhoun, coll. J. NOE-NYGAARD.

Remarks: This species differs from the genotype in its oblique antero-ventral outline, but both species are otherwise similar. However, as the oblique antero-ventral outline is a constant feature in all the specimens from Washington Land, whereas all the specimens from Melville Peninsula have broadly rounded antero-ventral outlines, this must be regarded as sufficient for a specific separation of the two forms.

Monoceratella punctata n. sp.

Plate 6. Figs. 5—10.

Description: The holotype is a right valve which is 1.4 mm long and 0.8 mm high. The hinge-line is straight and slightly shorter than the greatest length of the valve. Dorsal angles obtusely angular, the posterior dorsal angle slightly produced. Anterior and posterior margins broadly rounded, but anterior margin slightly oblique in its ventral part. Middle portion of the ventral margin almost straight and approx-

imately parallel to the dorsal margin. A horizontal spine projects ventrally of the middle of the valve. Anteriorly of the dorso-ventral median line the dorsal side of the valve is slightly inflated. The posterior part of the valve is somewhat depressed near the dorsal margin just anterior to the posterior dorsal angle. Between this depression and the inflated part anterior of the middle there is a long and narrow, curved sulcus which starts near the dorsal margin slightly behind the middle of the valve and runs first forwards then backwards to the posterior side of the base of the lateral spine, where it terminates. The surface of the valve is ornamented by very small pits, which are visible only under high magnification.

Two additional specimens were found in another limestone specimen. One of these is a complete carapace, the only one known of this genus. It was only possible to remove the internal mould of the carapace from the matrix. The surface of the mould, however, presents exactly the same features as that of the valve described above. The right valve of the carapace slightly overlaps the left valve along the anterior, ventral, and posterior margins. In the anterior part of the carapace both valves are dorsally inflated and protrude a little over the hinge-line.

Locality: Norman Lockyer Island, Grinnell Land. The holotype was found associated with a specimen of *Gonioceras holtedahli* Troedsson (No. 10632), the two additional specimens mentioned above were associated with the cranidium of *Thaleops borealis* n. sp., which has been mentioned above (No. A 10572) and a specimen of *Bythocypris subangularis* n. sp. Coll. P. SCHEL. Paleontological Museum, Oslo.

Remarks: This species resembles the genotype, *M. teres*, from Melville Peninsula in its rounded anterior outline. It differs in this respect from *M. obliqua* from Washington Land, which has an oblique antero-ventral margin. It differs from both species in the inflation of the dorsal part of the valve, anterior of the middle, in the existence of a slight sulcus behind the middle of the valve, and in the punctate surface. The sulcus of this species is reminiscent of the sulcus of *Acronotella*, but in this genus the sulcus is situated in the anterior part of the valve, in front of the lateral spine.

Family *AECHMINIDAE* SWARTZ.

BOUČEK and SWARTZ, incidentally in the same year and independently of each other, set the genera *Aechmina* JONES and HOLL and *Paraechmina* ULRICH and BASSLER aside from the typical Primitiidae in which they were formerly included. BOUČEK (1936, p. 53) established the subfamily Aechmininae in order to receive the two genera mentioned above. His diagnosis of this subfamily reads as follows:

“Einfache Primitiidae ohne Mittelfurche und meist auch ohne Mittelgrube. Schlossrand ziemlich kurz, mit einem aufrechten Horn (Dorn) in der Mitte.”

BOUČEK regarded the genus *Dicranella* ULRICH as a possible connecting link between this subfamily and the subfamily Primitiinae. Almost contemporaneously SWARTZ (1936a) independently established the family Aechminidae and gave a fuller discussion of this group in a more detailed revision of the Primitiidae and Beyrichiidae which was published afterwards (SWARTZ 1936b). SWARTZ defined this family in the following way:

“Subelliptical to subquadrate Ostracoda, with straight hinge and well marked subequal cardinal angles, and with a strong, remarkably persistent, dorso-median spine. Hingement appears simple; overlap inconspicuous or wanting. In part with a rounded pit adjacent to the spine; in part with marginal ridge or marginal spines.”

In regard to the relationships of this family, SWARTZ discusses its possible derivation from *Schmidtella* ULRICH or from sulcate Black River species such as *Dicranella? simplex* ULRICH.

In the opinion of the present writer the classification and relationships of these dorsally horned ostracoda as proposed by SWARTZ seems to be the more natural one, and this group seems to be sufficiently distinct from the sulcate Primitiidae to justify its separation as a family. The family Aechminidae is, therefore, credited to SWARTZ, although one must not overlook the fact that the same group was established almost contemporaneously as a subfamily by BOUČEK.

Almost contemporaneously, two additional dorsally horned genera were described by CORYELL and WILLIAMSON (1936) as *Cornulina* and *Aechminaria* from the Silurian Waldron shale of Indiana. Both of these genera must be included in the family Aechminidae, as has already been indicated by SWARTZ (1936b, p. 584).

Genus *AECHMINA* JONES and HOLL.

Aechmina acuminata n. sp.

Plate 5. Figs. 19, 20.

Description: The holotype and only specimen available is a left valve which is 1.5 mm long and 0.7 mm high. The hinge-line is straight and is equal to the greatest length of the valve. The anterior dorsal angle is acute. From here the anterior outline swings obliquely downwards and backwards, gradually passing into the ventral outline, which is somewhat oblique to the dorsal margin. The greatest height of the valve is in the posterior part. The posterior dorsal angle is rectangular and the posterior outline almost straight and passing in a narrow curve into the ventral outline. The valve is strongly convex dorso-ventrally,

its cross-section is almost semicircular. A rather heavy spine projects from the dorsal slope of the valve, just dorsally of the point of the greatest elevation. This spine is almost 0.3 mm thick at its base. Its length is unknown. Between the spine and the dorsal margin a faint depression of the valve can be observed and narrow furrows are located on the antero-dorsal and postero-dorsal sides of the base of the spine. The spine is directed obliquely upward, probably at an angle of about 45°. The surface of the valve is perfectly smooth.

Horizon: Wright Bay formation, Ordovician.

Locality: Cape Webster, south coast of Washington Land, North Greenland. Coll. GODFRED HANSEN.

Remarks: This is the first record of an occurrence of the genus *Aechmina* in North America in strata older than Richmond. In Europe *A. obtusa* JONES is known from the Bala of England, but on account of its elongate and acuminate outline *A. acuminata* is not comparable to any other hitherto known species of the genus.

Family **KIRKBYIDAE** ULRICH and BASSLER.

Genus *MACRONOTELLA* ULRICH.

Macronotella elongata n. sp.

Plate 5. Figs. 12—13.

Description: The holotype and only specimen available is a left valve which is 0.7 mm long and 0.5 mm high. It is moderately and evenly convex. The valve is somewhat lower in the anterior than in the posterior part. The dorsal line is straight and slightly shorter than the greatest length of the valve. Dorsal angles are rounded. The surface is reticulate, except for a distinct, small, circular area somewhat ventrally and posterior to the middle of the valve.

Horizon: Wright Bay formation, Ordovician.

Locality: Cape Webster, south coast of Washington Land, North Greenland. Coll. GODFRED HANSEN.

Remarks: This species belongs to the elongate group of *Macronotella* with no distinct dorsal swelling of the valves. Other species of this group are *M. tenuis* TEICHERT from Melville Peninsula and the European *M. praelonga* (STEUSLOFF). The latter species, however, has a distinctly shorter hinge-line (STEUSLOFF 1894, p. 781) and the former species has a pitted, not a reticulate surface (TEICHERT 1937).

Superfamily *CYPRIDACEA* BASSLER and KELLETT.Family *BEECHERELLIDAE* ULRICH.Genus *BASSLERITES* TEICHERT.

This genus has been erected for smooth small ostracodes, which are similar to *Krausella*, but in which the left valve does not overlap the right valve along the dorsal margin. It has been described as follows (TEICHERT 1937, p. 116):

Hinge-line straight. Left valve strongly overlaps the right valve along the ventral side, and slightly overlaps that valve anteriorly. Right valve has an acute posterior prolongation over the margin of the left valve. Surface of both valves smooth.

The genotype is *B. hanseni* the description of which is repeated below.

Basslerites hanseni TEICHERT.

Plate 6. Figs. 14—16.

1937. *Basslerites hanseni*, C. TEICHERT, Ordov. Sil. Faunas East. Arct. Canada, p. 117, pl. 23, figs. 11—15.

Description of holotype (entire carapace): Left valve larger than right valve, and 2.4 mm long and 1.2 mm high. Entire carapace 1.2 mm thick. Hinge-line straight, short, and only 1.2 mm long. Both valves are swollen along the hinge-line in such a way that the hinge-line is situated in a furrow between the swellings of the dorsal parts of the valves. Immediately in front of the hinge-line, the left valve slightly overlaps the right valve — the same slight overlap is to be seen along the anterior margin. Along the ventral margin the left valve distinctly overlaps the right valve, its ventral margin being drawn out broadly.

The ventral margin of the carapace is straight and parallel to the hinge-line; the anterior margin slopes gradually forward in its dorsal position and is more sharply recurved in the ventral part. The right valve is extended into a flange-like, acutely terminated prolongation which is produced over the posterior margin of the left valve for a distance of about 0.2 mm. In this place the posterior margin of the left valve is acutely recurved. There is a slight overlap of the left valve over the right valve along the posterior margin between the dorsal side of the terminating flange and the hinge-line. The posterior flange of the right valve is located higher than the ventral margin of the carapace between its middle and the venter.

Both valves are rather strongly and equally convex so, that the lateral cross-section of the carapace is broadly elliptical. The greatest gibbosity is in the middle of the valves. Surface of both valves perfectly smooth.

Horizon: Wright Bay formation, Ordovician.

Localities: Cape Webster, south coast of Washington Land (holotype and several other specimens), coll. GODFRED HANSEN in whose honour the species is named; additional specimens occur in a limestone specimen from an unknown locality between Cape Calhoun and Cape Webster, coll. J. NOE-NYGAARD; one specimen has been found associated with the holotype of *Leurorthoceras? groenlandicum* n. sp. from Cape Webster, coll. G. HANSEN.

Remarks: A very similar species of the same genus is *B. canadensis* TEICHERT, which has been found in rocks of Trenton age on Melville Peninsula, west coast of Foxe Basin, Arctic Canada. This species is characterized by a broader and less acute posterior flange and by a more slender form of the carapace (TEICHERT, 1937, p. 118).

Family BAIRDIIDAE LIENENKLAUS.

Genus *BYTHOCYPRIS* BRADY.

Bythocypris subangularis n. sp.

Plate 6. Figs. 11—13.

Description of the holotype: Complete carapace which is 1.5 mm long, 0.9 mm high and 0.7 mm thick. Dorsal margin strongly convex with the postero-dorsal and antero-dorsal outlines slightly flattened; ventral margin somewhat concave with the strongest concavity slightly anterior of the middle. Left valve slightly overlapping the right valve except for a short distance postero-dorsally. Both valves are moderately and equally convex. The surface is smooth.

Horizon: Wright Bay formation, Ordovician.

Localities: The holotype comes from the southern part of Washington Land, somewhere between Cape Calhoun and Cape Webster. Coll. J. NOE-NYGAARD. In addition to the holotype two smaller specimens and also a right valve of a slightly larger specimen have been found in the same rock specimen. A fifth specimen (left valve) was found associated with the holotype of *Leurorthoceras? groenlandicum* from Cape Webster, which has been described above. Coll. GODFRED HANSEN. A sixth specimen has been found on Norman Lockyer Island, Grinnell Land, associated with a specimen of *Thaleops borealis*. Coll. P. SCHEL. The latter specimen is in the Paleontological Museum, Oslo.

Remarks: Among the Ordovician species of the genus *Bythocypris incurvata* KUMMEROW is the one which is most reminiscent of the species described above; it differs in that the postero-dorsal slope is steeper than in *B. subangularis* (see KUMMEROW, 1934, p. 436). KUMMEROW'S species was derived from an erratic boulder in North Germany of the approximate age of the Lyckholm beds of Estonia. None of the North American Ordovician species of *Bythocypris* is similar to *B. subangularis*.

The subgenus *Bairdiocypris* KEGEL (1931, p. 246) is characterized by a straight part of the postero-dorsal margin of the smaller right valve, but probably *Bythocypris subangularis* can not be referred to this subgenus, because in this species the postero-dorsal part of the larger left valve is also straight, and the left valve does not overlap the right valve along this line. KEGEL'S figures of *Bairdiocypris* show that this overlap is very pronounced in species referred to this subgenus.

Bythocypris minuta n. sp.

Plate 6. Figs. 17—19.

Description: The holotype and only specimen available is a complete carapace which is 1.2 mm long, 0.35 mm high and 0.35 mm thick in the posterior part and slightly less thick anteriorly. The dorsal margin is straight in the middle, the ventral margin is slightly convex, with the convexity most pronounced in the anterior half. The anterior margin is evenly rounded, the posterior margin slightly acuminate. The left valve is slightly larger than the right valve and overlaps the latter anteriorly, ventrally and posteriorly. The overlap is broadest ventrally.

Locality: Cape Calhoun, Washington Land. The specimen was found associated with the pygidium of *Ceraurus* cf. *pleurexanthemus* GREEN (No. 348) which was figured by TROEDSSON (1928, plate 16, fig. 20). Coll. L. KOCH—J. NOE-NYGAARD.

Remarks: This species is characterized by its subcylindrical shape. It differs in this respect from *Bythocypris cylindrica* (HALL) which is much higher in the anterior half (see ULRICH, 1894, plate 44) *B. minuta* is reminiscent of the genus *Macrocypris* by its elongate form and the acuminate posterior end, but in *Macrocypris* the right valve is larger than the left valve.

Family BARYCHILINIDAE ULRICH.

Genus *BARYCHILINA* ULRICH.

Barychilina ordoviciana n. sp.

Plate 6. Figs. 21—22.

Description: The holotype and only specimen available is a left valve which is 1.1 mm long and 0.6 mm high. The outline is ovate with the ventral margin somewhat more rounded than the dorsal one. The anterior end is somewhat injured, but it has probably been rather narrowly rounded or subacute. The valve is strongly convex dorso-ventrally with the greatest gibbosity slightly dorsad of the middle, and broadly convex longitudinally. The surface is ornamented with fine, longitudinal striae, except for a narrow elongate area on the crest of the elevation of the valve. The striae are approximately parallel to the dorsal and ventral margins and meet at acute angles along the

longitudinal median line. The striae branch and anastomose sometimes, giving the surface of the valve an appearance that is highly reminiscent of a finger-print. Near the dorsal margin, slightly anteriorly of the middle, there is a circular shallow pit which is not ornamented.

Horizon: Wright Bay formation, Ordovician.

Locality: Cape Webster, south coast of Washington Land, North Greenland. Coll. GODFRED HANSEN.

Remarks: This is the first representative of this rare genus in rocks of Ordovician age. The dorsal position of the pit distinguishes it from the few younger species known of this genus.

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PLATES

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Plate 1.

Figs. 1—10: Specimens in the Mineralogical and Geological Museum, Copenhagen.
Fig. 11: Paleontological Museum, Oslo.

Figs. 1—3. *Strophomena regularis* n. sp. Holotype. Wright Bay formation, Ordovician. South coast of Washington Land, between Cape Webster and Cape Calhoun. Coll. J. NOE-NYGAARD.

Fig. 1. External cast of the ventral valve. Nat. size.

Fig. 2. Ventral valve. Nat. size.

Fig. 3. The same. $\times 2.8$.

Figs. 4, 5. *Rafinesquina pygmaea* n. sp. Wright Bay formation, Ordovician. Cape Webster, south coast of Washington Land. Coll. G. HANSEN.

Fig. 4. Ventral valve (on right side) and dorsal valve (holotype, on left side), probably derived from one specimen. The ventral valve is the holotype. $\times 2$.

Fig. 5. The holotype. $\times 6$.

Fig. 6. *Leptaena costata* n. sp. Holotype. Wright Bay formation, Ordovician. South coast of Washington Land, between Cape Webster and Cape Calhoun. Dorsal valve. $\times 2$. Coll. J. NOE-NYGAARD.

Figs. 7, 8. *Rafinesquina elongata* n. sp. Holotype. Wright Bay formation, Ordovician. Cape Webster, south coast of Washington Land. Coll. G. HANSEN.

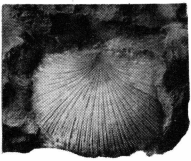
Fig. 8. Ventral valve. Nat. size.

Fig. 9. Part of the surface. $\times 3$.

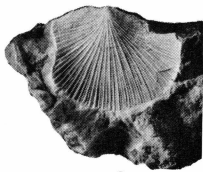
Fig. 9. *Goniceras* cf. *G. groenlandicum* Troedsson. Doubtful horizon, Ordovician. Cape Webster, south coast of Washington Land. Coll. G. HANSEN. Nat. size.

Fig. 10. *Strophomena* sp. Ventral valve. Wright Bay formation, Ordovician. Cape Webster, south coast of Washington Land. Coll. G. HANSEN. $\times 2.8$.

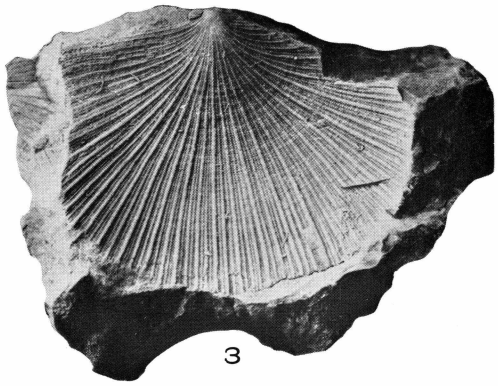
Fig. 11. *Strophomena* sp. Ventral valve. (Same species as Fig. 10). Ordovician. Norman Lockyer Island, Grinnell Land. Coll. P. SCHEI. $\times 2.8$.



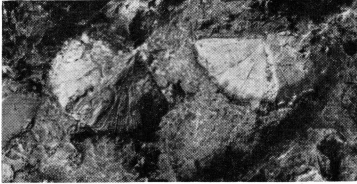
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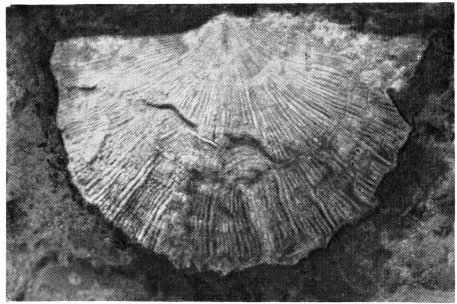
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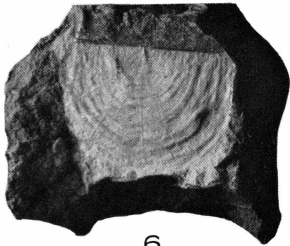
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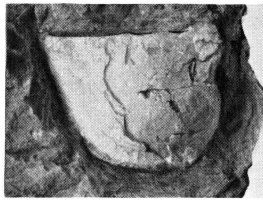
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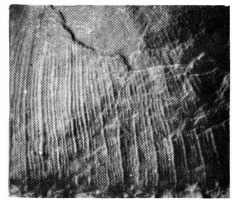
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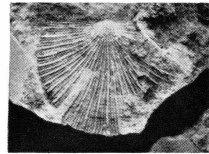
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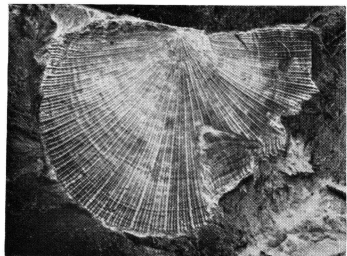
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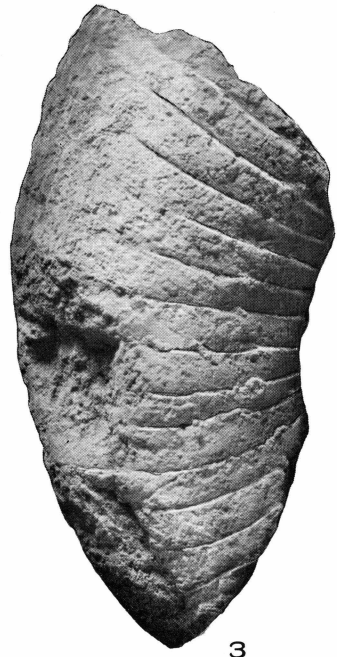
Plate 2.

Specimens in the Mineralogical and Geological Museum, Copenhagen.

- Figs. 1, 2. *Leurorhoceras? groenlandicum* n. sp. Holotype. Wright Bay formation, Ordovician. Cape Webster, south coast of Washington Land. Coll. G. HANSEN. Lateral view and cross-section.
- Figs. 3, 4. *Richardsonoceras?* sp. Perhaps from the Wright Bay formation, Ordovician. Cape Webster, south coast of Washington Land. Coll. G. HANSEN. Lateral and ventral views. Nat. size.
- Fig. 5. *Lophospira* sp. Wright Bay formation, Ordovician. South coast of Washington Land, between Cape Calhoun and Cape Webster. Coll. J. NOE-NYGAARD. Plaster cast of external mould. $\times 1.5$.



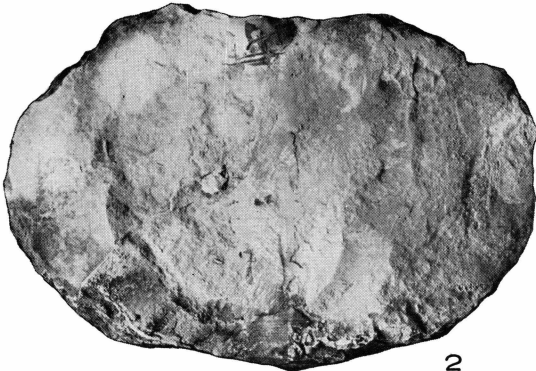
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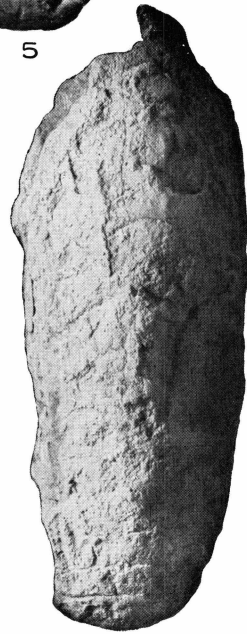
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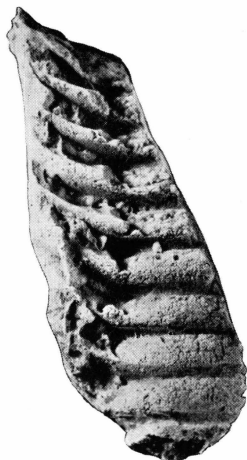


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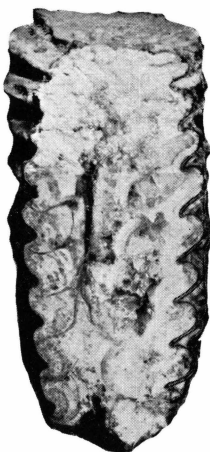
GERTRUD TEICHERT phot.

Plate 3.

- Figs. 1—10, 14: Specimens in the Mineralogical and Geological Museum, Copenhagen.
Figs. 11—13. Specimens in the Paleontological Museum, Oslo.
- Figs. 1—3. *Actinoceras böggildi* n. sp. Holotype. Doubtful horizon, Ordovician. Cape Webster, south coast of Washington Land. Coll. G. HANSEN. Dorsal view, dorso-ventral median section, and ventral view. Nat. size.
- Figs. 4, 5. *Richardsonoceras multicameratum* n. sp. Holotype. Wright Bay formation, Ordovician. Cape Webster, south coast of Washington Land. Coll. G. HANSEN. Lateral and ventral views. Nat. size.
- Figs. 6—13. *Thaleops borealis* n. sp.
- Figs. 6, 7. Cranidium of young specimen (nat. size and $\times 7$). Wright Bay formation, Ordovician. Cape Webster, south coast of Washington Land. Coll. G. HANSEN.
- Figs. 8—10. Cranidium of adult specimen (holotype). Wright Bay formation, Ordovician. South coast of Washington Land, between Cape Webster and Cape Calhoun. Coll. J. NØE-NYGAARD. View from above, anterior view and lateral view. Nat. size.
- Figs. 11—13. Cranidium from Norman Lockyer Island, east coast of Grinnell Land, entrance to Princess Mary Bay. Coll. P. SCHEL. Anterior view, view from above, and cross-section. Nat. size.
- Fig. 14. *Actinoceras websterense* n. sp. Holotype. Doubtful horizon, Ordovician. Cape Webster, south coast of Washington Land. Coll. G. HANSEN. Lateral section. Nat. size.



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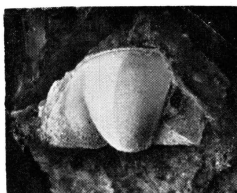
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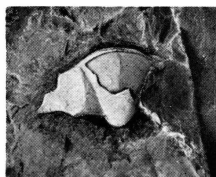
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Plate 4.

Specimens in the Mineralogical and Geological Museum, Copenhagen.

- Figs. 1—3. *Goldillaenus peculiaris* n. sp. Holotype. Cranidium. Wright Bay formation, Ordovician. South coast of Washington Land, between Cape Webster and Cape Calhoun. Coll. J. NOE-NYGAARD. View from above, anterior and lateral views. Nat. size.
- Fig. 4. *Bumastus* n. sp. Part of cranidium. Wright Bay formation, Ordovician. Cape Webster, south coast of Washington Land. Coll. G. HANSEN. Nat. size.
- Figs. 5—8. *Amphilichas? pulcher* n. sp. Hypostome (holotype) and large spine. Wright Bay formation, Ordovician. South coast of Washington Land, between Cape Webster and Cape Calhoun. Coll. J. NOE-NYGAARD.
- Figs. 5—7. View from above, anterior and lateral views. Nat. size. (In Fig. 6 portion of spine removed).
- Fig. 8. Partial view of hypostome and spine, enlarged about 6 diameters. Shows the similarity of the surface ornamentation of cranidium and spine.
- Figs. 9—11. *Leperditia groenlandica* n. sp. Holotype. Wright Bay formation, Ordovician. Cape Webster, south coast of Washington Land. Coll. G. HANSEN.
- Fig. 9, 10. Lateral and ventral view of right valve. $\times 2$.
- Fig. 11. Antero-ventral portion, about $\times 20$. Shows the row of grooves and the surface ornamentation of the shell.



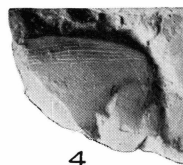
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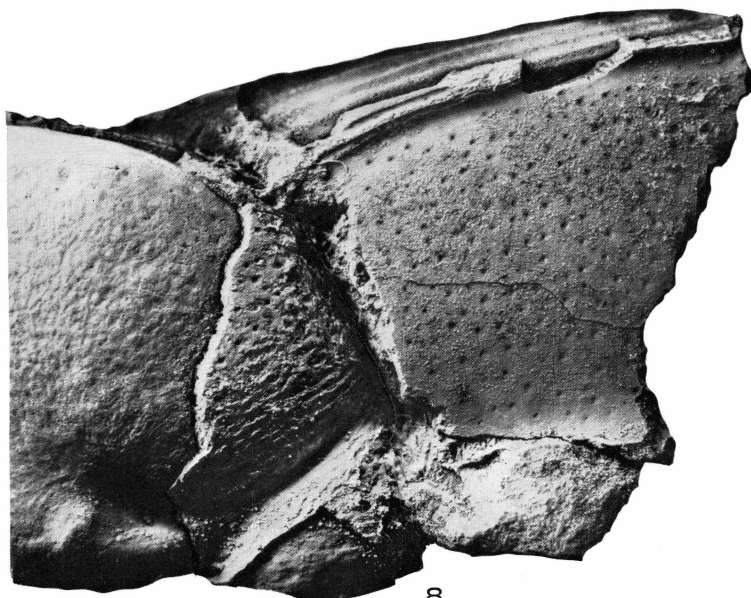
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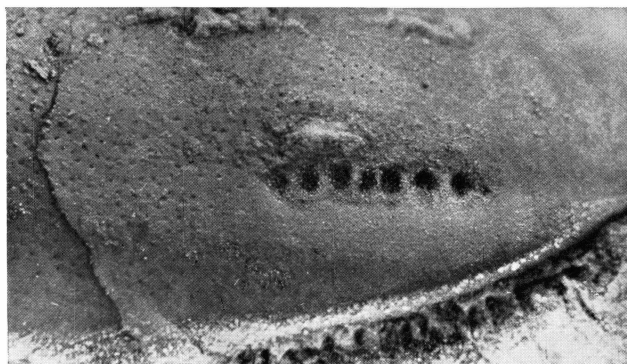
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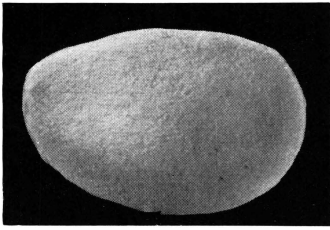


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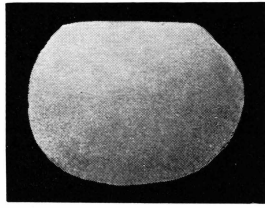
Plate 5.

Specimens in the Geological and Mineralogical Museum, Copenhagen.

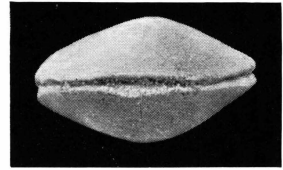
- Figs. 1, 2. *Anisochilina undulata* n. sp. Holotype. Wright Bay formation, Ordovician. South coast of Washington Land, between Cape Calhoun and Cape Webster. Coll. J. NOE-NYGAARD. Ventral valve. Lateral and ventral views. $\times 13$.
- Figs. 3—6. *Leperditella calhounensis* n. sp. Holotype. Ordovician. Cape Calhoun, Washington Land. Coll. L. KOCH—J. NOE-NYGAARD. Lateral, dorsal, posterior, and ventral views. $\times 18$.
- Figs. 7—9. *Schmidtella magna* n. sp. Holotype. Ordovician. Cape Calhoun, Washington Land. Coll. L. KOCH—J. NOE-NYGAARD. Left valve. Lateral, dorsal, and posterior views. $\times 13$.
- Figs. 10, 11. *Primitiella washingtoniana* n. sp. Holotype. Wright Bay formation, Ordovician. Cape Webster, south coast of Washington Land. Coll. G. HANSEN. Probably left valve. Lateral and ventral views. $\times 18$.
- Fig. 12—13. *Macronotella elongata* n. sp. Holotype. Wright Bay formation, Ordovician. Cape Webster, south coast of Washington Land. Coll. G. HANSEN. Fig. 12: central portion, enlarged $\times 75$. Fig. 13. Left valve. About $\times 40$.
- Fig. 14. *Eurychilina punctata* n. sp. Holotype. Wright Bay formation, Ordovician. South coast of Washington Land, between Cape Calhoun and Cape Webster. Coll. J. NOE-NYGAARD. Left valve. $\times 32$.
- Fig. 15. *Aparchites ellipticus* Ulrich. Wright Bay formation, Ordovician. Cape Webster, south coast of Washington Land. Coll. G. HANSEN. Right valve. $\times 18$.
- Figs. 16—18. *Hallatia parallela* n. sp. Holotype. Wright Bay formation, Ordovician. Cape Webster, south coast of Washington Land. Coll. G. HANSEN. Right valve. Ventral, dorsal and lateral views. $\times 18$.
- Figs. 19—20. *Aechmina acuminata* n. sp. Holotype. Wright Bay formation, Ordovician. Cape Webster, south coast of Washington Land. Coll. G. HANSEN. Left valve. Lateral and posterior views. $\times 22$.



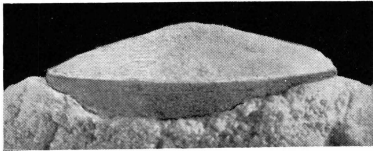
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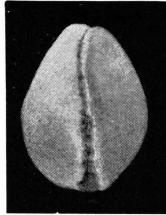
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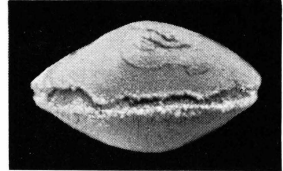
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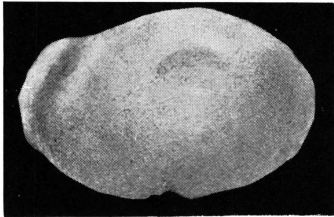
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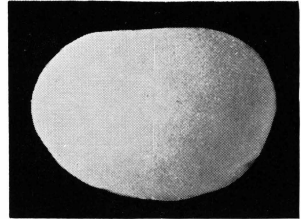
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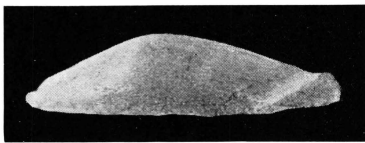
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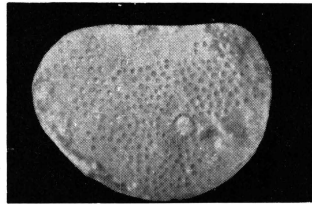
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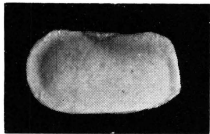
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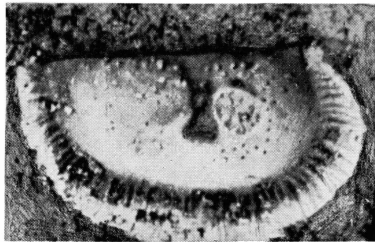
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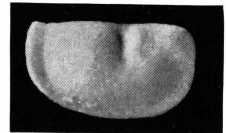
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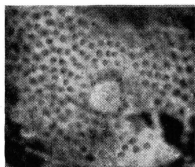
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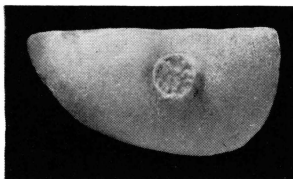
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Plate 6.

Figs. 1—4, 11—22: Specimens in the Mineralogical and Geological Museum, Copenhagen.

Figs. 5—10: Specimens in the Paleontological Museum, Oslo.

Figs. 1—4. *Monoceratella obliqua* n. sp. Wright Bay formation, Ordovician. Cape Webster, south coast of Washington Land. Coll. G. HANSEN.

Figs. 1—3. Holotype. Right valve. Lateral, dorsal and ventral views. $\times 18$.

Fig. 4. Posterior view of another specimen, embedded in matrix, to show the length of the lateral spine. $\times 18$.

Figs. 5—10. *Monoceratella punctata* n. sp. Ordovician. Norman Lockyer Island, Grinnell Land. Coll. P. SCHEL.

Figs. 5, 6. Holotype. Right valve. Lateral and dorsal views. $\times 20$.

Figs. 7—10. Internal mould of a complete carapace. Left, dorsal, ventral, and posterior views. $\times 20$.

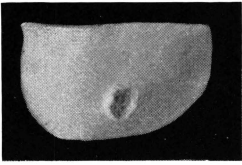
Figs. 11—13. *Bythocypris subangularis* n. sp. Holotype. Wright Bay formation, Ordovician. South coast of Washington Land, between Cape Calhoun and Cape Webster. Coll. J. NOE-NYGAARD. Complete carapace. Right, dorsal and ventral views. $\times 18$.

Figs. 14—16. *Basslerites hansenii* TEICHERT. Holotype. Wright Bay formation, Ordovician. Cape Webster, south coast of Washington Land. Coll. G. HANSEN. Holotype. Complete carapace. Right, dorsal and ventral views. $\times 18$.

Figs. 17—19. *Bythocypris minuta* n. sp. Holotype. Ordovician. Cape Calhoun, Washington Land. Coll. L. KOCH—J. NOE-NYGAARD. Complete carapace. Right, ventral, and dorsal views. $\times 18$.

Fig. 20. *Dilobella marginata* n. sp. Holotype. Ordovician. Cape Calhoun, Washington Land. Coll. L. KOCH—J. NOE-NYGAARD. Left valve. $\times 13$.

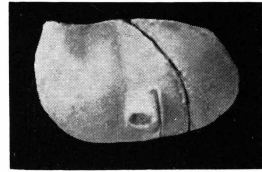
Figs. 21—22. *Barychilina ordoviciana* n. sp. Holotype. Wright Bay formation, Ordovician. Cape Webster, south coast of Washington Land. Coll. G. HANSEN. Left valve. Lateral and dorsal views. About $\times 50$.



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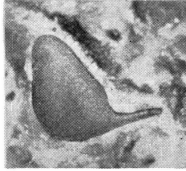
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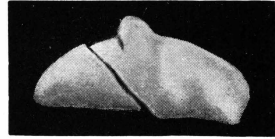
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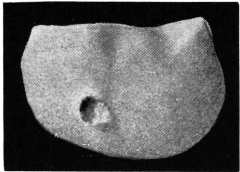
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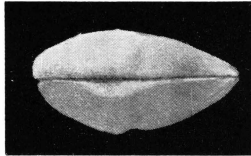
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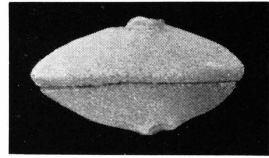
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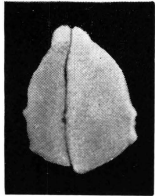
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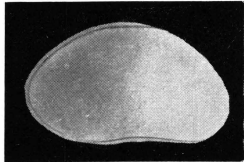
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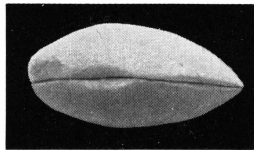
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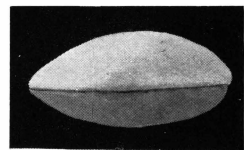
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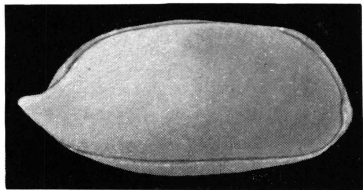
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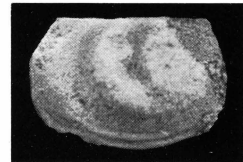
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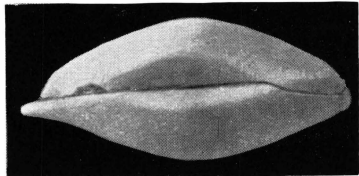
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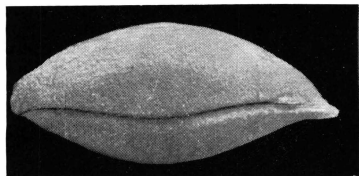
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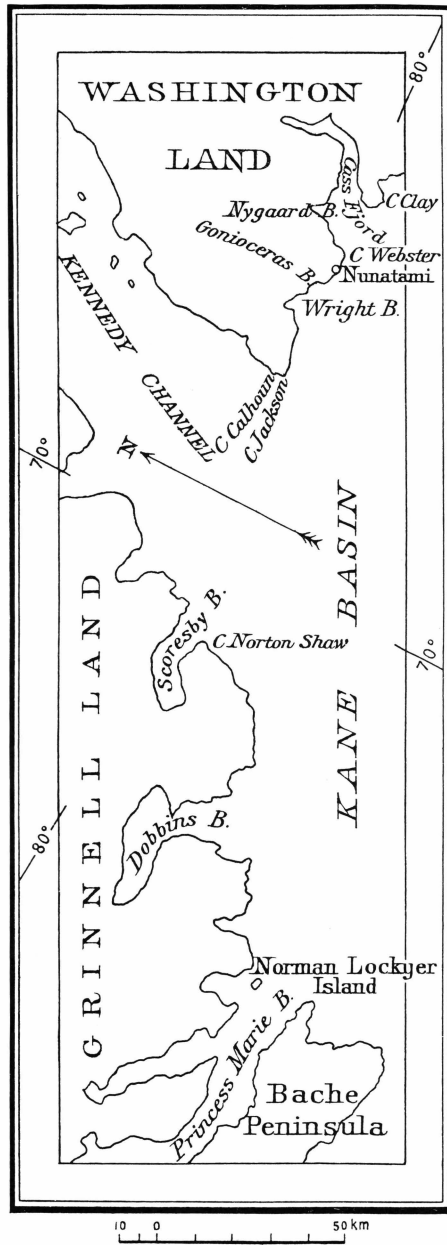
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Plate 7.

Map of the northern and northwestern shores of Kane Basin (Washington Land, Grinnell Land).



ERRATA

p. 35 line 1: for "FOERSTE and TEICHERT" read "HYATT".

p. 54 line 4: for "Monoceratina" read "Monoceratella".

Explanation of Plate 1 Fig. 4: for "ventral" read "dorsal" and for "dorsal"
read "ventral".