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BIOSTRATIGRAPHY AND CONODONT FAUNAS OF UPPER ORDOVICIAN THROUGH MIDDLE DEVONIAN ROCKS, EASTERN ARCTIC ARCHIPELAGO

T.T. Uyeno

With contributions by:
U. Mayr and R.F. Roblesky

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PREFACE

The lower and middle Paleozoic strata of the eastern Arctic Archipelago change rapidly laterally from thin, shallow-water, platform deposits to thicker, deeper water basinal deposits. The difficulty in correlating such strata has been overcome in part through well controlled conodont zonation, and by supplementary dating using palynomorphs and megafaunas. Such precise dating and correlation are essential for success in the search for petroleum and other mineral deposits. The study will also help refine calibration of the geological time scale in other parts of the world.

Ottawa

Elkanah A. Babcock
Assistant Deputy Minister
Geological Survey of Canada

PRÉFACE

Les couches du Paléozoïque inférieur et moyen de la partie est de l'archipel Arctique, présentent, latéralement, un passage très rapide de dépôts minces de plate-forme à des dépôts plus épais de bassin d'eau profonde. La corrélation fort complexe de ces couches a été rendue possible, en grande partie, grâce à une zonation bien étayée des conodontes ainsi qu'à des datations additionnelles obtenues à partir de palynomorphes et de mégafaunes. Afin de favoriser la découverte de gisements de pétrole et de gîtes minéraux, des datations et corrélations aussi précises que celles définies dans cette étude sont essentielles. La présente étude contribuera également à définir avec plus de précision les limites des principales divisions des temps géologiques dans d'autres parties du monde.

Ottawa

Elkanah A. Babcock
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Abstract

Conodont faunas from 18 separate stratigraphic units are described, and their biostratigraphic significance discussed. The study area encompasses southwestern Ellesmere Island and northwestern Devon Island of the Canadian Arctic Archipelago. In addition, three small islands located just west of Grinnell Peninsula are included. The units range in age from Late Ordovician (upper part of Fauna 12, Richmondian) to Middle Devonian (*costatus* Zone to possibly *australis* Zone, Eifelian). Most of the units have been biostratigraphically dated and correlations with the global boundary stratotypes located in western Europe effected.

The study area falls into two main depositional provinces: the Arctic Platform and the Franklinian Miogeocline. Following the Ellesmerian Orogeny, the latter province coincides with the Central Ellesmere Fold Belt, a part of the Franklinian Mobile Belt. The correlative strata in these provinces display considerable litho- and biofacies differences.

The succession of rocks was studied at eight localities, of which three surface sections are continuous (near Strathcona and Bird fiords on Ellesmere Island, and on the Sutherland River on Devon Island). Five sequences in the vicinity of Vendom Fiord are composites of shorter sections, whereas most of the localities on Grinnell Peninsula and the small nearby islands represent scattered outcrops, although some can be placed in approximate sequential order. Two sections are subsurface, from wells on Bjorne Peninsula on Ellesmere Island.

Four of the 18 units were studied at their type sections (Devon Island, Sutherland River, Prince Alfred, and Bird Fiord formations), while two units were studied at sections in close proximity to their types (Blue Fiord and Douro formations). In total 298 different stratigraphic intervals were studied, 209 from outcrops and 89 from the subsurface.

The conodont faunas are assigned to 94 multielement species and subspecies, and three form-species. Of these, four species are new: *Amydrotaxis chattertoni, Steptotaxis macgregori, S. maclareni, S. robleskyi,* and one subspecies, *Eognathodus bipennatus mayri.* Where possible, the conodont zones have been collated with those based on other fossil groups. Generally the conodonts are well preserved and of light amber colour or slightly darker (Colour Alteration Index, CAI of 1-2).

Résumé

La présente étude fournit une description des faunes de conodontes de 18 unités stratigraphiques distinctes et traite de leur importance biostratigraphique. La région à l'étude couvre le sud-ouest de l'île d'Ellesmere et le nord-ouest de l'île Devon de l'archipel Arctique canadien. Trois petites îles, situées juste à l'ouest de la presqu'île Grinnell, sont également incluses dans le territoire couvert par cette étude. L'âge des unités varie de l'Ordovicien supérieur (partie supérieure de la Faune 12, Richmondien) au Dévonien moyen (de la Zone à *costatus* jusqu'à, peut-être, la Zone à *australis*, Eifélien). La plupart des unités ont été datées biostratigraphiquement et corrélées aux stratotypes de limites reconnus à l'échell mondiale situés en Europe de l'Ouest.

La région à l'étude chevauche deux provinces de sédimentation principales : la plate-forme de l'Arctique et le miogéoclinal franklinien. Suite à l'orogenèse ellesmérienne, la seconde province correspond maintenant à la ceinture plissée du centre d'Ellesmere qui fait partie de la ceinture mobile franklinienne. Les couches qui ont été corrélées dans ces provinces présentent des lithofaciès et des biofaciès fort différents.

La succession de roches a été étudiée à l'aide de coupes provenant de huit localités, parmi lesquelles on trouve trois coupes de surface continues (près des fjords Strathcona et Bird dans l'île d'Ellesmere et sur la rivière Sutherland dans l'île Devon). Cinq séquences dans le voisinage du fjord Vendom sont constituées d'un assemblage de coupes plus courtes alors que dans

la presqu'île Grinnell et les petites îles voisines, les localités correspondent à des affleurements disséminés dont certains peuvent toutefois être placés dans un certain ordre de succession. Deux coupes sont souterraines, établies à partir de puits forés dans la péninsule Bjorne de l'île d'Ellesmere.

Quatre des 18 unités ont été analysées à l'emplacement même de leur stratotype (formations de Devon Island, de Sutherland River, de Prince Alfred et de Bird Fiord) tandis que deux autres unités ont été analysées dans des coupes situées à proximité de leur stratotype (formations de Blue Fiord et de Douro). Au total, 298 intervalles stratigraphiques distincts ont été étudiés, 209 à partir d'affleurements et 89 à partir de coupes souterraines.

Les faunes de conodontes ont été attribuées à 94 espèces et sous-espèces à composantes multiples et à trois espèces morphologiques. Quatre de ces espèces sont nouvelles : *Amydrotaxis chattertoni, Steptotaxis macgregori, S. maclareni, S. robleskyi*; ainsi que la sous-espèce, *Eognathodus bipennatus mayri.* Dans les unités s'y prêtant, les zones à conodontes ont été comparées à celles basées sur d'autres groupes de fossiles. En général, les conodontes sont bien conservés et présentent une couleur ambre clair ou légèrement plus foncé (indice d'altération des couleurs de 1 à 2).

Summary

The study focuses on a succession of rocks ranging in age from Late Ordovician (Richmondian Stage) to Middle Devonian (Eifelian Stage), in southwestern Ellesmere Island and northwestern Devon Island of the Canadian Arctic Archipelago. In addition, outcrops of the Disappointment Bay Formation, questionable Cape Phillips Formation, and an unnamed unit on three small islands, Crescent, Hyde Parker, and Spit (Kate), located in Penny Strait between Devon and Bathurst islands, are included. The succession is studied in parts at eight localities, of which three surface sections are continuous (at Strathcona Fiord and Bird Fiord on Ellesmere Island, and Sutherland River on Devon Island). Five sequences in the vicinity of Vendom Fiord are composites of shorter sections, whereas most of the localities on Grinnell Peninsula and the small nearby islands represent scattered outcrops, although some can be placed in approximate sequential order. Two sections are subsurface, from wells on Bjorne Peninsula on Ellesmere Island.

The succession is represented by 18 stratigraphic units, some of which are laterally equivalent. Some are informal in their usage. Most of these units have been biostratigraphically dated and have been correlated with the global boundary stratotype sections located in western Europe. Four of the units were studied at their type sections (Devon Island, Sutherland River, Prince Alfred, and Bird Fiord formations), while two units were studied at sections in close proximity to their type sections (Blue Fiord and Douro formations). In total, 298 separate stratigraphic levels were studied, 209 of which are from outcrops and 89 from the subsurface.

The study area encompasses two main depositional provinces: the Arctic Platform and the Franklinian Miogeocline, the latter coinciding with the Central Ellesmere Fold Belt, a part of the Franklinian Mobile Belt. Generally, the rocks of the Arctic Platform were deposited in relatively shallow waters, in part restricted in circulation, and nearshore. The Franklinian Mobile Belt strata that are dealt with in this study, on the other hand, are predominantly shelf sediments; Devonian nonmarine clastics are higher in the sequence. The Arctic Platform successions are limited to the area east of Vendom Fiord in the study area. They are considerably thinner than their counterparts in the Franklinian Mobile Belt, located to the west of the Fiord; the Blue Fiord Formation, for example, thickens from 231 m on the east to 1050 m on the west.

The primary purpose of this study is to date the above succession by means of conodonts, and to correlate the different units both within the study area, and with the global boundary stratotypes located in western Europe. Briefly, conodonts are microscopic (generally 0.1 to 1 mm in size), apatitic hard parts of an extinct group of marine animals. They are common to abundant in rocks of Late Cambrian to Triassic age. Because of their rapid evolution and widespread distribution in a variety of marine rocks, the conodonts have come to be regarded as an important group of index fossils.

Although conodont distribution is in general widespread, it is affected somewhat by different depositional environments. The polygnathid fauna, on which the international zonation is based in the Emsian Stage, for example, is abundant in the Blue Fiord Formation in parts of the Franklinian Mobile Belt, but is completely absent in the Arctic Platform. There, only the ubiquitous pandorinellinids are present. The polygnathid fauna is replaced by icriodontids as the lithofacies shifted from the carbonates of the Blue Fiord Formation to the clastics of the overlying Bird Fiord Formation.

The conodont zones/faunas encountered in this study may be briefly summarized as follows. In the Ordovician, conodonts of Fauna 12 (mid-Maysvillian to Richmondian) are present in the Irene Bay Formation and the lowest part of the overlying Allen Bay Formation. Fauna 13 of the Gamachian Stage may be represented in the lower Allen Bay Formation.

In the Silurian, the *celloni* Zone of the Telychian Stage (Llandovery) occurs in the highest part of the Allen Bay Formation, the lowest part of the Allen Bay-Read Bay carbonates, and in the lower Cape Phillips Formation. The Cape Phillips Formation also hosts the *patula* Zone of Wenlock age. The uppermost part of the Douro Formation contains the *siluricus* Zone (late Ludlow), and it is probable that the zone occurs throughout that formation.

In the Devonian, conodonts of the *hesperius* to *eurekaensis* zones interval (early Lochkovian) are present in the middle Sutherland River Formation at its type section. Lochkovian faunas also occur in the upper Cape Phillips to "Eids" (lower limestone member) formations and in the Devon Island Formation. The latter unit may range as high as the Pragian Stage.

The *dehiscens, gronbergi, inversus,* and *serotinus* zones (Emsian Stage) are well represented in the Blue Fiord Formation. The Vendom Fiord Formation yielded conodonts of early Emsian age. The Bird Fiord and Strathcona Fiord formations contain an icriodontan fauna noted above, but probably range in age from *costatus* to *australis* zones (Eifelian).

Only broad collations can be made between zonations based on conodonts and other fossil groups. In the Silurian part of the study, the graptolite *Cyrtograptus sakmaricus-C. laqueus* Zone occurs in the Cape Phillips Formation between the *celloni* and *patula* zones and therefore, by position, approximately equal to the *amorphognathoides* Zone. The latter zone straddles the Llandovery-Wenlock boundary. In a similar stratigraphic position, also in the Cape Phillips Formation, graptolites of latest Llandovery to earliest Wenlock age were found just above the *celloni* Zone of Telychian (C_5) age. Ludlow age brachiopods in the Douro Formation are associated with probable *siluricus* Zone conodonts.

In the Devonian, in the interval that can only be placed within the *hesperius* to *delta* zones (early Lochkovian), graptolites of the *M. uniformis* Zone are found in the Devon Island Formation, and of the *M. praehercynicus* Zone in the Cape Phillips Formation. Within this conodont interval, too, the brachiopod *Gypidula pelagica* Fauna occurs in the "Eids" Formation (lower limestone member), and in the interval of uppermost Devon Island to lowermost Sutherland River formations.

In the interval of *dehiscens* to *gronbergi* zones (early Emsian) in the Vendom Fiord Formation, the brachiopod *Sieberella-Nymphorhynchia pseudolivonica* Fauna occurs. In the Blue Fiord Formation, the *dehiscens* Zone hosts the brachiopod *A. kobehana* to lower *E. pinyonensis* zones, and the *inversus* Zone, the *Elythyna* beds or the *E. pinyonensis* Zone. An icriodontan fauna, consisting primarily of *Steptotaxis* spp., in the Bird Fiord Formation is associated with the brachiopod *W. kirki* Zone. The associated megafossils and palynomorphs are listed in the Appendix.

Systematic descriptions are given of 94 multielement species and subspecies, and three form-species. Of these, four species are new (*Amydrotaxis chattertoni, Steptotaxis macgregori, S. maclareni*, and *S. robleskyi*), and one subspecies (*Eognathodus bipennatus mayri*). The fauna can be assigned to eleven established families, plus an unknown family.

The conodonts contain trace amounts of organic matter that undergo visible changes in colour from pale yellow (Colour Alteration Index = 1) to brown to black (CAI = 5) with increasing temperature, as a result of a carbon-fixing process. The thermal window for commercial oil production generally corresponds with CAI 1-2 and gas with CAI 1-4.5. A thermal maturity study of the conodonts from two wells located on Bjorne Peninsula in southwestern Ellesmere Island was reported on briefly in the past. It was concluded that for the most part, CAI 1-2 corresponds with the "mature" rating in terms of organic source rock potential (SRP), based on geochemical study. Some discrepancies between the CAI and SRP readings may perhaps be explained by the different lithotypes from which the conodonts were extracted.

Generally the conodonts studied herein are well preserved and have CAI values of 1-2. Detailed regional patterns of CAI readings will be given in a future paper.

Sommaire

La présente étude porte sur une succession de roches, dont l'âge varie de l'Ordovicien supérieur (Richmondien) au Dévonien moyen (Eifélien), située dans le sud-ouest de l'île d'Ellesmere et le nord-ouest de l'île Devon de l'archipel Arctique canadien. Des affleurements localisés dans trois petites îles (Crescent, Hyde Parker et Spit (Kate)) situées dans le détroit de Penny, entre les îles Devon et Bathurst, sont également inclus dans le territoire couvert par l'étude. Ces affleurements sont rattachés à la Formation de Disappointment Bay, à la formation de Cape Phillips de nature discutable, ainsi qu'à une unité innommée. L'étude de la succession est basée sur un grand nombre de coupes partielles situées dans huit localités, dont trois coupes de surface continues (près des fjords Strathcona et Bird dans l'île d'Ellesmere et sur la rivière Sutherland dans l'île Devon). Cinq séquences dans le voisinage du fjord Vendom sont constituées d'un assemblage de coupes plus courtes alors que dans la presqu'île Grinnell et les petites îles voisines, les localités correspondent à des affleurements disséminés dont certains peuvent toutefois être placés dans un certain ordre de succession. Deux coupes sont souterraines, établies à partir de puits forés dans la péninsule Bjorne de l'île d'Ellesmere.

La succession est représentée à l'aide de 18 unités stratigraphiques, dont quelques-unes sont latéralement équivalentes. Certaines sont utilisées de façon informelle. La plupart de ces unités ont été datées biostratigraphiquement et corrélées aux stratotypes de limites reconnus à l'échelle mondiale situés en Europe de l'Ouest. Quatre unités ont été analysées à l'emplacement même de leur stratotype (formations de Devon Island, de Sutherland River, de Prince Alfred et de Bird Fiord) tandis que deux autres unités ont été analysées dans des coupes situées à proximité de leur stratotype (formations de Blue Fiord et de Douro). Au total, 298 intervalles stratigraphiques distincts ont été étudiés, 209 à partir d'affleurements et 89 à partir de coupe souterraines.

La région à l'étude couvre deux provinces de sédimentation principales : la plate-forme de l'Arctique et le miogéoclinal franklinien, ce dernier correspondant à la ceinture plissée du centre d'Ellesmere, qui fait partie de la ceinture mobile franklinienne. En général, les roches de la plate-forme de l'Arctique se sont déposées dans des eaux relativement peu profondes, à circulation partiellement limitée, près du littoral. Les couches de la ceinture mobile franklinienne dont il est question dans la présente étude sont, par ailleurs, surtout composées de sédiments épicontinentaux; les roches clastiques continentales dévoniennes sont situées à un niveau stratigraphique plus élevé. Les successions de la plate-forme de l'Arctique, dans la région à l'étude, ne se trouvent que dans la zone à l'est du fjord Vendom. Elles sont beaucoup plus minces que leurs équivalents latéraux dans la ceinture mobile franklinienne, à l'ouest du fjord; l'épaisseur de la Formation de Blue Fiord, par exemple, passe de 231 m à l'est à 1050 m à l'ouest.

La principal objectif poursuivi par cette étude est de dater la succession décrite précédemment, au moyen des conodontes qu'elle renferme, et de corréler, entre elles, les différentes unités à l'intérieur de la region à l'étude et avec les stratotypes de limites reconnus à l'échelle mondiale situés en Europe de l'Ouest. De façon sommaire, les conodontes peuvent être considérés comme les parties dures apatitiques microscopiques (généralement de 0,1 à 1 mm de dimension) d'animaux marins, appartenant à un groupe aujourd'hui disparu. Leur présence est de fréquente à abondante dans les roches s'étendant du Cambrien supérieur au Trias. En raison de leur évolution rapide et de leur répartition très répandue dans différentes roches marines, les conodontes sont maintenant considérés comme un important groupe de fossiles caractéristiques.

Même si la répartition des conodontes est en général assez répandue, elle est, toutefois, quelque peu influencée par la nature des milieux de sédimentation. La faune de polygnathides, qui a servi à établir la zonation internationale de l'Étage Emsien, par exemple, est abondante dans la Formation de Blue Fiord, dans certaines parties de la ceinture mobile franklinienne, mais est complètement absente des unités de la plate-forme de l'Arctique où l'on n'observe que les omniprésents pandorinellenides. Les icriodontanidés succèdent aux polygnathidés à mesure que le lithofaciès passes des carbonates de la Formation de Blue Fiord aux roches clastiques de la Formation de Bird Fiord sus-jacente.

Les zones et faunes à conodontes observées dans la présente étude peuvent être présentées sommairement de la façon qui suit. Dans les unités ordoviciennes, les conodontes de la Faune 12 (du Maysvillien moyen au Richmondien) sont présents dans la Formation d'Irene Bay et dans la partie inférieure de la Formation d'Allen Bay sus-jacente. La Faune 13, de l'Étage Gamachien, se situe au niveau de la partie inférieure de la Formation d'Allen Bay.

Dans les unités siluriennes, la Zone à *celloni* de l'Étage Telychien (Llandovérien) occupe le sommet de la Formation d'Allen Bay, la base des carbonates d'Allen Bay et de Read Bay ainsi que la partie inférieure de la Formation de Cape Phillips. La Formation de Cape Phillips contient également la Zone à *patula* du Wenlockien. Le sommet de la Formation de Douro contient la Zone à *siluricus* (Ludlowien supérieur) et il est probable que cette zone s'étende à l'ensemble de cette formation.

Dans les unités dévoniennes, les conodontes de l'intervalle s'étendant de la Zone à *hesperius* et à la Zone à *eurekaensis* (Lochkovien inférieur) sont présents dans la partie centrale de la Formation de Sutherland River à l'emplacement de son stratotype. Les faunes lochkoviennes se manifestant également dans la séquence s'étendant de la partie supérieure de la Formation de Cape Phillips à la Formation de "Eids" (membre calcaire inférieur) ainsi que dans la Formation de Devon Island. Cette dernière unité pourrait s'étendre aussi loin qu'à l'Étage Pragien.

Les zones à *dehiscens, gronbergi, inversus* et *serotinus* (Étage Emsien) sont bien représentées dans la Formation de Blue Fiord. La Formation de Vendom Fiord contient des conodontes de l'Emsien inférieur. Les formations de Bird Fiord et de Strathcona contiennent une faune d'icriodontanidés, tel qu'il a été mentionné précédemment, mais leur âge s'étend probablement de la Zone à *costatus* à la Zone à *australis* (Eifélian).

Seules des comparaisons très générales peuvent être effectuées à partir des zonations basées sur les conodontes et d'autres groupes fossiles. Dans le secteur de l'étude occupé par des roches siluriennes, la Zone de graptolites *Cyrtograptus sakmaricus*–*C. laqueus* est présente dans la Formation de Cape Phillips entre les zones à *celloni* et à *patula* de sorte qu'elle se situe à un niveau à peu près équivalent à celui de la Zone à *amorphognaoides*. Cette dernière zone chevauche la limite séparant le Llandovérien du Wenlockien. À peu près au même niveau stratigraphique, également à l'intérieur de la Formation de Cape Phillips, des graptolites de la toute fin du Llandovérien au tout début du Wenlockien sont présents juste au-dessus de la Zone à *celloni* du Télychien (C5). Les brachiopodes ludlowiens de la Formation de Douro sont associés aux conodontes représentant, probablement, la Zone à *siluricus*.

Dans les unités dévoniennes, on observe des graptolites appartenant à la Zone à *M. uniformis*, dans la Formation de Devon Island, et à la Zone à *M. praehercynicus*, dans la Formation de Cape Phillips, dans un intervalle qui ne peut être placé qu'au sein des zones à *hesperius* et à *delta* (Lochkovien inférieur). Au sein de ce même intervalle de conodontes, la Faune de brachiopodes *Gypidula pelagica* sont présents dans la Formation de "Eids" (membre calcaire inférieur) et dans l'intervalle s'étendant du sommet de la Formation de Devon Island à la base de la Formation de Sutherland River.

Dans l'intervalle s'étendant de la Zone à *dehiscens* à la Zone à *gronbergi* (Emsien inférieur) à l'intérieur de la Formation de Vendom Fiord, on trouve des brachiopodes appartenant à la Faune *Sieberella–Nymphorhynchia pseudolivonica.* Dans la Formation de Blue Fiord, la Zone à *dehiscens* renferme des brachiopodes de la Zone à *A. kobehana* jusqu'à la partie inférieure de la Zone à *E. pinyonensis* et la Zone à *inversus*, quant à elle, renferme des brachiopodes des couches à *Elythyna* ou de la Zone à *E. pinyonensis.* Dans la Formation de Bird Fiord, une faune d'icriodontanidés, composée principalement de *Steptotaxis* spp., est associée à la Zone de brachiopodes *W. kirki.* Une liste des mégafossiles et des palynomorphes associés est présentée dans l'annexe.

Quatre-vingt-quatorze espèces et sous-espèces à composantes multiples et trois espèces morphologiques sont décrites systématiquement. Quatre de ces espèces (*Amydrotaxis chattertoni, Steptotaxis macgregori, S. maclareni* et *S. robleskyi*) et une sous-espèce (*Eognathodus bipennatus mayri*) sont nouvelles. La faune identifiée peut être répartie en onze familles établies, plus une famille non connue.

Les conodontes contiennent des quantités à l'état de traces de matières organiques qui subissent des changements visibles de couleur passant du jaune pâle (indice d'altération des couleurs = 1) au brun à noir (indice d'altération des couleurs = 5) à mesure que la température augmente, par suite d'un processus de fixation du carbone. La fenêtre thermique délimitant la zone de production commericale du pétrole correspond généralement à un indice d'altération des couleurs de 1 à 2 alors que celle du gaz s'étend de 1 à 4,5. Les résultats d'une étude de maturité thermique effectuée à l'aide des conodontes provenant de deux puits situés dans la péninsule Bjorne, dans le sud-ouest de l'île d'Ellesmere, ont été sommairement présentés dans le passé. Selon les conclusions de cette étude, un indice d'altération des couleurs de 1 à 2 correspondait, dans la majorité des cas, à un potentiel de roche mère organique, évalué selon une approche géochimique, situé dans la catégorie "mature". Certaines discordances qui ont pu être observées entre l'indice d'altération des couleurs et le potentiel de roche mère pourraient s'expliquer par le prélèvement des conodontes dans des lithotypes différents.

Les conodontes, qui ont fait l'objet de la présente étude, sont en général bien conservés et la valeur de leur indice d'altération des couleurs est de 1 à 2. Les configurations régionales détaillées des indices d'altération des couleurs seront présentées dans une prochaine publication.

PART I. INTRODUCTION

Location and scope of study

Ellesmere and Devon islands are situated in the eastern part of the Canadian Arctic Archipelago (Fig. 1). The study area encompasses the southwestern part of Ellesmere Island and northwestern part of Devon Island, including Grinnell Peninsula (NTS 49 C, D, E; 59B; 69A). Three small islands, Crescent, Hyde Parker, and Spit (Kate), located in the Penny Strait and to the west of Grinnell Peninsula, have also been included since results of preliminary sampling have shown that the Devonian rocks there contain conodont faunas not present in other parts of the study area.

Seven stratigraphic sequences have been examined, of which three surface sections are continuous (Strathcona Fiord and Bird Fiord on Ellesmere Island, and Sutherland River on Devon Island; see Figures 1, 3, 6, and 8). The two sequences in the vicinity of Vendom Fiord are composites of shorter sections. Most of the samples from Area 4 (Figs. 1, 8, and 9), covering the southern part of Grinnell Peninsula and environs are from scattered outcrops, although some can be placed in an approximate sequential order. Two successions are subsurface, from wells on Bjorne Peninsula on Ellesmere Island (Figs. 1, 6, and 7).

The stratigraphic units studied here range from Late Ordovician to Middle Devonian in age. The units include the

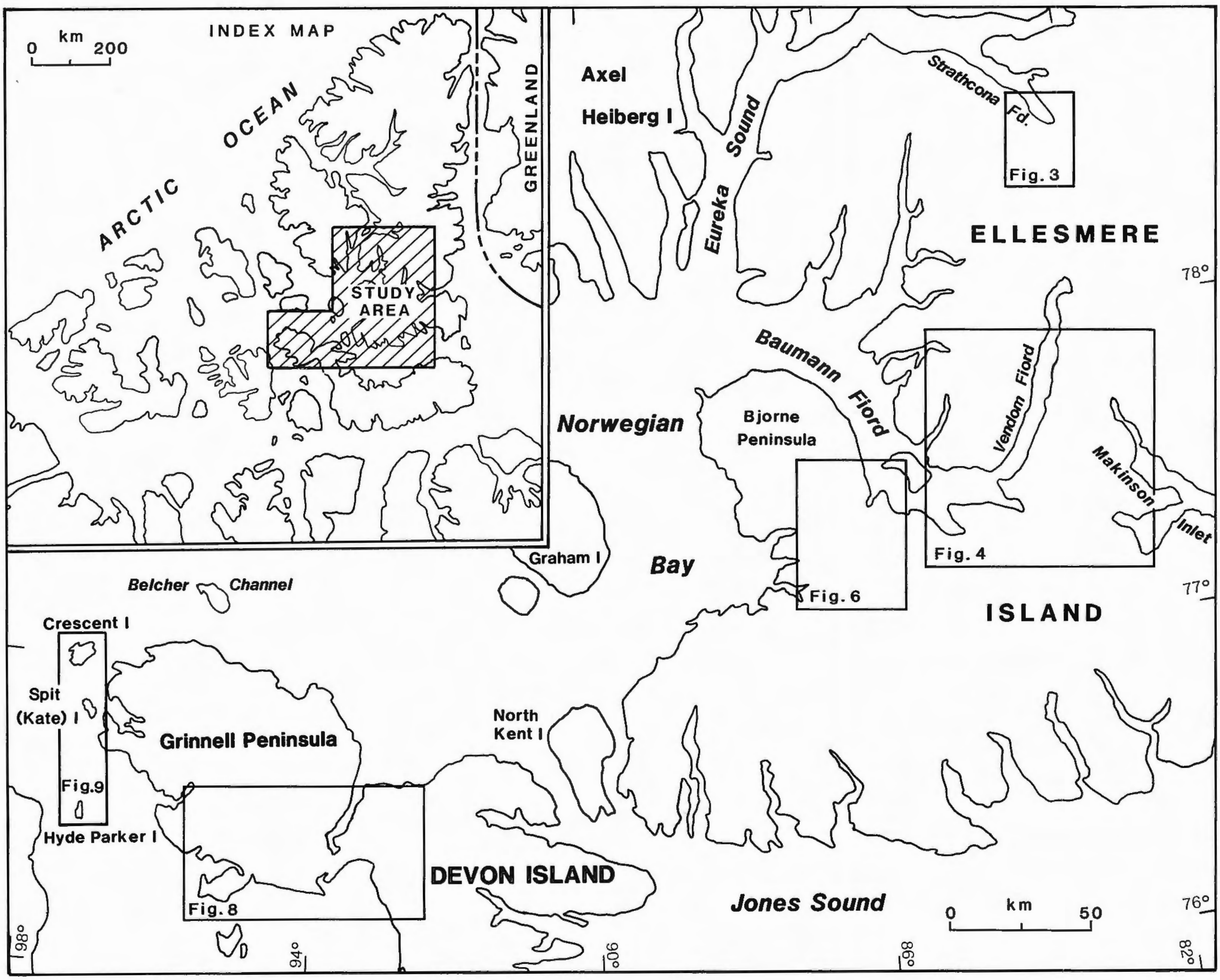


Figure 1. Index map of the Canadian Arctic Archipelago, showing locations of study areas.

type sections of the Devon Island, Sutherland River, and Prince Alfred formations (all at Section 3), and Bird Fiord Formation (Section 2A). The Blue Fiord Formation at the Bird Fiord section (2A) and the Douro Formation at Sutherland River (3) were measured and sampled at close proximity to their type sections.

This investigation is part of a comprehensive taxonomic and biostratigraphic study of Silurian and Devonian conodonts of the Canadian Arctic Islands. The overall objective of the study is to establish and apply conodont zones for regional and intercontinental correlation of Silurian and Devonian marine strata. To meet this task, it is necessary to identify and describe the fossils, some of which are new, and compare their ranges with those established in classic sections of Europe where global boundary stratotypes are located.

Field and laboratory work

A systematic study of Silurian and Devonian conodonts of the Canadian Arctic Islands was initiated by the writer in 1968. In the summer of that year and again in 1969, he and D.C. McGregor of the Geological Survey of Canada, measured and sampled nine sections in various parts of the Archipelago, from Prince Patrick Island on the west to Ellesmere Island in the east (McGregor and Uyeno, 1969; Uyeno and McGregor, 1970). Two of the sections in the present study were measured in 1969, with a five-foot staff equipped with a spirit level. Transportation between Resolute on Cornwallis Island and the sections was by casual charter of aircraft from Atlas Aviation and Gateway Aviation.

The Vendom Fiord Fiord sections were measured and sampled in 1977 by R.F. Roblesky as part of his M.Sc. thesis (Roblesky, 1979). Roblesky kindly consented to write the stratigraphy and depositional history of the various units in the Vendom Fiord area, and his work forms part of the present report. Sections on Sheills Peninsula in southern Grinnell Peninsula were measured and sampled in 1970 by U. Mayr while employed by J.C. Sproule and Associates Ltd., Calgary. Spot samples from elsewhere on Grinnell Peninsula and from three small islands to the west, were collected in 1971, 1972, and 1974 by J.Wm. Kerr while employed by the Geological Survey of Canada.

Conodonts from two wells on Bjorne Peninsula in southwestern Ellesmere Island, Panarctic Tenneco et al. Eids M-66 and Panarctic ARCO et al. Blue Fiord E-46, were obtained from bulk cuttings. The samples were provided in 1977 by Panarctic Oils Ltd., Petro-Canada Exploration Inc., and Tenneco Oil and Minerals, Ltd. A brief summary of the stratigraphy and conodont biostratigraphy was presented earlier by Mayr et al. (1978). Mayr kindly consented to write the stratigraphy and depositional history of the various units in these wells, and his report forms part of the present paper.

Regional geological setting

The sedimentary rocks of southwestern Ellesmere Island and northwestern Devon Island are situated principally within the Franklinian Mobile Belt (Fig. 2). East of Vendom Fiord, one of the composite sections (R-C) probably lies at the extreme cratonic edge of the Mobile Belt, whereas Composite Sections R-B, R-D, and R-F are located within the Arctic Platform (Fig. 4; Tables 4 and 5). Preliminary structural cross-sections at and close to the localities studied here were presented by Okulitch (1982).

According to Trettin (1987), the Franklinian Mobile Belt on Ellesmere Island comprises three major parts: 1) a southeasterly cratonic shelf (miogeocline), the Central Ellesmere Fold Belt, which consists predominantly of Cambrian to Ordovician shelf strata, but includes Silurian to Lower Devonian deep-water sediments, and Middle and Upper Devonian nonmarine clastics; 2) an inner sedimentary belt, the Hazen Fold Belt, predominantly of deep-water origin, but which includes Lower Cambrian shelf sediments in its southeastern part; and 3) an outer sedimentary-volcanic belt, deposited in deep water, the Clements Markham Fold Belt. The present study area lies entirely within the Central Ellesmere Fold Belt. Christie (1979) succinctly summarized the history of the Canadian portion of the Franklinian Geosyncline, and related the Innuitian region to Svalbard.

According to Thorsteinsson and Tozer (1970), the Mobile Belt was the site of almost continuous, intensive sedimentation between late Precambrian and Late Devonian times. In the shelf part of the Mobile Belt, carbonate, quartzose sandstone, and shale are the dominant facies that constitute sedimentary rocks in excess of 12 000 m thick.

The Arctic Platform includes the terrane where the Precambrian basement is overlain by flat-lying or little disturbed sedimentary strata predominantly of early Paleozoic age (Thorsteinsson and Tozer, 1970). The lower Paleozoic sequence ranges in age from Early Cambrian to Late Devonian in the north and from Middle Ordovician to Early Silurian in the south, and becomes thinner higher in the succession. To the northwest and north, the lower Paleozoic sediments are contiguous with folded strata of the Franklinian Mobile Belt and form a westerly- and northwesterly-dipping homocline (Goodbody, 1987).

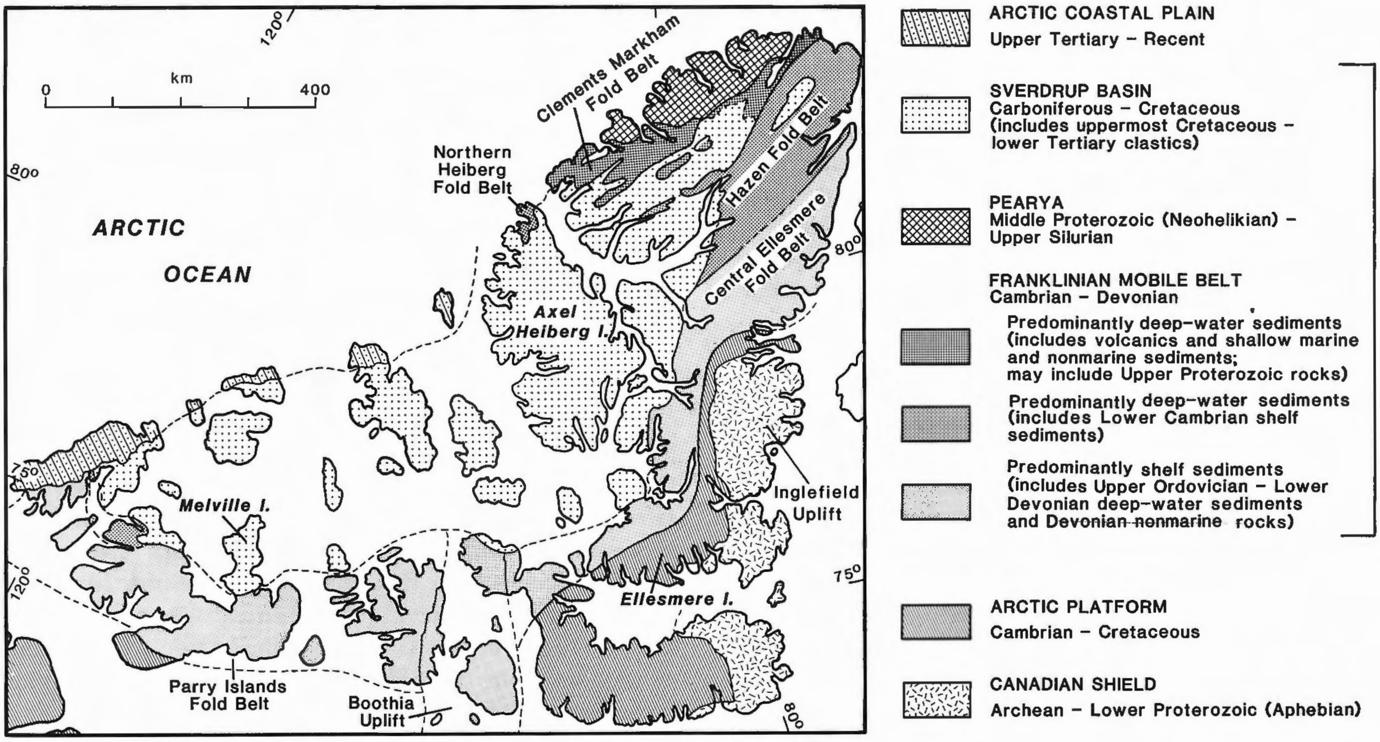


Figure 2. Stratigraphic-structural framework of the Canadian Arctic Archipelago. (After Trettin, 1987; Harrison and Bally, 1988). Note: strata of the Arctic Platform range in age from Cambrian to Cretaceous. Rocks younger than Devonian, however, constitute only a small fraction of the total exposed area.

Acknowledgments

The writer is grateful to R. Thorsteinsson and G.S. Nowlan of the Geological Survey of Canada, and P. Bultynck of the Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussels, for constructive comments on the manuscript; D.C. McGregor of the Geological Survey of Canada for his cooperation in the field and for unpublished information on the palynomorphs; R. Thorsteinsson for his guidance while measuring and sampling the lower parts of the Strathcona Fiord section, for supplying crucial samples that "filled in the gaps", especially the sample from the upper part of the Devon Island Formation from near the junction of Baumann and Vendom fiords, and for identifying the graptolites; A.W. Norris and B.S. Norford, both of the Geological Survey of Canada, for identifying the brachiopods and other megafossils; U. Mayr, now of the Geological Survey of Canada and R.F. Roblesky, now of Shell Canada Ltd., Calgary, for providing samples from Sheills Peninsula and Vendom Fiord area, respectively; D.W. Morrow of the Geological Survey of Canada for providing detailed geographic and stratigraphic information on samples from Grinnell Peninsula and neighbouring small islands; A.D. McCracken of the Geological Survey of Canada for providing a preprint of his paper co-authored with G.S. Nowlan; the Polar Continental Shelf Project for logistic support in the Arctic Islands; G.P. Michael, now with the University of Calgary, for taking SEM micrographs of some of the illustrated conodonts; and E. Ikebuchi for preparing some of the illustrations.

PART II. NOTES ON THE CONODONT FAUNAS

Previous conodont studies in the Canadian Arctic Islands

One of the earliest reports of conodonts of Siluro-Devonian age in the Arctic Islands was by Walliser (*in* Boucot et al., 1960), from beds located near Ptarmigan Lake in northwestern Devon Island (Section 3C herein; Fig. 8). These beds, which were originally assigned to the Sutherland River Formation, are now placed in the upper parts of Devon Island Formation, following revisions by Morrow and Kerr (1977, p. 53). Although originally believed to be of Late Silurian age, the associated megafossils were later dated as early Gedinnian (Berry and Boucot, 1970, p. 228). The upper parts of Devon Island Formation at nearby Sutherland River (Section 3A herein) were similarly dated as early Lochkovian (Thorsteinsson and Uyeno, 1981, p. 28).

Klapper (1969) described a fauna, now known to be of the *inversus* Zone, from the Blue Fiord Formation at Sutherland River (Section 3A herein; Fig. 8). Microfossils, including conodonts, from Ordovician, Silurian, and Devonian strata on Bathurst, Cornwallis, Devon, and Ellesmere islands were the subject of a Ph.D. thesis of Weyant (1971). The Lower Devonian conodonts from the lower member of the Blue Fiord Formation at the head of Eids Fiord in southwestern Ellesmere Island were subsequently described by that author (Weyant, 1975).

Lower and Middle Devonian conodonts from Young Inlet in northeastern Bathurst Island were listed, and some of the more biostratigraphically useful forms illustrated, by Uyeno (*in* McGregor and Uyeno, 1972). Conodonts from the "Blue Fiord" Formation in the subsurface of Cameron and Vanier islands, located northeast of Bathurst Island, were listed and illustrated by Uyeno and Mayr (1979). Two other papers, both of which are expanded in this report, were on conodonts of the Blue Fiord and Bird Fiord formations in their type area and at Sor Fiord (Section 2A herein; Fig. 6), and on Ordovician through Devonian sequences in two wells on Bjorne Peninsula (Sections 2B and 2C herein; Fig. 6) (Mayr et al., 1978; Uyeno and Klapper, 1980). Lower Ordovician through Lower Devonian conodonts from the Arctic Platform in the subsurface of northwestern Victoria, Prince of Wales and northeastern Somerset islands were listed, and some of the more biostratigraphically significant forms illustrated, by Mayr et al. (1980). The Upper Silurian and Lower Devonian stratigraphy, biostratigraphy, and description of conodonts in the environs of Boothia Uplift were published by Thorsteinsson and Uyeno (1981). A general summary of Lower and Middle Devonian conodont biostratigraphy of the Franklinian Mobile Belt and Arctic Platform of the Canadian Arctic Archipelago, was presented by Uyeno (1981b). Finally, data on those localities with the Lower-Middle and Middle-Upper Devonian boundaries in the Arctic Islands were summarized by McGregor et al. (1986).

Mirza (1976) and Barnes et al. (1976) reported on conodonts and conodont biostratigraphy from Upper Ordovician to Upper Silurian strata of the eastern Arctic Islands. The Upper Ordovician Fauna 12 of Sweet et al. (1971) was noted to occur in the Irene Bay Formation, extending to the lower part of the Allen Bay Formation. The Ordovician-Silurian boundary was considered to be disconformable. The superjacent conodont faunas reported were of middle Llandovery, Wenlock, and Ludlow ages.

Extensive listings of Ordovician and Silurian conodonts, identified by C.R. Barnes, G.S. Nowlan, and T.T. Uyeno, from Devon Island were reported by Thorsteinsson and Mayr (1987). The study area did not include Grinnell Peninsula. Similar listings of Lower, Middle, and Upper Ordovician, and Upper Silurian conodonts, identified by Barnes and Uyeno, from Somerset Island and northern Boothia Peninsula were reported by Stewart (1987).

Numerous studies of Canadian Arctic material of ages other than Silurian and Devonian have been undertaken. Nowlan (1976, 1979, 1985) and Barnes et al. (1976) described or listed conodonts of Late Cambrian to Late Ordovician age from the Franklinian Mobile Belt of the eastern Arctic islands.

In one of the earlier studies of Canadian Arctic Ordovician conodonts, Weyant (1968) described some upper Middle and lower Upper Ordovician forms from the upper part of the Cornwallis Group to the lower Allen Bay Formation on Hoved Island, a small island located in the Baumann Fiord in southwestern Ellesmere Island. A summary of data that were available up to that time on Ordovician conodont biostratigraphy of the Canadian Arctic was presented by Barnes (1974). Barnes (1977) described Middle Ordovician conodonts from the Ship Point and Bad Cache Rapids formations on Melville Peninsula. Landing and Barnes (1981) reported on a Lower Ordovician conodont fauna from the Cape Clay Formation in southern Devon Island.

Bender (1973) measured and sampled three sections in the Pennsylvanian and Lower Permian of northwestern Ellesmere Island. They included the type sections of the Nansen, Otto Fiord, and Hare Fiord formations. Conodont faunas of the Lower and Middle Pennsylvanian parts of the collections were described (Bender, 1980), and a manuscript on the remainder, coauthored with C.M. Henderson, is in the final stages of preparation.

Kozur and Nassichuk (1977) discussed Middle Permian representatives of *Gondolella* from the Assistance and Degerböls formations at northeastern Ellesmere Island. Henderson (1981) described some upper Lower to Middle Permian conodonts from northern Ellesmere Island. Nassichuk and Henderson (1986) determined the age of Belcher Channel Formation at southwestern Ellesmere Island, on the basis of ammonoids and conodonts.

Mosher (1973) described some Lower and Upper Triassic conodonts from nine samples obtained from matrices of Tozer's (1967) ammonoid collections. They originated from the Blind Fiord, Schei Point, and Blaa Mountain formations on northeastern Ellesmere and northern Axel Heiberg islands. Lower Triassic neogondolellid conodonts from the Blind Fiord Formation on Bjorne Peninsula, southwestern Ellesmere Island, were the subject of a talk presented by Rafek (1983).

At least a mention of some of the papers on conodonts from the neighbouring island of Greenland should be made.

Conodont faunas of Ordovician and Silurian age have been reported from Washington, Peary, and Hall lands, and even from limestone blocks in a fault zone breccia in the Precambrian Shield in West Greenland (Aldridge, 1979; R.J. Aldridge and H.A. Armstrong *in* Dawes and Peel, 1984; Stouge and Bagnoli Stouge, 1985; Stouge et al., 1985; Stouge and Peel, 1979). In a brief note, Smith (1982) reported on a 4000 m thick sequence, ranging in age from late Early Ordovician to Chazyan (Middle Ordovician). The units studied were the Cape Weber, Narwhal Sound, and Heim Bjerge formations at East Greenland.

Brief review of graphic correlations based on Ordovician, Silurian, and Devonian conodonts

Using the graphic correlation method initially proposed by Shaw (1964), Sweet (1979, 1984; summarized in Sweet and Bergström, 1986) established a Composite Standard Section (CSS) for upper Middle and Upper Ordovician rocks in the North American Midcontinent Province. The CSS provides the total stratigraphic ranges of species in terms of the 477 m thick sequence of rocks in the Cincinnati Region of Kentucky, Ohio, and Indiana. The CSS was divided into 79.5 vertically continuous 6 m thick units termed chronozones, which represent approximately equal time intervals.

A similar model for the Silurian was proposed by Kleffner (1985), using the section at Cellon, Austria as the Standard Reference Section (SRS). The Cellon section provided the basic sequence for Walliser's (1964) original zonation. The Silurian was divided into 16 standard time units (STUs), of approximately equal length, each 3.6 m thick in the SRS. In the interval of upper Llandovery to upper Pridoli, only three of the 10 zones previously assigned were recognized in the proposed chronostratigraphy: the *crassa, ploeckensis,* and *eosteinhornensis* zones. Among other revisions, it was proposed that the *crispa* Zone be incorporated in the *eosteinhornensis* Zone.

It may, however, be stratigraphically useful to continue to recognize the *crispa* Zone. Schönlaub (1986a) observed that in the same Cellon section, the upper range of *Ozarkodina crispa* (Walliser) is beneath the lowest occurrence of *Monograptus parultimus* Jaeger, and therefore the *crispa* Zone is entirely of Ludlow age.

The graphic correlation method was also used by Murphy and Berry (1983) to collate conodont, graptolite, brachiopod, and coral zones of the Lower Devonian of central Nevada. They observed that the interval of *hesperius* through *pesavis* zones in western North America is approximately equivalent to the Lochkovian of Czechoslovakia, and the Pragian begins approximately with the *sulcatus* Zone. The ranges of species depicted through graphic correlation are very similar to those reported by Schönlaub (*in* Chlupáč et al., 1985) from the Barrandian area of Czechoslovakia.

Ordovician-Silurian boundary

This systemic boundary is briefly reviewed here for two reasons: (1) the apparent disconformity at this level in many areas, including the Arctic Islands, presumably owing to eustatic sea level lowering and (or) cooling of waters resulting from Late Ordovician glaciation, and (2) the recent selection of the stratotype for this boundary and the subsequent concern that has been raised.

The Ordovician-Silurian boundary was selected to coincide with the base of the *Parakidograptus acuminatus* graptolite Biozone, with the stratotype located in a section at Dob's Linn near Moffat in the Southern Uplands of Scotland, U.K. (Bassett, 1985; Cocks, 1985; Holland, 1985). Subsequently there has been some concern about this selection (Berry, 1987; Lespérance et al., 1987). In terms of conodont zonation at Anticosti Island, the *P. acuminatus* level is probably above the top of Fauna 13 (McCracken and Nowlan, 1988), and therefore presumably within the lower part of the *Oulodus*? *nathani* Zone of McCracken and Barnes (1981).

Of the sections studied here, the Strathcona Fiord area (Section 1; Tables 1 and 2) presents the only sequence that possibly contains the Ordovician-Silurian boundary. As noted in the discussion under that section, *Amorphognathus ordovicicus* Branson and Mehl and *Pseudobelodina vulgaris vulgaris* Sweet range upward from the underlying Irene Bay Formation to the basal 82 m of the Allen Bay Formation. At the level of 114 m above the base of the formation, the occurrence of *Panderodus* cf. *P.* n. sp. A of McCracken and Barnes (1981) gives a hint of the presence of Fauna 13. *Oulodus*? *kentuckyensis* (Branson and Branson) occurs 213 m above the base of the formation. On Anticosti Island, *Panderodus* n. sp. A is restricted to the interval of Fauna 13, and *O.*? *kentuckyensis* has its lowest occurrence in the "Mixed Fauna" and ranges higher (McCracken and Barnes, 1981; McCracken and Nowlan, 1988). On this basis, the systemic boundary is tentatively placed at Section 1 between 114 m and 213 m above the base of the Allen Bay Formation. There is a strong possibility that the boundary is represented by disconformity, as noted below.

Fauna 13 was introduced by McCracken and Barnes (1981) and has been regarded as an informal acme zone in which *Gamachignathus ensifer* McCracken, Nowlan, and Barnes is very abundant (McCracken and Nowlan, 1988). As such it is difficult to recognize its presence without continuous sections with levels containing the species. Fauna 13 represents the Gamachian Stage, the youngest stage of the

Cincinnatian Series. The *Gamachignathus ensifer* Zone itself overlaps with the *Amorphognathus ordovicicus* Zone and the interval carrying Fauna 12, and extends to the top of the Fauna 13 interval. Fauna 13 was considered by Sweet and Bergström (1986) to be equivalent to the upper part of Fauna 12. Similar observations were made in the eastern Great Basin in western Utah and Nevada. Leatham (1987b), using a graphic correlation method, noted that intervals carrying elements of *Gamachignathus* are chronostratigraphically equivalent to upper Richmondian to post-Richmondian *Aphelognathus* faunas. That the genus *Gamachignathus* favoured cool water environments and (or) "offshore" areas has been suggested by McCracken et al. (1980), Leatham (1987a), and McCracken and Nowlan (1988).

Much has been written in the last few years on the systemic boundary between the Ordovician and Silurian, the Late Ordovician glaciation in Africa, and its effects on sedimentation and faunas on a global scale. In addition to those works mentioned elsewhere in this discussion, there are papers by Barnes (1984, 1986), Brenchley (1984), Brenchley and Newall (1984), Hambrey (1985), Holland (1984), Johnson, Cocks, and Copper (1981), Lespérance (1981), Mu and Rong (1983), Rong and Chen (1986), Štorch (1986), Wang et al. (1983), and Williams (1983). Colbath (1986) found similar extinction at this level in phytoplankton associations in the southern Appalachians.

In the Canadian Arctic Archipelago, Lenz and McCracken (1984) noted the apparent absence of upper Ashgill and lower Lower Llandovery strata in the cratonic sediments. They suggested that this was the result of glacio-eustatic sea level lowering during the Late Ordovician and Early Silurian. They also noted the total absence of the *Hirnantia* fauna from northern Canada.

At Twilight Creek in northeastern Bathurst Island, Melchin and Lenz (1984) noted the absence of the graptolite *extraordinarius* and *persculptus* zones, and the presence of shallow water carbonates within the Cape Phillips Formation during this time. That this may be related to regression during the latest Ordovician glaciation was suggested.

Lenz (1976) and Thorsteinsson and Mayr (1987) noted a disconformity at the Ordovician-Silurian boundary within the Allen Bay Formation on Cornwallis and Devon islands. This break coincides with the global sea level low at this time, which may have had its origin in the Ashgillian glaciation.

Brief review of some Silurian and Devonian series and stadial boundaries in terms of conodont zones

Since the Ordovician-Silurian systemic boundary has been reviewed above no further comments will be made, except to note that it is close to the boundary between Fauna 13 and the *nathani* Zone of McCracken and Barnes (1981).

In the Silurian System, the Llandovery-Wenlock boundary falls within the *amorphognathoides* Zone of Walliser (1964) (Aldridge, 1972, 1985; Mabillard and Aldridge, 1985). As discussed by Barrick and Klapper (1976, p. 67, 68), the age of the *crassa* Zone (of Walliser, 1964) is unclear, and may range from the highest Wenlock to lower Ludlow Series. Schönlaub (1986a) placed the Ludlow-Pridoli boundary immediately above the *crispa* Zone, since in the Prague Basin, Bohemia, and also at Cellon, Austria, *Monograptus parultimus* Jaeger starts above the last occurrence of the name-bearer, *Ozarkodina crispa* (Walliser). He (*ibid.*) questioned the usefulness of the *eosteinhornensis* Zone (of Walliser, 1964) as currently defined, since its name-bearer, *Ozarkodina remscheidensis eosteinhornensis* (Walliser), extends at least as far down as his redefined *snajdri* Zone (and not as originally defined by Helfrich, 1975, p. 22).

The Silurian-Devonian boundary is well defined, and is placed at the lowest occurrence of *Monograptus uniformis* Přibyl (McLaren, 1977). *Icriodus woschmidti* Ziegler has its lowest occurrence just below that of *M. uniformis* (see, among others, Klapper and Murphy, 1975, p. 6, 7, for additional comments on this boundary).

Within the Lower Devonian Series, neither the Lochkovian-Pragian boundary nor the Pragian-Emsian boundary has been formally defined biostratigraphically, at the time of writing. Weddige (1987) suggested that the base of the Pragian Stage be defined to coincide with the base of the *sulcatus* Zone. At the Černá rokle section near Kosoř, southwest of Prague, the base of the *sulcatus* Zone is only 0.7 m below the traditional Lochkovian-Pragian boundary (Weddige, 1987, Textfig. 7). The *Ozarkodina pandora* Murphy, Matti, and Walliser-*Eognathodus sulcatus* Philip lineage can be demonstrated in Bohemia. The Pragian-Emsian boundary may be contentious since the upper part of the Pragian and the lower part of the Emsian may temporally overlap. Klapper and Johnson (1980, Textfig. 1) questionably placed the base of the Emsian at the base of the *dehiscens* Zone.

The Lower-Middle Devonian Series boundary is coincident with the lower boundary of the Eifelian Stage. The boundary has been selected at the level of the first occurrence of *Polygnathus costatus partitus* Klapper, Ziegler, and Mashkova (see Ziegler and Klapper, 1985, for a thorough review).

The Eifelian-Givetian boundary has yet to be defined biostratigraphically. In the type Eifelian area, the *ensensis* Zone ranges from the uppermost Eifelian into the Givetian (Weddige, 1977). Based on studies of southern Moroccan sections and the type area of the Givet Limestone in the Ardennes, Bultynck (1987) suggested that the lowest occurrence of a new species of *Polygnathus* (= *P.* aff. *P. ansatus* Bultynck and Hollard, 1981) within the *ensensis* Zone may provide a potential level for the Eifelian-Givetian boundary.

Brief comments on the nature of the conodont faunas

Conodonts were recovered from most of the stratigraphic units sampled. One notable exception is the Prince Alfred Formation at Sutherland River, a result perhaps to be expected in view of its fluvial sedimentological characteristics (Morrow and Kerr, 1977, p. 60).

It is interesting to note the significant differences in both the abundance and diversity of conodont faunas from correlative rocks on the opposite sides of Vendom Syncline, the axis of which runs in part under Vendom Fiord (McGill, 1974, Fig. 4). As noted under the heading of regional geological setting, strata on the west side of the syncline are thicker and were deposited in more open marine environments; they belong to the shelf part of the Franklinian Miogeocline. Those from the east side had their origin in shallower waters, in closer proximity to the craton, now referable to the Arctic Platform province. The faunal differences may be demonstrated by the Blue Fiord Formation on either side of the syncline; at Section 2A, located west of the syncline and also within the Franklinian Mobile Belt, the formation can be dated confidently with the presence of zonally diagnostic polygnathids. The formation from the platform, on the other hand, was either barren of conodonts or yielded only pandorinellinids, such as *Pandorinellina expansa* Uyeno and Mason and *P. exigua exigua* (Philip). Incidental to this discussion, the Blue Fiord Formation at Strathcona Fiord (Section 1), although lying within the Mobile Belt, was found to be also lacking in polygnathids. This is not unexpected, perhaps, since the formation there is of lagoonal, possibly shallow subtidal to intertidal origin, with a very limited fauna (Trettin, 1978, p. 58).

One other interesting observation, the cause of which is not entirely obvious, is the extreme contrast in the construction of the conodont elements in faunas from two adjacent samples only 8 m apart. They are from the Ptarmigan Lake area (Section 3C; Fig. 8), one (GSC loc. 83671) from the uppermost part of the Devon Island Formation, incidentally its type section, in which the elements are minute and delicate. Conodonts from the overlying Sutherland River Formation (GSC loc. 83672), on the other hand, are large and robust. Representative specimens are illustrated in Plate 15, figures 19-22, 27, 28, 32-34, and Plate 16, figures 18-22, 25, 34-40. The contrasting nature of these elements may reflect their respective depositional environments. The Devon Island Formation was deposited on a paleoslope below wave base, whereas rocks of the Sutherland River Formation are the product of a shallow subtidal environment (Morrow and Kerr, 1977, p. 48, 53).

The conodont faunas and biostratigraphic significance of the conodonts and the associated megafaunas and palynomorphs are discussed under individual sections, with a general synopsis under the summary heading. The appendices at the end of this report provide detailed information of the number of specimens recovered, as well as lists of megafaunas and palynomorphs.

The conodonts contain trace amounts of organic matter that undergo visible changes in colour from pale yellow (CAI = 1) to brown to black (CAI = 5) with increasing temperature as a result of carbon-fixing (Epstein et al., 1977). The thermal window for commercial oil production generally corresponds to CAI 1-2 and for gas, CAI 1-4.5; the thermal cutoff for most hydrocarbon production is CAI >4.5 (Harris et al., 1980).

The conodont specimens studied herein are generally well preserved, and in their coloration fall mainly in the category of CAI 1-2. A thermal maturity study of the conodonts from two wells on Bjorne Peninsula in southwestern Ellesmere Island (Sections 2B and 2C herein; Fig. 6) was reported earlier (Mayr et al., 1978). The intervals within these wells with CAI 1-2 generally coincide with the "mature" rating in terms of organic source rock potential (SRP). The SRP reading is based on the yield of liquid hydrocarbons as a percentage of the total organic carbon (T.G. Powell, pers. comm., 1977). Discrepancy between the CAI and SRP readings may perhaps be explained by the differing lithotypes from which the conodonts were extracted. That is, in a rock that is assessed as a mature hydrocarbon source by geochemical analyses, the values of the conodont CAI may be slightly higher in terrigenous sediments than in carbonates (Mayr et al., 1978). The CAI readings of the samples in the present paper and numerous others from various parts of the Archipelago, are currently being filed in a computer database, and will be the subject of a future paper.

Broad collation of megafaunas and conodonts

Silurian

Graptolites of the Zone of *Cyrtograptus sakmaricus-C. laqueus* of latest Llandovery age occur in the lower part of the Cape Phillips Formation at Section 1. This fauna occurs between the *celloni* and *patula* zones, and is therefore probably equivalent to the *amorphognathoides* Zone.

Mabillard and Aldridge (1985) have demonstrated that this zone spans the Llandovery-Wenlock boundary in the Welsh Borderland. Similarly, in the lower Cape Phillips Formation in subsurface Section 2B, uppermost Llandovery-lowermost Wenlock graptolites occur a short interval above conodonts of the *celloni* Zone. The latter Zone is of Telychian (C_5) age (Klapper and Murphy, 1975, p. 7; see discussion by Uyeno and Barnes, 1983, p. 6-7), late Llandovery. These observations are in complete agreement with the findings of others (e.g., Jaeger and Schönlaub, 1980; Brazauskas and Paskevičius, 1981).

Brachiopods of Ludlow age were found associated with conodonts of probable *siluricus* Zone in the Douro Formation at Section 3B.

Devonian

In strata that can only be dated as being within the interval of *hesperius* to *delta* zones, significant megafaunal collections were recovered: in the Devon Island Formation at Subsection R-A3, graptolites of the *Monograptus uniformis* Zone; in the Cape Phillips Formation at Section 1, graptolites of the *Monograptus praehercynicus* Zone; and brachiopods of the *Gypidula pelagica* Fauna in the "Eids" Formation, lower limestone member, of Section 1, and in the uppermost Devon Island and lowermost Sutherland River formations at Section 3C. In the Vendom Fiord Formation at Section 1, brachiopods of the *Sieberella-Nymphorhynchia pseudolivonica* Fauna are associated with conodonts of the *dehiscens* to *gronbergi* zones interval.

The *dehiscens* Zone of the lower part of the lower member of the Blue Fiord Formation at Section 2A contains brachiopods of the *A. kobehana*-lower *E. pinyonensis* zones. At the same section, the upper member of the Blue Fiord Formation contains conodonts of the *inversus* Zone in association with brachiopods of the *Elythyna* beds or *E. pinyonensis* Zone. The upper part of the Bird Fiord Formation carries an icriodontan fauna, consisting principally of new species of *Steptotaxis* (*S. macgregori*, *S. maclareni*, and *S.* n. sp. C) together with brachiopods of the *Warrenella kirki* Zone.

At Section 2A, two-hole crinoid ossicles of *Gasterocoma*? *bicaula* Johnson and Lane, were recovered from the *dehiscens* to *serotinus* interval of the Blue Fiord Formation, as well as in the Bird Fiord Formation above the last occurrence of *Polygnathus serotinus* Telford and below the *W. kirki* Zone. *Polygnathus serotinus* has its highest occurrence in the *costatus* Zone (Klapper *in* Klapper and Johnson, 1980). The two-hole ossicles are also present in the Blue Fiord Formation at Section 1. The formation there cannot be so precisely dated on the basis of conodonts.

PART III. BRIEF HISTORY AND GENERAL GEOLOGICAL–BIOSTRATIGRAPHIC SUMMARY

The following is a brief history and summary of the general geology and biostratigraphy of the formations included in this report (see Table 1). For more detailed information on these units, the reader is directed to individual sections under Part IV. Parts of the following were presented in a preliminary survey by Uyeno (1981b); more recently, Raasch (1982) summarized the Lower and Middle Devonian faunal sequences in the Canadian Arctic Archipelago. Smith, Goodbody, and Rice (1987) presented a detailed synthesis of some of the Devonian formations in the study area, in the context of regional and local settings. The locations of the sections mentioned below are shown in Figures 1, 3, 4, 6, 8, and 9.

Irene Bay Formation, Cornwallis Group

The Irene Bay Formation was named by Kerr (1967a, p. 108-110), for an 83 m thick, fine grained, dark grey, thin to medium bedded argillaceous limestone sequence near the head of Irene Bay in central Ellesmere Island. It is the youngest of three formations of the Cornwallis Group. The formation is widely distributed in the Arctic Archipelago, and is everywhere overlain either by the Allen Bay Formation or its facies equivalent beds of the graptolitic Cape Phillips Formation. At the type section, both the upper and lower contacts are sharp but conformable. In the study area, it was encountered only at Section 1 (Strathcona Fiord).

Mayr (1978, p. 15) interpreted the Irene Bay Formation as having been deposited on an open shelf with unrestricted circulation.

The formation carries large fossils of the so-called Arctic Ordovician fauna, now termed the "*Bighornia-Thaerodonta*" fauna, which is generally considered to be of boreal origin. The significance and distribution of this fauna were discussed by Thorsteinsson (1963a, p. 38-39) and Lenz (1976, p. 316).

Allen Bay Formation and Allen Bay–Read Bay carbonates (undivided)

The Allen Bay Formation was named by Thorsteinsson and Fortier (1954) for a sequence of carbonate strata on southern Cornwallis Island. Since its inception, the formation has been emended, its upper part being allocated to the Cape Storm Formation of Kerr (1975). The formation, as currently used, is about 1100 m thick at its type section, and consists mainly of thick bedded to massive dolostone.

The Read Bay Formation was introduced by Thorsteinsson and Fortier (1954) for a relatively thick succession of mainly shelf-type carbonate strata lying conformably between the Allen Bay Formation below and the Snowblind Bay Formation above in southern parts of Cornwallis Island. The formation was subdivided into four informal members by Thorsteinsson (1958, p. 48-70), and later Kerr (1975) included a basal part of the formation in his Cape Storm Formation. Recently, Thorsteinsson (1981) raised the remaining Read Bay Formation to group status and defined, in ascending order, the Douro, Barlow Inlet, and Sophia Lake formations within the group. The Read Bay Group, as currently defined, comprises interbedded limestone and argillaceous limestone with minor dolostone, sandstone, siltstone, and shale. On Cornwallis Island, the group attains its maximum thickness of at least 2800 m.

The Douro Formation lies conformably on the Cape Storm Formation, and the Snowblind Bay Formation has a gradational contact with the Sophia Lake Formation (Thorsteinsson, 1981).

In northern parts of Cornwallis Island, shelly rocks of the Allen Bay, Cape Storm, Douro, and Barlow Inlet formations intergrade laterally with graptolitic rocks of the Cape Phillips Formation (Thorsteinsson, 1981, Fig. 4). In many parts of Ellesmere Island, the facies change from shelf-type carbonates to graptolitic rocks is reflected in an incomplete Allen Bay Formation, represented only by its basal part, overlain by an incomplete development of the Cape Phillips Formation. This relationship was observed in parts of the study area, including Strathcona Fiord and Bjorne Peninsula (Sections 1, R-A, 2B, and 2C, Table 1; see also Poey, 1982).

Preliminary reports on the relationship of shallow shelf rocks of the Allen Bay–Read Bay carbonates and basinal rocks of the Cape Phillips Formation in the complex transition interval of the Baumann Fiord area in southwestern Ellesmere Island were presented by Poey (1982, 1984). He noted a general upsection trend from shelf and slope facies to basinal carbonates and calcareous shale.

For the area near Prince Alfred Bay, northwestern Devon Island, Morrow and Kerr (1977, p. 23, 24) presented an integrated facies tract interpretation of Allen Bay–Cape Phillips deposition, similar to type II of Wilson's (1974) spectrum of carbonate-platform margins. The Allen Bay Formation was deposited in part in a region of carbonate shoals whereas other areas may have been predominantly a shelf-lagoon in somewhat deeper water. The Cape Phillips Formation was interpreted by these authors (op. cit.) as predominantly a slope deposit, rather than a basin floor deposit.

In the area of west-central Ellesmere Island, Trettin (1978, Textfigs. 46, 47) interpreted the Allen Bay–Read Bay carbonates (undivided) as representing a shelf carbonate facies (III), and the laterally equivalent Cape Phillips Formation as of slope clastic-carbonate facies (II) and submarine fan and (or) trough bottom pre-flysch or flysch facies (Ib).

Cape Phillips Formation

The Cape Phillips Formation was introduced by Thorsteinsson (1958, p. 78-80), for a sequence of shale, calcareous shale, and minor argillaceous limestone. At its type locality in northeastern Cornwallis Island, it is estimated to be about 3000 m thick (Thorsteinsson and Kerr, 1968, p. 6). In the study area, the unit conformably overlies the Allen Bay Formation or the undivided Allen Bay–Read Bay carbonates (Sections 1, R-A and 2C). The lower contact is unconformable, however, in the Eids well (Section 2B). The relationship with its adjacent units in the isolated outcrop that may possibly be assignable to the Cape Phillips Formation on Spit (Kate) Island is as yet unknown. The reader is referred to remarks under the Allen Bay and Allen Bay–Read Bay carbonates (undivided) for a brief account of the environments of deposition of the Cape Phillips Formation.

Well preserved radiolarians from the bedded and nodular limestones of the Cape Phillips Formation at northern Cornwallis and southern Baillie-Hamilton islands were recently described by Goodbody (1982, 1986). The fauna, comprising 69 new species, was considered to range from upper Llandovery to lower Ludlow.

Douro Formation, Read Bay Group

The Douro Formation was introduced by Thorsteinsson (1963b, p. 227, 228) for a sequence of predominantly grey, rubbly weathering, thin bedded, argillaceous limestone, with some mottled dolostone, and calcareous shale and siltstone, occurring in the Douro Range, northwestern Devon Island. The type locality chosen by Thorsteinsson (op. cit.) is about 2 km northwest of Sutherland River (Section 3B), and along the same outcrop belt.

The formation is 94.6 m thick at Section 3A. It is considerably thicker at Section 3B, where an incomplete sequence of 186 m was measured.

Thorsteinsson (1981, p. 5) interpreted the Douro Formation as resulting from deposition in a shelf environment, well below wave-base. Morrow and Kerr (1977, p. 46) recognized two lithofacies within the formation: an

TABLE 1

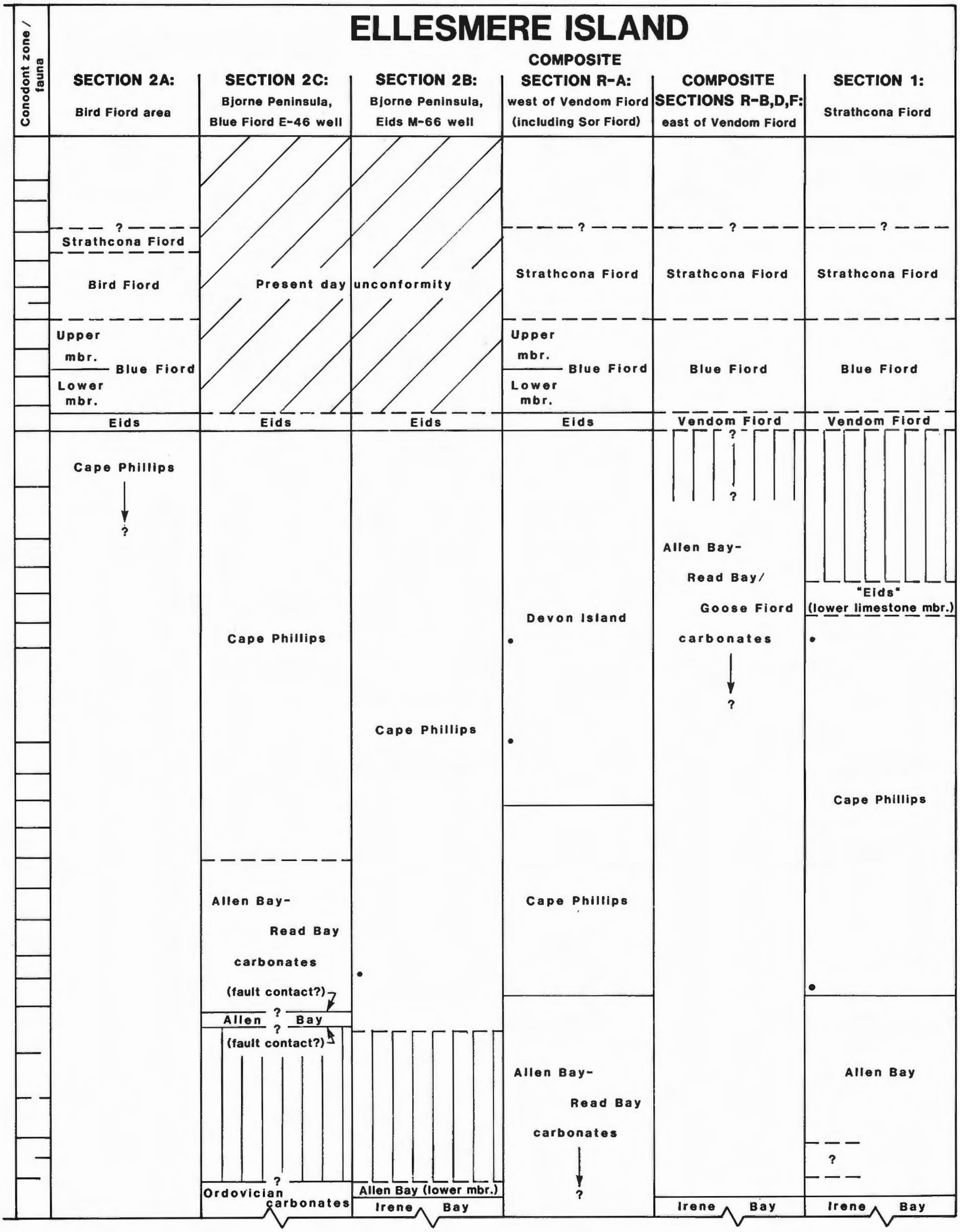
Correlation of some lower Paleozoic rocks of southwestern Ellesmere Island, northwestern Devon Island, and adjacent small islands, Canadian Arctic Archipelago.

System	Series		Stages		Conodont zones/faunas	DEVON ISLAND AREA 4: Grinnell Peninsula and environs	DEVON ISLAND SECTIONS 3A-C: Sutherland River and environs
DEVONIAN	MIDDLE		Givetian		varcus		
					ensensis		
			Couvinian	Eifelian	kockelianus	— — — ? — — —	
					australis	Strathcona Fiord	
					costatus	Bird Fiord	
					patulus (partitus / patulus)	Du5 Undivided Devonian carbonates	
	LOWER		? Dalejan	Emsian	serotinus	? Undivided Devonian carbonates	
			Zlichovian		inversus	Du1 carbonates	Blue Fiord
					gronbergi	?	Blue Fiord
				?	dehiscens	Disappointment Bay	Blue Fiord
			Pragian	Siegenian	kindlei	Cape Phillips?	Blue Fiord
			?		sulcatus	Unnamed formation	Blue Fiord
			Lochkovian	Gedinnian	pesavis	Unnamed formation	? Prince Alfred
					delta	Unnamed formation	Sutherland River
					eurekaensis		Sutherland River
					hesperius		●
SILURIAN	UPPER	PRIDOLI	(stages not yet formally established)		eosteinhornensis		● Devon Island
		LUDLOW	Ludfordian		crispa		Devon Island
					latialata		Devon Island
			Gorstian		siluricus		Douro
					ploeckensis		
					crassa		
	LOWER	WENLOCK	Homerian		sagitta		
			Sheinwoodian		patula		
					amorphognathoides		
		LLANDOVERY	Telychian		celloni		
			Aeronian		staurognathoides / kentuckyensis		
					discreta/deflecta / kentuckyensis		
			Rhuddanian		nathani		
ORDOVICIAN	UPPER		Gamachian		Fauna 13 / ?		
			Richmondian		Fauna 12 / ordovicicus		

● zonal graptolite occurrences

See Figures 1, 3, 4, 6, 8, and 9 for locations of sections.

The following information was kindly provided by R. Thorsteinsson (pers. comm., 1988): 1) strata referred to the upper parts of the Cape Phillips Formation at Section 1 can be reassigned to the Devon Island Formation, which includes the lower limestone member of the "Eids" Formation; 2) the dark clastics immediately underlying the Eids Formation in the subsurface at Sections 2A, 2B, and 2C, are probably more correctly referable



to the Devon Island Formation. According to Thorsteinsson, the Devon Island Formation is readily distinguishable from the Cape Phillips Formation in surface exposures; however, the two units are more difficult to separate in the subsurface, especially on the basis of cuttings (Mayr, pers. comm., 1988); 3) the top of the Strathcona Fiord Formation in the study area is of the same approximate age. The conodont zonation is from: Walliser (1957, 1964), Bischoff and Ziegler (1957), Nicoll and Rexroad (1969), Bergström (1971), Fåhraeus (1971), Sweet et al. (1971), Aldridge (1972), Klapper and Murphy (1975), Ziegler et al. (1976), Klapper (1977), Weddige (1977), Klapper and Ziegler (1979), and McCracken and Barnes (1981).

unburrowed dolostone and a burrowed limestone. The former lithofacies was deposited landward of the latter. The burrowed limestone lithofacies accumulated in a shallow, partly protected shelf or shelf-lagoon environment, whereas the unburrowed dolomitic lithofacies was the result of peritidal deposition.

The lithotypes and interpretation of depositional environments of the Douro Formation at southeastern Somerset Island were recently discussed by Narbonne and Dixon (1982). They envisaged two stages of transgression during its depositional history. On the basis of its predominant lithology of rubbly-weathering, grey limestone with abundant smooth-shelled brachiopods, the formation was further correlated with other areas in the south-central parts of the Islands, including Section 3A (Sutherland River) herein.

Brachiopods of the *Atrypella* community were described by Smith (1976) from the Douro Formation in the vicinity of Sections 3A, 3B, and 3C in northwestern Devon Island. The community consisted of a large number of individuals with low diversity. Douro brachiopods collected from Ellesmere, Somerset, Prince of Wales, and Cornwallis islands were reported by Jones (1982a). The relatively low diversity, noted earlier by Smith (1976), held even over this much wider area. The fauna was suggested to have been adapted to environments that were somewhat restricted, perhaps lacking proper nutrition or being high in salinity.

Conodonts from the upper part of the Douro Formation at Sections 3A, 3B, and 3C suggest an assignment to the *siluricus* Zone of early Late Ludlow age (Leintwardinian Stage in the old terminology, associated with graptolites *Monograptus fritschi linearis* Bouček and *M. bohemicus tenuis* Bouček; Jeppsson, 1987, Fig. 9.1). Ludlow age brachiopods are associated with some of the conodont collections.

Devon Island Formation

The name Devon Island Formation was proposed by Thorsteinsson (1963b, p. 228) for a 150 m thick sequence of graptolite-bearing siltstone and dolostone in the vicinity of Ptarmigan Lake in northwestern Devon Island (Section 3C, herein). At Section 3A, the formation is 190 m thick. According to Morrow and Kerr (1977, p. 90-91), the lower one third consists of yellowish weathering, silty calcareous shale, and the remainder of pale weathering, organic-rich silty dolostone. The formation lies with sharp but conformable relationships between the underlying Douro Formation and the overlying Sutherland River Formation. The basal contact with the Douro is invariably of late Ludlow age (Thorsteinsson, 1981, p. 16, 17, Table 1).

The Devon Island Formation is confined to northwestern Devon Island and southwestern Ellesmere Island (Thorsteinsson, 1981, p. 16). It represents a tongue of graptolitic rocks which extends southeasterly from the main graptolitic sequence represented by the Cape Phillips Formation which, in the deeper parts of the Franklinian Miogeocline, ranges in age from Late Ordovician to Early Devonian. A characteristic feature of the Devon Island Formation is the age and nature of its basal contact. It overlies carbonate rocks invariably sharply and conformably, and the contact falls within the Zone of *Monograptus bohemicus tenuis* of late Ludlow age. The fact that the base of the formation is invariably of this age renders the best support for recognizing the beds as a distinct unit (Thorsteinsson, pers. comm., 1988).

The stratigraphy of Section 1 (Strathcona Fiord) is currently being revised by R. Thorsteinsson (pers. comm., 1988). The upper part of what is designated herein as the Cape Phillips Formation is reassigned to the Devon Island Formation, with the latter unit also including the lower limestone member of the "Eids" Formation.

West of Vendom Fiord (Subsection R-A3), the Devon Island Formation can similarly be divided into lower and upper units (Roblesky, this report). The formation lies with sharp, but conformable contact beneath the Eids Formation.

In northwestern Devon Island, the laminated lithofacies of the Devon Island Formation was interpreted as clinothem deposits, and the medium-bedded lithofacies as undathem deposits (of Rich, 1951; Morrow and Kerr, 1977, p. 48, 52). Thorsteinsson (1981, p. 17) suggested that the few well-preserved shelly faunas occurring within the clastic matrices were transported as mass flow deposits from correlative shelf-type carbonate formations.

At a section located 3.5 km northeast of Subsection R-A3, R. Thorsteinsson (see Appendix; Fig. 4) collected *Monograptus bohemicus tenuis* Bouček in the Devon Island Formation at 2 m above its base (GSC loc. C-76042), and *M.* sp. cf. *M. ultimus* (Perner) at the level of 5.2 m above its base. According to Thorsteinsson (pers. comm., 1988), in the Canadian Arctic Archipelago, *M. bohemicus tenuis* makes its first appearance in the Zone of *M. fritschi linearis*, and ranges to just below the earliest appearance of graptolites representing the Zone of *M. ultimus*, the basal zone of the Pridolian. Thus, here as elsewhere, including the type section, *M. bohemicus tenuis* occurs at the very base of the Devon Island Formation.

At Subsection R-A3, the lowest occurrence of *Monograptus uniformis* is at 290 m above the base of the Devon Island Formation, thus marking the base of the Lower Devonian. *Icriodus woschmidti hesperius* was recovered from near the middle of the formation in a section located west of about the centre of Vendom Fiord (collected by R. Thorsteinsson; GSC loc. C-92466; see Appendix). Although the base of the formation is everywhere isochronous, the top of the Devon Island Formation at Section R-A is younger than at Section 3A. This is borne out by an extremely important sample (GSC loc. C-84882), found and later processed by R. Thorsteinsson, from the only calcareous bed within the Devon Island Formation in this vicinity. The sample, yielding a conodont collection of the *dehiscens* Zone, is from 10 m below the top of the formation, and is located near the junction of Vendom and Baumann fiords.

Sutherland River Formation

The Sutherland River Formation was proposed by Thorsteinsson (1963b, p. 229) with its type section at Sutherland River (Section 3A, herein). There, it is 116 m thick, and comprises a uniform succession of grey to olive grey, irregularly bedded, finely crystalline and dense dolostone (Thorsteinsson, 1981, p. 17). Its lower contact with the Devon Island Formation is conformable, but it has a disconformable contact with the overlying Prince Alfred Formation.

In the vicinity of Ptarmigan Lake (Section 3C), the Sutherland River Formation is 104 m thick (Morrow and Kerr, 1977, p. 94). There, it consists of light grey weathering, finely crystalline dolostone.

Morrow and Kerr (1977, p. 53) suggested a probable shallow subtidal origin for the fossiliferous dolostone lithofacies of the Sutherland River Formation, as indicated by the benthonic fauna and medium to thick bedding. The unfossiliferous dolostone lithofacies, with tidal-flat features such as birdseye structure and stromatolites, was interpreted as having a peritidal origin.

Thorsteinsson and Uyeno (1981, Table 1) suggested that the age of the Sutherland River Formation in northwestern Devon Island is probably about middle Lochkovian. This was based on its stratigraphic position, and the relationship of the overlying Prince Alfred Formation to its probable lateral equivalent, the upper Lochkovian Snowblind Bay Formation. Based on the present study, the age span of the Sutherland River Formation appears to be from about *hesperius* and (or) *eurekaensis* zones at the base, to *delta* Zone at the top.

Prince Alfred Formation

The Prince Alfred Formation was introduced by Thorsteinsson (1963b, p. 229, 230). Its designated type section is at Sutherland River (Section 3A, herein) and is 52 m thick. According to Morrow and Kerr (1977, p. 54), the unit overlies the Sutherland River Formation either disconformably or with a slight angular unconformity, with the contact drawn beneath a dolomite breccia zone. It lies unconformably below the Blue Fiord Formation.

The Prince Alfred Formation was subdivided broadly into two lithofacies: the sandstone lithofacies, which constitutes most of the formation, and the silty dolostone lithofacies (Morrow and Kerr, 1977, p. 54, 60).

The sandstone lithofacies of the Prince Alfred Formation was interpreted as an alluvial fan complex with associated marginal marine deposits, which may have bordered the eastern side of the Boothia Uplift. A single sample from the formation failed to yield any conodonts.

"Eids" Formation (Lower limestone member)

Since the informal lower limestone member of the "Eids" Formation was measured and sampled only at Section 1 (Strathcona Fiord), a more comprehensive description is given under that section in Part IV. On the advice of R. Thorsteinsson (pers. comm., 1985, 1988), the term "Eids" is placed in quotes here since it is considerably older than the Eids Formation at its type area, and is an entirely different and unrelated unit. In a study underway, Thorsteinsson (pers. comm., 1988) is proposing to include this unit in the upper part of the Devon Island Formation.

The carbonate sedimentation of the lower limestone member at Section 1 was interpreted as autochthonous. The abundant and diversified fauna was suggested to be of outer shelf setting favourable for benthos, in mainly quiet conditions with some current and wave action (Trettin, 1978, p. 19, 30).

Unnamed formation

The reader is referred to comments under stratigraphy of Area 4 (Part IV). Further remarks on the geology of the unnamed formation are probably unwarranted at this time since the stratigraphic and structural relationships of this unit are largely unknown. Morrow and Kerr (1986) tentatively referred to this unit as an equivalent of the Stuart Bay Formation. It should be noted, however, that the type section of the Stuart Bay Formation at Twilight Creek in northeastern Bathurst Island (McLaren, 1963c), ranges in age from possibly *gronbergi* to *serotinus* zones (Uyeno, 1981b; unpublished collections), and is, therefore, considerably younger than the unnamed formation.

Conodont samples from the unassigned unit were obtained from two small islands located to the northwest of Grinnell Peninsula. They contained faunas of the *delta* Zone, *kindlei* and (or) *dehiscens* zones, and a broadly ranging interval of *sulcatus* to *dehiscens* zones.

Vendom Fiord Formation

The Vendom Fiord Formation was introduced by Kerr (1967b). Its type section, 517 m thick, was chosen at a site west of Irene Bay on central Ellesmere Island. The formation comprises mainly sandy and silty dolostone, and dolomitic sandstone and siltstone, with a basal conglomerate unit, and minor amounts of laminated gypsum-anhydrite and limestone.

Of the area in west-central Ellesmere Island that is covered by the present report, Trettin (1978, Fig. 50) interpreted the Vendom Fiord Formation as representing a lagoon clastic-carbonate facies (IV). East of Vendom Fiord, Roblesky (1979, p. 66) proposed a depositional model of a continental-marine transition. Various environments were represented, including alluvial fans, braided streams, intermittent supratidal-playa lakes on the alluvial plain, and shallow subtidal, intertidal, and supratidal marine environments with intermittent clastic influx. The provenance of the clastics was the Inglefield Uplift to the east (Smith and Roblesky, 1984; Smith and Okulitch, 1987).

Perry (1978) recovered probable reworked Lochkovian brachiopods and conodonts from the basal clastics beds of the formation in the type area. The provenance of the fauna was suggested to be the underlying lower limestone member of the "Eids" Formation. The reworking was further suggested to be the result of an upper Lower Devonian transgression following a sea-level minimum during the Pragian.

Eids Formation

The term Eids Formation was introduced by McLaren (1963b, p. 317, 318), with the type section subsequently selected at a locality about 2 km southeast of the head of Eids Fiord (McLaren *in* Kerr and Thorsteinsson, 1972). It comprises principally dark grey, calcareous siltstone and mudstone, with minor limestone and sandstone. In the Bjorne Peninsula area, the Eids Formation has a gradational contact with the underlying Cape Phillips Formation (Sections 2B and 2C; Mayr, this report), and west of Vendom Fiord, the lower contact with the Devon Island Formation is sharp and conformable (Composite Section R-A; Roblesky, this report). At Sections 2B and 2C, located 14 m northeast and 15 m southeast, respectively, from the type section of the Eids Formation, the formation is 272.8 and 669.0 m thick, respectively. At Subsection R-A9, where the formation is completely exposed, it is 767 m thick.

In the area west of Vendom Fiord, Roblesky (1979, p. 42, 43) tentatively interpreted the lower part of the Eids Formation as representing deposition in an outer shelf environment, below wave base, and probably resulting from sedimentation of dilute sediment clouds of clay and silt-sized grains. The upper part, with its current ripple marks and rare flute casts, was deposited in an outer to middle shelf environment where sedimentation was possibly dominated by lower density gravity flows. The highest parts of the formation resulted from an oxygenated environment below wave base.

The Eids Formation was studied at Subsection R-A9, Sections 2B and 2C, and a locality northeast of 2B (GSC loc. 57730 on Fig. 6). Conodonts of the *dehiscens* Zone were obtained from the formation at Subsection R-A9 and the last-named locality. While only a relatively long-ranging taxon was recovered from Section 2C, and indeterminate fragments from Section 2B, the proximity of these localities to those sites with biostratigraphically diagnostic collections suggests a similar, if not identical, age assignment.

Jones and Smith (1980, 1985a, b) and Jones and Boucot (1983) reported on brachiopods from the upper part of the Eids Formation, in the areas between Blue Fiord and Sor Fiord and west of Vendom Fiord, in southwestern Ellesmere Island. The faunas were correlated with the middle and (or) upper subzones of the *Eurekaspirifer pinyonensis* Zone of Nevada, and therefore of middle to late Zlichovian or early Dalejan age. The apparent discrepancy in the ages based on the conodont and brachiopod evidence was attributed to environmental influence on the latter. It was thought the brachiopods lived in a basinal environment.

A new rugose coral, originating in the Eids Formation from a level more than 400 m above its base, was described by Pedder and Smith (1983). The type specimens were collected from a site about 5.5 km west of Section 2A herein.

Disappointment Bay Formation

Thorsteinsson (1958, p. 104-108) defined the Disappointment Bay Formation for a relatively thin sequence of strata that overlies the Cape Phillips Formation with a slight angular unconformity at the northeastern extremity of Cornwallis Island. At the type area, the unit is 85 m thick, and comprises mainly thin to thick bedded, finely crystalline dolostone, with smaller amounts of thin bedded sandstone and shale, and a basal limestone and chert conglomerate.

The Disappointment Bay Formation in the Cornwallis Island area was interpreted by Thorsteinsson (1981, p. 21) as having been deposited in a dominantly shallow marine environment. The laminated cryptocrystalline to fine grained dolostone further suggested an environment of restricted circulation.

The formation, the distributive area of which is centred on the Boothia Uplift (Thorsteinsson, 1981), displays considerable diachronism in the age of its basal contact. On Crescent Island (Area 4 on Table 1; Fig. 9), located northwest of Grinnell Peninsula, the basal part of the interval that was assigned to the Disappointment Bay Formation is dated as *dehiscens* Zone, and possibly ranges as high as the *gronbergi* Zone. In contrast, on Cornwallis and Lowther islands, the formation is of *inversus* Zone age (Johnson, 1973, 1975b; Thorsteinsson and Uyeno, 1981). R. Thorsteinsson (pers. comm., 1986) is of the opinion that the formation is diachronous as a result of tectonics related to the Boothia Uplift. The Uplift also caused the bevelling of the strata beneath the Disappointment Bay Formation at certain areas (Thorsteinsson, 1981).

Blue Fiord Formation

The type section of the Blue Fiord Formation is located close to Section 2A herein, and an account of the description and history of the formation is given under that section in Part IV.

At Sutherland River (Section 3A), only the lower 139 m of the formation is exposed. At this locality, it consists of crinoidal lime mudstone and wackestone, and lies with a disconformable contact on the Prince Alfred Formation.

In the Vendom Fiord area, the Blue Fiord Formation is a thick sequence of limestone and dolostone with lesser amounts of siltstone and gypsum. Two distinct, informal units are recognized: a lower carbonate member and an upper siltstone-carbonate member. In the past, the upper member has been referred to the Bird Fiord Formation (McGill, 1974, p. 381; Kerr, 1976, p. 17), or the "Bird Fiord" Formation (Jones, 1982c). In the Norfolk Inlet area of northwestern Devon Island, the formation is about 600 to 650 m thick, and is divisible into four informal 'members', consisting of alternation of limestone and dolostone lithologies (Prosh et al., 1988).

In Roblesky's (1979, p. 103, 104) interpretation, the Blue Fiord Formation was deposited under various marine environments. They include high energy carbonate buildup (massive skeletal facies), shelf deposits (bioclastic facies, nodular facies, and nodular and siltstone facies), shallow subtidal-lagoonal platform (peloid and massive dolostone facies), and evaporitic setting.

Smith and Stearn (1982) suggested a similar variety of environments for the deposition of the Blue Fiord Formation in southwestern Ellesmere Island, ranging from tidal flat through shallow platform, platform, slope and basin, basinal carbonate buildups, to seaward slope of the carbonate buildups. A reef complex within the Blue Fiord Formation in southwestern Ellesmere Island was described by Smith and Stearn (1987).

The Blue Fiord Formation was studied at six sections west of Vendom Fiord, 1, 2-A, R-A, and east of Vendom Fiord, at R-B, R-D, and R-F. A summary of the conodont zonation at Section 2A was presented earlier by Uyeno and Klapper (1980), and the age span there was clearly established, ranging from the *dehiscens* to *serotinus* zones, with the lower-upper member boundary falling within the *inversus* Zone. Also included in that paper was the Blue Fiord at a section near Sor Fiord, located 27.5 km east of Section 2A. The rugose corals of the latter section were later described by Pedder (1983). An identical age span of *dehiscens* to *serotinus* zones was observed at Section R-A, west of Vendom Fiord, with the *inversus* Zone hosting the lower-upper member boundary. Of the three composite sections studied east of Vendom Fiord, R-D failed to yield any conodonts, and at R-B and R-F, only long-ranging taxa were recovered. Long-ranging though they may be, the age span established at Sections 2A and R-A is supported, with the base of the upper member similarly falling within the *inversus* Zone.

At Sutherland River (Section 3A), conodonts of the *inversus* Zone, and probably of the upper part of that Zone, were recovered from the Blue Fiord Formation.

Trilobites from the Blue Fiord Formation at Sutherland River (Section 3A herein) and in the Bird Fiord area were studied by Ormiston (1967). At the time, they were considered to be of Eifelian age.

Stromatoporoids from the lower 100 m of the Blue Fiord Formation in the vicinity of Eids Fiord, Section 2A (herein), and Sor Fiord, were described by Stearn (1983). The fauna is a mixture of indigenous species and species known from Lower and Middle Devonian strata elsewhere, and is part of the Old World faunal realm.

A brachiopod fauna from the upper member (= "Bird Fiord") in the area west of Vendom Fiord was described by Jones (1982b). The fauna was correlated with Intervals 12 and 13 of Johnson (1977b), and with the upper part of the *gronbergi* Zone and the lower part of the *inversus* Zone. Spiriferid brachiopods from the Eids, Blue Fiord, and Bird

Fiord formations of southwestern Ellesmere Island were described by Jones and Boucot (1983).

A monograph by Brice (1982) described the brachiopods of the Blue Fiord Formation on Ellesmere, Devon, and Bathurst islands. The faunas, especially of the lower part of the formation, were suggested to be related to Nevada faunas. During the Blue Fiord sedimentation, the Arctic Islands belonged to the Cordilleran subprovince of the Old World Province. The lower part of the lower member at its type locality was correlated with the *Eurekaspirifer pinyonensis* Zone, and the interval from the upper part of the lower member to the lower part of the upper member at the type locality, with the *Leptathyris circula* Zone and the lower part of the *Warrenella kirki* Zone.

Undivided Devonian carbonates

The informal term "Undivided Devonian carbonates" was used by Morrow and Kerr (1977, 1986) for strata occurring on southern Grinnell Peninsula and neighbouring areas. In the eastern part of the peninsula, the carbonates were subdivided into four members, Du1 to Du4. Farther to the west, on Sheills Peninsula, an additional member (Du5), consisting of fossiliferous limestone, is present. At Section 11 of Morrow and Kerr (1986), located on western Sheills Peninsula, an almost complete Undivided Devonian carbonates sequence measures 145.4 m thick. There, the unit unconformably overlies the Middle Ordovician Thumb Mountain Formation, and conformably underlies the Bird Fiord Formation.

More recently, Goodbody (1989) assigned Morrow and Kerr's (op. cit.) members Du1 and Du2 to the Blue Fiord Formation, and the remainder to the Bird Fiord Formation, with Du3 assigned to its Goose Fiord Member, and Du4 and Du5 to the Blubber Point Member. As noted elsewhere, since the Devonian stratigraphy of the Grinnell Peninsula and its environs is currently being revised, Morrow and Kerr's (op. cit.) informal nomenclature is retained herein.

In the eastern part of Grinnell Peninsula, the Du1 member can be dated as *inversus* Zone, probably the upper part of it. Member Du5 only occurs in the western part of this region. In the Port Refuge area and on Sheills Peninsula, conodonts of the *costatus* Zone were recovered from this member. The intervening members Du2 to Du4 were not studied for this report.

Bird Fiord Formation

The type section of the Bird Fiord Formation is located at Section 2A, and an account of the description and history of the formation is given under that section in Part IV.

The lower part of the Bird Fiord Formation at its type section was interpreted by Embry and Klovan (1976, p. 522) as representing open-shelf deposits laid down during a time of intermittent clastic supply. Parts of the formation in the study area were interpreted as the product of deltaic-marine sedimentation.

In southwestern Ellesmere Island, in an area south of the Schei Syncline, Goodbody (1987; 1989) subdivided the Bird Fiord Formation into five members (in ascending order): Goose Fiord, Blubber Point, Baad Fiord, Cardigan Strait, and Grise Fiord, the last-named occurring only in the eastern parts. North of the Syncline, in the type area, the formation comprises the Norwegian Bay and the overlying Cardigan Strait members. Some of these terms were applied in areas to the west, in northwestern Devon Island and central Bathurst Island. Since the information became available only after this manuscript was essentially complete, and since it does not alter the main conclusions of this paper, viz. conodont taxonomy and biostratigraphy, the revision is not incorporated herein.

The Bird Fiord Formation marks the first influx of the Hecla Bay Clastic Wedge of Embry and Klovan (1976, p. 592), which altered drastically the depositional environment from that of the underlying Blue Fiord carbonates. The consequential change in the conodont fauna makes precise dating of the formation rather difficult, but based on the stratigraphic position of the formation and evidence from other fossil groups, the Lower-Middle Devonian boundary (that is, the *partitus* Boundary; see Ziegler and Klapper, 1985, p. 106) is placed at or near the base of the Bird Fiord Formation at its type section, 2A. The top of the formation is probably still within the Eifelian *australis* Zone. A probable Bird Fiord sample was obtained from Sheills Peninsula, but it, too, contained conodonts that can only be interpreted, at this time, as probably lower to middle Eifelian.

Ormiston (1967) described the trilobites from the Bird Fiord Formation in its type area of Bird Fiord. The age of the fauna at the time was considered to range from Eifelian to Givetian.

Brachiopods from the Bird Fiord Formation on Ellesmere, Devon, and Bathurst islands were described by Brice (1982). As with the underlying Blue Fiord Formation, the fauna of the Bird Fiord was suggested to be related to Nevada faunas. The Bird Fiord Formation at its type locality and elsewhere on Ellesmere and Devon islands was dated as probable late Eifelian, and as probable Givetian on Bathurst Island.

Bird Fiord brachiopods from a more restricted area at Goose Fiord, in extreme southwestern part Ellesmere Island, were described by Jones (1982c). It was noted that the differences between these fauna and others known elsewhere from this formation, for example, at Sor Fiord on Ellesmere Island, may reflect their environmental conditions. The age of the faunas was suggested as late Emsian, *inversus* or *serotinus* zones.

Also from the extreme southwestern Ellesmere Island, a new rugose coral fauna from Unit 3 (now part of the Goose Fiord Member; Goodbody, 1987, 1989) of the Bird Fiord Formation, was described by Pedder and Goodbody (1983). The fauna was dated as probable late Dalejan, and more specifically as a late or post-*serotinus* Zone, and a pre-*partitus* Zone age.

Rigby and Goodbody (1986) described a new heteractinid sponge, *Malluviospongia*, from the Bird Fiord Formation of southwestern Ellesmere Island.

Strathcona Fiord Formation, Okse Bay Group

Although the Strathcona Fiord Formation was formally introduced by Trettin in 1978 (p. 58-72), the term was used earlier by Embry and Klovan (1976, p. 524-528). It is the oldest of the five formations that comprise the Okse Bay Group. The term was applied to a unit of sedimentary rocks that in west-central Ellesmere Island lies interposed between the Blue Fiord and Hecla Bay formations, and in the area southwest of Vendom Fiord, overlies the Bird Fiord Formation. The formation consists of interbedded sandstone, siltstone, and shale with minor limestone. At its type section, located southeast of the southeastern extremity of Cañon Fiord, it is 497 m thick. In the Bird Fiord area (Section 2A), the recorded thickness is 200 m (Embry and Klovan, 1976, Textfig. 25). The Strathcona Fiord Formation in southwestern Ellesmere Island is entirely a facies equivalent of the Bird Fiord Formation (Goodbody, 1987, 1989). In a cross-section from the junction of Baumann and Vendom fiords to Bird Fiord, Goodbody (op. cit.) showed that the Strathcona Fiord Formation becomes thinner in a southwesterly direction at the expense of the Bird Fiord Formation. Eventually, in the Bird Fiord area, only its upper part forms a cap over the Bird Fiord Formation. In the Bird Fiord area (Section 2A), the recorded thickness of the Strathcona Fiord Formation is only 200 m (Embry and Klovan, 1976, Fig. 25).

Embry and Klovan (1976, p. 528) considered the Strathcona Fiord Formation as nonmarine, and interpreted the unit as representing tidal-flat and delta-plain deposits. The presence of conodonts from the lowest parts of the formation in the Vendom Fiord area, however, suggests marine influence at least in the initial stages of deposition.

PART IV. STRATIGRAPHY AND BIOSTRATIGRAPHY

Section 1: Strathcona Fiord area

Section 1 is located 13 m southwest of the head of Strathcona Fiord (Figs. 1, 3). It is in parts the same as Section 32 of Thorsteinsson (1972) and of Kerr (1976, p. 39-41) and, again in parts, as Section 11 of Trettin (1978, p. 105-107; parts of the section are illustrated in Figs. 66-69 of this reference). It is located on the southeastern limb of a southwestward-plunging anticline. A brief lithological description is given below, and the reader is referred to Kerr (op. cit.) and Trettin (op. cit.) for a more detailed account. See Part III for lithological characteristics and locations of the type sections of the formations discussed below. Conodont distribution and occurrences of megafossils and palynomorphs of Section 1 are shown in Table 2. Detailed occurrences of conodonts are listed in the Appendix (part 2), and most of the megafossils and palynomorphs noted below are similarly listed (Appendix, part 1).

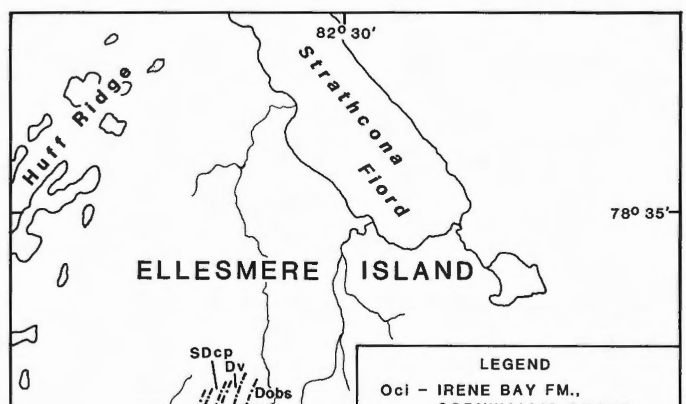
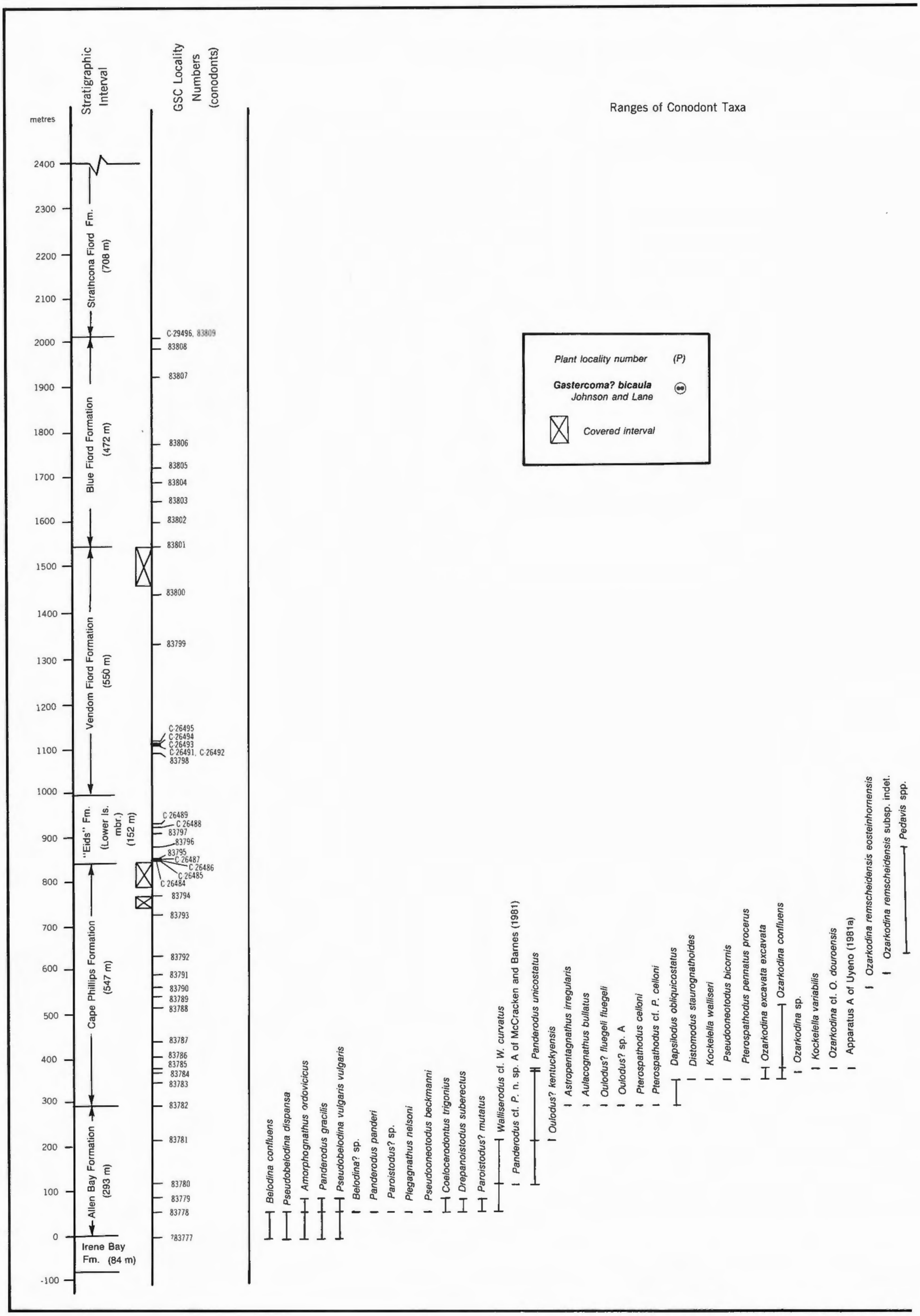


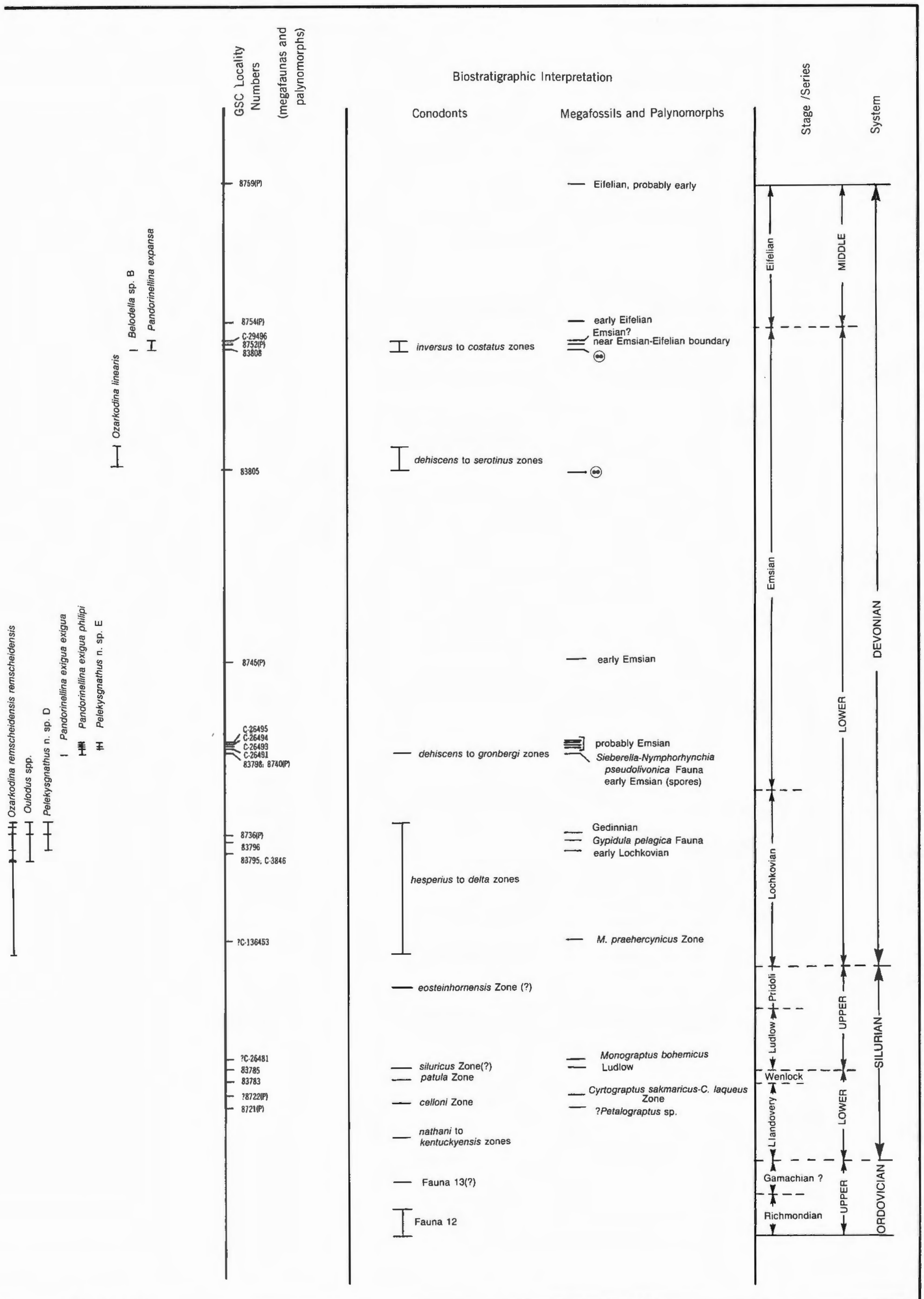
Figure 3. Location map of Section 1, Strathcona Fiord, Ellesmere Island.

TABLE 2

Range chart of conodont distribution, and occurrences of megafossils and palynomorphs, Section 1, Strathcona Fiord, Ellesmere Island



See Figures 1 and 3 for location of section. Refer to Appendix for detailed listing.



GSC Locality Numbers (megafaunas and palynomorphs)
Biostratigraphic Interpretation
Conodonts
Megafossils and Palynomorphs
Stage /Series
System
Ozarkodina remscheidensis remscheidensis
Oulodus spp.
Pelekysgnathus n. sp. D
Pandorinellina exigua exigua
Pandorinellina exigua philipi
Pelekysgnathus n. sp. E
Ozarkodina linearis
Belodella sp. B
Pandorinellina expansa
8759(P)
8754(P)
C-29496
8752(P)
83808
83805
8745(P)
C-26495
C-26494
C-26493
C-26491
83798; 8740(P)
8736(P)
83796
83795, C-3846
?C-136453
?C-26481
83785
83783
?8722(P)
8721(P)
inversus to costatus zones
dehiscens to serotinus zones
dehiscens to gronbergi zones
hesperius to delta zones
eosteinhornensis Zone (?)
siluricus Zone(?)
patula Zone
celloni Zone
nathani to kentuckyensis zones
Fauna 13(?)
Fauna 12
Eifelian, probably early
early Eifelian
Emsian?
near Emsian-Eifelian boundary
early Emsian
probably Emsian
Sieberella-Nymphorhynchia pseudolivonica Fauna
early Emsian (spores)
Gedinnian
Gypidula pelagica Fauna
early Lochkovian
M. praehercynicus Zone
Monograptus bohemicus
Ludlow
Cyrtograptus sakmaricus-C. laqueus Zone
?Petalograptus sp.
Eifelian
Emsian
Lochkovian
Pridoli
Ludlow
Wenlock
Llandovery
Gamachian ?
Richmondian
MIDDLE
LOWER
UPPER
LOWER
UPPER
DEVONIAN
SILURIAN
ORDOVICIAN

Irene Bay Formation, Cornwallis Group

The lowest unit sampled was the Irene Bay Formation of the Cornwallis Group, which conformably overlies the Thumb Mountain Formation. The upper parts of the formation were covered when the section was measured in 1969, but Kerr (1976, p. 41) noted that it is 83.8 m thick. Kerr (*ibid.*) further subdivided the formation into three units, all variably consisting of argillaceous, medium grey limestone. Conodonts from a talus sample from about 3 m below the top of the Irene Bay Formation (GSC loc. 83777) were reported by Barnes (1974, p. 233). He noted that they are similar to those of the uppermost part of the underlying Thumb Mountain Formation, but with the addition of: *Amorphognathus ordovicicus* Branson and Mehl, *Belodina profunda* (Branson and Mehl) [= *Pseudobelodina vulgaris vulgaris* Sweet], *B.* n. spp., and "*Cordylodus*" *robustus* Ethington and Clark. The fauna was assigned by Barnes (*ibid.*) to Fauna 12 of Sweet et al. (1971), which is known to range from the mid-Maysvillian through Richmondian.

Allen Bay Formation

The Allen Bay Formation overlies the Irene Bay Formation with a sharp, conformable contact (Kerr, 1976, p. 40). At this section, the formation is 293 m thick, and was subdivided into four units by Kerr (op. cit.). It consists primarily of light, fine grained dolostone with some grey, fine grained limestone. A fauna virtually identical to that mentioned above from GSC locality 83777 in the underlying Irene Bay Formation continues up into the basal part of the Allen Bay Formation (see also Barnes, 1974, p. 233; Weyant, 1968, Textfig. 2, p. 24). In this study, *Amorphognathus ordovicicus* was recovered from 52 m and 82 m above the base of the formation (GSC locs. 83778 and 83779). These localities also yielded unidentifiable fragmentary trilobites and graptolites. The genus *Gamachignathus*, which is suggestive of Fauna 13 of the Gamachian Stage, was not found in the present collections. It was, however, reported from the lower part of the Allen Bay Formation in central-eastern Cornwallis Island (McCracken, pers. comm., 1987), and from east North Greenland (Hurst and Sheehan, 1982). There is a hint that elements of Fauna 13 may be present at 114 m above the base of the formation (GSC loc. 83780). There, *Panderodus unicostatus* (Branson and Mehl), *P.* cf. *P.* n. sp. A of McCracken and Barnes (1981), and *Walliserodus* cf. *W. curvatus* (Branson and Branson), occur. *Panderodus* n. sp. A was reported from Members 1 to 3 of the Ellis Bay Formation on Anticosti Island, in an interval assigned to Fauna 13, by McCracken and Barnes (1981, Textfig. 12).

The only occurrence of *Oulodus*? *kentuckyensis* (Branson and Branson) is at 213 m above the base of the Allen Bay Formation (GSC loc. 83781). McCracken and Barnes (1981, p. 80, 81) reported this species from Member 6 of the Ellis Bay Formation on Anticosti Island, where its first occurrence coincides with the base of the *nathani* Zone, and lies close to the proposed Ordovician-Silurian boundary. On Anticosti Island, the species ranges higher into the *kentuckyensis* Zone in the Becscie and Gun River formations (Fåhraeus and Barnes, 1981). On the basis of this occurrence, the Ordovician-Silurian boundary at this section is placed between GSC localities 83780 and 83781. It is difficult to assess the exact position of the fauna at the latter locality, since *O.*? *kentuckyensis*, as noted above, ranges up higher elsewhere. There may well be a hiatus at the systemic boundary (see under Ordovician-Silurian Boundary in Part II).

While in the field, R. Thorsteinsson kindly provided a tentative graptolite identification of *Petalograptus* sp. at 283 m above base of formation (= 10 m below its top; GSC plant loc. 8721), suggesting a middle Llandovery age. From the level 8 m higher (GSC loc. 83782), conodonts of the *celloni* Zone were recovered, indicating a late Llandovery (Telychian) age. Diagnostic species include *Pterospathodus celloni* (Walliser), *Aulacognathus bullatus* (Nicoll and Rexroad), *Astropentagnathus irregularis* Mostler, and *Oulodus*? *fluegeli fluegeli* (Walliser).

Cape Phillips Formation

The Cape Phillips Formation lies conformably on the Allen Bay Formation. At Section 1, the formation is 547 m thick, and was subdivided by Kerr (1976, p. 40) into four units. It comprises primarily quartzose, fine grained, thin bedded siltstone, with some dark, silty shale and minor amounts of coquinal limestone.

R. Thorsteinsson (pers. comm., 1988) is currently revising the stratigraphy of Section 1. The upper part of the strata herein referred to the Cape Phillips Formation is being assigned to the Devon Island Formation, with the latter unit also including Trettin's (1978) lower limestone member of the "Eids" Formation.

The lowest sample in the formation, at 52 m above its base (GSC loc. 83783), yielded a fauna that is assigned to the *patula* Zone of basal Wenlock (Sheinwoodian Stage). The fauna consists in part of *Ozarkodina confluens* (Branson and Mehl), *O. excavata excavata* (Branson and Mehl), *Distomodus staurognathoides* (Walliser), *Kockelella walliseri* (Helfrich), and *Pterospathodus pennatus procerus* (Walliser). The occurrence of the last-named is an anomaly as previously it was known only from the older *amorphognathoides* Zone (Klapper *in* Ziegler, 1977, p. 529; Barrick and Klapper, 1976, Textfig. 3). A basal Wenlock age is supported by a large megafauna from the same locality that was dated by B.S. Norford (see Appendix) as ranging from latest Llandovery (*Cyrtograptus sakmaricus-C. laqueus* Zone) to early Wenlock. Further support comes from R. Thorsteinsson's (pers. comm., 1969, 1985) tentative field identification of *Stomatograptus grandis* (Suess) and *Cyrtograptus sakmaricus* Koren, from talus material close to GSC plant locality 8722 (26 m above base of formation). These species suggest assignment to the Zone of *Cyrtograptus sakmaricus-C. laqueus* of latest Llandovery age (Lenz, 1978; 1979, p. 152).

The *siluricus* Zone of late Ludlow age may be represented at GSC locality 83785 (78 m above base of formation) with the presence of *Kockelella variabilis* Walliser, *Ozarkodina* cf. *O. douroensis* Uyeno, and Apparatus A of Uyeno (1981a). *O.* cf. *O. douroensis* was previously recovered from the Cape Storm Formation at Goodsir Creek on eastern Cornwallis Island (Uyeno, 1981a, p. 41), and near the top of the Read Bay/Allen Bay carbonate unit in the Panarctic ARCO et al. Blue Fiord E-46 well in the interval of 1005.8 to 1036.3 m (Section 2C herein; Mayr et al., 1978, p. 396). A Ludlow age for this interval is supported by the brachiopods from the same collection and dated by A.W. Norris (see Appendix). Further support is offered by the occurrence of *Monograptus bohemicus* (Barrande) at GSC locality C-26481 (Trettin, 1978, p. 111); based on measurements on the air photograph (Trettin, *ibid.*, Fig. 66), this locality is approximately 450 m below the top of the formation, and therefore approximately 97 m above its base.

Samples from an 84 m thick interval above GSC locality 83785 were either barren or yielded non-diagnostic conodonts. GSC locality 83788 (219 m above base of formation) did yield *Ozarkodina confluens*, but only its Pb element is present. Although the various morphotypes of the Pa element of that species are biostratigraphically restricted (Klapper and Murphy, 1975, p. 32, 33), the species as a whole ranges up to within the Pridoli. *Ozarkodina remscheidensis eosteinhornensis* (Walliser) at the level of 262 m above the base of the formation (GSC loc. 83790) suggests a late Ludlow to earliest Lochkovian age (Denkler and Harris, 1985, p. 8). Since a possible late Ludlow fauna occurs some 184 m below, this occurrence probably suggests an upper part of this long range. The nominate subspecies, *O. remscheidensis remscheidensis* (Ziegler), has its lowest occurrence at 335 m above the base of the formation (GSC loc. 83792), and continues upward through a 293 m thick interval. The nominate subspecies has been reported elsewhere to have an extremely long range (late Ludlow through *hesperius* Zone to the lower part of the *sulcatus* Zone; Denkler and Harris, 1985, p. 8; Murphy and Berry, 1983, Textfig. 2). In the Canadian Arctic Islands generally, however, a total range of *hesperius* to *delta* zones, as suggested by Klapper (*in* Klapper and Johnson, 1980, p. 450), seems most likely. One piece of evidence for this is the graptolite *Monograptus praehercynicus* Jaeger, collected and identified by R. Thorsteinsson, from a locality about 367 m above the base of the formation (GSC loc. C-136453; the loc. no. 28710 given by Trettin, 1978, p. 111 is in error and a new number has been assigned), and hence approximately 32 m above GSC locality 83792. The Zone of *M. praehercynicus*, of middle Lochkovian age, was equated with the *eurekaensis* and *delta* zones by Thorsteinsson and Uyeno (1981, Table 1). Samples from the upper beds of the Cape Phillips Formation were either barren or did not yield diagnostic conodonts. Furthermore, the upper 1000 m or so were covered when measured in 1969.

"Eids" Formation, Lower limestone member

The informal lower limestone member of the "Eids" Formation at Section 1 is 152 m thick. When measured in 1969, it was separated from the underlying Cape Phillips Formation by a covered interval of about 66 m (see Trettin, 1978, Appendix 1, Part B, p. 63). The member, subdivided into five units by Trettin (op. cit., p. 63-65), consists of lime wackestone, with lesser amounts of poorly washed grainstone and crystalline dolostone. As previously noted under the Cape Phillips Formation, the stratigraphy of Section 1 is being revised by R. Thorsteinsson (pers. comm., 1988). The lower limestone member of the "Eids" Formation is included with the Devon Island Formation in this revision.

Ozarkodina remscheidensis remscheidensis has its highest occurrence in the "Eids" Formation (81 m above base of formation, GSC loc. C-26489), which suggests a *delta* Zone age. This age assignment is supported by brachiopod collections from about 1.8 to 2.9 m above the base of the "Eids" Formation, which suggest an "early" but probably not basal Lochkovian age (GSC loc. C-3846; Trettin, 1978, p. 113). Further support is offered by rich megafaunas from the levels of 6 m and 32 m above the base of the formation (GSC locs. 83795 and 83796, respectively). A.W. Norris (see Appendix) dated these collections as early Lochkovian, with the higher one more specifically designated as the *Gypidula pelagica* Fauna of Lenz (1966). According to Lenz (*in* Jackson et al., 1978, p. 30), this fauna immediately precedes his *Spirigerina supramarginalis* Fauna, an equivalent of the *Quadrithyris* Zone of Johnson (1970, 1975a). The latter zone coexists with conodonts of the *delta* and *pesavis* zones (Johnson, 1977b, p. 20). Spores from 54 m above the base of the formation (GSC plant loc. 8736) suggest a most likely age of Gedinnian (D.C. McGregor; see Appendix). The upper half of the formation was not sampled for conodonts.

Vendom Fiord Formation

The contact of the Vendom Fiord Formation with the underlying lower limestone member of the "Eids" Formation is not exposed, but has a disconformable relationship (Trettin, 1978, p. 40). Trettin (op. cit., Appendix 1, Part B, p. 65-76) subdivided this formation into Units 1 to 13, in ascending order. He described (op. cit., p. 40) the formation as consisting "mainly of sandstone (including dolarenite), siltstone (including dolsiltite [sic]), and dolostone with lesser amounts of conglomerate, limestone, and gypsum-anhydrite". The thickness measured for this study was 550 m.

The lowest sampled interval, at 91 m above the base of the formation (GSC loc. 83798) and probably from Unit 5 of Trettin (1978), yielded *Pandorinellina exigua exigua* (Philip) and *P. exigua philipi* (Klapper). The overlap of the ranges of these two subspecies occurs in the *dehiscens* to *gronbergi* zones of late Pragian to Zlichovian (early Emsian) age (Klapper *in* Klapper and Johnson, 1980, p. 450; Uyeno and Klapper, 1980, Fig. 8.2). According to A.W. Norris (see Appendix), a *dehiscens* Zone assignment is more likely based on the brachiopod fauna from the same collection. An early Emsian age assignment is also supported by exceptionally abundant spore data derived from an interval 0.3 m higher (GSC plant loc. 8740; McGregor, see Appendix). *P. exigua philipi* continues upward to 125 m above base of the formation, occurring in four, closely spaced samples, associated with probable Emsian age megafossils (GSC loc. C-26491, C-26493 to C-26495; Trettin, 1978, p. 116). An abundant spore flora from 299 m above base of formation (GSC plant loc. 8745) was also dated as early Emsian (McGregor, see Appendix).

The remainder of the thick Vendom Fiord Formation either was barren or yielded only biostratigraphically insignificant forms. A 100 m thick covered interval separates the Vendom Fiord from the overlying Blue Fiord Formation.

Blue Fiord Formation

At Section 1, the Blue Fiord Formation is 472 m thick and was subdivided into three units by Trettin (1978, Appendix 1, Part B, p. 76-78). It comprises mainly lime wackestone, with some dolostone, and minor amounts of siltstone. The lower and upper contacts with the Vendom Fiord and Strathcona Fiord formations are conformable and gradational.

Samples collected from the lower half of the formation failed to yield any conodonts (GSC locs. 83801 to 83804). A sparse fauna with *Ozarkodina linearis* (Philip) was obtained from 117 m and 234 m above the base of the formation (GSC locs. 83805 and 83806, respectively). Elsewhere this species is known to range from the *dehiscens* to *serotinus* zones (Klapper *in* Klapper and Johnson, 1980, p. 450), thus spanning almost the entire Emsian Stage. Since, however, *O. linearis* occurs within or immediately below the *gronbergi* Zone at Section 2A and at Sor Fiord (Klapper *in* Uyeno and Klapper, 1980, Fig. 8.3), it is possible that the Blue Fiord occurrence here represents a similar time range. Biaxial crinoid ossicles, *Gasterocoma*? *bicaula* Johnson and Lane, occur at GSC locality 83805.

Pandorinellina expansa Uyeno and Mason from the upper beds (1 m and 22 m below top of formation; GSC locs. C-29496 and 83808, respectively) suggests a range from the *inversus* to *costatus* zones (Uyeno and Klapper, 1980, Figs. 8.2, 8.3; Klapper *in* Klapper and Johnson, 1980, p. 450), that is, from about middle Emsian to early Eifelian. Brachiopods from the former locality were questionably dated as Emsian (Trettin, 1978, p. 116) and the latter contains biaxial crinoid ossicles. Spores from 18 m from top of the formation are close to the Emsian-Eifelian boundary (GSC plant loc. 8752; McGregor, see Appendix).

Strathcona Fiord Formation, Okse Bay Group

The Strathcona Fiord Formation, the lowest unit of the Okse Bay Group, overlies the Blue Fiord Formation with a gradational and conformable contact. Trettin (op. cit., p. 78-83) subdivided the formation into 9 units, and recorded a thickness of 708.1 m. Although of variable lithology, it is predominantly greyish, sandy quartzose siltstone and greyish, fine grained, quartzose sandstone. Flat lamination and some crosslamination are common. No conodont samples were taken from this formation. D.C. McGregor (see Appendix) listed an extensive spore flora from a sample located 39.5 m above base of the formation (GSC plant loc. 8754), and dated it as early Eifelian.

Composite Sections R-A to R-F: Vendom Fiord area

(by T.T. Uyeno and R.F. Roblesky)

On the west side of Vendom Fiord, five separate subsections were measured and described in detail (Figs. 1 and 4). Of these, four are included in this study and are considered under Composite Section, R-A. On the east side, of the 12 subsections that were accorded similar treatment (Figs. 1 and 4), five are included herein, and referred to as Composite Sections R-B, R-D, and R-F. Other sections may be briefly mentioned in order to demonstrate the general geology of the area. Included in these sections are (in ascending order): the undivided Allen Bay–Read Bay carbonates, Cape Phillips Formation, Devon Island

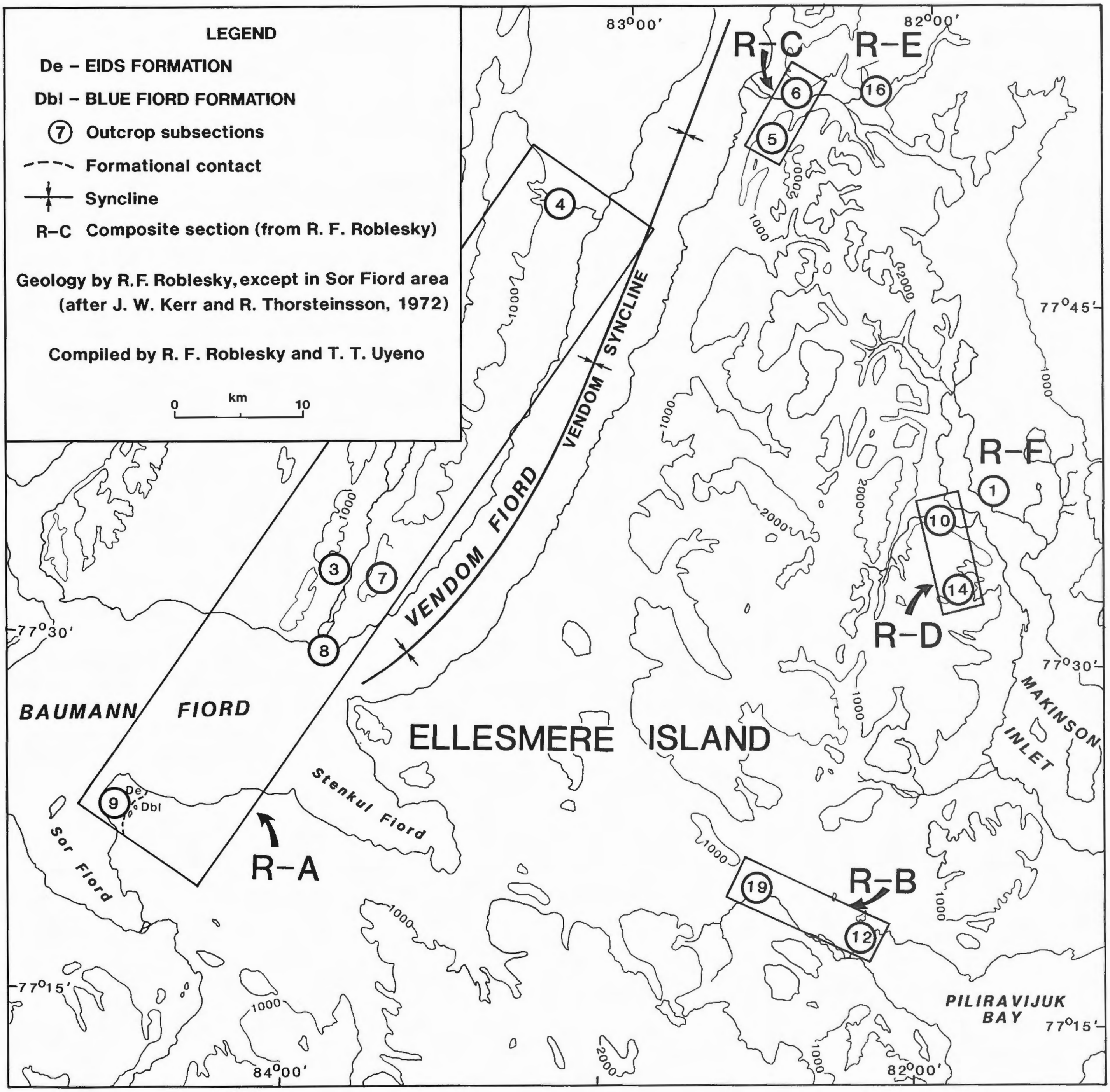
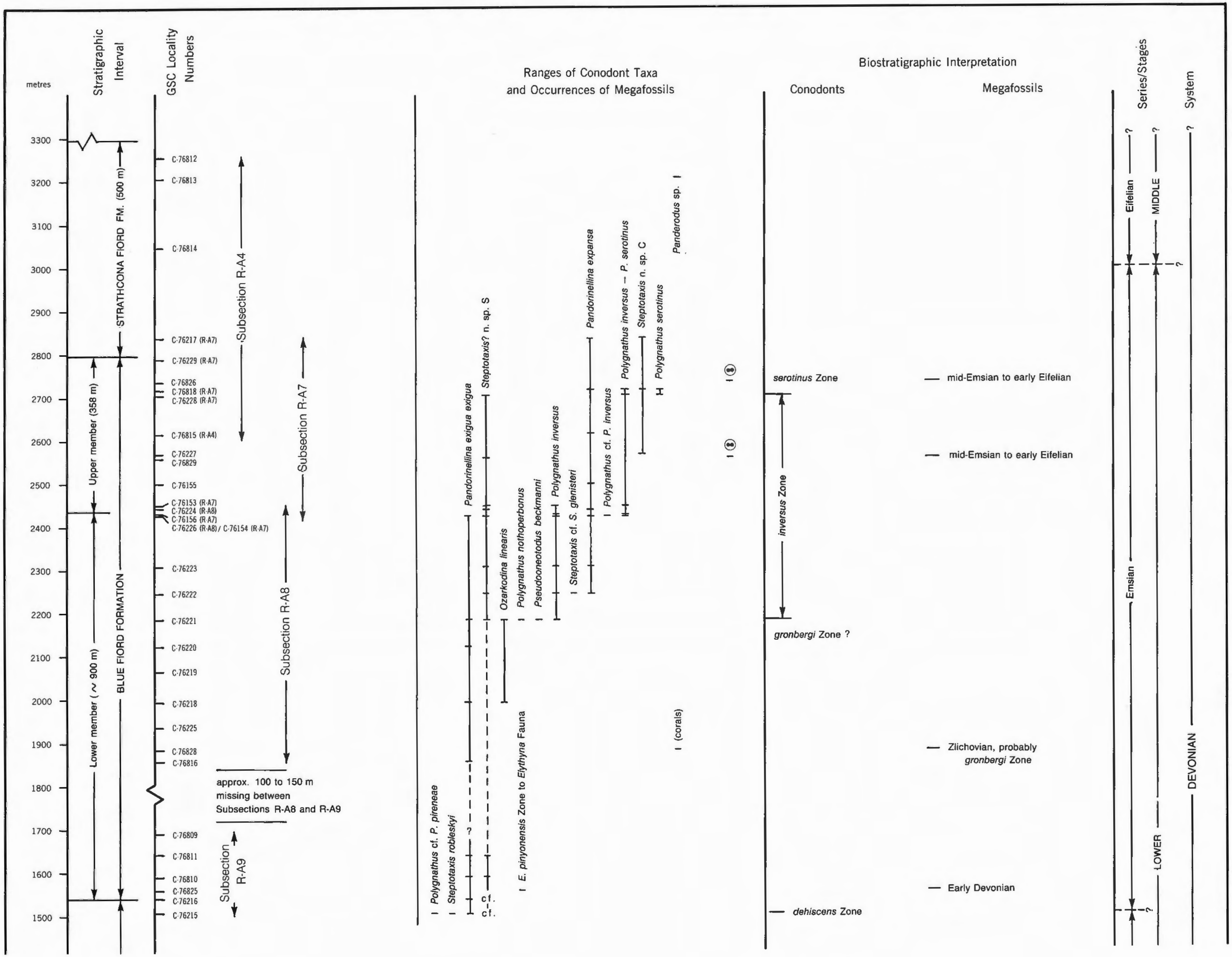
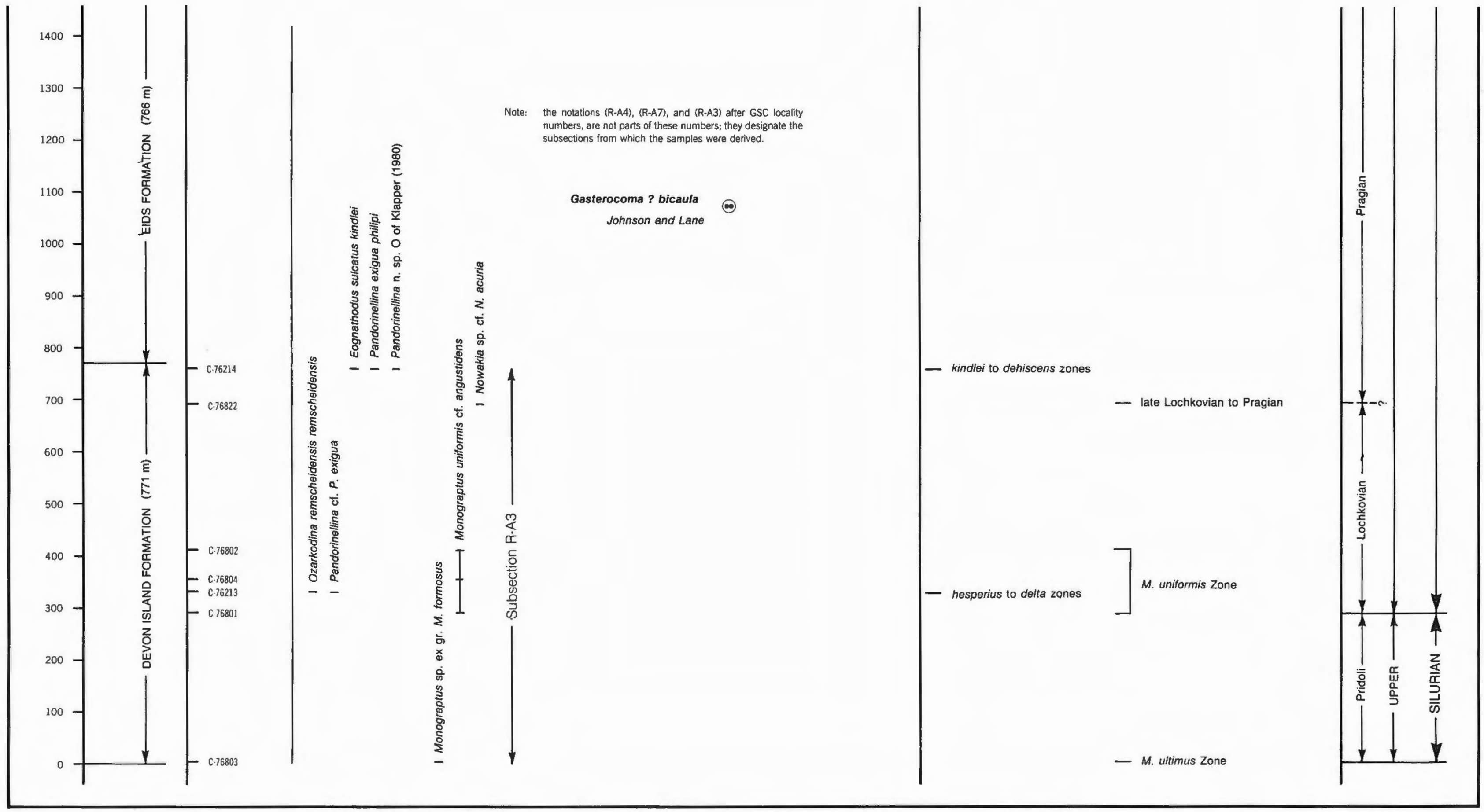


Figure 4. *Location map of Composite Sections R-A, west of Vendom Fiord, including Sor Fiord area, and R-B to R-F, east of Vendom Fiord, Ellesmere Island.* ***Note:*** *Composite Section R-A comprises Subsections 3, 4, 7-9; Composite Section R-B comprises Subsections 12 and 19; Composite Section R-C comprises Subsections 5 and 6; Composite Section R-D comprises Subsections 10 and 14; Composite Section R-E comprises Subsection 16; and Composite Section R-F comprises Subsection 1.*

TABLE 3

Range chart of conodont distribution, and occurrences of megafossils, Composite Section R-A, west of Vendom Fiord, Ellesmere Island





See Figures 1 and 4 for location of sections. Refer to Appendix for detailed listing.

Formation, Eids Formation, the lower and upper members of the Blue Fiord Formation, and the Strathcona Fiord and Hecla Bay formations of the Okse Bay Group. However, since neither the Cape Phillips nor the Hecla Bay Formation from this area yielded any conodonts, these units have been excluded from this study. The conodont faunas from sections located east of Vendom Fiord tend to be sparse both in terms of abundance and diversity in comparison with those from the west side. These rocks were deposited in more restricted environments and closer to the craton than those located west of the fiord, as reflected in their lithologies and thicknesses (Fig. 5).

In the following, the sections on lithic description of formations, their stratigraphic relationships, and environments of deposition were written by R.F. Roblesky. Conodont determinations are based on collections made by him. Conodont distribution and occurrences of some megafossils of the above Composite Sections are shown in Tables 3-5. Detailed occurrences of conodonts are listed in the Appendix (part 2), and most of the megafossils noted below are similarly listed (Appendix, part 1).

Allen Bay–Read Bay carbonates (undivided)

The reader is referred to McGill (1974) for description of lithology and depositional history of the Allen Bay–Read Bay carbonates in the Vendom Fiord area. In this study, investigations were limited to brief reconnaissance traverses, mainly to examine the uppermost beds and to observe the nature of the upper contact. In the eastern parts of Vendom Fiord area, the carbonates are disconformably overlain by the Vendom Fiord Formation. Below the disconformity the unit consists of dolostone, the upper beds of which exhibit solution features and brecciation. In the central parts, the contact between the carbonates and the overlying Vendom Fiord Formation appears to be conformable.

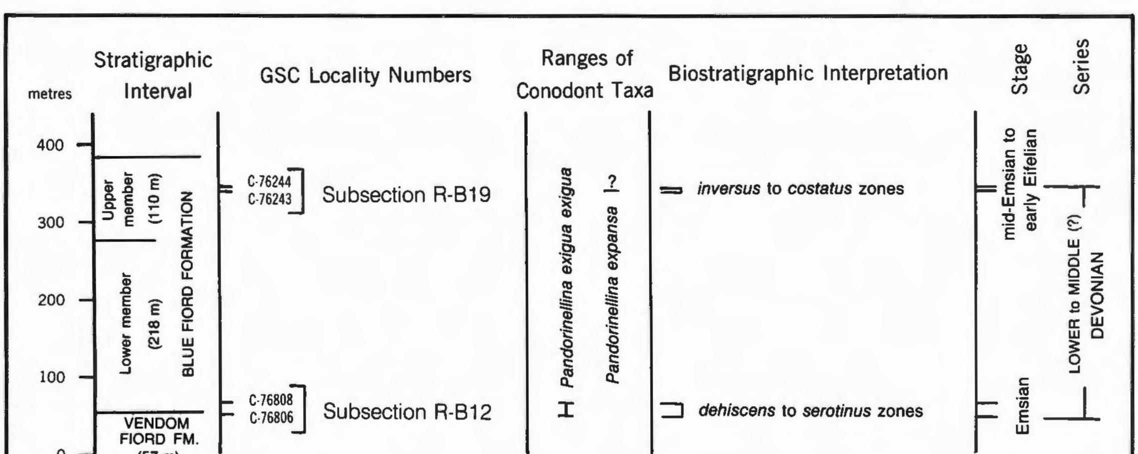
Conodonts from the equivalents of the Allen Bay–Read Bay carbonates, referable to the Goose Fiord Formation in parts of the east side of the Fiord (R. Thorsteinsson pers. comm., 1986), were obtained from Subsection R-D10 only. There, *Ozarkodina excavata excavata* occurs at 53 m and 68 m below the top unit (GSC locs. C-76231 and C-76230, respectively). This subspecies has an extremely long range, from the *patula* Zone (Sheinwoodian Stage, Wenlock) through the *gronbergi* Zone (Zlichovian, early Emsian) (Klapper *in* Ziegler, 1973, p. 226; Barrick and Klapper, 1976, Textfig. 3; Klapper *in* Klapper and Johnson, 1980, p. 450; Nowlan, 1981, p. 273).

Devon Island Formation

The Devon Island Formation is confined to the western limb of the Vendom Syncline, west of Vendom Fiord. The formation is relatively complete at Subsection R-A3 where it can be divided into lower and upper members, 381 m and 390 m thick, respectively. The lower member consists of alternating dark grey weathering, thinly laminated, fissile, calcareous siltstones, and yellowish-grey weathering, thin- to

TABLE 4

Range chart of conodont distribution,
Composite Section R-B, east of Vendom Fiord, Ellesmere Island



See Figures 1 and 4 for location of sections. Refer to Appendix for detailed listing.

medium-laminated, massive, silty limestones. The siltstone units vary in thickness from 1 to 3 m and the limestones from 0.5 to 4 m, with the latter increasing in abundance upward. The member is notably recessive and appears on aerial photographs as a medium to dark grey unit. It contains a sparse fauna, consisting of graptolites, brachiopods, fish fragments, and tentaculitids.

The upper member of the Devon Island Formation comprises alternating dark grey weathering, thinly laminated, fissile, calcareous siltstones, and greyish-yellow weathering, thinly to medium-laminated, massive, silty dolostones. The dolostone units vary in thickness from 0.5 to 5 m and the siltstones from 0.5 to 3 m. The upper member is slightly more recessive than the lower member, appearing as a medium grey unit on aerial photographs. The sparse fauna consists of graptolites, fish fragments, and tentaculitids.

The upper 3 m at Subsection R-A3 consists of a markedly resistant, light olive-grey weathering, massive, sandy limestone (skeletal grainstone). It has sharp upper and lower contacts and is directly overlain by shales of the Eids Formation. The skeletal grains consist of brachiopods, crinoids, bryozoans, corals, and ostracodes.

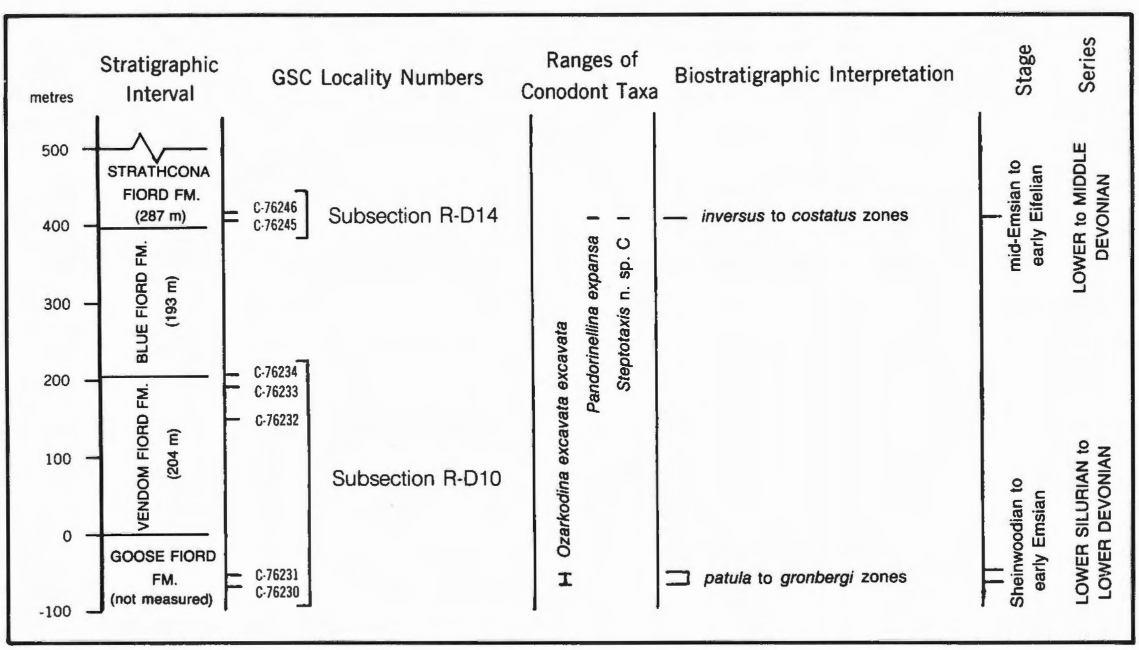
The entire Devon Island Formation is exposed at Subsection R-A3. Graptolites, identified by R. Thorsteinsson as *Monograptus* sp. ex. gr. *M. formosus* Bouček, from 3.3 m above the base of the formation (GSC loc. C-76803), indicate the Zone of *M. ultimus*, the basal zone of the Pridolian. A sample from 331 m above the base (GSC loc. C-76213) yielded *Ozarkodina remscheidensis remscheidensis* and *Pandorinellina* cf. *P. exigua* (Philip). This fauna is bracketed by the graptolite *Monograptus uniformis* subsp. cf. *M. uniformis angustidens* Přibyl, from 290 m, 353 m, and 412 m above the base (GSC locs. C-76801, C-76804, and C-76802, respectively), which indicate the Zone of *Monograptus uniformis*, the basal zone of the Lochkovian. The Silurian-Devonian boundary is thus placed at GSC locality C-76801.

Icriodus woschmidti Ziegler, which is usually associated with graptolites of the *uniformis* Zone, was not found at Section R-A3. Its subspecies, *I. woschmidti hesperius* Klapper and Murphy, together with *Ozarkodina remscheidensis remscheidensis,* does occur, however, in a sample obtained from about the middle of the Devon Island Formation (GSC loc. C-92466; collected by R. Thorsteinsson; see Appendix), from a locality approximately midway between Sections 1 (Strathcona Fiord) and R-A8. These species suggest assignment to the *hesperius* Zone of uppermost Pridoli to early Lochkovian age.

At the level of 690 m above the base (GSC loc. C-76882), *Nowakia* sp. cf. *N. acuria* (Richter), identified by A.W. Norris, suggests a late Lochkovian to Pragian age. A sample

TABLE 5

Range chart of conodont distribution,
Composite Section R-D, east of Vendom Fiord, Ellesmere Island



See Figures 1 and 4 for location of sections. Refer to Appendix for detailed listing.

from 12 m below the top of the formation (GSC loc. C-76214), yielded *Pandorinellina exigua philipi*, *P.* n. sp. O of Klapper *in* Klapper and Johnson (1980), and *Eognathodus sulcatus kindlei* Lane and Ormiston. This fauna can be assigned to the *kindlei* and (or) *dehiscens* zones of middle Pragian to early Emsian age.

The highest sample available from the Devon Island Formation is from a level 10 m below its top, from a site near the junction of Vendom and Baumann fiords (GSC loc. C-84882; see Appendix). Its conodont fauna includes *Polygnathus dehiscens dehiscens* Philip and Jackson and *Icriodus taimyricus* Kuzmin, and is assignable to the *dehiscens* Zone.

Eids Formation

As with the underlying Devon Island Formation, with which it has a sharp and conformable contact, the Eids Formation crops out only on the western limb of the Vendom Syncline in this area. The entire formation is exposed at Subsection R-A9, where it is divisible into two informal units, a lower member of 126 m thickness, and an upper member, 641 m thick. At Subsection R-A3, only the lower 120 m of the lower member is exposed.

The lower member of the Eids Formation is a monotonous sequence of friable mudstone with lesser amounts of siltstone. The unit is recessive and dark grey, thin bedded and thin to medium laminated, with laminae 3 to 5 mm thick. The poorly exposed upper member is a greyish green weathering sequence of siltstones and sandstones. It is thin to medium bedded, with grain size generally tending to coarsen upwards. The fauna of the formation is sparse and consists of scolecodonts and brachiopods.

The Eids Formation is conformably overlain by carbonates of the Blue Fiord Formation. This contact is transitional and arbitrarily drawn at the base of the lowest major fossiliferous carbonate unit.

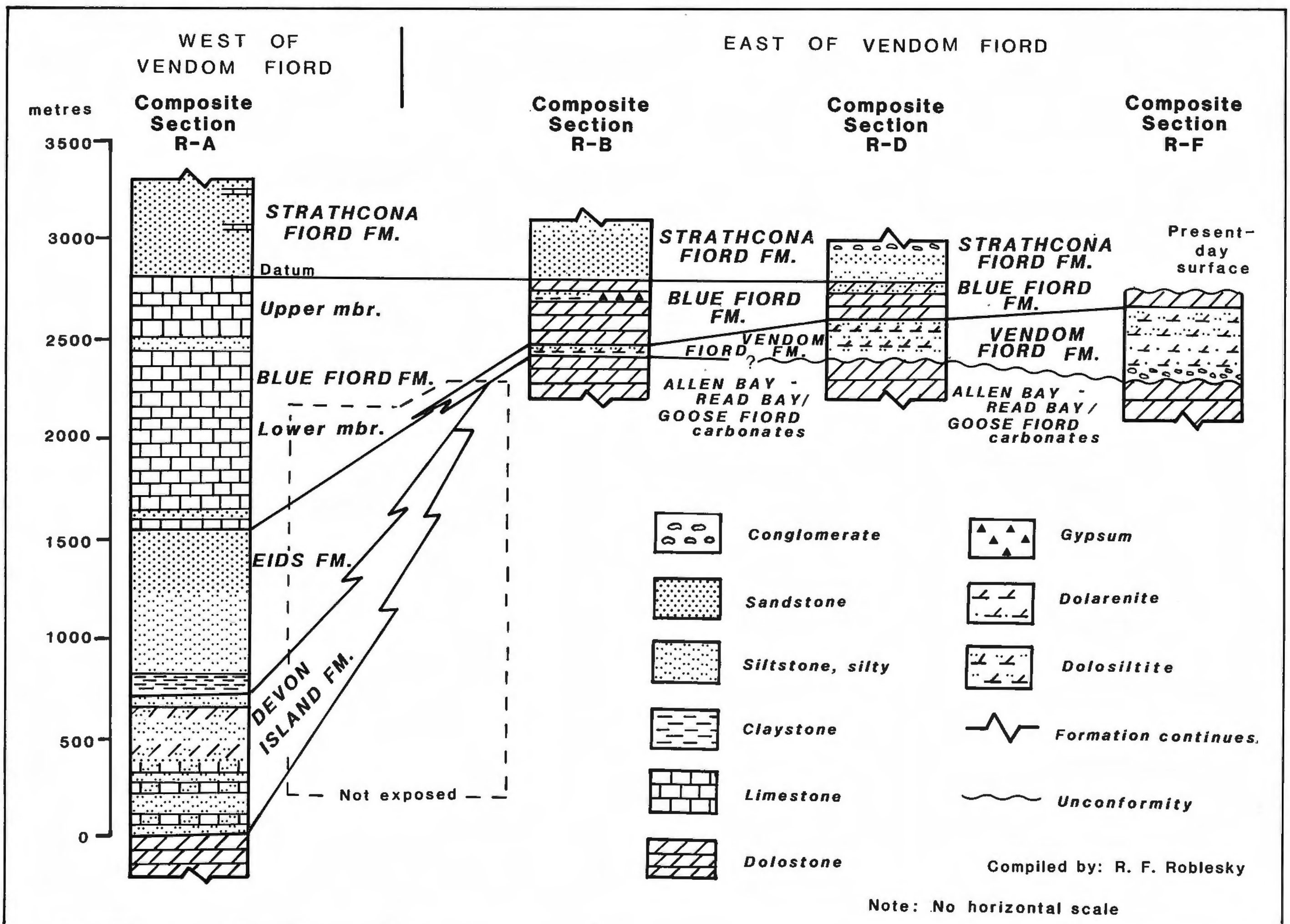


Figure 5. Cross-section across Vendom Syncline, Ellesmere Island. (See Figures 1 and 4 for location.)

The single Eids sample is from Subsection R-A9, located 30 m below the top of the formation (GSC loc. C-76215). It yielded *Polygnathus* cf. *P. pireneae* Boersma, *Steptotaxis robleskyi* n. sp., *S.*? cf. *S.*? n. sp. S, and *Pandorinellina exigua exigua*, a fauna that is assigned to the *dehiscens* Zone of early Emsian age. At a section located 8 km southwest of R-A9, Klapper (*in* Uyeno and Klapper, 1980, Fig. 8.3; GSC loc. C-12504) obtained *Polygnathus dehiscens dehiscens* Philip and Jackson from near the top of the formation.

At Subsection R-F1, a sample from 3 m above the base of the Vendom Fiord Formation contained *Pandorinellina exigua exigua* (GSC loc. C-76211). As noted above, the same subspecies was found in this formation at Subsection R-B12.

A sample from the upper part of the Vendom Fiord Formation at Subsection R-D10 (192 m above base of formation; GSC loc. C-76223) contained only specimens of *Panderodus.*

Vendom Fiord Formation

The Vendom Fiord Formation outcrops in narrow belts east of Vendom Fiord. Of the six sections in which this unit was examined, three have yielded conodonts. The formation markedly thins to the west, ranging from 396 m at Subsection R-F1 to 57 m at R-B12 (Fig. 5).

At two of the sections included in this study, a disconformable relationship between the Vendom Fiord Formation and the underlying strata is probable. At, and in the vicinity of, Subsections R-F1 and R-E16, dolostone cobble and pebble conglomerates are present at the base of the formation. At the former locality, the conglomerates rest with irregular contact on carbonates of the Goose Fiord Formation. The underlying dolostones are brecciated and contain numerous solution features. In the vicinity of Subsection R-E16 the basal conglomerates rest on a scoured surface of red-weathering dolosiltites and cryptalgal dolostones of an unnamed red-bed unit. At Subsection R-D10, red-weathering dolosiltites and siltstones of the Vendom Fiord Formation rest sharply on the dolostones of the Goose Fiord Formation. The contact is planar and the underlying carbonates are brecciated.

On the other hand, at Subsections R-B12 and R-C6, the Vendom Fiord Formation is interpreted as resting conformably on the Goose Fiord Formation. At both locations the contact is sharp and planar. No brecciation or solution features are present in the underlying carbonates.

Throughout the Vendom Fiord area, the Vendom Fiord Formation is conformably overlain by carbonates of the Blue Fiord Formation. The contact is gradational and placed where resistant, "clean" carbonates predominate over recessive, clastic and silty carbonate rocks.

At Subsection R-B12, the only sample with conodonts from the Vendom Fiord Formation is from 5 m below its top (GSC loc. C-76806). It contained *Pandorinellina exigua exigua*, which continues upward to the basal part of the lower member of the Blue Fiord Formation (12 m above base; GSC loc. C-76808). As previously noted, this taxon is long-ranging, spanning from the *dehiscens* to *serotinus* zones.

Blue Fiord Formation

The Blue Fiord Formation is a thick sequence of limestone and dolostone with lesser amounts of siltstone and gypsum. It outcrops on both the eastern and western limbs of the Vendom Syncline, and underlies most of the study area. Thicknesses range from 1050 m west of Vendom Fiord to 231 m on the east (Fig. 5). Two distinct, informal units have been recognized: a lower carbonate member and an upper siltstone-carbonate member.

The lower carbonate member ranges in thickness from 672+ to ~193 m, similarly increasing from east to west. It is composed of limestone and dolostone, with lesser amounts of calcareous dolostone, dolomitic limestone, siltstone, and calcareous mudstone. In the study area, it is predominantly limestone in the western and southwestern parts, and dolostone in the east and southeast. At Subsection R-A8 it consists of two subunits, a lower light grey weathering, cliff-forming limestone with minor dolostone interbeds, and an upper dark greyish-brown weathering, relatively less resistant limestone.

Five major facies have been recognized in the lower carbonate member: 1) bioclastic, 2) massive skeletal, 3) nodular, 4) peloid, and 5) massive dolomite.

The upper siltstone-carbonate member thickens from 31 to 369 m in a westerly direction. It is composed of limestone, dolostone, and gypsum with lesser amounts of dolomitic limestone, calcareous dolostone, siltstones, and calcisiltites. At Subsections R-A4 and R-A7, located west of Vendom Fiord, the member is divisible into two informal subunits: a lower, markedly recessive, greyish green weathering, interlaminated quartz siltstone and calcisiltite with lesser amounts of limestone interbeds, and an upper cliff-forming, greyish-yellow weathering limestone with minor dolomitic limestone and dolostone interbeds. At Subsections R-C6 and R-B19 on the eastern side of the fiord, the member is composed of a lower recessive unit of greyish green weathering, laminated, silty dolostone, thick bedded, reddish weathering gypsum, and siltstone, and an upper cliff-forming unit of dolostone, calcareous dolostone, and limestone.

Six major facies have been recognized in the upper member: 1) siltstone, 2) nodular-skeletal calcarenite, 3) evaporite, 4) skeletal, 5) calcisphere-peloid, and 6) fenestral dolostone.

Biostratigraphy of the lower member

West of Vendom Fiord, the basal 164 m of the lower member are exposed at Subsection R-A9, and the upper 670 m of the lower member at Subsection R-A8; an estimated 100 to 150 m of intervening layers are thought to be missing between these sections (Table 3).

The lower half of the lower member at Subsection R-A9 yielded two species, both occurring in the underlying Eids Formation, namely *Pandorinellina exigua exigua* and *Steptotaxis*? cf. *S.*? n. sp. S. The former species is long-ranging, spanning from the *dehiscens* to *serotinus* zones (Klapper *in* Klapper and Johnson, 1980, p. 450; Uyeno and Klapper, 1980, Fig. 8.2). A large megafauna from 23 m above the base of the formation (GSC loc. C-76825), identified by A.W. Norris (see Appendix), was assigned to the *Eurekaspirifer pinyonensis* Zone to *Elythyna* Fauna, Intervals 10 to 14 inclusive of Johnson (1977a, p. 8, Textfig. 2). This range is identically correlative with the range mentioned above, that is, from the *dehiscens* to *serotinus* zones (Johnson, 1977b, p. 22-24). Since *dehiscens* Zone conodonts occur in the upper beds of the Eids Formation, and possible *gronbergi* Zone species occur in presumably higher beds (Subsection R-A8), it is probable that the present conodonts and megafaunas represent the lower part of this range.

The lower part of the lower member of the Blue Fiord Formation at Subsection R-A8 yielded only long-ranging conodonts. At 555 m below the top of the lower member, however, A.E.H. Pedder (see Appendix; GSC loc. C-76828) identified a megafauna that he dated as Zlichovian, and that he correlated with some part of the *gronbergi* Zone. At the level of 253 m below the top of the member (GSC loc. C-76221), *Polygnathus inversus* Klapper and Johnson and *P. nothoperbonus* Mawson occur, a combination which suggests a lower part of the *inversus* Zone. *P. inversus* ranges higher to a level 10 m below the top (GSC loc. C-76226) at R-A8, where it co-occurs with *P. inversus* transitional to *P. serotinus* Telford. That interval between C-76221 and C-76218 (446 m below top) with *Ozarkodina linearis* is, by stratigraphic position, tentatively placed in the *gronbergi* Zone.

Biostratigraphy of the upper member

The contact between the lower and upper members is exposed at Subsections R-A8 and R-A7. In the latter sequence, *Polygnathus inversus* and *P. inversus* transitional to *P. serotinus* range from the lower member to the lower part of the upper member. The transitional form ranges higher to 271 m above the base of the member (GSC loc. C-76228), where it co-occurs with *P. serotinus. Steptotaxis*? n. sp. S ranges up to the lowest part of the *serotinus* zones at R-A7, whereas *S.* n. sp. C ranges into the *serotinus* Zone and possibly higher.

Biaxial crinoid ossicles, *Gasterocoma*? *bicaula* Johnson and Lane, occur at 121 m, 301 m, and 311 m above the base of the member (GSC locs. C-76829, C-76826, and C-76823 [=C-76831], respectively). The megafauna from the last locality was dated as *serotinus* Zone by Pedder (1983, p. 233).

At Subsection R-B19, the upper member of the Blue Fiord Formation yielded *Pandorinellina expansa* (64 m above base of member; GSC loc. C-76243). At a level 7 m higher (GSC loc. C-76244), a fragmented spathognathodiform element, questionably assigned to that species, is present. As also previously noted, this taxon, too, is long-ranging, and known from the *inversus* to *costatus* zones.

Strathcona Fiord Formation, Okse Bay Group

The Strathcona Fiord Formation outcrops on both limbs of the Vendom Syncline, and is preserved in a number of fault-bounded blocks in the vicinity of the north arm on Makinson Inlet. Of the five subsections in which it was examined, two have produced conodonts: R-A7 on the west and R-D14 to the east. Its thickness ranges from ~287 m at R-D14, to ~519 m at R-C5, and to ~968 m at R-A4, demonstrating a considerable thinning in an easterly direction, toward the craton.

Throughout the study area the Strathcona Fiord Formation conformably overlies the Blue Fiord Formation. The contact is gradational and is placed at the lowest clastic unit within a transitional sequence of carbonate and clastic strata. The formation is in turn overlain by the Hecla Bay Formation of the Okse Bay Group. This upper contact was not exposed and is most commonly represented by a rubbly, covered interval.

The formation is characterized by alternating recessive and resistant units of sandstone and siltstone. The most striking feature, which makes it so easily recognizable, is its dusky red weathering colour. It is composed mainly of siltstone and very fine to fine grained sandstone with lesser amounts of fine to medium grained sandstone, and minute amounts of lime wackestone and mudstone, and chert-pebble conglomerate.

West of Vendom Fiord, conodonts from this formation were obtained only from Subsection R-A7, at 13 m above the base of the formation (GSC loc. C-76217). Two species are represented, *Pandorinellina expansa* and *Steptotaxis* n. sp. C, both of which range up from the underlying upper member of the Blue Fiord Formation. The former species is known to range as high as the *costatus* Zone elsewhere (Klapper *in* Klapper and Johnson, 1980, p. 450).

In the Strathcona Fiord Formation east of Vendom Fiord (Subsection R-D10), *Pandorinellina expansa* and *Steptotaxis* n. sp. C occur at 7.6 m above the base of the formation (GSC loc. C-76245). The former species suggests assignment of this fauna to the interval of *inversus* to *costatus* zones. *S.* n. sp. C is known at west of Vendom Fiord (Section R-A7) from the upper member of the Blue Fiord Formation and the lowest part of the overlying Strathcona Fiord Formation.

Section 2A: Bird Fiord area

Section 2A is located approximately 10 km northeast of the head of Bird Fiord on southwestern Ellesmere Island (Figs. 1, 6). As stated earlier in Part III, the Bird Fiord area hosts the type sections of the Blue Fiord and Bird Fiord formations. McLaren (1963b, p. 325) noted that two distinct members are recognizable within the Bird Fiord Formation. In a later map by Kerr and Thorsteinsson (1972), the Bird Fiord is shown as consisting of a lower member, comprising limestone and shale that are variably quartzose and green weathering, and an upper member of sandstone that is partly calcareous and mainly of red or green colour. The thicknesses of the individual Bird Fiord members were not given. The type sections for these formations were subsequently selected by McLaren (*in* Kerr and Thorsteinsson, 1972).

Goodbody (1989) divided the Bird Fiord Formation at Bird Fiord into two members, the lower Norwegian Bay Member, 580 m thick, and the upper Cardigan Strait Member, 235 m thick. These units correspond closely to the informal divisions of Kerr and Thorsteinsson (1972) noted above.

At Section 2A, the Blue Fiord Formation was sampled along creeks located 2.5 km east of the type section, and the Bird Fiord Formation from its type section. The base of the section is at UTM Zone 16X, 518 000 m E, 8 574 500 m N, and its top at UTM Zone 16X, 518 750 m E, 8 569 000 m N (approximately equivalent to lat. 77°14.2′N, long. 86°16.5′W, and lat. 77°11.1′N, long. 86°14.5′W, respectively). The Bird Fiord Formation collection is supplemented by three samples collected by R. Thorsteinsson in 1979 (Fig. 6).

Incidental to the main thrust of this paper, the presence of biaxial crinoid ossicles, *Gasterocoma*? *bicaula* Johnson and Lane, in both the Blue Fiord and Bird Fiord formations at this section is noted. *Gasterocoma*? *bicaula* ranges almost throughout the Blue Fiord Formation (from the *dehiscens* to *serotinus* zones), and in the Bird Fiord Formation it occurs at GSC locality 83767 (523 m above base of formation). At the latter locality it is of early Eifelian age.

In the following, the biostratigraphic summary that was presented by Uyeno and Klapper (1980) has been slightly revised and updated. Brachiopod and spore data that were kindly provided by A.W. Norris and D.C. McGregor, respectively, are included. The thickness of the upper brown limestone member of the Blue Fiord Formation in that paper was erroneously shown as 688 m (Uyeno *in* Uyeno and Klapper, 1980, Fig. 8.2); it should have read 572 m, resulting in a total formational thickness of 1261 m. The thickness of the overlying Bird Fiord Formation is similarly revised to 853 m, from 868 m.

Conodont distribution and occurrences of some megafossils and palynomorphs in Section 2A are shown on Table 6. Detailed occurrences of conodonts are listed in the Appendix (part 2), and most of the megafossils and palynomorphs noted below are similarly listed (Appendix, part 1).

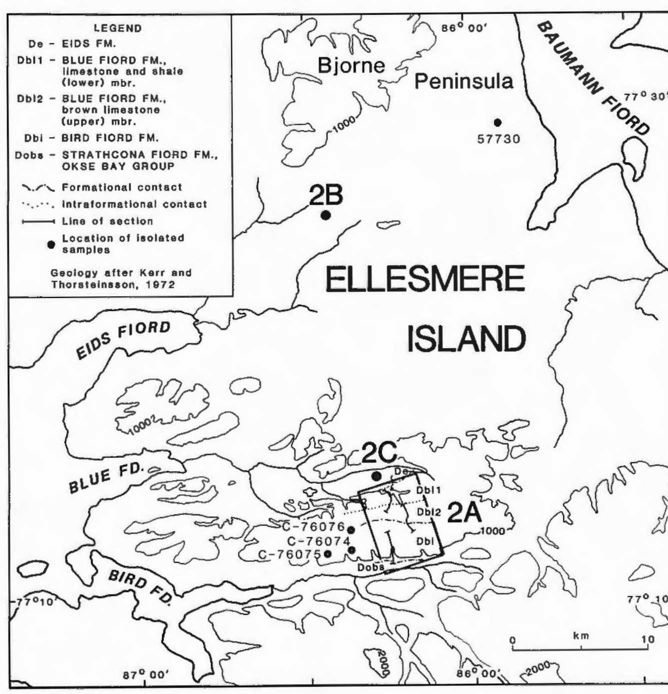
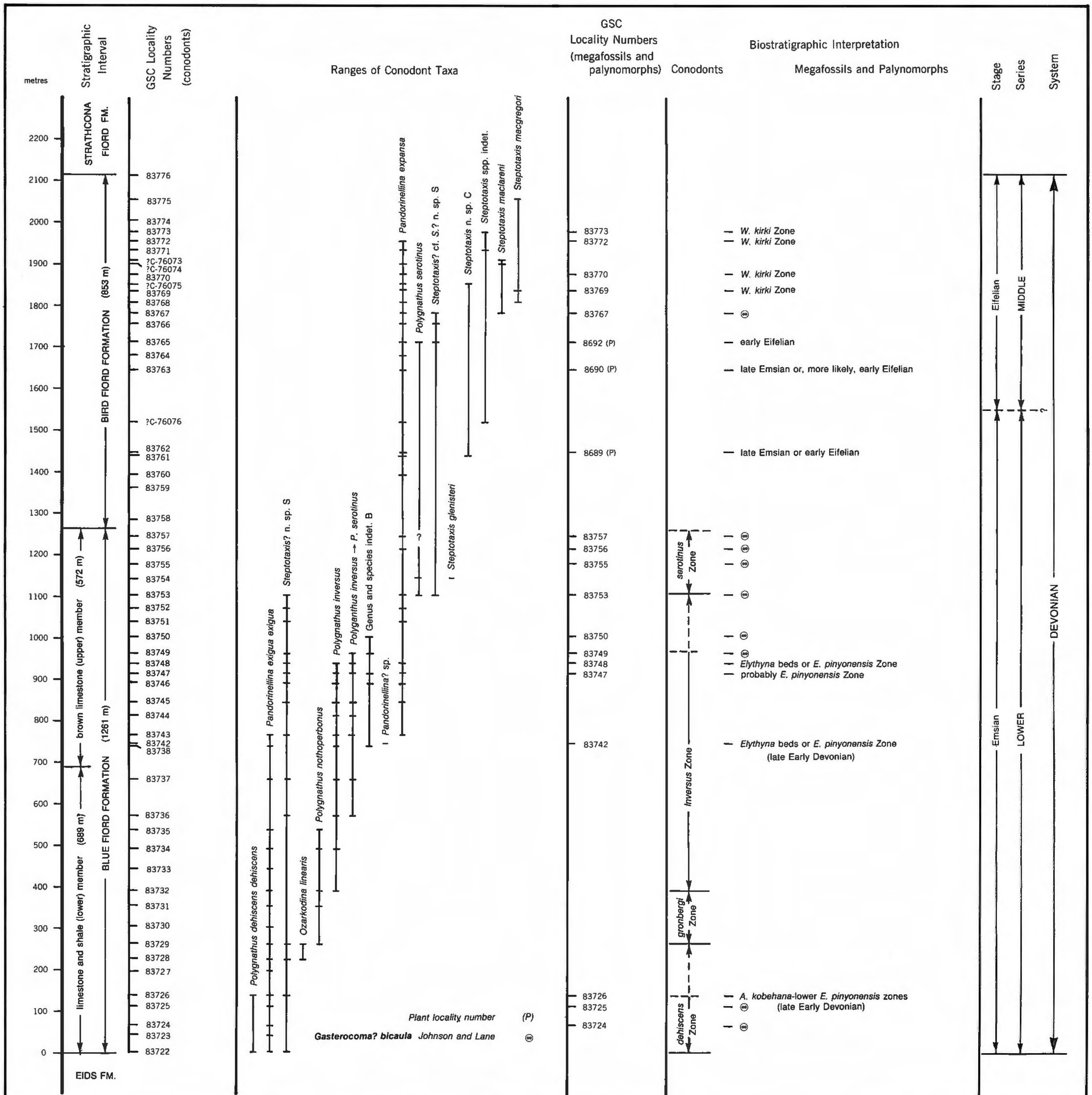


Figure 6. Location map of Sections 2A, Bird Fiord; 2B, CSP Eids M-66 well; and 2C, Blue Fiord E-46 well, Ellesmere Island.

TABLE 6

Range chart of conodont distribution, and occurrences of megafossils and palynomorphs, Section 2A, Bird Fiord, Ellesmere Island



See Figures 1 and 6 for location of section. Refer to Appendix for detailed listing.

Eids Formation

The only collection from the Eids Formation in this general area was obtained from GSC locality 57730 (Fig. 6; also marked "115" on Map 1312A of Kerr and Thorsteinsson, 1972; 30 km north-northeast of the Blue Fiord type section). According to McLaren (1963b, p. 317, 318), the formation comprises mainly dark grey, calcareous siltstone and mudstone, with minor limestone and sandstone. The fauna includes *Steptotaxis robleskyi* n. sp. and *Pandorinellina exigua exigua* (Philip). The former species was also recovered from the Eids Formation at Sor Fiord (Subsection R-A9), where it is associated with a fauna of the *dehiscens* Zone. Collins (1969, p. 32) reported a nautiloid faunule which, on the basis of its similarity with Russian faunas, was suggested to be Eifelian.

Blue Fiord Formation, Limestone and shale (lower) member

According to McLaren (1963b, p. 319-322), in the type area the member consists of brown to brownish grey nodular limestones and interbedded grey calcareous mudstones and shales. The medium to thick bedded limestone is commonly fine to medium grained, with conchoidal fracturing, and to a lesser extent, bioclastic and very coarse grained. The limestone may be strongly nodular with argillaceous interbeds and the limestone units may grade upward into calcareous shale units. The member is highly fossiliferous with abundant corals, stromatoporoids, brachiopods, and trilobites.

The contact with the underlying Eids Formation is transitional and is drawn at the first occurrence of well developed limestone.

Blue Fiord Formation, Brown limestone (upper) member

The member consists of brown and brownish grey, strongly bioclastic, coarse grained limestone. The nature of the bedding is difficult to determine owing to its poor exposure, but it appears to be thick bedded to massive with some layers thin and rubbly. The member is sparsely fossiliferous, with corals, brachiopods, and trilobites as its main components (McLaren, 1963b, p. 322-324).

At this section, the member is conformably overlain by the Bird Fiord Formation. The contact is placed at the level above which shale units become more common (Embry and Klovan, 1976, p. 518).

The conodont zonation of the Blue Fiord Formation, presented in Uyeno and Klapper (1980), remains unchanged. Thus, the *dehiscens* Zone occurs in the lower 267 m of the lower member (GSC locs. 83722 to 83728), and at a section just west of Sor Fiord, located some 30 km east of Section 2A, the zone extends down to the upper part of the underlying Eids Formation (GSC loc. C-12504; Klapper *in* Uyeno and Klapper, 1980, Fig. 8.3). Brachiopods assignable to the *Acrospirifer kobehana* and the lower part of the *Eurekaspirifer pinyonensis* zones were obtained from GSC locality 83726, at 141 m above the base of the formation. The *gronbergi* Zone ranges from the interval between 267 m and 393 m in the lower member (GSC locs. 83729 to 83731). The succeeding *inversus* Zone ranges over a long stratigraphic interval, from 393 to 1104 m above the base of the formation, up into the upper part of the upper member of the Blue Fiord Formation (GSC locs. 83732 to 83752). Brachiopods assignable to the *Elythyna* beds or *E. pinyonensis* Zone were recovered from levels 56 m and 250 m above the base of the member (GSC locs. 83742 and 83748), and of probable *E. pinyonensis* Zone from 227 m level (GSC loc. 83747). According to Johnson (1977a, b), the *E. pinyonensis* Zone ranges from the *dehiscens* to *inversus* zones. The remainder of the Blue Fiord Formation (GSC locs. 83753 to 83757) can be assigned to the *serotinus* Zone.

Bird Fiord Formation

McLaren (1963b, p. 324-326) noted that at the type area the lower 210 m of the Bird Fiord Formation consists of medium and thin bedded, dark brownish grey and grey limestone and dolomitic limestone. The medium beds are nodular and rubbly, resembling the lower member of the underlying Blue Fiord Formation. The thinner beds are variably quartzose and sandy, with some calcareous sandstone beds.

The succeeding 245 to 275 m of beds comprise mainly medium to thick bedded, brown nodular limestones that are replete with tabulate and rugose corals, interbedded with grey and greenish grey calcareous shale. Overlying these beds are about 425 m of more sandy beds, the lower part of which consists of medium bedded, argillaceous, and quartzose sandy limestone, interbedded with greenish grey, sandy and micaceous mudstone, and some quartzose sandstone beds. The sandstone units increase upward, with minor amounts of sandy limestones interbedded with sandy mudstone.

The formation, which is fossiliferous throughout, contains tabulate corals, stromatoporoids, brachiopods, and trilobites. The higher beds are dominated by pelecypods and gastropods. Plant remains increase in abundance upwards.

The Bird Fiord Formation is conformably overlain by the Strathcona Fiord Formation of the Okse Bay Group. The contact is placed at the base of the first red shale unit (Embry and Klovan, 1976, p. 526; Embry *in* Christie and Embry, 1981, p. 21).

The Bird Fiord Formation marks the entry of the Hecla Bay Clastic Wedge (Embry and Klovan, 1976, p. 592). With the shift in both litho- and biofacies, the zonally significant genus, *Polygnathus*, was almost completely replaced in the conodont population. With the exception of a single sample containing *P. serotinus* (454 m above the base of the formation, GSC loc. 83765), the polygnathids were essentially replaced by icriodontids. Three new *Steptotaxis* species occur in the type Bird Fiord Formation, namely, *S. maclareni*, *S. macgregori*, and *S.* n. sp. C. The last species actually has its lowest occurrence in the *inversus* Zone of the underlying Blue Fiord Formation at a section west of Sor Fiord (Klapper *in* Uyeno and Klapper, 1980, Fig. 8.3). The occurrence of *Polygnathus serotinus* at GSC loc. 83765 places an upper limit of *costatus* Zone (Klapper *in* Klapper and Johnson, 1980, p. 454).

Spore floras from levels of 187 m and 386 m above the base of the formation (GSC locs. 83762 and 83763) indicate a late Emsian or Eifelian age, with the latter more probably early Eifelian (D.C. McGregor; see Appendix). From slightly higher in the section, at 450 m level (GSC plant loc. 8692), spores of an early Eifelian age were recovered. Still higher in the Bird Fiord Formation, in the interval of 576 to 718 m above its base (GSC locs. 83769, 83770, 83772, and 83773), *Elythina sverdrupi* Brice was recovered which suggests assignment to the *Warrenella kirki* Zone of Eifelian age (A.W. Norris; see Appendix).

Unlike the Blue Fiord Formation, the age of the Bird Fiord Formation cannot be unequivocally stated in terms of the standard conodont zones. Based on its stratigraphic position and evidence from other fossil groups, however, the Lower-Middle Devonian (Emsian-Eifelian) boundary is tentatively placed at or near the base of the Bird Fiord Formation at its type section.

Sections 2B and 2C: Bjorne Peninsula wells

(by T.T. Uyeno and U. Mayr)

In the following, the sections on lithic description of formations, their stratigraphic relationships, and interpretations of environments of deposition were written by Ulrich Mayr.

Two wells, the Panarctic Tenneco et al. CSP Eids M-66 (lat. 77°25′58″N, long. 86°26′07″W) and Panarctic ARCO et al. Blue Fiord E-46 (lat. 77°15′27.00″N, long. 86°18′07.08″W) (hereafter referred to as the Eids and Blue Fiord wells, respectively), are located in the southern part of Bjorne Peninsula in southwestern Ellesmere Island (Figs. 1, 6). Both wells were spudded in the Eids Formation; the former penetrated a sequence ranging from the Eids through Copes Bay Formation (Lower Ordovician) to a total depth of 11 000 ft (3352.8 m), whereas the Blue Fiord well extended to a depth of 7683 ft (2341.8 m), bottoming in fault repetitions of the Thumb Mountain Formation. The strata in both wells were deposited in a marginal zone of a carbonate platform.

All intervals are given in terms of metres below the top of the wells. Conodonts from the wells were obtained from bulk samples of cuttings, which were usually taken over 30 ft (9.1 m) intervals in the Eids well, and over 100 ft (30.5 m) intervals in the Blue Fiord well. In the latter well, two core samples, from the intervals of 954.0 to 959.8 m and 1326.5 to 1329.2 m, were also analyzed. Since cuttings were used, there is a possibility of contamination from overlying strata. The conodonts obtained are consistent, nonetheless, and there is no suggestion of faunal mixing. As noted in the Appendix (part 2), most of the samples from the Eids and Cape Phillips formations from the Eids well were either barren or yielded only indeterminate fragments. The distribution of some of the more significant conodont species and occurrences of megafossils and palynomorphs are illustrated on Tables 7 and 8. Most of the megafossils and palynomorphs noted below are listed in the Appendix (part 1). A brief summary of the biostratigraphy of the conodonts from these wells was presented in Mayr et al. (1978). Correlation and stratigraphic logs of the two wells are graphically presented in Figure 7.

Eids Formation

The Eids Formation is 272.8 m and 669.0 m thick in the Eids and Blue Fiord wells, respectively. Several informal lithological subdivisions can be recognized as follows:

In the Eids M-66 well, unit 1 (upper; 82.6 to 272.8 m, 190.2 m thick) overlies the Cape Phillips Formation on a gradational contact. This unit is transitional between typical Cape Phillips shale below and the siltstone of the Eids Formation above. It consists of very dark grey, micaceous, slightly calcareous and variably silty shale, interbedded and interlaminated with siltstone. The siltstone is medium grey, fine grained and variably argillaceous and calcareous.

Unit 2 (0.0 to 82.6 m) consists of medium grey, calcareous, micaceous siltstone, interbedded with subordinate amounts of very fine grained sandstone and argillaceous siltstone.

In the Eids well, only five indeterminate conodont fragments were recovered from the ten Eids samples that were processed.

McGregor (see Appendix) identified palynomorphs from two separate intervals within the Eids Formation in the Eids well: 15.2 to 30.5 m, and 76.2 to 91.4 m. The higher level was dated as mid-Emsian, with the lower as Emsian but not oldest Emsian age.

In the Blue Fiord E-46 well, unit 1 (481.5 to 669.0 m, 187.5 m thick) consists predominantly of dark, calcareous shale which is variably silty. In the lower part, several intervals of bioclastic breccias appear to be present. The lithology of this unit is similar to that of the underlying Cape Phillips Formations.

Unit 2 (0.0 to 481.5 m) comprises dominantly medium grey, argillaceous, micaceous, calcareous siltstone, which changes in the lower part to silty shale. The argillaceous siltstone is interbedded with a siltstone of similar lithology to that in the Eids well.

In the Eids Formation of the Blue Fiord well, *Pandorinellina exigua exigua* (Philip) occurs within the intervals of 18.3 to 33.5 m and 365.8 to 396.2 m. That subspecies has a long range of *dehiscens* to *serotinus* zones (Uyeno and Klapper, 1980; Klapper *in* Klapper and Johnson, 1980), and thus spans almost the entire Emsian Stage. Of this range, however, it probably represents the lower part since *dehiscens*-age conodonts were obtained from an outcrop of the Eids Formation located approximately 27 km to the northeast (GSC loc. 57730, Fig. 6; also marked "115" on GSC Map 1312A of Kerr and Thorsteinsson, 1972; see Appendix). Furthermore, *Polygnathus dehiscens dehiscens* was recovered from the base of the overlying Blue Fiord Formation at Section 2A, only 1.5 km to the south.

McGregor (see Appendix) identified palynomorphs from four different intervals within the Eids Formation in the Blue Fiord well: 30.5 to 45.7 m, 167.6 to 182.9 m, 320.0 to 335.3 m, and 457.2 to 472.4 m. The lower three were dated as mid-Emsian and the highest as probably mid-Emsian.

In both wells the lower contact of the Eids Formation is gradational and is based on a change in the gamma ray log response.

Cape Phillips Formation

The more basinward site of deposition of the Eids well (Section 2B) probably accounts for the more complete Cape Phillips Formation (330.7 m) in comparison with the Blue Fiord well (Section 2C; 187.8 m; see Fig. 7). R. Thorsteinsson (pers. comm., 1988) prefers to regard the clastic beds in the Blue Fiord well as Devon Island Formation, rather than Cape Phillips, and interprets the underlying carbonate beds as a local development of reef mound within that formation. In southwestern Ellesmere Island, the Devon Island Formation is known for its spectacular reef mounds which, in some places, extend from the base to the top of the formation (R. Thorsteinsson, pers. comm., 1988). At least a part of the carbonates in the Blue Fiord well may represent a reefoidal platform margin. Extensive dolomitization hinders facies interpretation.

The Cape Phillips Formation in the Eids well is subdivided into two units: a lower dark, siliceous and calcareous shale, and an upper shale and extremely fine siltstone. The unit in the Blue Fiord well is a dark shale interbedded with siltstone. Since the sequences in these sections are dissimilar in thickness and lithology, each well is discussed separately.

In the Eids M-66 well, unit 1 (lower; 569.4 to 603.5 m, 34.1 m thick) consists of black chert, dark grey siliceous shale and dark grey, calcareous shale. Unit 2 (upper; 272.8 to 569.4 m, 296.6 m thick) overlies unit 1 with sharp contact; its upper part consists of non-calcareous shale that grades to extremely fine siltstone, with several levels of concentrated, pyritized sponge spicules. The lower part of unit 2 comprises highly calcareous shale interbedded with dark brown lime mudstone and skeletal wackestone, and it is these beds that yielded conodonts (Table 7).

The lowest part of the formation in the Eids well, the interval at 585.2 to 603.5 m, has yielded only *Oulodus*? *fluegeli fluegeli* (Walliser). The subspecies ranges upward to the interval at 557.8 to 566.9 m, but there it co-occurs with species that are characteristic of the *celloni* Zone elsewhere, including its name-giver, *Pterospathodus celloni* (Walliser), as well as *Astropentagnathus irregularis* Mostler, and possibly *Carniodus carnulus* Walliser. On this basis, the lowest part of the formation, below the 566.9 m level, is tentatively assigned to the upper part of the *staurognathoides* Zone (C_{3-4}), with the overlying *celloni* Zone extending to the 530.4 m level. As in the case of the E-46 well, this suggests an unconformity at the Ordovician-Silurian boundary, with Fauna 13 of the Upper Ordovician and the lowest parts of the Llandovery missing. Graptolites from the interval at 524.3 to 527.3 m were identified by R. Thorsteinsson (*in* Mayr et al., 1978, p. 393) as ?*Stomatograptus* sp. indet. and *Monograptus* sp. indet., which suggest uppermost Llandovery or lowest Wenlock. This level may be equivalent to the *amorphognathoides* Zone. *Walliserodus* cf. *W. curvatus* (Branson and Branson) occurs in the interval at 502.9 to 512.1 m. The remainder of the Cape Phillips Formation was either barren or yielded only indeterminate fragments.

In the Blue Fiord E-46 well, only one unit (669.0 to 856.8 m; 187.8 m thick) is distinguished in this succession. It comprises very dark grey to black, variable shale interbedded with siltstone. The shale is predominantly silty

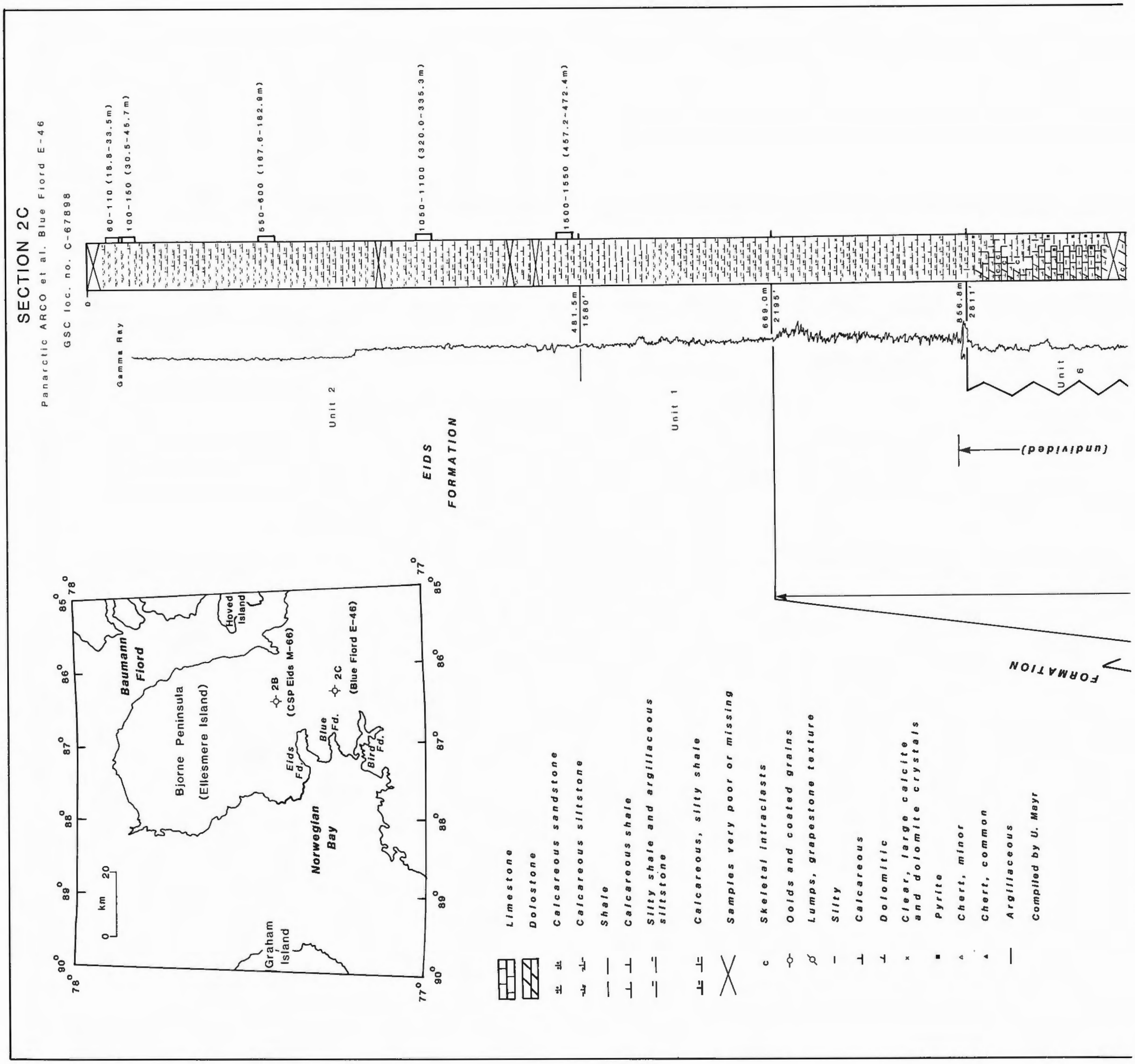
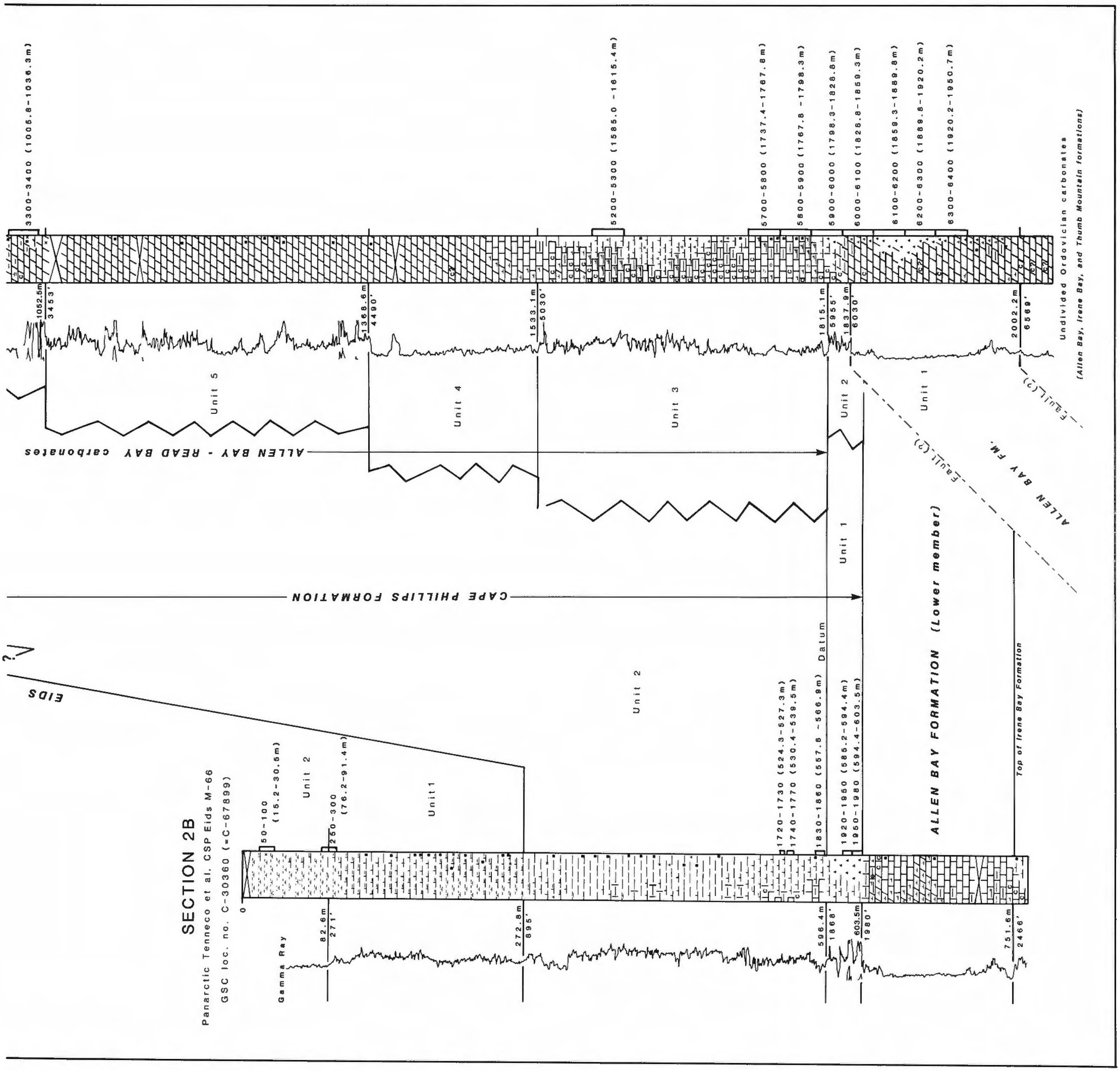


Figure 7. Stratigraphic logs of the Panarctic Tenneco et al. CSP Eids M-66 well (Section 2B) and the Panarctic ARCO et al. Blue Fiord E-46 well (Section 2C), Bjorne Peninsula, Ellesmere Island. Note: The marked intervals yielded datable fossils; the ranges and age interpretations of these fossils are given in Tables 7 and 8, and fossil lists are in the Appendix. (See Figures 1 and 6 for locations.)

and calcareous and contains a high proportion of mica which decreases in amount downward. Rare sponge spicules and trilobite fragments were observed in the upper part.

No significant conodonts were recovered from the Cape Phillips Formation in the Blue Fiord well. Except for a single interval which yielded only indeterminate fragments, all the samples were barren.

In both wells, the lower boundary of the Cape Phillips Formation is a distinct shale-carbonate contact.



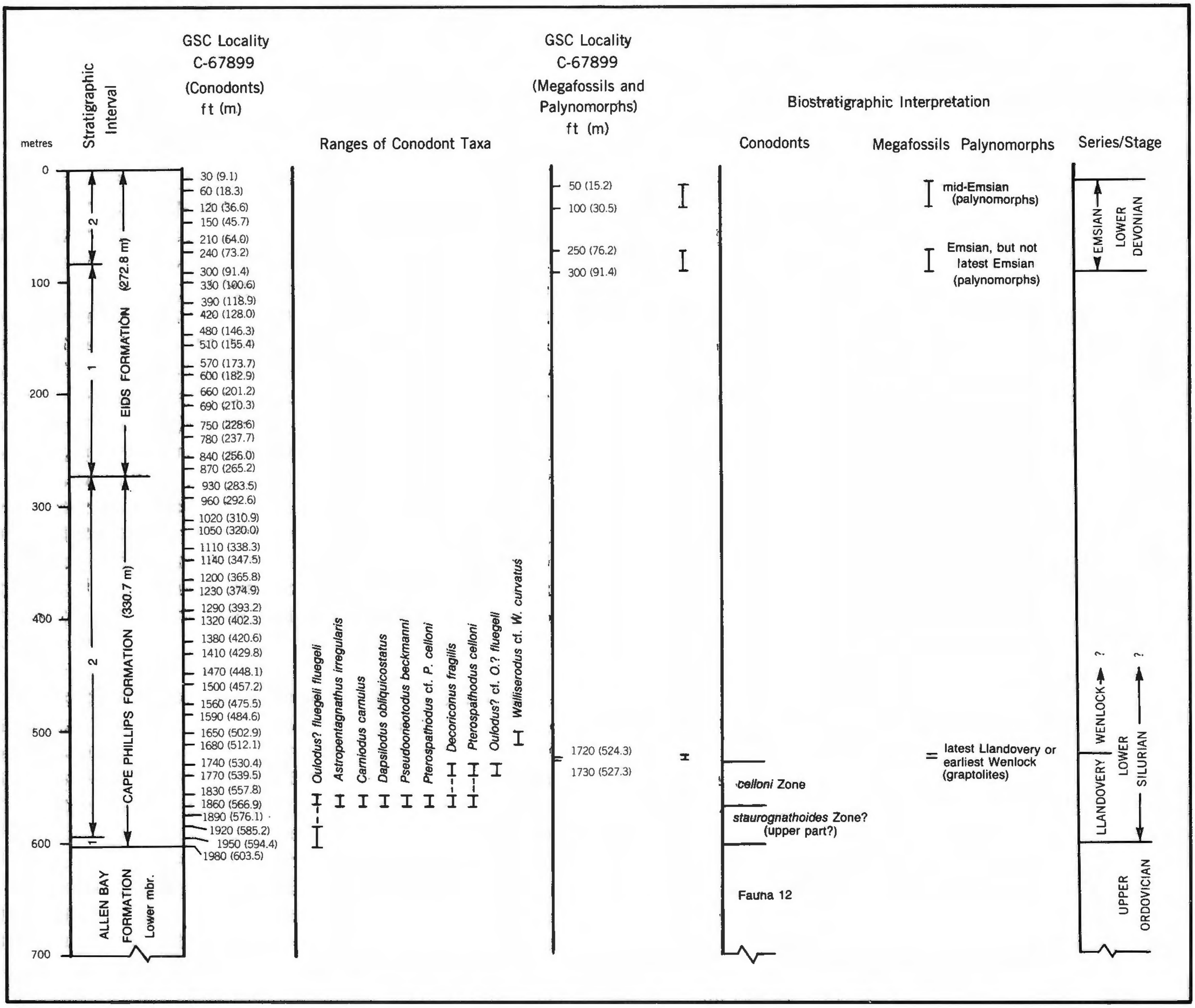
Allen Bay Formation and Allen Bay–Read Bay carbonates (undivided)

The Siluro-Ordovician carbonates are well developed in the Blue Fiord well, with a relatively undisturbed sequence present between 856.8 and 1837.9 m. Below that level, at least 164.3 m (1837.9 to 2002.2 m) of structurally deformed Allen Bay Formation were penetrated. In contrast, the corresponding carbonates in the Eids well are only 148.1 m thick (603.5 to 751.6 m).

In the Eids M-66 well, the carbonates can be assigned to the lower unit of the Allen Bay Formation. The unit (603.5 to 751.6 m; 148.1 m thick) consists of dark grey-brown limestone, interbedded in the upper part with dark grey-brown, calcareous, very finely crystalline dolostone.

TABLE 7

Range chart of conodont distribution, and occurrences of megafossils and palynomorphs, Section 2B, Panarctic Tenneco et al. CSP Eids M-66 well, Ellesmere Island



See Figures 1 and 6 for location of section. Refer to Appendix for detailed listing.

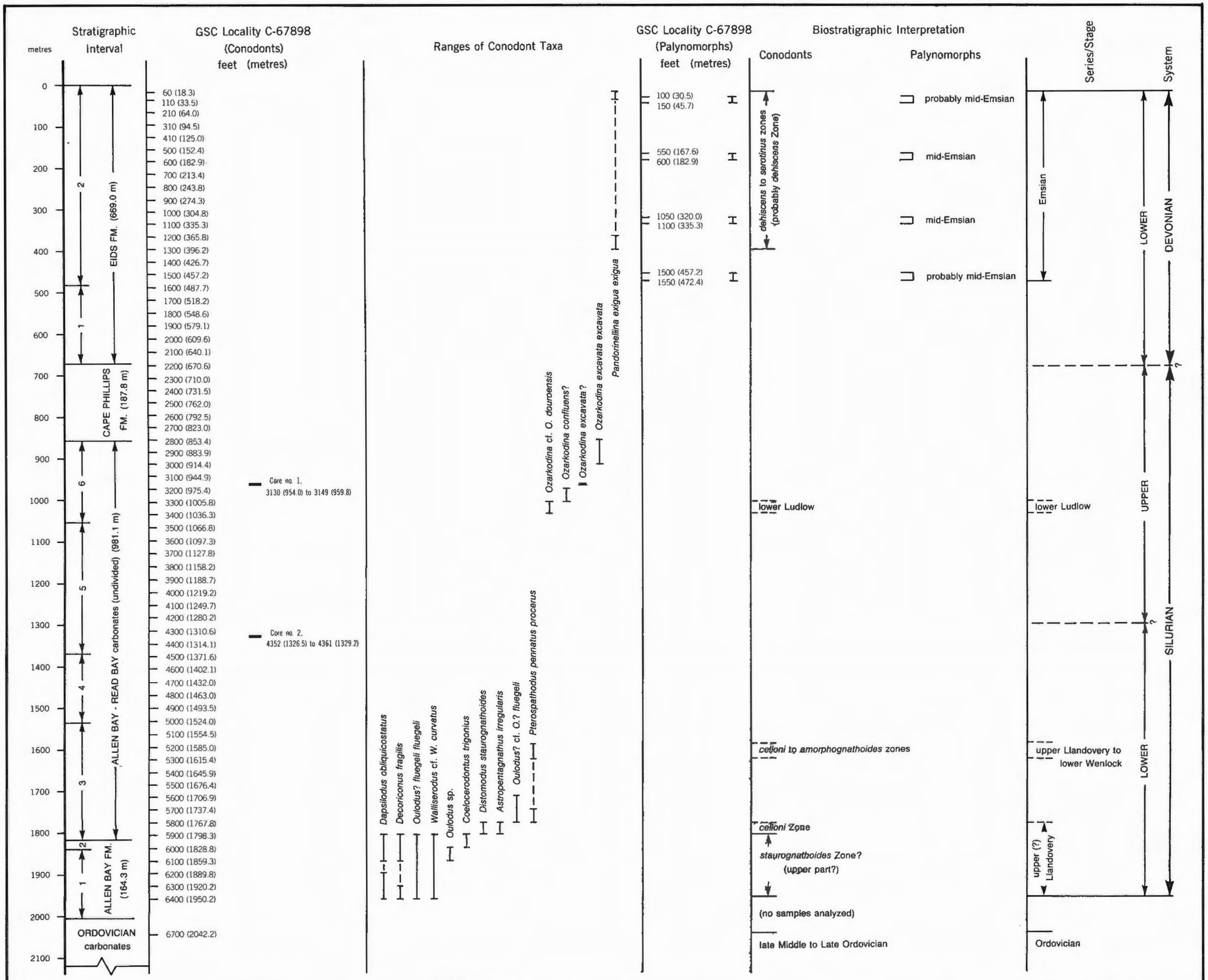
Argillaceous limestone is present in the highest and lowest parts of the unit. The unit is fossiliferous with abundant fragments of *Pseudogygites* sp. in the lower part.

The Allen Bay/Cape Phillips formational contact occurs at the 1980 ft (603.5 m) level [erroneously cited as 569.4 m in Mayr et al., 1978]. This contact represents an unconformity at the Ordovician-Silurian boundary since conodonts of Fauna 12 (Late Ordovician) occur below it. Since Barnes (*in* Mayr et al., 1978, p. 396) reported on this well, additional processing has revised the upper limit of Fauna 12 from the 618.7 m level.

In the Blue Fiord E-46 well, six lithological units can be distinguished. Unit 1 (1837.9 to 2002.2 m, 164.3 m thick) is probably a fault-bounded interval and consists of very dark brown, finely crystalline dolostone, with lesser amounts of lighter coloured, medium crystalline dolostone. Abundant medium brown chert characterizes the upper part of the unit, and the lower part has rare echinoderm fragments. Unit 2

TABLE 8

Range chart of conodont distribution, and occurrences of palynomorphs, Section 2C, Panarctic ARCO et al. Blue Fiord E-46 well, Ellesmere Island



See Figures 1 and 6 for location of section. Refer to Appendix for detailed listing.

(1815.1 to 1837.9 m; 22.8 m thick) overlies unit 1 with a sharp contact. This unit is argillaceous, comprising black, finely crystalline, argillaceous dolomite, very dark grey, calcareous and dolomitic shale, and medium brown, medium crystalline dolomite with minor dark grey chert. Unit 3 (1533.1 to 1815.1 m; 282.0 m thick) consists of limestone, interbedded with shale in the middle part. Several varieties of limestone are present, the most abundant of which are light brown skeletal grain- and packstone and medium brown, lime mudstone. Some lime mudstone is dark brown, argillaceous and dolomitic, and grades into calcareous and dolomitic shale. Traces of oolitic and lump grainstone are also present. The unit is highly fossiliferous with numerous brachiopods, ostracodes and echinoderm fragments. Unit 4 (1368.6 to 1533.1 m; 164.5 m thick) overlies unit 3 with gradational contact. It is lithologically similar to unit 5 (1052.5 to 1368.6 m; 316.1 m thick) and the two units are discussed together. While both consist of very pale, almost white dolostone, unit 4 is uniformly medium crystalline, whereas unit 5 has variable crystal size, ranging from fine to medium crystalline. The most significant difference in the units is in gamma ray response, which is relatively uniform in unit 4, but fluctuating in unit 5. Fossils were observed only in the lower part of unit 4 where the dolostone is calcareous and transitional to light brown lime mudstone. Unit 6 (856.8 to 1052.5 m; 195.7 m thick) overlies unit 5 with a gradational contact which is based on a downward increase in pale dolostone. The unit consists predominantly of medium brown, slightly silty lime mudstone, some of which may be dolomitic. Interbedded with the mudstone are dark brown, very finely crystalline, calcareous dolostone and medium to dark grey-brown, calcareous shale.

Unit 2 is probably of slope origin, while unit 3 may represent a shallow shelf. Units 4 and 5 are extensively dolomitized, hindering facies interpretation, but it is possible that they represent a reefoidal platform margin. Reefs are known from outcrops on nearby Svendsen Peninsula (Mayr, 1973; McGill, 1974). The finely crystalline dolostone of unit 6 implies a shelf with somewhat restricted conditions.

In the Eids well, the Siluro-Ordovician carbonates are underlain by the medium brown, lime mudstone and dark grey-brown to olive, calcareous shale of the Irene Bay Formation (top at 751.6 m).

Conodonts from below the 2045.2 m level in the Blue Fiord well were dated as late Middle to Late Ordovician by C.R. Barnes (pers. comm., 1977). No samples were analyzed within the interval of 1950.7 to 2042.2 m. Conodonts from the interval of 1798.3 to 1950.7 m (parts of informal units 1 to 3 discussed above) are placed tentatively in the upper part of the *staurognathoides* Zone (C_{3-4}), principally on the basis of *Oulodus*? *fluegeli fluegeli* (Walliser), and its position here immediately below elements of the *celloni* Zone. A similar form, identified as *O.*? *fluegeli* subsp. A, has its first appearance in the upper part of the *staurognathoides* Zone and ranges upward into the *inconstans* Zone on Anticosti Island (Uyeno and Barnes, 1983). In eastern North Greenland and the Carnic Alps, however, the nominate subspecies is known to occur in the *celloni* Zone (Walliser, 1964; Aldridge, 1979). Both the *celloni* and its part equivalent, *inconstans* Zone, are confined to the C_5 division of Telychian age (see discussion by Uyeno and Barnes, 1983, p. 6).

The base of the *celloni* Zone in this well is selected at the 1798.3 m level with the first occurrence of *Astropentagnathus irregularis* Mostler. This species is characteristic of the *inconstans* Zone in the Welsh Borderland (Aldridge, 1972; Aldridge et al., 1979), and on Anticosti Island it occurs in the basal part of that zone. Similar to Anticosti Island, *Pterospathodus pennatus procerus* (Walliser) appears in succession after *A. irregularis*, ranging from 1585 to 1798.3 m (unit 3) with an intervening gap. Aldridge (1975) recorded the range of the species as *inconstans* to *amorphognathoides* zones. In the absence of the name-giver or species characteristic of the *amorphognathoides* Zone, it can only be stated that the higher occurrence of this subspecies may indicate either an upper part of the *celloni* Zone or the *amorphognathoides* Zone. On Anticosti Island it ranges to a position just below the first occurrence of *Pterospathodus amorphognathoides* Walliser.

Samples from the intervening units 4 and 5 yielded extremely fragmentary collections, consisting mainly of broken panderodids and indeterminate fragments. This is not entirely surprising since these units may have been deposited on a reefoidal platform margin.

The next significant taxon, *Ozarkodina* cf. *O. douroensis* Uyeno, occurs in the interval of 1005.8 to 1036.3 m, within unit 6. While precise conodont zonation cannot be determined on the basis of this species, an identical form was recovered from the Cape Storm Formation at Goodsir Creek on eastern Cornwallis Island, and in western part of that island (GSC loc. C-67669; Thorsteinsson and Uyeno, 1981, p. 22, 23). At the latter locality it was found associated with *Monograptus bohemicus bohemicus* (Barrande) and *M. chimaera* subsp. cf. *M. chimaera chimaera* (Barrande), and therefore of the graptolite *chimaera* Zone of early Ludlow age.

Sections 3A, 3B, and 3C: Sutherland River and environs

The geographic locations of Sections 3A, 3B, and 3C are shown on Figures 1 and 8. Section 3A was measured along the northern bank of Sutherland River, about 7 km east of Prince Alfred Bay in northwestern Devon Island. It is precisely the same as Locality 8 in Thorsteinsson and Uyeno (1981, p. 37), with the base of the section at UTM Zone 15X, 505 300 m E, 8 471 400 m N, and the top at 504 650 m E, 8 471 100 m N. In that work, however, data were restricted to the Devon Island Formation and the lowest 1 m of the Disappointment Bay [Blue Fiord herein] Formation. It is also in parts the same as Section 4 of Morrow and Kerr (1977, p. 89-92), to which the reader is referred for excellent, detailed lithic descriptions of the formations. In the following account, a brief summary is made primarily from that reference. Measurements were made originally in feet using a Jacob staff.

Section 3B is located 2.5 km upstream from Section 3A, on the northern bank where Sutherland River traverses the Douro Range. It is located between UTM Zone 15X, 506 800 m E, 8 473 700 m N (base) and 506 500 m E, 8 473 350 m N (top).

Section 3C is located in the Douro Range, approximately 7 km northwest of Section 3A, on the northwestern side of Ptarmigan Lake, between UTM Zone 15X, 501 450 m E, 8 477 850 m N (base) and 501 550 m E, 8 478 250 m N (top). It is identical to Section 6 of Morrow and Kerr (1977). A single supplementary sample was collected by J.Wm. Kerr in 1971 from an unspecified level within the Devon Island Formation. It is from a site close to Section 3C, at UTM Zone 15X, 501 700 m E, 8 478 750 m N.

Conodont distribution and occurrences of some megafossils of Sections 3A, 3B, and 3C are shown in Tables 9 and 10. Detailed occurrences of conodonts are listed in the Appendix (part 2), and most of the megafossils noted below are similarly listed (Appendix, part 1).

Douro Formation, Read Bay Group

At Section 3A, only the upper 24 m of the Douro Formation were studied. The section was measured upward from the centre of overturned beds (marked on GSC Map 1421A, Morrow and Kerr, 1977). According to these authors (op. cit., p. 91) the upper Douro consists mainly of dark greenish grey weathering, thin to medium bedded, dolomitic limestone, containing brachiopods, gastropods, ostracodes, thamnoporid-like corals, and echinoderm and bryozoan fragments. The lower beds of the overlying Devon Island Formation were poorly exposed, but the contact is conformable according to Morrow and Kerr (op. cit.).

A thicker, but still incomplete, sequence of the Douro Formation was measured at Section 3B, where it consists of some 186 m of strata. Although detailed lithic description is lacking for this section, it is similar to that at Section 3A. There, the sharp, conformable contact with the overlying Devon Island Formation can be observed.

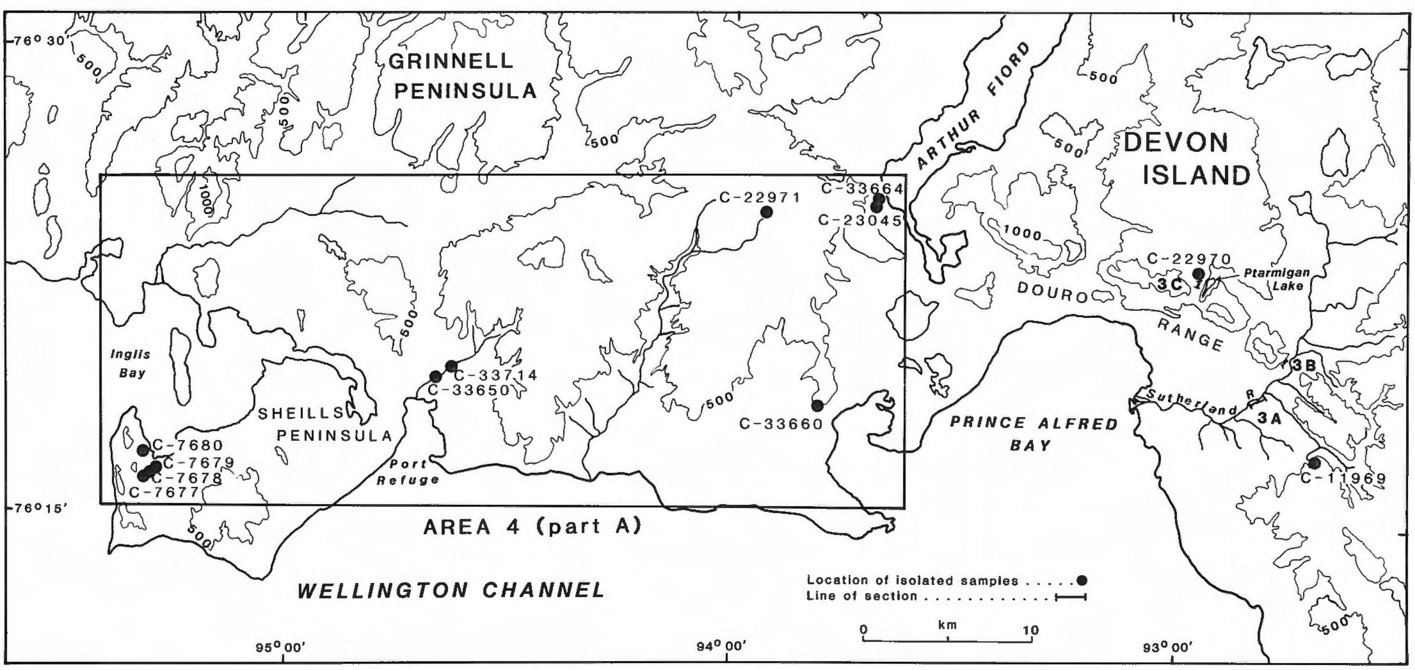
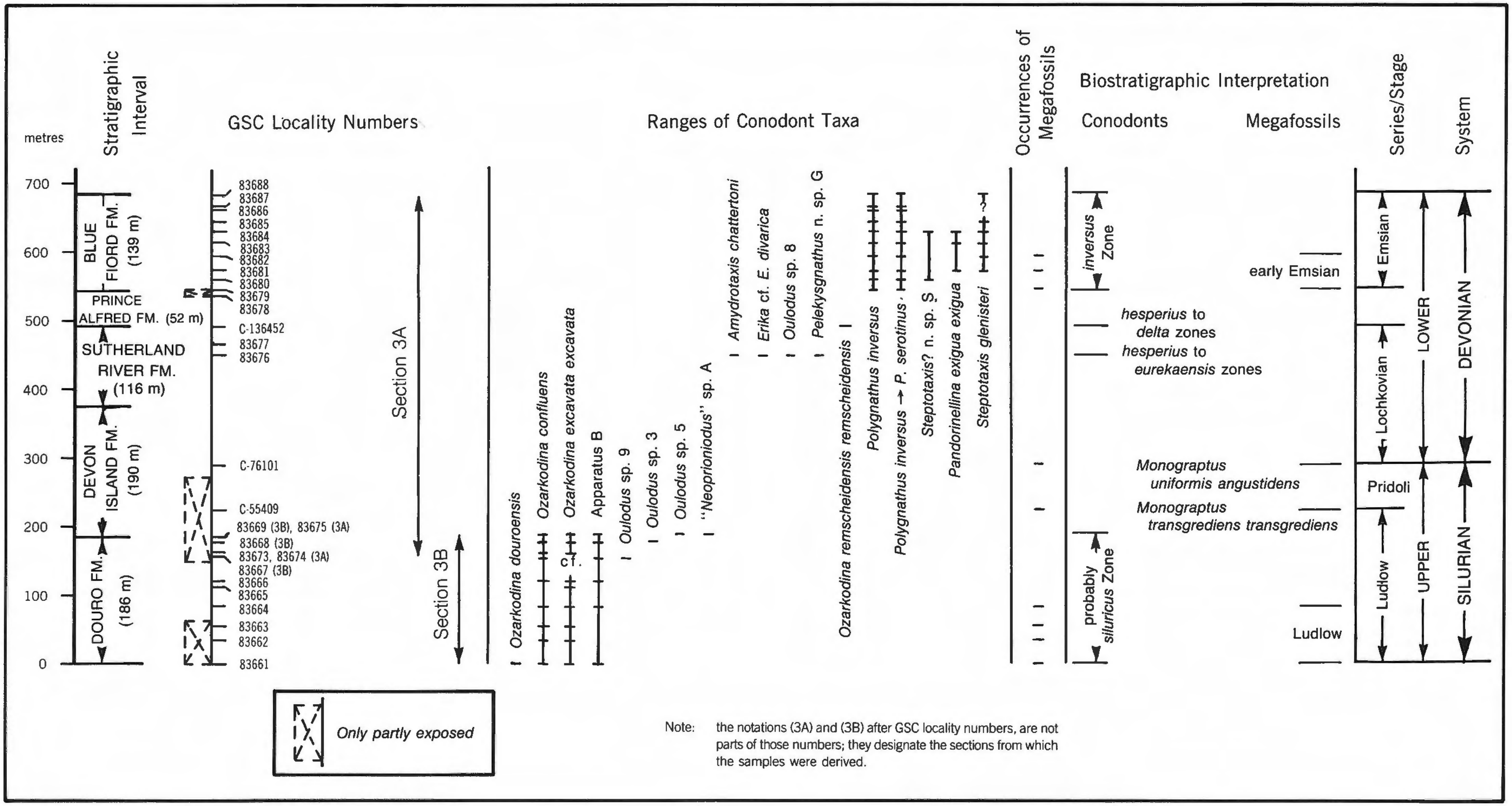


Figure 8. Location map of Sections 3A and 3B (Sutherland River), 3C (northwest of Ptarmigan Lake), and of isolated samples from the Grinnell Peninsula, Devon Island (part of Area 4).

TABLE 9

Range chart of conodont distribution, and occurrences of megafossils, Sections 3A and 3B, Sutherland River, Devon Island



See Figures 1 and 8 for location of sections. Refer to Appendix for detailed listing.

Only the highest carbonate bed, presumed to be from the top of the Douro Formation, was sampled at Section 3C. Contact with the Devon Island Formation was not observed, since the lowest outcrop of the latter unit was about 23 m above the Douro. The covered interval is included within the Devon Island Formation since it is by far the more recessive of the two.

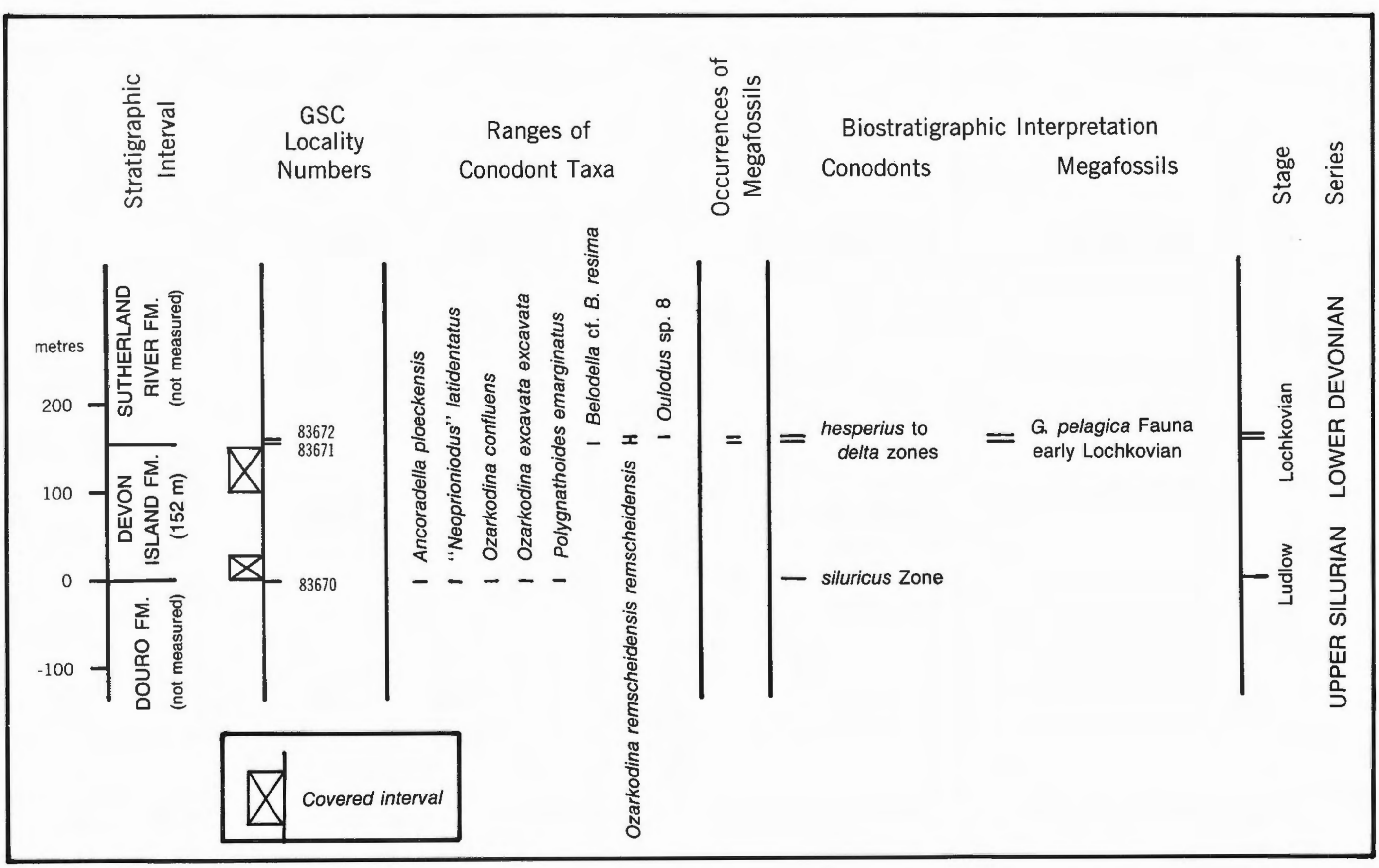
Three samples were taken from the Douro Formation at Section 3A, the lower two from approximately the same level on either side of an overturned fold (GSC locs. 83673 and 83674, 24 m below the top of formation). They yielded *Ozarkodina confluens* and *O. excavata excavata*. A sample from the highest bed in the Douro contained these two species and, in addition, Apparatus B and *Oulodus* sp. 5. The age of these collections can only be stated in broad terms, that is, Late Silurian, Ludlow to Pridoli. Within this relatively long range, however, the probable age is late Ludlow. This is based on (1) other occurrences of Apparatus B (upper Douro on Boothia Peninsula and lower part of the Peel Sound Formation on Prince of Wales Island; Uyeno, 1981a, p. 48), and (2) the presence of *siluricus* Zone conodonts in the highest Douro beds at Section 3C (Ptarmigan Lake), located only 7 km to the northwest, and at a section 5 km to the southeast (Thorsteinsson and Uyeno, 1981, Fig. 24, Loc. 9). Conodonts of the *siluricus* Zone were also retrieved from about the middle of the Douro Formation at Goodsir Creek on eastern Cornwallis Island (Thorsteinsson and Uyeno, 1981, p. 23).

At Section 3B, approximately 186 m of the upper Douro Formation was measured and sampled. *Ozarkodina confluens, O. excavata excavata* and Apparatus B range throughout this interval, with *O. douroensis* restricted to the lowest level (GSC loc. 83661, 186 m below top of formation). *O. douroensis* is suggestive of the *siluricus* Zone and has been previously reported from the Douro and upper part of the Cape Storm formations (Thorsteinsson and Uyeno, 1981, p. 22). *Oulodus* sp. 3, from 9.1 m below top of formation (GSC loc. 83668), has been previously recorded from the lower part of the Peel Sound Formation on Prince of Wales Island (Uyeno, 1981a, p. 47).

The lower four localities at Section 3B (186 m, 152 m, 131 m, and 104 m below the top of the formation, GSC locs. 83661 to 83664, respectively) yielded brachiopods of Ludlow age (A.W. Norris; see Appendix).

TABLE 10

Range chart of conodont distribution, and occurrences of megafossils, Section 3C, northwest of Ptarmigan Lake, Devon Island



See Figures 1 and 8 for location of section. Refer to Appendix for detailed listing.

The highest bed in the Douro Formation at Section 3C yielded *Polygnathoides emarginatus* and "*Neoprioniodus*" *latidentatus* (probable Pb and M elements, respectively, of the *P. siluricus* apparatus) and is therefore assignable to the *siluricus* Zone. It contains, in addition, *Ancoradella ploeckensis*, the occurrence of which suggests that the overlap of this species and *P. siluricus* ranges throughout the Douro Formation (see Thorsteinsson and Uyeno, 1981, p. 24). It also suggests that in this area the overlap occurs throughout the range of the *siluricus* Zone as well, and is not restricted to the lower part of the zone as it is elsewhere (Cellon in the Carnic Alps and Pete Hanson Creek in Nevada; see Klapper and Murphy, 1975, p. 12). That the top of the Douro Formation coincides with the upper limit of the *siluricus* Zone is suggested by the occurrence of *latialata* Zone conodonts in the immediately overlying Devon Island Formation, as well as in the Barlow Inlet Formation at Goodsir Creek in eastern Cornwallis Island, and Somerset Island Formation at western Boothia Peninsula (Thorsteinsson and Uyeno, 1981, p. 25, 30). There is no physical or paleontological evidence to suggest a hiatus between the Douro and these superjacent units.

Devon Island Formation

At Section 3A, the Devon Island Formation is 190 m thick. The outcrops of the lower and higher parts are poorly exposed and represented largely by rubble. According to Morrow and Kerr (1977, p. 90, 91), the lower one third of the sequence consists mainly of medium yellow weathering, very dark brown, organic-rich, silty calcareous shale. Some beds have abundant graptolites; brachiopods and fish plates are also present. The upper two thirds consist of pale weathering, in places finely laminated, brownish, organic-rich silty dolostone. It is not as fossiliferous as the lower part, but does contain some graptolites. The contact with the overlying Sutherland River Formation is covered but is probably conformable (Morrow and Kerr, op. cit.).

Only the lowest 8 m of the formation were measured at Section 3B. Samples for palynological studies were taken from the hard siltstone and silty shale.

The type section of the Devon Island Formation is located at Section 3C, where it is 152 m thick. When measured in 1969, the lower 23 m were snow covered and the upper 49 m were covered with talus. The sporadically exposed central part consists mainly of platy, medium bedded (about 1 cm thick), hard, grey to dark brown, yellow weathering, calcareous siltstone and silty shale. According to Morrow and Kerr (1977, p. 95), the upper contact with the Sutherland River Formation is conformable.

No conodont samples were taken by the author from the Devon Island Formation at either Section 3A or 3B. Several collections made by R. Thorsteinsson, and reported by Thorsteinsson and Uyeno (1981, p. 30), however, have assured detailed control on the age of this formation at Section 3A. The data are supplemented by the finding of *Pedavis latialata* from an interval of 0 to 30 cm above the base of the Devon Island Formation at a section located about 4.5 km southeast of Section 3A (GSC loc. C-11969 on Fig. 10, collected by D.W. Morrow; Morrow and Kerr, 1977, p. 122). At Section 3A, conodonts of the *latialata* Zone were reported from a talus sample that probably was derived from the lowest part of the formation, and *Icriodus woschmidti hesperius* Klapper from a collection near the top. The formation thus spans from late Ludlow to early Lochkovian. The highest occurrence of *Monograptus transgrediens transgrediens* (Perner), the youngest Pridolian graptolite, was reported from 36.5 m above the base (GSC loc. C-55409), and the first or lowest occurrence of *M. uniformis angustidens* Přibyl from 103.6 m above base (GSC loc. C-76101; Thorsteinsson and Uyeno, 1981, p. 30).

The highest bed of this formation at its type section, 3C, has yielded *Ozarkodina remscheidensis remscheidensis* (GSC loc. 83671). That subspecies was also recovered from an undesignated level at a locality near this section, together with *O. remscheidensis* cf. *O. r. remscheidensis* and *Oulodus* sp. 8 (GSC loc. C-22970). As noted elsewhere in this paper, in the Canadian Arctic Islands generally, the range of the nominate subspecies is probably from the *hesperius* to *delta* zones. Within this range, these collections are probably assignable to the *hesperius* to *eurekaensis* zones, based on knowledge of the conodont distribution in the Devon Island and Sutherland River formations at Section 3A. Furthermore, the extension of *Oulodus* sp. 8 into the overlying Sutherland River Formation at Sections 3A and 3B suggests a temporal continuity between these units. Thus far, *O.* sp. 8 is known only from these localities. A brachiopod fauna from the same collection was dated as early Lochkovian (A.W. Norris, see Appendix).

Sutherland River Formation

The type section of the Sutherland River Formation at Section 3A is 116 m thick. As with the upper part of the underlying Devon Island Formation, the lower 60 m of the formation are poorly exposed and represented largely by rubble. According to Morrow and Kerr (1977, p. 90) and Patton (*in* Christie and Embry, 1981, p. 94), the formation is fairly uniform throughout, consisting of thin to medium bedded, grey to olive-grey, silty dolostone that weathers light brown to light yellowish grey. The upper 15 m comprise alternating sandy dolostone and sandstone. There are minor occurrences of dolomitized crinoid fragments and a few collophane (fish?) fragments. The upper contact with the Prince Alfred Bay Formation is disconformable (Thorsteinsson, 1981, p. 17).

At Section 3C, only the lowest part of the Sutherland River Formation was measured. It consists of light yellowish brown, finely crystalline dolostone that weathers very light grey, and contains minor amounts of crinoid fragments. The formation is 104 m thick at this section (Morrow and Kerr, 1977, p. 94).

At Section 3A, the type section, from the level of 74 m above its base (GSC loc. 83676), *Amydrotaxis chattertoni* n. sp. and *Erika* cf. *E. divarica* Murphy and Matti were recovered. The former species was previously described, in part, from Nevada and the Yukon Territory as *Ozarkodina* n. sp. F by Klapper and Murphy (1975, p. 45), and based on these occurrences, its suggested range is from the *hesperius* to *eurekaensis* zones. The highest bed from Section 3A and a talus sample from about 8 m above the base of the formation at Section 3C (GSC locs. C-136452 and 83672, respectively) contained *Ozarkodina remscheidensis remscheidensis*. As noted earlier, this is long ranging, but elsewhere in the Arctic Islands it appears to have its upper limit in the *delta* Zone. The age span of the Sutherland River Formation is probably from the *hesperius* to *delta* zones. A megafaunal collection from locality 83672 was assigned to the *Gypidula pelagica* Fauna of Lenz (1966), of Lochkovian age, by A.W. Norris (see Appendix).

Prince Alfred Formation

The Prince Alfred Formation was measured only at Section 3A, its type section. There, it is 52 m thick, with only the lower part of the formation exposed, and consists primarily of very fine grained, light grey, medium to thick bedded, commonly dolomitic, quartzose sandstone. The minor constituents include siltstone of similar colour and texture as the sandstone, and silty, light grey, finely crystalline dolostone (Thorsteinsson, 1981, p. 17). The upper contact with the Blue Fiord Formation is disconformable.

As was noted earlier, a single sample from the type section of the Prince Alfred Formation did not yield any conodonts (GSC loc. 83678; 52 m above base). By position, however, it is dated as between a probable *delta* Zone and the upper part of the *inversus* Zone. Thorsteinsson (1981, p. 18) previously suggested a late Lochkovian age, by correlation with the Snowblind Bay Formation.

Blue Fiord Formation

The Blue Fiord Formation was measured only at Section 3A, where the lower 139 m are exposed. The formation consists of light to dark brown, yellowish grey weathering, crinoidal lime mudstone and wackestone. The beds are thick to massive, with several richly fossiliferous layers containing crinoid fragments and brachiopods.

The conodont faunas from the Blue Fiord Formation are clearly assignable to the *inversus* Zone and, by comparison with the sequence at its type area (Section 2A), to the upper half of that zone. *Polygnathus inversus* and a form transitional between it and *P. serotinus*, range throughout the sampled sequence of the formation. Also present are *Steptotaxis glenisteri* (Klapper) and *S.* n. sp. C of Uyeno and Klapper (1980) which elsewhere in the Arctic Islands occur high in the *inversus* Zone and the *serotinus* Zone. Rich brachiopod faunas were identified by A.W. Norris (see Appendix) from the levels of 0 m, 30 m, and 49 m above the base of the formation (GSC locs. 83679, 83681, and 83682, respectively); all three were dated as early Emsian. If the Prince Alfred Formation is indeed late Lochkovian, there is a considerable hiatus of 3 or 4 conodont zones between it and the overlying Blue Fiord Formation. This relationship was previously depicted by Thorsteinsson and Uyeno (1981, Table 1).

Area 4: Grinnell Peninsula and environs

Literature on the general geology of the Grinnell Peninsula and its neighbouring islands is relatively scarce. The stratigraphy and structural geology are complicated by rapid facies changes, and by the juxtaposition of the Cornwallis Fold Belt and the Ellesmere Greenland Fold Belt. The published records on Devonian strata include Thorsteinsson (1963b), McLaren (1963a), and Morrow and Kerr (1977), which cover the areas immediately surrounding Prince Alfred Bay and Arthur Fiord, the vicinity of Tucker Point, and the north-central part of the Peninsula around Lyall River. An unpublished report (1968) by J.C. Sproule and Associates Ltd., Calgary, deals with the northwestern part of the Peninsula and western Sheills Peninsula. Embry and Klovan (1976) studied the thick Middle to Upper Devonian clastic wedge of the Franklinian Geosyncline, including the east-central part of the Peninsula, with assignment of several new names. An open file report by Morrow and Kerr (1986) contains a geological map of the Peninsula and accompanying notes with detailed descriptions of 11 measured sections located at the southern and northern coasts, northwestern parts of Sheills Peninsula, and the western side of the Grinnell Peninsula.

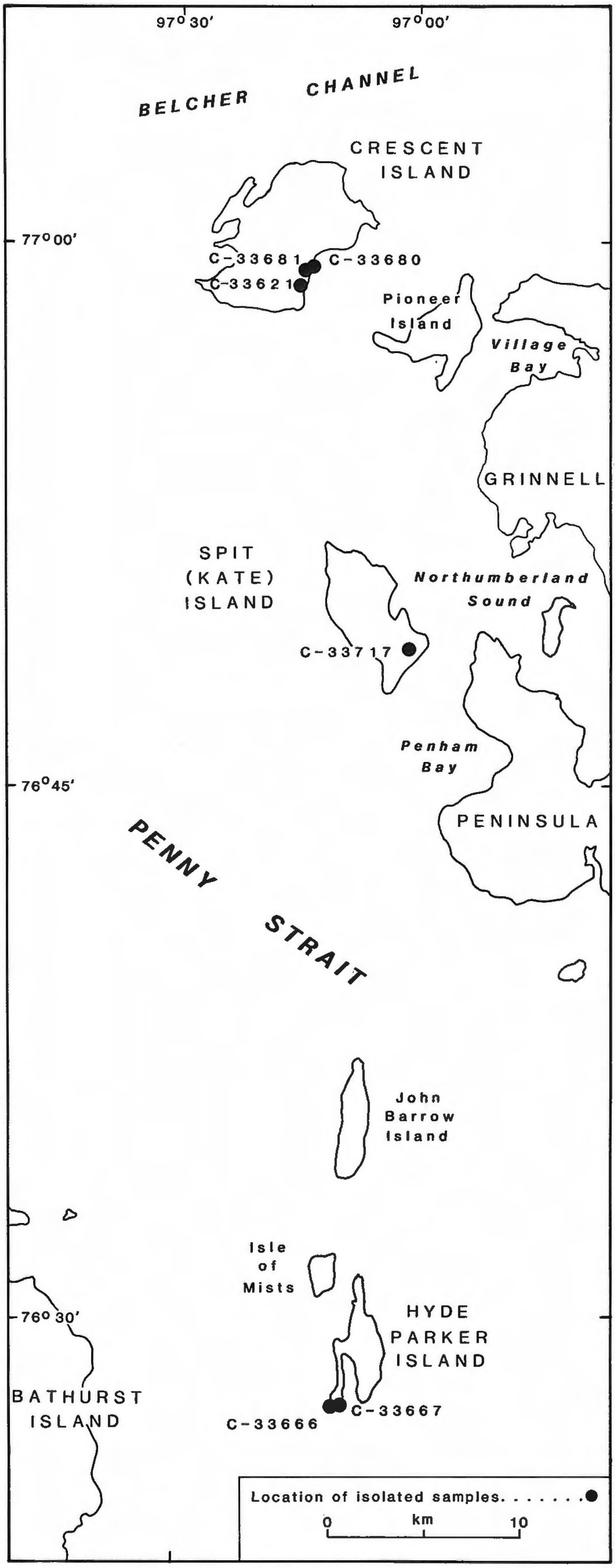


Figure 9. Location map of part of Area 4, showing isolated samples from the three small islands, Crescent, Spit (Kate), and Hyde Parker, in the Penny Strait, between Devon (Grinnell Peninsula) and Bathurst islands.

In the summer of 1986, a Geological Survey of Canada field party led by U. Mayr commenced a mapping program of northwestern Devon Island, including Grinnell Peninsula. There, two kilometres of relatively tectonically undisturbed Devonian strata are preserved (Prosh et al., 1988). Based on data collected in 1986 and 1987, the nomenclature of the Undivided Devonian carbonates of Morrow and Kerr (1977, 1986) was revised, essentially with the elimination of that informal term, the assignment of the lower two members, Du1 and Du2, to the Blue Fiord Formation, and the inclusion of the upper three members, Du3 to Du5, in the Bird Fiord Formation (Goodbody et al., 1988). Since that information became available only after this manuscript was essentially complete, the informal Du terminology is used herein.

Sixteen samples from southern Grinnell Peninsula and three small neighbouring islands to the west of the Peninsula were examined for conodonts (Figs. 1, 8, 9). The islands are, from north to south, Crescent, Spit (Kate), and Hyde Parker. As noted above, the stratigraphy and structure of this area are highly complex and still remain to be completely unravelled. The purpose of this study is to report the new findings since 1) they contain faunas previously unreported from the Arctic Islands, and 2) they may facilitate future mapping of the area. The conodonts and associated megafossils and palynomorphs are listed in the Appendix. Where possible, stratigraphic assignments have been made through the kind efforts of D.W. Morrow. The collecting was done by U. Mayr (then with J.C. Sproule and Associates Ltd.) in 1968, and by J.Wm. Kerr in 1974. The following list is by geographic location first, and then, as far as possible, in a chronological order, from the oldest to youngest.

Hyde Parker Island

Both samples from the southern tip of Samuel Peninsula on Hyde Parker Island, GSC localities C-33666 and C-33667, contain conodonts of the *delta* Zone. The former locality is described by Morrow as a rubbly, greenish grey reefal lithofacies, overlain by reefal beds. The latter is located 250 m west of C-33666, and occurs in an off-reef lithofacies. The difference in lithology may account, at least to a certain extent, for the variation in the faunas; only the name-giver, *Ancyrodelloides delta* (Klapper and Murphy), and *Ozarkodina remscheidensis remscheidensis* (Ziegler) are common to both. As may perhaps be expected, the off-reef facies has a more varied fauna, consisting of at least

12 species, as compared with only six for the reefal facies. The samples cannot be assigned readily to any known stratigraphic unit, and are referred to an unnamed formation.

Locality C-33666 also yielded brachiopods of the *Quadrithyris* Zone (J.G. Johnson, pers. comm. to J.Wm. Kerr, 1975). This is in full accord with the *delta* Zone conodonts from the same sample (Johnson, 1977b, p. 20).

Crescent Island

Three samples were obtained from the southeastern part of Crescent Island: C-33681, C-33621, and C-33680. The first, C-33681, is from a unit consisting of limestone rubble with shale, at a level 15 m below the Disappointment Bay Formation. At this time, it cannot be assigned readily to any known stratigraphic unit, and is referred to an unnamed formation. It contains *Pandorinellina exigua philipi* (Klapper) and questionably *Eognathodus sulcatus* Philip, and is thus assigned to a relatively long interval of *sulcatus* to *dehiscens* zones (Klapper *in* Klapper and Johnson, 1980, p. 447, 450; Uyeno *in* McGregor and Uyeno, 1972, Table 1). A probable Emsian age was suggested on the basis of associated brachiopods (J.G. Johnson pers. comm. to J.Wm. Kerr, 1975).

The second sample, C-33621, is also from an unnamed formation. It contains *Eognathodus sulcatus kindlei* Lane and Ormiston and thus falls within the long range of C-33681, that is, from the *kindlei* to *dehiscens* zones (Klapper *in* Klapper and Johnson, 1980, p. 447; Uyeno *in* McGregor and Uyeno, 1972, Table 1).

The third, C-33680, is from the basal part of the Disappointment Bay Formation. It contains *Polygnathus dehiscens dehiscens* Philip and Jackson, which elsewhere has a range of *dehiscens* to *gronbergi* zones (Klapper *in* Klapper and Johnson, 1980, p. 452). The absence of *Polygnathus nothoperbonus* Mawson in this sample, which in the Arctic Islands is an indicator of the *gronbergi* Zone, suggests that perhaps it may be within the older part of this range.

Spit (Kate) Island

A single sample, C-33717, was obtained from the southeastern part of tiny Spit (Kate) Island. It is from a small bluff of limestone occurring within a unit that may possibly be referable to the Cape Phillips Formation. The presence of *Eognathodus sulcatus kindlei* suggests an age assignment of *kindlei* to *dehiscens* zones (see C-33681 above).

Grinnell Peninsula

In the vicinity of Tucker Point, McLaren (1963a) recorded about 900 ft (274 m) of Blue Fiord Formation, the upper beds of which are faunally and lithologically similar to the type section in southwestern Ellesmere Island. The lower beds consist of grey bituminous dolostone. Overlying the Blue Fiord is 650 ft (198 m) of calcareous sandstone and shale with some sandy limestone, assigned to the Bird Fiord Formation. The Bird Fiord, in turn, is overlain by approximately 2.2 km of strata of the Okse Bay Group (Embry and Klovan, 1976).

In the southeastern part of the Peninsula, the measured successions closest to the collecting sites reported herein are Sections 8 and 9 of Morrow and Kerr (1977, p. 106-117). At both sections, however, the Undivided Devonian carbonates are incomplete, and are 8 m and 40 m thick, respectively. At Section 8, the carbonates are described as bluish grey weathering, organic-rich, biomicritic limestone characterized by thick continuous bedding.

In the eastern part of the Peninsula, the Undivided Devonian carbonates can be subdivided into four members: Dul, basal limestone; Du2, dolostone; Du3, sandy limestone, anhydrite, dolostone; and Du4, limestone. Farther to the west, on Sheills Peninsula, an additional member, Du5, is present, which is noted on the map legend as fossiliferous limestone (Morrow and Kerr, 1977, 1986).

Section 11 of Morrow and Kerr (1986) is at the same locality or very close to the sampling sites of C-7677 to C-7680, listed below. There, an interrupted succession of strata, ranging from the Bay Fiord to Bird Fiord formations is exposed. The lowest Devonian unit is the Du2 member, 41.5 m thick, consisting of pale greyish green, dolomitic limestone; this is overlain by the Du3 member, 38.7 m thick, of sandy dolomite conglomerate, weathering medium to dark brown; the Du4 member, 39.6 m thick, of bluish grey weathering, tan, pelmicritic limestone; and the Du5 member, 25.6 m thick, consisting of brown weathering, silty micritic limestone, rich in brachiopods and corals in crinoid matrix. The Undivided Devonian carbonates are overlain by the Bird Fiord Formation, 25.9 m thick, consisting of calcareous sandstone and sandy limestone, weathering orange and greenish grey, containing abundant brachiopods, corals, and crinoid fragments.

Detailed locations of the collecting sites mentioned below are given in the Appendix.

The eastern part of southern Grinnell Peninsula, which includes localities C-33644, C-23045, C-22971, and C-33660, was mapped by Morrow and Kerr (1977). The first two are in close proximity, located about 1 km west of Arthur Fiord, and are placed within the Undivided Devonian carbonates unit, Du. Sample C-33644 is a crinoidal limestone with brachiopods. Both contain conodonts of the *inversus* zone, and probably high within that zone as suggested by *Steptotaxis glenisteri* (Klapper). Sample C-22971 is from a locality about 6 km due west of the first two. It is from the basal member, Du1, composed of brown crinoidal limestone; its conodont fauna, with *S. glenisteri* and a transitional form between *Polygnathus inversus* and *P. serotinus* Telford, is also suggestive of the upper *inversus* Zone.

Approximately 11 km due south of the above three localities and 2 km west of Prince Alfred Bay, is locality C-33660. The sample is a fossiliferous limestone, also assignable to Du, from top of Pym Mountain. Since it contains *Steptotaxis glenisteri* and *Pandorinellina expansa* Uyeno and Mason but no polygnathids, its age can only be stated as *inversus* to *serotinus* zones.

The next two samples, C-33714 and C-33650, are from localities separated by 1.5 km, situated about 23 km due west of C-33660 and about 3 km northeast of Port Refuge. Both consist of fossiliferous limestone and are referable to the Du5 member, the highest unit of the Undivided Devonian carbonates in this area. The fauna of the former sample contains *Polygnathus linguiformis linguiformis* Hinde gamma morphotype of Bultynck (1970) and *P. l. bultyncki* Weddige, whereas the second, C-33650, contains *Icriodus norfordi* Chatterton. Both collections are indicative of the *costatus* Zone (Klapper *in* Klapper and Johnson, 1980, p. 448, 453).

The following three samples, C-7677, C-7678, and C-7680, from the northwestern part of Sheills Peninsula, are referable to the Undivided Devonian carbonates of Morrow and Kerr (1977, 1986), and probably more specifically to the Du4 or Du5 member. The report by Sproule and Associates Ltd. (1968, Appendix II, p. 2) described sample C-7677 as consisting of thick bedded, olive-green, highly calcareous skeletal grainstone, the grains composed of poorly sorted crinoidal debris. Sample C-7678 consists of similar skeletal grainstone, interspersed with thin bedded, dark green, calcareous, profusely fossiliferous, quartz sandstone. Conodonts from C-7680 and C-7677 include *Icriodus norfordi* which, as noted above, suggests a *costatus* Zone assignment. The former locality also contains a subspecies of *Eognathodus bipennatus* (Bischoff and Ziegler) with a broad platform, herein named *E. bipennatus mayri. Icriodus* cf. *I. norfordi*, which is present in both of these samples as well as in C-7678, also appears to be indicative of the *costatus* Zone.

Localities C-7677, C-7678, and C-7679, were collected in an upward succession. The highest sample, C-7679, is probably from the Bird Fiord Formation. Its age is more difficult to evaluate; it contains *Icriodus* sp. A which superficially resembles *I. angustus* Stewart and Sweet. The latter ranges elsewhere from the *costatus* to *kockelianus* zones (Klapper *in* Klapper and Johnson, 1980, p. 447).

Palynomorphs from two of the Sheills Peninsula samples were studied by D.C. McGregor (see Appendix). McGregor and Camfield (1982) reported that samples C-7678 and C-7679 were in the lower part of the spore *devonicus-naumovii* Zone, of late early Eifelian age. They also reported that the flora in both are "approximately temporally equivalent to the Cape De Bray Formation and possibly the lowermost Weatherall Formation on eastern Melville Island, and to part of the Strathcona Fiord Formation of southwestern Ellesmere Island."

PART V. SYSTEMATIC PALEONTOLOGY

The classification used herein in general follows that of Supplement 2 of Part W of the Treatise on Invertebrate Paleontology (Robison, 1981), even though it has several shortcomings (Fåhraeus, 1983, 1984). As the present work is primarily biostratigraphic in nature, the valid issues raised by Fåhraeus (*ibid.*) are not discussed herein. Also, recent evidence and reassessment of the old, from the Dinantian Granton sandstone in Scotland, suggest that the conodonts do not constitute a separate phylum, but are a separate group of jawless craniates (Briggs et al., 1983; Aldridge et al., 1986). That the conodont-bearing animals may have had affinity with the vertebrates has been suggested by others (e.g., Barskov et al., 1982; Dzik, 1986).

It should be noted here that discussion of the affinity of the conodont-bearing animal is an ongoing process. More recently, for example, Tillier and Cuif (1986) and Tillier and Janvier (1986) have suggested that conodonts belonged to aplacophoran molluscs, a point refuted by Briggs et al. (1987). Nowlan and Carlisle (1987) suggested the Granton specimens have affinities with cephalochordates. A historical review of the paleobiology of the conodont animal was recently presented by Aldridge (1987).

The locational notation used in the Treatise cited above is followed herein, with the exception of icriodontid and some simple cone apparatuses. For the Icriodontidae, the scheme introduced by Klapper and Philip (1971, 1972), and subsequently expanded by Johnson and Klapper (1981), is used.

The primary type and figured specimens are deposited in the collections of the Geological Survey of Canada, 601 Booth Street, Ottawa.

Phylum CONODONTA Pander, 1856

Class CONODONTATA Pander, 1856

Order CONODONTOPHORIDA Eichenberg, 1930

Superfamily PRIONIODONTACEA Bassler, 1925

Family BALOGNATHIDAE Hass, 1959

Genus *Amorphognathus* Branson and Mehl, 1933

Type species. *A. ordovicica* Branson and Mehl, 1933.

Amorphognathus ordovicicus Branson and Mehl

Plate 1, figures 1-7

1933 *Amorphognathus ordovicica* n. sp. BRANSON and MEHL, p. 127, Pl. 10, fig. 38.

1971 *Amorphognathus ordovicicus* Branson and Mehl. BERGSTRÖM, p. 134-135, Pl. 2, figs. 6, 7.

1977 *Amorphognathus ordovicicus* Branson and Mehl. LINDSTRÖM *in* Ziegler (ed.), p. 35-40 (includes synonymy).

1979 *Amorphognathus ordovicicus* Branson and Mehl. SWEET, p. 55, Fig. 10 (1, 13).

1979 *Amorphognathus ordovicicus* Branson and Mehl. ROSS, NOLAN, and HARRIS, Fig. 6 (a-f).

1980 *Amorphognathus ordovicicus* Branson and Mehl. ORCHARD, p. 16, Pl. 4, figs. 1-13, 17, 18.

1981 *Amorphognathus ordovicicus* Branson and Mehl. NOWLAN and BARNES, p. 9-10, Pl. 1, figs. 1-14 (includes further synonymy).

1981 *Amorphognathus ordovicicus* Branson and Mehl. WEYANT *in* Paris et al., p. 19-20, Pl. 1, figs. 1-13; Pl. 3, figs. 4, 6, 8, 9.

1982 *Amorphognathus ordovicicus* Branson and Mehl. LENZ and MCCRACKEN, Pl. 1, figs. 1-5.

1985 *Amorphognathus ordovicicus* Branson and Mehl. SAVAGE and BASSETT, p. 691, Pl. 84, figs. 1-21; Pl. 85, figs. 1-26; Pl. 86, figs. 1-13.

1985 *Amorphognathus ordovicicus* Branson and Mehl. ORCHARD *in* Bergström et al., Pl. 2.5, figs. 2, 3, 5, 8, 9.

Remarks. Eight specimens of the blade and nonblade platform (Pa) elements are present. Also present are the four elements of the ramiform complex, comprising Sc (eoligonodiniform, 5 specimens), Sb (cladognathiform, 6), Sa (hibbardelliform, 4), and Sd (tetraprioniodiform, 4). The two remaining components are the M (holodontiform, 1) and Pb (ambalodiform, 5) elements.

In terms of a Composite Standard Section of the North American Midcontinent Province, Sweet (1984) noted the range of *Amorphognathus ordovicicus* extended from the upper *velicuspis* to *shatzeri* zones (CSS 1150 to 1269), of mid-Maysvillian to Richmondian age.

Occurrence. Lower Allen Bay Formation at Strathcona Fiord (Section 1); also in Section 1 (GSC loc. 83777), from a talus sample from near the base of the underlying Irene Bay Formation (Barnes, 1974, p. 233); in the eastern Arctic Archipelago, previously reported from the Allen Bay(?) Formation (Weyant, 1968, Fig. 2, p. 24), and the Thumb Mountain, Irene Bay, and Allen Bay formations (Nowlan, 1976, p. 120-123; Mirza, 1976, p. 70, 71.)

Family ICRIODONTIDAE Müller and Müller, 1957

Genus *Icriodus* Branson and Mehl, 1938

Type species. *Icriodus expansus* Branson and Mehl, 1938.

Remarks. Two basic types of simple cones, termed S_2 and M_2 elements, were recognized in the *Icriodus* apparatus by Klapper and Ziegler (*in* Ziegler, ed., 1975, p. 67) and Nicoll (1977, p. 222). Subsequently the S_2 elements were divided into three morphotypes, termed S_{2a}, S_{2b}, and S_{2c} by Uyeno (1978; *in* Norris and Uyeno, 1981, p. 25 and 1983, p. 36). A similar division was made for the S_2 elements in *Steptotaxis* by Uyeno and Klapper (1980).

Nicoll (1982) proposed yet another set of notations for the simple cones in the *Icriodus* apparatus: Ca, Cb, Cc, Cd, Ce, and Cf. The first three probably correspond to S_{2a}, S_{2b}, and S_{2c}, whereas the last two represent morphotypes of M_2 elements. On the basis of his study of exquisitely preserved clusters of *Icriodus expansus* from the Napier Formation of the Canning Basin, Western Australia, Nicoll (*ibid.*) also suggested that the orientation of the I element of *Icriodus* should be reversed, that is, the dual-tipped basal pits directed anteriorly, and the platform-like, denticle-supporting structure posteriorly. In the present study, however, the orientation first proposed by Branson and Mehl (1933, 1938) is used, for the primary reason that most Devonian workers are more accustomed to it.

The neotenic origin of *Icriodus* from *Pedavis* during the Late Silurian was suggested by Broadhead and McComb (1982).

Icriodus norfordi Chatterton

Plate 17, figures 16-20, 22, 24-28;
Plate 19, figures 23-30, 35

1978 *Icriodus* n. sp. CHATTERTON and PERRY, Pl. 2, figs. 13, 14.

1979 *Icriodus norfordi* n. sp. CHATTERTON, p. 202-203, Pl. 6, figs. 6-12.

1980 *Icriodus norfordi* Chatterton. KLAPPER *in* Klapper and Johnson, p. 448, Pl. 3, figs. 25, 26 (includes synonymy).

Remarks. According to Chatterton (1979) the characteristic features of the I element of *Icriodus norfordi* include the formation, by the middle and lateral row nodes, of transverse ridges in the anterior part of the spindle, and of ridges of inverted chevron pattern in the posterior part; the lateral attachment of a denticle onto the posterior process; and the development of a weak spur on the inner side. A number of larger specimens from the Undivided Devonian carbonates on Grinnell Peninsula do exhibit ridges of transverse and inverted chevron patterns, and they have been referred to this species. A few specimens, however, some from the same collections as those yielding "typical" forms, differ slightly and exhibit one or more of the following features: the ridges on the anterior part of the spindle are incomplete, that is, the nodes of the lateral rows do not extend to those of the middle row, or these ridges have an upright chevron pattern, which is the reverse of that on the posterior half of the spindle; the lateral node attached to the posterior process may be small and inconspicuous, or may be totally absent; the basal cavity is abruptly expanded in the posterior half to two thirds of the spindle, in semicircular or subquadrate shape, with a distinct spur developed on the inner side. Specimens of such forms are designated *Icriodus* cf. *I. norfordi* in this study.

In general, most specimens of both morphotypes have longitudinal spacing of the lateral-row denticles that is uniform throughout the length of the spindle, and the middle row nodes that are aligned in a straight to slightly curved line. The spindle is widest about one third of the unit distance from the posterior margin. The posterior process consists of two principal denticles, which are commonly fused to form a blade with a distinct keel along the upper surface. The process is about the same length as the nodes on the spindle. As noted by Chatterton (1979, p. 202), the smaller specimens exhibit lateral row nodes that alternate with those of the middle row (Pl. 17, figs. 24, 25; Pl. 19, fig. 35). They cannot be readily assigned to either of the morphotypes, but in the abundance tables, are referred to *I. norfordi*.

The accompanying simple cones consist of S_2 and M_2 elements. The S_{2a} element may have a single ridge extending from the top of the cusp to the base on its outer lateral face. The S_{2b} element may similarly exhibit one or two short ridges at the base of the cusp. Since the collections yielding these cones also contain both morphotypes of I elements, they cannot be definitely assigned to either. In the abundance tables they are all referred to *I. norfordi*.

Occurrence. The Du4 or Du5, and Du5 members of the Undivided Devonian carbonates of Morrow and Kerr (1977) on Sheills Peninsula (GSC locs. C-7677, C-7678, and C-7680), and in southern Grinnell Peninsula (GSC loc. C-33650).

Icriodus taimyricus Kuzmin

Plate 17, figures 6-9

1967 *Icriodus taimyricus* n. sp. KUZMIN, p. 54-56, Pl. 1, figs. 2-4.

1974 *Icriodus taimyricus* Kuzmin. LANE, p. 722, 725, Pl. 1, figs. 1-14; Pl. 2, figs. 1-12.

1980 *Icriodus taimyricus* Kuzmin. KLAPPER *in* Klapper and Johnson, p. 449 (includes synonymy).

1984 *Vjaloviodus taimyricus* (Kuzmin). GAGIYEV, p. 107, Fig. 1a-d.

1985 *Icriodus taimyricus* Kuzmin. SAVAGE, BLODGETT, and JAEGER, Pl. 1, figs. 1-15.

Remarks. Two fragmentary specimens, identifiable as the I element of *Icriodus taimyricus*, were recovered from the Devon Island Formation at a locality west of Vendom Fiord on Ellesmere Island (GSC loc. C-84882). Two simple cones are associated with them, of a form similar to that referred to as S_{2c} by Uyeno (1978, Pl. 4, fig. 35). If this partial reconstruction is correct, then the assignment of this species to *Icriodus* is corroborated in part (see Lane, 1974).

Recently, Gagiyev (1984) reassigned this species to a new genus, *Vjaloviodus*, on the basis of the I element alone, with the suggestion that icriodid apparatuses may perhaps be mono-elemental. As noted above, however, simple cones may form a part of the *Icriodus taimyricus* apparatus.

Sobolev (1984, p. 73-74) introduced a new subspecies, *Icriodus taimyricus proavusus*, from Novaya Zemlya. It differs principally from the nominate subspecies in the carina, which extends the entire length of the platform of the I element. Further, it was reported from older strata, from the Morzhova Bay Horizon, in the upper part of the local *Pandorinellina exigua philip* Zone, and below the first occurrence of *Polygnathus dehiscens* Philip and Jackson.

Owing to the fragmentary nature of the present specimens, a definite assignment cannot be made to either of the above subspecies. The fact that the Canadian Arctic collection is associated with *Polygnathus dehiscens*, however, suggests that it probably belongs to the nominate subspecies.

Icriodus woschmidti Ziegler

Remarks. In his reconstruction of the apparatus of the nominate subspecies, Serpagli (1983) proposed a six-element model which includes several ramiform elements. Whether this model is applicable to the apparatus of *I. woschmidti hesperius* cannot be determined on the basis of this study.

Icriodus woschmidti hesperius Klapper and Murphy

Plate 16, figures 23, 24, 26-33

1969 *Icriodus woschmidti* Ziegler. KLAPPER, p. 10, Pl. 2, figs. 1, 2.

1975 *Icriodus woschmidti hesperius* subsp. nov. KLAPPER and MURPHY, p. 48-49, Pl. 11, figs. 1-19.

1980 *Icriodus woschmidti hesperius* Klapper and Murphy. KLAPPER *in* Klapper and Johnson, p. 449, Pl. 2, fig. 11.

1980 *Icriodus woschmidti hesperius* Klapper and Murphy. SCHÖNLAUB, Pl. 6, fig. 5.

1980 *Icriodus woschmidti hesperius* Klapper and Murphy. SCHÖNLAUB *in* Chlupáč et al., Pl. 19, figs. 1, 12.

1981a *Icriodus woschmidti hesperius* Klapper and Murphy. UYENO, p. 43, Pl. 5, figs. 41-46.

1981 *Caudicriodus woschmidti* (Ziegler). UYENO *in* Norris and Uyeno, p. 8, Pl. 5, figs. 10-17.

Remarks. Specimens assignable to the I, S_{2a}, S_{2b}, and S_{2c} elements of *Icriodus woschmidti hesperius* were recovered from a section located some 33 km southeast of Section 1, on Ellesmere Island (GSC loc. C-92466). Dr. R. Thorsteinsson (pers. comm., 1982), who collected the sample, considers it to be from about the middle of the Devon Island Formation. The illustrated S_{2a} and S_{2b} elements have sharply keeled posterior and anterior margins, and a prominent costa on their lateral faces. The S_{2b} element was previously illustrated by Klapper and Murphy (1975, Pl. 11, fig. 1), from the Roberts Mountains Formation in central Nevada, and the S_{2a} and S_{2c} by Uyeno (1981a, Pl. 5, figs. 41, 42) from the Devon Island Formation at Sutherland River on Devon Island (Section 3A herein).

Icriodus sp. A

Plate 18, figures 15-17

Remarks. A single icriodontan element was recovered from the Undivided Devonian carbonates, probably Du4 or Du5 member, of Morrow and Kerr (1977), on Sheills Peninsula, Devon Island (GSC loc. C-7679) that bears some superficial resemblance to *Icriodus angustus* Stewart and Sweet. The straight spindle consists of six distinct nodes in the median row, and arranged slightly offset to them are four lateral row nodes, similarly distinct. The posterior extension of the median row consists of two principal denticles, a large posterior and a smaller anterior, the latter being immediately preceded by a minute denticle, and the posteriormost fourth denticle, which is set at a sharp angle from the rest of the extension. The extreme posterior margin of the extension is broken on the specimen. The basal cavity is narrowly expanded posteriorly, coming to a sharp, offset tapering point beneath the posteriormost denticle. Viewed laterally, the upper marginal outline of the platform is straight, gradually increasing in height over the principal denticles, and abruptly much lower over the posteriormost denticle. The lower marginal outline is nearly straight.

Icriodus angustus has a similar upper platform ornamentation and basal cavity outline. The notable difference between it and the present species is in the posterior extension of the median row. In *I. angustus* the extension is only slightly curved inward, whereas in *I.* sp. A, the posteriormost denticle forms a sharp angle with the rest of the unit. A single simple cone M_2 element is present in the same collection.

Genus *Pedavis* Klapper and Philip, 1971

Type species. *Icriodus pesavis* Bischoff and Sannemann, 1958.

Remarks. Nicoll (1982, p. 200) suggested that the orientation of the I element of *Pedavis*, as well as those of *Icriodus*, *Pelekysgnathus*, and *Steptotaxis*, be reversed, that is, the dual-tipped basal end be directed anteriorly, and the platform-like, denticle-supporting structure posteriorly. As with *Icriodus*, however, the orientation of the *Pedavis* I element as previously used in the literature is continued in this study.

The notational nomenclature proposed by Nicoll (1982) for the simple cone elements in the *Icriodus* apparatus is difficult to apply completely to *Pedavis*. The sagittodontan (S_1) element and some of the M_2 elements, such as "*Rotundacodina*" *dubia* (Rhodes), cannot be readily placed within the C series.

Pedavis breviramus Murphy and Matti

Plate 20, figures 30-34

1983 *Pedavis breviramus* n. sp. MURPHY and MATTI, p. 55-56, Pl. 7, figs. 2, 3, 6, 12 (includes synonymy).

Remarks. An apparatus referable to *P. breviramus* was recovered from an unnamed formation on Hyde Parker Island (GSC loc. C-33667). It is associated with *Ancyrodelloides delta* (Klapper and Murphy).

Pedavis latialata (Walliser)

Plate 17, figure 15

1964 *Icriodus latialatus* n. sp. WALLISER, p. 38, Pl. 9, fig. 1; Pl. 11, fig. 13.

1971 *Pedavis latialata* (Walliser). KLAPPER and PHILIP, p. 439, Textfig. 9.

1975 *Pedavis latialata* (Walliser). KLAPPER and MURPHY, p. 49-50, Pl. 12, figs. 16, 18, 19.

1977 *Pedavis latialata* (Walliser). MEHRTENS and BARNETT, p. 496, Pl. 1, fig. 17.

1980 *Pedavis latialata* (Walliser). SCHÖNLAUB *in* Chlupáč et al., Pl. 25, figs. 2, 3.

1981a *Pedavis latialata* (Walliser). UYENO, p. 44, Pl. 6, figs. 23, 24, 30-38.

1983 *Pedavis latialata* (Walliser). MURPHY and MATTI, Pl. 8, fig. 8.

Remarks. A single specimen of the I element of *Pedavis latialata* was recovered from the basal 8 cm of the Devon Island Formation at Section 3 of Morrow and Kerr (1977, p. 85-89, 122; GSC loc. C-11969). The section is located approximately 4.5 km southeast of Sutherland River (Section 3A). The conodont is associated with *Encrinurus* (*Frammia*) cf. *E.* (*F.*) *arcticus* (Haughton) which, according to Dr. B.S. Norford (pers. comm., 1982), suggests a late Ludlovian age.

Occurrence. The Barlow Inlet Formation on Goodsir Creek, eastern Cornwallis Island, and the basal Devon Island Formation at Sutherland River (Uyeno, 1981a).

Pedavis sp.

Plate 4, figures 16, 17, 24-26;
Plate 5, figures 34, 35

Remarks. Four I elements, all extensively fragmented, were recovered from the upper part of the Cape Phillips Formation at Strathcona Fiord (Section 1), at 335 m above the base of the formation (GSC loc. 83792). Although poorly preserved, they are probably referable to *Pedavis* rather than *Icriodus*. Two lines of evidence suggest this: firstly, the upper surface of the anterolateral process has a costa that is weakly serrated, and secondly, there are modified sagittodontan elements in the same collection. The I element of *Icriodus woschmidti hesperius* Klapper and Murphy may also have a costa on the anterolateral process, but it is generally not serrated (see Klapper and Murphy, 1975, Pl. 11, fig. 19; Uyeno, 1981a, Pl. 5, fig. 45).

The accompanying S_1 (modified sagittodontan) element may be coarsely and faintly costate with smooth upper surfaces on its anterior and posterior processes. The M_2 element is similarly faintly costate with short, narrow anterior and posterior ridges at the base.

In a collection from higher in Section 1, in the Eids Formation at 32 m above the base of the formation (GSC loc. 83796), the following were recovered: a single, poorly preserved I element, and two S_1 elements, both highly costate but only one with serrated anterior and posterior margins. Still in the Eids Formation, and 26 m higher (GSC loc. 83797), a single small specimen of serrated sagittodontan element was found.

There are similar, if not identical, fragmented I elements in a collection from about the middle of the Devon Island Formation (GSC loc. C-92466; about 32 km southeast of Section 1; see Appendix). *Icriodus woschmidti hesperius* is also present in that collection.

Genus *Pelekysgnathus* Thomas, 1949

Type species. *Pelekysgnathus inclinatus* Thomas, 1949.

Pelekysgnathus csakyi (Chatterton and Perry)

Plate 20, figures 4-9, 13-15

1977 *Icriodus csakyi* n. sp. CHATTERTON and PERRY, p. 793-794, Pl. 4, figs. 4-6.

1980 *Pelekysgnathus csakyi* (Chatterton and Perry). KLAPPER *in* Klapper and Johnson, p. 451.

Remarks. The pelekysgnathan elements that are referred to *P. csakyi* have a single, reclined cusp, preceded anteriorly by five to seven smaller denticles. The lateral outline of the upper margin is flat to widely rounded. The anterior margin is abrupt and high, forming a right angle with the lower margin. A distinct ridge occurs on the posterior face of the cusp, beginning at the cusp tip and running, slightly offset from the median, to the edge of the basal flare. The basal cavity outline shows abrupt widening slightly anterior of the centre of the unit, either symmetrically or asymmetrically. The posterior edge of the basal margin protrudes slightly beyond the edge of the cusp. The accompanying simple cones consist of S_2 and M_2 elements.

The two specimens of the type series of *Pelekysgnathus csakyi* illustrated by Chatterton and Perry (1977) demonstrate that the I element may have one or two large cusps.

As noted elsewhere in this paper, the progenitor of *P. csakyi* is more likely *P.* n. sp. G rather than *Icriodus hadnagyi* Chatterton and Perry (1977, p. 793). The lineage suggested by the present study is *P. arcticus* Uyeno, *P.* n. sp. G, and *P. csakyi.*

Occurrence. Unnamed formation on Hyde Parker Island (GSC loc. C-33667).

Pelekysgnathus n. sp. D

Plate 4, figures 11-15, 18-23

Remarks. Ten I elements of *Pelekysgnathus* are placed in open nomenclature. They are characterized by a dominant reclining cusp that is at least twice as large as the remaining denticles. The anterior margin is almost perpendicular to the lower margin of the unit. The lower marginal outline is sinuous. The denticles located anteriorly of the cusp number three to five, and are of similar size, giving the upper margin a flat to slightly convex outline. The posterior half of the basal cavity is abruptly and widely expanded, and is rapidly tapered at about mid-length of the unit.

The simple cone elements consist of S_{2a} and M_2, and a form that is transitional between them. This transitional form may be equivalent to Cb of Nicoll (1982). With the exception of the S_{2a} element, which exhibits a low ridge on the outer lateral face, the cones have smooth lateral sides. It should be noted that these simple cone elements may possibly belong to a *Pedavis* apparatus that is present in the same collection. Since the latter apparatus is represented by a single I and twoS_1 (modified sagittodontan) elements; however, it is probable that the cones are parts of *Pelekysgnathus* n. sp. D.

The I element of *Pelekysgnathus* n. sp. D is similar to its counterpart in *P.* n. sp. C of Uyeno (1981a, p. 46). The latter has a basal cavity outline that is more gradually tapering, and a lower marginal outline that is convex. The simple cone elements of *P.* n. sp. C also differ in having costate surfaces. The I element differs from that of *P. klamathensis* Savage in several features. The latter species has a basal cavity outline that is asymmetrical owing to a small sinus located posteriorly on the inner lateral margin. Also the upper marginal outline is more convex and the cusp is less prominent.

Occurrence. The Eids Formation at Strathcona Fiord (Section 1), at 32 m and 58 m above the base of the formation (GSC locs. 83796 and 83797).

Pelekysgnathus n. sp. E

Plate 5, figures 11, 12, 14-20

Remarks. Three I elements of *Pelekysgnathus* are placed in open nomenclature. The I element is characterized by its square outline as viewed laterally, that is, the unit is about as high as it is long. The cusp is slightly reclined posteriorly and is about the same height, or about as half again as high, as the remaining denticles. The denticles number between four and six, are slightly declining in height anteriorly, and the middle two or three may be fused. The anteriormost denticle is slightly proclined. The basal cavity outline is symmetrical, widest posteriorly, and gradually tapering anteriorly. In upper view the row of denticles is curved inward or may be slightly sinuous.

The accompanying simple cones consist of two forms of M_2 elements. One bears on its inner lateral face a costa that is slightly offset from the median position and may be equivalent to the Cd element of Nicoll (1982); the other is assignable to the Cf element. Both forms exhibit fine costation near the base of the unit.

Occurrence. The Vendom Fiord Formation at Strathcona Fiord (Section 1), at 107 m, 108 m, and 125 m above the base of the formation (GSC locs. C-26491, C-26492, and C-26495).

Pelekysgnathus n. sp. G

Plate 12, figures 31, 32, 36-40

Remarks. Two I elements from the Sutherland River Formation at its type section (Section 3A; GSC loc. 83676) have features in common with its counterparts in two previously described species of *Pelekysgnathus, P. arcticus* Uyeno and *P. csakyi* (Chatterton and Perry). As with the former, the present I elements have an upper marginal outline that gradually slopes anteriorly, although one of the specimens of *P. arcticus* illustrated by Uyeno (1981a, Pl. 7, figs. 20-22) has an abrupt anterior edge. There may be one or two erect to slightly reclined cusps, preceded anteriorly by six erect denticles. *Pelekysgnathus arcticus* carries only a single prominent cusp, whereas *P. csakyi* has one or two. As with both species, the posterior edge of the basal margin in *P.* n. sp. G protrudes farther than the edge of the cusp. The basal cavity abruptly widens in the posterior half, either symmetrically, as in *P. arcticus*, or asymmetrically, as in *P. csakyi*. The accompanying simple cones consist of S_2 and M_2 elements.

Pelekysgnathus n. sp. G appears to be intermediate between *P. arcticus* and *P. csakyi* in its morphology, and perhaps in its time-range as well. *Pelekysgnathus* n. sp. G occurs with *Amydrotaxis chattertoni* n. sp., that elsewhere has been dated as *hesperius* to *eurekaensis* zones. *Pelekysgnathus arcticus* was described from the environs of the Boothia Uplift in the eastern Arctic Archipelago, where it ranges from the upper part of the *siluricus* Zone to within the Pridoli (Uyeno, 1981a). *Pelekysgnathus csakyi* occurs in the *eurekaensis* Zone in the Delorme Formation in southwestern District of Mackenzie (Chatterton and Perry, 1977; Klapper *in* Klapper and Johnson, 1980, p. 451), and in the *delta* Zone (Devon Island, herein).

Pelekysgnathus sp. 1

Plate 20, figures 23-29

Remarks. Three small pelekysgnathan elements were recovered from an unnamed formation on Hyde Parker Island (GSC loc. C-33666). The unit consists of a straight single row of denticles with a reclining cusp, which is only slightly larger than the remaining denticles, and located near the posterior end. Anterior of the cusp are five or six erect denticles, and there are two reclining denticles posteriorly; all are confluent and free only at their apices. Viewed laterally, the upper marginal outline shows a gradual increase in height from the anterior margin to the cusp, and a steep decline posterior of it. The lower marginal outline is straight. The basal cavity is gradually widened posteriorly. The simple cones, which are assumed to belong to the same apparatus, consist of M_2 and S_2 elements. A peculiar simple cone, represented by two specimens, has a circular or subquadrate basal outline, and a large compressed cusp flanked on one side by two smaller denticles. It approaches the form of the S_{2b} element of a *Steptotaxis* apparatus.

Pelekysgnathus sp. 1 occurs in the *delta* Zone.

Genus *Steptotaxis* Uyeno and Klapper, 1980

Type species. *Pelekysgnathus pedderi* Uyeno and Mason, 1975.

Remarks. The principal characteristic of this genus is the coronellan element in the S_2 position in addition to acodinan elements.

Steptotaxis glenisteri (Klapper)

Plate 10, figures 22, 23;
Plate 13, figures 13, 14, 21-24,
30, 31, 35, 36; Plate 17, figures 11-14, 21

1969 *Pelekysgnathus glenisteri* n. sp. KLAPPER, p. 12, Pl. 2, figs. 22-27, 30-34.

1975 *Pelekysgnathus glenisteri* Klapper. KLAPPER *in* Ziegler (ed.), p. 259-260, *Pelekysgnathus* - Pl. 1, figs. 9-13.

1979 *Sannemannia glenisteri* (Klapper). UYENO and MAYR, Pl. 38.1, figs. 45, 46.

1980 *Sannemannia glenisteri* (Klapper). KLAPPER *in* Klapper and Johnson, p. 455.

1980 *Steptotaxis glenisteri* (Klapper). UYENO and KLAPPER, p. 89, 91, Pl. 8.2, figs. 12, 13.

Remarks. In the study area, *Steptotaxis glenisteri* was recovered from the Blue Fiord Formation at Sections 2A and 3A, and from the Undivided Devonian carbonates in southeastern Grinnell Peninsula (GSC locs. C-22971, C-23045, C-33644, and C-33660). The holotype specimen is from Section 3A herein, 45.7 m above the base of the Blue Fiord Formation (Klapper, 1969, p. 9). Elsewhere in the

Canadian Arctic Archipelago, the species was previously reported from the Stuart Bay Formation at Young Inlet in northeastern Bathurst Island (McGregor and Uyeno, 1972), and the Blue Fiord Formation in the subsurface of Cameron Island (Uyeno and Mayr, 1979).

Steptotaxis macgregori n. sp.

Plate 10, figures 18-21, 24-44

1980 *Steptotaxis* n. sp. B. UYENO *in* Uyeno and Klapper, p. 91, Pl. 8.2, figs. 24-39.

Diagnosis. A species of *Steptotaxis* the I element of which is characterized by a principal platform with three longitudinal rows of nodes. In large specimens, the straight middle row is fused into a ridge, whereas the nodes on the two lateral rows are widened to form short, transverse ridges. The two lateral processes are only incipiently developed, and represented by a short and relatively narrow lateral widening of the basal margin. The S_{2c} element is variable, and may resemble the I element in its icriodontan denticulation.

Description. I element. The principal platform has three longitudinal rows of nodes. In small specimens, the nodes are distinct, but in large individuals, the straight middle row is fused into a ridge and the lateral row nodes are transversely elongated to form short ridges. In an extreme (gerontic?) case, some of these transverse ridges reach the middle row, and those located at the posterior end of the platform are bifurcated at their lateral margins. The lateral margins of the platform vary from only slightly sinuous and subparallel, to broadly expanding posteriorly. The posterior lateral processes are only incipiently developed, and represented by short and relatively narrow expansion of the basal margin; their upper surface is smooth and unornamented. The large cusp is reclined and extends posteriorly beyond the basal margin; its posterior face is smooth.

In lower view, the basal cavity margin is only narrowly expanded posteriorly, but is abruptly so in the posterior one third of the unit. At this site the margin widens about equally on both sides under the lateral processes. In large specimens, a short spur is developed at the posterior edge of the basal margin; it may represent an incipiently developed posterior process.

In lateral view, the upper margin is broadly arched, from the low point at the anterior end of the unit, to the tip of the cusp. The cusp is at least twice the size of the nodes in the middle row. The posterior edge is concave posteriorly. The lower margin is slightly to moderately arched.

Simple cones. The S_{2b} and S_{2c} elements are morphologically quite variable. The S_{2b} elements are modified acodinans, ranging from those with a single lateral denticle (Pl. 10, fig. 34), to those with rather complex denticulation at the base (Pl. 10, figs. 29, 30, 35). The S_{2c} elements may be represented by a form with a single row of denticles, with or without lateral processes (Pl. 10, figs. 36, 40, 41), or a modified I element with a single row consisting of a ridge, followed posteriorly by a cusp, and with a row of nodes on one or both sides of that ridge (Pl. 10, figs. 31, 32). All S_2 and M_2 elements have white matter distributed throughout the cusp.

Remarks. The incipiently developed lateral processes of the I element distinguish *Steptotaxis macgregori* from other species of the genus. On the basis of the I element alone, the species may be erroneously assigned to the genus *Icriodus.*

Stratum typicum and locus typicus. Bird Fiord Formation, 549 m above the base of the formation, Section 2A (type) at Bird Fiord area, Ellesmere Island, GSC locality 83768 (see Appendix for detailed locality).

Type series. Holotype, the specimen illustrated in Plate 10, figures 37-39 (GSC 64515). Paratypes, GSC 64509 to 64514, 64516 to 64518, 86439 to 86446.

Derivation of name. After D.C. McGregor, for his dedicated study of Devonian palynostratigraphy of the Canadian Arctic Islands.

Steptotaxis maclareni n. sp.

Plate 11, figures 4, 5, 12;
Plate 16, figures 1-13

1980 *Steptotaxis* n. sp. A. UYENO *in* Uyeno and Klapper, p. 91, Pl. 8.2, figs. 1-11.

Diagnosis. A species of *Steptotaxis,* the I element of which is characterized by the principal platform with a single curved row of nodes. A moderately long lateral process, with a denticulation pattern similar to that on the principal row, occurs on the inner side. A more poorly developed lateral process is present on the outer side, and is represented by a series of unconnected nodes.

Remarks. I element. The principal platform has a single curved longitudinal row of nodes, numbering seven to nine, which, in some specimens, are linked by a thin ridge. On the inner side of the platform is a lateral process, about a third to one half the total unit length, with a denticulation pattern similar to that on the principal row. It may be connected to the principal row by a thin ridge (Pl. 16, fig. 9), or detached, running parallel to the principal row posteriorly, and laterally divergent anteriorly (Pl. 11, fig. 12; Pl. 16, figs. 1, 5, 8). The outer lateral process is absent in small specimens, and only poorly developed in large individuals. It is represented by a series of unconnected, distinct nodes, numbering four or five, along the outer basal margin of the unit.

In lower view, the basal cavity outline is broadly convex on the outer side, whereas the inner side is abruptly expanded in the posterior two thirds. The posterior margin is straight to slightly convex posteriorly.

In lateral view, the erect cusp is only slightly larger than other denticles in the principal row; its posterior face has a vertical ridge. Both the upper and lower margins are straight and parallel. With the posterior margin vertical, and the anterior margin also erect to reclined only slightly, the entire unit has a rectangular outline.

Simple cones. The S_{2b} and S_{2c} elements are morphologically quite variable. The S_{2b} elements may have coarse costae with small nodular protrusions (Pl. 16, fig. 11), or with a rather complex denticulation at the base (Pl. 16, fig. 13). The S_{2c} element may have a large, subcentrally located cusp, preceded anteriorly by an icriodontan-like denticulation, consisting of a middle ridge flanked on either side by two or three transverse ridges (Pl. 11, fig. 4). All S_2 and M_2 elements have white matter distributed throughout the cusp.

Remarks. Steptotaxis maclareni is distinguished from other species of *Steptotaxis* by its single row of nodes on the principal platform, flanked by a well developed inner lateral process, and a poorly developed outer lateral process. Although some I elements of *S.*? n. sp. S also have a single row of nodes, most have nodes that are traversed by ridges. The I element of *S. uyenoi* (Chatterton, 1979, Pl. 7, figs. 8, 27) may similarly have a single row of nodes, but the well developed lateral and posterior processes serve to distinguish it.

The lower marginal outline is somewhat similar to that of several species of *Icriodus*, such as *I. difficilis* Ziegler and Klapper and *I. retrodepressus* Bultynck.

Stratum typicum and locus typicus. Bird Fiord Formation, approximately 640 m above the base of the formation, near Section 2A at Bird Fiord area, Ellesmere Island, GSC locality C-76074 (see Appendix for detailed locality).

Type series. Holotype, the specimen illustrated in Plate 16, figures 1-4 (GSC 64496). Paratypes, GSC 64497 to 64502, 86448, 86589 to 86591.

Derivation of name. After Digby J. McLaren, one of the pioneers of Devonian stratigraphy in the Arctic Archipelago, and the author of the Bird Fiord Formation, whence the new species is derived.

Steptotaxis robleskyi n. sp.

Plate 6, figures 9, 10, 15-27, 32-34

Diagnosis. A species of *Steptotaxis,* the I element of which is characterized by six or more short transverse ridges that intersect the thin longitudinal ridge extending from the anterior end to the cusp. Extending laterally from the posterior end of the platform are two thin ridges, or two moderately well developed, denticulated accessory processes, or one of each type. The asymmetrical basal cavity is broadly expanded posteriorly, with a sinus developed on the inner margin about mid-length of the unit.

Description. I element. In upper view, the main platform is essentially straight or gently sinuous. Anterior of the cusp it consists of at least six denticles connected by a thin longitudinal ridge. These denticles are traversed by short ridges, although at the extreme anterior end the ridges may alternate in position on either side of the longitudinal ridge.

A somewhat variable feature occurs at the extreme posterior end of the main platform. At this site may be two short to moderately long lateral processes, which proceed proximally forward but distally backward so that they are concave to the posterior. Both processes may originate as ridges at the tip of the cusp, or one may start from the denticle immediately posterior to it. One or both processes may remain as simple, unornamented ridges throughout their lengths, or may develop irregular denticulation. The posterior margin of the unit may be smoothly rounded, or may have a short vertical ridge.

In lower view, the cavity is deep, moderately expanded in the anterior half and broadly expanded in the posterior half. Its asymmetry is due to a sinus located at mid-length on the inner margin.

In lateral view, the upper margin forms an arc, with the relatively large cusp at a higher level than the anterior end. In one specimen, however, the arc is more complete, so that the middle of the unit is the high point, and the small cusp and the anterior end are at about the same level. The lower margin is sinuous.

Simple cones. The S_{2c} position is filled by coronellan elements, some of which take on bizarre shapes. The variations include a form with an upper surface approaching that of the I element, but the thin longitudinal ridge is moderately to highly sinuous. Only the longitudinal ridge may be present, or it may be accompanied by transverse ridges. If the latter, the transverse ridges may go straight across, or may alternate on either side of the longitudinal ridge.

The second S_2 element is a transitional form between the coronellan and acodinan, that is, it is essentially a cone with elaborate lateral ridges. The third is a modified acodinan (S_{2b}).

The M_2 element is a simple cone with circular cross-section in its cusp. One form has a wide circular basal margin, whereas another has a narrower lower margin with faint costae on its sides near the base.

Remarks. The I element of *Steptotaxis robleskyi* is a morphological transition between *S.? furnishi* (Klapper) and *S. glenisteri* (Klapper). The posterior lateral processes represented by simple ridges are a feature characteristic of *S.? furnishi*, whereas *S. glenisteri* possesses processes that are more ornamented. Like the ridges in *S.? furnishi*, however, the processes are directed more laterally rather than anteriorly, as in *S. glenisteri*. The features of the main platform are more similar to those of *S. glenisteri*, although one specimen of *S.? furnishi* illustrated by Klapper (1969, Pl. 2, fig. 18) has transverse ridges that are aligned on either side of the median longitudinal ridge.

The bizarre coronellan element that superficially resembles the I element is also present in the apparatus of *S. glenisteri* (Klapper and Philip, 1972, Pl. 3, figs. 25, 29, 37).

Steptotaxis robleskyi, found associated with *Pandorinellina exigua exigua* (Philip) and *Polygnathus* cf. *P. pireneae* Boersma, probably belongs to the *dehiscens* Zone. Thus the new species is contemporaneous with *S.? furnishi*, and is older than *S. glenisteri*, which is from the *inversus* and *serotinus* zones (Klapper *in* Klapper and Johnson, 1980, p. 451, 455, Tables 5, 6; Uyeno and Klapper, 1980, Textfig. 8.2).

In addition to the type locality of the species, *Steptotaxis robleskyi* has also been found in the Eids Formation at a locality 3.7 km west of Baumann Fiord on Bjorne Peninsula (GSC loc. 57730; see Fig. 10 and Appendix; also marked "115" on GSC Map 1312, Kerr and Thorsteinsson, 1972). There, it is associated with *Pandorinellina exigua exigua* (Philip) and a Pa element of *Polygnathus* sp. indeterminate. From the same locality, Collins (1969, p. 32) reported a nautiloid faunule consisting of *Spyroceras thoas* (Hall), *S.?* aff. *S. karpinskyi* Zhuravleva, *Hindeoceras* sp., *Folioceras segmentum* Collins, and *Leurocycloceras superplenum*? Collins. The age of the nautiloid faunule was concluded to be Eifelian.

Stratum typicum and locus typicus. Eids Formation, 30.2 m below top of the formation, Vendom Fiord area, Ellesmere Island, Subsection R-A9, GSC locality C-76215 (see Appendix for detailed locality).

Type series. Holotype, the specimen illustrated in Plate 6, figures 32-34 (GSC 86365). Paratypes, GSC 86350 to 86364.

Derivation of name. After Robert Roblesky, who collected the type material and whose field study forms a part of the present paper.

Steptotaxis n. sp. C

Plate 7, figures 27, 28; Plate 8, figures 8, 9, 16, 17, 19-22; Plate 11, figures 9, 10; Plate 16, figures 14-17

1980 *Sannemannia* n. sp. KLAPPER *in* Klapper and Johnson, p. 455, Pl. 3, figs. 27, 28.

1980 *Steptotaxis* n. sp. C. UYENO and KLAPPER, p. 91, Pl. 8.2, figs. 14, 18, 19; Pl. 8.3, figs. 1, 2, 7-9, 14-22.

Diagnosis. A species of *Steptotaxis*, the I element of which has a principal platform with three longitudinal rows of nodes. The middle row may be partly or entirely fused to form a ridge. The inner lateral process, which is the longer of the two, is directed somewhat anteriorly, whereas the outer lateral process is laterally projected. An extremely short, laterally directed posterior process may be present, and may be regarded as an extension of the inner lateral process. The denticulation pattern on these processes is similar to that on the principal platform. The S_{2c} element consists of a large cusp, preceded anteriorly by a low platform with a denticulation pattern similar to that on the principal platform of the I element.

Remarks. In the current study, *Steptotaxis* n. sp. C was recovered from the Bird Fiord Formation at and near its type section (GSC locs. 83761 and C-76075), the upper member of the Blue Fiord Formation (Subsection R-A7), and the lower part of the Strathcona Fiord Formation (Subsections R-A7 and R-D14). It was also reported previously from the upper part of the Blue Fiord Formation at Sor Fiord (Klapper *in* Uyeno and Klapper, 1980, Fig. 2.3).

This species is left in open nomenclature pending its formal naming by Dr. Gilbert Klapper.

Steptotaxis? n. sp. S

Plate 7, figures 8-12, 18-20, 29, 30, 34-38;
Plate 8, figures 23-33; Plate 10, figures 1-17;
Plate 13, figures 15-19, 25-29, 32-34

1975 *Pelekysgnathus* sp. WEYANT, Pl. 1, figs. 24, 29, 30, 32.

1975 *Pelekysgnathus furnishi* Klapper. WEYANT, Pl. 1, figs. 25-28.

1980 *Pelekysgnathus* n. sp. KLAPPER *in* Klapper and Johnson, p. 451.

1980 *Pelekysgnathus* n. sp. UYENO and KLAPPER, Pl. 8.2, figs. 20-23; Pl. 8.3, figs. 3, 10.

(?)1984 *Steptotaxis glenisteri* (Klapper). SOBOLEV, Pl. 5, figs. 8, 9, 10, 13.

Description. I element. The principal platform has a longitudinal ridge throughout its length; the ridge may be straight, slightly curved or sinuous and irregular. The ridge may be ornamented with simple denticles or nodes, or with nodes that have transverse ridges; often such transverse ridges are irregularly aligned, so that they are neither parallel with others nor form a straight line across the longitudinal ridge. In those that are simply denticulated, one or two denticles may be bent laterally. The cusp may be free of ornamentation, or may be flanked by one or two lateral ridges that run from the crest of the denticle to the lower margin. The lateral ridges are usually low and simple, but one or both processes may be distinct and ornamented with nodes and/or denticles. A sharp ridge runs along the posterior face of the cusp; in lateral view, this ridge may be slightly sinuous or markedly convex.

The basal cavity outline ranges from symmetrical with gradual widening posteriorly, to that with a sinus and spur developed on the inner side. The posterior margin of the cavity outline is straight to slightly concave.

S_2 and M_2 elements. The accompanying S_2 elements have a basal cavity that may be circular or oval, and the cross-section of the cusp is highly variable, ranging from circular to lenticular with posterior and/or anterior carinae. There may be additional carinae arranged asymmetrically so that in cross-section the cusp may be convex on the outer side and concave on the inner. The cusp may be finely striated.

The S_{2b} element is essentially a modified acodinan, consisting of a simple cone with denticulation at its base. This secondary denticulation is rather elaborate in certain specimens, and such a form is transitional to S_{2c}, coronellan elements. Other elements assigned to this species comprise S_{2a}, S_{2c}, and M_2. The M_2 cones may be similarly variable, but all have a circular basal cavity margin.

Remarks. As noted above, the I element of *Steptotaxis*? n. sp. S can be widely variable. It ranges from pelekysgnathan to steptotaxiform; in the Blue Fiord Formation at its type area and at Sor Fiord, no coronellan elements were found in the same collections. In the past, therefore, the species was referred to the genus *Pelekysgnathus* for justifiable reasons. Considerable effort was made to distinguish between the end members of this broad spectrum, but these attempts were repeatedly thwarted by the presence of intermediate forms. At the moment, there appears to be no objective way of separating them. In the Blue Formation west of Vendom Fiord and at Sutherland River, however, coronellan elements (S_{2c}) or forms transitional to the coronellan element (S_{2b}-S_{2c} transition) are present. Because of this uncertainty, the species is only tentatively assigned to *Steptotaxis*.

To some extent, the small (juvenile?) forms of *Steptotaxis glenisteri* (Klapper) are similar to the large (adult?) forms of *S.*? n. sp. S, suggesting pedogenesis. The latter species has a lower stratigraphic range, commencing near the base of the Blue Fiord Formation, and small forms that may belong to it occur as low as the Eids Formation.

The specimens illustrated by Sobolev (1984) from the upper Sinel'ninsky Horizon on Novaya Zemlya, may belong to the new species. The I element displays a single row of nodes with little or no lateral expansion or transverse ridges. That collection is associated with *Polygnathus inversus* Klapper and Johnson. It is also possible that the specimens identified as *Pelekysgnathus klamathensis* Savage and *P. furnishi* Klapper by Sobolev (1984, Pl. 3, figs. 5, 6, 9, 10; Pl. 4, figs. 5, 6) may be assignable to *Steptotaxis*? n. sp. S. Intergradational forms may exist in the collections to help solve this question. *P. furnishi* was reported from the lower Sinel'ninsky Horizon, and *P. klamathensis* from the lower and upper parts of that Horizon, in the highest sample (19-39 of Exposure 203 on Kabaniy Peninsula) co-occurring with the above *S. glenisteri*.

In the study area, *Steptotaxis*? n. sp. S is relatively widespread both stratigraphically and geographically within the Blue Fiord Formation. It was recovered at Sections 2A and 3A, and at Subsections R-A7, R-A8, and R-A9.

This species is left in open nomenclature pending its formal naming by Dr. Gilbert Klapper.

Steptotaxis? cf. *S.*? n. sp. S

Plate 11, figures 1-3, 6-8

1980 *Pelekysgnathus* sp. UYENO *in* Uyeno and Klapper, Pl. 8.2, figs. 15-17.

Remarks. Nine I elements from the upper part of the upper member, Blue Fiord Formation, and the Bird Fiord Formation at Section 2A, and an additional six I elements from the Eids and Blue Fiord formations at Subsection R-A9 and at GSC locality 57730, are only tentatively assigned to the genus *Steptotaxis.* In two of the three Bird Fiord samples in which no other I elements are present, the accompanying simple cones consist of S_2 and M_2 elements only, and the coronellan (S_{2c}) form is absent. One of the Blue Fiord collections (GSC loc. C-76216, Subsection R-A9) contains a form transitional between S_{2b} and S_{2c}. The tentative assignment of these collections to *Steptotaxis* is based on their morphological similarity to the I element of *S.*? n. sp. S. The features in common include the irregular longitudinal and transverse ridges, and the development of lateral processes. The main distinguishing criterion is the basal marginal outline that is symmetrically and widely expanded posteriorly. Certain I elements of *S.*? n. sp. S may also be widely expanded, but in general only asymmetrically, and often with a sinus on the inner side.

Family RHIPIDOGNATHIDAE Lindström, 1970

Genus *Carniodus* Walliser, 1964

Type species. *Carniodus carnulus* Walliser, 1964.

?*Carniodus carnulus* Walliser

Plate 12, figure 9

(?)1964 *Carniodus carinthiacus* n. sp. WALLISER, p. 31-33, Pl. 6, fig. 8; Pl. 27, figs. 20-26; Textfig. 4u.

(?)1986 *Carniodus carnulus* Walliser. NEHRING-LEFELD, p. 632-634, Pl. 2, figs. 1-10 (includes synonymy).

Remarks. A single specimen that may possibly be identified with the form-species "*Carniodus*" *carinthiacus*, was obtained from the Cape Phillips Formation in the subsurface on Bjorne Peninsula (Section 2B; GSC loc. C-30360/1830-1860). It differs from that form-species principally in the sharp, lateral ridge that runs the entire length of the unit. The lower surface consists of a straight median keel that is flanked by a pair of downward directed keels and separated from them by a narrow furrow. The specimen occurs in the *celloni* Zone. "*Carniodus*" *carinthiacus* is the Pb element in the *Carniodus carnulus* apparatus.

Family PTEROSPATHODONTIDAE Cooper, 1977a

Genus *Pterospathodus* Walliser, 1964

Type species. *Pterospathodus amorphognathoides* Walliser, 1964.

Remarks. Jeppsson (1979, p. 237, 238) made a detailed comparison and noted the similarity in the construction of the apparatuses of *Pterospathodus* and *Amorphognathus.* He concluded that *Pterospathodus* is probably a Silurian representative of the family Balognathidae. As stated under the introduction of this chapter, however, the classification used in the Treatise [Robison (1981)] is followed herein.

Pterospathodus celloni (Walliser)

Plate 3, figures 1-7, 13, 14; Plate 11, figures 25-30

1964 *Spathognathodus celloni* n. sp. WALLISER, p. 73-74, Pl. 4, fig. 13; Pl. 14, figs. 3-16; Textfigs. 1b, 7b-f.

1964 *Roundya brevialata* n. sp. WALLISER, p. 69, Pl. 4, fig. 16; Pl. 31, figs. 8-10.

1975 *Llandoverygnathus celloni* (Walliser). ALDRIDGE, Pl. 1, figs. 20, 21.

1975 *Llandoverygnathus celloni* (Walliser). SCHÖNLAUB, p. 53, Pl. 1, figs. 18, 19.

1976 *Pterospathodus celloni* (Walliser). BARRICK and KLAPPER, p. 82-83, Pl. 1, figs. 3, 5 (includes synonymy).

1981 *Spathognathodus celloni* Walliser. ZHOU et al., Pl. 2, figs. 12, 13.

1982 *Pterospathodus celloni* (Walliser). ALDRIDGE and MOHAMED, Pl. 2, fig. 7.

1983 *Pterospathodus celloni* (Walliser). UYENO and BARNES, p. 24, Pl. 5, figs. 17, 18, 20-24 (includes further synonymy).

1983 *Spathognathodus celloni* Walliser. ZHOU and ZHAI, p. 295-296, Pl. 68, figs. 3, 4.

1985 *Pterospathodus celloni* (Walliser). MABILLARD and ALDRIDGE, Textfig. 7a.

1985 *Pterospathodus celloni* (Walliser). ALDRIDGE, p. 80, Pl. 3.1, figs. 25, 26.

1986 *Pterospathodus celloni* (Walliser). NAKREM, Fig. 6a.

Remarks. In addition to the four elements (Pa, Pb, M, and S) that have been included in the apparatus of *Pterospathodus celloni* by Barrick and Klapper (1976), a second S element is proposed as also belonging to it. This is a nearly symmetrical form, and is therefore probably the Sa element originally described as form-species "*Roundya*" *brevialata* by Walliser (1964). As noted by that author, this element is characterized by short, asymmetrically arranged lateral processes that bear one or two flat, peg-like denticles. The short posterior process begins on the cusp as a ridge that is slightly off-centre, and which is flanked on either side by a narrow furrow; it bears one to three denticles similar to those on the lateral processes. In the Cellon section, the stratigraphic range of "*R.*" *brevialata* matches that of the Pa element, except for the single occurrence in Sample 11 from a bed immediately above the last occurrence of the Pa element (Walliser, 1964, Table 2, Part 1). A later paper by Walliser (1971, Fig. 2) showed the Sa element restricted to the *celloni* Zone.

A form that may possibly be the third S element of the *P. celloni* apparatus is also present in a collection from the upper Allen Bay Formation at Section 1. It is neoprioniodid, and is superficially similar to "*Neoprioniodus*" *subcarnus* Walliser, the Sc element of *Carniodus carnulus* Walliser. It differs from the latter in its posterior process with flat, planar sides which, in its upper surface, bears more acicular denticles that are free to about mid-length. They are similar in general outline, and in both there may be a ridge on the outer, anterolateral surface.

In both the Allen Bay and Cape Phillips collections, there are forms that are virtually identical with the Pa element of *Pterospathodus celloni.* They have, however, a single node on the upper surface of the outer lateral projection and, in this respect, morphologically approach *Aulacognathus bullatus* (Nicoll and Rexroad). Unlike the latter, which exhibits lateral projections located symmetrically and opposite to each other, the lateral flares on these specimens are more characteristic of *P. celloni* and are arranged offset to each other.

Occurrence. The Allen Bay Formation (see above), and the lower part of the Cape Phillips Formation at Section 2B. Elsewhere in the Canadian Arctic Islands, previously reported from the Cape Storm and Cape Phillips formations in the eastern part of the Archipelago (Mirza, 1976, p. 104-105).

Pterospathodus pennatus procerus (Walliser)

Plate 3, figures 18-20

1964 *Spathognathodus pennatus procerus* n. sp., n. ssp. WALLISER, p. 80, Pl. 15, figs. 2-8; Textfig. 1e.

1975 *Llandoverygnathus pennatus* (Walliser). ALDRIDGE, Pl. 1, figs. 24, 25.

1976 *Pterospathodus pennatus procerus* (Walliser). BARRICK and KLAPPER, p. 83, Pl. 1, fig. 19.

1983 *Pterospathodus pennatus procerus* (Walliser). UYENO and BARNES, p. 24, Pl. 8, figs. 1-3 (includes synonymy to 1981).

1983a *Pterospathodus pennatus procerus* (Walliser). WANG and ZIEGLER, Fig. 3.22.

1983 *Pterospathodus pennatus procerus* (Walliser). SAVAGE, POTTER, and GILBERT, Textfig. 2.

1985 *Pterospathodus pennatus procerus* (Walliser). SAVAGE, p. 714-715, Textfig. 4.

1985 *Pterospathodus pennatus procerus* (Walliser). STOUGE and BAGNOLI STOUGE, p. 109, Pl. 2, figs. 14-17.

1985 *Pterospathodus pennatus procerus* (Walliser). YU, Pl. 1, figs. 1, 2.

1986 *Pterospathodus pennatus procerus* (Walliser). NEHRING-LEFELD, p. 637, Pl. 1, figs. 1, 2; Pl. 5, figs. 8, 9.

Remarks. Based on Anticosti Island collections, Uyeno and Barnes (1983) suggested that the Pb element of *Pterospathodus pennatus procerus* is identical with, or very similar to, that of *P. amorphognathoides.* From the lower Cape Phillips Formation at Strathcona Fiord (Section 1) at 52 m above the base of the formation (GSC loc. 83783), five specimens were recovered that are referable to the Pa and Pb elements of this taxon. As in Anticosti Island material, no Pa element of *P. amorphognathoides* was found in the same collection. The subspecies was also recovered from the lower Allen Bay—Read Bay carbonates (undivided) in subsurface Section 2C.

Genus *Astropentagnathus* Mostler, 1967

Type species. *Astropentagnathus irregularis* Mostler, 1967.

Astropentagnathus irregularis Mostler

Plate 2, figures 4-6; Plate 11, figures 23, 24, 31-35

1967 *Astropentagnathus irregularis* n. sp. MOSTLER, p. 298-300, Pl. 1, figs. 1-11.

1967 *Spathognathodus tyrolensis* n. sp. MOSTLER, p. 302, Pl. 1, figs. 17, 19, 20, 23.

(?)1971 *Falcodus*? n. sp. SCHÖNLAUB, p. 47, Pl. 3, figs. 1-3.

(?)1971 *Synprioniodina typica* n. sp. SCHÖNLAUB, p. 49, Pl. 3, figs. 4, 5.

1983 *Astropentagnathus irregularis* Mostler. UYENO and BARNES, p. 15, Pl. 4, figs. 23, 24 (includes synonymy to 1981).

1983 *Astropentagnathus irregularis* Mostler. NOWLAN, Fig. 4(D).

1985 *Astropentagnathus irregularis* Mostler. ORCHARD *in* Norford and Orchard, p. 10, Pl. 2, figs. 2, 3, 6.

1985 ''*Rhynchognathodus*'' (n. sp. sensu Schönlaub). ORCHARD *in* Norford and Orchard, Pl. 2, fig. 10.

1985 *Astropentagnathus irregularis* Mostler. ALDRIDGE, p. 82, Pl. 3.2, figs. 1, 2.

Remarks. The septimembrate apparatus of *Astropentagnathus irregularis* was reconstructed by Mirza (1976, p. 74, Pl. 2, figs. 1-7), based on material from the Cape Phillips Formation on Hoved Island, and the Cape Storm Formation in the Vendom Fiord area. Not all elements assigned by that author were found in the present collections from the Cape Phillips Formation in the subsurface of Bjorne Peninsula, and the Allen Bay Formation at Strathcona Fiord (Section 1). The two Pa, Pb, M, Sb?, and Sa elements are present.

The M (rhynchognathodontan) element varies somewhat, as noted by Schönlaub (1971). The posterior projection of the anticusp may be short with a smooth upper surface, or denticulated (Pl. 11, figs. 33, 35). In one fragmentary specimen, the posterior process meets the cusp on its lateral side, and the two lateral processes appear to converge onto the cusp at a small angle, rather than being in the same plane (Pl. 11, fig. 34).

The Pb element is morphologically close to ''*Ozarkodina*'' *gaertneri* Walliser in its general outline, that is, the long, high blade anterior of the prominent cusp, and posterior of it, the relatively low and short blade. The lateral projections of the blade under the cusp are longer, and the projection on the inner side is more prominent, with a serrated ridge on its upper surface. The blade has a distinct ridge on either side, near and parallel with the lower margin. The basal cavity is enlarged under the cusp and lateral projections, and continues as a narrow groove under the blade.

The Sa element is similar to ''*Synprioniodina*'' *typica* Schönlaub, but the two lateral processes in the fragmentary Allen Bay specimen appear to be about the same length. It is a symmetrical form with the processes bent slightly posteriorly, and the two processes form an arch of about 70 degrees. The prominent cusp is compressed and biconvex in cross-section. The denticles on the lateral processes are similarly compressed, and are free only at the tips. All denticles, including the cusp, contain white matter. The basal cavity is under the cusp, with narrow grooves extending from it for short distances under the lateral processes.

The Sb? element is vaguely similar to *Falcodus*? n. sp. of Schönlaub (1971, p. 47, Pl. 3, figs. 1-3). Like the latter, it is somewhat detortiform in its general outline, with the distal part of the outer lateral process being slightly bent anteriorly. The two lateral processes are of about equal length. The pattern of dentition and the nature of the basal cavity are similar to those of the Sa element.

Schönlaub's (1971) collection of ''*S.*'' *typica* and *F.*? n. sp. are from sample numbers 194/3 and 194/4, at the northeast wall of the Seewarte in the central Carnic Alps in Austria. There, they co-occur with ''*Hadrognathus*'' *irregularis* (Mostler), ''*Neospathognathodus*'' *tyrolensis* (Mostler), and ''*Rhynchognathodus*'' n. sp., which are thought to form parts of the *A. irregularis* apparatus (Schönlaub, 1971, p. 40; Klapper and Murphy, 1975, p. 25; Uyeno and Barnes, 1983, p. 15).

Occurrence. The Allen Bay Formation (Section 1), Allen Bay–Read Bay carbonates (undivided; 2C), and Cape Phillips Formation (2B); previously reported from the Cape Phillips and Cape Storm formations at Hoved Island and the Vendom Fiord area, Ellesmere Island (Mirza, 1976).

Genus *Aulacognathus* Mostler, 1967

Type species. *Aulacognathus kuehni* Mostler, 1967.

Aulacognathus bullatus (Nicoll and Rexroad)

Plate 2, figures 26-28, 34-36

1964 *Spathognathodus* sp., ex. aff. *S. celloni* Walliser. WALLISER, p. 74, Pl. 14, figs. 17, 18; Textfig. 7a.

1964 *Ozarkodina* sp., ex. aff. *O. adiutricis* Walliser. WALLISER, p. 54, Pl. 27, fig. 11; Textfig. 7n.

1969 *Neospathognathodus bullatus* n. sp. NICOLL and REXROAD, p. 44-45, Pl. 1, figs. 5-7.

1975 *Aulacognathus bullatus* (Nicoll and Rexroad). KLAPPER and MURPHY, p. 26, Pl. 2, figs. 15-20.

1981 *Aulacognathus bullatus* (Nicoll and Rexroad). NOWLAN, Pl. 5, figs. 20, 23, 24.

1983 *Aulacognathus bullatus* (Nicoll and Rexroad). UYENO and BARNES, p. 15, Pl. 4, figs. 18, 20-22 (includes synonymy to 1981).

1983 *Aulacognathus bullatus* (Nicoll and Rexroad). NOWLAN, Fig. 4 (E, O, P).

1983 *Aulacognathus bullatus* (Nicoll and Rexroad). ZHOU and ZHAI, p. 269, Pl. 65, fig. 8.

1985 Gen. and sp. indet. A. STOUGE and BAGNOLI STOUGE, p. 110, Pl. 2, fig. 21.

1986 *Aulacognathus bullatus* (Nicoll and Rexroad). NAKREM, Figs. 8g, i [j?].

Remarks. Elements of *Aulacognathus bullatus* were recovered from the upper Allen Bay Formation at Strathcona Fiord (Section 1) at 291 m above the base of the formation (GSC loc. 83782). Previously Mirza (1976, p. 107) reported it from the Cape Phillips Formation on Hoved Island.

The North Greenland specimen illustrated by Stouge and Bagnoli Stouge (1985) appears to be a fragment of the posterior part of the Pa element of *Aulacognathus bullatus*. The M element was illustrated by Nowlan (1981, Pl. 5, fig. 23).

Genus *Polygnathoides* Branson and Mehl, 1933

Type species. *Polygnathoides siluricus* Branson and Mehl, 1933.

Polygnathoides emarginatus (Branson and Mehl)

Plate 15, figures 4, 5

1933 *Polygnathellus emarginatus* n. sp. BRANSON and MEHL, p. 49, Pl. 3, fig. 38.

1975 *Polygnathoides emarginatus* (Branson and Mehl). KLAPPER and MURPHY, p. 56, Pl. 8, figs. 22-25 (includes synonymy).

1980 *Polygnathoides emarginatus* (Branson and Mehl). SCHÖNLAUB *in* Chlupáč et al., Pl. 17, fig. 5.

1981a *Polygnathoides emarginatus* (Branson and Mehl). UYENO, p. 46, Pl. 9, figs. 24, 25.

Remarks. Specimens of *Polygnathoides siluricus* Branson and Mehl were not recovered from the same collection as those of *P. emarginatus*; the two are often found associated, and may represent the Pa and Pb elements of an apparatus. The form-species "*Neoprioniodus*" *latidentatus* Walliser, a possible M component of that apparatus, was found with *P. emarginatus* in the upper Douro Formation at Sutherland River (Section 3C; GSC loc. 83670).

Elsewhere in the Canadian Arctic Archipelago, the species was found in the upper part of the Douro Formation at a section about 5 km southeast of Sutherland River. There, it occurs with *P. siluricus* (Uyeno, 1981a).

Family DISTOMODONTIDAE Klapper, 1981a

Genus *Distomodus* Branson and Branson, 1947

Type species. *Distomodus kentuckyensis* Branson and Branson, 1947.

Distomodus staurognathoides (Walliser)

Plate 3, figures 21, 26-29; Plate 12, figure 8

1964 *Hadrognathus staurognathoides* n. sp. WALLISER, p. 35, Pl. 5, fig. 2; Pl. 13, figs. 6-15.

1974 *Hadrognathus staurognathoides* Walliser. ALDRIDGE, p. 301, Fig. 1I.

1975 *Hadrognathus staurognathoides* Walliser. SCHÖNLAUB, p. 53-56, Pl. 1, figs. 1-4, 17, 20, 23; Pl. 2, figs. 1-10, 12-21.

1976 *Distomodus staurognathoides* (Walliser). BARRICK and KLAPPER, p. 71-72, Pl. 1, figs. 20-28 (includes synonymy).

1977a *Hadrognathus staurognathoides* Walliser. COOPER, p. 1066-1067, Pl. 1, figs. 1, 5-7, 12, 16.

1978 *Hadrognathus staurognathoides* Walliser. MILLER, Pl. 4, fig. 26.

1979 *Distomodus staurognathoides* (Walliser). ALDRIDGE, Pl. 1, figs. 16, 17.

1981 *Distomodus staurognathoides* (Walliser). NOWLAN, Pl. 5, figs. 21, 27; Pl. 6, fig. 21.

1982 *Distomodus staurognathoides* (Walliser). ALDRIDGE and MOHAMED, Pl. 2, figs. 1-6.

1983 *Distomodus staurognathoides* (Walliser). UYENO and BARNES, p. 17, Pl. 3, figs. 1-15.

1983 *Distomodus staurognathoides* (Walliser). NOWLAN, Figs. 4F-H.

1983 *Distomodus staurognathoides* (Walliser). MABILLARD and ALDRIDGE, Pl. 1, figs. 15-20.

1985 *Distomodus staurognathoides* (Walliser). ALDRIDGE, p. 80, Pl. 3.1, figs. 12-17.

1985 *Distomodus staurognathoides* (Walliser). SAVAGE, Fig. 9.

1985 *Distomodus staurognathoides* (Walliser). MABILLARD and ALDRIDGE, Textfig. 7d.

1986 *Distomodus staurognathoides* (Walliser). NAKREM, Figs. 8a, b.

Remarks. A part of the apparatus of *Distomodus staurognathoides* was recovered from the lower Cape Phillips Formation at Strathcona Fiord (Section 1; GSC loc. 83783). The cusp on the Sa element is short and stocky, rather than tall and slender as in those illustrated by others; in this respect, the Cape Phillips specimens are similar to those from Anticosti Island (Uyeno and Barnes, 1983). Only the Pa and Sa elements are present.

A specimen of the M element was recovered from the Allen Bay–Read Bay carbonates (undivided) in the subsurface at Bjorne Peninsula (Section 2C).

Superfamily PANDERODONTACEA Lindström, 1970

Family PANDERODONTIDAE Lindström, 1970

Genus *Panderodus* Ethington, 1959

Type species. *Paltodus unicostatus* Branson and Mehl, 1933.

Remarks. Sweet (1979, p. 62, 63) presented a thorough review of the genus *Panderodus*. He suggested that its apparatus consists of five types of elements, four of which form a symmetry-transition series. Earlier, Barrick (1977, p. 54) had suggested a four-element apparatus, with only the tortiform of Sweet (1979) missing. Based on a study of a cluster of *Panderodus unicostatus* (Branson and Mehl) from the Llandovery of Podolia, Ukraine, Dzik and Drygant (1986) have recently proposed an apparatus consisting of seven pairs of elements. These elements were arranged in two parallel rows, with cusps opposing in every pair, and the largest elements located at the anterior end. A similar conclusion was reached by M.P. Smith et al. (1987) following a detailed study of an assemblage, found associated with traces of soft parts, of *P. unicostatus* from the Brandon Bridge of Waukesha, Wisconsin.

Nowlan and Barnes (1981) demonstrated that the genus *Panderodus* possesses a number of different apparatus styles. Three of these styles were elucidated, and placed in informal groups, in the Upper Ordovician collection from the Vauréal Formation of Anticosti Island. Group I apparatuses included those similar to that of the type species, *P. unicostatus*; apparatuses of groups II and III were considered to be bi-elemental.

In a study of Middle Ordovician (Chazyan, Llandeilian) conodont fauna from the Cobbs Arm Limestone of New World Island, Newfoundland, Fåhraeus and Hunter (1986) noted that, in simple-cone apparatuses, there is a gradual increase in the curvature of the cusp within each element type. They referred to this as a curvature-transition series, and used *Panderodus gracilis* (Branson and Mehl) to demonstrate this observation.

Panderodus gracilis (Branson and Mehl)

Plate 1, figures 14, 19, 20

1933 *Paltodus gracilis* n. sp. BRANSON and MEHL, p. 108, Pl. 8, figs. 20, 21.

1979 *Panderodus gracilis* (Branson and Mehl). HARRIS, BERGSTRÖM, ETHINGTON, and ROSS, Pl. 5, figs. 1-3.

1979 *Panderodus gracilis* (Branson and Mehl). ROSS, NOLAN, and HARRIS, Fig. 6 (h, i).

1980 *Panderodus gracilis* (Branson and Mehl). NOWLAN *in* Bolton and Nowlan, p. 20, Pl. 7, figs. 19, 21-23.

1981 *Panderodus gracilis* (Branson and Mehl). NOWLAN and BARNES, p. 16, Pl. 6, figs. 20, 23, 27 (includes synonymy to 1978).

1981 *Panderodus gracilis* (Branson and Mehl). McCRACKEN and BARNES, p. 85-86, Pl. 1, figs. 1-12, 15.

1981 *Panderodus gracilis* (Branson and Mehl). NOWLAN, Pl. 6, figs. 22, 23.

1982 *Panderodus gracilis* (Branson and Mehl). LENZ and McCRACKEN, Pl. 2, figs. 2, 5, 6, 8, 12, 15.

Remarks. A possible relationship of *Panderodus gracilis* with *P. unicostatus* (Branson and Mehl) was discussed by Nowlan and Barnes (1981, p. 16) and McCracken and Barnes (1981, p. 86). The latter species occurs stratigraphically higher in Section 1 (see under *P. unicostatus*).

The ratio of graciliform, combined with arcuatiform, to compressiform is 2.5:1 in GSC locality 83778, the only sample with a fairly large number represented.

In terms of a Composite Standard Section of the North American Midcontinent Province, Sweet (1984) recorded the range of *Panderodus gracilis* from the base of the *friendsvillensis* to *shatzeri* zones (CSS 680 to 1286), of Chazyan to Richmondian age. McCracken and Barnes (1981) noted that, on Anticosti Island, the species ranges into the Llandovery. Jeppsson (1983, p. 125; 1984, p. 107) recorded the species as high as Ludlow, in the Hemse Beds of Gotland.

Occurrence. The lower part of the Allen Bay Formation at Strathcona Fiord (Section 1); in the eastern Arctic Islands, previously reported from the upper Cornwallis Group and Allen Bay(?) Formation (Weyant, 1968, p. 24), and the Thumb Mountain, Irene Bay, and Allen Bay formations (Nowlan, 1976, p. 316-318; Mirza, 1976, p. 126-127). Barnes (1977, p. 107) recorded it from the Bad Cache Rapids Formation on Melville Peninsula.

Panderodus panderi (Stauffer)

Plate 1, figures 23, 29

1940 *Paltodus panderi* n. sp. STAUFFER, p. 427, Pl. 60, figs. 8, 9.

1979 *Panderodus panderi* (Stauffer). SWEET, p. 64, Fig. 7(2-6, 10).

1981 *Panderodus panderi* (Stauffer). NOWLAN and BARNES, p. 17, Pl. 6, figs. 3, 4, 14 (includes synonymy to 1978).

1981 *Panderodus panderi* (Stauffer). McCRACKEN and BARNES, p. 86, Pl. 2, figs. 11-13.

Remarks. Sweet (1979, p. 64) presented a comprehensive diagnosis of *Panderodus panderi.* Later (Sweet, 1984), he noted that in a Composite Standard Section of the North American Midcontinent Province, *Panderodus panderi* ranges from the *sweeti* to *shatzeri* zones (CSS 793 to 1286), of Chazyan to Richmondian age. On Anticosti Island, the species was reported to extend to Fauna 13 of Gamachian age (McCracken and Barnes, 1981).

Two specimens of a similar form, identified as *Panderodus* cf. *P. panderi*, were reported by Mayr et al. (1980, p. 211, Pl. 32.1, figs. 11, 12) from a stratigraphic interval regarded as ranging from the Irene Bay Formation to the lowermost part of the Allen Bay Formation. They are from the depth interval of 1249.7 to 1280.2 m in the Panarctic Deminex Garnier O-21 well, located in northeastern Somerset Island.

Occurrence. The Allen Bay Formation at Strathcona Fiord (Section 1); from the Canadian Arctic, previously reported from the Bad Cache Rapids Formation on Melville Peninsula (Barnes, 1977, p. 107), and from the upper part of Thumb Mountain through Irene Bay formations on Hoved Island, southwestern Ellesmere Island, and northwestern Devon Island, including Grinnell Peninsula (Nowlan, 1976, p. 319).

Panderodus unicostatus (Branson and Mehl)

Plate 1, figures 27, 28, 32;
Plate 4, figure 10

1933 *Paltodus unicostatus* n. sp. BRANSON and MEHL, p. 42, Pl. 3, fig. 3.

1981 *Panderodus unicostatus* (Branson and Mehl). ALDRIDGE, DORNING, and SIVETER, Pl. 2.2, figs. 1-3.

1983 *Panderodus unicostatus* (Branson and Mehl). UYENO and BARNES, p. 22-23, Pl. 9, figs. 17-22 (includes synonymy to 1981).

1983 *Panderodus unicostatus* (Branson and Mehl). MABILLARD and ALDRIDGE, Pl. 4, figs. 9-14.

1984 *Panderodus unicostatus* (Branson and Mehl). IDRIS, Pl. 1, fig. 27.

1985 *Panderodus unicostatus* (Branson and Mehl). YU, Pl. 1, figs. 4, 6.

1986 *Panderodus unicostatus* (Branson and Mehl). NAKREM, Fig. 7j.

1986 *Panderodus simplex* (Branson and Mehl) s.f. NEHRING-LEFELD, Pl. 3, fig. 1; Pl. 5, figs. 11, 12.

1986 *Panderodus unicostatus* (Branson and Mehl). DZIK and DRYGANT, Figs. 1-3.

1987 *Panderodus unicostatus* (Branson and Mehl). SMITH, BRIGGS, and ALDRIDGE, Figs. 6.4, 6.5.

Remarks. McCracken and Barnes (1981, p. 86; 1982, p. 1477) expressed their doubt that *Panderodus unicostatus* can be distinguished from *P. gracilis* (Branson and Mehl). Because of limited material, however, they maintained recognition of the two species and, for a similar reason, this practice is followed herein.

A number of panderodid elements were recovered from the Undivided Devonian carbonates on Grinnell Peninsula. No detailed study of them was done, and they are referred to *Panderodus* cf. *P. unicostatus* because of their close similarity to that species (Pl. 17, fig. 23).

Occurrence. The Allen Bay and lower Cape Phillips formations at Strathcona Fiord (Section 1; the Cape Phillips occurrence, GSC loc. 83785, is represented by the serrated element). Previously reported *P. unicostatus* from the Cornwallis Group and Allen Bay(?) Formation on Hoved Island (Weyant, 1968, p. 24).

Panderodus cf. *P.* n. sp. A
of McCracken and Barnes, 1981

Plate 1, figure 31

(cf.) 1981 *Panderodus* n. sp. A s.f. McCRACKEN and BARNES, p. 87, Pl. 1, fig. 13.

Description. The slightly bowed unit has a long and erect cusp, and a "heel" that is about one third of the unit height. Its anterior edge is sharp and slightly offset inwardly, whereas the posterior edge is similarly sharp but is abruptly bent at about one third the unit height. Its inner face is nearly planar and smooth, except for extremely fine striae. The outer face is slightly convex, with a costa running close to, and parallel with, the posterior edge; near the base the costa is located in a deep groove.

In lateral view, the basal cavity is conical, extends slightly beyond the height of the "heel", and has its tip close to the anterior edge. In basal view, the cavity has a "dumbbell" shape, with a constriction at the site of the deep groove; that part below the constriction is subcircular, and above it, elongated. White matter is present in the cusp.

Remarks. This species is an arcuatiform element which, like *Panderodus* n. sp. A of McCracken and Barnes (1981), is characterized by an expanded base and almost heel-like posterior margin. It differs slightly from that species, however, in having a cusp that is more erect than proclined. There is no clear reentry of the posterior edge of the cusp, and consequently no distinct heel is observed.

Panderodus n. sp. A was recovered from Members 1 to 3 of the Ellis Bay Formation on Anticosti Island, in an interval assigned to Fauna 13 of the Gamachian Stage (McCracken and Barnes, 1981, Fig. 12).

The single specimen is from the lower Allen Bay Formation at Strathcona Fiord (Section 1), at GSC locality 83780, located 114 m above the base of the formation.

Genus *Belodina* Ethington, 1959

Type species. *Belodus compressus* Branson and Mehl (emend. Bergström and Sweet, 1966).

Remarks. The diagnosis of *Belodina* was emended by Sweet (1979, p. 8). Belodiniform elements were reassigned to several genera, including *Belodina, Pseudobelodina, Parabelodina,* and *Culumbodina.*

Belodina confluens Sweet

Plate 1, figures 8, 9

1979 *Belodina confluens* n. sp. SWEET, p. 59-60, Fig. 5(10, 17), Fig. 6(9).

1979 *Belodina compressa* (Branson and Mehl). ROSS, NOLAN, and HARRIS, Fig. 6(z).

1981 *Belodina confluens* Sweet. SWEET *in* Ziegler (ed.), p. 73-77, *Belodina* - Pl. 2, figs. 8-14.

1981 *Belodina compressa* (Branson and Mehl). NOWLAN and BARNES, p. 12, Pl. 8, figs. 1-4.

1981 *Belodina compressa* (Branson and Mehl). McCRACKEN and BARNES, p. 75, Pl. 3, figs. 10-12, 16-18.

1982 *Belodina compressa* (Branson and Mehl). LENZ and McCRACKEN, Pl. 2, figs. 3, 4, 7.

1986 *Belodina confluens* Sweet. YU and WANG, p. 101, Pl. 1, figs. 3, 14, 15; Pl. 2, figs. 6, 8, 12.

Remarks. In the present collection are five specimens of the grandiform element, the cusps of which are slightly compressed and are narrowly rounded apically. The compressiform element has a short radius of curvature and in this regard it is closer to its counterpart in *Belodina stonei* Sweet than to *B. confluens*. It lacks, however, the relatively high base of the former. The compressiform element also exhibits an anterior margin that is regularly curved throughout its length. The illustrated compressiform has a broken heel (Pl. 1, fig. 8). No eobelodiniform was recovered.

In terms of a Composite Standard Section of the North American Midcontinent Province, Sweet (1984) recorded the range of *Belodina confluens* from the base of the *confluens* to *robustus* zones (CSS 1025 to 1169) of late "Trentonian" (Shermanian) to Maysvillian age. On Anticosti Island, the species ranges up to Fauna 13 of Gamachian age (McCracken and Barnes, 1981).

Occurrence. The lower part of the Allen Bay Formation at Strathcona Fiord (Section 1); in the eastern Arctic Archipelago, previously reported from the Cornwallis Group and Allen Bay(?) Formation (Weyant, 1968, p. 36, 37), the upper Thumb Mountain, Irene Bay, and Allen Bay formations (Nowlan, 1976, p. 133, 134; Mirza, 1976, p. 79). It was also reported from the Bad Cache Rapids Formation on Melville Peninsula (Barnes, 1977, p. 105).

Belodina? sp.

Plate 1, figure 10

(?)1968 *Plegagnathus dartoni* (Stone and Furnish). KOHUT and SWEET, p. 1472, Pl. 186, figs. 9-11.

Remarks. A single acostate rastrate specimen from the Allen Bay Formation at Strathcona Fiord (Section 1) is questionably assigned to *Belodina*. It possesses a single large basal cavity, a furrow on the inner side, and nine denticles with an additional germ denticle at each end of this series. The radius of curvature is moderately short.

Kohut and Sweet (1968) illustrated a specimen from the Drakes Formation at Middletown, Kentucky, that bears some resemblance to the present form. The number of denticles (five) is significantly smaller, however. Its generic assignment is unclear (see Sweet, 1979, p. 67), although Nowlan and Barnes (1981, p. 12; see also addendum, p. 29) noted its similarity to specimens of *Belodina profunda* (Branson and Mehl) that bear five denticles, and which were recovered from the Vauréal Formation on Anticosti Island.

Genus *Plegagnathus* Ethington and Furnish, 1959

Type species. *Plegagnathus nelsoni* Ethington and Furnish, 1959.

Remarks. Recently Sweet (1979, p. 66) and Nowlan and Barnes (1981, p. 23) revised *Plegagnathus* to multielement status. Their reconstructions are basically similar, with the inclusion of the form-species "*Cordylodus*" *robustus* Ethington and Furnish.

Plegagnathus nelsoni Ethington and Furnish

Plate 1, figure 41

1959 *Plegagnathus nelsoni* n. sp. ETHINGTON and FURNISH, p. 544-545, Pl. 73, figs. 2, 3.

1979 *Plegagnathus nelsoni* Ethington and Furnish. SWEET, p. 67, Fig. 7(19, 26, 27, 32, 33) (includes synonymy to 1977).

1979 *Plegagnathus nelsoni* Ethington and Furnish. ROSS, NOLAN, and HARRIS, Fig. 6(q).

1981 *Plegagnathus dartoni* (Stone and Furnish). NOWLAN and BARNES, p. 23, Pl. 7, figs. 10, 11, 13-15.

1981 *Plegagnathus nelsoni* Ethington and Furnish s.f. McCRACKEN and BARNES, p. 89, Pl. 3, fig. 24.

Remarks. Sweet (1979, p. 66, 67) distinguished *Plegagnathus dartoni* (Stone and Furnish) from *P. nelsoni* by characters of the acostate rastrate elements that are bowed to the furrowed side, in their respective apparatuses. In such elements, the anterobasal corner is situated beneath the proximal third of the denticulated posterior process in *P. dartoni*, whereas in *P. nelsoni* it is beneath, or behind, the midpoint of the process. Also, the acostate elements of *P. dartoni* typically have more numerous and slender denticles than do homologous components of *P. nelsoni*. Sweet (1979, p. 67) cautioned, however, that the latter criterion be used with care in separating the two species.

The single plegagnathiform specimen in the present collection possesses the attributes of the positioning of the anterobasal corner and the denticulation characteristics of *Plegagnathus dartoni*. It is, however, bowed toward the unfurrowed side, so the critical distinguishing criterion noted above cannot be observed. Since all previous secondary identifications of *P. dartoni*, including those of Weyant (1968) from the Allen Bay(?) Formation on Hoved Island, and of Barnes (1974) from the Irene Bay Formation on Bathurst Island, have been reassigned to *P. nelsoni* by Sweet (1979, p. 66), the present specimen is similarly referred to that species.

In this study, *Plegagnathus nelsoni* was recovered from the Allen Bay Formation at Strathcona Fiord (Section 1). No other components of the apparatus were recovered.

Genus *Pseudobelodina* Sweet, 1979

Type species. *Belodina kirki* Stone and Furnish, 1959.

Pseudobelodina dispansa (Glenister)

Plate 1, figures 24, 30

1957 *Belodus dispansus* n. sp. GLENISTER, p. 729-730, Pl. 8, figs. 14, 15.

1959 *Belodina dispansa* (Glenister). STONE and FURNISH, p. 220-221, Pl. 31, fig. 11.

1979 *Pseudobelodina dispansa* (Glenister). SWEET, p. 68-69, Fig. 5(6, 18), Fig. 6(1, 6-8) (includes synonymy).

1979 *Belodina dispansa* (Glenister). ROSS, NOLAN, and HARRIS, Fig. 6(j).

1981 *Belodina dispansa* (Glenister). NOWLAN and BARNES, p. 12, Pl. 8, figs. 6, 7, 10, 11.

1981 *Belodina dispansa* (Glenister). McCRACKEN and BARNES, p. 75, Pl. 3, figs. 19-21.

1981 *Pseudobelodina dispansa* (Glenister). SWEET *in* Ziegler (ed.), p. 331, *Pseudobelodina* - Pl. 3, fig. 8.

1982 *Pseudobelodina dispansa* (Glenister). LENZ and McCRACKEN, Pl. 2, figs. 11, 14.

1986 *Pseudobelodina dispansa* (Glenister). YU and WANG, p. 103, Pl. 1, figs. 5, 8, 12, 16, 17.

Remarks. One of the specimens illustrated herein (Pl. 1, fig. 30; Sb or Sc element) exhibits two short, stubby, proclined denticles. The number and width of the denticles are more characteristic of *Pseudobelodina vulgaris vulgaris* Sweet, but in the latter, the denticles are more erect. Furthermore, the radius of curvature in the latter is shorter. A similar form was illustrated by Sweet, Thompson, and Satterfield (1975, Pl. 1, fig. 2; noted by Sweet, 1979, p. 69) from the Cape Limestone of eastern Missouri.

Sweet (1984) noted that in a Composite Standard Section of the North American Midcontinent Province, *Pseudobelodina dispansa* ranges from the *undatus* to *shatzeri* zones (CSS 986 to 1280), of "Trentonian" (Kirfieldian) to Richmondian age. On Anticosti Island, the species ranges as high as Fauna 13 of Gamachian age (McCracken and Barnes, 1981).

Occurrence. The Allen Bay Formation at Strathcona Fiord (Section 1); in the eastern Arctic Islands, previously reported from the Allen Bay(?) Formation (Weyant, 1968, p. 24, 37), and the upper Thumb Mountain, Irene Bay, and Allen Bay formations (Nowlan, 1976, p. 135; Mirza, 1976, p. 80). Elsewhere in the Canadian Arctic it was reported from the uppermost Thumb Mountain Formation on Bathurst Island (Barnes, 1974, p. 232), and on Melville Peninsula from the Bad Cache Rapids Formation (Barnes, 1977, p. 105).

Pseudobelodina vulgaris vulgaris Sweet

Plate 1, figure 35

1959 *Belodina profunda* (Branson and Mehl). STONE and FURNISH, p. 221, Pl. 31, figs. 16, 17.

1979 *Pseudobelodina vulgaris vulgaris* n. sp., n. subsp. SWEET, p. 71, Fig. 5(2-4) (includes synonymy to 1977).

1980 *Belodina profunda* (Branson and Mehl). NOWLAN *in* Bolton and Nowlan, p. 18, Pl. 8, figs. 8, 9.

1981 *Pseudobelodina vulgaris vulgaris* Sweet. SWEET *in* Ziegler (ed.), p. 351-352, *Pseudobelodina* - Pl. 2, figs. 2, 9, 10.

1981 *Belodina profunda* (Branson and Mehl). NOWLAN and BARNES, p. 12, Pl. 7, figs. 1-9.

1981 *Belodina profunda* (Branson and Mehl). McCRACKEN and BARNES, p. 75, Pl. 3, figs. 13-15.

1982 *Pseudobelodina vulgaris vulgaris* Sweet. LENZ and McCRACKEN, Pl. 2, fig. 19.

Remarks. Sweet (1979, p. 71) erected a new species, *Pseudobelodina vulgaris*, to accommodate that form which had been placed previously in "*Belodina*" *profunda* by several authors. "*Belodina*" *profunda* is now included in the apparatus of *P. inclinata* (Branson and Mehl; see Sweet, 1979, p. 69).

In a Composite Standard Section of the North American Midcontinent Province, the range of *P. vulgaris vulgaris* was demonstrated by Sweet (1979, 1984) to extend from late Edenian (lower *velicuspis* Zone, CSS 1108) to Richmondian [Fauna 12 of Sweet, Ethington and Barnes (1971)]. On Anticosti Island, the taxon ranges as high as Fauna 13 of Gamachian age (McCracken and Barnes, 1981; McCracken and Nowlan, 1988).

Occurrence. The Allen Bay Formation at Strathcona Fiord (Section 1), and a talus sample from near the top of the underlying Irene Bay Formation, in the same section, (GSC loc. 83777; Barnes, 1974, p. 233). In the eastern Arctic Islands, previously reported from the Allen Bay(?) Formation (Weyant, 1968, p. 24, 38, 39), and the uppermost Thumb Mountain, Irene Bay, and Allen Bay formations (Nowlan, 1976, p. 137; Mirza, 1976, p. 81). It was also reported from the Irene Bay Formation on northern Bathurst Island (Barnes, 1974, p. 233), and the Bad Cache Rapids Formation on Melville Peninsula (Barnes, 1977, p. 105).

Family BELODELLIDAE Khodalevich and Tschernich, 1973

Genus *Belodella* Ethington, 1959

Type species. *Belodus devonicus* Stauffer, 1940.

Remarks. Klapper and Barrick (1983, p. 1223) recently gave a thorough diagnosis of the genus. The *Belodella* apparatus may be quadri- or quinquimembrate, and in the present study, both types were recovered.

Belodella cf. *B. resima* (Philip)

Plate 16, figures 18-22, 25

(cf.) 1965 *Belodus resimus* n. sp. PHILIP, p. 98-99, Pl. 8, figs. 15-17, 19; Textfigs. 2e, f.

1981a *Belodella* sp. UYENO, p. 48, Pl. 10, figs. 13, 15.

Description. M element. The unit has a slightly asymmetrical, biconvex cross-section, with sharp anterior and posterior keels except at the extreme base. It is uniformly tapered from the base, gently recurved, and very slightly curved inward. Lateral faces are smooth; its posterior keel is adenticulate. The base is broadly expanded.

S elements. The Sa element has a symmetrical, triangular cross-section, and is slightly curved inward distally; its anterior face is wide at the base, gradually narrowing to the tip. The Sa-Sb transition has a similar symmetrical, triangular cross-section, but the unit is completely straight; its anterior face is much narrower than the Sa, and is uniformly thin throughout. The Sb element has an asymmetrical triangular cross-section only at the base, the narrow anterior face tapering to a keel a short distance above the base; the unit is markedly incurved distally. The Sc element has an asymmetrical lenticular cross-section, and the entire unit is twisted outwardly and the tip curved inwardly. All S elements have extremely fine denticulation on their posterior keels and smooth lateral faces. They are reclined and uniformly tapered from the broadly expanded base.

Remarks. The above reconstruction is based on the model proposed by Barrick (1977, p. 50). *Belodella* cf. *B. resima* differs from *B. silurica* Barrick principally in its broadly expanded base. It also appears to be younger, having been found in the probable *hesperius* Zone at the top of the Devon Island Formation at its type section (Section 3C).

Belodella sp. A

Plate 19, figures 15, 18-22

Description. M? element. The unit has an asymmetrical, almost right-angled triangular cross-section, with sharp posterior and anterolateral keels that nearly reach the base. The posterior keel is adenticulate. It is uniformly tapered from the base, reclined to gently recurved, and very slightly curved inward. Lateral and anterior faces are smooth and flat to gently convex. The base is broadly expanded.

S elements. The Sd element has a slightly asymmetrical, biconvex cross-section, and distinct anterior and posterior keels. The posterior keel is directed inward. The denticulation on the posterior keel is erect, extremely minute and sparse. The unit is gently tapering and the cusp is erect. The Sa element has a slightly asymmetrical, isosceles triangular cross-section with sharp and slightly protruding inner anterolateral and posterior keels; the outer anterolateral keel is sharp but less distinct. The posterior keel bears minute, erect denticles. The erect cusp is mounted on a base that is only narrowly expanded. Its anterior and outer lateral faces are flat to gently convex, whereas the inner lateral face is more convex. The Sb element is similar to the Sa, but its anterior face is considerably narrower, and all three faces are flat. The posterior and inner lateral keels are distinct sharp ridges, whereas the outer lateral keel has a rounded edge. The denticles on the posterior keel are minute, closely spaced, and erect. The cusp is erect to proclined and is mounted on a moderately expanded base. The Sc element is characterized by a flat inner lateral face and a slightly convex outer lateral face, resulting in a cross-section that is a thin, planar-convex lens shape. The posterior and inwardly directed anterior keels are sharp. The posterior keel bears numerous, closely spaced, acicular denticles that are parallel with the tip of the cusp. The proclined cusp is mounted on a narrowly expanded base.

Remarks. Belodella sp. A differs from *B.* cf. *B. resima* (Philip) in its M? element, which has a triangular cross-section, and in the presence of an Sd element. The present species is from the *kindlei* Zone, whereas *B.* cf. *B. resima* occurs in the probable *hesperius* Zone in the Devon Island Formation.

Belodella sp. A was recovered from an unnamed formation on Crescent Island (GSC loc. C-33621).

Belodella sp. B

Plate 5, figure 13

Remarks. Belodella sp. B is represented by two specimens, both recovered from the upper Blue Fiord Formation at Strathcona Fiord (Section 1), at 450 m above the base of the formation (GSC loc. 83808). Anterior of the prominent cusp is a series of irregularly sized, minute denticles, with a wide gap between the posteriormost denticle in this series and the cusp. The unit is essentially symmetrical, except posteriorly where the cusp is bent inward. The species may possibly have affinity with *Belodella asiaticus* (Moskalenko).

Genus *Coelocerodontus* Ethington, 1959

Type species. *Coelocerodontus trigonius* Ethington, 1959.

Coelocerodontus trigonius Ethington

Plate 1, figures 11, 12, 33, 34

1959 *Coelocerodontus trigonius* n. sp. ETHINGTON, p. 273, Pl. 39, fig. 14.

1959 *Coelocerodontus tetragonius* n. sp. ETHINGTON, p. 273, Pl. 39, fig. 15.

1966 *Coelocerodontus trigonius* Ethington. WEBERS, p. 25, Pl. 2, figs. 12-14.

1968 *Coelocerodontus trigonius* Ethington. WEYANT, p. 41, Pl. 6, figs. 3, 5.

1968 *Coelocerodontus tetragonius* Ethington. WEYANT, p. 41, Pl. 6, fig. 4.

1979 *Coelocerodontus trigonius* Ethington. ROSS, NOLAN, and HARRIS, Fig. 6(t).

Remarks. Webers (1966, p. 25) revised the species to multielement status, and included in it "*Coelocerodontus*" *trigonius* and "*C.*" *tetragonius*. The trigonid element may have lateral faces that are smooth (Pl. 11, figs. 12, 34) or costate (Pl. 11, fig. 11; see also Webers, 1966, Pl. 2, fig. 13a; Weyant, 1968, Pl. 6, fig. 5).

In terms of a Composite Standard Section of the North American Midcontinent Province, Sweet (1984) noted that *Coelocerodontus trigonius* ranges from the *tenuis* to *velicuspis* zones (CSS 1015 to 1126), of "Trentonian" (Shermanian) to Edenian age.

Occurrence. The Allen Bay Formation at Strathcona Fiord (Section 1; at GSC locality 83778, only the trigonid elements were found, whereas both the trigonid and tetragonid elements were present at GSC locality 83779); in the Arctic Islands, previously reported from the Allen Bay(?) Formation on Hoved Island (Weyant, 1968), and the upper part of the Thumb Mountain and Irene Bay formations at Hoved Island and Svarte Fiord, southwestern Ellesmere Island (Nowlan, 1976, p. 142, Tables 5, 6). Also present in an undescribed collection from the basal Allen Bay Formation, located 17 m above the base of the formation, at Lost River in northern Boothia Peninsula (GSC loc. C-60690). There, it is associated with *Maclurites* sp. and a nautiloid, in what may be an Arctic Ordovician Fauna (Miall and Kerr, 1980, p. 29).

Genus *Walliserodus* Serpagli, 1967

Type species. *Paltodus debolti* Rexroad, 1967.

Walliserodus cf. *W. curvatus* (Branson and Branson)

Plate 1, figures 15, 22, 38-40;
Plate 12, figure 3

(cf.) 1981 *Walliserodus* cf. *W. curvatus* (Branson and Branson). NOWLAN and BARNES, p. 24, 25, Pl. 8, figs. 17-24.

(cf.) 1981 *Walliserodus* cf. *W. curvatus* (Branson and Branson). McCRACKEN and BARNES, p. 91, Pl. 1, figs. 22-25.

Remarks. Elements of this species were recovered from the Allen Bay Formation at Strathcona Fiord (Section 1). Only the M elements are present at GSC localities 83778 and 83780, located 52 m and 114 m, respectively, above the base of the formation. These specimens are similar to the corresponding element from the Vauréal and Ellis Bay formations on Anticosti Island, described by Nowlan and Barnes (1981) and McCracken and Barnes (1981), in having acostate lateral faces. On the basis of this single element alone, however, it is difficult to determine whether the Allen Bay species is conspecific with that from Anticosti Island.

Higher in the same section, at 213 m above the base of the Allen Bay Formation (GSC loc. 83781), three elements are present that are assignable to M, Sc, and Sa. The M element differs slightly from the stratigraphically lower ones in exhibiting a costa on the outer face. It differs, too, from "*Acodus*" *unicostatus* Branson and Branson, the M element of *Walliserodus curvatus*, which has a lateral costa (see Rexroad, 1967, Fig. 4). The Sa element is similar to the Anticosti Island specimens, in having an anterior face that is flat rather than convex (Nowlan and Barnes, 1981, p. 25). The Sc element ("*Acodus*" *curvatus* Branson and Branson) bears a costa on the inner lateral face, and this feature suggests that the species to which it belongs is probably closer to *W. curvatus* than to *W. sancticlairi* Cooper (see Cooper, 1976, p. 214, 215; Barrick, 1977, p. 59).

M elements (Pl. 12, fig. 10), also with a costa on the outer lateral face, were recovered from the subsurface Allen Bay Formation in the Panarctic ARCO et al. Blue Fiord E-46 well on Bjorne Peninsula (Section 2C; see also Mayr et al., 1978). They are similar to that reported above from the Allen Bay Formation at GSC locality 83781.

The species was also recovered from the lower Cape Phillips Formation in subsurface Section 2B.

Superfamily DISTACODONTACEA Bassler, 1925

Family DREPANOISTODONTIDAE
Fåhraeus and Nowlan, 1978

Genus *Drepanoistodus* Lindström, 1971

Type species. *Oistodus forceps* Lindström, 1955.

Remarks. Fåhraeus and Hunter (1986) demonstrated that the apparatus of *Drepanoistodus* has four curvature-transition series, and that three of these series include a characteristic geniculate, oistodontiform element. This reconstruction could not be replicated here on the basis of the present limited material.

Drepanoistodus suberectus (Branson and Mehl)

Plate 1, figures 13, 16-18

1933 *Oistodus suberectus* n. sp. BRANSON and MEHL, p. 111, Pl. 9, fig. 7.

1979 *Drepanoistodus suberectus* (Branson and Mehl). SWEET, Fig. 7(21, 23, 30).

1979 *Drepanoistodus suberectus* (Branson and Mehl). ROSS, NOLAN, and HARRIS, Fig. 6(v).

1980 *Drepanoistodus suberectus* (Branson and Mehl). ORCHARD, p. 20, Pl. 5, figs. 10, 11, 26, 27, 31.

1981 *Drepanoistodus suberectus* (Branson and Mehl). NOWLAN and BARNES, p. 12-13, Pl. 4, figs. 17-19 (includes synonymy to 1978).

1981 *Drepanoistodus suberectus* (Branson and Mehl). McCRACKEN and BARNES, p. 77, Pl. 3, figs. 1-6.

1982 *Drepanoistodus suberectus* (Branson and Mehl). LENZ and McCRACKEN, Pl. 2, fig. 22.

1983 *Drepanoistodus suberectus* (Branson and Mehl). DZIK, Textfig. 4.10, 11.

1985 *Drepanoistodus suberectus* (Branson and Mehl). SAVAGE and BASSETT, p. 708, Pl. 81, fig. 8; Pl. 82, fig. 38.

1987 *Drepanoistodus suberectus* (Branson and Mehl). BAUER, p. 16, 17, Pl. 1, figs. 15-17, 22.

Remarks. Sweet (1984) noted that, in terms of a Composite Standard Section of the North American Midcontinent Province, *Drepanoistodus suberectus* ranges from the base of the *friendsvillensis* to *shatzeri* zones (CSS 680 to 1288), of Chazyan to Richmondian age. McCracken and Barnes (1981) observed the occurrence of this species in Fauna 13 of Gamachian age on Anticosti Island.

Occurrence. The lower Allen Bay Formation at Strathcona Fiord (Section 1); in the eastern Arctic Islands, previously reported from the upper Cornwallis Group and Allen Bay(?) Formation (Weyant, 1968, p. 24), and the Bay Fiord, Thumb Mountain, Irene Bay, and Allen Bay formations (Nowlan, 1976, p. 202, 203; Mirza, 1976, p. 93-94); also the Bad Cache Rapids Formation on Melville Peninsula (Barnes, 1977, p. 106).

Genus *Paroistodus* Lindström, 1971

Type species. *Oistodus parallelus* Pander, 1856.

Paroistodus? *mutatus* (Branson and Mehl)

Plate 1, figures 25, 26

1933 *Belodus*? *mutatus* n. sp. BRANSON and MEHL, p. 126, Pl. 10, fig. 17.

1981 *Paroistodus*? *mutatus* (Branson and Mehl). NOWLAN and BARNES, p. 20, Pl. 1, figs. 15-24 (includes synonymy to 1978).

1981 *Paroistodus*? *mutatus* (Branson and Mehl). McCRACKEN and BARNES, p. 88, Pl. 3, figs. 7-9.

1982 *Paroistodus*? *mutatus* (Branson and Mehl). LENZ and McCRACKEN, Pl. 2, figs. 9, 10, 13, 18.

1986 *Paroistodus*? *mutatus* Nowlan and Barnes. YU and WANG, p. 102, 103, Pl. 1, fig. 7.

Remarks. Of the three morphotypes assigned to this species by Nowlan and Barnes (1981, p. 20), only the first and third are available in the present collection: "*Acodus*" *mutatus* (Branson and Mehl) and "*Oistodus*" *venustus* Stauffer. At GSC locality 83778, the oistodiform: 'drepanodiform' ratio is 23:2, and at GSC locality 83779, it is 3:0. Both acodiform elements have a costa on each side.

Occurrence. The Allen Bay Formation at Strathcona Fiord (Section 1); in the eastern Arctic Islands, previously reported from the Allen Bay(?) Formation (Weyant, 1968, Fig. 2, p. 24), and the upper Thumb Mountain, Irene Bay, Allen Bay, and Read Bay formations (Nowlan, 1976, p. 325, 326; Mirza, 1976, p. 131, 132).

Paroistodus? sp.

Plate 1, figure 21

Remarks. A single specimen was recovered that differs from the oistodiform element of *Paroistodus*? *mutatus* in that its base is only about half the length of the cusp. The basal margin is also only slightly sigmoidal, whereas in *P.*? *mutatus* there is a marked upturn in the anterior quarter. The specimen was recovered from the Allen Bay Formation at Strathcona Fiord (Section 1) at GSC locality 83778, at 52 m above the base of the formation.

Weyant (1968, p. 53, 54, Pl. 2, fig. 10) illustrated an oistodiform element from the Allen Bay(?) Formation, 90 m above the base of the formation, on Hoved Island. The basal part of the anterior margin of its cusp, however, is rounded, so that the anterobasal corner is of an obtuse angle.

The specimen is questionably assigned to *Paroistodus*? until other constituent elements are found. G.S. Nowlan (pers. comm., 1988) has kindly suggested that this may be an oistodiform element of *Besselodus*.

Superfamily HIBBARDELLACEA Müller, 1956

Family HIBBARDELLIDAE Müller, 1956

Genus *Oulodus* Branson and Mehl, 1933

Type species. *Oulodus mediocris* Branson and Mehl, 1933 [=junior synonym of *Oulodus serratus* (Stauffer, 1930)].

Oulodus? *fluegeli fluegeli* (Walliser)

Plate 2, figures 19-22, 25, 29-33

1964 *Lonchodina fluegeli* n. sp. WALLISER, p. 44, Pl. 6, fig. 4; Pl. 32, figs. 22-24.

1979 *Oulodus*? *fluegeli* (Walliser). ALDRIDGE, p. 14, 15, Pl. 2, figs. 6-11 (includes synonymy).

1983 *Oulodus*? *fluegeli* (Walliser). MABILLARD and ALDRIDGE, Pl. 2, figs. 15, 16.

1984 *Oulodus*? *fluegeli* (Walliser). ALDRIDGE and JEPPSSON, Textfig. 3g-l.

1985 *Oulodus*? *fluegeli* (Walliser). ALDRIDGE, p. 80, Pl. 3.1, figs. 18-23.

1985 *Oulodus*? *fluegeli* (Walliser). ORCHARD *in* Norford and Orchard, p. 11, Pl. 1, figs. 2, 9, 10, 12-14, 16-18, 20, 21; Pl. 2, figs. 8, 9, 12, 15 [? = *Oulodus fluegeli* n. subsp. A of Uyeno and Barnes, 1983], 16, 23, 24.

1986 *Oulodus*? *fluegeli* (Walliser). NAKREM, Figs. 7b, e, h, i.

Remarks. Elements of *Oulodus*? *fluegeli fluegeli* were previously recovered from Peary Land, eastern North Greenland, and were lucidly described by Aldridge (1979). The Allen Bay specimens differ only slightly from them, in that the Sb (greilingiform) element has anterolateral processes that are approximately equal in length, whereas the Greenland form has one longer than the other. This difference, however, is considered herein to be within intraspecific variation. A very similar, if not identical, reconstruction was presented by Mirza (1976, p. 116-119), who assigned it to the genus *Ozarkodina*. It was reported from the Cape Phillips Formation on Hoved Island. Orchard (*in* Norford and Orchard, 1985) included in his reconstruction hindeodelliform elements similar to that from the present collections.

The apparatus reconstructed by Savage (1985, p. 718, 719, Fig. 10) includes an M element different from "*Neoprioniodus*" *planus* Walliser. As noted by Aldridge (1979, p. 15; 1985, p. 80), and Uyeno and Barnes (1983, p. 19), the assignment of this taxon to *Oulodus* is questionable because of its denticulation pattern. The generic assignment is not contingent on the nature of the Sa element, as suggested by Savage (op. cit.).

One Pa element from the Road River Formation in the subsurface of southeastern Yukon Territory, illustrated by Orchard (*in* Norford and Orchard, 1985, Pl. 2, fig. 15), has lateral processes of different lengths and a small basal posterior extension of the cusp. Elements similar to it from Anticosti Island were assigned to *Oulodus*? *fluegeli* subsp. A by Uyeno and Barnes (1983, p. 18, 19).

Oulodus fluegeli subsp. A, described from the Jupiter and Chicotte formations on Anticosti Island by Uyeno and Barnes (1983, p. 18, 19), differs primarily from the nominate subspecies in possessing a diadelognathiform Pa element.

Occurrence. The upper Allen Bay Formation at Strathcona Fiord (Section 1), at 291 m above the base of the formation (GSC loc. 83782; differs mainly from *O.*? sp. A, also from the same locality, in its more delicate construction); also found in the lower Cape Phillips Formation at Section 2, and the Allen Bay Formation and the lowest part of the Allen Bay–Read Bay carbonates (undivided) at Section 2C.

Oulodus? *kentuckyensis* (Branson and Branson)

Plate 2, figures 1-3, 7-10

1947 *Ligonodina kentuckyensis* n. sp. BRANSON and BRANSON, p. 555, Pl. 82, figs. 28, 35.

1981 *Oulodus*? *kentuckyensis* (Branson and Branson). McCRACKEN and BARNES, p. 80, 81, Pl. 6, figs. 1-20 (includes synonymy to 1978).

1981 *Oulodus*? *kentuckyensis* (Branson and Branson). NOWLAN, Pl. 4, figs. 15, 19.

1981 *Oulodus*? *kentuckyensis* (Branson and Branson). FÅHRAEUS and BARNES, Pl. 1, figs. 5, 6.

1984 *Oulodus kentuckyensis* (Branson and Branson). IDRIS, Pl. 1, figs. 14, 15.

Remarks. The tentative assignment of this species to the genus *Oulodus* was discussed by McCracken and Barnes (1981, p. 78-79). The P elements in the present collection are identical with "*Lonchodina*"? sp. and "*L.*" *walliseri* Ziegler, both described from the Brassfield Limestone in the Cincinnati area by Rexroad (1967, p. 37, 38, Pl. 3, figs. 5, 6).

McCracken and Barnes (1981) considered parts of *Oulodus* spp. A and B of Cooper (1975, p. 997, 998), described from the Brassfield Limestone of southern Ohio, to be synonymous with *O.*? *kentuckyensis*. They reported this species from Member 6 of the Ellis Bay Formation on Anticosti Island, the first occurrence of which coincides with the base of the *Oulodus*? *nathani* Zone, and with the proposed Ordovician-Silurian boundary. On Anticosti Island, it continues through Becsie and Gun River formations (Fåhraeus and Barnes, 1981). Nowlan (1981, p. 269) reported it from the upper part of the Clemville Formation at Chaleurs Bay, Quebec.

Occurrence. The Allen Bay Formation at Strathcona Fiord (Section 1), at 213 m above the base of the formation (GSC loc. 83781).

Oulodus? sp. A

Plate 2, figures 16-18, 23, 24

Remarks. A small collection, consisting of eight specimens, is tentatively grouped together as an apparatus, and assigned to *Oulodus*? sp. A. It is from the Allen Bay Formation at Strathcona Fiord (Section 1), 291 m above the base of the formation (GSC loc. 83782).

The Pa? element is detortiform with a denticulated posterior process extending from the base of the cusp. Its lateral processes bear denticles that are confluent to midheight. A basal attachment(?) material obscures the lower surface.

The Pb element is slightly arched ozarkodiniform. The prominent cusp is flanked by lateral processes bearing relatively small denticles that are free to their bases. The cavity, deepest under the cusp, is extended as grooves beneath the lateral processes.

The M, Sc, and Sa elements have prominent cusps with denticles that are free to their bases. The outer lateral process in the M element is twisted anteriorly. The hibbardellan Sa element has an inverted basal cavity under its lateral processes.

From the same locality another *Oulodus*? apparatus, *O.*? *fluegeli fluegeli* (Walliser), was recovered. The two taxa are quite distinct from each other. Both are questionably assigned to *Oulodus* since their denticulation pattern is not characteristic, that is, the denticles are not peg-like with wide, U-shaped intervening spaces (see Sweet and Schönlaub, 1975, p. 45). Constituent elements of *O.*? sp. A are more robust in their construction than those of *O.*? *fluegeli fluegeli*.

Oulodus? sp. B

Plate 20, figure 16

Remarks. A single specimen, of probable Sa or Sb element, was recovered from an unnamed formation on Hyde Parker Island (GSC loc. C-33667). It is a peculiar form with a large, prominent cusp and lateral processes that bear one or two small denticles on their distal margins. All denticles have a lenticular cross-section. In these respects, it superficially resembles *Oulodus* sp. 8 described herein, but differs in the flatter faces on the processes and in the absence of minute, stubby denticles between the cusp and the small denticles. It is associated with *Ancyrodelloides delta* (Klapper and Murphy) and *Erika* cf. *E. divarica* Murphy and Matti.

Oulodus sp. 3 of Uyeno (1981a)

Plate 15, figures 29, 30

1981a *Oulodus* sp. 3. Uyeno, p. 47, Pl. 10, figs. 1-3.

Remarks. An Sa and a possible Sc element of *Oulodus* sp. 3 of Uyeno (1981a) were recovered from the Douro Formation at Sutherland River (Section 3B; GSC loc. 83668). It was previously reported from the lower part of the Peel Sound Formation on Prince of Wales Island (GSC loc. C-63592). As noted earlier, components of this apparatus are characterized by a sharp, ridge-like protrusion at the junction of the inverted basal cavity and lateral faces. The prominent cusp is flanked by one or two much smaller denticles, all of which have a circular cross-section. The Sc? element is ligonodinid with a similar prominent cusp. Although it has an oval cross-section, its lateral and posterolateral keels are in line with the basal lateral and posterior processes. The lower surface exhibits an inverted basal cavity with a median narrow furrow. The Sc assignment is questioned since it may belong to another apparatus, similar to *Oulodus* sp. 6 of Uyeno (1981a).

Oulodus sp. 5 of Uyeno (1981a)

Plate 12, figures 11, 12

1981a *Oulodus* sp. 5. Uyeno, p. 47, Pl. 10, figs. 27-30.

Remarks. The Pa element of *Oulodus* sp. 5 is gently digyrate with an inwardly bent cusp. The Pa and Pb elements each have a prominent cusp flanked by processes bearing denticles of similar shape as the cusp, but considerably smaller; all denticles have lenticular cross-section. The basal pit is located beneath the cusp, with inverted basal cavity under the processes.

Occurrence. The Douro Formation at Sutherland River (Section 3A; GSC loc. 83675); reported earlier from the upper part of that formation at Boothia Peninsula (GSC loc. C-26655; Uyeno, 1981a).

Oulodus sp. 8

Plate 12, figures 26, 33; Plate 15, figures 19-22

Description. Elements of *Oulodus* sp. 8 are characterized by a prominent cusp and one or two large denticles near the extremities of the processes. In between the cusp and these large denticles are minute, stubby denticles, usually increasing in size distally, and linearly arranged along a slight medial depression. The denticles have circular or oval cross-sections. The lateral faces of the processes are convex, being widest at mid-height. The lower margin flares over the basal cavity and tapers broadly to the extremities of the processes. The white matter is restricted to the denticles.

The cusp on the Pa element is strongly inclined posteriorly. The posterior process, which is about half as long as its anterior counterpart, is slightly bent anteriorly, so that in lower view, the basal outline is slightly sinuous. The Pb element differs slightly from the Pa in its straight basal outline. The M element, not illustrated, is synprioniodinan with a denticulation pattern similar to that of other constituents of the apparatus.

The Sb element is a peculiar angulodontan form with cusp slightly inclined posteriorly. It is closer in its gross morphology to its counterpart in an *Ozarkodina* apparatus than to that of *Oulodus*.

Elements of *Oulodus tenuistriatus* (Pickett) share some features in common with those of the present species. These features include the characteristic denticulation pattern and the convex lateral faces on the processes. The former differs primarily in its diagnostic fine ridges on the cusp and large denticles, features that are completely lacking in the present species.

Occurrence. The Sutherland River Formation at Sections 3A and 3C, and the underlying Devon Island Formation near Section 3C (GSC loc. C-22970).

Oulodus sp. 9

Plate 15, figures 23-26

Remarks. An *Oulodus* apparatus, represented by four elements, was recovered from the Douro Formation at Sutherland River (Section 3B; GSC loc. 83667). All elements are robust with discrete denticles that have convex faces and keeled edges. White matter occurs throughout except for the basal margins. The basal cavity is located beneath the cusp with grooves extending to about mid-length of the processes. The Pa element is gently digyrate. The large cusp in the M element is inwardly bent and twisted laterally so that the anterior keel is pointed inwardly. The Sa element has a similar prominent cusp but is only moderately bent inwardly. In the Sb? element the cusp is only slightly twisted laterally, and only moderately bent inwardly.

Another *Oulodus* apparatus, referred to *O.* sp. 5 by Uyeno (1981a, p. 47, Pl. 10, figs. 27-30), was recovered from the Douro Formation on Boothia Peninsula. That apparatus is similar to the one described here but differs principally in having denticles with a more circular cross-section. Its Pa element also displays a more prominent cusp and a lesser number of denticles on its anterior and posterior processes. These slight differences may not warrant their separation, and perhaps with additional information and material, the two may be considered synonymous.

Oulodus sp. 10

Plate 12, figures 1, 2, 4

Remarks. Three specimens, assignable to the Pa, M?, and Sc elements of an indeterminate species of *Oulodus*, were recovered from the Allen Bay Formation in the subsurface on Bjorne Peninsula (Section 2C; GSC loc. C-67898/6000-6100). Occurring in the same sample are elements of *Oulodus*? *fluegeli fluegeli* (Walliser). The Pa element of *O.* sp. differs from its counterpart of the latter taxon in possessing only one lateral process that is markedly bent anteriorly; the other is straight and flat, and lies in a plane in front of the cusp. The wide basal cavity lies beneath the cusp with narrow grooves extending from it under the lateral processes. The M? element has similar dentition and a basal cavity like that in the Pa, but differs, however, in one of its lateral processes being considerably shorter than the other. The Sc element is ligonodiniform. All constituent elements exhibit a denticulation pattern characteristic of the genus.

Superfamily POLYGNATHACEA Bassler, 1925

Family KOCKELELLIDAE Klapper, 1981b

Genus *Kockelella* Walliser, 1957

Type species. *Kockelella variabilis* Walliser, 1957.

Kockelella variabilis Walliser

Plate 4, figure 32

1957 *Kockelella variabilis* n. sp. WALLISER, p. 35, 36, Pl. 1, figs. 3-10.

1976 *Kockelella variabilis* Walliser. BARRICK and KLAPPER, p. 77, 78, Pl. 3, figs. 12-17.

1980 *Kockelella variabilis* Walliser. UYENO *in* Mayr et al., Pl. 32.1, fig. 37.

1980 *Kockelella variabilis* Walliser. ALDRIDGE, Figs. 8-16.

1980 *Kockelella variabilis* Walliser. SCHÖNLAUB, Pl. 6, fig. 1.

1981a *Kockelella variabilis* Walliser. UYENO, p. 46, Pl. 8, figs. 9-16.

1981 *Kockelella variabilis* Walliser. KLAPPER *in* Ziegler (ed.), p. 179-183, *Kockelella* - Pl. 3, figs. 1-3 (includes synonymy).

1983a *Kockelella variabilis* Walliser. WANG and ZIEGLER, Fig. 3.7.

1983 *Kockelella variabilis* Walliser. BARRICK, Fig. 18J.

1985 *Kockelella variabilis* Walliser. YU, p. 23, 24, Pl. 2, fig. 8; Pl. 3, figs. 16, 17.

1985 *Kockelella variabilis* Walliser. ALDRIDGE, p. 88, Pl. 3.4, figs. 4-9.

Occurrence. Two fragmentary Pa elements from the lower Cape Phillips Formation at Strathcona Fiord (Section 1), at 78 m above the base of the formation (GSC loc. 83785); no other constituent elements were found.

In the Arctic Archipelago, previously reported from the upper Douro Formation at southwestern Ellesmere Island, and the lower Barlow Inlet Formation at Goodsir Creek on eastern Cornwallis Island (Uyeno, 1981a, p. 51, 54). It was also reported from the Barlow Inlet Formation in the subsurface of Russell Island (Uyeno *in* Mayr et al., 1980) and in the Cape Storm Formation at Vendom Fiord on southwestern Ellesmere Island (Mirza, 1976, p. 99, 100).

Kockelella walliseri (Helfrich)

Plate 3, figures 15-17, 22-25

1964 *Spathognathodus* n. sp. WALLISER, p. 88, Pl. 22, fig. 8.

1975 *Spathognathodus walliseri* n. sp. HELFRICH, p. 24, 26, Appendix 1-69 to 1-71, Pl. 1, figs. 1, 9, 10, 19, 21.

1976 *Kockelella walliseri* (Helfrich). BARRICK and KLAPPER, p. 78, Pl. 2, figs. 24, 25.

1980 *Kockelella walliseri* (Helfrich). HELFRICH, Pl. 2, figs. 15, 16.

1981 *Kockelella walliseri* (Helfrich). KLAPPER *in* Ziegler (ed.), p. 187-189, *Kockelella*–Pl. 1, figs. 4, 5 (includes synonymy).

1981 *Kockelella walliseri* (Helfrich). ALDRIDGE, DORNING, and SIVETER, Pl. 2.1, fig. 9.

1983 *Kockelella walliseri* (Helfrich). BARRICK, Fig. 18P.

1985 *Kockelella walliseri* (Helfrich). ALDRIDGE, p. 87, Pl. 3.3, fig. 17.

Remarks. In the same collection as two specimens of the Pa element of *Kockelella walliseri* are forms that may belong to the same apparatus. These specimens were recovered from the Cape Phillips Formation at Strathcona Fiord (Section 1), at 52 m above the base of the formation (GSC loc. 83783). The Pa element has been abundantly and clearly described, and needs no further elaboration here.

The element tentatively assigned to the Pb position is more like a highly arched ozarkodinan element than an ortuform element, and in this respect differs from Pb elements previously assigned to most other species of *Kockelella* (e.g., *K. stauros* Barrick and Klapper, 1976). The Pb element of *K. ranuliformis* appears to be morphologically closest to it (see Barrick and Klapper, 1976, Pl. 2, fig. 7). It has a robust blade that is only slightly curved inward, with a prominent, biconvex cusp. The anterior process bears six or seven closely spaced, reclined, compressed denticles, which are fused at the base. The denticulation pattern on the posterior process is similar to that on the anterior one, but denticles are smaller.

The M element is neoprioniodontan with a prominent, biconvex cusp that is slightly twisted. The long posterior process bears six erect, discrete denticles. The basal cavity has a flaring margin on the inner side, and tapers under the posterior process.

The Sc element is a "modified ligonodinan" (see Barrick and Klapper, 1976, p. 73). The tall, prominent cusp is biconvex, twisted, and slightly reclined. The discrete denticles on the posterior process are similarly reclined. The anterolateral process extends downward and thence may extend slightly posteriorly or anteriorly from the cusp; it bears three or four discrete denticles that are only slightly compressed.

The Sb element is only moderately arched, but is strongly curved inward. The prominent biconvex cusp is slightly twisted, inclined posteriorly and tilted inwardly. The two processes are of about equal length, and each has four discrete, laterally compressed denticles. The denticles on the anterior process tend to be erect, whereas those on the posterior process are reclined.

No Sa element was recovered.

Genus *Ancoradella* Walliser, 1964

Type species. *Ancoradella ploeckensis* Walliser, 1964.

Ancoradella ploeckensis Walliser

Plate 15, figures 31

1964 *Ancoradella ploeckensis* n. sp. WALLISER, p. 28, 29, Pl. 16, figs. 16-21.

1975 *Ancoradella ploeckensis* Walliser. KLAPPER and MURPHY, p. 52, Pl. 9, figs. 12-14.

1979 *Ancoradella ploeckensis* Walliser. LANE and ORMISTON, p. 52, Pl. 10, figs. 13, 14.

1981a *Ancoradella ploeckensis* Walliser. UYENO, p. 46, Pl. 8, figs. 17, 18, (?)19, 20, 21.

1985 *Ancoradella ploeckensis* Walliser. ORCHARD *in* Norford and Orchard, p. 10, Pl. 2, fig. 1.

Occurrence. Only the Pa element recovered from the highest part of the Douro Formation in the vicinity of Ptarmigan

Lake, northwestern Devon Island (Section 3C); in the Arctic Archipelago, previously reported from the Douro Formation at eastern Cornwallis Island, and at southwestern Ellesmere Island (Uyeno, 1981a, p. 51, 54).

Family POLYGNATHIDAE Bassler, 1925

Genus *Polygnathus* Hinde, 1879

Type species. *Polygnathus dubius* Hinde, 1879.

Remarks. Klapper and Johnson (1975) suggested two evolutionary lines in the development of *Polygnathus* during the Emsian, both starting with *P. dehiscens* Philip and Jackson, and one leading to *P. serotinus* Telford, and the other to *P. costatus* Klapper. Bardashev (1986) modified this, and added two more, again all starting with *P. dehiscens*, and leading to i) *P. linguiformis bultyncki* Weddige, ii) *P. costatus patulus* Klapper, iii) *P. serotinus*, and iv) *P. cracens* Klapper, Ziegler and Mashkova.

Klapper and Johnson (1975, p. 70) initially suggested, and Mawson (1987, p. 259) later reiterated, that *Polygnathus pireneae* Boersma is a possible progenitor of *P. dehiscens*. Mawson (1987) further distinguished a lineage peculiar to the southern hemisphere, leading from *P. dehiscens abyssus* Mawson to *P. pseudoserotinus* Mawson.

Polygnathus dehiscens Philip and Jackson

Polygnathus dehiscens dehiscens Philip and Jackson

Plate 9, figures 1-4; Plate 17, figures 1, 2;
Plate 19, figures 1-4

1967 *Polygnathus linguiformis dehiscens* n. subsp. PHILIP and JACKSON, p. 1265, Textfigs. 2i-k, 3a.

1976 *Polygnathus dehiscens* Philip and Jackson. BULTYNCK, p. 61, 62, Pl. 11, figs. 1-15.

1977 *Polygnathus dehiscens* Philip and Jackson. KLAPPER *in* Ziegler (ed.), p. 447, 448, *Polygnathus* - Pl. 8, figs. 7, 8 (includes synonymy).

1979 *Polygnathus dehiscens* Philip and Jackson. BULTYNCK, Pl. 1, figs. 14-17.

1980 *Polygnathus dehiscens* Philip and Jackson. KLAPPER *in* Klapper and Johnson, p. 452 (includes synonymy).

1980 *Polygnathus dehiscens* Philip and Jackson. SCHÖNLAUB *in* Chlupáč et al., Pl. 21, figs. 2-4, 6, 8-17; Pl. 23, figs. 10, 14, 15.

1980 *Polygnathus dehiscens* Philip and Jackson. UYENO and KLAPPER, Pl. 8.1, figs. 1-4; Textfigs. 8.2, 8.3.

1981 *Polygnathus dehiscens* Philip and Jackson. BULTYNCK and HOLLARD, p. 42, Pl. 2, fig. 5.

1981 *Polygnathus dehiscens* Philip and Jackson. MASHKOVA and APEKINA, p. 90, 92, Textfigs. 9, 10.

1982 *Polygnathus dehiscens* Philip and Jackson. WANG, p. 442, 443, Pl. 1, figs. 6-9.

1983 *Polygnathus dehiscens* Philip and Jackson. XIONG, p. 316, Pl. 69, fig. 1.

1984 *Polygnathus dehiscens* (Philip and Jackson). SOBOLEV, Pl. 2, figs. 8, 12, 13; Pl. 3, fig. 4; Pl. 4, fig. 2.

1984 *Polygnathus dehiscens* Philip and Jackson. APEKINA, p. 79, 80, Pl. 22, fig. 8.

1985 *Polygnathus dehiscens* Philip and Jackson. SADLER *in* Austin et al., p. 136, Pl. 4.1, fig. 14.

1985 *Polygnathus dehiscens* Philip and Jackson. SAVAGE, BLODGETT, and JAEGER, Pl. 1, figs. 27, 28.

1986 *Polygnathus dehiscens* Philip and Jackson. ZIEGLER and WANG, Pl. 1, fig. 1.

1986b *Polygnathus dehiscens* Philip and Jackson. SCHÖNLAUB, Pl. 3, figs. 8-10.

1987 *Polygnathus dehiscens dehiscens* Philip and Jackson. MAWSON, p. 270, 272, Pl. 32, figs. 1-10; Pl. 36, fig. 6.

Remarks. One Pa element of *Polygnathus dehiscens dehiscens* has an abbreviated platform with the carina protruding slightly beyond the platform margin (Pl. 9, figs. 3, 4). The basal cavity is characteristic of the species, however. Another Pa element (Pl. 17, figs. 1, 2) shows some inversion in the posterior end of the cavity, and thus morphologically approaches *Polygnathus gronbergi* Klapper and Johnson (1975, Pl. 1, figs. 9-12).

Occurrence. The lower Blue Fiord (Section 2A), Devon Island (near junction of Vendom and Baumann fiords, southwestern Ellesmere Island, GSC loc. C-84882), and basal

Disappointment Bay formations (Crescent Island, GSC loc. C-33680).

Polygnathus inversus Klapper and Johnson

Plate 7, figures 6, 7, 39-44;
Plate 9, figures 7-12, 15, 16, 36, 37;
Plate 13, figures 1-4; Plate 17, figures 35-38

1975 *Polygnathus inversus* sp. nov. KLAPPER and JOHNSON, p. 73, Pl. 3, figs. 15-39.

1979 *Polygnathus inversus* Klapper and Johnson. BULTYNCK and MORZADEC, Pl. 1, figs. 18-20.

1979 *Polygnathus inversus* Klapper and Johnson. BULTYNCK, Pl. 1, fig. 10.

1979 *Polygnathus inversus* Klapper and Johnson. LANE, MÜLLER, and ZIEGLER, p. 219, Pl. 1, figs. 1, 2.

1979 *Polygnathus inversus* Klapper and Johnson. UYENO and MAYR, Pl. 38.1, figs. 41, 42.

1980 *Polygnathus inversus* Klapper and Johnson. UYENO *in* Mayr et al., Pl. 32.1, figs. 53, 54.

1980 *Polygnathus inversus* Klapper and Johnson. KLAPPER *in* Klapper and Johnson, p. 453 (includes synonymy).

1980 *Polygnathus inversus* Klapper and Johnson. UYENO and KLAPPER, Pl. 8.1, figs. 7-12; Pl. 8.3, figs. 6, 13.

1981 *Polygnathus inversus* Klapper and Johnson. MASHKOVA and APEKINA, p. 93, Pl. 1, figs. 5, 6.

1983b *Polygnathus inversus* Klapper and Johnson. WANG and ZIEGLER, Pl. 5, figs. 7, 8.

1984 *Polygnathus inversus* Klapper and Johnson. SOBOLEV, Pl. 5, figs. 2-4.

1984 *Polygnathus inversus* Klapper and Johnson. APEKINA, p. 82, 83, Pl. 22, fig. 10.

1986 *Polygnathus inversus* Klapper and Johnson. BARDASHEV, Pl. 5, figs. 15, 16.

1987 *Polygnathus inversus* Klapper and Johnson. MAWSON, p. 274, Pl. 33, figs. 3-8; Pl. 36, figs. 8, 9.

Remarks. The principal distinguishing characteristic of *Polygnathus inversus* is the shape and position of the pit and basal cavity. The range of variation of some features in the upper surface of the platform is similar to that of different morphotypes of *P. linguiformis linguiformis* Hinde (see Bultynck, 1970, p. 125-127; Ziegler et al., 1976, p. 122-124). Such variable features include the degree of development of the tongue, of transverse ridges in the posterior third of the platform, and of a flange on the outer platform margin. Wang (1979, p. 401, 402) distinguished a new species, *P. declinatus*, based in part on these upper surface features. As noted above, they are widely variable and that species is herein considered to fit within the concept of a transitional form between *P. inversus* and *P. serotinus* Telford (as noted previously by Uyeno and Klapper, 1980, p. 89; see comments by Mawson, 1987, p. 278). Lane and Ormiston (1979, p. 63) differentiated various morphotypes of *P. serotinus* on a similar basis.

There is considerable overlap in the ranges of *Polygnathus inversus* and *P. inversus* transitional to *P. serotinus* in the Blue Fiord Formation at Sections 2A and 3A. Both *P. inversus* and its transitional form to *P. serotinus* were also recovered from the Blue Fiord Formation at Subsections R-A7 and R-A8, and from the Undivided Devonian carbonates in southeastern Grinnell Peninsula. In the upper part of the upper member of the Blue Fiord Formation at R-A7, the transitional form occurs with *P. serotinus* (GSC locs. C-76228 and C-76818).

An aberrant form of *Polygnathus inversus* was recovered from the lower Blue Fiord Formation at a section located west of Vendom Fiord (Subsection R-A8; GSC loc. C-76226). The pit is located more anteriorly, between the gentle inward curvature of the keel and the anterior edge of the platform. Posterior of the pit is a wide, symmetrical, inverted basal cavity which, superficially at least, resembles that of *P. kendalli* Johnson and Klapper. In the latter species, as in *P. inversus*, the pit and basal cavity are located immediately anterior of the curvature of the keel.

Occurrence. In the Canadian Arctic Archipelago, previously reported from the Stuart Bay Formation at Young Inlet in northeastern Bathurst Island (McGregor and Uyeno, 1972), the Blue Fiord Formation in the subsurface of Cameron Island (Uyeno and Mayr, 1979), and the Blue Fiord Formation on the larger of the Princess Royal Islands, off Victoria Island (Uyeno *in* Mayr et al., 1980).

Polygnathus linguiformis Hinde

Remarks. Several morphotypes of *Polygnathus linguiformis* have been recognized in recent years. Some of them have been assigned formal subspecific status (Wittekindt, 1966; Weddige, 1977; Sparling, 1983). Some, including those previously named, have been included in synonymy with the nominate subspecies, *P. linguiformis linguiformis*, and denoted informally by Greek letters (Bultynck, 1970; Ziegler and Klapper *in* Ziegler et al., 1976).

Polygnathus linguiformis linguiformis Hinde
gamma morphotype of Bultynck (1970)

Plate 18, figures 5-7, 9

1879 *Polygnathus linguiformis* n. sp. HINDE, p. 367, Pl. 17, fig. 15.

1970 *Polygnathus linguiformis linguiformis* Hinde gamma forma nova. BULTYNCK, p. 126, 127, Pl. 11, figs. 1-6; Pl. 12, figs. 1-6.

1976 *Polygnathus linguiformis linguiformis* Hinde forme gamma. BULTYNCK and BOONEN, p. 501, Pl. 1, fig. 1.

1976 *Polygnathus linguiformis linguiformis* Hinde, la forma gamma de Bultynck. GARCÍA-LÓPEZ, Pl. 1, fig. 2.

1977 *Polygnathus linguiformis linguiformis* Hinde gamma morphotype Bultynck. KLAPPER *in* Ziegler (ed.), p. 463, 464, *Polygnathus*–Pl. 11, figs. 1-7 (includes synonymy).

1978 *Polygnathus linguiformis linguiformis* Hinde. URBANEK, Pl. 3, fig. 7.

1979 *Polygnathus linguiformis linguiformis* Hinde (gamma morphotype Bultynck). ORCHARD, Pl. 1, fig. 27.

1980 *Polygnathus linguiformis linguiformis* Hinde gamma morphotype Bultynck. KLAPPER *in* Klapper and Johnson, p. 453.

1981 *Polygnathus linguiformis linguiformis* Hinde gamma morphotype Bultynck, 1970. BULTYNCK and HOLLARD, p. 43, 44, Pl. 7, fig. 1.

1981 *Polygnathus linguiformis linguiformis* Hinde. SPARLING, p. 313, 314, Textfig. 3.

1981 *Polygnathus linguiformis linguiformis* Hinde gamma morphotype Bultynck. WANG and ZIEGLER, Pl. 1, fig. 12; Pl. 2, fig. 25.

1981 *Polygnathus linguiformis linguiformis* Hinde form gamma of Bultynck. HUDDLE, p. B30, Pl. 15, figs. 9-21.

1982 *Polygnathus linguiformis linguiformis* Hinde. UYENO *in* Uyeno et al., p. 29, 30, Pl. 2, figs. 20-31.

1982 *Polygnathus linguiformis linguiformis* Hinde gamma morphotype Bultynck. UYENO *in* Norris et al., p. 74, Pl. 31, figs. 30, 31, 39-41; Pl. 32, figs. 1-6, 27, 28; Pl. 34, figs. 9-16, 23-25; Pl. 38, figs. 14, 15.

1983 *Polygnathus linguiformis linguiformis* Hinde gamma morphotype Bultynck, 1970. SPARLING, p. 858, Figs. 11E-G, I; 13U, V, AC.

1983 *Polygnathus linguiformis linguiformis* Hinde gamma morphotype. KLAPPER and BARRICK, Fig. 12V.

1983 *Polygnathus linguiformis linguiformis* Hinde. KLUG, p. 90, Figs. 11O-Q.

1984 *Polygnathus linguiformis linguiformis* gamma Bultynck. APEKINA, p. 84, 85, Pl. 23, figs. 7, 12.

1985 *Polygnathus linguiformis linguiformis* Hinde. ORCHARD *in* Austin et al., p. 143, Pl. 4.3, fig. 15.

1985 *Polygnathus linguiformis linguiformis* Hinde. OLIVIERI, p. 302, 303, Pl. 2, figs. 17-21.

1986 *Polygnathus l. linguiformis*, gamma Bultynck. BARDASHEV and ZIEGLER, Pl. 1, fig. 13.

1986b *Polygnathus l. linguiformis* Hinde, gamma morphotype. SCHÖNLAUB, Pl. 5, figs. 25, 26 [only].

Remarks. The gamma morphotype was recovered from the Du5 member of the Undivided Devonian carbonates in southern Grinnell Peninsula (GSC loc. C-33714). There, it is associated with *P. linguiformis bultyncki* Weddige, and a form transitional between the gamma morphotype and *P. l. bultyncki.*

Polygnathus linguiformis bultyncki Weddige

Plate 18, figures 1, 2, 8

1970 *Polygnathus linguiformis linguiformis* Hinde alpha forma nova. BULTYNCK, p. 126, Pl. 9, figs. 1-7.

1977 *Polygnathus linguiformis bultyncki* n. ssp. WEDDIGE, p. 313, 314, Pl. 5, figs. 90-92.

1977 *Polygnathus linguiformis linguiformis* Hinde alpha morphotype Bultynck. KLAPPER *in* Ziegler, (ed.), p. 462, *Polygnathus* - Pl. 9, figs. 6, 8 (includes synonymy).

1979 *Polygnathus linguiformis bultyncki* Weddige. LANE, MÜLLER, and ZIEGLER, p. 219, Pl. 1, fig. 22.

1979 *Polygnathus linguiformis bultyncki* Weddige. ZAGORA and ZAGORA, p. 1451, Figs. 3-5.

1980 *Polygnathus linguiformis bultyncki* Weddige. KLAPPER *in* Klapper and Johnson, p. 453 (includes further synonymy).

1980 *Polygnathus linguiformis bultyncki* Weddige. SCHÖNLAUB *in* Chlupáč et al., Pl. 8, figs. 22, 26.

1981 *Polygnathus linguiformis linguiformis* Hinde, alpha morphotype Bultynck, 1970. BULTYNCK and HOLLARD, p. 43, Pl. 2, figs. 14-16.

1983b *Polygnathus linguiformis bultyncki* Weddige, alpha and beta morphotypes. WANG and ZIEGLER, p. 89, Pl. 5, figs. 18, 19.

1984 *Polygnathus linguiformis bultyncki* Weddige. APEKINA, p. 83, 84, Pl. 23, fig. 2.

1985 *Polygnathus linguiformis bultyncki* Weddige. SADLER *in* Austin et al., p. 138, Pl. 4.2, figs. 8, 9.

1986 *Polygnathus linguiformis bultyncki* Weddige beta morphotype. ZIEGLER and WANG, Pl. 1, fig. 15.

1986 *Polygnathus linguiformis bultyncki* Weddige. BULTYNCK, Pl. 7, figs. 2-4.

1986b *Polygnathus linguiformis bultyncki* Weddige. SCHÖNLAUB, Pl. 4, fig. 26.

Remarks. Forms that are morphologically transitional between *P. linguiformis bultyncki* and the gamma morphotype of the nominate subspecies (Pl. 18, figs. 3, 4, 11, 12) were previously reported by Klapper (*in* Johnson, J.G. et al., 1981, Textfig. 6), from the lower Denay Limestone of central Nevada. There, as in the Du5 member of the Undivided Devonian carbonates in southern Grinnell Peninsula (GSC loc. C-33714), they occur with both *P. l. bultyncki* and *P. l. linguiformis* gamma morphotype.

Wang and Ziegler (1983b) distinguished alpha and beta morphotypes of this subspecies. The former was suggested to be more common in the neritic facies, and the beta morphotype in the pelagic facies. If this division is applied to the present collection, most of the specimens would be designated as alpha morphotypes.

Polygnathus nothoperbonus Mawson

Plate 7, figures 4, 5; Plate 9, figures 5, 6, 13, 14

1975 *Polygnathus* aff. *P. perbonus* (Philip). KLAPPER and JOHNSON, p. 74, Pl. 2, figs. 1-10.

1979 *Polygnathus* aff. *P. perbonus* (Philip). UYENO and MAYR, Pl. 38.1, figs. 18, 19.

1980 *Polygnathus* aff. *P. perbonus* (Philip). KLAPPER *in* Klapper and Johnson, p. 454.

1980 *Polygnathus* aff. *P. perbonus* (Philip). UYENO and KLAPPER, Pl. 8.1, figs. 5, 6; Pl. 8.3, figs. 11, 12.

1983a *Polygnathus* aff. *perbonus* (Philip). WANG and ZIEGLER, Fig. 2:17.

1987 *Polygnathus nothoperbonus* sp. nov. MAWSON, p. 276, Pl. 32, figs. 11-15; Pl. 33, figs. 1, 2; Pl. 36, fig. 7.

Occurrence. The lower member of the Blue Fiord Formation at Section 2A and Subsection R-A8; in the Canadian Arctic Archipelago, previously reported from the Blue Fiord Formation in the subsurface on Vanier Island (Uyeno and Mayr, 1979).

Polygnathus cf. *P. pireneae* Boersma

Plate 7, figures 1-3

(cf.) 1974 *Polygnathus pireneae* n. sp. BOERSMA, p. 287, 288, Pl. 2, figs. 1-12.

(cf.) 1977a *Polygnathus boucoti* n. sp. SAVAGE, p. 58, 59, Pl. 1, figs. 13-28; Textfig. 2.

(cf.) 1984 *Polygnathus* cf. *boucoti* Savage. SOBOLEV, Pl. 3, figs. 3, 8.

Remarks. A single polygnathan element was obtained from the Eids Formation at Sor Fiord on Ellesmere Island (Subsection R-A9), at 30.2 m below the top of the formation (GSC loc. C-76215). Although it is fragmentary, with the extreme posterior end of the specimen missing, it appears to be similar to *Polygnathus boucoti* Savage. This species, which was considered synonymous with *P. pireneae* Boersma by Lane and Ormiston (1979, p. 62) and Klapper *in* Klapper and Murphy (1980, p. 454), may perhaps be distinct (Murphy and Matti, 1983, p. 40). The single specimen in the present collection does not help to resolve this problem (see also discussion by Savage et al., 1985, p. 1883). The Eids specimen exhibits two minute denticles on the outer side, above the basal cavity, and only a very weakly developed platform. It is associated in the same sample with *Steptotaxis robleskyi* n. sp. and *Pandorinellina exigua exigua* (Philip).

Polygnathus serotinus Telford

Plate 7, figures 13, 14;
Plate 9, figures 21, 22, 34, 35

1975 *Polygnathus foveolatus serotinus* n. subsp. TELFORD, p. 43, 44, Pl. 7, figs. 5-8.

1976 *Polygnathus serotinus* Telford. BULTYNCK, p. 63, 64, Pl. 10, fig. 23; Pl. 11, fig. 21.

1977 *Polygnathus serotinus* Telford. KLAPPER *in* Ziegler (ed.), p. 495, 496, *Polygnathus* - Pl. 9, figs. 4, 5 (includes synonymy).

1978 *Polygnathus serotinus* Telford. REQUADT and WEDDIGE, p. 207, Textfigs. 9a-c.

1979 *Polygnathus serotinus* Telford. CHATTERTON, p. 198, Pl. 1, fig. 25 [only].

1979 *Polygnathus serotinus* Telford. BULTYNCK, Pl. 1, figs. 6, 7.

1979 *Polygnathus serotinus* Telford. UYENO and MAYR, Pl. 38.1, figs. 47, 48.

1979 *Polygnathus serotinus* Telford. LANE, MÜLLER, and ZIEGLER, p. 220, Pl. 1, figs. 5, 6, 20, 21.

1980 *Polygnathus serotinus* Telford. SCHÖNLAUB, Pl. 8, figs. 4, 8-10, 23, 24.

1980 *Polygnathus serotinus* Telford. KLAPPER *in* Klapper and Johnson, p. 454.

1980 *Polygnathus serotinus* Telford. UYENO and KLAPPER, Pl. 8.1, figs. 17-20.

1981 *Polygnathus serotinus* Telford. MASHKOVA and APEKINA, p. 91, Pl. 1, figs. 1-4.

1983 *Polygnathus serotinus* Telford. XIONG, p. 317, Pl. 69, fig. 5.

1983b *Polygnathus serotinus* Telford. WANG and ZIEGLER, Pl. 6, figs. 16-18.

1984 *Polygnathus serotinus* Telford. SOBOLEV, Pl. 6, figs. 2, 3.

1984 *Polygnathus serotinus* Telford. APEKINA, p. 85, Pl. 22, fig. 11.

1985 *Polygnathus serotinus* Telford. SADLER *in* Austin et al., p. 140, Pl. 4.2, figs. 12, 13.

1986 *Polygnathus serotinus* Telford. ZIEGLER and WANG, Pl. 1, figs. 9, 10.

1986 *Polygnathus serotinus* Telford. BULTYNCK, Pl. 5, figs. 17, 18 [? = transitional to *P. inversus* Klapper and Johnson]; Pl. 6, figs. 3, 4.

1986b *Polygnathus serotinus* Telford. SCHÖNLAUB, Pl. 3, figs. 23-26.

1987 *Polygnathus serotinus* Telford 'delta morphotype'. MAWSON, p. 280, Pl. 33, figs. 9-12; Pl. 36, fig. 10.

Remarks. Lane and Ormiston (1979, p. 63) distinguished three morphotypes of *Polygnathus serotinus* in their collections from the Salmontrout River area of east-central Alaska. Their specimens came from the upper part of the *patulus* Zone. Of these morphotypes, those designated as alpha and delta by these authors (*ibid.*) have been noted in the upper member of the Blue Fiord and Bird Fiord formations at Section 2A. The species was also recovered from the upper part of the upper member, Blue Fiord Formation west of Vendom Fiord (Subsection R-A7), where it occurs with a form transitional to *P. inversus* (GSC locs. C-76228 and C-76818).

Elsewhere in the Canadian Arctic Archipelago, *Polygnathus serotinus* was previously reported from the Blue Fiord Formation in the subsurface of Cameron Island (Uyeno and Mayr, 1979).

Genus *Amydrotaxis* Klapper and Murphy, 1980

Type species. *Spathognathodus johnsoni* Klapper, 1969.

Remarks. Hitherto five species of *Amydrotaxis* have been reported: *A. johnsoni* (Klapper) and *A. sexidentata* Murphy and Matti, from the Cordilleran region of North America, *A.* n. sp. of Savage (1984) from an island off northwestern Washington, and from eastern Australia, *A. druceana* (Pickett) and *A. corniculans* Mawson (Pickett, 1980; Mawson, 1986). The new species, described herein as *A. chattertoni*, may be the oldest of the six, overlapping in part with *A.* n. sp. of Savage (1984), *A. sexidentata*, and *A. corniculans*. On the basis of its occurrence on Devon Island, and in Nevada and the Yukon Territory (Klapper and Murphy, 1975, p. 45), *A. chattertoni* ranges from the *hesperius* to *eurekaensis* zones. Its closest morphological affinity with *Ozarkodina remscheidensis remscheidensis* suggests that it may be the earliest species of the genus, arising from the latter in the *hesperius* Zone. The generic derivation was previously suggested by Murphy and Matti (1983, p. 30).

Amydrotaxis chattertoni n. sp.

Plate 12, figures 13-25, 27-30, 34, 35;
Plate 20, figures 10-12

1975 *Ozarkodina* n. sp. F. KLAPPER and MURPHY, p. 45, partim, Pl. 5, figs. 24-26.

[non] 1981a *Ozarkodina* n. sp. F of Klapper and Murphy (1975). UYENO, p. 42, Pl. 4, figs. 15-18; Pl. 5, figs. 1-7 [=cf. *O. remscheidensis remscheidensis* (Ziegler)].

Diagnosis. A species of *Amydrotaxis,* the Pa element of which is characterized by three large, triangular denticles.

Description. The Pa element is usually dominated by three large, triangular denticles, one located at each of the extreme anterior and posterior ends, and another in a central position, each separated from the other by one to three small denticles. The denticles are mostly erect, with the exception of the posterior large one, which is reclined. The basal margin is symmetrically and widely flared over the centrally located basal cavity, and tapers widely posteriorly and only narrowly anteriorly. The lower margin is straight to slightly convex. In upper view, the blade is straight.

The Pb element is dominated by a large reclined cusp. Anterior of the cusp are two to four small denticles, with that closest to the cusp similarly reclined as the cusp. The narrow upper margin posterior of the cusp may be adenticulate, but commonly carries one or two minute denticles. The basal margin is widely and slightly asymmetrically flared over the basal cavity, situated under the cusp, and tapers widely posteriorly and narrowly anteriorly.

The elements of the symmetry transition series are characterized by a dominant cusp, flanked by smaller denticles that are wide, flattened, sharply pointed, sharp-edged, and free through their entire length. They all possess a relatively wide flare in the basal margin over the basal cavity, with tapering grooves extending under the processes. The anterior process of the Sc element may be only moderately bent inwardly, with the denticles on it directed posterolaterally, parallel with the cusp. One form is transitional in its curvature and denticle orientation between the Sc and Sb positions. The Sb element differs from the M in the smaller angle between the two lateral processes. The Sa element is slightly palmate.

The M element is a modified lonchodinan, with a prominent cusp, and lateral processes carrying one or two broad denticles. The basal cavity is widest under the cusp, with narrow tapering grooves extending under the processes. White matter occurs throughout the denticles in all the elements, but is absent in the basal parts of the units.

Remarks. The Pa element of *Amydrotaxis chattertoni* is similar to some extreme forms of the analogous element of *Ozarkodina remscheidensis remscheidensis* (Ziegler). Indeed the Nevada, and Royal Creek, Yukon specimens were earlier referred to as "an aberrant form" of that taxon (see Klapper and Murphy, 1975, p. 45). Conversely, Uyeno (1981a, p. 42) referred to a species herein named *A. chattertoni*, specimens that are in fact an extreme form of *O. r. remscheidensis*. It is often difficult, if not impossible, to determine the correct taxonomic assignment of such forms without the accompanying elements. The Pa element of *O. remscheidensis remscheidensis* may differ slightly in its more restricted basal cavity flare, usually confined to the central area of the blade, whereas in *A. chattertoni* it is widely tapering posteriorly. The lateral surfaces of the latter may be more outwardly convex. The aberrant forms mentioned above may be transitional between *O. r. remscheidensis* and *A. chattertoni*; note the rather unusual Pb elements which accompany the above Pa, as illustrated by Uyeno (1981a, Pl. 4, fig. 18; Pl. 5, fig. 7).

Stratum typicum and locus typicus. Sutherland River Formation, 74 m above base of formation, Section 3A (type) at Sutherland River, GSC locality 83676 (see Appendix for detailed locality).

Type series. Holotype, the specimen illustrated in Plate 12, figures 13-15 (GSC 86479). Paratypes, GSC 86480 to 86495, 86684 to 86686.

Derivation of name. After B.D.E. Chatterton, University of Alberta.

Genus *Ancyrodelloides* Bischoff and Sannemann, 1958

Type species. *Ancyrodelloides trigonica* Bischoff and Sannemann, 1958.

Ancyrodelloides delta (Klapper and Murphy)

Plate 20, figures 38-41

1980 *Ozarkodina delta* n. sp.. KLAPPER and MURPHY, p. 499, 501, 502, Figs. 4:2-6, 10-12, 15-17 (includes synonymy).

1980 *Ozarkodina delta* Klapper and Murphy. KLAPPER *in* Klapper and Johnson, p. 449, Pl. 1, figs. 18-22.

1983 *Ancryodelloides delta* (Klapper and Murphy). MURPHY and MATTI, p. 24, 25, Pl. 4, figs. 7-9, 14-18 (includes synonymy).

Remarks. Only the Pa element has been assigned with certainty to this species so far. Murphy and Matti (1983, p. 13, Pl. 4, figs. 1-3) illustrated a rather distinct form considered to be representative of the Pb element but which is apparently common to all species of *Ancyrodelloides*. It superficially resembles ''*Ozarkodina*'' *gaertneri* Walliser, the Pb element of certain *Pterospathodus* apparatuses. No such form was found in the two collections with the Pa element of *A. delta* (unnamed formation on Hyde Parker Island, GSC locs. C-33666, C-33667).

Genus *Eognathodus* Philip, 1965

Type species. *Eognathodus sulcatus* Philip, 1965.

Eognathodus bipennatus (Bischoff and Ziegler)

1957 *Spathognathodus bipennatus* n. sp. BISCHOFF and ZIEGLER, p. 115, 116, Pl. 21, figs. 31a, b, c.

Eognathodus bipennatus mayri n. subsp.

Plate 18, figures 10, 13, 14, 18-23

1970 *Spathognathodus* cf. *bipennatus* Bischoff and Ziegler. BULTYNCK, p. 134 [partim], Pl. 19, figs. 1 a-c [only; figs. 2, 4, 5 = *E. bipennatus montensis* Weddige].

Diagnosis. A subspecies of *Eognathodus bipennatus* with platform of the same width as the flare of the basal cavity. The platform is shallowly concave, rimmed by a marginal ridge consisting of a series of nodes. The platform surface is marked by low ridges that are transverse on the anterior half and of chevron pattern on the posterior half.

Description. Pa element. The platform is extremely wide, of subquadrate to triangular outline, and generally widest at one third to one half of the platform length from its anterior margin. The upper surface of the platform is slightly concave, and marked by a series of low ridges that run transversely on the anterior half and form a chevron pattern posteriorly. The upper margin of the platform is a serrated rim, created in part by intersection of the ridges with the margin. The margin forms an inverted V as it merges into the free blade. A large pit, surrounded by an equally large basal cavity, is located at mid-length of the unit. The basal cavity is in the form of a pair of shallow subsymmetrical lobes, each of which has a subquadrate to oval outline, and is about the same width as the widest part of the platform. The cavity continues as extremely narrow grooves along the keels beneath the free blade and the platform. Viewed laterally, the lower margin is straight to slightly convex upward; the upper margin is straight over the platform and gradually increases in height over the free blade. The anterior margin is vertical, whereas the posterior margin may be similarly vertical or sloping to the lower margin.

Nonplatform elements. The synprioniodinan M element has a minute denticle on the anterior side of the erect and compressed cusp. The denticles on the posterior process are aligned parallel with the cusp. The basal pit under the cusp is small. The trichonodellan Sa element has a similar small basal pit, with denticles on its lateral processes that are free only at their tips. The lateral processes and the denticles, including the cusp, are relatively compressed.

Remarks. Eognathodus bipennatus mayri differs from other subspecies principally in its wide platform. It is similar in most other features.

Bultynck (1970) illustrated a similarly robust specimen from Aisemont in an interval tentatively assigned to the Co2b. On Sheills Peninsula, Devon Island, the new subspecies occurs with *Icriodus norfordi* Chatterton, and is probably of the *costatus* Zone.

In the present collection, only the M and Sa elements have been recovered. In the apparatus of the nominate subspecies reconstructed by Bultynck and Boonen (1976, Fig. 4), their counterparts display denticules that are more discrete, free to their bases, and less compressed.

Stratum typicum and locus typicus. Undivided Devonian carbonates of Morrow and Kerr (1977, 1986), probably Du4 or Du5 member, Grinnell Peninsula, Devon Island, GSC locality C-7680 (see Appendix for detailed locality).

Type series. Holotype, the specimen illustrated in Plate 18, figures 18-20 (GSC 86649). Paratypes, GSC 86646 to 86648, 86650.

Derivation of name. After Ulrich Mayr, who mapped the Sheills Peninsula in 1968, and who collected the specimens on which the new taxon is based.

Eognathodus sulcatus Philip

Eognathodus sulcatus kindlei Lane and Ormiston

Plate 6, figures 35-37; Plate 20, figures 35-37

1969 *Spathognathodus sulcatus* (Philip). KLAPPER, p. 22, 23, Pl. 2, figs. 37, 47; Pl. 3, figs. 16, 17, 21.

1979 *Eognathodus sulcatus kindlei* subsp. nov. LANE and ORMISTON, p. 53-54, Pl. 4, figs. 1-5, 12, 13 (includes synonymy).

1981 *Eognathodus sulcatus* lambda morph. MURPHY, MATTI, and WALLISER, p. 771, Pl. 2, fig. 29; Pl. 3, figs. 1, 2, 11; Textfig. 4.

1985 *Eognathodus sulcatus kindlei* Lane and Ormiston. SAVAGE, BLODGETT, and JAEGER, Pl. 1, figs. 18-20.

Occurrence. The Devon Island Formation west of Vendom Fiord (GSC loc. C-76214; Subsection R-A3), and near the junction of Vendom and Baumann fiords (GSC loc. C-84882). Also on Crescent Island, from unnamed formation (GSC loc. C-33621), and on Spit (Kate) Island, from possible Cape Phillips Formation (GSC loc. C-33717).

Elsewhere in the Canadian Arctic Archipelago, *E. sulcatus kindlei* was previously reported from the Stuart Bay Formation at Young Inlet in northeastern Bathurst Island (McGregor and Uyeno, 1972).

Genus *Ozarkodina* Branson and Mehl, 1933

Type species. *Ozarkodina typica* Branson and Mehl, 1933.

Ozarkodina confluens (Branson and Mehl)

Plate 4, figures 1-3, 7-9;
Plate 14, figures 1-3, 5, 7-10, 12, 13, 20

1933 *Spathodus primus* n. sp. BRANSON and MEHL, p. 46, Pl. 3, figs. 25-30.

1933 *Hindeodella confluens* n. sp. BRANSON and MEHL, p. 45-46, Pl. 3, figs. 21-23.

1971 *Spathognathodus primus* (Branson and Mehl). SERPAGLI, p. 92, 93, Pl. 21, fig. 14.

1973 *Ozarkodina confluens* (Branson and Mehl). KLAPPER *in* Ziegler (ed.), p. 221, 222, *Ozarkodina*–Pl. 1, fig. 2 (includes synonymy).

1975 *Hindeodella confluens* Branson and Mehl. JEPPSSON, p. 31-35, Pls. 5, 6, 7; Pl. 8, figs. 1-3 (includes further synonymy).

1975 *Ozarkodina confluens* (Branson and Mehl). KLAPPER and MURPHY, p. 30-33, Pl. 3, figs. 1-23; Pl. 4, figs. 1-27; Pl. 8, figs. 11-15 (includes further synonymy).

1975 *Ozarkodina confluens* (Branson and Mehl). ALDRIDGE, Pl. 2, figs. 1-6.

1975 *Spathognathodus primus primus* (Branson and Mehl). HELFRICH, Appendix 1-60 to 1-62, Pl. 2, figs. 2, 5, 8, 9; Pl. 3, figs. 1-12; Pl. 11, fig. 11; Pl. 13, figs. 5, 10; Pl. 16, fig. 23.

1977b *Ozarkodina confluens* (Branson and Mehl). COOPER, p. 187, 188, Pl. 16, figs. 1-7.

1977 *Ozarkodina confluens* (Branson and Mehl). BULTYNCK, Pl. 39, figs. 12-19.

1978 *Ozarkodina confluens* (Branson and Mehl). PICKETT, Pl. 1, figs. 1-9.

1978 *Spathognathodus primus* (Branson and Mehl). MILLER, Pl. 2, fig. 21.

1979 *Ozarkodina confluens* (Branson and Mehl). LANE and ORMISTON, p. 55, Pl. 10, figs. 15, [18?], 19.

1980 *Ozarkodina confluens* (Branson and Mehl). UYENO *in* Mayr et al., Pl. 32.1, figs. 15, 16, 22-25, 36, 41, 42.

1980 *Ozarkodina confluens* (Branson and Mehl). SCHÖNLAUB *in* Chlupáč et al., Pl. 17, figs. 3, 21; Pl. 25, fig. 19.

1981a *Ozarkodina confluens* (Branson and Mehl). UYENO, p. 40, Pl. 1, figs. 1-34.

1981 *Ozarkodina confluens* (Branson and Mehl). ALDRIDGE, DORNING, and SIVETER, Pl. 2.3, fig. 5.

1981 *Ozarkodina confluens* (Branson and Mehl). VIIRA, p. 179-181, Pl. 30, figs. 1-3, 14-16; Pl. 33, figs. 5-12; Pl. 42, figs. 1-11; Pl. 44, fig. 4; Pl. 48, fig. 5; Pl. 51, figs. 2, 3.

1981 *Ozarkodina confluens* (Branson and Mehl). NOWLAN, Pl. 7, figs. 18, 19, 22-24.

1983 *Ozarkodina confluens* (Branson and Mehl). BARRICK, Fig. 18H.

1983 *Ozarkodina confluens* (Branson and Mehl). HARRIS, HATCH, and DUTRO, Pl. 1, fig. A.

1983 *Spathognathodus primus* subspp. (Branson and Mehl). VIIRA, p. 51-61, Pl. 1, figs. 3-6, 8-10; Pl. 2, figs. 1-4, 9, 10; Pl. 3, figs. 1-10; Pl. 4, figs. 1-6, 8, 10; Pl. 6, figs. 1-13.

1985 *Ozarkodina confluens* (Branson and Mehl). ALDRIDGE, Pl. 3.4, fig. 1.

Remarks. Rexroad et al. (1978, p. 7) reconstructed an apparatus for this species based on collections from the Wabash Formation of southern Indiana. All the elements, with the exception of Pb, in that apparatus conform to *O. confluens* as previously defined. The authors (*ibid.*) thus retained the same specific assignment, but suggested that it differs at a subspecific level.

Viira (1983) introduced six new subspecies of "*Spathognathodus*" *primus*, based on a detailed study of the Pa elements in the interval of Jaagarahu through Ohesaare horizons, primarily from the subsurface of Saaremaa Island, Estonia. Some of these subspecies correspond to the various morphotypes recognized by Walliser (1964, Fig. 8) and by Klapper and Murphy (1975, p. 32-33).

Ozarkodina confluens is a widespread species, and has been reported from several stratigraphic intervals in the Arctic Islands. The units include the Cape Storm, Douro, lower member of Peel Sound, Somerset Island, Barlow Inlet, Sophia Lake, and Devon Island formations (Mirza, 1976, p. 110-112; Uyeno *in* Mayr et al., 1980; Uyeno, 1981a, p. 51-54). In the current study, the species was recovered from the lower Cape Phillips Formation at Section 1, the Douro Formation at Sections 3A, 3B, and 3C, and questionably from the upper part of the Allen Bay – Read Bay carbonates (undivided) in subsurface Section 2C.

Ozarkodina douroensis Uyeno

Plate 14, figures 26, 27, 32-34

1980 *Ozarkodina* n. sp. B of Klapper and Murphy (1975). UYENO *in* Mayr et al., Pl. 32.1, figs. 17-20.

1981a *Ozarkodina douroensis* n. sp. UYENO, p. 40, 41, Pl. 2, figs. 18-39 (includes synonymy).

Remarks. As previously noted (Uyeno, 1981a), the Pb element of *Ozarkodina douroensis* is similar to that of *O. confluens* (Branson and Mehl). Although not always consistent, there is a noticeable swelling about mid-height of the blade throughout the length of the unit; in the latter form, the blade is generally more flattened. Uyeno (*in* Mayr et al., 1980) illustrated the accompanying M and Sa elements, as well as the Pa and Pb elements. Like the Pb element, the M and Sa elements are also similar to their counterparts of *O. confluens.* The only difference is in the M element, which is synprioniodinan with three small denticles mounted on a short process anterior of the cusp. Generally, the M element of *O. confluens* is either prioniodinan, or has only a single minute denticle in this position (e.g., Jeppsson, 1975, Pl. 7, fig. 8; Uyeno, 1981a, Pl. 1, fig. 15).

Jeppsson (1984, p. 108) hinted that there may be some relationship between *Ozarkodina douroensis* and *Eognathodus sulcatus* (Philip). On the other hand, the lineage of the latter was suggested by Murphy et al. (1981) to be connected with *O. remscheidensis* (Ziegler) and *O. pandora* Murphy, Matti and Walliser.

This is the second reporting of *O. douroensis* from the Douro Formation near its type area. The present occurrence is at Sutherland River (Section 3B), some 4.5 km east of the type area, whereas the other finding was by Weyant (1971, p. 117) at Camp Creek, about the same distance away, but to the west.

Elsewhere in the Canadian Arctic Archipelago, the species has been reported from the Douro Formation at Prince of Wales Island (including the holotype specimen), Goodsir Creek on eastern Cornwallis Island, and at Boothia Peninsula. At the first two localities, it was also recovered from the underlying Cape Storm Formation (Uyeno, 1981a). Uyeno (*in* Mayr et al., 1980) recorded it from the Cape Storm Formation in the KMG Decalta Young Bay F-62 well in eastern Prince of Wales Island.

Ozarkodina cf. *O. douroensis* Uyeno

Plate 4, figures 27-30; Plate 12, figures 5-7

1980 *Ozarkodina* cf. *O.* n. sp. B of Klapper and Murphy (1975). UYENO *in* Mayr et al., Pl. 32.1, fig. 26.

1981a *Ozarkodina* cf. *O. douroensis* n. sp. UYENO, p. 41, Pl. 4, figs. 13, 14.

1985 *Ozarkodina* cf. *O. douroensis* Uyeno (*sensu* Uyeno, 1981a). ORCHARD *in* Norford and Orchard, p. 11, 12, Pl. 2, figs. 13, 14.

Remarks. Three fragmentary specimens of spathognathodontan element that are similar to those previously referred to *Ozarkodina* cf. *O. douroensis*, were recovered from the lower Cape Phillips Formation at Strathcona Fiord (Section 1) at 78 m above the base of the formation (GSC loc. 83785). Based on its morphology and stratigraphic position, Uyeno (1981a) suggested that this form may be intermediate between *O. confluens* (Branson and Mehl) and *O. douroensis.*

Previous occurrences of *Ozarkodina* cf. *O. douroensis* in the Canadian Arctic Archipelago are in the Cape Storm Formation at Goodsir Creek on eastern Cornwallis Island, and near the top of the Read Bay–Allen Bay carbonates (undivided) in the subsurface at Bjorne Peninsula in southwestern Ellesmere Island (Section 2C). It was also found in the subsurface Cape Storm Formation of northwestern Victoria Island (Uyeno *in* Mayr et al., 1980). It was reported for the first time from the mainland, from the Road River Formation in the subsurface of southeastern Yukon Territory (Norford and Orchard, 1985). There, it was dated as possibly Wenlock.

Ozarkodina excavata (Branson and Mehl)

Remarks. The relatively wide variation in the morphology of the Pa element of *Ozarkodina excavata* was recently outlined by Murphy and Cebecioglu (1986, p. 865).

Ozarkodina excavata excavata (Branson and Mehl)

Plate 3, figures 11, 12; Plate 8, figures 7, 10, 11;
Plate 14, figures 11, 14-19, 23-25, 31;
Plate 15, figures 15-18

1933 *Prioniodus excavatus* n. sp. BRANSON and MEHL, p. 45, Pl. 3, figs. 7, 8.

1933 *Ozarkodina simplex* n. sp. BRANSON and MEHL, p. 52, Pl. 3, figs. 46, 47.

1953 *Prioniodella inclinata* n. sp. RHODES, p. 324, Pl. 23, figs. 233-235.

1973 *Ozarkodina excavata excavata* (Branson and Mehl). KLAPPER *in* Ziegler (ed.), p. 225, 226, *Ozarkodina* - Pl. 1, fig. 5 (includes synonymy).

1975 *Hindeodella excavata excavata* (Branson and Mehl). JEPPSSON, p. 25-31, Pl. 4, figs. 1-17 (includes synonymy).

1975 *Ozarkodina excavata excavata* (Branson and Mehl). KLAPPER and MURPHY, p. 34-37, Pl. 6, figs. 1-20.

1976 *Ozarkodina excavata excavata* (Branson and Mehl). BARRICK and KLAPPER, p. 78, 79, Pl. 4, figs. 13-23, 26.

1976 *Ozarkodina excavata excavata* (Branson and Mehl). KUWANO, Pl. 2, figs. 7-10, 12-19.

1978 *Ozarkodina excavata excavata* (Branson and Mehl). REXROAD, NOLAND, and POLLOCK, p. 9-10, Pl. 1, figs. 17-22.

1979 *Ozarkodina excavata excavata* (Branson and Mehl). LANE and ORMISTON, p. 55, Pl. 2, figs. 30, 31; Pl. 9, figs. 18-23.

1980 *Ozarkodina excavata excavata* (Branson and Mehl). UYENO *in* Mayr et al., Pl. 32.1, figs. 28, 32.

1980 *Ozarkodina excavata* (Branson and Mehl). HELFRICH, Pl. 2, figs. 31-38.

1981a *Ozarkodina excavata excavata* (Branson and Mehl). UYENO, p. 41, Pl. 2, figs. 6-13, 17.

1981 *Ozarkodina excavata excavata* (Branson and Mehl). NOWLAN, Pl. 6, figs. 10-16, 18.

1981 *Ozarkodina excavata* (Branson and Mehl). ALDRIDGE, DORNING, and SIVETER, Pl. 2.2, fig. 4.

1981 *Ozarkodina excavata excavata* (Branson and Mehl). VIIRA, p. 181-183, Pl. 31, figs. 1-4, 9, 11; Pl. 43, figs. 1-4; Pl. 44, fig. 7.

1983a *Spathognathodus inclinatus inclinatus* (Rhodes). WANG and ZIEGLER, Fig. 3.13.

1983 *Ozarkodina excavata excavata* (Branson and Mehl). HARRIS, HATCH, and DUTRO, Pl. 1, figs. D-H.

1983 *Ozarkodina excavata excavata* (Branson and Mehl). NOWLAN, Fig. 3N, Q, U.

1985 *Ozarkodina excavata excavata* (Branson and Mehl). SAVAGE, p. 722, Fig. 14.

1985 *Spathognathodus inclinatus inclinatus* (Rhodes). YU, Pl. 2, figs. 3-7; Pl. 3, fig. 9.

1985a *Ozarkodina excavata excavata* (Branson and Mehl). MASTANDREA, p. 250, 252, Pl. 1, figs. 11, 14, 15, 17, 19-21.

1985 *Ozarkodina excavata excavata* (Branson and Mehl). ORCHARD *in* Norford and Orchard, Pl. 1, fig. 19.

1986 *Ozarkodina excavata excavata* (Branson and Mehl). MAWSON, p. 48, Pl. 4, figs. 1-22.

Remarks. A slightly aberrant partial apparatus of this subspecies was recovered from the Douro Formation at Sutherland River (Section 3B; GSC loc. 83667; referred to as *O.* cf. *O. excavata excavata*, illustrated in Plate 15, figs. 1, 2, 6-10). It consists of Pb, M, Sa, Sa-Sb transition, Sb, and Sc elements. The Pb, M, and Sa elements are characterized by a basal flare over the expanded basal cavity, located immediately beneath the cusp. On the Pb and Sa, a thin ridge runs for a short distance on either side of the flare, along the basal margin of the process. Denticles on all these elements have keels and are biconvex in cross-section; in the Sc and Sa, they are discrete, whereas in the Pb element the denticles are confluent to mid-height. The M element is morphologically close to "*Neoprioniodus*" *latidentatus* Walliser, but differs slightly by having an upturned antero-basal corner. This feature is more characteristic of "*N.*" *excavatus* (Branson and Mehl), the form-species that has been included by others in the apparatus of *O. excavata excavata.*

Rexroad et al. (1978) suggested that "*Ozarkodina*" *simplex* Branson and Mehl is not synonymous with "*Prioniodella*" *inclinata* Rhodes and, therefore, that the name *Ozarkodina excavata excavata* should be restricted to an apparatus that includes the former Pa element. Barrick and Klapper (1976), however, noted that in their collections from the Clarita Formation of Oklahoma, there is a wide variation in the morphology of the Pa element, ranging from "*O.*" *simplex* to "*P.*" *inclinata.*

Occurrence. The Cape Phillips Formation (Section 1), Allen Bay–Read Bay carbonates (undivided; Section 2C and Subsection R-D10), Douro Formation (Sections 3A, 3B, and 3C), and the Devon Island Formation (southeast of Section 3A; GSC loc. C-11969). Elsewhere in the Arctic Islands, previously reported from the Cape Storm, Douro, lower member of Peel Sound, Somerset Island, Barlow Inlet, and Devon Island formations (Mirza, 1976, p. 113-115; Uyeno *in* Mayr et al., 1980; Uyeno, 1981a, p. 51-54).

Ozarkodina linearis (Philip)

Plate 5, figures 21-23; Plate 7, figures 15-17;
Plate 9, figures 18-20

1966 *Eognathodus linearis* n. sp. PHILIP, p. 444-445, Pl. 4, figs. 33-36; Textfig. 3.

1970 *Spathognathodus linearis* (Philip). PHILIP and JACKSON *in* Pedder et al., p. 217, Pl. 38, figs. 16-21.

1973 *Ozarkodina linearis* (Philip). KLAPPER *in* Ziegler (ed.), p. 237, *Ozarkodina*–Pl. 2, fig. 2.

1980 *Eognathodus linearis* Philip. SCHÖNLAUB, Pl. 6, fig. 12; Pl. 7, figs. 14, 15, 27, 28, 30.

1980 *Ozarkodina linearis* (Philip). UYENO and KLAPPER, Pl. 8.1, figs. 22-24; Textfigs. 8.2, 8.3.

1987 *Ozarkodina linearis* (Philip). MAWSON, p. 288, 290, Pl. 38.

Remarks. Klapper (*in* Ziegler (ed.), 1973) reassigned this species to the genus *Ozarkodina*, presumably on the basis of the similarity of its Pa element with that of *O. snajdri* (Walliser). Schönlaub (1980) demonstrated that the Pa element may develop a node or a denticulated ridge on the outer flare over the basal cavity. This development was not observed in any of the material included in this study. A reconstruction of the apparatus of *O. linearis* was recently proposed by Mawson (1987).

Occurrence. The Blue Fiord Formation at Sections 1 and 2A, and at Subsection R-A8; at the latter two, found in the lower member of the formation.

Ozarkodina remscheidensis (Ziegler)

Remarks. The lineage of *Ozarkodina remscheidensis*-*O. pandora* Murphy, Matti, and Walliser-*Eognathodus sulcatus* Philip was clearly demonstrated by Murphy et al. (1981). The intermediary taxon was not found in this study.

Ozarkodina remscheidensis remscheidensis (Ziegler)

Plate 4, figures 4-6; Plate 5, figures 1-3, 6-8, 30-33, 36, 37; Plate 6, figure 11; Plate 13, figures 11, 12, 20; Plate 15, figures 27, 28, 32-24; Plate 16, figures 34-40; Plate 17, figures 10, 29-34

1960 *Spathognathodus remscheidensis* n. sp. ZIEGLER, p. 194-196, Pl. 13, figs. 1, 2, 4, 5, 7, 8, 10, 14.

1971 *Spathognathodus steinhornensis remscheidensis* Ziegler. BULTYNCK, p. 11-18, Figs. 4-10.

1973 *Ozarkodina remscheidensis remscheidensis* (Ziegler). KLAPPER *in* Ziegler (ed.), p. 241, 242, *Ozarkodina*–Pl. 2, fig. 4 (includes synonymy).

1973 *Spathognathodus remscheidensis* Ziegler. SAVAGE, p. 329, Pl. 34, figs. 19-29, 33-42; Textfig. 28.

1975 *Ozarkodina remscheidensis remscheidensis* (Ziegler). KLAPPER and MURPHY, p. 41-43, Pl. 7, figs. 22, 25-30.

1976 *Ozarkodina remscheidensis* (Ziegler). SAVAGE, p. 1182, Pl. 1, figs. 1-15.

1977 *Ozarkodina remscheidensis remscheidensis* (Ziegler). BULTYNCK, Pl. 39, figs. 1-9, 11; Pl. 40, figs. 1-19.

1977 *Ozarkodina remscheidensis remscheidensis* (Ziegler). CHATTERTON and PERRY, p. 786, 789-791, Pl. 3, figs. 28-35; Pl. 4, figs. 1-3, 7-9, 23-26, 30, 31, 33-36.

1979 *Ozarkodina remscheidensis remscheidensis* (Ziegler). LANE and ORMISTON, p. 57, Pl. 1, figs. 3-5, 8, 15, 17, 18, 34-36, 43.

1980 *Ozarkodina remscheidensis remscheidensis* (Ziegler). UYENO *in* Mayr et al., Pl. 32.1, fig. 31.

1980 *Ozarkodina remscheidensis remscheidensis* (Ziegler). KLAPPER *in* Klapper and Johnson, p. 450.

1980 *Ozarkodina remscheidensis remscheidensis* (Ziegler). SCHÖNLAUB, Pl. 1, figs. 1-3, 8-10, 12, 13, 15, 16, 18, 20, 21; Pl. 2, figs. 1-3; Pl. 3, figs. 14, 17, 18, 20, 21; Pl. 4, fig. 2 [only]; Pl. 6, figs. 4, 6, 7, 9, 11; Pl. 7, figs. 2, 7, 29.

1980 *Ozarkodina remscheidensis remscheidensis* (Ziegler). SCHÖNLAUB *in* Chlupáč et al., Pl. 18, figs. 11, 14-26; Pl. 19, figs. 7, 13, 14, 18-21; Pl. 20, figs. 1-3.

1980 *Ozarkodina remscheidensis remscheidensis* (Ziegler). SERPAGLI and MASTANDREA, Figs. 1, 6-12.

1980 *Ozarkodina remscheidensis remscheidensis* (Ziegler). JAEGER and SCHÖNLAUB, Pl. 4, figs. 1-3, 8-10, 12, 13, 15, 16, 18, 20, 21; Pl. 5, figs. 1-3.

1981a *Ozarkodina remscheidensis remscheidensis* (Ziegler). UYENO, p. 41, 42, Pl. 3, figs. 1-12, 21-23, 29-38.

1981 *Spathognathodus remscheidensis* Ziegler. WANG, p. 81, 82, Pl. 1, figs. 1-6.

1982 *Ozarkodina remscheidensis* (Ziegler). SAVAGE, p. 986, Pl. 1, figs. 1-23; Pl. 2, figs. 21-26.

1982 *Spathognathodus steinhornensis remscheidensis* Ziegler. DEGARDIN and LETHIERS, p. 347, Pl. 1, fig. 13.

1983a *Ozarkodina remscheidensis* (Ziegler). WANG and ZIEGLER, Fig. 2.21.

1985a *Ozarkodina remscheidensis remscheidensis* (Ziegler). MASTANDREA, p. 252, 254, Pl. 1, figs. 1-7, 12.

1985b *Ozarkodina r. remscheidensis* (Ziegler). MASTANDREA, Pl. 1, fig. 1.

1985 *Ozarkodina remscheidensis remscheidensis* (Ziegler). NEHRING-LEFELD, p. 43-45, Pl. 8, figs. 5-10

1985 *Spathognathodus steinhornensis remscheidensis* Ziegler. NEHRING-LEFELD, p. 44, Pl. 8, figs. 16-21.

1986b *Ozarkodina remscheidensis remscheidensis* (Ziegler). SCHÖNLAUB, Pl. 1, figs. 1-3, 8-10, 12, 13, 15, 16, 18, 20, 21; Pl. 2, figs. 1-3.

1986 *Ozarkodina remscheidensis remscheidensis* (Ziegler). BULTYNCK, p. 202, Pl. 37, figs. 9-11, 13-15, 18.

1986 *Ozarkodina remscheidensis remscheidensis* (Ziegler). BORREMANS and BULTYNCK, p. 52, 53, Figs. 11, 12, 14-20, 22.

1986 *Ozarkodina remscheidensis remscheidensis* (Ziegler). MAWSON, p. 49, Pl. 6, figs. 1-20.

1987 *Ozarkodina remscheidensis* (Ziegler). KUWANO, Pl. 2, figs. 1-6.

Remarks. Bultynck (1971) recognized three morphotypes within the Pa element of *O. remscheidensis remscheidensis*. A similar subdivision was later observed by Chatterton and Perry (1977).

A complete apparatus of *O. remscheidensis remscheidensis* was recovered from the Devon Island Formation at its type section (GSC loc. 83671; Section 3C). This particular apparatus is peculiar, however, in that all the constituent elements are minute, considerably smaller than those in other collections from the Arctic Archipelago or those illustrated in the literature. Other conodonts in the same collection are similarly diminutive, including *Belodella* cf. *B. resima* (Philip; see Pl. 16, figs. 18-22, 25).

A form herein considered to be an aberrant Pa element of *O. r. remscheidensis* was recovered from the Devon Island Formation near its type section (Pl. 17, fig. 10; GSC loc. C-22970; see Appendix). It is similar in many features to that from the Sophia Lake Formation on southwestern Devon Island, illustrated by Uyeno (1981a, Pl. 4, figs. 15-17). Initially such forms were considered to represent the Pa element of *Ozarkodina* n. sp. F of Klapper and Murphy (1975), but that species is herein reassigned to *Amydrotaxis chattertoni* n. sp. As noted under the latter, the remaining constituent elements of their respective apparatuses are required to clearly distinguish the two species. It should be noted further that the aberrant *O. r. remscheidensis* mentioned above is slightly different again from a similar form from the same locality, and illustrated by Uyeno (1981a, Pl. 5, figs. 1-5). The two Sophia Lake morphotypes may be transitional between *O. r. remscheidensis* and *A. chattertoni*, as previously noted under the latter.

Yet another morphotype of the Pa element of *O. r. remscheidensis* was recovered from an unnamed formation on Hyde Parker Island (GSC loc. C-33667). It is transitional to *O. r. repetitor* (Carls and Gandl) in having more even denticulation, but unlike the latter, the denticles are wider anteriorly and not as numerous. This morphotype is associated with *Ancyrodelloides delta* (Klapper and Murphy).

Occurrence. The Cape Phillips Formation and the lower limestone member of the "Eids" Formation at Section 1; the Sutherland River Formation at Sections 3A and 3C; the Devon Island Formation at Section 3C, at Subsection R-A3, and at GSC loc. C-92466 in southwestern Ellesmere Island; and in an unnamed formation on Hyde Parker Island. Elsewhere in the Canadian Arctic Archipelago, previously reported from the Devon Island Formation at Sutherland River (Section 3A) and at a section about 5 km southeast of there (Uyeno, 1981a). Also found in the Upper member of the Drake Bay Formation in the subsurface of Russell Island (Uyeno *in* Mayr et al., 1980).

Ozarkodina remscheidensis eosteinhornensis (Walliser)

Plate 5, figures 4, 5

1964 *Spathognathodus steinhornensis eosteinhornensis.* WALLISER, p. 85, 86, Pl. 9, fig. 15; Pl. 20, figs. 7, 8, 12-16, 19-25.

1971 *Spathognathodus steinhornensis eosteinhornensis* Walliser. BULTYNCK, p. 7-11, Textfigs. 2, 24.

1973 *Ozarkodina remscheidensis eosteinhornensis* (Walliser). KLAPPER *in* Ziegler (ed.), p. 243, 244, *Ozarkodina*–Pl. 2, fig. 5 (includes synonymy).

1973 *Spathognathodus eosteinhornensis* Walliser. POLLOCK and REXROAD, p. 83, figs. 37-40.

1975 *Ozarkodina steinhornensis eosteinhornensis* (Walliser). ALDRIDGE, Pl. 2, figs. 23, 24.

1975 *Spathognathodus steinhornensis eosteinhornensis* Walliser. HELFRICH, Appendix 1-65 to 1-67, Pl. 11, figs. 1-10, 12-16; Pl. 14, figs. 5, 6.

1975 *Ozarkodina remscheidensis eosteinhornensis* (Walliser). KLAPPER and MURPHY, p. 40, 41, Pl. 7, figs. 11-21, 23, 24.

1980 *Ozarkodina r. eosteinhornensis* (Walliser). SCHÖNLAUB, Pl. 3, figs. 10-13, 15, 16.

1980 *Ozarkodina r. eosteinhornensis* (Walliser). SCHÖNLAUB *in* Chlupáč et al., Pl. 17, figs. 16-19; Pl. 18, figs. 9, 10, 12, 13; Pl. 25, figs. 16-18.

1982 *Spathognathodus steinhornensis eosteinhornensis* Walliser. DEGARDIN and LETHIERS, p. 346, 347, Pl. 1, fig. 12.

1983 *Spathognathodus steinhornensis eosteinhornensis* Walliser aff. *Spathognathodus steinhornensis scanicus* (Jeppsson). VIIRA, p. 62, Pl. 8, figs. 1-9; Textfig. 4.

1983 *Spathognathodus steinhornensis eosteinhornensis* Walliser s.s. VIIRA, p. 62, 63, Pl. 9, figs. 1-7; Textfig. 4.

1983 *Ozarkodina remscheidensis eosteinhornensis* (Walliser). HARRIS, HATCH, and DUTRO, Pl. 1, figs. B, C, J, K, L-P; Pl. 2, figs. J-O.

1985 *Ozarkodina remscheidensis eosteinhornensis* (Walliser). ALDRIDGE, p. 90, Pl. 3.4, fig. 20.

1986 *Ozarkodina remscheidensis eosteinhornensis* (Walliser). BULTYNCK, p. 202, Pl. 37, figs. 16, 17, 19, 21.

1987 *Ozarkodina eosteinhornensis* (Walliser). NICOLL and REXROAD, Pl. 3.1, figs. 1-6; Pl. 3.2, figs. 1-5; Pl. 3.3, figs. 1-4; Pl. 3.5, figs. 1-3.

Remarks. Nicoll and Rexroad (1987) reported on several fused clusters, assigned to *O. eosteinhornensis*, from Silurian strata in northern Indiana. They suggested that the apparatus was septimembrate, containing 15 elements. This suggestion could not be confirmed on the basis of the present collections.

Bultynck (1971) differentiated three morphotypes of the Pa element of this subspecies. Subsequently, Viira (1977, p. 184) recognized three different morphotypes among the Pa element, and later (Viira, 1983) this was expanded to four morphotypes, some of which overlap with those of Bultynck (1971): "*Spathognathodus*" *steinhornensis eosteinhornensis* sensu stricto, "*S.*" *s. eosteinhornensis* aff. "*S.*" *s. scanicus* (Jeppsson), "*S.*" *s. eosteinhornensis* aff. "*S.*" *s. remscheidensis* Ziegler, and "*S.*" *s. eosteinhornensis canadensis* Walliser. Of these, the last two are considered herein to be closer to *remscheidensis* (see also Walliser, 1964, p. 87; Klapper et al., 1971, Fig. 1; Uyeno, 1981a, p. 41. The holotype of "*Spathognathodus*" *canadensis* came from the Sutherland River Formation, northwest of Ptarmigan Lake on Devon Island, GSC loc. 26428, and close to Section 3C herein [Walliser, 1960, p. 34; Thorsteinsson, 1963b, p. 229]).

Nine fragmentary specimens were recovered from about the middle of the Cape Phillips Formation at Strathcona Fiord (Section 1), at 262 m above the base of the formation (GSC loc. 83790). They represent the Pa, Pb, and M elements of *Ozarkodina remscheidensis eosteinhornensis.* Although fragmented, the denticulation pattern on the Pa element suggests their assignment to this subspecies.

Genus *Pandorinellina* Müller and Müller, 1957

Type species. *Pandorina insita* Stauffer, 1940.

Pandorinellina exigua (Philip)

Pandorinellina exigua exigua (Philip)

Plate 5, figures 9, 10; Plate 6, figures 28-31; Plate 8, figures 4-6, 12-15, 34-42; Plate 9, figures 26-28, 31-33; Plate 14, figures 21, 22, 28-30; Plate 17, figures 3-5; Plate 19, figures 11-14

1966 *Spathognathodus exiguus* n. sp. PHILIP, p. 449, 450, Pl. 3, figs. 26-37; Textfig. 7.

1973 *Pandorinellina exigua exigua* (Philip). KLAPPER *in* Ziegler (ed.), p. 319, *Ozarkodina*–Pl. 2, fig. 10.

1974 *Pandorinellina exigua exigua* (Philip). KLAPPER *in* Perry et al., p. 1086, 1087, Pl. 6, figs. 12, 13.

1979 *Pandorinellina exigua exigua* (Philip). LANE and ORMISTON, p. 58, 59, Pl. 6, figs. 15, 20, 24-26.

1979 *Pandorinellina exigua exigua* (Philip). UYENO and MAYR, Pl. 38.1, figs. 11, 12.

1980 *Pandorinellina exigua exigua* (Philip). KLAPPER *in* Klapper and Johnson, p. 450.

1980 *Pandorinellina exigua exigua* (Philip). UYENO and KLAPPER, Pl. 8.1, figs. 25-27; Textfigs. 8.2, 8.3.

1981 *Pandorinellina exigua exigua* (Philip). SAVAGE, Pl. 1, figs. 1-16, 21-32.

1987 *Pandorinellina exigua exigua* (Philip). MAWSON, p. 292, 294, Pl. 40.

Remarks. In the present study, the nominate subspecies co-occurs with *P. exigua philipi* (Klapper) in only one sample. This is from the Vendom Fiord Formation at Strathcona Fiord (Section 1), 91 m above the base of the formation (GSC loc. 83798).

As in the case of *P. exigua philipi* (Klapper, 1969, p. 17), the basal cavity outline of the Pa element of the nominate subspecies may be only slightly to markedly asymmetrical. Specimens with the latter characteristic were recovered from the Blue Fiord Formation at Sutherland River, Devon Island (Section 3A), and from the Undivided Devonian carbonates on Grinnell Peninsula (GSC loc. C-22971). The outer lateral lobe over the basal cavity is generally shorter and twice as wide as that on the inner side.

Occurrence. The Vendom Fiord Formation (Section 1 and Subsection R-B12), Eids Formation (Section 2C and Subsection R-A9, and on Bjorne Peninsula, GSC loc. 57730), Disappointment Bay Formation (Crescent Island, GSC loc. C-33680), and Blue Fiord Formation (Sections 2A and 3A; Subsections R-A7, R-A8, R-A9, R-B12, and R-F1), and lower part of the Undivided Devonian carbonates (southeastern Grinnell Peninsula, GSC locs. C-22971 and C-23045). Elsewhere in the Canadian Arctic Archipelago, previously reported from the Blue Fiord Formation in the subsurface of Vanier Island (Uyeno and Mayr, 1979).

Pandorinellina exigua philipi (Klapper)

Plate 6, figures 1-6, 41

1969 *Spathognathodus exiguus philipi* n. subsp. KLAPPER, p. 16-18, Pl. 4, figs. 30-38.

1973 *Pandorinellina exigua philipi* (Klapper). KLAPPER *in* Ziegler (ed.), p. 321, 322, *Ozarkodina*–Pl. 2, fig. 11 (includes synonymy).

1977b *Pandorinellina exigua philipi* (Klapper). SAVAGE, p. 281, Pl. 1, figs. 33, 34.

1977 *Pandorinellina exigua philipi* (Klapper). SAVAGE, CHURKIN, and EBERLEIN, p. 2932, 2934, Pl. 1, figs. 1-33.

1979 *Pandorinellina exigua philipi* (Klapper). LANE and ORMISTON, p. 59, Pl. 6, figs. 1-3, 8, 9.

1980 *Pandorinellina exigua philipi* (Klapper). KLAPPER *in* Klapper and Johnson, p. 450.

1982 *Pandorinellina exigua philipi* (Klapper). HOSE, ARMSTRONG, HARRIS, and MAMET, Pl. 7, figs. 10, 11.

1982 *Spathognathodus exiguus* Philip. WANG, p. 443, 444, Pl. 1, figs. 10-12.

1984 *Pandorinellina exigua philipi* (Klapper). WEDDIGE, Pl. 1, fig. 2.

1985 *Pandorinellina exigua philipi* (Klapper). SAVAGE, BLODGETT, and JAEGER, Pl. 1, figs. 16, 17.

Remarks. The apparatus of *Pandorinellina exigua philipi* was previously reconstructed by Savage et al. (1977), based on material from southeastern Alaska. The specimen illustrated by Wang (1982) has a restricted basal cavity, a feature characteristic of this subspecies. It was recovered from the Lijiang district of Yunnan, China.

Occurrence. The Vendom Fiord (Section 1) and Devon Island formations (Subsection R-A3; near junction of Vendom and Baumann fiords, GSC loc. C-84882), and from an unnamed formation on Crescent Island (GSC loc. C-33681).

Pandorinellina cf. *P. exigua* (Philip)

Plate 6, figure 12

(cf.) 1966 *Spathognathodus exiguus* n. sp. PHILIP, p. 449, 450, Pl. 3, figs. 26-37; Textfig. 7.

Remarks. Two spathognathodontan specimens were recovered from the Devon Island Formation west of Vendom Fiord on Ellesmere Island (Subsection R-A3; GSC loc. C-76213). They are similar to the Pa element of *Pandorinellina exigua*, but differ slightly in having only a very moderate right-lateral offset (Klapper, 1969, p. 16). The symmetrical basal cavity that is confined to the central part of the blade resembles that of *P. exigua philipi*.

Pandorinellina expansa Uyeno and Mason

Plate 5, figures 24-29; Plate 6, figures 7, 8; Plate 7, figures 21-26, 31; Plate 8, figures 1-3, 18; Plate 9, figures 23-25, 30

1972 *Spathognathodus* n. sp. A. UYENO *in* McGregor and Uyeno, p. 13, Pl. 5, figs. 19-21, 30-32.

1974 *Pandorinellina exigua* n. subsp. A. KLAPPER *in* Perry et al., p. 1087, Pl. 6, figs. 1-8.

1975 *Pandorinellina expansa* n. sp. UYENO and MASON, p. 718-720, Pl. 1, figs. 6, 9, 11-19.

1976 *Spathognathodus* n. sp. A of McGregor and Uyeno, 1972. FORDHAM, Pl. 4, figs. 7-17.

1976 *Ozarkodina* n. sp. A of McGregor and Uyeno, 1972. FORDHAM, Pl. 4, fig. 26.

1977 *Pandorinellina expansa* Uyeno and Mason. KLAPPER *in* Ziegler (ed.), p. 435, 436, *Pandorinellina*–Pl. 1, figs. 9-17 (includes synonymy).

1979 *Pandorinellina expansa* Uyeno and Mason. LANE and ORMISTON, p. 59, Pl. 7, figs. 3, 4, 22, 27, 28; Pl. 9, fig. 12.

1979 *Pandorinellina expansa* Uyeno and Mason. UYENO and MAYR, Pl. 38.1, figs. 43, 44.

1980 *Pandorinellina expansa* Uyeno and Mason. UYENO and KLAPPER, Pl. 8.1, figs. 29-31; Figs. 8.2, 8.3.

1981 *Pandorinellina expansa* Uyeno and Mason. UYENO *in* Norris and Uyeno, p. 27, Pl. 11, figs. 26-28.

1984 *Pandorinellina expansa* Uyeno and Mason. SOBOLEV, Pl. 5, figs. 1, 14.

Occurrence. The Blue Fiord Formation (Sections 1 and 2A; Subsections R-A4, R-A7, R-A8, R-B19, and R-D14), Bird Fiord Formation (Section 2A and three localities close to 2A, GSC locs. C-76074 to C-76076), and Strathcona Fiord Formation (Subsections R-A7 and R-D14), and the upper part of the Undivided Devonian carbonates on southeastern Grinnell Peninsula. Elsewhere in the Canadian Arctic Archipelago, previously reported from the "Eids" Formation at Twilight Creek in northeastern Bathurst Island (McGregor and Uyeno, 1972; Uyeno and Mason, 1975), and the Blue Fiord Formation in the subsurface of Cameron Island (Uyeno and Mayr, 1979).

Pandorinellina n. sp. O of Klapper, 1980

Plate 6, figures 38-40

1980 *Pandorinellina* n. sp. O. KLAPPER *in* Klapper and Johnson, p. 451 (includes synonymy).

1981 *Pandorinellina optima* (Moskalenko). SAVAGE, Pl. 1, figs. 17-20.

Remarks. The Pa element of *Pandorinellina* n. sp. O is relatively longer than its counterpart of *P. optima*, the large denticles being restricted to about a quarter of the unit anteriorly. In the latter, these denticles occupy a relatively wider space, about a third of the unit length. The basal cavity of *P.* n. sp. O is located about mid-length of the unit, whereas in *P. optima* it is situated slightly posterior of centre.

Three specimens were recovered from the Devon Island Formation west of Vendom Fiord (Subsection R-A3), at 12 m below the top of the formation (GSC loc. C-76214).

Pandorinellina sp. A

Plate 19, figures 5-10, 16, 17

(cf.) 1979 *Pandorinellina steinhornensis praeoptima* (Mashkova). LANE and ORMISTON, p. 59, Pl. 3, figs. 1, 5.

Remarks. Twelve spathognathodontan elements were recovered from an unnamed formation on Crescent Island (GSC loc. C-33621). They are somewhat similar to the form illustrated by Lane and Ormiston (1979) from the Salmontrout Limestone of eastern Alaska. The unit has a single denticle centrally located over the basal cavity.

There are five to seven denticles on the anterior half of the blade, and four to seven on the posterior half. The one or two denticles near the anterior end of the blade tend to be higher and wider than the remainder and are of similar size to the centrally located denticle. The denticles on the posterior half gradually decrease in height distally. The flare over the basal cavity is wide and slightly asymmetrical, and has its anterior edge situated about mid-length of the blade. The present form occurs within the *kindlei* Zone.

The Alaskan form has a similar number of denticles, about three on the anterior and seven on the posterior half. The denticles, which are smaller than those of the present species, also tend to be of more uniform size. It is from the *sulcatus* and *kindlei* zones. The small Crescent Island form (Pl. 19, fig. 10) is closer to the Alaskan species.

The present unnamed species is referred to the genus *Pandorinellina* on the basis of its overall similarity with the Alaskan form.

Pandorinellina? sp.

Plate 9, figure 17

(?)1979 *Ozarkodina* sp. or *Pandorinellina* sp. UYENO and MAYR, Pl. 38.1, figs. 6, 7.

Remarks. A single spathognathodontan element was recovered from the *inversus* Zone, in the lower part of the upper brown limestone member of the Blue Fiord Formation at its type area (Section 2A; GSC loc. 83742). The specimen is small, presumably juvenile, and is characterized by a single high denticle, centrally located over the basal cavity. The eight denticles located posterior of it are of uniform size. Of the seven on the anterior half of the blade, the three at the distal end are slightly wider than others. It is questionably assigned to *Pandorinellina* since its apparatus is not known.

A morphologically similar form, again represented by a single specimen, was recovered from the reef flank facies of the Blue Fiord Formation in the subsurface of Vanier Island (Uyeno and Mayr, 1979). Its occurrence there probably falls within the interval of *gronbergi* to *inversus* zones. It differs from the Ellesmere Island specimen in that its anterior denticles are taller distally.

Family UNKNOWN

Genus *Dapsilodus* Cooper, 1976

Type species. *Distacodus obliquicostatus* Branson and Mehl, 1933.

Dapsilodus obliquicostatus (Branson and Mehl)

Plate 2, figures 11-15

1933 *Distacodus obliquicostatus* n. sp. BRANSON and MEHL, p. 41, Pl. 3, fig. 2.

1976 *Dapsilodus obliquicostatus* (Branson and Mehl). COOPER, p. 212, Pl. 2, figs. 10-13, 18-20.

1977 *Dapsilodus obliquicostatus* (Branson and Mehl). BARRICK, p. 50-52, Pl. 2, figs. 6, 10, 13.

1978 *Dapsilodus obliquicostatus* (Branson and Mehl). REXROAD, NOLAND, and POLLOCK, p. 4, Pl. 1, fig. 9.

1981 *Dapsilodus obliquicostatus* (Branson and Mehl). ALDRIDGE, DORNING, and SIVETER, Pl. 2.1, figs. 6-8.

1983 *Dapsilodus obliquicostatus* (Branson and Mehl). UYENO and BARNES, p. 16, Pl. 9, figs. 11, 12.

1984 *Dapsilodus obliquicostatus* (Branson and Mehl). ALDRIDGE and JEPPSSON, Textfig. 3a-c.

1986 *Dapsilodus obliquicostatus* (Branson and Mehl). NAKREM, Fig. 7l.

1986 *Distacodus obliquicostatus* Branson and Mehl s.f. NEHRING-LEFELD, Pl. 3, fig. 4; Pl. 5, fig. 10.

Occurrence. The upper part of the Allen Bay Formation and the lower part of the overlying Cape Phillips Formation at Strathcona Fiord (Section 1). Also found in these formations, as well as in the Allen Bay–Read Bay carbonates (undivided) in the two Bjorne Peninsula wells (Sections 2B and 2C). In the Arctic Islands, previously reported from the Cape Storm Formation in the Vendom Fiord area on Ellesmere Island (Mirza, 1976, p. 87).

Genus *Decoriconus* Cooper, 1975

Type species. *Paltodus costulatus* Rexroad, 1967.

Decoriconus fragilis (Branson and Mehl)

Plate 11, figures 11, 13-17, 21, 22

1933 *Paltodus fragilis* n. sp. BRANSON and MEHL, p. 43, Pl. 3, fig. 6.

1976 *Decoriconus fragilis* (Branson and Mehl). COOPER, p. 212, 213, Pl. 2, figs. 5, 8, 14-17.

1977 *Decoriconus fragilis* (Branson and Mehl). BARRICK, p. 53, 54, Pl. 2, figs. 15, 21-23 (includes synonymy).

1981 *Decoriconus fragilis* (Branson and Mehl). ALDRIDGE, DORNING, and SIVETER, Pl. 2.1, figs. 3-5.

1983 *Decoriconus fragilis* (Branson and Mehl). UYENO and BARNES, p. 16, 17, Pl. 9, figs. 1-10, 13-16.

1984 *Decoriconus fragilis* (Branson and Mehl). ALDRIDGE and JEPPSSON, Textfig. 3d-f.

Remarks. A small, denticulate form, represented by five specimens (Pl. 11, figs. 11, 13, 17, 21, 22), was recovered from the lower Cape Phillips Formation in the subsurface on Bjorne Peninsula, Ellesmere Island (Section 2B). It is included in the *Decoriconus fragilis* apparatus because of its overall similarity to those forms, in particular the Sa-Sb element, previously assigned to that species. The unit is laterally compressed with the cusp reclined, and is moderately bowed inward. The outline of the anterior margin is broadly rounded, and the margin itself is keeled. A thin ridge may be present on one or both of the lateral faces, near the anterior margin, and positioned about mid-height of the unit; the ridge runs subparallel to, and distally approaches, the anterior margin. A series of short ridges may be present at the basal part of the anterolateral faces. The unit is widest at its base and has an inconspicuous heel. An indistinct furrow is present on both lateral faces. The denticles are of irregular sizes, some confluent with their apices, and others discrete; they all point toward the cusp tip. Both lateral faces are finely costate except near the base. The basal cavity is shallow and, where clearly discernible, has only one tip; its marginal outline as viewed basally, is lenticular. White matter occurs throughout the cusp.

The short basal ridges are also present in rastrate elements of *Pseudobelodina*, and in some elements of *Dapsilodus*. The basal cavity in the former is deep with two tips, whereas the present form is shallow with only one tip. The denticulation pattern is unlike that in *Pseudobelodina*, which is normally regular, although *P. dispansa* (Glenister) may display a similar pattern; it is also unlike that in *Belodella*, which is numerous and acicular.

A *Decoriconus* apparatus that includes an element with serrated posterior edge was previously reported by McCracken and Barnes (1981, Pl. 2, fig. 24). It should be noted, however, that the serration on that element is much less conspicuous than the denticulation on the present specimen.

McCracken and Barnes (1981, p. 74, Pl. 3, fig. 26) described a specimen as *Belodella*? n. sp. A, from the lowest part of Member 6 of the Ellis Bay Formation on Anticosti Island. The principal difference between it and the Cape Phillips form is the deep cavity, extending to about two thirds the unit height, in the former.

Occurrence. The lower part of the Cape Phillips Formation at Section 2B, and from the Allen Bay Formation and the lowest part of the Allen Bay–Read Bay carbonates (undivided) at Section 2C, both on Bjorne Peninsula.

Genus *Erika* Murphy and Matti, 1983

Type species. *Erika divarica* Murphy and Matti, 1983.

Remarks. Murphy and Matti (1983, p. 41) recorded this genus from the *delta* Zone in Nevada. If the generic assignment of the species reported herein is correct, *Erika* may have appeared as early as the *hesperius* Zone.

Murphy (1987, p. 292) suggested that *Erika divarica* Murphy and Matti may have been restricted to particular habitats and was not abundant in its community.

Erika cf. *E. divarica* Murphy and Matti

Plate 13, figures 9, 10

(cf.) 1983 *Erika divarica* n. sp. MURPHY and MATTI, p. 41-44, Pl. 6, figs. 1-13; Textfig. 7.

Remarks. Five specimens that are similar to the Sc and Sb elements of *Erika divarica* were recovered from the type section of the Sutherland River Formation (GSC loc. 83676; Section 3A) and from an unnamed formation on Hyde Parker Island (GSC loc. C-33667). As pointed out by Murphy and Matti (1983), the characteristic features of this species include an inverted basal cavity, alternate denticles that are directed in different directions, the U-shaped outline of the elements, and the peg-like denticles. The alternation in denticles is, superficially at least, similar to that of *Apatognathus* Branson and Mehl, although it is a much more uniform feature in that form-genus.

Unlike the Sc element of *Erika divarica*, the present form has a much more prominent cusp and a posterior process that curves downward distally. The Sb element has a similarly prominent cusp. The large, lenticular pit of the Sb, however, is not situated beneath the cusp, but rather is located about midway along the longer of the two lateral processes; its exact position cannot be determined, since that process is incomplete in the only specimen that can be confidently assigned to this element.

Erika divarica was reported from the *delta* Zone in central Nevada. The present form is similarly associated with *Ancyrodelloides delta* Murphy and Matti in an unnamed formation. Its occurrence in the Sutherland River Formation cannot be as precisely dated, but based on its association with *Amydrotaxis chattertoni* n. sp., it is probably slightly older, in the range of the *hesperius* to *eurekaensis* zones.

Genus *Pseudooneotodus* Drygant, 1974

Type species. *Oneotodus*? *beckmanni* Bischoff and Sannemann, 1958.

Remarks. Pseudooneotodus was emended as a multielement genus by Barrick (1977, p. 57), with two known species, each of which includes squat and slender forms with a single apical denticle. The distinguishing elements of these species are the two-denticle form in *P. bicornis* Drygant and the three-denticle form in *P. tricornis* Drygant.

In collections from Strathcona Fiord (Section 1), the single denticle and two-denticle forms are present, but are mutually exclusive. Also, in two samples from the Jupiter Formation on Anticosti Island, only the single denticle element was recovered (Uyeno and Barnes, 1983, p. 23; GSC locs. C-92669 and C-92705). Presumably there were at least two *Pseudooneotodus* apparatuses that were composed only of single denticle elements, namely *P. beckmanni* (Bischoff and Sannemann) and *P. mitratus* (Moskalenko) (see Cooper, 1977a, p. 1069; McCracken and Barnes, 1981, p. 89).

Pseudooneotodus humilis Orchard (1980, p. 25) has two cones, one a single denticle element and the other a cone that bears an apical ridge.

Pseudooneotodus beckmanni (Bischoff and Sannemann)

Plate 1, figures 36, 37

1958 *Oneotodus*? *beckmanni* n. sp. BISCHOFF and SANNEMANN, p. 98, Pl. 15, figs. 22-25.

1976 *Oneotodus*? *beckmanni* Bischoff and Sannemann. WEYANT, p. 159, Pl. 34, figs. 4, 5.

1977a *Pseudooneotodus beckmanni* (Bischoff and Sannemann). COOPER, p. 1068, 1069, Pl. 2, figs. 14, 17.

1979 *Pseudoneotodus beckmanni* (Bischoff and Sannemann). ROSS, NOLAN, and HARRIS, Fig. 6y.

1981 *Pseudooneotodus beckmanni* (Bischoff and Sannemann). NOWLAN and BARNES, p. 23, Pl. 2, figs. 20, 21 (includes synonymy to 1978).

1981 *Pseudooneotodus beckmanni* (Bischoff and Sannemann). McCRACKEN and BARNES, p. 89, Pl. 2, figs. 30, 31.

1981 *Pseudooneotodus beckmanni* (Bischoff and Sannemann). NOWLAN, Pl. 5, fig. 31.

1983 *Pseudooneotodus bicornis* Drygant. UYENO and BARNES, p. 23, Pl. 3, figs. 25, 26 (only).

1984 *Pseudooneotodus beckmanni* (Bischoff and Sannemann). IDRIS, Pl. 1, fig. 21.

1985a *Pseudooneotodus beckmanni* (Bischoff and Sannemann). MASTANDREA, Pl. 1, fig. 10.

1986 *Pseudooneotodus beckmanni* (Bischoff and Sannemann) s.f. NEHRING-LEFELD, Pl. 6, fig. 8.

Occurrence. The Allen Bay (Section 1), Cape Phillips (Section 2B), and Blue Fiord formations (Sections 2A and 3A, and Subsection R-A8). Previously Weyant (1968, p. 64) reported it from Hoved Island, but did not give details of its distribution, other than that it occurs in the upper half of the limestones, and thus presumably in the Allen Bay(?) Formation.

Pseudooneotodus bicornis Drygant

Plate 2, figures 37, 38

1974 *Pseudooneotodus bicornis* n. sp. DRYGANT, p. 67, Pl. 2, figs. 40-48.

1981 *Pseudooneotodus bicornis* Drygant. ALDRIDGE, DORNING, and SIVETER, Pl. 2.1, figs. 1, 2.

1983 *Pseudooneotodus bicornis* Drygant. UYENO and BARNES, p. 23, Pl. 3, figs. 27, 28 (only) (includes synonymy to 1980).

1983a *Pseudooneotodus bicornis* Drygant. WANG and ZIEGLER, Figs. 3.18, 3.19.

1985 *Pseudooneotodus bicornis* Drygant. MABILLARD and ALDRIDGE, Textfig. 7e.

1985 *Pseudooneotodus bicornis* Drygant. ALDRIDGE, p. 86, 87, Pl. 3.3, fig. 16.

1986 *Pseudooneotodus bicornis* Drygant s.f. NEHRING-LEFELD, p. 635, Pl. 2, fig. 13; Pl. 6, figs. 3, 4.

Occurrence. Two specimens from the lower Cape Phillips Formation at Strathcona Fiord (Section 1), at GSC locality 83783.

Apparatus A of Uyeno (1981a)

Plate 4, figure 31

1981a Apparatus A. UYENO, p. 48, Pl. 9, figs. 1-6, 12, 13.

Occurrence. A single specimen, identical to those previously referred to the Pa? element of Apparatus A by Uyeno (1981a), from the lower Cape Phillips Formation at Strathcona Fiord (Section 1) at 78 m above the base of the formation (GSC loc. 83785). Previously recovered from the Cape Storm Formation at Goodsir Creek on eastern Cornwallis Island (Uyeno, 1981a), and at northwestern Somerset Island (in undescribed collections).

Apparatus B of Uyeno (1981a)

Plate 15, figures 11-14

1980 Apparatus B. UYENO *in* Mayr et al., Pl. 32.1, figs. 8, 21, 27, 34.

1981a Apparatus B. UYENO, p. 48, Pl. 10, figs. 6, 7, 10-12, 18-22.

Remarks. Additional specimens that may be assigned to Apparatus B of Uyeno (1981a) were recovered from the upper part of the Douro Formation at Sutherland River (Sections 3A and 3B). As noted earlier, the characteristic features of the components of this apparatus are the extremely small pit surrounded by a wide inverted basal cavity, the latter being wider on the outer than the inner side. The lower margin is entirely keeled, disrupted only by the pit. The peg-like denticles are biconvex in cross-section, usually more rounded on the outer side, and have U-shaped intervening spaces. The inverted basal cavity and the lateral faces of the unit meet at a high angle, and often a low ridge is formed at this junction. In the present collection, the digyrate element is designated Pa; the other two elements designated are Pb and (?)M, the latter also slightly digyrate.

As also noted earlier, *Oulodus* sp. 3 of Uyeno (1981a) differs from Apparatus B in displaying a sharp, ridge-like protrusion at the junction of the inverted basal cavity and lateral faces.

Occurrence. The upper part of the Douro Formation on Boothia Peninsula (GSC loc. C-26655), and lower part of the Peel Sound Formation on Prince of Wales Island (GSC loc. C-63592; Uyeno, 1981a); previously reported from the Read Bay Group (undivided) and Cape Storm Formation in the subsurface of eastern Prince of Wales Island, and in the Douro Formation in the subsurface of Russell Island (Uyeno *in* Mayr et al., 1980).

Apparatus C

Plate 20, figures 17-22

Remarks. An apparatus consisting of six elements, associated with conodonts of the *delta* Zone, was recovered from an unnamed formation on Hyde Parker Island (GSC loc. C-33666). All the elements are characterized by their small size, the prominent cusp that is finely striated throughout its length, short processes, and by the relatively large basal cavity. Except for the Sa and Sc elements, the cusp tends to be compressed. The apparatus cannot be readily assigned to any genus at this time, principally because of the peculiar Pa element.

The Pa element is a subsymmetrical form that is almost palmate. Each of the short lateral processes bears three denticles that are confluent to about their mid-length. The basal cavity occupies the entire lower surface, widest beneath the cusp, and rapidly tapers to both ends. The Pb element is similar to Pa, but its orientation is distinctly different: the cusp is keeled anteriorly and posteriorly rather than laterally, with corresponding anterior and posterior processes, each of which bears three denticles. The basal cavity is confined to that area immediately beneath the cusp. The M element consists of a large cusp that is slightly twisted and is sinuous in lateral outline. The cusp is keeled on both sides but has a short process, with three short denticles, on one side only.

The symmetry transition series consists of three elements, each with a large basal cavity that is restricted to the area beneath the cusp. The Sc element has a short cusp with circular cross-section and a short posterior process bearing two stubby denticles. The keel on the inner lateral side of the cusp is extended basally and posteriorly on the upper surface of the lateral process. The keel on the outer lateral side is extended basally only, and forms a part of the anticusp process. The posterior face of the cusp of the Sb element bears a distinct keel that is slightly off-centre. The keel is extended posteriorly and basally over a short process. A second keel on the inner lateral side of the cusp is extended laterally and merges with a short process that bears three stubby denticles. The third keel on the outer lateral side of the cusp is extended basally only. The symmetrical Sa element has a cusp with circular cross-section. Short processes are attached at the base of the cusp on lateral and posterior sides, the last of which bears two denticles.

"*Neoprioniodus*" sp. A

Plate 12, figure 10; Plate 14, figures 4, 6

Remarks. Six neoprioniodinid elements were recovered from the uppermost part of the Douro Formation, within the *siluricus* Zone, at Sutherland River (Sections 3A and 3B; GSC locs. 83675 and 83669). The apparatus to which they belong is not known at present.

The unit consists of a reclined cusp that has a biconvex cross-section with sharp anterior and posterior edges. Three to six denticles are present on the posterior process. They are considerably smaller than the cusp, but similarly shaped and confluent with adjacent denticles only at their bases. Those at the posterior end tend to be more reclined than others. The cusp is flexed inward rather strongly. The basal cavity is located beneath the cusp and continues as a long, narrow groove throughout the length of the process. In lateral view, the basal margin is straight under the process with a downward sigmoidal curve under the cusp. The extreme anterobasal corner of the specimen illustrated in Plate 14, figure 4 is broken.

"*Neoprioniodus*" sp. A displays some features similar to M elements of previously described species, such as *Ozarkodina pirata* Uyeno and Barnes. The present form differs principally in the relatively shorter posterior process with fewer denticles and in the rounded anterobasal corner.

Genus and species indet. B

Plate 9, figure 29

Description. A small, simple cone with a strongly recurved cusp that is filled with white matter. The base of the unit is completely excavated and widely inflated on the outer side. A conical apex of the basal cavity is located near the anterior margin of the cusp base. The inner side of both the cusp and the base is flat, so that in lower view, the basal margin is semicircular in outline. A distinct keel that is offset from the median to the inner side runs from the cusp tip to the basal margin. Another distinct keel occurs on the outer side, running from the cusp base downward to slightly beyond the basal margin. The base is relatively short and the basal margin forms an acute angle with the anterior and posterior margins of the unit.

Remarks. Five specimens were recovered from the *inversus* Zone in the lower half of the brown limestone member of the Blue Fiord Formation at Section 2A. They are morphologically similar to the simple cones described from the Eifelian (*ensensis* Zone) Spillville Formation in northern Iowa (Klapper and Barrick, 1983, p. 1230, Figs. 7N, O). The Iowa specimens differ principally in their longer base, less conspicuous outer keel, and in the formation of an obtuse angle at the junction of the basal and anterior margins. The Iowa specimens, too, may represent the M element of *Ozarkodina raaschi* Klapper and Barrick.

A similar form has been recovered from the Bird Fiord Formation east of Vendom Fiord (Subsection R-B19; GSC loc. C-76243). There, it probably represents the M element of an *Ozarkodina* apparatus. Another similar form was reported from the Eids Formation in northwestern Victoria Island, which was questionably referred to as the Pb element of *Pandorinellina expansa* Uyeno and Mason (Uyeno *in* Mayr et al., 1980, Pl. 32.1, fig. 49). Yet another similar form is the M element of *O. brevis* (Bischoff and Ziegler; see Uyeno *in* Norris et al., 1982, Pl. 32, figs. 33, 34).

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APPENDIX

PART 1

Listing of megafossils and palynomorphs by section/area

(Note: three sets of GSC locality numbers are used: Ottawa-based numbers, without any prefix; Calgary-based numbers, with prefix C-; and plant locality numbers.)

SECTION 1: STRATHCONA FIORD AREA

Allen Bay Formation

GSC plant loc. 8721: 283 m above base of formation.
(R. Thorsteinsson, pers. comm., 1969)

?*Petalograptus* sp.

Age: possibly middle Llandovery

Cape Phillips Formation

Talus material close to **GSC plant loc. 8722:** 26 m above base of formation.
(R. Thorsteinsson, pers. comm., 1985)

Stomatograptus grandis (Suess)
Cyrtograptus sakmaricus Koren

Age: *Cyrtograptus sakmaricus-C. laqueus* Zone of latest Llandovery age.

GSC loc. 83783: 52 m above base of formation.
(Identified by B.S. Norford; Report no. S-3-BSN-1983)

echinoderm fragments
ostracode
bryozoans
solitary corals
Favosites? sp.
Heliolites? sp.
Multisolenia sp.
numerous undetermined brachiopod genera
Cyrtia sp.
Dicoelosia sp.
Howellella? sp.
Lissatrypa? sp.
Nucleospira sp.
Pentamerus? sp.
Skenidioides sp.
Spinatrypa? sp.
Bumastus? sp.
Cyphoproetus? sp.
Encrinurus sp.
Dictyonema sp.
Monograptus cf. *M. parapriodon* Bouček
anaspid fish (id. R. Thorsteinsson)
aff. *Tolypelepsis* sp. (id. R. Thorsteinsson)

Age: Early Silurian, latest Llandovery (*sakmaricus-laqueus* Zone) to early Wenlock.

GSC loc. 83785: 78 m above base of formation.
(Identified by A.W. Norris; Report no. 8-AWN-85)

stromatoporoid fragments
thamnoporid fragments
cup coral fragments
Dicaelosia sp. cf. *D. diversifrons* Johnson, Boucot and Murphy (1976)
fish bone fragments

Age: Ludlow, Late Silurian.

Comments: The form tentatively referred to *Dicaelosia diversifrons* Johnson, Boucot and Murphy occurs typically in the D Fauna of Ludlovian age in the Roberts Mountains Formation of Nevada. The arctic form is not as deeply indented at the anterior end, but has the same fine branching costellae.

GSC loc. 83789: 243 m above base of formation.
(Identified by A.W. Norris; Report no. 8-AWN-1985)

fish bone fragment

Age: not determined.

"Eids" Formation, lower limestone member

GSC loc. 83795: 6 m above base of formation.
(Identified by A.W. Norris; Report no. 8-AWN-1985)

auloporids
Coenites sp.
cf. *Stylopleura* sp.–fragments
cf. *Eoschuchertella* sp.
Ancillotoechia sp. cf. *A. gutta* Johnson, Boucot and Murphy

Age: early Lochkovian, Early Devonian.

GSC loc. 83796: 32 m above base of formation.
(Identified by A.W. Norris; Report no. 8-AWN-1985)

auloporid

thamnoporid
Iridistrophia sp.
Salopina submurifer Johnson, Boucot and Murphy
Resserella sp. cf. *R. elegantuloides* (Kozlowski)
Gypidula peligica lux Johnson, Boucot and Murphy
Schizophoria paraprima Johnson, Boucot and Murphy
Atrypa nieczlawensis Kozlowski
Ancillotoechia sp.
Katunia? sp.
echinoderm ossicle with single axial canal

Age: *Gypidula pelagica* Fauna of Lenz (1966), early Lochkovian, Early Devonian.

Comments: The brachiopods in samples 83795 and 83796 are typical of the widespread *Gypidula pelagica* Fauna of Lenz (1966), which indicate an early Lochkovian, Early Devonian age. Elements of the fauna have been described by Johnson et al. (1973) from Nevada, by Norris and Uyeno (1981) from Cathedral Mountain, southwestern District of Mackenzie, by Perry (1984) from the District of Mackenzie and Yukon Territory, by Lenz (1977a, b) from Royal Creek, Yukon Territory, and others.

GSC plant loc. 8736: 54 m above base of formation. (Identified by D.C. McGregor; Report no. F1-3-1981-DCM)

Aneurospora sp.
Apiculiretusispora? *spicula* Richardson and Lister
Apiculiretusispora spp.
Cymbosporites sp. cf. *C. catillus* Allen
Hispanaediscus sp. (McGregor and Narbonne, 1978)
Retusotriletes spp.
Tholisporites chulus (Cramer) McGregor var. *chulus*

Remarks: The most likely age is Gedinnian. Several fragments of eurypterid cuticle were recovered, and together with acritarchs and scolecodonts they indicate a nearshore marine depositional environment.

Vendom Fiord Formation

GSC loc. 83798: 91 m above base of formation. (Identified by A.W. Norris; Report no. 8-AWN-1985)

Desquamatia n. sp. of Ludvigsen (1970)

Age: *Sieberella-Nymphorhynchia pseudolivonica* Fauna of Lenz (1968), probably equivalent to conodont *dehiscens* Zone, late Pragian-early Zlichovian.

Comments: *Desquamatia* n. sp. of Ludvigsen (1970) occurs typically in the Michelle Formation of the northern Yukon Territory where it is associated with conodonts of the *dehiscens* Zone of Late Pragian-early Zlichovian age (Jackson et al., 1978).

GSC plant loc. 8740: 91.3 m above base of formation. (Identified by D.C. McGregor: Report no. F1-3-1981-DCM)

Apiculatasporites perpusillus (Naumova) McGregor
Apiculatisporis microconus Richardson
Apiculiretusispora spp.
cf. *Camptozonotriletes caperatus* McGregor
Clivosispora ?*verrucata* McGregor
cf. *C. verrucata* McGregor var. *convoluta* McGregor and Camfield
Dibolisporites ?*bullatus* Allen
D. ?*eifeliensis* (Lanninger) McGregor
Dictyotriletes ?*gorgoneus* Cramer
D. subgranifer McGregor
D. spp.
Emphanisporites rotatus McGregor
Retusotriletes pychovii Naumova
Verruciretusispora dubia (Eisenack) Richardson and Rasul
cf. *Verrucosisporites palygonalis* Lanninger

Remarks: Spores are exceptionally abundant in this sample. The age is early Emsian (approximately Zlichovian). A few scolecodonts were found, indicating a marine influence at the site of deposition.

GSC plant loc. 8745: 299 m above base of formation. (Identified by D.C. McGregor; Report no. F1-3-1981-DCM)

Apiculatisporis microconus Richardson
cf. *Archaeozonotriletes columnus* Allen
A. divellomedium Chibrikova
?*Bullatisporites bullatus* Allen
Camarozonotriletes sextantii McGregor and Camfield
Dibolisporites echinaceus (Eisenack) Richardson
D. eifeliensis (Lanninger) McGregor
D. ?*quebecensis* McGregor
D. ?*wetteldorfensis* Lanninger
Dictyotriletes emsiensis (Allen) McGregor
D. ?*gorgoneus* Cramer
D. ?*minor* Naumova
Emphanisporites minutus Allen
E. rotatus McGregor
Retusotriletes ?*dubiosus* McGregor
R. pychovii Naumova
?*Stenozonotriletes furtivus* Allen
?*Verrucosisporites polygonalis* Lanninger

Remarks: The age is early Emsian.

Blue Fiord Formation

GSC plant loc. 8752: 18 m below top of formation. (Identified by D.C. McGregor; Report no. F1-3-1981-DCM)

Ancyrospora sp. cf. *A. nettersheimensis* Riegel
Apiculatisporis microconus Richardson
Apiculiretusispora plicata (Allen) Streel
Dibolisporites echinaceus (Eisenack) Richardson
Grandispora spp.
Retusotriletes ?microaculeatus Chibrikova

Remarks: In terms of the western European standard this sample is within the age range upper Wetteldorf Schichten to upper Lauch Schichten, i.e. close to the Emsian-Eifelian boundary. The general aspect of the assemblage suggests a a latest Emsian age, but this conclusion is tentative.

Strathcona Fiord Formation, Okse Bay Group

GSC plant loc. 8754: 39.5 m above base of formation. (Identified by D.C. McGregor; Report no. F1-3-1981-DCM)

Acinosporites acanthomammillatus Richardson
A. lindlarensis Riegel var. *minor* McGregor and Camfield
Ancyrospora longispinosa Richardson
Anulatisporites sp.
Apiculiretusispora plicata (Allen) Streel
Archaeozonotriletes divellomedium Chibrikova
Brochotriletes sp.
Bullatisporites bullatus Allen
Calamospora atava (Naumova) McGregor
Calyptosporites decorus Tiwari and Schaarschmidt
?*C. spinosus* Tiwari and Schaarschmidt
?*Camptotriletes simplex* Naumova
cf. *Cristatisporites orcadensis* Richardson
Dibolisporites echinaceus (Eisenack) Richardson
D. gibberosus (Naumova ex Kedo) Richardson
D. gibberosus (Naumova ex Kedo) Richardson var. *major* Kedo
Dictyotriletes spp.
Emphanisporites minutus Allen
E. schultzii McGregor
Hymenozonotriletes dasydentatus Chibrikova
?*H. ollii* Chibrikova
Hystricosporites porrectus (Balme and Hassell) Allen
Retusotriletes ?dubiosus McGregor
?*R. microaculelatus* Chibrikova
R. pychovii Naumova
R. ?rotundus (Streel) Streel
cf. *Rhabdosporites langii* (Eisenack) Richardson
cf. *Samarisporites praetervisus* (Naumova) Allen
Verruciretusispora dubia (Eisenack) Richardson and Rasul

Remarks: The age is early Eifelian.

GSC plant loc. 8759: 349 m above base of formation. (Identified by D.C. McGregor; Report no. F1-3-1981-DCM)

cf. *Acinosporites acanthomammillatus* Richardson
A. apiculatus (Streel) Streel
A. macrospinosus Richardson
Anapiculatisporites petilus Richardson
Apiculiretusispora brandtii Streel
Bullatisporites bullatus Allen
Dibolisporites echinaceus (Eisenack) Richardson
Emphanisporites minutus Allen
E. rotatus McGregor
E. schultzii McGregor
Grandispora velata (Eisenack) Playford
Hymenozonotriletes ollii Chibrikova
Hystricosporites gravis Owens
Retusotriletes divulgatus Chibrikova
R. rotundus (Streel) Streel
Verruciretusispora dubia (Eisenack) Richardson and Rasul

Remarks: The age is Eifelian, probably early Eifelian.

COMPOSITE SECTION R-A: WEST OF VENDOM FIORD

SUBSECTION R-A3

Devon Island Formation

Note: The following two localities are from a section located 3.5 km northeast of Subsection R-A3, at UTM Zone 17X, 431 000 m E, 8 611 900 m N.

(Identified by R. Thorsteinsson: Report no. 1-RT-78)

GSC loc. C-76042: 2.0 m above base of formation.

Monograptus bohemicus tenuis Bouček

GSC loc. C-76043: 5.2 m above base of formation.

Monograptus sp. cf. *M. ultimus* (Perner)

Age: late early Ludlovian or late Ludlovian. In the Canadian Arctic Archipelago, *M. bohemicus* makes its first appearance in the *M. fritschi linearis* Zone, the uppermost zone of the early Ludlovian, and dies out just below the earliest occurrence of graptolites representing the basal zone (*M. ultimus*) of the Pridolian.

(Identified by R. Thorsteinsson; Report no. 2-RT-78)

GSC loc. C-76803: 3.3 m above base of formation.

Monograptus sp. ex. gr. *M. formosus* Bouček
M. sp. cf. *M. ultimus* (Perner)

GSC loc. C-76801: 290 m above base of formation.

Monograptus uniformis subsp. cf. *M. uniformis angustidens* Přibyl
M. n. sp.

GSC loc. C-76804: 353 m above base of formation.

Monograptus uniformis subsp. cf. *M. uniformis angustidens* Přibyl
M. sp. indet.

GSC loc. C-76802: 412 m above base of formation.

Monograptus uniformis subsp. cf. *M. uniformis angustidens* Přibyl

Age and comments: On GSC locs. C-76801 to C-76804, it should be noted that the forms in collection C-76803 identified as *Monograptus* sp. ex. gr. *M. formosus* and those identified as *M.* sp. cf. *M. ultimus* occur on separate pieces of rock. *Monograptus* sp. ex. gr. *M. formosus* can be assigned to the *M. ultimus* Zone, basal zone of the Pridolian, since monograptids of the *M. formosus* group are apparently confined to that zone. The forms identified as *M.* cf. *M. ultimus* are too poorly preserved for exact taxonomic placement, but on the assumption that they are occurring in close stratigraphic proximity to *M.* sp. ex. gr. *M. formosus*, they are very probably that species.

All other collections identified above are correlative with the *Monograptus uniformis* Zone, basal graptolite zone of the Lochkovian.

GSC loc. C-76822: 690 m above base of formation.
(Identified by A.W. Norris; Report no. 12-AWN-1978)

Nowakia sp. cf. *N. acuaria* (Richter)

Age: late Lochkovian to Pragian of Early Devonian.

SUBSECTION R-A7

Blue Fiord Formation, upper member

GSC loc. C-76829: 121 m above base of member.
(Identified by A.W. Norris; Report no. 12-AWN-1978)

Schizophoria sp.
Chonetes? sp.
Gasterocoma? *bicaula* Johnson and Lane
echinoderm ossicle with cross-like axial canal
Dechenella (*Dechenella*) sp. cf. *D.* (*D.*) *maclareni* Ormiston

Age: mid-Emsian of Early Devonian to early Eifelian of early Middle Devonian.

GSC loc. C-76826: 301 m above base of member.
(Identified by A.W. Norris; Report no. 12-AWN-1978)

favositid and colonial corals
Gasterocoma? *bicaula* Johnson and Lane—very small form
echinoderm ossicle with single axial canal

Age: mid-Emsian of Early Devonian to early Eifelian of early Middle Devonian.

SUBSECTION R-A8

Blue Fiord Formation, lower member

GSC loc. C-76828: 555 m below top of member.
(Identified by A.E.H. Pedder; Report no. RFR-96-AEHP-79)

Favosites sp. indet.
Crassialveolites sp. undet.
Spongonaria sp. nov. infested with *Chaetosalpinx* sp.
abundant single axis crinoid ossicles

Age: Devonian, Zlichovian, probably *gronbergi* Zone.

SUBSECTION R-A9

Blue Fiord Formation, lower member

GSC loc. C-76825: 23 m above base of member.
(Identified by A.W. Norris; Report no. 12-AWN-1978)

Carinapyga sp. cf. *C. maclareni praecedens* of Brice (1982)
Phragmastrophia sp.
Cortezorthis maclareni Johnson and Talent
Athyrhynchus susanae intermedius Brice
Elythyna sp. cf. *E. kingi* Johnson
Warrenella transversa Ludvigsen and Perry
echinoderm ossicle with single axial canal
echinoderm ossicle with five-pointed-star-shaped axial canal

Age: *Eurekaspirifer pinyonensis* Zone to *Elythyna* Fauna, Early Devonian.

SECTION 2A: BIRD FIORD AREA

Blue Fiord Formation, lower member

GSC loc. 83726: 141 m above base of member and formation. (Identified by A.W. Norris; Report no. 6-AWN-1980)

Phragmostrophia sp. cf. *P. merriami* Harper, Johnson and Boucot
Atrypa? sp.–fragment
Dentalium? sp.–fragment

Age: *Acrospirifer kobehana* and lower part of *Eurekaspirifer pinyonensis* zones, late Early Devonian.

Blue Fiord Formation, upper member

GSC loc. 83742: 56 m above base of member (=745 m above base of formation).
(Identified by A.W. Norris; Report no. 6-AWN-1980)

Schizophoria sp. cf. *S. nevadaensis* Merriam
cf. *Atrypa* sp. B of Johnson (1975b)
Warrenella? sp.

Age: *Elythyna* beds or *E. pinyonensis* Zone, late Early Devonian.

GSC loc. 83747: 227 m above base of member (= 916 m above base of formation).
(Identified by A.W. Norris; Report no. 6-AWN-1980)

Cymostrophia sp.–large form
Camarotoechia(?) sp.–impression of very small form
echinoderm ossicle with single axial canal

Age: probably *E. pinyonensis* Zone, late Early Devonian.

GSC loc. 83748: 250 m above base of member (= 939 m above base of formation).
(Identified by A.W. Norris; Report no. 6-AWN-1980)

cf. *Atrypa* sp. B of Johnson (1975b)

Age: *Elythyna* beds or *Eurekaspirifer pinyonensis* Zone, late Early Devonian.

Bird Fiord Formation

GSC loc. 83762 (GSC plant loc. 8689): 188 m above base of formation.
(Identified by D.C. McGregor; Report no. F1-10-1985-DCM)

Ancyospora sp.
Apiculiretusispora gaspiensis McGregor
Dibolisporites echinaceus (Eisenack) Richardson
D. sp. cf. *D. gibberosus* (Naumova) Richardson var. *major* Kedo
Emphanisporites rotatus McGregor
?*Hymenozonotriletes facetus* Arkhangelskaya
Hystricosporites sp.

Conclusion: The spore assemblage is late Emsian or early Eifelian. It is probably not older than the uppermost Wetteldorf Formation of the Eifel region of Germany, as anchor-spined spores (*Ancyrospora* and *Hystricosporites*) first appear in rocks of that age. The age cannot be determined more precisely on the basis of this meagre assemblage.

The sample also contains scolecodonts (jaw elements of polychaetus annelids). They are not useful for age determination at present, but they do suggest that the environment of deposition was shallow marine, based on the preferred habitat of these organisms today.

GSC loc. 83763 (GSC plant loc. 8690): 386 m above base of formation.
(Identified by D.C. McGregor; Report no. F1-10-1985-DCM)

?*Acinosporites apiculatus* (Streel) Streel
Ancyrospora sp.
Apiculiretusispora gaspiensis McGregor
A. plicata (Allen) Streel
Cymbosporites? *opacus* McGregor and Camfield
Dibolisporites echinaceus (Eisenack) Richardson
Grandispora eximia (Allen) McGregor and Camfield
Hystricosporites (3 spp.)
?*Periplecotriletes tortus* Egorova

Conclusion: As for the foregoing sample, the age is late Emsian or early Eifelian. Early Eifelian is perhaps the more likely choice. However, the possibility that the age may be late Emsian cannot be eliminated. The spores are corroded and most of them fragmentary.

Scolecodonts and rare acritarchs are present, indicating that the sample was deposited in a marine environment.

GSC plant loc. 8692: 450 m above base of formation.
(Identified by D.C. McGregor; Report no. F1-10-1985-DCM)

?*Anulisporites jonkeri* Riegel
Apiculiretusispora brandtii Streel
Dibolisporites echinaceus (Eisenack) Richardson
Dictyotriletes sp.
Emphanisporites rotatus McGregor
Kraeuselisporites ollii? (Chibrikova) McGregor and Camfield

Perotrilites selectus (Arkhangelskaya) McGregor and Camfield
Rhabdosporites langii (Eisenack) Richardson

Conclusion: This sample is early Eifelian, *G. velata-R. langii* Zone. *Anulatisporites jonkeri* occurs in the Nohn Formation of the Eifel. In the Arctic Islands a similar form has been recovered from low in the Bird Formation of Bathurst Island, and high in the Bird Fiord Formation and in the Strathcona Fiord Formation of southeastern Ellesmere Island. *Rhabdosporites langii* is not known to occur in rocks older than those of the Nohn Formation.

Scolecodonts are also present.

GSC loc. 83769: 576 m above base of formation.
(Identified by A.W. Norris; Report no. 6-AWN-1980)

Elythina sverdrupi Brice

Age: *Warrenella kirki* Zone, Eifelian, early Middle Devonian.

GSC loc. 83770: 613 m above base of formation.
(Identified by A.W. Norris; Report no. 6-AWN-1980)

Elythina sverdrupi Brice
undet. pelecypod? fragment

Age: *Warrenella kirki* Zone, Eifelian, early Middle Devonian.

GSC loc. 83772: 696 m above base of formation.
(Identified by A.W. Norris; Report no. 6-AWN-1980)

Elythina sverdrupi Brice
strophomenid fragments
echinoderm ossicle with single axial canal

Age: *Warrenella kirki* Zone, Eifelian, early Middle Devonian.

GSC loc 83773: 717 m above base of formation.
(Identified by A.W. Norris; Report no. 6-AWN-1980)

Elythina sverdrupi Brice

Age: *Warrenella kirki* Zone, Eifelian, early Middle Devonian.

Comments by A.W. Norris on Report no. 6-AWN-1980: *Phragmostrophia* sp. cf. *P. merriami* in sample 83726 suggests a correlation with the *Eurekaspirifer pinyonensis* Zone of Nevada from where it was first described by Harper, Johnson, and Boucot (1967). It is recorded also by Lenz (1977a, p. 43) from the Zlichovian part of the Royal Creek section where associated conodonts suggest correlation with the *Acrospirifer kobehana* and the lower part of the *Eurekaspirifer pinyonensis* Zones of Nevada, and with conodont faunas 7 and 8 of Klapper et al. (1971), which are currently placed in the *dehiscens* Zone (Klapper, 1977, fig. 2). The *dehiscens* Zone is aligned by Klapper and Ziegler (1979, Textfig. 2) with the uppermost Pragian and lower Zlichovian Stages of the Early Devonian.

Schizophoria sp. cf. *S. nevadaensis* in sample 83742 and a large form of *Cymostrophia* in sample 83747 are closely similar to forms present in the *E. pinyonensis* Zone of Nevada. *Atrypa* sp. B of Johnson (1975) in samples 83742 and 83748 occurs typically in the Disappointment Bay Formation on Lowther Island where the associated brachiopods indicate correlation with the *E. pinyonensis* Zone or *Elythyna* beds, and associated conodonts indicate correlation with the *E. pinyonensis* Zone of Nevada. *Schizophoria nevadaensis* occurs in Johnson's (1977, table 3). Intervals 12 and 13 in Nevada which are within the conodont *inversus* Zone. This zone is aligned by Klapper and Ziegler (1979, Textfig. 2) with the uppermost Zlichovian and lower part of the Dalejan Stages of the late Early Devonian.

Elythina sverdrupi Brice, present in samples GSC 83769, 83770, 83772, and 83773, is recorded as ranging throughout the lower member into the lower half of the upper member of the Bird Fiord Formation in its type area on Ellesmere Island.

SECTION 2B: PANARCTIC TENNECO ET AL. CSP EIDS M-66 WELL

Location: lat. 77°25′58″N, long. 86°26′07″W, Bjorne Peninsula, Ellesmere Island.

Eids Formation

GSC loc. C-67899/50-100: 15.2 m to 30.5 m below top of well.
(Identified by D.C. McGregor; Report no. F1-9-1977-DCM)

Spores, scolecodonts, chitinozoans, and large leiospheres were recovered. They are dark brown, rather corroded, and mostly unidentifiable. The only spore that could be positively identified is *Emphanisporites rotatus* McGregor. It is long-ranging in the Devonian but reaches its acme in the Emsian. It and the general form of the other palynomorphs present suggest a mid-Emsian age.

GSC loc. C-67899/250-300: 76.2 m to 91.4 m below top of well.
(Identified by D.C. McGregor; Report no. F1-9-1977-DCM)

Spores, chitinozoans, and scolecodonts are present, but poorly preserved. *Dibolisporites echinaceus* (Eisenack) Richardson and *D.* cf. *D. quebecensis* McGregor indicate an Emsian, but not earliest Emsian age.

GSC loc. C-67899/700-750: 213.4 m to 228.6 m below top of well.
(Identified by D.C. McGregor; Report no. F1-9-1977-DCM)

Some fragments of marine palynomorphs (chitinozoans and scolecodonts) are present, and rare, poorly preserved, unidentifiable spores. No age determination is possible. The organic material is dark brown to black, indicating a moderately high degree of thermal alteration.

Cape Phillips Formation

GSC loc. C-67899/1720-1730: 524.3 m to 527.3 m below top of well.
(Identified by R. Thorsteinsson; Report no. 2-RT-77)

?*Stomatograptus* sp. indet.
Monograptus sp. indet.

Age: Each of these fossils is represented by a single, small fragment. The generic assignment of *Stomatograptus* sp. indet. is queried because of a slight possibility that this form is in fact an indeterminate species of *Retiolites*, but in either instance the age is latest Llandoverian or earliest Wenlockian.

SECTION 2C: PANARCTIC ARCO ET AL. BLUE FIORD E-46 WELL

Location: lat. 77°15′27.00″N, long. 86°18′07.08″W, Bjorne Peninsula, Ellesmere Island.

Eids Formation

GSC loc. C-67898/100-150: 30.5 m to 45.7 m below top of well.
(Identified by D.C. McGregor; Report no. F1-9-1977-DCM)

Spores, acritarchs, chitinozoans and scolecodonts are present at this level indicating a marine depositional environment. The material is medium to dark brown, caused by a moderate degree of thermal alteration. The following spores were identified:

cf. *Apiculiretusispora gaspiensis* McGregor
Calamospora atava (Naumova) McGregor
Dictyotriletes emsiensis (Allen) McGregor
Dibolisporites echinaceus (Eisenack) Richardson (*gibberosus* type)
Emphanisporites rotatus McGregor
Retusotriletes spp.

Age: Emsian, probably mid-Emsian.

GSC loc. C-67898/550-600: 167.6 m to 182.9 m below top of well.
(Identified by D.C. McGregor; Report no. F1-9-1977-DCM)

Spores and scolecodonts were recovered. The palynomorphs are somewhat corroded, probably as a result of post-depositional oxidation. The following species are present, among others:

cf. *Apiculiretusispora gaspiensis* McGregor
Calamospora atava (Naumova) McGregor
Dibolisporites echinaceus (Eisenack) Richardson (*gibberosus* type)
D. eifeliensis (Lanninger) McGregor
Emphanisporites rotatus McGregor
Tholisporites chulus (Cramer) McGregor var. *magnus*
Verruciretusispora multituberculata (Lanninger) McGregor

Age: mid-Emsian.

GSC loc. no. C-67898/1050-1100: 320 m to 335.3 m below top of well.
(Identified by D.C. McGregor; Report no. F1-9-1977-DCM)

The sample contains spores, acritarchs, and scolecodonts, indicating a marine depositional environment and fairly extensive post-depositional oxidation. The few spores that could be identified indicate an age close to that of the previous samples, i.e. mid-Emsian.

GSC loc. no. C-67898/1500-1550: 457.2 m to 472.4 m below top of well.
(Identified by D.C. McGregor; Report no. F1-9-1977-DCM)

Large leiospheres (150-400 μm in diameter) are the most abundant palynomorphs in this sample. Fossils of this sort are exceedingly abundant in some rocks. However, they are long-ranging and taxonomically indistinct, thus of little stratigraphic use, except possibly for local correlation. Spores, scolecodonts, and chitinozoans are present in lesser numbers. The few that could be identified suggest a mid-Emsian age.

Cape Phillips Formation

GSC loc. no. C-67898/2100-2150: 640.1 m to 655.3 m below top of well.
(Identified by D.C. McGregor; Report no. F1-9-1977-DCM)

The index of thermal alteration of the organic matter is about the same as for the sample from 100-150 feet (30.5-45.7 m), but the material is more finely disseminated and corroded. Spores and acritarchs are present, but none could be identified, and no age determination is possible.

SECTION 3A: SUTHERLAND RIVER, SOUTH OF THE GRINNELL THRUST

Blue Fiord Formation

GSC loc. 83679: 0-0.3 m above base of formation.
(Identified by A.W. Norris; Report no. 8-AWN-1985)

Desquamatia sp. cf. *D. nevadana* (Merriam)
Spinatrypa sp.
Crurithyris? sp.
Elythyna sp.
Etymothyris? sp.
echinoderm ossicle with single axial canal

Age: early Emsian, Early Devonian.

Comments: See under GSC loc. 83682.

GSC loc. 83681: 30 m above base of formation.
(Identified by A.W. Norris; Report no. 8-AWN-1985)

Bifida ogilviensis Perry, Klapper and Lenz (1974)
Emanuella sp.
Spinatrypa sp.
Elythyna sp.
echinoderm ossicle with single axial canal
echinoderm ossicle with single axial canal surrounded by four smaller canals

Age: early Emsian, Early Devonian.

Comments: See under GSC loc. 83682.

GSC loc. 83682: 49 m above base of formation.
(Identified by A.W. Norris; Report no. 8-AWN-1985)

cf. *Chattertonia mackenzia* Perry
Carinagypa sp. cf. *C. aseptata* Johnson
Spinatrypa sp.
cf. *Elythyna transversa intermedia* Johnson
echinoderm ossicle with single axial canal

Age: Zlichovian, late Early Devonian.

Comments: Some of the more diagnostic brachiopods in samples from GSC locs. 83679, 83681 and 83682 from the Disappointment Bay Formation [now termed Blue Fiord Formation] of Devon Island are forms that occur typically within the upper part of the *E. pinyonensis* Zone of Nevada as defined by Johnson and Niebuhr (1976). The complete range of the *pinyonensis* Zone is from the conodont *dehiscens* Zone at the base to the conodont *inversus* Zone at the top. Some of the brachiopods from Devon Island are also similar to forms occurring within the lower part of the Ogilvie Formation of the Yukon Territory described by Perry et al. (1974) where they are associated with conodonts of the *inversus* Zone.

SECTION 3B: SUTHERLAND RIVER, NORTH OF THE GRINNELL THRUST

Douro Formation

GSC loc. 83664: 104 m below top of formation.
(Identified by A.W. Norris; Report no. 8-AWN-1985)

Atrypoidea phoca (Salter)

Age: Ludlow, Late Silurian.

Comments: See under GSC loc. 83661.

GSC loc. 83663: 131 m below top of formation.
(Identified by A.W. Norris; Report no. 8-AWN-1985)

Atrypoidea sp. cf. *A. scheii* (Holtedahl)

Age: Ludlow, Late Silurian.

Comments: See under GSC loc. 83661.

GSC loc. 83662: 152 m below top of formation.
(Identified by A.W. Norris; Report no. 8-AWN-1985)

Atrypoidea sp.

Age: Ludlow, Late Silurian.

Comments: See under GSC loc. 83661.

GSC loc. 83661: 186 m below top of formation.
(Identified by A.W. Norris; Report no. 8-AWN-1985)

Atrypoidea phoca (Salter)
Atrypoidea scheii (Holtedahl)

Age: Ludlow, Late Silurian.

Comments: A number of recent papers on the genus *Atrypoidea* (Jones, 1974, 1981; Smith, 1976; Smith and Johnson, 1977) have shown wide variation in size and shape of forms that are controlled by facies and time. For this reason, species of the genus have been difficult to use in zoning the Upper Silurian. However, the forms present in samples from GSC locs. 83661, 83662, 83663 and 83664 are consistent with a Ludlow, Late Silurian age.

SECTION 3C: NORTHWEST OF PTARMIGAN LAKE

Devon Island Formation

GSC loc. 83671: 152 m above base of formation.
(Identified by A.W. Norris; Report no. 8-AWN-1985)

indet. bryozoan fragments
Schizophoria paraprima Johnson, Boucot and Murphy
Ancillotoechia sp. cf. *A. gutta* Johnson, Boucot and Murphy
Howellella sp. 1 of Perry (1984)
echinoderm ossicle with five-side axial canal

Age: early Lochkovian, Early Devonian.

Comments: *Schizophoria paraprima* Johnson, Boucot and Murphy, *Ancillotoechia gutta* Johnson, Boucot and Murphy, and *Howellella* sp. 1 of Perry (1984) are forms that are confined to lower Lochkovian beds in northwestern Canada.

Sutherland River Formation

GSC loc. 83672: 8 m above base of formation.
(Identified by A.W. Norris; Report no. 8-AWN-1985)

thamnoporid fragment
cf. *Stylopleura* sp.–fragment
indet. bryozoan fragments
indet. inarticulate brachiopod fragments
indet. tiny planispiral gastropod
cf. *Warburgella rugulosa canadensis* Ormiston–pygidium
indet. trilobite tail fragment

Age: *Gypidula pelagica* Fauna of Lenz (1966), Lochkovian, Early Devonian.

Comments: The form suggestive of *Warburgella rugulosa canadensis* Ormiston is based on an uncertain identification of a pygidium. The subspecies is a common associate of the *Gypidula pelagica* Fauna of Lochkovian, Early Devonian age.

AREA 4: GRINNELL PENINSULA AND ENVIRONS

Unnamed formation

GSC loc. C-33666: southern tip of Samuel Peninsula, Hyde Parker Island, UTM Zone 14X, 547 350 m E, 8 487 350 m N (pers. comm., J.G. Johnson to J.Wm. Kerr, April, 1985).

Schizophoria sp. 2
Protocortezorthis sp. (carinate) 3
Brachyprion cf. *mirabilis* 9
Carinagypa? sp. 1
Machaeraria? sp. 1
Linguopugnoides sp. 1
Atrypa sp. 1
Favosites sp. 1

Age: *Quadrithyris* Zone, late Lochkovian. The same species of *Protocortezorthis* occurs in C-11467, Cornwallis Island. The specimens of *Brachyprion* are similar to those occurring in GSC collection 67038, Bathurst Island (see Johnson, 1975a).

GSC loc. C-33681: 15 m below Disappointment Bay Formation, southeastern Crescent Island, UTM Zone 14X, 543 950 m E, 8 546 000 m N (pers. comm., J.G. Johnson to J.Wm. Kerr, April, 1975).

Schizophoria sp. 16
indet. orthotetacean sp. 1
indet. chonetid sp. 1
indet. large smooth spiriferid 2
indet. trilobite pygidium 2
indet. solitary tetracoral 3

Age: probably Emsian, based on the large smooth spiriferid that resembles *Elythyna* spp. of the Disappointment Bay Formation and the *pinyonensis* Zone of Nevada.

Undivided Devonian carbonate unit, Du

GSC loc. C-7678: western Sheills Peninsula, UTM Zone 15X, 438 750 m E, 8 467 000 m N.
(Identified by D.C. McGregor; Report no. F1-6-1986-DCM)

?*Acinosporites acanthomammillatus* Richardson
A. lindlarensis Riegel var. *lindlarensis*
Ancyrospora longispinosa Richardson
Apiculiretusispora densiconata Tiwari and Schaarschmidt
Archaeotriletes ornatus Kedo
Baculatisporites semilucensis (Naumova) McGregor and Camfield
Densosporites concinnus (Owens) McGregor and Camfield
cf. *Densosporites devonicus* Richardson
Dibolisporites echinaceus (Eisenack) Richardson
D. gibberosus (Kedo) Richardson var. *major* Kedo
Emphanisporites rotatus McGregor
E. schultzii McGregor
Grandispora velata (Eisenack) Playford
Periplecotriletes tortus Yegorova

Perotrilites selectus (Arkhangelskaya) McGregor and Camfield
Reticulatisporites vulgaris (Arkhangelskaya) Arkhangelskaya
Retusotriletes rugulatus Riegel
R. subgibberosus? Naumova
Rhabdosporites facetus (Arkhangelskaya) Arkhangelskaya
cf. *R. mirus* Arkhangelskaya
Sinuosisporis kalugianus Arkhangelskaya
Verruciretusispora dubia (Eisenack) Richardson and Rasul

Comments: This assemblage is in the lower part of the spore *devonicus-naumovii* Zone, and is late early Eifelian. The sample is approximately temporally equivalent to the Cape De Bray Formation and possibly the lowermost Weatherall Formation on eastern Melville Island (McGregor and Camfield, 1982), and to part of the Strathcona Fiord Formation of southwestern Ellesmere Island (D.C. McGregor, GSC internal report, 1981). These beds contain several species that are present in early to mid-Eifelian strata of the Russian Platform (Arkhangelskaya, 1985).

GSC loc. C-7679: western Sheills Peninsula, UTM Zone 15X, 438 900 m E, 8 467 200 m N.
(Identified by D.C. McGregor; Report no. F1-6-1986-DCM)

?*Acinosporites acanthomammillatus* Richardson
Anapiculatisporites petilus Richardson
?*Ancyrospora longispinosa* Richardson
Apiculiretusispora densiconata Tiwari and Schaarschmidt
Densosporites concinnus (Owens) McGregor and Camfield
D. devonicus Richardson
Dibolisporites echinaceus (Eisenack) Richardson
Emphanisporites rotatus McGregor
Grandispora velata (Eisenack) Playford
?*Periplecotriletes* sp.
Reticulatisporites vulgaris (Arkhangelskaya) Arkhangelskaya
?*Retusotriletes lanceolatus* Kedo
R. rugulatus Riegel
Rhabdosporites langi (Eisenack) Richardson
?*Samarisporites amoenus* Arkhangelskaya
Sinuosisporis flavus? Arkhangelskaya

Comments: Same as for GSC loc. C-7678.

PART 2

Listing and abundance of conodonts by section/area

(Note: three sets of GSC locality numbers are used: Ottawa-based numbers, without any prefix; Calgary-based numbers, with prefix C-; and plant locality numbers. Asterisk [*] denotes specimens figured in this study.)

SECTION 1: STRATHCONA FIORD AREA

Allen Bay Formation

GSC loc. 83778: 52 m above base of formation.
(wt. of sample = 2.8 kg)

Amorphognathus ordovicicus Branson and Mehl
- Pa (platform): 6*
- Pb (ambalodontiform): 4*
- M (holodontiform): 1*
- Sa (hibbardelliform): 3*
- Sb (cladognathiform): 6
- Sc (eoligonodiniform): 4*
- Sd (tetraprioniodiform): 4

Belodina confluens Sweet
- grandiform: 5*
- compressiform: 2*

Belodina? sp.: 1*

Coelocerodontus trigonius Ethington
- trigonid (with smooth lateral face): 2*
- trigonid (with striated face): 1*

Drepanoistodus suberectus (Branson and Mehl)
- drepanodontiform: 21*
- suberectiform: 3*
- oistodontiform: 1*

Panderodus gracilis (Branson and Mehl)
- graciliform: 15*
- arcuatiform: 8*
- compressiform: 9*

Panderodus panderi (Stauffer): 4*

Paroistodus? *mutatus* (Branson and Mehl)
- oistodontiform: 23*
- acodontiform: 2*

Paroistodus? sp.
- oistodontiform: 1*

Plegagnathus nelsoni Ethington and Furnish: 1*

Pseudobelodina dispansa (Glenister): 3*

Pseudobelodina vulgaris vulgaris Sweet: 2*

Pseudooneotodus beckmanni (Bischoff and Sannemann): 3*

Walliserodus cf. *W. curvatus* (Branson and Branson)
- M: 1*

GSC loc. 83779: 82 m above base of formation.
(wt. of sample = 0.7 kg)

Amorphognathus ordovicicus Branson and Mehl
- Pa (platform): 2
- Pb (ambalodontiform): 1
- Sa (hibbardelliform): 1
- Sc (eoligonodiniform): 1

Coelocerodontus trigonius Ethington
- trigonid: 2*
- tetragonid: 1*

Drepanoistodus suberectus (Branson and Mehl)
- drepanodontiform: 2

Panderodus gracilis (Branson and Mehl)
- graciliform: 1
- compressiform: 1

Paroistodus? *mutatus* (Branson and Mehl)
- oistodontiform: 3

Pseudobelodina dispansa (Glenister): 1

Pseudobelodina vulgaris vulgaris Sweet: 1

GSC loc. 83780: 114 m above base of formation.
(wt. of sample = 1.0 kg)

Panderodus unicostatus (Branson and Mehl)
- graciliform: 4
- arcuatiform: 1
- compressiform: 1

Panderodus cf. *P.* n. sp. A of McCracken and Barnes, 1981
- arcuatiform: 1*

Walliserodus cf. *W. curvatus* (Branson and Branson)
- M: 1*

GSC loc. 83781: 213 m above base of formation.
(wt. of sample = 0.7 kg)

Oulodus? *kentuckyensis* (Branson and Branson)
- Pa: 1* Sa: 2*
- Pb: 1* Sb: 1*
- M: 3* Sc: 1*

Panderodus unicostatus (Branson and Mehl)
- graciliform: 9*
- arcuatiform: 6*
- compressiform: 5*

Walliserodus cf. *W. curvatus* (Branson and Branson)
- M: 4* Sa: 2*
- Sc: 1*

GSC loc. 83782: 291 m above base of formation.
(wt. of sample = 1.1 kg)

Astropentagnathus irregularis Mostler

Pa_1: 2* Sa: 1*
Sb?: 2*

Aulacognathus bullatus (Nicholl and Rexroad)
Pa: 2*
Pb: 2*

Dapsilodus obliquicostatus (Branson and Mehl)
M: 11* S: 11*

Oulodus? *fluegeli fluegeli* (Walliser)
Pa: 3* Sa: 3*
Pb: 4* Sb: 5*
M: 8* Sc: 3*

Oulodus? sp. A
Sa: 1*
Pb: 1* Sb: 1*
M: 3* Sc: 2*

Panderodus sp.: 8

Pterospathodus celloni (Walliser)
Pa: 1* Sa: 2*
Pb: 1* Sb: 1*
Sc: 2*

Pterospathodus cf. *P. celloni* (Walliser)
Pa: 1*

Unassigned elements:
Pb (ozarkodiniform): 2
M (synprioniodiniform): 1

Cape Phillips Formation

GSC loc. 83783: 52 m above base of formation.
(wt. of sample = 6.3 kg)

Dapsilodus obliquicostatus (Branson and Mehl)
M: 2 S: 2

Distomodus staurognathoides (Walliser)
Pa: 2* Sa: 2*

Kockelella walliseri (Helfrich)
Pa: 2*
Pb: 3* Sb: 3*
M: 1* Sc: 3*

Ozarkodina confluens (Branson and Mehl)
Pa: 2* Sa: 2*
Sb: 2*
Sc: 1*

Ozarkodina excavata excavata (Branson and Mehl)
Pa: 2*
Pb: 2*

Panderodus sp.: 27

Pseudooneotodus bicornis Drygant: 2*

Pterospathodus pennatus procerus (Walliser)
Pa: 3*
Pb: 2*

Unassigned elements:
M: 1

GSC loc. 83784: 72 m above base of formation.
(wt. of sample = 0.7 kg)

Ozarkodina sp.
Pa: 1 (fragmentary)
Pb: 1 (fragmentary)

Panderodus sp.: 1 (fragmentary)

GSC loc. 83785: 78 m above base of formation.
(wt. of sample = 3.8 kg)

Kockelella variabilis Walliser
Pa: 2*

Ozarkodina confluens (Branson and Mehl)
Pa: 1 (fragmentary) Sa: 1 (small)

Ozarkodina cf. *O. douroensis* Uyeno
Pa: 2*

Ozarkodina excavata excavata (Branson and Mehl)
Pa: 2 Sa: 1

Panderodus unicostatus (Branson and Mehl)
unassigned elements: 12* (serrated element illustrated)

Apparatus A of Uyeno (1981a)
Pa?: 1*

GSC loc. 83786: 110 m above base of formation.
(wt. of sample = 0.8 kg)

Unassigned element:
Sa?: 1 (fragmentary)

GSC loc. 83787: 142 m above base of formation.
(wt. of sample = 1.0 kg)

No conodonts

GSC loc. 83788: 219 m above base of formation.
(wt. of sample = 1.0 kg)

Ozarkodina confluens (Branson and Mehl)
Pb: 1

GSC loc. 83789: 243 m above base of formation.
(wt. of sample = 0.8 kg)

No conodonts

GSC loc. 83790: 262 m above base of formation.
(wt. of sample = 0.9 kg)

Ozarkodina remscheidensis eosteinhornensis (Walliser)
Pa: 6*
Pb: 2
M: 1

GSC loc. 83791: 293 m above base of formation.
(wt. of sample = 0.8 kg)

Ozarkodina remscheidensis (Ziegler) subsp. indet.
Pa: 3 (fragmentary)

Panderodus sp.: 1

GSC loc. 83792: 335 m above base of formation.
(wt. of sample = 0.9 kg)

Ozarkodina remscheidensis remscheidensis (Ziegler)
Pa: 7*
Pb: 1
Pedavis sp.
I: 4* S_1: 4*
M_2: 2*

GSC loc. 83793: 424 m above base of formation.
(wt. of sample = 0.8 kg)

No conodonts

GSC loc. 83794: 472 m above base of formation.
(wt. of sample = 3.5 kg)

Unassigned element:
Sc: 1

"Eids" Formation, lower limestone member

GSC loc. C-26484: 2.1 m above base of formation.
(wt. of sample = 2.2 kg)

Ozarkodina remscheidensis remscheidensis (Ziegler)
Pa: 4
Pb: 3
Unassigned element:
M_2: 1

GSC loc. C-26485: 4.0 m above base of formation.
(wt. of sample = 1.4 kg)

Ozarkodina remscheidensis remscheidensis (Ziegler)
Pa: 9 Sa: 3
Pb: 8 Sb: 2
M: 4 Sc: 1
Unassigned elements:
M_2: 10

GSC loc. C-26486: 4.6 m above base of formation.
(wt. of sample = 1.0 kg)

Ozarkodina remscheidensis remscheidensis (Ziegler)
Pa: 1
M: 2

GSC loc. C-26487: 5.2 m above base of formation.
(wt. of sample = 0.9 kg)

Ozarkodina remscheidensis remscheidensis (Ziegler)
Pa: 5 Sa: 2
Pb: 1
Unassigned elements:
S_2: 1
M_2: 8

GSC loc. 83795: 6 m above base of formation.
(wt. of sample = 1.4 kg)

Oulodus sp.
Pa: 1 Sa: 1
Pb: 1 Sb: 1
M: 1 Sc: 1
Ozarkodina remscheidensis remscheidensis (Ziegler)
Pa: 14 Sa: 1
Pb: 6 Sb: 1
M: 2 Sc: 1
Unassigned elements:
S_2 (acodinan): 1
S_2-M_2 transition: 1
M_2 (smooth): 6
M_2 (costate): 1

GSC loc. 83796: 32 m above base of formation.
(wt. of sample = 6.2 kg)

Ozarkodina remscheidensis remscheidensis (Ziegler)
Pa: 19* Sa: 8*
Pb: 16* Sb: 4*
M: 17* Sc: 5*
Panderodus sp.: 10
Pedavis sp.
I: 1 (fragmentary)
S_1: 2*
Pelekysgnathus n. sp. D
I: 9* S_{2a}: 17*
S_{2a}-M_2 transitional: 8*
M_2: 17*

GSC loc. 83797: 58 m above base of formation.
(wt. of sample = 1.0 kg)

Oulodus sp.
Pa: 1 Sa: 1
M: 1 Sb: 2
Ozarkodina remscheidensis remscheidensis (Ziegler)
Pa: 14* Sa: 1
Pb: 9* Sb: 1
M: 2 Sc: 5
Pelekysgnathus n. sp. D
I: 1* S_{2a}: 1
S_{2a}-M_2 transitional: 1
M_2: 10
Unassigned element:
S_1: 1

GSC loc. C-26488: 72.5 m above base of formation.
(wt. of sample = 0.5 kg)

Ozarkodina remscheidensis remscheidensis (Ziegler)
Pa: 1
Pb: 1
M: 1

Unassigned elements:
S_2: 1
M_2: 1

GSC loc. C-26489: 81.1 m above base of formation. (wt. of sample = 1.4 kg)

Oulodus sp.
Pa?: 1 Sb: 1
Pb: 1
Ozarkodina remscheidensis remscheidensis (Ziegler)
Pa: 7 Sa: 1
Pb: 6 Sb: 3
M: 2
Pelekysgnathus n. sp. D
I: 1 S_{2a}: 2
S_{2a}-M_2 transitional: 2
M_2: 4

Vendom Fiord Formation

GSC loc. 83798: 91 m above base of formation. (wt. of sample = 1.2 kg)

Belodella sp.: 1
Pandorinellina exigua exigua (Philip)
Pa: 1*
Pandorinellina exigua philipi (Klapper)
Pa: 5* Sc: 1
Pb: 2**
(Note: elements with * may in part belong to *P. exigua exigua*)
Unassigned elements:
S_2-M_2 transitional: 2
M_2: 8

GSC loc. C-26491: 107.0 m above base of formation. (wt. of sample = 1.4 kg)

Pandorinellina exigua philipi (Klapper)
Pa: 14*
Pelekysgnathus n. sp. E.
I: 1* M_2: 19*

GSC loc. C-26492: 108.2 m above base of formation. (wt. of sample = 1.0 kg)

Pelekysgnathus n. sp. E
I: 1 M_2: 4

GSC loc. C-26493: 111.3 m above base of formation. (wt. of sample = 0.5 kg)

Pandorinellina exigua philipi (Klapper)
Pa: 2
Unassigned element:
M_2: 1

GSC loc. C-26494: 121.6 m above base of formation. (wt. of sample = 0.9 kg)

Panderodus sp.: 117
Pandorinellina exigua philipi (Klapper)
Pa: 5
Unassigned elements:
M_2: 21
S_2: 1

GSC loc. C-26495: 124.7 m above base of formation. (wt. of sample = 0.9 kg)

Panderodus sp.: 7
Pandorinellina exigua philipi (Klapper)
Pa: 6
Pb: 1
Pelekysgnathus n. sp. E
I: 1* M_2: 17*

GSC loc. 83799: 331 m above base of formation. (wt. of sample = 1.4 kg)

Unassigned element:
M_2 (smooth): 1

GSC loc. 83800: 441 m above base of formation. (wt. of sample = 1.0 kg)

No conodonts

Blue Fiord Formation

No conodonts were recovered from the following:

GSC loc. 83801: 6 m above base of formation (wt. of sample = 1.1 kg); **GSC loc. 83802:** 56 m above base of formation (wt. of sample = 1.2 kg); **GSC loc. 83803:** 107 m above base of formation (wt. of sample = 1.0 kg); and **GSC loc. 83804:** 146 m above base of formation (wt. of sample = 0.6 kg).

GSC loc. 83805: 177 m above base of formation. (wt. of sample = 0.8 kg)

Ozarkodina linearis (Philip)
Pa: 2*
Panderodus sp.: 2
(biaxial crinoid ossicles)

GSC loc. 83806: 234 m above base of formation. (wt. of sample = 0.8 kg)

Ozarkodina linearis (Philip)
Pa: 2

Panderodus sp.: 3

GSC loc. 83807: 387 m above base of formation.
(wt. of sample = 1.0 kg)

Unassigned element:
a single indeterminate fragment only

GSC loc. 83808: 450 m above base of formation.
(wt. of sample = 1.5 kg)

Belodella sp. B: 2*
Panderodus sp.: 23
Pandorinellina expansa Uyeno and Mason
Pa: 3*
(biaxial crinoid ossicles)

GSC loc. C-29496: 470.8 m above base of formation.
(wt. of sample = 3.1 kg)

Belodella sp.: 6
Panderodus sp.: 89
Pandorinellina expansa Uyeno and Mason
Pa: 2*
Pb: 1*

GSC loc. 83809: 471 m above base of formation.
(wt. of sample = 1.1 kg)

No conodonts

COMPOSITE SECTION R-A: WEST OF VENDOM FIORD

SUBSECTION R-A3

GSC loc. C-76213: Devon Island Formation, 329.2 m above base of formation.

Ozarkodina remscheidensis remscheidensis (Ziegler)
Pa: 2*
Pandorinellina cf. *P. exigua* (Philip)
Pa: 2*
Unassigned element:
S_{2c}: 1

GSC loc. C-76214: Devon Island Formation, 12.2 m below top of formation.

Eognathodus sulcatus kindlei Lane and Ormiston
Pa: 2*
Panderodus sp.: 5
Pandorinellina exigua philipi (Klapper)
Pa: 7*
Pandorinellina n. sp. O of Klapper (1980)
Pa: 3*
Unassigned elements:
Pb: 1 Sa: 1

SUBSECTION R-A4

GSC loc. C-76815: Blue Fiord Formation, upper member, 177.4 m below top of formation.
(wt. of sample = 2.0 kg)

Belodella sp.: 36
Panderodus sp.: 17
Pandorinellina expansa Uyeno and Mason
Pa: 1
Unassigned elements:
M: 1 Sb: 1
M_2: 5

GSC loc. C-76814: Strathcona Fiord Formation, 248.4 m above base of formation.

No conodonts

GSC loc. C-76813: Strathcona Fiord Formation, 409.7 m above base of formation.
(wt. of sample = 2.0 kg)

Panderodus sp.: 1

GSC loc. C-76812: Strathcona Fiord Formation, 458.7 m above base of formation.
(wt. of sample = 2.0 kg)

No conodonts

SUBSECTION R-A7

GSC loc. C-76154: Blue Fiord Formation, lower member, 9.1 m below top of member.

Belodella sp.: 74
Coelocerodontus sp.: 3
Panderodus sp.: 212
Pandorinellina exigua exigua (Philip)
Pa: 2
Pandorinellina expansa Uyeno and Mason
Pa: 7*
Pb: 1
Polygnathus inversus Klapper and Johnson
Pa: 3*
Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 2
Unassigned elements:
Pb: 9 Sa: 1
M: 6 Sb: 2

M_2: 21 Sc: 1
S_{2a}: 1

GSC loc. C-76156: Blue Fiord Formation, lower member, 7.6 m below top of member.

Belodella sp.: 1
Panderodus sp.: 7
Polygnathus inversus Klapper and Johnson
Pa: 9
Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 1*

GSC loc. C-76153: Blue Fiord Formation, upper member, 13.7 m above base of member.

Belodella sp.: 33
Panderodus sp.: 42
Polygnathus inversus Klapper and Johnson
Pa: 31*
Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 19*
Steptotaxis? n. sp. S
I: 1 S_{2b}: 1
M_2: 10
Unassigned elements:
Pb: 5 Sa: 1
M: 3 Sb: 1
M_2: 3

GSC loc. C-76155: Blue Fiord Formation, upper member, 63.1 m above base of member.

Belodella sp.: 57
Coelocerodontus sp.: 2
Panderodus sp.: 245
Pandorinellina expansa Uyeno and Mason
Pa: 11
Pb: 9
Polygnathus sp. indet.
Pa: - (all small)
Unassigned elements:
Pb: 2 Sb: 3
M: 3 Sc: 1
M_2: 73 S_2: 6

GSC loc. C-76227: Blue Fiord Formation, upper member, 133.5 m above base of member.
(wt. of sample = 1.8 kg)

Belodella sp.: 20
Panderodus sp.: 130
Steptotaxis? n. sp. S
I: 10* M_2: 8*
S_{2b}: 1*
(Note: elements with * may in part belong to *Steptotaxis* n. sp. C)
Steptotaxis n. sp. C
I: 1*
Unassigned elements:
Pb: 1
M_2: 13

GSC loc. C-76228: Blue Fiord Formation, upper member, 269.7 m above base of member.
(wt. of sample = 2.0 kg)

Belodella sp.: 4
Panderodus sp.: 71
Polygnathus inversus Klapper and Johnson transitional to *P. serotinus*
Pa: 3
Polygnathus serotinus Telford
Pa: 3*
Steptotaxis? n. sp. S
I: 1 M_2: 4
S_{2a}: 1
Unassigned elements:
Pb: 1 M: 1
M_2: 4 S_2: 1

GSC loc. C-76818: Blue Fiord Formation, upper member, 280.4 m above base of member.

Belodella sp.: 4
Panderodus sp.: 39
Pandorinellina expansa Uyeno and Mason
Pa: 1
Polygnathus inversus Klapper and Johnson transitional to *P. serotinus*
Pa: 3
Polygnathus serotinus Telford
Pa: 2
Steptotaxis n. sp. C
I: 1*

GSC loc. C-76229: Blue Fiord Formation, upper member, 351.1 m above base of member.

No conodonts

GSC loc. C-76217: Strathcona Fiord Formation, 42 m above base of formation.

Panderodus sp.: 41
Pandorinellina expansa Uyeno and Mason
Pa: 10*
Pb: 2

Steptotaxis n. sp. C

I: 1*	M_2: 7
	S_{2b}: 2
	S_{2c}: 3*

SUBSECTION R-A8

GSC loc. C-76816: Blue Fiord Formation, lower member 579.1 m below top of member.
(wt. of sample = 0.5 kg)

Panderodus sp.: 40
Pandorinellina exigua exigua (Philip)
Pa: 2

GSC loc. C-76225: Blue Fiord Formation, lower member, 503.5 m below top of member.
(wt. of sample = 1.0 kg)

Panderodus sp.: 45
Unassigned element:
M_2: 1

GSC loc. C-76218: Blue Fiord Formation, lower member, 444.1 m below top of member.
(wt. of sample = 1.3 kg)

Belodella sp.: 2
Ozarkodina linearis (Philip)
Pa: 4
Panderodus sp.: 103
Pandorinellina exigua exigua (Philip)
Pa: 5
Unassigned elements:

Pb: 2	Sa: 1
M_2: 5	Sc: 1

GSC loc. C-76219: Blue Fiord Formation, lower member, 371.9 m below top of member.
(wt. of sample = 2.0 kg)

Panderodus sp.: 11
Unassigned elements:
M_2: 4

GSC loc C-76220: Blue Fiord Formation, lower member, 315.2 m below top of member.
(wt. of sample = 2.0 kg)

Belodella sp.: 3
Coelocerodontus sp.: 1
Panderodus sp.: 45
Pandorinellina exigua exigua (Philip)
Pa: 3
Pb: 6
Unassigned elements:
M_2: 3

GSC loc. C-76221: Blue Fiord Formation, lower member, 252.1 m below top of member.
(wt. of sample = 2.1 kg)

Belodella sp.: 37
Coelocerodontus sp.: 1
Ozarkodina linearis (Philip)
Pa: 2*
Panderodus sp.: 268
Pandorinellina exigua exigua (Philip)
Pa: 2
Polygnathus inversus Klapper and Johnson
Pa: 3
Polygnathus nothoperbonus Mawson
Pa: 39*
Pseudooneotodus beckmanni (Bischoff and Sannemann): 2
Steptotaxis? n. sp. S

I: 6*	M_2: 58
	S_{2a}: 3
	S_{2b}: 13*

Unassigned elements:

Pb: 5	Sa: 1
M: 8	Sb: 1

GSC loc. C-76222: Blue Fiord Formation, lower member, 195.1 m below top of member.
(wt. of sample = 2.0 kg)

Belodella sp.: 11
Panderodus sp.: 128
Pandorinellina expansa Uyeno and Mason
Pa: 2*
Pb: 2*
Polygnathus inversus Klapper and Johnson
Pa: 30*
Steptotaxis? n. sp. S

I: 6	M_2: 13⋆
	S_{2b}: 2⋆

(Note: elements with ⋆ may in part belong to *Steptotaxis* cf. *S. glenisteri*)
Steptotaxis cf. *S. glenisteri* (Klapper)
I: 1
Unassigned elements:

Pb: 9	Sb: 1
M: 3	Sc: 1

GSC loc. C-76223: Blue Fiord Formation, lower member, 131.7 m below top of member.
(wt. of sample = 2.1 kg)

Belodella sp.: 12
Coelocerodontus sp.: 2
Panderodus sp.: 54
Pandorinellina expansa Uyeno and Klapper
Pa: 4*

Polygnathus inversus Klapper and Johnson
Pa: 15
Steptotaxis? n. sp. S
I: 5*   M2: 9
S_{2b}: 3*
S_{2c}: 2*
Unassigned elements:
Pb: 1   Sc: 1
M: 1

GSC loc. C-76226: Blue Fiord Formation, lower member, 9.8 m below top of formation.
(wt. of sample = 1.6 kg)

Belodella sp.: 12
Panderodus sp.: 122
Polygnathus inversus Klapper and Johnson
Pa: 3
Polygnathus cf. *P. inversus* Klapper and Johnson
Pa: 1*
Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 28*
Steptotaxis? n. sp. S
I: 1 M_2: 14
Unassigned elements:
Pb: 3 M_2: 19
M: 2 S_2: 2

GSC loc. C-76224: Blue Fiord Formation, upper member, 4.0 m above base of member.
(wt. of sample = 1.1 kg)

Belodella sp.: 17
Panderodus sp.: 86
Pandorinellina expansa Uyeno and Mason
Pa: 5
Pb: 4
Steptotaxis? n. sp. S
I: 3 M_2: 9
S_{2b}: 2
Unassigned element:
M: 1

SUBSECTION R-A9

GSC loc. C-76215: Eids Formation, 30.2 m below top of formation.

Belodella sp.: 13
Panderodus sp.: 59
Pandorinellina exigua exigua (Philip)
Pa: 19*
Polygnathus cf. *P. pireneae* Boersma
Pa: 1*
Steptotaxis? cf. *S.*? n. sp. S
I: 1 (small)
Steptotaxis robleskyi n. sp.
I: 8* M_2: 8*
S_{2a}: 9**
S_{2b}: 3**
S_{2b}-S_{2c} transitional: 4**
S_{2c}: 9**
(Note: elements with * may in part belong to *Steptotaxis*? cf. *S.*? n. sp. S)
Unassigned elements:
Pb: 7   Sb: 2
M: 3   Sc: 1

GSC loc. C-76216: Blue Fiord Formation, lower member, 0.6 m above base of member.

Belodella sp.: 4
Panderodus sp.: 31
Pandorinellina exigua exigua (Philip)
Pa: 6
Steptotaxis? cf. *S.*? n. sp. S
I: 4 M_2: 7
S_{2a}: 6
S_{2b}: 1
S_{2b}-S_{2c} transitional: 1
Unassigned element:
Pb: 1

GSC loc. C-76810: Blue Fiord Formation, lower member, 52.7 m above base of member.
(wt. of sample = 2.0 kg)

Belodella sp.: 20
Coelocerodontus sp.: 6
Panderodus sp.: 210
Pandorinellina exigua exigua (Philip)
Pa: 59   Sa: 1
Pb: 21
M: 9   Sc: 4
Steptotaxis? n. sp. S
I: 7* M_2: 32
S_{2a}: 13
S_{2b}: 8*
S_{2b}-S_{2c} transitional: 2*

GSC loc. C-76811: Blue Fiord Formation, lower member, 104.2 m above base of member.
(wt. of sample = 2.0 kg)

Belodella sp.: 40
Coelocerodontus sp.: 7
Panderodus sp.: 259
Pandorinellina exigua exigua (Philip)
Pa: 71*   Sa: 8*
Pb: 19*   Sb: 1*

M: 30* Sc: 13*
Steptotaxis? n. sp. S
I: 9* M_2: 140
S_{2a}: 3
S_{2b}: 28

GSC loc. C-76809: Blue Fiord Formation, lower member, 154.5 m above base of member.
(wt. of sample = 2.0 kg)

Belodella sp.: 2
Panderodus sp.: 3
?*Pandorinellina exigua* (Philip)
Pa: 1 (fragmentary)
Unassigned element:
S_{2a}: 1

COMPOSITE SECTION R-B: EAST OF VENDOM FIORD

SUBSECTION R-B11

GSC loc. C-76247: Blue Fiord Formation, upper member, 39.3 m below top of member.
(wt. of sample = 1.4 kg)

No conodonts

GSC loc. C-76248: Blue Fiord Formation, upper member, 12.8 m below top of member.
(wt. of sample = 1.5 kg)

No conodonts

SUBSECTION R-B12

GSC loc. C-76806: Vendom Fiord Formation, 4.6 m below top of formation.
(wt. of sample = 1.6 kg)

Pandorinellina exigua exigua (Philip)
Pa: 9*
Pb: 1*

GSC loc. C-76808: Blue Fiord Formation, lower member, 11.9 m above base of member.
(wt. of sample = 2.0 kg)

Pandorinellina exigua exigua (Philip)
Pa: 1

SUBSECTION R-B19

GSC loc. C-76243: Blue Fiord Formation, upper member, 64.0 m above base of member.
(wt. of sample = 2.0 kg)

Ozarkodina sp.
Pa: 2 Sa: 1
Pb: 2 Sb: 1
M: 1
Panderodus sp.: 39
Pandorinellina expansa Uyeno and Mason
Pa: 1
Pb: 1

GSC loc. C-76244: Blue Fiord Formation, upper member, 71.0 m above base of member.
(wt. of sample = 1.2 kg)

Panderodus sp.: 17
?*Pandorinellina expansa* Uyeno and Mason
Pa: 1 (fragmentary)
Unassigned elements:
M_2: 3

COMPOSITE SECTION R-C: EAST OF VENDOM FIORD

SUBSECTION R-C5

GSC loc. C-76240: Blue Fiord Formation, upper member, 7.6 m below top of member.
(wt. of sample = 2.0 kg)

Unassigned element:
Pa (spathognathodontan): 1

GSC loc. C-76239: Strathcona Fiord Formation, 112.8 m above base of formation.
(wt. of sample = 1.5 kg)

No conodonts

SUBSECTION R-C6

GSC loc. C-76235: Allen Bay–Read Bay carbonates (undivided)/Goose Fiord Formation, 30.5 m below top of unit.
(wt. of sample = 2.0 kg)

Panderodus sp.: 2
Unassigned element:
M_2: 1

GSC loc. C-76236: Blue Fiord Formation, lower member, 172.8 m above base of member.
(wt. of sample = 1.3 kg)

No conodonts

GSC loc. C-76237: Blue Fiord Formation, lower member, 250.5 m above base of member.
(wt. of sample = 1.6 kg)

No conodonts

COMPOSITE SECTION R-D: EAST OF VENDOM FIORD

SUBSECTION R-D10

GSC loc. C-76230: Allen Bay–Read Bay carbonates (undivided)/Goose Fiord Formation, 68.0 m below top of unit.
(wt. of sample = 1.9 kg)

Belodella sp.: 1

Ozarkodina excavata excavata (Branson and Mehl)
Pb: 1* Sa: 1
M: 2*
Panderodus sp.: 47

GSC loc. C-76231: Allen Bay–Read Bay carbonates (undivided)/Goose Fiord Formation, 52.7 m below top of unit.
(wt. of sample = 1.9 kg)

Ozarkodina excavata excavata (Branson and Mehl)
Pa: 2*
Panderodus sp.: 6
Unassigned element:
Sb: 1

GSC loc. C-76232: Vendom Fiord Formation, 149.0 m above base of formation.
(wt. of sample = 1.9 kg)

No conodonts

GSC loc. C-76233: Vendom Fiord Formation, 191.1 m above base of formation.
(wt. of sample = 1.9 kg)

Panderodus sp.: 2

GSC loc. C-76234: Blue Fiord Formation, lower member, 2.4 m above base of member.
(wt. of sample = 1.9 kg)

No conodonts

SUBSECTION R-D14

GSC loc. C-76245: Strathcona Fiord Formation, 7.6 m above base of formation.

Panderodus sp.: 44
Pandorinellina expansa Uyeno and Mason
Pa: 6*
Pb: 1
Steptotaxis n. sp. C
I: 1* M_2: 2
S_2?: 1*
Unassigned element:
Sc: 1

GSC loc. C-76246: Strathcona Fiord Formation, 15.2 m above base of formation.
(wt. of sample = 1.8 kg)

Panderodus sp.: 2

COMPOSITE SECTION R-F: EAST OF VENDOM FIORD

SUBSECTION R-F1

GSC loc. C-76211: Blue Fiord Formation, lower member, 3.0 m above base of member.

Pandorinellina exigua exigua (Philip)
Pa: 3*

SECTION 2A: BIRD FIORD AREA

Blue Fiord Formation, limestone and shale (lower) member

GSC loc. 83722: 0.3 m above base of formation.
(wt. of sample = 1.7 kg)

Belodella sp.: 2
Panderodus sp.: 131
Pandorinellina exigua exigua (Philip)
Pa: 96*
Polygnathus dehiscens dehiscens Philip and Jackson
Pa: 2*
Pseudooneotodus beckmanni (Bischoff and Sannemann): 1
Steptotaxis? n. sp. S
I: 72* M_2: 25
S_2: 97

GSC loc. 83723: 45 m above base of formation.
(wt. of sample = 1.5 kg)

Belodella sp.: 3
Panderodus sp.: 16
Pandorinellina exigua exigua (Philip)
Pa: 3

GSC loc. 83724: 70 m above base of formation.
(wt. of sample = 1.6 kg)

Belodella sp.: 3
Panderodus sp.: 17
Pandorinellina exigua exigua (Philip)
Pa: 16
(Biaxial crinoid ossicles)

GSC loc. 83725: 112 m above base of formation.
(wt. of sample = 1.6 kg)

Belodella sp.: 1
Panderodus sp.: 60
Pandorinellina exigua exigua (Philip)
Pa: 4
Unassigned elements:
M_2: 4
(Biaxial crinoid ossicles)

GSC loc. 83726: 141 m above base of formation.
(wt. of sample = 1.4 kg)

Belodella sp.: 2
Panderodus sp.: 90
Pandorinellina exigua exigua (Philip)
Pa: 280
Polygnathus dehiscens dehiscens Philip and Jackson
Pa: 3*
Pseudooneotodus beckmanni (Bischoff and Sannemann): 1
Steptotaxis? n. sp. S
I: 21 M_2: 39
S_2: 58

GSC loc. 83727: 197 m above base of formation.
(wt. of sample = 1.3 kg)

Panderodus sp.: 7
Pandorinellina exigua exigua (Philip)
Pa: 14
Unassigned elements:
M_2: 3
S_{2a}: 5
S_{2b}: 6

GSC loc. 83728: 230 m above base of formation.
(wt. of sample = 1.4 kg)

Belodella sp.: 4
Ozarkodina linearis (Philip)
Pa: 2
Panderodus sp.: 148
Pandorinellina exigua exigua (Philip)
Pa: 224*
Steptotaxis? n. sp. S
I: 10* M_2: 71
S_2: 98

GSC loc. 83729: 267 m above base of formation.
(wt. of sample = 1.3 kg)

Belodella sp.: 16
Ozarkodina linearis (Philip)
Pa: 4*
Panderodus sp.: 323
Pandorinellina exigua exigua (Philip)
Pa: 67
Polygnathus nothoperbonus Mawson
Pa: 70*
Steptotaxis? n. sp. S
I: 10* M_2: 77
S_2: 127

GSC loc. 83730: 308 m above base of formation.
(wt. of sample = 1.5 kg)

Belodella sp.: 10
Panderodus sp.: 62
Pandorinellina exigua exigua (Philip)
Pa: 12
Unassigned elements:
M_2: 8
S_2: 1

GSC loc. 83731: 357 m above base of formation.
(wt. of sample = 1.4 kg)

Belodella sp.: 13
Panderodus sp.: 123
Pandorinellina exigua exigua (Philip)
Pa: 11
Polygnathus nothoperbonus Mawson
Pa: 58
Unassigned elements:
M_2: 7
S_2: 9

GSC loc. 83732: 393 m above base of formation.
(wt. of sample = 1.4 kg)

Belodella sp.: 11
Panderodus sp.: 157
Pandorinellina exigua exigua (Philip)
Pa: 19
Polygnathus inversus Klapper and Johnson
Pa: 4

Polygnathus nothoperbonus Mawson
Pa: 21
Unassigned elements:
M_2: 12
S_2: 3

GSC loc. 83733: 447 m above base of formation.
(wt. of sample = 1.9 kg)

Belodella sp.: 9
Panderodus sp.: 256
Pandorinellina exigua exigua (Philip)
Pa: 19
Unassigned elements:
M_2: 5

GSC loc. 83734: 495 m above base of formation.
(wt. of sample = 1.4 kg)

Belodella sp.: 5
Panderodus sp.: 68
Pandorinellina exigua exigua (Philip)
Pa: 42
Polygnathus inversus Klapper and Johnson
Pa: 1
Polygnathus nothoperbonus Mawson
Pa: 1
Unassigned elements:
M_2: 7
S_2: 1

GSC loc. 83735: 539 m above base of formation.
(wt. of sample = 1.5 kg)

Belodella sp.: 3
Panderodus sp.: 7
Pandorinellina exigua exigua (Philip)
Pa: 2
Polygnathus nothoperbonus Mawson
Pa: 1
Unassigned elements:
M_2: 3
S_2: 1

GSC loc. 83736: 574 m above base of formation.
(wt. of sample = 1.4 kg)

Belodella sp.: 3
Panderodus sp.: 191
Polygnathus inversus Klapper and Johnson
Pa: 23*
Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 5
Steptotaxis? n. sp. S
I: 1* M_2: 4
S_2: 1

GSC loc. 83737: 661 m above base of formation.
(wt. of sample = 1.3 kg)

Belodella sp.: 15
Panderodus sp.: 445
Pandorinellina exigua exigua (Philip)
Pa: 1
Polygnathus inversus Klapper and Johnson
Pa: 43*
Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 7
Steptotaxis? n. sp. S
I: 4* M_2: 46
S_2: 26

Blue Fiord Formation, brown limestone (upper) member

GSC loc. 83738: 739 m above base of formation.
(wt. of sample = 1.4 kg)

Belodella sp.: 109
Panderodus sp.: 130
Pandorinellina exigua exigua (Philip)
Pa: 3
Polygnathus inversus Klapper and Johnson
Pa: 3
Genus and species indet. B: 1
Unassigned elements:
M_2: 7
S_2: 1

GSC loc. 83742: 745 m above base of formation.
(wt. of sample = 1.4 kg)

Belodella sp.: 3
Panderodus sp.: 9
Pandorinellina? sp.
Pa: 1*

GSC loc. 83743: 770 m above base of formation.
(wt. of sample = 0.6 kg)

Belodella sp.: 76
Panderodus sp.: 51
Pandorinellina exigua exigua (Philip)
Pa: 1
Pandorinellina expansa Uyeno and Mason
Pa: 1
Polygnathus inversus Klapper and Johnson
Pa: 32
Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 6*

Steptotaxis? n. sp. S
I: 3 M_2: 43
S_2: 53

GSC loc. 83744: 814 m above base of formation. (wt. of sample = 1.1 kg)

Belodella sp.: 14
Panderodus sp.: 132
Polygnathus inversus Klapper and Johnson
Pa: 2
Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 9
Unassigned elements:
M_2: 24
S_2: 16

GSC loc. 83745: 848 m above base of formation. (wt. of sample = 0.7 kg)

Belodella sp.: 4
Panderodus sp.: 32
Pandorinellina expansa Uyeno and Mason
Pa: 5
Polygnathus inversus Klapper and Johnson
Pa: 7
Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 4
Steptotaxis? n. sp. S
I: 1 M_2: 1
S_2: 4

GSC loc. 83746: 893 m above base of formation. (wt. of sample = 0.7 kg)

Belodella sp.: 2
Panderodus sp.: 119
Pandorinellina expansa Uyeno and Mason
Pa: 19
Pb: 2*
Polygnathus inversus Klapper and Johnson
Pa: 2
Steptotaxis? n. sp. S
I: 1 M_2: 6
S_2: 7
Genus and species indet. B: 1*

GSC loc. 83747: 916 m above base of formation. (wt. of sample = 1.0 kg)

Belodella sp.: 7
Panderodus sp.: 135
Pandorinellina expansa Uyeno and Mason
Pa: 10
Polygnathus inversus Klapper and Johnson
Pa: 1
Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 1
Steptotaxis? n. sp. S
I: 2 M_2: 2
Genus and species indet. B: 1

GSC loc. 83748: 939 m above base of formation. (wt. of sample = 0.8 kg)

Belodella sp.: 55
Panderodus sp.: 95
Pandorinellina expansa Uyeno and Mason
Pa: 3
Polygnathus inversus Klapper and Johnson
Pa: 12
Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 3
Steptotaxis? n. sp. S
I: 4 M_2: 49
S_2: 39

GSC loc. 83749: 966 m above base of formation. (wt. of sample = 0.8 kg)

Belodella sp.: 5
Panderodus sp.: 33
Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 3*
Steptotaxis? n. sp. S
I: 2 S_2?: 1 (fragmentary)
Genus and species indet. B: 1
(Biaxial crinoid ossicles)

GSC loc. 83750: 1006 m above base of formation. (wt. of sample = 0.8 kg)

Belodella sp.: 1
Panderodus sp.: 12
Genus and species indet. B: 1
(Biaxial crinoid ossicles)

GSC loc. 83751: 1041 m above base of formation. (wt. of sample = 0.8 kg)

Belodella sp.: 1
Panderodus sp.: 6
Pandorinellina expansa Uyeno and Mason
Pa: 1
Steptotaxis? n. sp. S
I: 1

GSC loc. 83752: 1072 m above base of formation. (wt. of sample = 0.8 kg)

Belodella sp.: 22
Panderodus sp.: 53
Pandorinellina expansa Uyeno and Mason
Pa: 38
Steptotaxis? n. sp. S
I: 2 M_2: 2
S_2: 4

GSC loc. 83753: 1104 m above base of formation. (wt. of sample = 0.7 kg)

Belodella sp.: 30
Panderodus sp.: 131
Pandorinellina expansa Uyeno and Mason
Pa: 39
Polygnathus serotinus Telford
Pa: 19
Steptotaxis? n. sp. S
I: 1 M_2: 6
S_2: 3
Steptotaxis? cf. *S.*? n. sp. S
I: 1
(Biaxial crinoid ossicles)

GSC loc. 83754: 1144 m above base of formation. (wt. of sample = 0.7 kg)

Belodella sp.: 1
Panderodus sp.: 153
Polygnathus serotinus Telford
Pa: 65*
Steptotaxis glenisteri (Klapper)
I: 1* M_2?: 1

GSC loc. 83755: 1179 m above base of formation. (wt. of sample = 0.8 kg)

Belodella sp.: 1
Panderodus sp.: 69
Unassigned element:
S_2: 1
(Biaxial crinoid ossicles)

GSC loc. 83756: 1215 m above base of formation. (wt. of sample = 0.8 kg)

Belodella sp.: 2
Panderodus sp.: 89
Pandorinellina expansa Uyeno and Mason
Pa: 1
(Biaxial crinoid ossicles)

GSC loc. 83757: 1246 m above base of formation. (wt. of sample = 1.0 kg)

Belodella sp.: 2
Panderodus sp.: 29
Pandorinellina expansa Uyeno and Mason
Pa: 2
Polygnathus sp. indet.
Pa: 1 (fragmentary)
(Biaxial crinoid ossicles)

Bird Fiord Formation

GSC loc. 83758: 23 m above base of formation. (wt. of sample = 1.0 kg)

No conodonts

GSC loc. 83759: 102 m above base of formation. (wt. of sample = 1.1 kg)

Panderodus sp.: 6
Unassigned element:
S_2: 1

GSC loc. 83760: 133 m above base of formation. (wt. of sample = 2.1 kg)

Panderodus sp.: 1
Pandorinellina expansa Uyeno and Mason
Pa: 1

GSC loc. 83761: 179 m above base of formation. (wt. of sample = 0.9 kg)

Panderodus sp.: 15
Pandorinellina expansa Uyeno and Mason
Pa: 3
Steptotaxis n. sp. C
I: 2* M_2: 7
S_{2a}: 8
S_{2c}: 3

GSC loc. 83762: 188 m above base of formation. (wt. of sample = 0.5 kg)

Panderodus sp.: 8
Pandorinellina expansa Uyeno and Mason
Pa: 1

GSC loc. 83763: 386 m above base of formation. (wt. of sample = 0.7 kg)

No conodonts

GSC loc. 83764: 419 m above base of formation. (wt. of sample = 0.7 kg)

Panderodus sp.: 10
Unassigned elements:
Pb (ozarkodinan): 1
M_2: 2

GSC loc. 83765: 454 m above base of formation. (wt. of sample = 0.7 kg)

Panderodus sp.: 28
Pandorinellina expansa Uyeno and Mason
Pa: 10*
Polygnathus serotinus Telford
Pa: 6*
Steptotaxis? cf. *S.*? n. sp. S
I: 3* M_2: 8
S_2: 2

GSC loc. 83766: 497 m above base of formation. (wt. of sample = 0.9 kg)

Panderodus sp.: 6
Pandorinellina expansa Uyeno and Mason
Pa: 3
Steptotaxis? cf. *S.*? n. sp. S
I: 3 M_2: 10
S_2: 5

GSC loc. 83767: 523 m above base of formation. (wt. of sample = 0.9 kg)

Panderodus sp.: 5
Pandorinellina expansa Uyeno and Mason
Pa: 1
Steptotaxis? cf. *S.*? n. sp. S
I: 2*
Steptotaxis maclareni n. sp.
I: 3* M_2: 6★
S_2: 2★
S_{2c}: 2★

(Note: elements with ★ may in part belong to *Steptotaxis*? cf. *S.*? n. sp. S)
(Biaxial crinoid ossicles)

GSC loc. 83768: 549 m above base of formation. (wt. of sample = 1.3 kg)

Panderodus sp.: 12
Pandorinellina expansa Uyeno and Mason
Pa: 4
Steptotaxis macgregori n. sp.
I: 2* M_2: 17
S_{2a}: 2
S_{2b}: 1
S_{2c}: 2*

GSC loc. 83769: 576 m above base of formation. (wt. of sample = 1.3 kg)

Panderodus sp.: 3
Pandorinellina expansa Uyeno and Mason
Pa: 3
Steptotaxis macgregori n. sp.
I: 3* M_2: 28*
S_{2a}: 10*
S_{2b}: 1*
S_{2c}: 6*

GSC loc. 83770: 613 m above base of formation. (wt. of sample = 0.9 kg)

Pandorinellina expansa Uyeno and Mason
Pa: 3
Unassigned elements:
M_2: 2

GSC loc. 83771: 675 m above base of formation. (wt. of sample = 1.1 kg)

Pandorinellina expansa Uyeno and Mason
Pa: 1
Steptotaxis sp. indet.
M_2: 5
S_{2a}: 4
S_{2b}: 2
S_{2c}: 3

GSC loc. 83772: 696 m above base of formation. (wt. of sample = 0.7 kg)

Pandorinellina expansa Uyeno and Mason
Pa: 1
Unassigned elements:
M_2: 2

GSC loc. 83773: 717 m above base of formation. (wt. of sample = 0.8 kg)

Steptotaxis sp. indet.
M_2: 2
S_{2c}: 1

GSC loc. 83774: 745 m above base of formation. (wt. of sample = 0.8 kg)

Panderodus? sp.: 1
Unassigned element:
S_{2b}?: 1 (fragmentary)

GSC loc. 83775: 797 m above base of formation. (wt. of sample = 0.9 kg)

Steptotaxis macgregori n. sp.
I: 3* S_{2c}: 1

Unassigned element:
I: 1 (icriodontid?)

GSC loc. 83776: 853 m above base of formation.
(wt. of sample = 0.7 kg)

No conodonts

SECTION 2B: PANARCTIC TENNECO ET AL. CSP EIDS M-66 WELL

Top of Allen Bay Formation at 603.5 m below top of well.

Cape Phillips Formation

GSC loc. C-30360/1950-1980: 594.4 m to 603.5 m below top of well, unit 1.
(wt. of sample = 1.1 kg)

Dapsilodus obliquicostatus (Branson and Mehl): 4
Oulodus? *fluegeli fluegeli* (Walliser)
M: 1 Sa: 1

GSC loc. C-30360/1920-1950: 585.2 m to 594.4 m below top of well, unit 1.
(wt. of sample = 0.9 kg)

Dapsilodus obliquicostatus (Branson and Mehl): 3
Decoriconus fragilis (Branson and Mehl): 3
Oulodus? *fluegeli fluegeli* (Walliser)
Pa: 2 Sa: 1
Pb: 3 Sb: 4
M: 5 Sc: 2
Panderodus sp.: 3

GSC loc. C-30360/1890-1920: 576.1 m to 585.2 m below top of well, unit 1.
(wt. of sample = 1.1 kg)

Unassigned element:
Sc: 1

GSC loc. C-30360/1830-1860: 557.8 m to 566.9 m below top of well, unit 2.
(wt. of sample = 0.9 kg)

Astropentagnathus irregularis Mostler
Pa_1: 6* Sa: 1
Pa_2: 1*
Pb: 1*
M: 3*
Belodella sp.: 6
?*Carniodus carnulus* Walliser
Pb?: 1*
Dapsilodus obliquicostatus (Branson and Mehl): 16
Decoriconus fragilis (Branson and Mehl)
S: 3*
denticulate rastrate: 5*
Oulodus? *fluegeli fluegeli* (Walliser)
Pa: 9 Sa: 13
Pb: 3 Sb: 9
M: 15
Panderodus sp.: 21
Pseudooneotodus beckmanni (Bischoff and Sannemann): 3
Pterospathodus celloni (Walliser)
Pa: 1* Sa: 1*
M: 1* Sb: 1*
Pterospathodus cf. *P. celloni* (Walliser)
Pa: 1*
Unassigned elements:
M: 1 Sa: 2
Sc: 1
?eobelodiniform-like element: 1

GSC loc. C-30360/1740-1770: 530.4 m to 539.5 m below top of well, unit 2.
(wt. of sample = 1.0 kg)

Decoriconus fragilis (Branson and Mehl): 1
Oulodus? cf. *O.*? *fluegeli* (Walliser)
Pa: 2 Sa: 1
Sb: 1
M: 2 Sc: 2
Panderodus sp.: 5
Pterospathodus celloni (Walliser)
Pa: 2 Sa: 1
M: 2

GSC loc. C-30360/1650-1680: 502.9 m to 512.1 m below top of well, unit 2.
(wt. of sample = 1.1 kg)

Panderodus sp.: 2
Walliserodus cf. *W. curvatus* (Branson and Mehl): 1
Unassigned elements:
Pb: 3
M: 2

GSC loc. C-30360/1560-1590: 475.5 m to 484.6 m below top of well, unit 2.
(wt. of sample = 1.0 kg)

No conodonts

GSC loc. C-30360/1470-1500: 448.1 m to 457.2 m below top of well, unit 2.
(wt. of sample = 0.9 kg)

Unassigned element:
Pa: 1 (small spathognathodontan)

GSC loc. C-30360/1380-1410: 420.6 m to 429.8 m below top of well, unit 2.
(wt. of sample = 1.1 kg)

Unassigned element:
Pa: 1 (small spathognathodontan)

GSC loc. C-30360/1290-1320: 393.2 m to 402.3 m below top of well, unit 2.
(wt. of sample = 1.1 kg)

Unassigned element:
M: 1

No conodonts were recovered from the following:

GSC loc. 30360/1200-1230: 365.8 m to 374.9 m below top of well, unit 2 (wt. of sample = 1.1 kg); **GSC loc. 30360/1110-1140:** 338.3 m to 347.5 m below top of well, unit 2 (wt. of sample = 1.1 kg); **GSC loc. 30360/1020-1050:** 310.9 m to 320.0 m below top of well, unit 2 (wt. of sample = 1.1 kg); and **GSC loc. 30360/930-960:** 283.5 m to 292.6 m below top of well, unit 2 (wt. of sample = 1.1 kg).

Top of Cape Phillips Formation at 272.8 m below top of well.

Eids Formation

GSC loc. C-30360/840-870: 256.0 m to 265.2 m below top of well, unit 1.
(wt. of sample = 1.1 kg)

Indeterminate fragment only: 1

GSC loc. C-30360/750-780: 228.6 m to 237.7 m below top of well, unit 1.
(wt. of sample = 1.1 kg)

No conodonts

GSC loc. C-30360/660-690: 201.2 m to 210.3 m below top of well, unit 1.
(wt. of sample = 1.1 kg)

Indeterminate fragments only: 3

No conodonts were recovered from the following:

GSC loc. C-30360/570-600: 173.7 m to 182.9 m below top of well, unit 1 (wt. of sample = 1.1 kg); **GSC loc. C-30360/480-510:** 146.3 m to 155.4 m below top of well, unit 1 (wt. of sample = 1.1 kg); **GSC loc. C-30360/390-420:** 118.9 m to 128.0 m below top of well, unit 1 (wt. of sample = 1.1 kg); **GSC loc. C-30360/300-330:** 91.4 m to 100.6 m below top of well, unit 1 (wt. of sample = 1.1 kg); **GSC loc. C-30360/210-240:** 64.0 m to 73.2 m below top of well, unit 2 (wt. of sample = 1.1 kg); and **GSC loc. C-30360/120-150:** 36.6 m to 45.7 m below top well, unit 2 (wt. of sample = 1.1 kg)

GSC loc. C-30360/30-60: 9.1 m to 18.3 m below top of well, unit 2.
(wt. of sample = 1.1 kg).

Indeterminate fragment only: 1

SECTION 2C: PANARCTIC ARCO ET AL. BLUE FIORD E-46 WELL

Top of Ordovician carbonates at 2002.2 m below top of well.

Allen Bay Formation

GSC loc. C-67898/6300-6400: 1920.2 m to 1950.7 m below top of well, unit 1.
(wt. of sample = 1.2 kg)

Dapsilodus obliquicostatus (Branson and Mehl): 25
Decoriconus fragilis (Branson and Mehl): 9
Oulodus? *fluegeli fluegeli* (Walliser)
Pa: 6 Sa: 2
Pb: 3 Sb: 5
M: 3 Sc: 2
Panderodus sp.: 8
Walliserodus cf. *W. curvatus* (Branson and Mehl): 9

GSC loc. C-67898/6200-6300: 1889.8 m to 1920.2 m below top of well, unit 1.
(wt. of sample = 1.2 kg)

Dapsilodus obliquicostatus (Branson and Mehl): 3
Oulodus? *fluegeli fluegeli* (Walliser)
Pa: 1 Sa: 1
Pb: 1
M: 4 Sc: 2
Panderodus sp.: 6
Walliserodus cf. *W. curvatus* (Branson and Mehl): 2

GSC loc. C-67898/6100-6200: 1859.3 m to 1889.8 m below top of well, unit 1.
(wt. of sample = 1.2 kg)

Oulodus? *fluegeli fluegeli* (Walliser)
Pa: 1 Sa: 1
M: 4 Sb: 2
Panderodus sp.: 2
Walliserodus cf. *W. curvatus* (Branson and Mehl): 3

GSC loc. C-67898/6000-6100: 1828.8 m to 1859.3 m below top of well, units 1 and 2.
(wt. of sample = 1.4 kg)

Coelocerodontus sp.: 1
Dapsilodus obliquicostatus (Branson and Mehl): 21
Decoriconus fragilis (Branson and Mehl)
Sa: 1* unassigned elements: 4
Sa-Sb transitional: 1*
Oulodus? *fluegeli fluegeli* (Walliser)
Pa: 6 Sa: 4
Pb: 5 Sb: 4
M: 8 Sc: 2
Oulodus sp. 10
Pa: 1* Sc: 1*
M?: 1*
Panderodus sp.: 20
Walliserodus cf. *W. curvatus* (Branson and Mehl): 13
Unassigned elements:
Pb: 1 Sc: 3
M: 1

GSC loc. C-67898/5900-6000: 1798.3 m to 1828.8 m below top of well. Allen Bay Formation, unit 2, and Allen Bay–Read Bay carbonates (undivided), unit 3.
(wt. of sample = 1.2 kg)

Coelocerodontus trigonius Ethington: 2
Dapsilodus obliquicostatus (Branson and Mehl): 3
Decoriconus fragilis (Branson and Mehl): 1
Oulodus? *fluegeli fluegel* (Walliser)
M: 2 Sa: 1
Sc: 2
Panderodus sp.: 10
Walliserodus cf. *W. curvatus* (Branson and Mehl)
M: 3* unassigned elements: 4

Top of Allen Bay Formation at 1815.1 m below top of well.

Allen Bay–Read Bay carbonates (undivided)

GSC loc. C-67898/5800-5900: 1767.8 m to 1798.3 m below top of well, unit 3.
(wt. of sample = 1.2 kg)

Astropentagnathus irregularis Mostler
Pa_1: 1 Sb?: 1
M: 1
Distomodus staurognathoides (Walliser)
M: 1*
Panderodus sp.: 1
Unassigned elements:
Pb?: 2 Sa: 1
Sc: 1

GSC loc. C-67898/5700-5800: 1737.4 m to 1767.8 m below top of well, unit 3.
(wt. of sample = 0.6 kg)

Oulodus? cf. *O.*? *fluegeli* (Walliser)
Pa: 1
M: 1
Panderodus sp.: 6
Pterospathodus pennatus procerus (Walliser)
Pa: 1
Unassigned elements:
Sa: 2
Sc: 1

GSC loc. C-67898/5600-5700: 1706.9 m to 1737.4 m below top of well, unit 3.
(wt. of sample = 1.2 kg)

Carniodus? sp.: 1 (fragmentary)
Oulodus? cf. *O.*? *fluegeli* (Walliser)
Pa: 1
M: 1
Panderodus sp.: 13
Walliserodus? sp.: 2

GSC loc. C-67898/5500-5600: 1676.4 m to 1706.9 m below top of well, unit 3.
(wt. of sample = 0.8 kg)

Panderodus sp.: 7
Unassigned elements:
Pb: 2
M: 1

GSC loc. C-67898/5400-5500: 1645.9 m to 1676.4 m below top of well, unit 3.
(wt. of sample = 0.8 kg)

Panderodus sp.: 7
Indeterminate fragments

GSC loc. C-67898/5300-5400: 1615.4 m to 1645.9 m below top of well, unit 3.
(wt. of sample = 0.7 kg)

Indeterminate fragments

GSC loc. C-67898/5200-5300: 1585.0 m to 1615.4 m below top of well, unit 3.
(wt. of sample = 1.0 kg)

Panderodus sp.: 9
Pterospathodus pennatus procerus (Walliser)
Pa: 1

GSC loc. C-67898/5100-5200: 1554.5 m to 1585.0 m below top of well, unit 3.
(wt. of sample = 1.2 kg)

Panderodus sp.: 1
Indeterminate fragments

GSC loc. C-67898/5000-5100: 1524.0 m to 1554.5 m below top of well, units 3 and 4.
(wt. of sample = 0.9 kg)

Indeterminate fragments

GSC loc. C-67898/4900-5000: 1493.5 m to 1524.0 m below top of well, unit 4.
(wt. of sample = 1.2 kg)

Panderodus sp.: 2

GSC loc. C-67898/4800-4900: 1463.0 m to 1493.5 m below top of well, unit 4.
(wt. of sample = 1.2 kg)

Oulodus sp.
Pb: 1
Panderodus sp.: 6

GSC loc. C-67898/4700-4800: 1432.6 m to 1463.0 m below top of well, unit 4.
(wt. of sample = 1.0 kg)

Ozarkodina sp.
Pa: 1 (fragmentary)
Pb: 1
Panderodus sp.: 5

GSC loc. C-67898/4600-4700: 1402.1 m to 1432.6 m below top of well, unit 4.
(wt. of sample = 0.5 kg)

Panderodus sp.: 13

GSC loc. C-67898/4500-4600: 1371.6 m to 1402.1 m below top of well, unit 4.
(wt. of sample = 1.2 kg)

Panderodus sp.: 32

GSC loc. C-67898/4400-4500: 1341.1 m to 1371.6 m below top of well, units 4 and 5.
(wt. of sample = 0.3 kg)

Panderodus sp.: 1
Indeterminate fragments

GSC loc. C-67898/4352-4361: 1326.5 m to 1329.2 m below top of well, unit 5; core no. 2.
(wt. of sample = 0.9 kg)

Panderodus sp.: 1

GSC loc. C-67898/4300-4400: 1310.6 m to 1341.1 m below top of well, unit 5.
(wt. of sample = 0.1 kg)

Panderodus sp.: 2

GSC loc. C-67898/4200-4300: 1280.2 m to 1310.6 m below top of well, unit 5.
(wt. of sample = 0.5 kg)

Panderodus sp.: 7
Unassigned elements:
Pb?: 1 Sb: 1
Sc: 1

GSC loc. C-67898/4100-4200: 1249.7 m to 1280.2 m below top of well, unit 5.
(wt. of sample = 0.4 kg)

Panderodus sp.: 1
Unassigned element:
M: 1

GSC loc. C-67898/4000-4100: 1219.2 m to 1249.7 m below top of well, unit 5.
(wt. of sample = 0.2 kg)

Panderodus sp.: 1
Indeterminate fragments

GSC loc. C-67898/3900-4000: 1188.7 m to 1219.2 m below top of well, unit 5.
(wt. of sample = 0.3 kg)

Panderodus sp.: 1
Indeterminate fragments

GSC loc. C-67898/3800-3900: 1158.2 m to 1188.7 m below top of well, unit 5.
(wt. of sample = 0.3 kg)

Panderodus sp.: 1
Unassigned element:
Pb?: 1

GSC loc. C-67898/3700-3800: 1127.8 m to 1158.2 m below top of well, unit 5.
(wt. of sample = 0.8 kg)

Panderodus sp.: 1

GSC loc. C-67898/3600-3700: 1097.3 m to 1127.8 m below top of well, unit 5.
(wt. of sample = 0.3 kg)

Panderodus sp.: 1

GSC loc. C-67898/3500-3600: 1066.8 m to 1097.3 m below top of well, unit 5.
(wt. of sample = 0.3 kg)

Ozarkodina? sp.
Pa: 1 Sc?: 1
Panderodus sp.: 2

GSC loc. C-67898/3300-3400: 1005.8 m to 1036.3 m below top of well, unit 6.
(wt. of sample = 0.9 kg)

Ozarkodina cf. *O. douroensis* Uyeno
Pa: 1*
Pb: 3
Panderodus sp.: 9

GSC loc. C-67898/3200-3300: 975.4 m to 1005.8 m below top of well, unit 6.
(wt. of sample = 0.3 kg)

Ozarkodina confluens (Branson and Mehl)?
Pa: 2 (fragmentary) Sb: 1

GSC loc. C-67898/3100-3200: 944.9 m to 975.4 m below top of well, unit 6.
(wt. of sample = 0.3 kg)

Unassigned elements:
Pb: 1 Sa: 1

GSC loc. C-67898/3130-3149: 954.0 m to 959.8 m below top of well, unit 6; core no. 1.
(wt. of sample = 1.0 kg)

Ozarkodina excavata (Branson and Mehl)?
Sa: 1
Panderodus sp.: 2
Unassigned elements:
M: 1 Sc?: 1

GSC loc. C-67898/3000-3100: 914.4 m to 944.9 m below top of well, unit 6.
(wt. of sample = 0.3 kg)

No conodonts

GSC loc. C-67898/2900-3000: 883.9 m to 914.4 m below top of well, unit 6.
(wt. of sample = 1.1 kg)

Ozarkodina excavata excavata (Branson and Mehl)
Pa: 2
Pb: 2 Sc: 2
Panderodus sp.: 4

GSC loc. C-67898/2800-2900: 853.4 m to 883.9 m below top of well. Allen Bay–Read Bay carbonates, unit 6, and Cape Philips Formation.
(wt. of sample = 0.4 kg)

Ozarkodina excavata excavata (Branson and Mehl)
Pa: 2
Pb: 1 Sb: 1
M: 2 Sc: 2
Panderodus sp.: 5

Top of Allen Bay–Read Bay carbonates (undivided) at 856.8 m below top of well.

Cape Phillips Formation

GSC loc. C-67898/2700-2800: 823.0 m to 854.4 m below top of well.
(wt. of sample = 1.2 kg)

Indeterminate fragments

No conodonts were recovered from the following:

GSC loc. C-67898/2600-2700: 792.5 m to 823.0 m below top of well (wt. of sample = 1.2 kg); **GSC loc. C-67898/2500-2600:** 762.0 m to 792.5 m below top of well (wt. of sample = 1.2 kg); **GSC loc. C-67898/2400-2500:** 731.5 m to 762.0 m below top of well (wt. of sample = 1.2 kg); **GSC loc. C-67898/2300-2400:** 701.0 m to 731.5 m below top of well (wt. of sample = 1.2 kg); **GSC loc. C-67898/2200-2300:** 670.6 m to 701.0 m below top of well (wt. of sample = 1.2 kg); and **GSC loc. C-67898/2100-2200:** 640.1 m to 670.6 m below top of well (wt. of sample = 1.2 kg).

Top of Cape Phillips Formation at 669.0 m below top of well.

Eids Formation

No conodonts were recovered from the following:

GSC loc. C-67898/2000-2100: 609.6 m to 640.1 m below top of well, unit 1 (wt. of sample = 1.2 kg); **GSC loc. C-67898/1900-2000:** 579.1 m to 609.6 m below top of well, unit 1 (wt. of sample = 1.2 kg); **GSC loc. C-67898/1800-1900:** 548.6 m to 579.1 m below top of well, unit 1 (wt. of sample = 1.2 kg); **GSC loc. C-67898/1700-1800:** 518.2 m to 548.6 m below top of well, unit 1 (wt. of sample = 1.2 kg); **GSC loc. C-67898/1600-1700:** 487.7 m to 518.2 m below top of well, unit 1 (wt. of sample = 1.2 kg); **GSC loc. C-67898/1500-1600:** 457.2 m to 487.7 m below top of well, units 1 and 2 (wt. of sample = 1.2 kg); **GSC loc. C-67898/1400-1500:** 426.7 m to 457.2 m below top of well, unit 2 (wt. of sample = 1.2 kg); and **GSC loc. C-67898/1300-1400:** 396.2 m to 426.7 m below top of well, unit 2 (wt. of sample = 1.2 kg).

GSC loc. C-67898/1200-1300: 365.8 m to 396.2 m below top of well, unit 2.
(wt. of sample = 1.2 kg)

Panderodus sp.: 1
Pandorinellina exigua exigua (Philip)
Pa: 1

No conodonts were recovered from the following:

GSC loc. C-67898/1100-1200: 335.3 m to 365.8 m below top of well, unit 2 (wt. of sample = 1.2 kg); **GSC loc. C-67898/1000-1100:** 304.8 m to 335.3 m below top of well, unit 2 (wt. of sample = 1.2 kg); **GSC loc. C-67898/900-1000:** 274.3 m to 304.8 m below top of well, unit 2 (wt. of sample = 1.2 kg); **GSC loc. C-67898/800-900:** 243.8 m to 274.3 m below top of well, unit 2 (wt. of sample = 1.2 kg); **GSC loc. C-67898/700-800:** 213.4 m to 243.8 m below top of well, unit 2 (wt. of sample = 1.2 kg); **GSC loc. C-67898/600-700:** 182.9 m to 213.4 m below top of well, unit 2 (wt. of sample = 1.2 kg); **GSC loc. C-67898/500-600:** 152.4 m to 182.9 m below top of well, unit 2 (wt. of sample = 1.2 kg); **GSC loc. C-67898/410-500:** 125.0 m to 152.4 m below top of well, unit 2 (wt. of sample = 1.0 kg); and **GSC loc. C-67898/310-400:** 94.5 m to 121.9 m below top of well, unit 2 (wt. of sample = 1.0 kg).

GSC loc. C-67898/210-300: 64.0 m to 91.4 m below top of well, unit 2.
(wt. of sample = 1.0 kg)

Indeterminate fragments

GSC loc. C-67898/110-200: 33.5 m to 61.0 m below top of well, unit 2.
(wt. of sample = 1.0 kg)

No conodonts

GSC loc. C-67898/60-110: 18.3 m to 33.5 m below top of well, unit 2.
(wt. of sample = 0.5 kg)

Panderodus sp.: 1
Pandorinellina exigua exigua (Philip)
Pa: 1

SECTION 3A: SUTHERLAND RIVER, SOUTH OF THE GRINNELL THRUST

Douro Formation

GSC locs. 83673 and 83674: 24 m below top of formation.
(wt. of sample = 4.9 kg)

Ozarkodina confluens (Branson and Mehl)
Pa: 2 Sb: 1
Ozarkodina excavata excavata (Branson and Mehl)
Pa: 6 Sa: 2
M: 2 Sb: 2
Panderodus sp.: 53
Unassigned elements:
Pb: 5 Sc: 3

GSC loc. 83675: 0 to 0.3 m below top of formation.
(wt. of sample = 2.4 kg)

"*Neoprioniodus*" sp. A: 3*
Oulodus sp. 5 of Uyeno (1981a)
Pa: 1* Sc: 1*
Pb: 1*
Ozarkodina confluens (Branson and Mehl)
Pa: 1 (small specimen)
Ozarkodina excavata excavata (Branson and Mehl)
Pa: 2 Sa: 1
Pb: 3 Sb: 6
M: 4 Sc: 4
Panderodus sp.: 83
Apparatus B of Uyeno (1981a)
Unassigned element: 1

Sutherland River Formation (type section)

GSC loc. 83676: 74 m above base of formation.
(wt. of sample = 2.4 kg)

Amydrotaxis chattertoni n. sp.
Pa: 40* Sa: 29*
Pb: 8* Sb: 19*
M: 1* Sc: 9*
Erika cf. *E. divarica* Murphy and Matti
Sb: 1*
Sc: 2*
Oulodus sp. 8
Sa: 2*
Sb: 1*
Pelekysgnathus n. sp. G
I: 2* S_2: 1*
M_2: 22*

GSC loc. 83677: 91 m above base of formation.
(wt. of sample = 2.3 kg)

Unassigned elements (probably of *Pelekysgnathus* sp.):

S_2: 1
M_2: 22

GSC loc. C-136452: 116 m above base of formation.
(wt. of sample = 2.5 kg)

Ozarkodina remscheidensis remscheidensis (Ziegler)
Pa: 28* Sa: 1
Pb: 11 Sb: 1
M: 2
Pelekysgnathus sp.
I: 1 S_2: 2
M_2: 18
(Note: all specimens minute and fragile)

Prince Alfred Formation (type section)

GSC loc. 83678: 43 m above base of formation.
(wt. of sample = 1.8 kg)

No conodonts

Blue Fiord Formation

GSC loc. 83679: 0 to 0.3 m above base of formation.
(wt. of sample = 2.5 kg)

Belodella sp.: 24
Panderodus sp.: 131
Polygnathus inversus Klapper and Johnson
Pa: 5
Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 3
Unassigned elements:
Pb: 1
M_2: 11
S_{2c}: 1

GSC loc. 83680: 15 m above base of formation
(wt. of sample = 2.1 kg)

Belodella sp.: 8
Panderodus sp.: 275
Polygnathus inversus Klapper and Johnson
Pa: 14
Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 2
Steptotaxis? n. sp. S
I: 9* M_2: 43*
S_{2a}: 5*
S_{2b}: 1*
S_{2c}: 3*
Unassigned elements:
Pb: 4 Sb: 1
Sc: 1

GSC loc. 83681: 30 m above base of formation.
(wt. of sample = 2.3 kg)

Belodella sp.: 75
Panderodus sp.: 269
Pandorinellina exigua exigua (Philip)
Pa: 67*
Polygnathus inversus Klapper and Johnson
Pa: 22
Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 16
Pseudooneotodus beckmanni (Bischoff and Sannemann): 1
Steptotaxis glenisteri (Klapper)
I: 14* M_2: 34*
S_{2a}: 4*
S_{2b}: 11*
S_{2c}: 7*
Unassigned elements:
Sa (diplododellan): 2
Pb: 36 Sb: 8
M: 22 Sc: 4

GSC loc. 83682: 49 m above base of formation.
(wt. of sample = 2.4 kg)

Panderodus sp.: 153
Polygnathus inversus Klapper and Johnson
Pa: 2
Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 1
Steptotaxis glenisteri (Klapper)
I: 3 M_2: 13
S_{2a}: 1
S_{2b}: 1

GSC loc. 83683: 70 m above base of formation.
(wt. of sample = 2.4 kg)

Belodella sp.: 24
Panderodus sp.: 495
Pandorinellina exigua exigua (Philip)
Pa: 28*
Polygnathus inversus Klapper and Johnson
Pa: 7

Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 27*
Steptotaxis glenisteri (Klapper)
I: 1 M_2: 11
S_{2b}: 1
Unassigned elements:
Sa: 1
Pb: 8   Sb: 3
M: 9   Sc: 3

GSC loc. 83684: 85 m above base of formation. (wt. of sample = 2.7 kg)

Belodella sp.: 27
Panderodus sp.: 329
Pandorinellina exigua exigua (Philip)
Pa: 38
Polygnathus inversus Klapper and Johnson
Pa: 15*
Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 26
Steptotaxis glenisteri (Klapper)
I: 6 M_2: 10
S_{2b}: 1
Steptotaxis? n. sp. S
I: 1*
Unassigned elements:
Sa: 3
Pb: 13   Sb: 1
M: 19   Sc: 7

GSC loc. 83685: 101 m above base of formation. (wt. of sample = 2.5 kg)

Belodella sp.: 12
Coelocerodontus sp.: 1
Panderodus sp.: 373
Polygnathus inversus Klapper and Johnson
Pa: 8
Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 7
Steptotaxis glenisteri (Klapper)
I: 1 M_2: 27
S_{2a}: 2
Unassigned elements:
Pb: 2   Sa: 2
M: 4

GSC loc. 83686: 116 m above base of formation. (wt. of sample = 2.5 kg)

Belodella sp.: 24
Panderodus sp: 346
Polygnathus inversus Klapper and Johnson
Pa: 8
Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 7
Unassigned elements:
Pb: 3   Sb: 1
M: 2
M_2: 10

GSC loc. 83687: 123 m above base of formation. (wt. of sample = 2.7 kg)

Belodella sp.: 16
Panderodus sp.: 362
Polygnathus inversus Klapper and Johnson
Pa: 12
Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 22*
Steptotaxis glenisteri (Klapper)?
I: 1 M_2: 30
S_{2a}: 1
Unassigned elements:
Pb: 2
M: 4

GSC loc. 83688: 184 m above base of formation. (wt. of sample = 2.7 kg)

Belodella sp.: 77
Panderodus sp.: 654
Polygnathus inversus Klapper and Johnson
Pa: 17*
Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 8
Steptotaxis glenisteri (Klapper)
I: 6 M_2: 94
S_{2a}: 7
S_{2b}: 8
S_{2c}: 2
Unassigned elements:
Pb: 5   Sa: 1
M: 5   Sb: 1

SECTION 3B: SUTHERLAND RIVER, NORTH OF THE GRINNELL THRUST

Douro Formation

GSC loc. 83661: 186 m below top of formation.
(wt. of sample = 2.2 kg)

Oulodus sp.
Pa: 2 — Sa: 1
Sb: 3
Sc: 2
Ozarkodina confluens (Branson and Mehl)
Pa: 17 — Sa: 1
Ozarkodina douroensis Uyeno
Pa: 21* — Sa: 1
Pb: 7* — Sb: 2
M: 2 — Sc: 1
Ozarkodina excavata excavata (Branson and Mehl)
Pa: 3 — Sa: 1
Sb: 5
Panderodus sp.: 61
Apparatus B of Uyeno (1981a)
Pa: 2* — Unassigned elements: 6
Pb: 1
M?: 1
Unassigned elements:
Pb: 9
M: 8 — Sc: 1

GSC loc. 83662: 152 m below top of formation.
(wt. of sample = 2.8 kg)

Ozarkodina confluens (Branson and Mehl)
Pa: 2
Ozarkodina excavata excavata (Branson and Mehl)
Pa: 20 — Sa: 7
M: 9 — Sb: 14
Panderodus sp.: 24
Unassigned elements:
Pb: 2 — Sc: 6

GSC loc. 83663: 131 m below top of formation.
(wt. of sample = 2.2 kg)

Oulodus sp.
Sa: 1
Sc: 1
Ozarkodina confluens (Branson and Mehl)
Pa: 10
M: 2
Ozarkodina excavata excavata (Branson and Mehl)
Pa: 7* — Sa: 10*
Pb: 8** — Sb: 9*
M: 20* — Sc: 13**
(Note: elements with * may in part belong to *O. confluens*)
Panderodus sp.: 73
Apparatus B of Uyeno (1981a)
Unassigned element: 1

GSC loc. 83664: 104 m below top of formation.
(wt. of sample = 1.8 kg)

Ozarkodina confluens (Branson and Mehl)
Pa: 3
M: 1
Ozarkodina excavata excavata (Branson and Mehl)
Pa: 7* — Sa: 2
Pb: 4** — Sb: 10**
M: 10* — Sc: 5*
(Note: elements with * may in part belong to *O. confluens*)
Panderodus sp.: 19
Apparatus B of Uyeno (1981a)
Unassigned elements: 2

GSC loc. 83665: 79 m below top of formation.
(wt. of sample = 2.6 kg)

Ozarkodina excavata excavata (Branson and Mehl)
Pa: 1 — Sa: 1
Pb: 6 — Sb: 1
Sc: 1

GSC loc. 83666: 66 m below top of formation.
(wt. of sample = 2.0 kg)

Oulodus sp.
M: 8 — Sa: 4
Sb: 1
Sc: 2
Ozarkodina confluens (Branson and Mehl)
Pa: 1*
Ozarkodina excavata excavata (Branson and Mehl)
Pa: 1 — Sc: 3
Pb: 1
Panderodus sp.: 43
Apparatus B of Uyeno (1981a)
Unassigned elements: 2

GSC loc. 83667: 28 m below top of formation.
(wt. of sample = 2.0 kg)

Oulodus sp. 9
Pa: 1* — Sa: 2*
M: 1* — Sb?: 1*
Ozarkodina confluens (Branson and Mehl)
Pa: 2*
Pb: 2* — Sb: 1*
M: 1* — Sc: 1*

Ozarkodina cf. *O. excavata excavata* (Branson and Mehl)
Pb: 1* Sa: 1*
M: 2* Sa-Sb transitional: 1*
Sb: 1*
Sc: 1*
Panderodus sp.: 33
Apparatus B of Uyeno (1981a)
Unassigned element: 1
Unassigned elements:
M: 3 Sa: 1
Sc: 1

GSC loc. 83668: 9 m below top of formation.
(wt. of sample = 1.9 kg)

Oulodus sp. 3 of Uyeno (1981a)
Sa: 1*
Sc?: 1
Ozarkodina confluens (Branson and Mehl)
Pa: 1 Sb: 3
Ozarkodina excavata excavata (Branson and Mehl)
Pa: 16* Sa: 2
Sb: 8
M: 8 Sc: 1
Panderodus sp.: 54
Apparatus B of Uyeno (1981a)
Pb: 1*
M?: 1*
Unassigned elements:
Pb: 4 Sc: 7

GSC loc. 83669: 0 to 0.3 m below top of formation.
(wt. of sample = 2.0 kg)

Belodella sp.: 2
"*Neoprioniodus*" sp. A: 3*
Ozarkodina confluens (Branson and Mehl)
Pa: 1* Sa: 3*
Pb: 1* Sb: 2*
M: 1*
Ozarkodina excavata excavata (Branson and Mehl)
Pa: 6* Sa: 2
M: 4 Sb: 2
Panderodus sp.: 140
Apparatus B of Uyeno (1981a)
Unassigned element: 1
Unassigned elements:
Pb: 6 Sc: 1

SECTION 3C: NORTHWEST OF PTARMIGAN LAKE

GSC loc. 83670: Douro Formation, 0 to 0.3 m below top of formation.
(wt. of sample = 2.1 kg)

Ancoradella ploeckensis Walliser
Pa: 1*
"*Neoprioniodus*" *latidentatus* Walliser: 1*
[see under *Polygnathoides emarginatus* (Branson and Mehl) in text]
Oulodus sp.
Sc: 2
Ozarkodina confluens (Branson and Mehl)
Pa: 3 Sa: 2
Pb: 1 Sb: 2
M: 2 Sc: 1
Ozarkodina excavata excavata (Branson and Mehl)
Pa: 1
M: 1
Panderodus sp.: 111
Polygnathoides emarginatus (Branson and Mehl): 2*

GSC loc. 83671: Devon Island Formation (type section), 152 m above base of formation.
(wt. of sample = 2.6 kg)

Belodella cf. *B. resima* (Philip)
M: 9* S: 53*
Oulodus sp.
Pb: 1 Sc: 1
Ozarkodina remscheidensis remscheidensis (Ziegler)
Pa: 3* Sa: 3*
Pb: 4* Sb: 5*
M: 8* Sc: 1*
Panderodus sp.: 3

GSC loc. 83672: Sutherland River Formation, 8 m above base of formation.
(wt. of sample = 2.5 kg)

Oulodus sp. 8
Pa: 2* Sa: 2*
Pb: 6*
M: 2 Sc: 4*
Oulodus? sp.
Sa: 1
Sb: 2
Ozarkodina remscheidensis remscheidensis (Ziegler)
Pa: 22* Sa: 1
Pb: 6 Sb: 11
M: 1
Unassigned elements:
S_1: 2 (striated)
M_2: 3 (striated)

(Note: specimens in this collection are large and robust, in strong contrast to those from GSC loc. 83671).

LOCALITIES NOT IN MAIN SECTIONS

ELLESMERE ISLAND

GSC loc. 57730: Eids Formation, exact stratigraphic interval unknown; on Bjorne Peninsula, 3.7 km west of Baumann Fiord, southwestern Ellesmere Island, lat. 77°29′12″N, long. 85°55′00″W. (Collected by R. Thorsteinsson; see Collins, 1969, p. 32; locality marked '115' on Map 1312A of Kerr and Thorsteinsson, 1972; see also Fig. 10 herein.) (wt. of sample = 2.1 kg).

"*Drepanodus*" sp.: 4
Panderodus sp.: 169
Pandorinellina exigua exigua (Philip)
Pa: 8
Polygnathus sp. indet.
Pa: 1 (fragmentary)
Steptotaxis? cf. *S.*? n. sp. S
I: 1
Steptotaxis robleskyi n sp.
I: 9 — M_2: 4★
S_{2a}: 3★
S_{2b}-S_{2c} transitional: 1★

(Note: elements with ★ may in part belong to *Steptotaxis*? cf. *S.*? n. sp. S)

GSC loc. C-76073: Bird Fiord Formation, approximately 650 m above base of formation, near type section (Section 2A), southwestern Ellesmere Island; UTM Zone 16X, 512 750 m E, 8 569 125 m N, NTS 49 C. (Collected by R. Thorsteinsson).

Steptotaxis maclareni n. sp.
I: 1 — S_{2c}: 1

GSC loc. C-76074: Bird Fiord Formation, approximately 640 m above base of formation, near type section (Section 2A), southwestern Ellesmere Island; UTM Zone 16X, 513 675 m E, 8 569 250 m N, NTS 49 C. (Collected by R. Thorsteinsson).

Pandorinellina expansa Uyeno and Mason
Steptotaxis maclareni n. sp.
I: 6* — M_2: 10*
S_{2a}: 1*
S_{2b}: 3*

GSC loc. C-76075: Bird Fiord Formation, approximately 590 m above base of formation, near type section (Section 2A), southwestern Ellesmere Island; UTM Zone 16X, 515 325 m E, 8 570 000 m N, NTS 49 C. (Collected by R. Thorsteinsson).

Panderodus sp.: 30
Pandorinellina expansa Uyeno and Mason
Pa: 7
Steptotaxis n. sp. C.
I: 1* — M_2: 9
S_{2c}: 2*
S_2: 5

GSC loc. C-76076: Bird Fiord Formation, approximately 260 m above base of formation, near type section (Section 2A), southwestern Ellesmere Island; UTM Zone 16X, 515 650 m E, 8 271 625 m N, NTS 49 C. (Collected by R. Thorsteinsson).

Panderodus sp.: 1
Panderinellina expansa Uyeno and Mason
Steptotaxis sp.
S_{2c}: 1

GSC loc. C-84882: Devon Island Formation, 10 m below top of formation; near junction of Vendom and Baumann fiords, southwestern Ellesmere Island; UTM Zone 17X, 430 000 m E, 8 608 000 m N, NTS 49 D. (Collected by R. Thorsteinsson).

Eognathodus sulcatus kindlei Lane and Ormiston
Pa: 6
Icriodus taimyricus Kuzmin
I: 3* — S_{2c}: 2*
Panderodus sp.: 6
Pandorinellina exigua philipi (Klapper)
Pa: 3
Polygnathus dehiscens dehiscens Philip and Jackson
Pa: 1*

GSC loc. C-92466: Devon Island Formation, stratigraphically about middle of formation, located about midway between Section 1 and Composite Section R-A, southwestern Ellesmere Island, UTM Zone 17X, 441 000 m E, 8 686 600 m N, NTS 49 E. (Collected by R. Thorsteinsson).

Icriodus woschmidti hesperius Klapper and Murphy
I: 25* — S_{2a}: 17*
S_{2b}: 8*
S_{2c}: 8*
Ozarkodina remscheidensis remscheidensis (Ziegler)
Pa: 22 — Sa: 1
Pb: 1 — Sb: 1
Sc: 1
Pedavis sp.
I: 1 (fragmentary)
M_2 (striated): 6
Unassigned elements:
Pa (spathognathodontan): 2

DEVON ISLAND

GSC loc. C-11969: Devon Island Formation, 0 to 30 cm above base of formation; about 4.5 km southeast of Section 3A, northwestern Devon Island; UTM Zone 15X, 508 350 m E, 8 467 500 m N, NTS 59 B. (Collected by D.W. Morrow; see Morrow and Kerr, 1977, p. 122; conodonts extracted from surface bedding plane).

Ozarkodina excavata excavata (Branson and Mehl)
Pa: not counted
Pedavis latialata (Walliser)
I: 1*

GSC loc. C-22970: Devon Island Formation, near type section, near Ptarmigan Lake, northwestern Devon Island, exact stratigraphic position unknown; UTM Zone 15X, 501 700 m E, 8 478 750 m N, NTS 59 B. (Collected by J.Wm. Kerr; wt. of sample = 1.8 kg).

Oulodus sp. 8
Pa: 1
Pb: 1
Oulodus sp.
Pa?: 1 Sa: 1
Sb?: 1
Sc: 2
Ozarkodina remscheidensis remscheidensis (Ziegler)
Pa: 20* Sa: 3*
Pb: 11* Sb: 3*
M: 6* Sc: 5*
?*Ozarkodina remscheidensis remscheidensis* (Ziegler)
Pa: 1*

The following localities listed under Grinnell Peninsula (Devon Island), and Crescent, Hyde Parker, and Spit (Kate) islands are included under Area 4.

GRINNELL PENINSULA, DEVON ISLAND

GSC loc. C-7677: Undivided Devonian carbonates of Morrow and Kerr (1977), probably Du4 or Du5 member, northwestern Sheills Peninsula, northwestern Devon Island; UTM Zone 15X, 438 600 m E, 8 466 900 m N, NTS 59 B. (Collected by U. Mayr; wt. of sample = 1.2 kg).

Icriodus norfordi Chatterton
I: 6
Icriodus cf. *I. norfordi* Chatterton
I: 8*
Panderodus sp.: 1

GSC loc. C-7678: Undivided Devonian carbonates of Morrow and Kerr (1977), probably Du4 or Du5 member, northwestern Sheills Peninsula, northwestern Devon Island; UTM Zone 15X, 438 750 m E, 8 467 000 m N, NTS 59 B. (Collected by U. Mayr; wt. of sample = 0.8 kg).

Icriodus cf. *I. norfordi* Chatterton
I: 2 M_2: 1
Polygnathus linguiformis Hinde, subsp. indet.
Pa: 1 (fragmented)

GSC loc. C-7679: Undivided Devonian carbonates of Morrow and Kerr (1977), probably Du4 or Du5 member, northwestern Sheills Peninsula, northwestern Devon Island; UTM Zone 15X, 438 900 m E, 8 467 200 m N, NTS 59 B. (Collected by U. Mayr; wt. of sample = 0.5 kg).

Icriodus sp. A
I: 1* M_2: 1

GSC loc. C-7680: Undivided Devonian carbonates of Morrow and Kerr (1977), probably Du4 or Du5 member, northwestern Sheills Peninsula, northwestern Devon Island; UTM Zone 15X, 438 300 m E, 8 468 250 m N, NTS 59 B. (Collected by U. Mayr; wt. of sample = 1.2 kg).

Eognathodus bipennatus mayri n. subsp.
Pa: 32* Sa: 1*
Pb?: 1 (small)
M: 1* Sc?: 1 (small)
Icriodus norfordi Chatterton
I: 45* S_2: 5*
M_2: 8*
Icriodus cf. *I. norfordi* Chatterton
I: 2*

GSC loc. C-22971: Undivided Devonian carbonates of Morrow and Kerr (1977), basal member, Du1, southeastern Grinnell Peninsula, Devon Island; UTM Zone 15X, 475 250 m E, 8 483 000 m N, NTS 59 B. (Collected by D.W. Morrow and J.Wm. Kerr; wt. of sample = 0.5 kg).

Belodella sp: 41
Coelocerodontus sp.: 3
Panderodus sp.: 138
Pandorinellina exigua exigua (Philip)
Pa: 18*
Polygnathus inversus Klapper and Johnson
Pa: 6
Polygnathus inversus transitional to *P. serotinus* Telford
Pa: 2
Steptotaxis glenisteri (Klapper)
I: 1 M_2: 3
Unassigned elements:
Pb: 1 Sa: 1
Sb: 1
Sc: 2

GSC loc. C-23045: Undivided Devonian carbonates (Du) of Morrow and Kerr (1977), southeastern Grinnell Peninsula, Devon Island; UTM Zone 15X, 482 200 m E, 482 750 m N, NTS 59 B. (Collected by D.W. Morrow and J.Wm. Kerr; wt. of sample = 1.4 kg).

Belodella sp.: 4
Coelocerodontus sp.: 1
Panderodus sp.: 188
Pandorinellina exigua exigua (Philip)
Pa: 2
Pelekysgnathus sp.
I: 1
Polygnathus inversus Klapper and Johnson
Pa: 2*
Steptotaxis glenisteri (Klapper)
I: 1* S_{2c}: 2*
Unassigned elements:
Pb: 3 Sa: 1
M: 2 Sc: 2
M_2: 46

GSC loc. C-33644: Undivided Devonian carbonates (Du) of Morrow and Kerr (1977), southeastern Grinnell Peninsula, Devon Island; UTM Zone 15X, 482 250 m E, 8 483 000 m N, NTS 59 B. (Collected by D.W. Morrow and J.Wm. Kerr; wt. of sample = 0.7 kg).

Belodella sp.: 2
Panderodus sp.: 97
Polygnathus inversus Klapper and Johnson
Pa: 1
Pb: 2
Steptotaxis glenisteri (Klapper)
I: 2* S_{2b}: 2*
M_2: 16

GSC loc. C-33650: Undivided Devonian carbonates of Morrow and Kerr (1977), Du5 member, 3 km northeast of Port Refuge, southern Grinnell Peninsula, Devon Island; UTM Zone 15X, 455 900 m E, 8 472 650 m N, NTS 59 B. (Collected by D.W. Morrow and J.Wm. Kerr; wt. of sample = 2.1 kg).

Icriodus norfordi Chatterton
I: 211* S_2: 12*
M_2: 7*
Icriodus cf. *I. norfordi* Chatterton
I: 35*

GSC loc. C-33660: Undivided Devonian carbonates (Du) of Morrow and Kerr (1977), Pym Mountain, southeastern Grinnell Peninsula, Devon Island; UTM Zone 15X, 478 000 m E, 8 487 850 m N, NTS 59 B. (Collected by D.W. Morrow and J.Wm. Kerr; wt. of sample = 2.0 kg).

Belodella sp.: 8
Panderodus cf. *P. unicostatus* (Branson and Mehl)
Unassigned: 99* (Sa illustrated)
Pandorinellina expansa Uyeno and Mason
Pa: 13
Pb: 12
M: 5
Steptotaxis glenisteri (Klapper)
I: 1 S_{2b}: 1
S_{2c}: 3
M_2: 12

GSC loc. C-33714: Undivided Devonian carbonates of Morrow and Kerr (1977), Du5 member, 3 km northeast of Port Refuge, southern Grinnell Peninsula, Devon Island; UTM Zone 15X, 456 750 m E, 8 473 250 m N, NTS 59 B. (Collected by D.W. Morrow and J.Wm. Kerr; wt. of sample = 2.0 kg).

Panderodus sp.: 70
Pandorinellina expansa Uyeno and Mason
Pa: 75
Pb: 16
Polygnathus linguiformis bultyncki Weddige
Pa: 7*
Polygnathus linguiformis linguiformis Hinde gamma morphotype of Bultynck (1970)
Pa: 10*
Polygnathus linguiformis linguiformis Hinde gamma morphotype transitional to *P. linguiformis bultyncki*
Pa: 4*
Unassigned elements:
Pb: 10 Sb: 5
M: 18 Sc: 4

CRESCENT ISLAND

GSC loc. C-33621: unnamed formation, Crescent Island; UTM Zone 14X, 543 500 m E, 8 545 250 m N, NTS 69 A. (Collected by D.W. Morrow and J.Wm. Kerr; wt. of sample = 3.2 kg).

Belodella sp. A
Unassigned element: 61*
Eognathodus sulcatus kindlei Lane and Ormiston
Pa: 20*
Panderodus sp.: 125
Pandorinellina sp. A
Pa: 12*
Unassigned elements:
Pb: 2 Sa: 1
M: 1 Sc: 1
M_2-S_2 transitional: 2
M_2: 5

GSC loc. C-33680: basal Disappointment Bay Formation, Crescent Island; UTM Zone 14X, 544 050 m E, 8 546 000 m N, NTS 69 A. (Collected by D.W. Morrow and J.Wm. Kerr; wt. of sample = 3.3 kg).

Belodella sp.: 96
Coelocerodontus sp.: 3
Panderodus sp.: 194
Pandorinellina exigua exigua (Philip)
Pa: 97*
Pedavis sp.
I: 4 S_1: 4
M_2: 51
M_2-S_2 transitional: 6
Polygnathus dehiscens dehiscens Philip and Jackson
Pa: 18*
Unassigned elements:
Pb: 9 Sc: 2
M: 7

GSC loc. C-33681: unnamed formation, Crescent Island; UTM Zone 14X, 543 950 m E, 8 546 000 m N, NTS 69 A. (Collected by D.W. Morrow and J.Wm. Kerr; wt. of sample = 2.2 kg).

Belodella sp.: 11
Coelocerodontus sp.: 1
Eognathodus sulcatus Philip?
Pa: 3
Panderodus sp.: 15
Pandorinellina exigua philipi (Klapper)
Pa: 3
Pb: 2
M: 1
Unassigned element:
M_2 (striated): 1

HYDE PARKER ISLAND

GSC loc. C-33666: unnamed formation, Hyde Parker Island; UTM Zone 14X, 547 350 m E, 8 487 350 m N, NTS 69 A. (Collected by D.W. Morrow and J.Wm. Kerr; wt. of sample = 1.5 kg).

Ancyrodelloides delta (Klapper and Murphy)
Pa: 2*
Belodella sp.: 2
Ozarkodina remscheidensis remscheidensis (Ziegler)
Pa: 10
Panderodus sp.: 54
Pelekysgnathus sp. 1
I: 3* S_2: 5*
S_2?: 1*
M_2: 2*
Apparatus C
Pa: 1* Sa: 1*
Pb: 3* Sb: 1*
M: 1* Sc: 1*
Unassigned elements:
Sa: 1
Pb: 2 Sb: 3
M: 2 Sc: 6

GSC loc. C-33667: unnamed formation, Hyde Parker Island; UTM Zone 14X, 547 600 m E, 8 487 350 m N, NTS 69 A. (Collected by D.W. Morrow and J.Wm. Kerr; wt. of sample = 1.9 kg).

Amydrotaxis chattertoni n. sp.
Pa: 1* Sa: 1*
Pb: 1*
Ancyrodelloides delta (Klapper and Murphy)
Pa: 11*
Belodella sp.: 3
Coelocerodontus sp.: 3
Erika cf. *E. divarica* Murphy and Matti
Sb?:1
Sc: 1
Oulodus? sp. B.
Sa?: 1*
Oulodus sp.
Sa: 1
Sb: 1
Ozarkodina remscheidensis remscheidensis (Ziegler) transitional to *O. remscheidensis repetitor* (Carls and Gandl)
Pa: 46*
Pandorinellina cf. *P. exigua* (Philip)
Pa: 1 (small)
Panderodus sp.: 345
Pedavis breviramus Murphy and Matti
I: 5* S_1: 1*
M_2: 7*
Pelekysgnathus csakyi Chatterton and Perry
I: 2* S_2: 5*
M_2: 7*
Unassigned elements:
Pb: 19 Sb: 8
M: 18 Sc: 3

SPIT (KATE) ISLAND

GSC loc. C-33717: Cape Phillips Formation?, Spit (Kate) Island; UTM Zone 14X, 549 750 m E, 8 526 500 m N, NTS 69 A. (Collected by D.W. Morrow and J.Wm. Kerr; wt. of sample = 1.6 kg).

Belodella sp.: 1
Eognathodus sulcatus kindlei (Lane and Ormiston)
Pa: 2
Icriodus sp.
I: 2 (small) M_2: 2
S_2: 1
Panderodus sp.: 1

Part 3
Inventory of GSC localities cited

GSC loc. (P)=Plant	Section/Area No.	Section/Area Name	Formation (member)	Metres above base of unit (*Metres below top of unit)
8689(P)		See under 83762		
8690(P)		See under 83763		
8692(P)	1	Strathcona Fiord	Bird Fiord	450
8721(P)	1	Strathcona Fiord	Allen Bay	283
8722(P)	1	Strathcona Fiord	Cape Phillips	26
8736(P)	1	Strathcona Fiord	"Eids"	54
8740(P)	1	Strathcona Fiord	Vendom Fiord	91.3
8745(P)	1	Strathcona Fiord	Vendom Fiord	299
8752(P)	1	Strathcona Fiord	Blue Fiord	18
8749(P)	1	Strathcona Fiord	Strathcona Fiord	39.5
8759(P)	1	Strathcona Fiord	Strathcona Fiord	349
57730	–	Ellesmere Island	Eids	?
83661	3B	Sutherland River	Douro	186*
83662	3B	Sutherland River	Douro	152*
83663	3B	Sutherland River	Douro	131*
83664	3B	Sutherland River	Douro	104*
83665	3B	Sutherland River	Douro	79*
83666	3B	Sutherland River	Douro	66*
83667	3B	Sutherland River	Douro	28*
83668	3B	Sutherland River	Douro	9*
83669	3B	Sutherland River	Douro	0-0.3*
83670	3C	Ptarmigan Lake	Douro	0-0.3*
83671	3C	Ptarmigan Lake	Devon Island	152
83672	3C	Ptarmigan Lake	Sutherland River	8
83673, 83674	3A	Sutherland River	Douro	24*
83675	3A	Sutherland River	Douro	0-0.3*
83676	3A	Sutherland River	Sutherland River	74
83677	3A	Sutherland River	Sutherland River	91
83678	3A	Sutherland River	Prince Alfred	43
83679	3A	Sutherland River	Blue Fiord	0-0.3
83680	3A	Sutherland River	Blue Fiord	15
83681	3A	Sutherland River	Blue Fiord	30
83682	3A	Sutherland River	Blue Fiord	49
83683	3A	Sutherland River	Blue Fiord	70
83684	3A	Sutherland River	Blue Fiord	85
83685	3A	Sutherland River	Blue Fiord	101
83686	3A	Sutherland River	Blue Fiord	116
83687	3A	Sutherland River	Blue Fiord	123
83688	3A	Sutherland River	Blue Fiord	184

GSC loc. (P)=Plant	Section/Area No.	Name	Formation (member)	Metres above base of unit (*Metres below top of unit)
83722	2A	Bird Fiord	Blue Fiord (lower)	0.3
83723	2A	Bird Fiord	Blue Fiord (lower)	45
83724	2A	Bird Fiord	Blue Fiord (lower)	70
83725	2A	Bird Fiord	Blue Fiord (lower)	112
83726	2A	Bird Fiord	Blue Fiord (lower)	141
83727	2A	Bird Fiord	Blue Fiord (lower)	197
83728	2A	Bird Fiord	Blue Fiord (lower)	230
83729	2A	Bird Fiord	Blue Fiord (lower)	267
83730	2A	Bird Fiord	Blue Fiord (lower)	308
83731	2A	Bird Fiord	Blue Fiord (lower)	357
83732	2A	Bird Fiord	Blue Fiord (lower)	393
83733	2A	Bird Fiord	Blue Fiord (lower)	447
83734	2A	Bird Fiord	Blue Fiord (lower)	495
83735	2A	Bird Fiord	Blue Fiord (lower)	539
83736	2A	Bird Fiord	Blue Fiord (lower)	574
83737	2A	Bird Fiord	Blue Fiord (lower)	661
83738	2A	Bird Fiord	Blue Fiord (upper)	739
83742	2A	Bird Fiord	Blue Fiord (upper)	745
83743	2A	Bird Fiord	Blue Fiord (upper)	770
83744	2A	Bird Fiord	Blue Fiord (upper)	814
83745	2A	Bird Fiord	Blue Fiord (upper)	846
83746	2A	Bird Fiord	Blue Fiord (upper)	848
83747	2A	Bird Fiord	Blue Fiord (upper)	916
83748	2A	Bird Fiord	Blue Fiord (upper)	939
83749	2A	Bird Fiord	Blue Fiord (upper)	966
83750	2A	Bird Fiord	Blue Fiord (upper)	1006
83751	2A	Bird Fiord	Blue Fiord (upper)	1041
83752	2A	Bird Fiord	Blue Fiord (upper)	1072
83753	2A	Bird Fiord	Blue Fiord (upper)	1104
83754	2A	Bird Fiord	Blue Fiord (upper)	1144
83755	2A	Bird Fiord	Blue Fiord (upper)	1179
83756	2A	Bird Fiord	Blue Fiord (upper)	1215
83757	2A	Bird Fiord	Blue Fiord (upper)	1246
83758	2A	Bird Fiord	Blue Fiord	23
83759	2A	Bird Fiord	Blue Fiord	102
83760	2A	Bird Fiord	Blue Fiord	133
83761	2A	Bird Fiord	Blue Fiord	179
83762 8689(P)	2A	Bird Fiord	Blue Fiord	188
83763 8690(P)	2A	Bird Fiord	Blue Fiord	386
83764	2A	Bird Fiord	Blue Fiord	419
83765	2A	Bird Fiord	Blue Fiord	454
83766	2A	Bird Fiord	Blue Fiord	497
83767	2A	Bird Fiord	Blue Fiord	523
83768	2A	Bird Fiord	Blue Fiord	549
83769	2A	Bird Fiord	Blue Fiord	576
83770	2A	Bird Fiord	Blue Fiord	613

GSC loc. (P)=Plant	Section/Area No.	Section/Area Name	Formation (member)	Metres above base of unit (*Metres below top of unit)
83771	2A	Bird Fiord	Blue Fiord	675
83772	2A	Bird Fiord	Blue Fiord	696
83773	2A	Bird Fiord	Blue Fiord	717
83774	2A	Bird Fiord	Blue Fiord	745
83775	2A	Bird Fiord	Blue Fiord	797
83776	2A	Bird Fiord	Blue Fiord	853
83777	1	Strathcona Fiord	Irene Bay	~3*
83778	1	Strathcona Fiord	Allen Bay	52
83779	1	Strathcona Fiord	Allen Bay	82
83780	1	Strathcona Fiord	Allen Bay	114
83781	1	Strathcona Fiord	Allen Bay	213
83782	1	Strathcona Fiord	Allen Bay	291
83783	1	Strathcona Fiord	Cape Phillips	52
83784	1	Strathcona Fiord	Cape Phillips	72
83785	1	Strathcona Fiord	Cape Phillips	78
83786	1	Strathcona Fiord	Cape Phillips	110
83787	1	Strathcona Fiord	Cape Phillips	142
83788	1	Strathcona Fiord	Cape Phillips	219
83789	1	Strathcona Fiord	Cape Phillips	243
83790	1	Strathcona Fiord	Cape Phillips	262
83791	1	Strathcona Fiord	Cape Phillips	293
83792	1	Strathcona Fiord	Cape Phillips	335
83793	1	Strathcona Fiord	Cape Phillips	424
83794	1	Strathcona Fiord	Cape Phillips	472
83795	1	Strathcona Fiord	"Eids"	6
83796	1	Strathcona Fiord	"Eids"	32
83797	1	Strathcona Fiord	"Eids"	58
83798	1	Strathcona Fiord	Vendom Fiord	91
83799	1	Strathcona Fiord	Vendom Fiord	331
83800	1	Strathcona Fiord	Vendom Fiord	441
83801	1	Strathcona Fiord	Blue Fiord	6
83802	1	Strathcona Fiord	Blue Fiord	56
83803	1	Strathcona Fiord	Blue Fiord	107
83804	1	Strathcona Fiord	Blue Fiord	146
83805	1	Strathcona Fiord	Blue Fiord	177
83806	1	Strathcona Fiord	Blue Fiord	234
83807	1	Strathcona Fiord	Blue Fiord	387
83808	1	Strathcona Fiord	Blue Fiord	450
83809	1	Strathcona Fiord	Blue Fiord	471
C-7677	4	Grinnell Peninsula	Undivided Dev. carb. (Du4/Du5)	
C-7678	4	Grinnell Peninsula	Undivided Dev. carb. (Du4/Du5)	
C-7679	4	Grinnell Peninsula	Undivided Dev. carb. (Du4/Du5)	
C-7680	4	Grinnell Peninsula	Undivided Dev. carb. (Du4/Du5)	
C-11969	–	Devon Island	Devon Island	0-0.3

GSC loc. (P)=Plant	Section/Area No.	Name	Formation (member)	Metres above base of unit (*Metres below top of unit)
C-22971	4	Grinnell Peninsula	Undivided Dev. carb. (Dul)	
C-22970	–	Devon Island	Devon Island	?
C-23045	4	Grinnell Peninsula	Undivided Dev. carb.	?
C-26484	1	Strathcona Fiord	"Eids"	2.1
C-26485	1	Strathcona Fiord	"Eids"	4.0
C-26486	1	Strathcona Fiord	"Eids"	4.6
C-26487	1	Strathcona Fiord	"Eids"	5.2
C-26488	1	Strathcona Fiord	"Eids"	72.5
C-26489	1	Strathcona Fiord	"Eids"	81.1
C-26491	1	Strathcona Fiord	Vendom Fiord	107.0
C-26492	1	Strathcona Fiord	Vendom Fiord	108.2
C-26493	1	Strathcona Fiord	Vendom Fiord	111.3
C-26494	1	Strathcona Fiord	Vendom Fiord	121.6
C-26495	1	Strathcona Fiord	Vendom Fiord	124.7
C-26496	1	Strathcona Fiord	Blue Fiord	470.8
C-30360	2B	Eids M-66 well		
1950-1980	2B	Eids M-66 well	Cape Phillips	594.4-603.5
1920-1950	2B	Eids M-66 well	Cape Phillips	585.2-594.4
1890-1920	2B	Eids M-66 well	Cape Phillips	576.1-585.2
1830-1860	2B	Eids M-66 well	Cape Phillips	557.8-566.9
1720-1730	2B	Eids M-66 well	Cape Phillips	524.3-527.3
1740-1770	2B	Eids M-66 well	Cape Phillips	530.4-539.5
1650-1680	2B	Eids M-66 well	Cape Phillips	502.9-512.1
1560-1590	2B	Eids M-66 well	Cape Phillips	475.5-484.6
1470-1500	2B	Eids M-66 well	Cape Phillips	448.1-457.2
1380-1410	2B	Eids M-66 well	Cape Phillips	420.6-429.8
1290-1320	2B	Eids M-66 well	Cape Phillips	393.2-402.3
1200-1230	2B	Eids M-66 well	Cape Phillips	365.8-374.9
1110-1140	2B	Eids M-66 well	Cape Phillips	338.3-347.5
1029-1050	2B	Eids M-66 well	Cape Phillips	310.9-320.0
930-960	2B	Eids M-66 well	Cape Phillips	283.5-292.6
840-870	2B	Eids M-66 well	Eids	256.0-265.2
750-780	2B	Eids M-66 well	Eids	228.6-237.7
700-750	2B	Eids M-66 well	Eids	213.4-228.6
660-690	2B	Eids M-66 well	Eids	201.2-210.3
570-600	2B	Eids M-66 well	Eids	173.7-182.9
480-510	2B	Eids M-66 well	Eids	146.3-155.4
390-420	2B	Eids M-66 well	Eids	118.9-128.0
300-330	2B	Eids M-66 well	Eids	91.4-100.6
210-240	2B	Eids M-66 well	Eids	64.0-73.2
250-300	2B	Eids M-66 well	Eids	76.2-91.4
120-150	2B	Eids M-66 well	Eids	36.6-45.7
50-100	2B	Eids M-66 well	Eids	15.2-30.5
30-60	2B	Eids M-66 well	Eids	9.1-18.3

GSC loc. (P)=Plant	Section/Area No.	Section/Area Name	Formation (member)	Metres above base of unit (*Metres below top of unit)
C-33621	4	Crescent Island	unnamed	?
C-33644	4	Grinnell Peninsula	Undivided Dev. carb.	?
C-33650	4	Grinnell Peninsula	Undivided Dev. carb.	?
C-33660	4	Grinnell Peninsula	Undivided Dev. carb.	?
C-33666	4	Hyde Parker Island	unnamed	?
C-33667	4	Hyde Parker Island	unnamed	?
C-33680	4	Crescent Island	Disappointment Bay	?
C-33681	4	Crescent Island	unnamed	?
C-33714	4	Grinnell Peninsula	Undivided Dev. carb. (Du5)	
C-33717	4	Spit (Kate) Island	Cape Phillips?	?
C-67898	2C	Blue Fiord E-46 well		
6300-6400	2C	Blue Fiord E-46 well	Allen Bay	1920.2-1950.7
6200-6300	2C	Blue Fiord E-46 well	Allen Bay	1889.8-1920.2
6100-6200	2C	Blue Fiord E-46 well	Allen Bay	1859.3-1889.8
6000-6100	2C	Blue Fiord E-46 well	Allen Bay	1828.8-1859.3
5900-6000	2C	Blue Fiord E-46 well	Allen Bay	1789.3-1828.8
5800-5900	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1767.8-1798.3
5700-5800	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1737.4-1767.8
5600-5700	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1706.9-1737.4
5500-5600	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1676.4-1706.9
5400-5500	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1645.9-1676.4
5300-5400	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1615.4-1645.9
5100-5200	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1554.5-1585.0
5000-5100	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1524.0-1554.5
4900-5000	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1493.5-1524.0
4800-4900	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1463.0-1493.0
4700-4800	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1432.6-1463.0
4600-4700	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1402.1-1432.6
4500-4600	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1371.6-1402.1
4400-4500	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1341.1-1371.6
4352-4361	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1326.5-1329.2
4300-4400	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1310.6-1341.1
4200-4300	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1280.2-1310.6
4100-4200	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1249.7-1280.2
4000-4100	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1219.2-1249.7
3900-4000	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1188.7-1219.2
3800-3900	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1158.2-1188.7
3700-3800	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1127.8-1158.2
3600-3700	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1097.3-1127.8
3500-3600	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1066.8-1097.3
3300-3400	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	1005.8-1036.3
3200-3300	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	975.4-1005.8
3100-3200	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	944.9-975.4
3130-3149	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	954.0-959.8
3000-3100	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	914.4-944.9
2900-3000	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	883.9-914.4
2800-2900	2C	Blue Fiord E-46 well	Allen Bay–Read Bay	853.4-883.9

GSC loc. (P)=Plant	Section/Area No.	Name	Formation (member)	Metres above base of unit (*Metres below top of unit)
2700-2800	2C	Blue Fiord E-46 well	Cape Phillips	823.0-853.4
2600-2700	2C	Blue Fiord E-46 well	Cape Phillips	792.5-823.0
2500-2600	2C	Blue Fiord E-46 well	Cape Phillips	762.5-792.5
2400-2500	2C	Blue Fiord E-46 well	Cape Phillips	731.5-762.0
2300-2400	2C	Blue Fiord E-46 well	Cape Phillips	701.0-731.5
2200-2300	2C	Blue Fiord E-46 well	Cape Phillips	670.6-701.0
2100-2200	2C	Blue Fiord E-46 well	Cape Phillips	640.1-670.6
2100-2150	2C	Blue Fiord E-46 well	Cape Phillips	640.1-655.3
2000-2100	2C	Blue Fiord E-46 well	Eids	609.6-640.1
1900-2000	2C	Blue Fiord E-46 well	Eids	579.1-609.6
1800-1900	2C	Blue Fiord E-46 well	Eids	548.6-579.1
1700-1800	2C	Blue Fiord E-46 well	Eids	518.2-548.6
1600-1700	2C	Blue Fiord E-46 well	Eids	487.7-518.2
1500-1600	2C	Blue Fiord E-46 well	Eids	457.2-487.7
1500-1550	2C	Blue Fiord E-46 well	Eids	457.2-472.4
1400-1500	2C	Blue Fiord E-46 well	Eids	426.7-457.2
1300-1400	2C	Blue Fiord E-46 well	Eids	396.2-426.7
1200-1300	2C	Blue Fiord E-46 well	Eids	365.8-396.2
1100-1200	2C	Blue Fiord E-46 well	Eids	335.3-365.8
1050-1100	2C	Blue Fiord E-46 well	Eids	320.0-335.3
1000-1100	2C	Blue Fiord E-46 well	Eids	304.8-335.3
900-1000	2C	Blue Fiord E-46 well	Eids	274.3-304.8
800-900	2C	Blue Fiord E-46 well	Eids	243.8-274.3
700-800	2C	Blue Fiord E-46 well	Eids	213.4-243.8
600-700	2C	Blue Fiord E-46 well	Eids	182.9-213.4
550-600	2C	Blue Fiord E-46 well	Eids	167.6-182.9
500-600	2C	Blue Fiord E-46 well	Eids	152.4-182.9
410-500	2C	Blue Fiord E-46 well	Eids	125.0-152.4
310-400	2C	Blue Fiord E-46 well	Eids	94.5-121.9
210-300	2C	Blue Fiord E-46 well	Eids	64.0-94.1
110-200	2C	Blue Fiord E-46 well	Eids	33.5-61.0
100-150	2C	Blue Fiord E-46 well	Eids	30.5-45.7
60-110	2C	Blue Fiord E-46 well	Eids	18.3-33.5
C-76073	–	Ellesmere Island	Bird Fiord	~650
C-76074	–	Ellesmere Island	Bird Fiord	~640
C-76075	–	Ellesmere Island	Bird Fiord	~590
C-76076	–	Ellesmere Island	Bird Fiord	~260
C-76153	R-A7	West Vendom Fiord	Blue Fiord (upper)	13.7
C-76154	R-A7	West Vendom Fiord	Blue Fiord (lower)	9.1*
C-76155	R-A7	West Vendom Fiord	Blue Fiord (upper)	63.1
C-76156	R-A7	West Vendom Fiord	Blue Fiord (lower)	7.6*
C-76211	R-F1	East Vendom Fiord	Blue Fiord (lower)	3.0
C-76213	R-A3	West Vendom Fiord	Devon Island	329.2
C-76214	R-A3	West Vendom Fiord	Devon Island	12.2*

GSC loc. (P)=Plant	Section/Area No.	Section/Area Name	Formation (member)	Metres above base of unit (*Metres below top of unit)
C-76215	R-A9	West Vendom Fiord	Eids	30.2*
C-76216	R-A9	West Vendom Fiord	Blue Fiord (lower)	0.6
C-76217	R-A7	West Vendom Fiord	Strathcona Fiord	42
C-76218	R-A8	West Vendom Fiord	Blue Fiord (lower)	444.1*
C-76219	R-A8	West Vendom Fiord	Blue Fiord (lower)	371.9*
C-76220	R-A8	West Vendom Fiord	Blue Fiord (lower)	315.2*
C-76221	R-A8	West Vendom Fiord	Blue Fiord (lower)	252.1*
C-76222	R-A8	West Vendom Fiord	Blue Fiord (lower)	195.1*
C-76223	R-A8	West Vendom Fiord	Blue Fiord (lower)	131.7*
C-76224	R-A8	West Vendom Fiord	Blue Fiord (upper)	4.0
C-76225	R-A8	West Vendom Fiord	Blue Fiord (lower)	503.5*
C-76226	R-A8	West Vendom Fiord	Blue Fiord (lower)	9.8*
C-76227	R-A7	West Vendom Fiord	Blue Fiord (upper)	133.5
C-76228	R-A7	West Vendom Fiord	Blue Fiord (upper)	269.7
C-76229	R-A7	West Vendom Fiord	Blue Fiord (upper)	351.1
C-76230	R-D10	East Vendom Fiord	Allen Bay–Read Bay	68.0*
C-76231	R-D10	East Vendom Fiord	Allen Bay–Read Bay	57.2*
C-76232	R-D10	East Vendom Fiord	Vendom Fiord	149.0
C-76233	R-D10	East Vendom Fiord	Vendom Fiord	191.1
C-76234	R-D10	East Vendom Fiord	Blue Fiord (lower)	191.9
C-76235	R-C6	East Vendom Fiord	Allen Bay–Read Bay	30.5*
C-76236	R-C6	East Vendom Fiord	Blue Fiord (lower)	172.8
C-76237	R-C6	East Vendom Fiord	Blue Fiord (lower)	250.5
C-76239	R-C5	East Vendom Fiord	Strathcona Fiord	112.8
C-76240	R-C5	East Vendom Fiord	Blue Fiord (upper)	7.6*
C-76243	R-B19	East Vendom Fiord	Blue Fiord (upper)	64.0
C-76244	R-B19	East Vendom Fiord	Blue Fiord (upper)	71.0
C-76245	R-D14	East Vendom Fiord	Strathcona Fiord	7.6
C-76246	R-D14	East Vendom Fiord	Strathcona Fiord	15.2
C-76247	R-B11	East Vendom Fiord	Blue Fiord (upper)	39.3*
C-76248	R-B11	East Vendom Fiord	Blue Fiord (upper)	12.8*
C-76801	R-A3	West Vendom Fiord	Devon Island	290
C-76802	R-A3	West Vendom Fiord	Devon Island	412
C-76803	R-A3	West Vendom Fiord	Devon Island	3.3
C-76804	R-A3	West Vendom Fiord	Devon Island	353
C-76806	R-B12	East Vendom Fiord	Vendom Fiord	4.6*
C-76808	R-B12	East Vendom Fiord	Blue Fiord (lower)	11.9
C-76809	R-A9	West Vendom Fiord	Blue Fiord (lower)	154.5
C-76810	R-A9	West Vendom Fiord	Blue Fiord (lower)	52.7
C-76811	R-A9	West Vendom Fiord	Blue Fiord (lower)	104.2
C-76812	R-A4	West Vendom Fiord	Strathcona Fiord	458.7
C-76813	R-A4	West Vendom Fiord	Strathcona Fiord	409.7
C-76814	R-A4	West Vendom Fiord	Strathcona Fiord	248.4
C-76815	R-A4	West Vendom Fiord	Blue Fiord (upper)	177.4*

GSC loc. (P)=Plant	Section/Area No.	Section/Area Name	Formation (member)	Metres above base of unit (*Metres below top of unit)
C-76816	R-A8	West Vendom Fiord	Blue Fiord (lower)	579.1*
C-76818	R-A7	West Vendom Fiord	Blue Fiord (upper)	280.4
C-76822	R-A3	West Vendom Fiord	Devon Island	690
C-76825	R-A9	West Vendom Fiord	Blue Fiord (lower)	23
C-76826	R-A7	West Vendom Fiord	Blue Fiord (upper)	301
C-76828	R-A8	West Vendom Fiord	Blue Fiord (lower)	555
C-76829	R-A7	West Vendom Fiord	Blue Fiord (upper)	121
C-84882	–	Ellesmere Island	Devon Island	10*
C-92466	–	Ellesmere Island	Devon Island	~mid-fm.
C-136452	3A	Sutherland River	Sutherland River	116

PLATES 1 to 20

Illustrations of lower Paleozoic conodonts, and their explanations.

PLATE 1

All figures x 50, unless otherwise noted

All localities are from the Allen Bay Formation at Strathcona Fiord area (Section 1). GSC loc. 83778, 52 m above base of formation. GSC loc. 83779, 82 m above base of formation. GSC loc. 83780, 114 m above base of formation. GSC loc. 83781, 213 m above base of formation.

Figures 1-7. *Amorphognathus ordovicicus* Branson and Mehl. (GSC loc. 83778).

1. GSC 86707, upper view of blade platform Pa element.
2. GSC 86708, upper view of non-blade platform Pa element.

3, 4. GSC 86198 and 86199, outer and inner lateral views of two ambalodontiform Pb elements.

5. GSC 86200, inner lateral view of holodontiform M element.
6. GSC 86201, lateral view of hibbardelliform Sa element.
7. GSC 86202, inner lateral view of eoligonodiniform Sc element.

Figures 8, 9. *Belodina confluens* Sweet. (GSC loc. 83778).

8. GSC 86203, inner lateral view of compressiform element (heel partly broken).
9. GSC 86204, inner lateral view of grandiform element.

Figure 10. *Belodina*? sp. (GSC loc. 83778).
GSC 86205, inner lateral view of element that is bowed toward furrowed side.

Figures 11, 12. *Coelocerodontus trigonius* Ethington. (GSC loc. 83778).

11. GSC 86206, lateral view of trigonid element with striated lateral face.
12. GSC 86207, lateral view of trigonid element with smooth lateral face.

Figures 13, 16-18. *Drepanoistodus suberectus* (Branson and Mehl). (GSC loc. 83778).

13. GSC 86208, lateral view of suberectiform element.
16. GSC 86209, inner lateral view of oistodontiform element.
17. GSC 86210, lateral view of drepanodontiform element with rounded lower anterior margin.
18. GSC 86211, lateral view of drepanodontiform element with angular lower anterior margin.

Figures 14, 19, 20. *Panderodus gracilis* (Branson and Mehl). (GSC loc. 83778).

14. GSC 86212, inner lateral view of compressiform M element.
19. GSC 86213, inner lateral view of graciliform Sa element.
20. GSC 86214, outer lateral view of arcuatiform Sb element.

Figure 15. *Walliserodus* cf. *W. curvatus* (Branson and Branson). (GSC loc. 83778).
GSC 86215, inner lateral view of M element.

Figure 21. *Paroistodus*? sp. (GSC loc. 83778).
GSC 86216, inner lateral view of oistodontiform element.

Figure 22. *Walliserodus* cf. *W. curvatus* (Branson and Branson). (GSC loc. 83780).
GSC 86217, inner lateral view of M element.

Figures 23, 29. *Panderodus panderi* (Stauffer). (GSC loc. 83778).
GSC 86218 and 86219, outer and inner lateral views of two similiform Sa elements.

Figures 24, 30. *Pseudobelodina dispansa* (Glenister). (GSC loc. 83778).

24. GSC 86220, inner lateral view of Sc element.
30. GSC 86221, inner lateral view of asymmetrical, either Sc or Sb, element.

Figures 25, 26. *Paroistodus*? *mutatus* (Branson and Mehl). (GSC loc. 83778).

25. GSC 86222, lateral view of acodontiform element.
26. GSC 86223, lateral view of oistodontiform element.

Figures 27, 28, 32. *Panderodus unicostatus* (Branson and Mehl). (GSC 83781).

27. GSC 86224, inner lateral view of graciliform Sa element.
28. GSC 86225, outer lateral view of compressiform M element.
32. GSC 86226, inner lateral view of arcuatiform Sb element.

Figure 31. *Panderodus* cf. *P.* n sp. A of McCracken and Barnes (1981). (GSC loc. 83780).
GSC 86227, inner lateral view of arcuatiform Sb element.

Figure 33, 34. *Coelocerodontus trigonius* Ethington. (GSC loc. 83779)

33. GSC 86228, lateral view of tetragonid element.
34. GSC 86229, lateral view of trigonid element with smooth lateral face.

Figure 35. *Pseudobelodina vulgaris vulgaris* Sweet. (GSC loc. 83778).
GSC 86230, inner lateral view of Sb element.

Figures 36, 37. *Pseudooneotodus beckmanni* (Bischoff and Sannemann). (GSC loc. 83778).
GSC 86231 and 86232, upper and lateral views of two single-denticle, conical elements, x 150.

Figures 38-40. *Walliserodus* cf. *W. curvatus* (Branson and Branson). (GSC loc. 83781).

38. GSC 86233, lateral view of Sa element.
39. GSC 86234, inner lateral view of M element.
40. GSC 86235, inner lateral view of Sc element.

Figure 41. *Plegagnathus nelsoni* Ethington and Furnish. (GSC loc. 83778).
GSC 86236, inner lateral view of plegagnathodontiform element that is bowed toward unfurrowed side.

PLATE 1

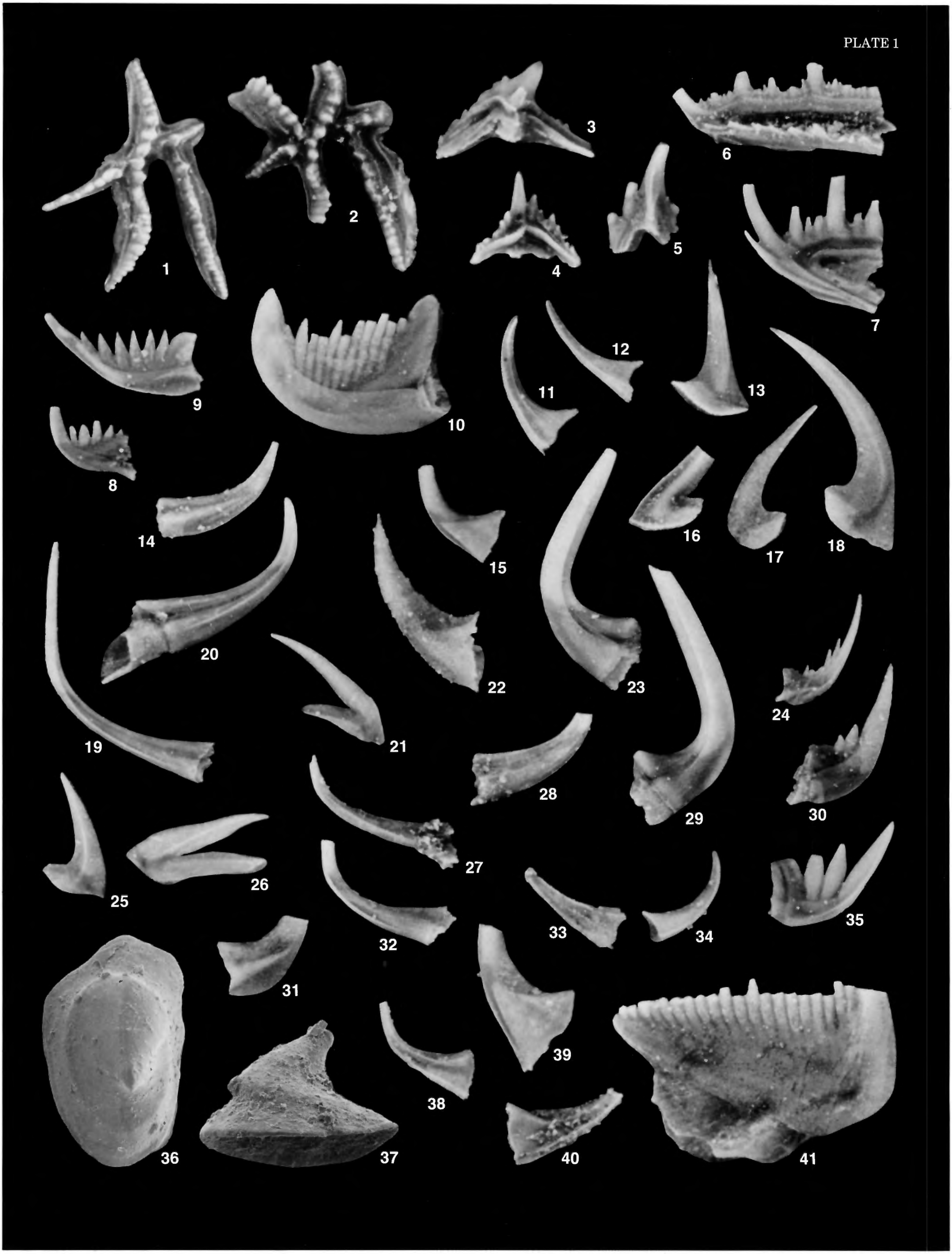
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PLATE 2

All figures x 50, unless otherwise noted

All localities are from the Strathcona Fiord area (Section 1).

GSC loc. 83781, Allen Bay Formation, 213 m above base of formation. GSC loc. 83782, Allen Bay Formation, 291 m above base of formation. GSC loc. 83783, Cape Phillips Formation, 52 m above base of formation.

Figure 1-3, 7-10. *Oulodus*? *kentuckyensis* (Branson and Branson). (GSC loc. 83781).

1. GSC 86237, outer lateral view of Pa element.
2. GSC 86238, inner lateral view of Pb element.

3, 10. GSC 86239 and 86240, inner lateral view of two M elements.

7. GSC 86241, posterior view of Sa element.
8. GSC 86242, inner lateral view of Sb element.
9. GSC 86243, inner lateral view of Sc element.

Figures 4-6. *Astropentagnathus irregularis* Möstler. (GSC loc. 83782).

4. GSC 86244, inner lateral view of Sb? element.
5. GSC 86245, upper view of Pa_1 element.
6. GSC 86246, posterior view of Sa element.

Figures 11-15. *Dapsilodus obliquicostatus* (Branson and Mehl). (GSC loc. 83782).

11, 14. GSC 86247 and 86248, inner and outer lateral views of two M elements.

12, 13, 15. GSC 86249, 86250, and 86251, all lateral views of three S elements.

Figures 16-18, 23, 24. *Oulodus*? sp. A. (GSC loc. 83782).

16. GSC 86252, inner lateral view of Sb element.
17. GSC 86253, posterior view of Sa element.
18. GSC 86254, inner lateral view of M element.
23. GSC 86255, inner lateral view of Pb element.
24. GSC 86256, inner lateral view of Sc element.

Figures 19-22, 25, 29-33. *Oulodus*? *fluegeli fluegeli* (Walliser). (GSC loc. 83782).

19. GSC 86257, posterior view of Pa element.

20, 21. GSC 86258 and 86259, inner lateral view of two Pb elements.

22, 25, 29. GSC 86260, 86261, and 86262, all inner lateral view of three Sb elements.

30. GSC 86263, posterior view of Sa element.

31, 32. GSC 86264 and 86265, inner lateral view of two M elements.

33. GSC 86266, inner lateral view of Sc element.

Figures 26-28, 34-36. *Aulacognathus bullatus* (Nicoll and Rexroad). (GSC loc. 83782).

26-28. GSC 86267, upper, inner lateral, and lower views of Pa element.

34-36. GSC 86268, lower, upper, and inner lateral views of Pb element.

Figures 37, 38. *Pseudooneotodus bicornis* Drygant. (GSC loc. 83783).

GSC 86269 and 86270, posterior and upper views of two, two-denticle, conical elements, x 75.

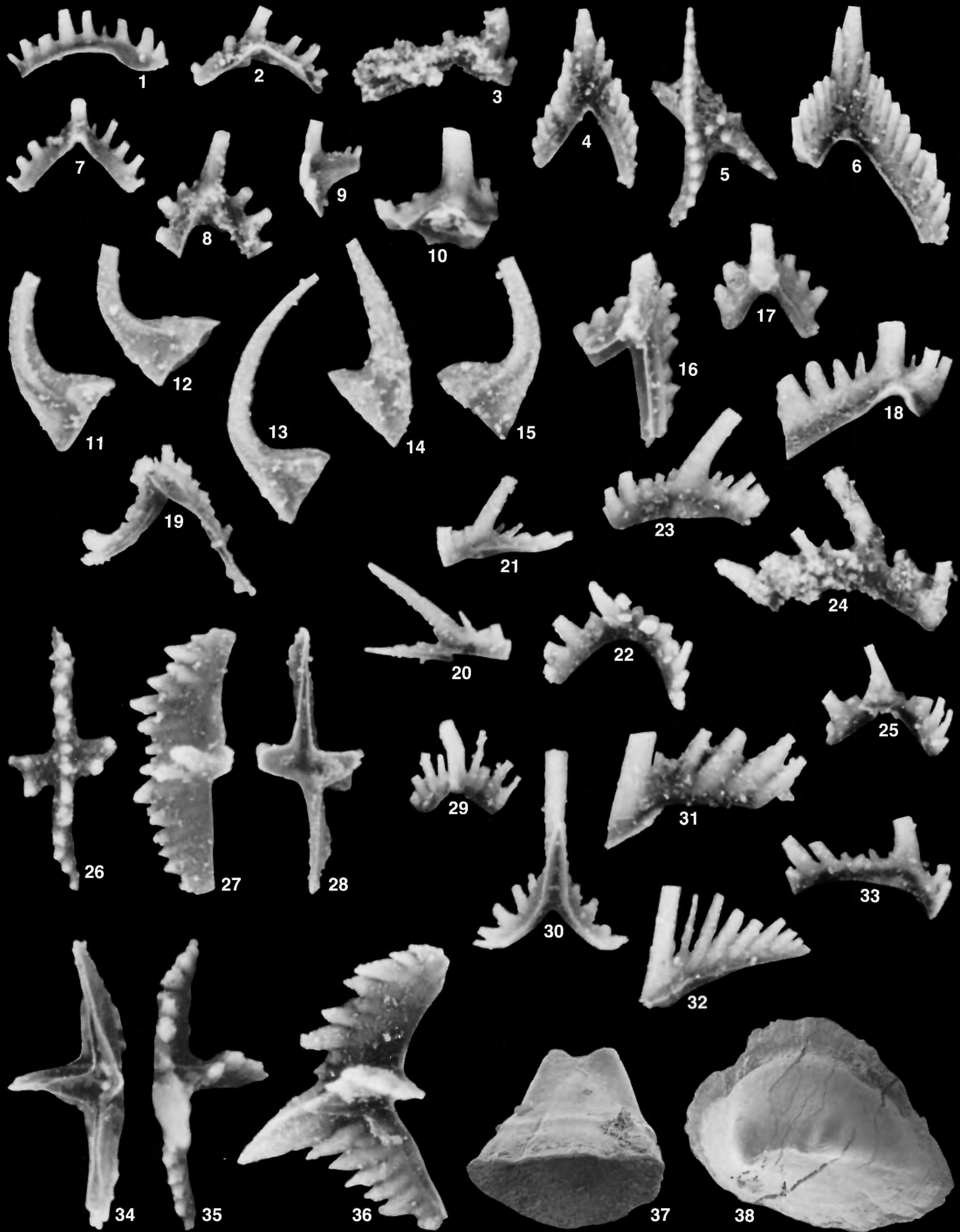
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PLATE 3

All figures x 50, unless otherwise noted

All localities are from the Strathcona Fiord area (Section 1).

GSC loc. 83782, Allen Bay Formation, 291 m above base of formation. GSC loc. 83783, Cape Phillips Formation, 52 m above base of formation.

Figures 1-7, 13, 14. *Pterospathodus celloni* (Walliser). (GSC loc. 83782).

- 1-3. GSC 86271, inner lateral, upper, and lower views of Pa element.
- 4, 7. GSC 86272 and 86273, outer lateral view of two Sc elements, with and without lateral costa, respectively.
- 5, 14. GSC 86274 and 86275, posterior and lateral views of two Sa elements.
- 6. GSC 86276, outer lateral view of Pb element.
- 13. GSC 86277, inner lateral view of Sb element.

Figures 8-10. *Pterospathodus* cf. *P. celloni* (Walliser). (GSC loc. 83782).

GSC 86278, lower, upper, and outer lateral views of Pa element.

Figures 11, 12. *Ozarkodina excavata excavata* (Branson and Mehl). (GSC loc. 83783).

- 11. GSC 86279, inner lateral view of Pa element.
- 12. GSC 86280, inner lateral view of Pb element.

Figures 15-17, 22-25. *Kockelella walliseri* (Helfrich). (GSC loc. 83783).

- 15. GSC 86281, inner lateral view of M element, x 35.
- 16. GSC 86282, inner lateral view of Sc element, x 35.
- 17. GSC 86283, inner lateral view of Sb element (note that the two "lines" on the main cusp are reflection of the light source, and are not striae).
- 22. GSC 86284, inner lateral view of Pb element, x 35.
- 23, 25. GSC 86285, upper and lower views of Pa element, x 35.
- 24. GSC 86286, upper view of Pa element.

Figures 18-20. *Pterospathodus pennatus procerus* (Walliser). (GSC loc. 83783).

- 18. GSC 86287, outer lateral view of Pb element.
- 19, 20. GSC 86288 and 86289, upper views of two Pa elements.

Figures 21, 26-29. *Distomodus staurognathoides* (Walliser). (GSC loc. 83783).

- 21, 27. GSC 86290, lateral and upper views of Sa element, x 35.
- 26. GSC 86291, upper view of Pa element, x 25.
- 28, 29. GSC 86292, upper and lower views of Pa element, x 35.

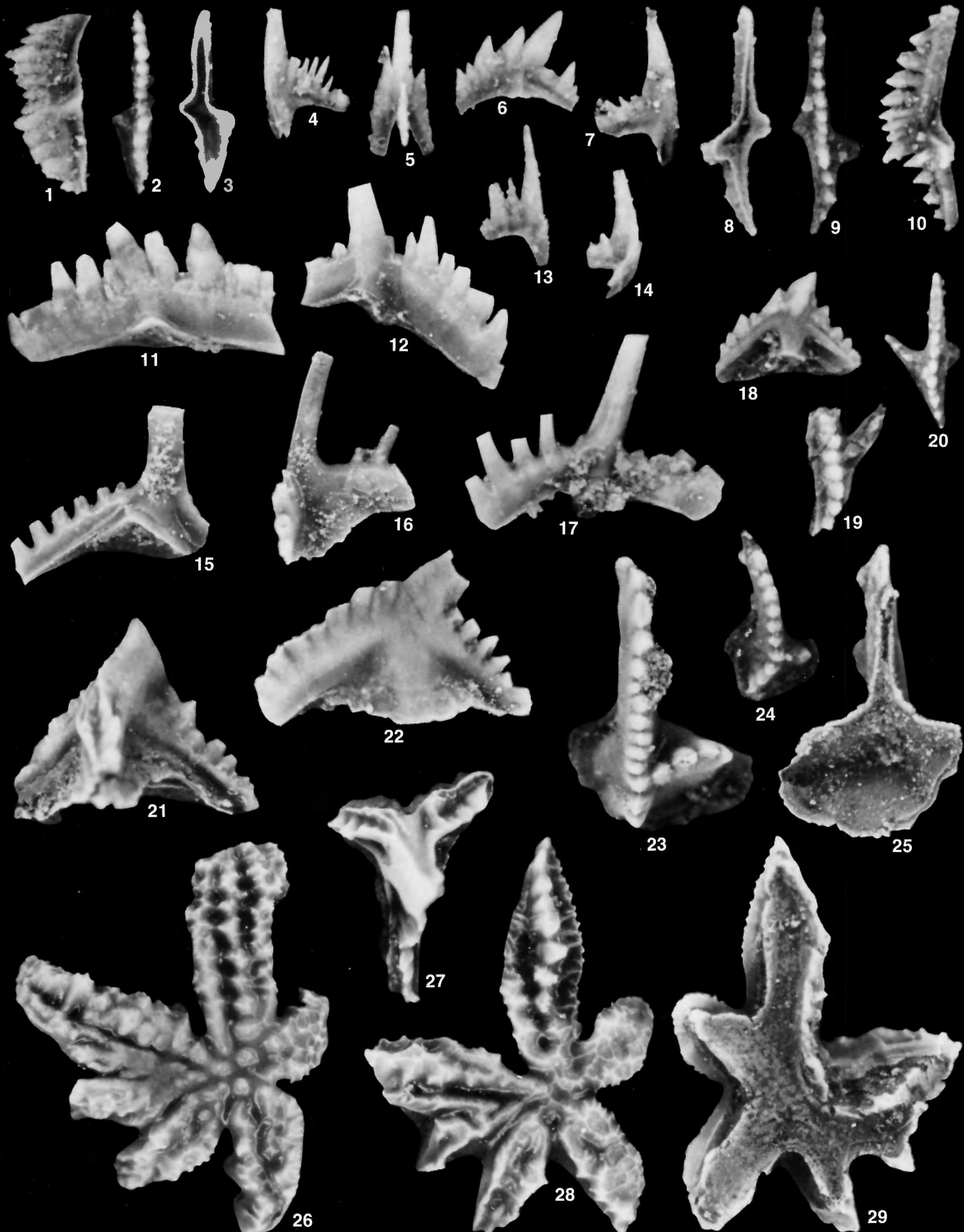
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PLATE 4

All figures x 50, unless otherwise noted

All localities are from the Strathcona Fiord area (Section 1).

GSC loc. 83783, Cape Phillips Formation, 52 m above base of formation. GSC loc. 83785, Cape Phillips Formation, 78 m above base of formation. GSC loc. 83792, Cape Phillips Formation, 335 m above base of formation. GSC loc. 83796, "Eids" Formation, Lower limestone member, 32 m above base of formation. GSC loc. 83797, "Eids" Formation, Lower limestone member, 58 m above base of formation.

Figures 1-3, 7-9. *Ozarkodina confluens* (Branson and Mehl). (GSC loc. 83783).

1, 2. GSC 86293, outer lateral and upper views of Pa element.
3. GSC 86294, lateral view of Pa element.
7. GSC 86295, inner lateral view of Sb element.
8. GSC 86296, posterior view of Sa element.
9. GSC 86297, inner lateral view of Sc element.

Figures 4-6. *Ozarkodina remscheidensis remscheidensis* (Ziegler). (GSC loc. 83792).

4. GSC loc. 86298, lateral view of Pa element.
5, 6. GSC 86299, upper and outer lateral views of Pa element.

Figure 10. *Panderodus unicostatus* (Branson and Mehl). (GSC loc. 83785).

GSC 86300, lateral view of serrated element, x 150.

Figures 11-15, 18-22. *Pelekysgnathus* n. sp. D. (GSC loc. 83796).

11-13. GSC 86301, outer lateral, upper, and lower views of I element.
14, 15. GSC 86302 and 86303, lateral view of two I elements.
18, 19. GSC 86304 and 86305, outer and inner lateral views of two S_{2a} elements.
20, 21. GSC 86306 and 86307, lateral view of two M_2 elements.
22. GSC 86308, inner lateral view of $S_{2a}-M_2$ transitional element.

Figures 16, 17, 24-26. *Pedavis* sp. (GSC loc. 83792).

16, 17. GSC 86309 and 86310, outer lateral view of two S_1 elements.
24. GSC 86311, lateral view of M_2 element.
25, 26. GSC 86312 and 86313, upper view of two I elements (26 at x 35).

Figure 23. *Pelekysgnathus* n. sp. D. (GSC loc. 83797).

GSC 86314, lateral view of I element.

Figures 27-30. *Ozarkodina* cf. *O. douroensis* Uyeno. (GSC loc. 83785).

27-29. GSC 86315, inner lateral, upper, and lower views of Pa element, x 35.
30. GSC 86316, upper view of Pa element, x 35.

Figure 31. Apparatus A of Uyeno (1981a). (GSC loc. 83785).

GSC 86317, inner lateral view of Pa? element.

Figure 32. *Kockelella variabilis* Walliser. (GSC loc. 83785).

GSC 86318, upper view of Pa element.

PLATE 4

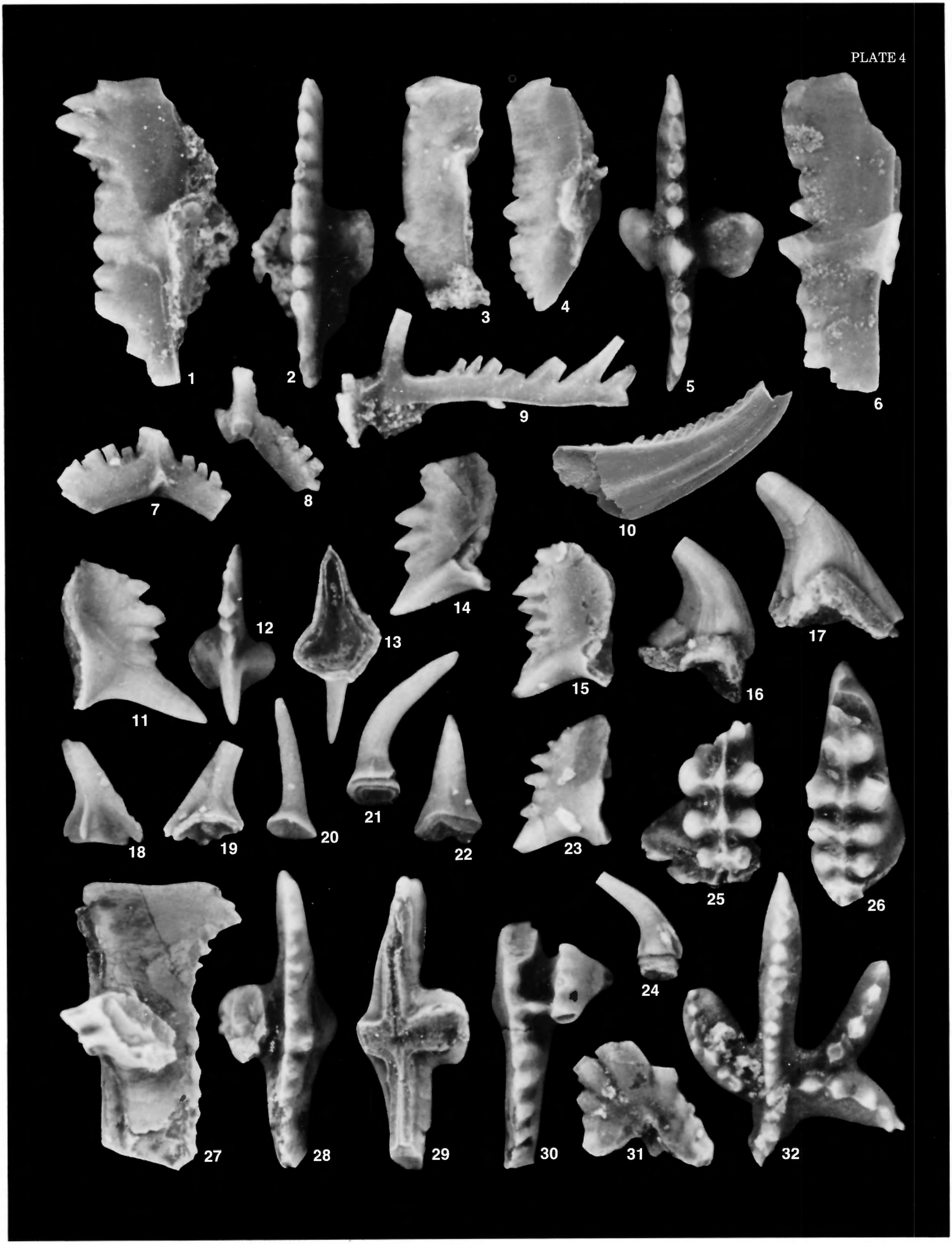
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PLATE 5

All figures x 50

All localities are from the Strathcona Fiord area (Section 1).

GSC loc. 83790, Cape Phillips Formation, 262 m above base of formation. GSC loc. 83796, "Eids" Formation, Lower limestone member, 32 m above base of formation. GSC loc. 83797, "Eids" Formation, Lower limestone member, 58 m above base of formation. GSC loc. 83798, Vendom Fiord Formation, 91 m above base of formation. GSC loc. C-26491, Vendom Fiord Formation, 107 m above base of formation. GSC loc. C-26495, Vendom Fiord Formation, 124.7 m above base of formation. GSC loc. 83805, Blue Fiord Formation, 177 m above base of formation. GSC loc. 83808, Blue Fiord Formation, 450 m above base of formation. GSC loc. C-29496, Blue Fiord Formation, 470.8 m above base of formation.

Figure 1-3, 6-8. *Ozarkodina remscheidensis remscheidensis* (Ziegler). (GSC loc. 83797).

1-3. GSC 86319, lateral, upper, and lower views of Pa element.
6, 7. GSC 86320 and 86321, lateral view of two Pa elements.
8. GSC 86322, lateral view of Pb element.

Figures 4, 5. *Ozarkodina remscheidensis eosteinhornensis* (Walliser). (GSC loc. 38790).

GSC 86323 and 86324, oblique upper and lateral views of two Pa elements.

Figures 9, 10. *Pandorinellina exigua exigua* (Philip). (GSC loc. 83798).

GSC 86325, outer lateral and lower views of Pa element.

Figures 11, 12, 18-20. *Pelekysgnathus* n. sp. E. (GSC loc. C-26491).

11, 12. GSC 86326 and 86327, lateral and inner lateral views of two M_2 elements.
18-20. GSC 86328, lateral, upper and lower views of I element.

Figure 13. *Belodella* sp. B. (GSC loc. 83808).

GSC 86329, inner lateral view of Sa? element.

Figures 14-17. *Pelekysgnathus* n. sp. E. (GSC loc. C-26495).

14. GSC 86330, lateral view of M_2 element.
15-17. GSC 86331, upper, inner lateral, and lower views of I element.

Figures 21-23. *Ozarkodina linearis* (Philip). (GSC loc. 83805).

GSC 86332, lateral, lower, and upper views of Pa element.

Figure 24. *Pandorinellina expansa* Uyeno and Mason. (GSC loc. 83808).

GSC 86333, lateral view of Pa element.

Figures 25-29. *Pandorinellina expansa* Uyeno and Mason. (GSC loc. C-29496).

25. GSC 86334, lateral view of Pb element.
26-28. GSC 86335, outer lateral, lower, and upper views of Pa element.
29. GSC 86336, upper view of Pa element.

Figures 30-33, 36, 37. *Ozarkodina remscheidensis remscheidensis* (Ziegler). (GSC loc. 83796).

30. GSC 86337, lateral view of Pa element.
31. GSC 86338, posterior view of Sa element.
32. GSC 86339, inner lateral view of Sb element.
33. GSC 86340, inner lateral view of Sc element.
36. GSC 86341, inner lateral view of Pb element.
37. GSC 86342, inner lateral view of M element.

Figures 34, 35. *Pedavis* sp. (GSC loc. 83796).

GSC 86343 and 86344, inner and outer lateral views of two S_1 elements.


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PLATE 6

All figures x 50

The following localities are from the Strathcona Fiord area (Section 1): GSC loc. 83798, Vendom Fiord Formation, 91 m above base of formation. GSC loc. C-26491, Vendom Fiord Formation, 107 m above base of formation.

The following localities are from the west side of Vendom Fiord (Composite Section R-A): GSC loc. C-76213, Devon Island Formation, 329.2 m above base of formation (Subsection R-A3). GSC loc. C-76214, Devon Island Formation, 12.2 m below top of formation (Subsection R-A3). GSC loc. C-76154, Blue Fiord Formation, lower member, 9.1 m below top of member (Subsection R-A7). GSC loc. C-76226, Blue Fiord Formation, lower member, 9.8 m below top of member (Subsection R-A8). GSC loc. C-76215, Eids Formation, 30.2 m below top of formation (Subsection R-A9).

Figures 1-4. *Pandorinellina exigua philipi* (Klapper). (GSC loc. 83798).

- 1-3. GSC 86345, lower, upper, and lateral views of Pa element.
- 4. GSC 86346, lateral view of Pb element.

Figures 5, 6. *Pandorinellina exigua philipi* (Klapper). (GSC loc. C-26491).

GSC 86347 and 86348, lateral view of two Pa elements.

Figures 7, 8. *Pandorinellina expansa* Uyeno and Mason. (GSC loc. C-76154).

GSC 86349, lateral and upper views of Pa element.

Figures 9, 10, 15-27, 32-34. *Steptotaxis robleskyi* n. sp. (GSC loc. C-76215).

- 9, 10. GSC 86350 and 86351, upper view of two paratype I elements.
- 15, 16. GSC 86352 and 86353, upper view of two paratype S_{2c} elements.
- 17, 18, 20, 24. GSC 86354 to 86357, respectively, lateral view of four paratype S_{2c} elements.
- 19, 23. GSC 86358 and 86359, lateral view of two paratype S_{2b} to S_{2c} transitional elements.
- 21, 26. GSC 86360 and 86361, lateral view of two paratype S_{2a} elements.
- 22. GSC 86362, lateral view of paratype S_{2b} element.
- 25, 27. GSC 86363 and 86364, lateral view of two paratype M_2 elements.
- 32-34. GSC 86365, lateral, lower, and upper views of holotype I element.

Figure 11. *Ozarkodina remscheidensis remscheidensis* (Ziegler). (GSC loc. C-76213).

GSC 86366, lateral view of Pa element.

Figure 12. *Pandorinellina* cf. *P. exigua* (Philip). (GSC loc. C-76213).

GSC 86367, lateral view of Pa element.

Figures 13, 14. *Polygnathus inversus* Klapper and Johnson transitional to *P. serotinus* Telford. (GSC loc. C-76226).

GSC 86368, upper and lower views of Pa element.

Figures 28-31. *Pandorinellina exigua exigua* (Philip). (GSC loc. C-76215).

- 28-30. GSC 86369, upper, outer lateral, and lower views of Pa element.
- 31. GSC 86370, lateral view of Pa element.

Figures 35-37. *Eognathodus sulcatus kindlei* Lane and Ormiston. (GSC loc. C-76214).

GSC 86371, inner lateral, upper, and lower views of Pa element.

Figures 38-40. *Pandorinellina* n. sp. O of Klapper (1980). (GSC loc. C-76214).

GSC 86372, lower, upper, and lateral views of Pa element.

Figure 41. *Pandorinellina exigua philipi* (Klapper). (GSC loc. C-76214).

GSC 86373, lateral view of Pa element.

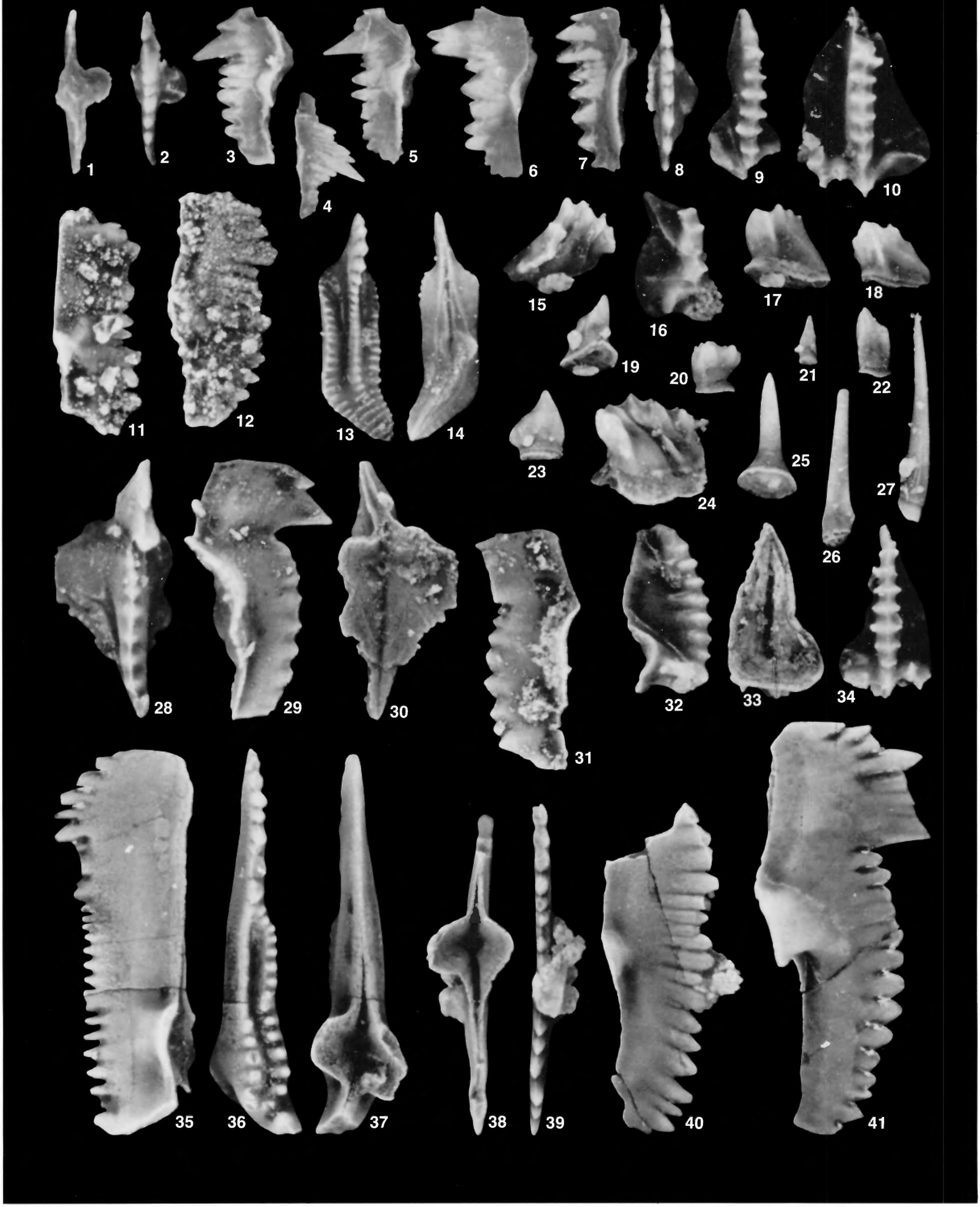
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PLATE 7

All figures x 50

All localities are from the west side of Vendom Fiord (Composite Section R-A).

The following localities are from Subsection R-A7: GSC loc. C-76154, Blue Fiord Formation, lower member, 9.1 m below top of member. GSC loc. C-76153, Blue Fiord Formation, upper member, 13.7 m above base of member. GSC loc. C-76227, Blue Fiord Formation, upper member, 133.5 m above base of member. GSC loc. C-76228, Blue Fiord Formation, upper member, 269.7 m above base of member. GSC loc. C-76818, Blue Fiord Formation, upper member, 280.4 m above base of member.

The following localities are from Subsection R-A8: GSC loc. C-76221, Blue Fiord Formation, lower member, 252.1 m below top of member. GSC loc. C-76222, Blue Fiord Formation, lower member, 195.1 m below top of member. GSC loc. C-76223, Blue Fiord Formation, lower member, 131.7 m below top of member. GSC loc. C-76226, Blue Fiord Formation, lower member, 9.8 m below top of member.

The following locality is from Subsection R-A9: GSC loc. C-76215, Eids Formation, 30.2 m below top of formation.

Figures 1-3. *Polygnathus* cf. *P. pireneae* Boersma. (GSC loc. C-76215).
GSC 86374, upper, lateral, and lower views of Pa element.

Figures 4, 5. *Polygnathus nothoperbonus* Mawson. (GSC loc. C-76221).
GSC 86375, lower and upper views of Pa element.

Figures 6, 7. *Polygnathus inversus* Klapper and Johnson. (GSC loc. C-76154).
GSC 86376, lower and upper views of Pa element.

Figures 8-12, 18-20. *Steptotaxis*? n. sp. S. (GSC loc. C-76221).
8, 9. GSC 86377, inner lateral and upper views of I element.
10. GSC 86378, upper view of I element.
11, 12. GSC 86379 and 86380, lateral view of two S_{2b} elements.
18-20. GSC 86381, inner lateral, upper, and lower views of I element.

Figures 13, 14. *Polygnathus serotinus* Telford. (GSC loc. C-76228).
GSC 86382, upper and lower views of Pa element.

Figures 15-17. *Ozarkodina linearis* (Philip). (GSC loc. C-76221).
GSC 86383, lateral, upper, and lower views of Pa element.

Figures 21-24, 31. *Pandorinellina expansa* Uyeno and Mason. (GSC loc. C-76222).
21-23. GSC 86384, lateral, upper, and lower views of Pa element.
24, 31. GSC 86385 and 86386, lateral view of two Pb elements.

Figures 25, 26. *Pandorinellina expansa* Uyeno and Mason. (GSC loc. C-76223).
GSC 86387, lateral and upper views of Pa element.

Figures 27, 28. *Steptotaxis* n. sp. C. (GSC loc. C-76818).
GSC 86388, upper and lateral views of I element.

Figures 29, 30. *Steptotaxis*? n. sp. S. (GSC loc. C-76227).
GSC 86389 and 86390, upper and outer lateral views of two I elements.

Figures 32, 33. *Polygnathus* cf. *P. inversus* Klapper and Johnson. (GSC loc. C-76226).
GSC 86391, upper and lower views of Pa element.

Figures 34-38. *Steptotaxis*? n. sp. S (GSC loc. C-76223).
34. GSC 86392, lateral view of S_{2b} element.
35, 36. GSC 86393 and 86394, upper and oblique lateral views of two S_{2c} elements.
37, 38. GSC 86395 and 86396, upper view of two I elements. 37, lateral ridge on one side only; 38, lateral ridges on both sides.

Figures 39, 40. *Polygnathus inversus* Klapper and Johnson. (GSC loc. C-76222).
GSC 86397, upper and lower views of Pa element.

Figures 41, 42. *Polygnathus inversus* Klapper and Johnson transitional to *P. serotinus* Telford. (GSC loc. C-76153).
GSC 86398, upper and lower views of Pa element.

Figures 43, 44. *Polygnathus inversus* Klapper and Johnson. (GSC loc. C-76153).
GSC 86399, lower and upper views of Pa element.

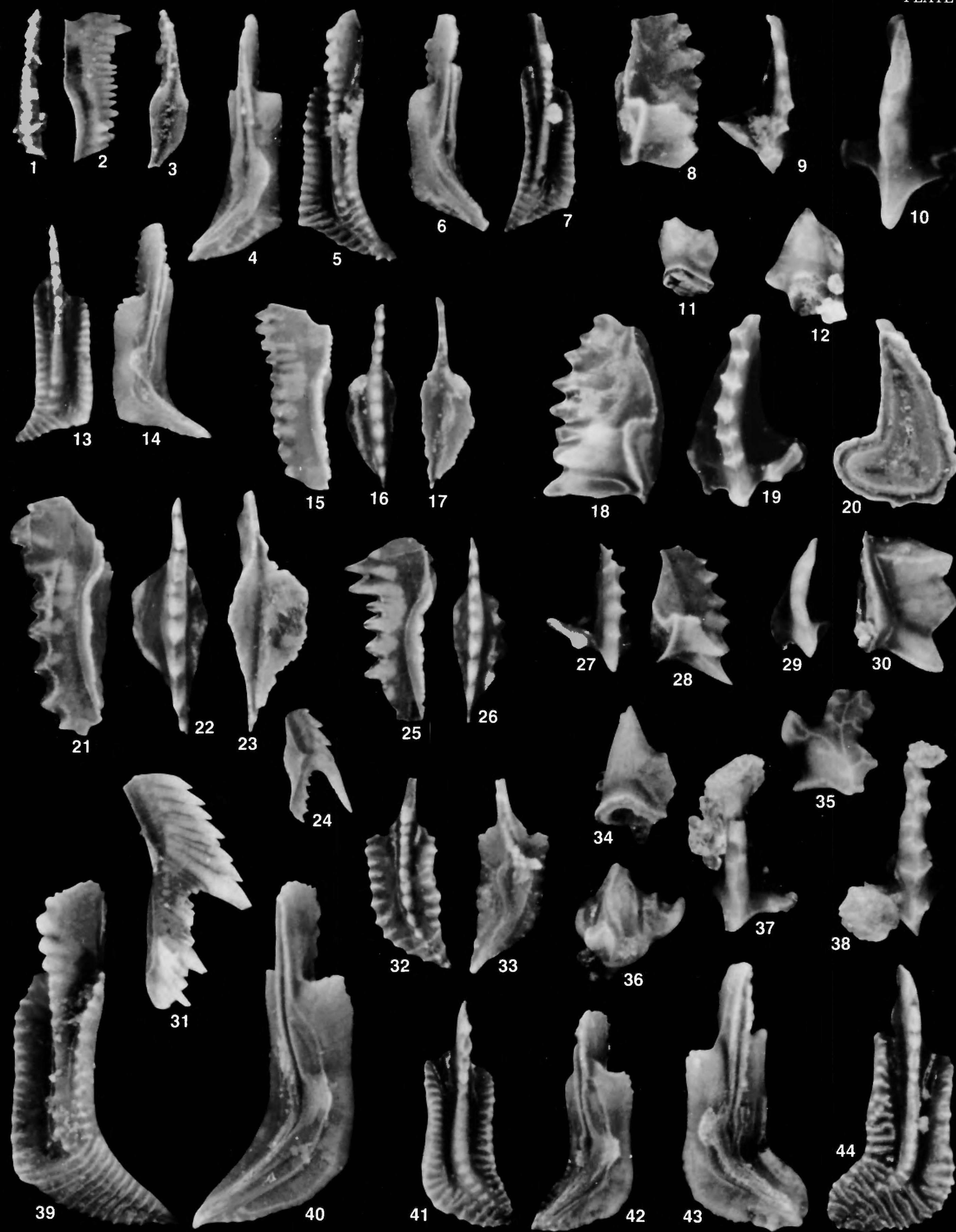
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PLATE 8

All figures x 50

The following localities are from the west side of Vendom Fiord (Composite Section R-A): GSC loc. C-76227, Blue Fiord Formation, upper member, 133.5 m above base of member (Subsection R-A7). GSC loc. C-76217, Strathcona Fiord Formation, 42 m above base of formation (Subsection R- A7). GSC loc. C-76810, Blue Fiord Formation, lower member, 52.7 m above base of member (Subsection R-A9). GSC loc. C-76811, Blue Fiord Formation, lower member, 104.2 m above base of member (Subsection R-A9).

The following localities are from the east side of Vendom Fiord: GSC loc. C-76806, Vendom Fiord Formation, 4.6 m below top of formation (Subsection R-B12). GSC loc. C-76230, Allen Bay–Read Bay carbonates (undivided)/Goose Fiord Formation, 68 m below top of unit (Subsection R-D10). GSC loc. C-76231, Allen Bay–Read Bay carbonates (undivided)/Goose Fiord Formation, 52.7 m below top of unit (Subsection R-D10). GSC loc. C-76245, Strathcona Fiord Formation, 7.6 m above base of formation (Subsection R-D14). GSC loc. C-76211, Blue Fiord Formation, lower member, 3 m above base of member (Subsection R-F1).

Figures 1-3. *Pandorinellina expansa* Uyeno and Mason. (GSC loc. C-76217).

GSC 86400, lower, upper, and lateral views of Pa element.

Figures 4-6. *Pandorinellina exigua exigua* (Philip). (GSC loc. C-76211)

GSC 86401, lower, lateral, and upper views of Pa element.

Figures 7, 10, 11. *Ozarkodina excavata excavata* (Branson and Mehl).

7, 11. GSC 86402 and 86403, inner lateral view of Pb and M elements. (GSC loc. C-76230).
10. GSC 86404, lateral view of Pa element. (GSC loc. C-76231).

Figures 8, 9. *Steptotaxis* n. sp. C. (GSC loc. C-76245).

8. GSC 86405, lateral view of S_2? element.
9. GSC 86406, upper view of I element.

Figures 12-15. *Pandorinellina exigua exigua* (Philip). (GSC loc. C-76806).

12-14. GSC 86407, upper, lower, and lateral views of Pa element.
15. GSC 86408, lateral view of Pb element.

Figures 16, 17, 21, 22. *Steptotaxis* n. sp. C. (GSC loc. C-76217).

16, 17. GSC 86409 and 86410, upper and oblique lateral views of two S_{2c} elements.
21. GSC 86411, upper view of I element.
22. GSC 86412, lateral view of S_{2c} element.

Figure 18. *Pandorinellina expansa* Uyeno and Mason. (GSC loc. C-76245).

GSC 86413, lateral view of Pa element.

Figure 19, 20. *Steptotaxis* n. sp. C. (GSC loc. C-76227).

GSC 86414, lower and upper views of I element.

Figures 23, 24, 31-33. *Steptotaxis*? n. sp. S. (GSC loc. C-76810).

23, 33. GSC 86415 and 86416, lateral view of two I elements (23 with lateral ridges on both sides).
24. GSC 86417, lateral view of S_{2b} element.
31, 32. GSC 86418 and 86419, lateral view of two S_{2b}-S_{2c} transitional elements.

Figures 25-30. *Steptotaxis*? n. sp. S. (GSC loc. C-76811).

25-27. GSC 86420, lateral, upper, and lower views of I element.
28-30. GSC 86421, upper, lateral, and lower views of I element (with no lateral ridges).

Figures 34-42. *Pandorinellina exigua exigua* (Philip). (GSC loc. C-76811).

34-36. GSC 86422, upper, outer lateral, and lower views of Pa element.
37. GSC 86423, inner lateral view of Sc element.
38. GSC 86424, inner lateral view of Sb element.
39. GSC 86425, posterior view of Sa element.
40. GSC 86426, inner lateral view of M element.
41. GSC 86427, inner lateral view of Pb element.
42. GSC 86428, lateral view of Pa element.


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PLATE 9

All figures x 50

All localities are from the Bird Fiord Formation area (Section 2A).

The following localities are from the Blue Fiord Formation, the lower limestone and shale member: GSC loc. 83722, 0.3 m above base of formation. GSC loc. 83726, 141 m above base of formation. GSC loc. 83728, 230 m above base of formation. GSC loc. 83729, 267 m above base of formation. GSC loc. 83736, 574 m above base of formation. GSC loc. 83737, 661 m above base of formation.

The following localities are from the Blue Fiord Formation, the upper brown limestone member: GSC loc. 83742, 745 m above base of formation. GSC loc. 83743, 770 m above base of formation. GSC loc. 83746, 893 m above base of formation. GSC loc. 83749, 966 m above base of formation. GSC loc. 83754, 1144 m above base of formation.

The following locality is from the Bird Fiord Formation: GSC loc. 83765, 454 m above base of formation.

Figures 1-4. *Polygnathus dehiscens dehiscens* Philip and Jackson.

1, 2. GSC 64481, upper and lower views of Pa element. (GSC loc. 83722; Pl. 8.1, figs. 1, 2 of Uyeno and Klapper, 1980).

3, 4. GSC 64482, lower and upper views of Pa element. (GSC loc. 83726; Pl. 8.1, figs. 3, 4 of Uyeno and Klapper, 1980).

Figures 5, 6, 13, 14. *Polygnathus nothoperbonus* Mawson.

5, 6. GSC 64483, lower and upper views of Pa element. (GSC loc. 83729; Pl. 8.1, figs. 5, 6 of Uyeno and Klapper, 1980).

13, 14. GSC 86429, upper and lower views of Pa element. (GSC loc. 83729).

Figures 7, 8, 15, 16. *Polygnathus inversus* Klapper and Johnson transitional to *P. serotinus* Telford.

7, 8. GSC 64488, upper and lower views of Pa element. (GSC loc. 83749; Pl. 8.1, figs. 15, 16 of Uyeno and Klapper, 1980).

15, 16. GSC 64487, upper and lower views of Pa element. (GSC loc. 83743; Pl. 8.1, figs. 13, 14 of Uyeno and Klapper, 1980).

Figures 9-12, 36, 37. *Polygnathus inversus* Klapper and Johnson.

9, 10. GSC 64485, lower and upper views of Pa element. (GSC loc. 83736; Pl. 8.1, figs. 9, 10 of Uyeno and Klapper, 1980).

11, 12. GSC 64484, upper and lower views of Pa element. (GSC loc. 83736; Pl. 8.1, figs. 7, 8 of Uyeno and Klapper, 1980).

36, 37. GSC 64486, lower and upper views of Pa element. (GSC loc. 83737; Pl. 8.1, figs. 11, 12 of Uyeno and Klapper, 1980).

Figure 17. *Pandorinellina*? sp.

GSC 64491, lateral view of Pa element. (GSC loc. 83742; Pl. 8.1, fig. 21 of Uyeno and Klapper, 1980).

Figures 18-20. *Ozarkodina linearis* (Philip).

GSC 64492, upper, lateral, and lower views of Pa element. (GSC loc. 83729; Pl. 8.1, figs. 22-24 of Uyeno and Klapper, 1980).

Figures 21, 22, 34, 35. *Polygnathus serotinus* Telford.

21, 22. GSC 64489, upper and lower views of Pa element. (GSC loc. 83754; Pl. 8.1, figs. 17, 18 of Uyeno and Klapper, 1980).

34, 35. GSC 64490, lower and upper views of Pa element. (GSC loc. 83765; Pl. 8.1, figs. 19, 20 of Uyeno and Klapper, 1980).

Figures 23-25, 30. *Pandorinellina expansa* Uyeno and Mason.

23-25. GSC 64495, lateral, lower, and upper views of Pa element. (GSC loc. 83765; Pl. 8.1, figs. 29-31 of Uyeno and Klapper, 1980).

30. GSC 64494, lateral view of Pb element. (GSC loc. 83746; Pl. 8.1, fig. 28 of Uyeno and Klapper, 1980).

Figures 26-28, 31-33. *Pandorinellina exigua exigua* (Philip).

26-28. GSC 64493, upper, lateral, and lower views of Pa element. (GSC loc. 83722; Pl. 8.1, figs. 25-27 of Uyeno and Klapper, 1980).

31-33. GSC 86430, lateral, upper, and lower views of Pa element. (GSC loc. 83728).

Figure 29. Genus and species indet. B.

GSC 86431, lateral view. (GSC loc. 83746).

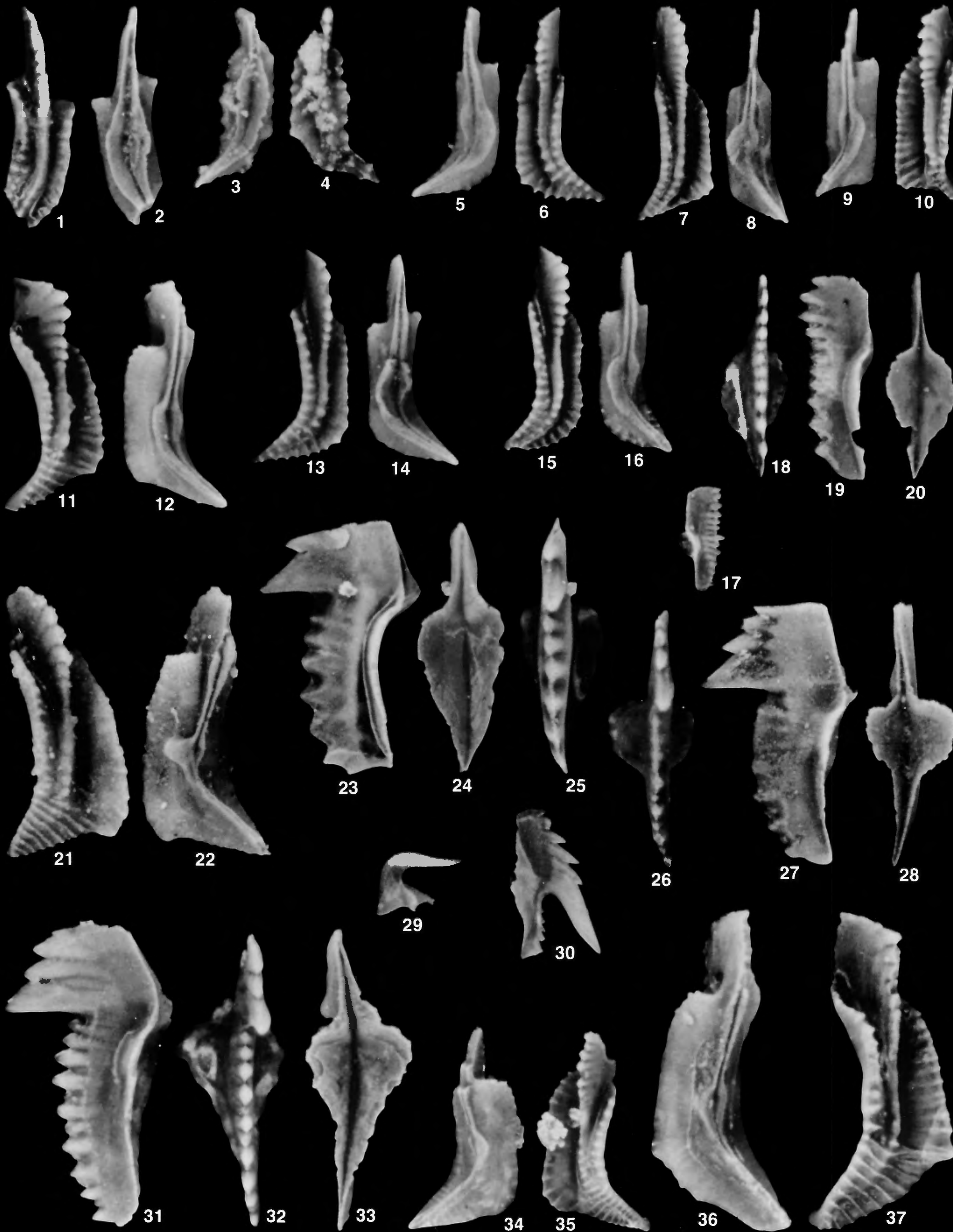

PLATE 10

All figures x 50

All localities are from the Bird Fiord area (Section 2A).

The following localities are from the Blue Fiord Formation: GSC loc. 83722, 0.3 m above base of formation. GSC loc. 83728, 230 m above base of formation. GSC loc. 83729, 267 m above base of formation. GSC loc. 83736, 574 m above base of formation. GSC loc. 83737, 661 m above base of formation. GSC loc. 83754, 1144 m above base of formation.

The following localites are from the Bird Fiord Formation: GSC loc. 83768, 549 m above base of formation. GSC loc. 83769, 576 m above base of formation. GSC loc. 83775, 797 m above base of formation.

Figures 1-17. *Steptotaxis*? n. sp. S.

1-3. GSC 86432, lateral, upper, and lower views of I element. (GSC loc. 83722).

4-6. GSC 86433, upper, lateral, and lower views of I element. (GSC loc. 83722).

7, 8. GSC 86434 and 86435, lateral view of two I elements. (GSC locs. 83728 and 83736; GSC 86435 with lateral ridges on both sides).

9-11. GSC 64507, upper, lower, and lateral views of I element. (GSC loc. 83722; Pl. 8.2, figs. 20-22 of Uyeno and Klapper, 1980).

12-14. GSC 64508, lateral, upper and lower views of I element. (GSC loc. 83737; Pl. 8.2, fig. 23 of Uyeno and Klapper, 1980).

15-17. GSC 86436, 86437, and 86438, upper view of three I elements. (GSC locs. 83737, 83728, and 83729, respectively).

Figures 18-21, 24-36. *Steptotaxis macgregori* n. sp. (GSC loc. 83769).

18, 36. GSC 86439 and 64516, lateral view of two paratype S_{2c} elements. (GSC 64516 in Pl. 8.2, fig. 35 of Uyeno and Klapper, 1980).

19, 20. GSC 86440, lateral and upper views of paratype S_{2c} element.

31, 32. GSC 64511, upper and lower views of paratype S_{2c} element (Pl. 8.2, figs. 27, 28 of Uyeno and Klapper, 1980).

21, 33. GSC 86441 and 64517, lateral view of two paratype S_{2a} elements. (GSC 64517 in Pl. 8.2, fig. 36 of Uyeno and Klapper, 1980).

24, 28. GSC 86442 and 64514, lateral view of two paratype M_2 elements. (GSC 64514 in Pl. 8.2, fig. 31 of Uyeno and Klapper, 1980).

25, 26. GSC 64509, lower and upper views of paratype I element (Pl. 8.2, figs. 24, 25 of Uyeno and Klapper, 1980).

27. GSC 64510, lateral view of paratype I element (Pl. 8.2, fig. 26 of Uyeno and Klapper, 1980).

29, 30, 34, 35. GSC 64513, 86443, 86444, and 64512, respectively, all lateral views of four paratype S_{2b} elements. (GSC 64513 and 64512 in Pl. 8.2, figs. 29, 30 of Uyeno and Klapper, 1980).

Figures 22, 23. *Steptotaxis glenisteri* (Klapper). (GSC loc. 83754).

GSC 64503, lower and upper views of I element. (Pl. 8.2, figs. 12, 13 of Uyeno and Klapper, 1980).

Figures 37-41. *Steptotaxis macgregori* n. sp. (GSC loc. 83768).

37-39. GSC 64515, upper, lateral, and lower views of holotype I element. (Pl. 8.2, figs. 32-34 of Uyeno and Klapper, 1980).

40, 41. GSC 86445 and 86446, lateral views of two paratype S_{2c} elements.

Figures 42-44. *Steptotaxis macgregori* n. sp. (GSC loc. 83775).

GSC 64518, upper, lateral, and lower views of paratype I element. (Pl. 8.2, figs. 37-39 of Uyeno and Klapper, 1980).


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PLATE 11

Magnification of figures as indicated

The following localities are from the Bird Fiord Formation of the Bird Fiord area (Section 2A):GSC loc. 83761, 179 m above base of formation. GSC loc. 83765, 454 m above base of formation. GSC loc. 83767, 523 m above base of formation.

The following locality is from the Eids M-66 well: GSC loc. C-30360/1830-1860, Cape Phillips Formation, 557.8-566.9 m below top of well.

The following locality is from the Blue Fiord E-46 well: GSC loc. C-67898/6000-6100, Allen Bay Formation, 1828.8-1859.3 m below top of well.

Figures 1-3, 6-8. *Steptotaxis*? cf. *S.*? n. sp. S.

1-3. GSC 64506, lateral, upper, and lower views of I element, x 50. (GSC loc. 83767; Pl. 8.2, figs. 15-17 of Uyeno and Klapper, 1980).
6-8. GSC 86447, lower, upper, and lateral views of I element, x 50. (GSC loc. 83765).

Figures 4, 5, 12. *Steptotaxis maclareni* n. sp. (GSC loc. 83767).

4, 5. GSC 86448 and 64500, lateral and upper views of two paratype S_{2c} elements, x 50. (GSC 64500 in Pl. 8.2, fig. 8 of Uyeno and Klapper, 1980).
12. GSC 64502, upper view of paratype I element, x 50. (Pl. 8.2, fig. 11 of Uyeno and Klapper, 1980).

Figures 9, 10. *Steptotaxis* n. sp. C of Uyeno and Klapper (1980). (GSC loc. 83761).

GSC 86449, lower and upper views of I element, x 50.

Figures 11, 13, 16, 17, 21, 22. *Decoriconus fragilis* (Branson and Mehl). (GSC loc. C-30360/1830-1860).

11, 21. GSC 86450 and 86451, inner lateral view of two denticulate rastrate elements, x 200.
13. GSC 86452, outer lateral view of denticulate rastrate element, x 175.
16. GSC 86453, lateral view of Sa element, x 100.
17, 22. GSC 86454 and 86455, inner lateral view of two denticulate rastrate elements, x 150.

Figures 14, 15. *Decoriconus fragilis* (Branson and Mehl). (GSC loc. C-67898/6000-6100).

14. GSC 86456, inner lateral view of Sa-Sb transitional element, x 175.
15. GSC 86457, inner lateral view of Sa element, x 125.

Figures 18-20. *Pterospathodus* cf. *P. celloni* (Walliser). (GSC loc. C-30360/1830-1860).

GSC 86458, lateral, lower, and upper views of Pa element, x 50.

Figures 23, 24, 31-35. *Astropentagnathus irregularis* Mostler. (GSC loc. C-30360/1830-1860).

23. GSC 86459, inner lateral view of Pb element, x 50.
24. GSC 86460, upper view of Pa_1 element, x 75.
31, 32. GSC 86461, upper and lower views of Pa_2 element, x 40.
33. GSC 86462, lateral view of M element with short, adenticulate anticusp, x 75.
34. GSC 86463, lateral view of M element, x 125.
35. GSC 86464, posterior view of M element with denticulate anticusp, x 100.

Figures 25-30. *Pterospathodus celloni* (Walliser). (GSC loc. C-30360/1830-1860).

25-27. GSC 86465, lateral, lower, and upper views of Pa element, x 50.
28. GSC 86466, inner lateral view of M element, x 100.
29. GSC 86467, oblique lateral view of Sa element, x 75.
30. GSC 86468, outer lateral view of Sb element, x 125.


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PLATE 12

All figures x 50, unless otherwise noted

The following locality is from the Eids M-66 well: GSC loc. C-30360/1830-1860, Cape Phillips Formation, 557.8-566.9 m below top of well.

The following localities are from the Blue Fiord E-46 well: GSC loc. C-67898/6000-6100, Allen Bay Formation, 1828.8-1859.3 m below top of well. GSC loc. C-67898/5900-6000, Allen Bay Formation and Allen Bay–Read Bay carbonates (undivided), 1789.3-1828.8 m below top of well. GSC loc. C-67898/5800-5900, Allen Bay–Read Bay carbonates (undivided), 1767.8-1798.3 m below top of well. GSC loc. C-67898/3300-3400, Allen Bay–Read Bay carbonates (undivided), 1005.8-1036.3 m below top of well.

The following localities are from Sutherland River (Section 3A): GSC loc. 83675, Douro Formation, 0-0.3 m below top of formation. GSC loc. 83676, Sutherland River Formation, 74 m above base of formation.

Figures 1, 2, 4. *Oulodus* sp. 10. (GSC loc. C-67898/6000-6100).

1. GSC 86469, inner lateral view of Sc element, x 100.
2. GSC 86470, posterior view of M? element, x 100.
4. GSC 86471, posterior view of Pa element, x 75.

Figure 3. *Walliserodus* cf. *W. curvatus* (Branson and Mehl). (GSC loc. C-67898/5900-6000).

GSC 86472, inner lateral view of M element.

Figures 5-7. *Ozarkodina* cf. *O. douroensis* Uyeno. (GSC loc. C-67898/3300-3400).

GSC 86473, upper, lower, and lateral views of Pa element (note the extensive basal plate material).

Figure 8. *Distomodus staurognathoides* (Walliser). (GSC loc. C-67898/5800-5900).

GSC 86474, inner lateral view of M element.

Figure 9. ?*Carniodus carnulus* Walliser. (GSC loc. C-30360/1830-1860).

GSC 86475, lateral view of Pb? element, x 75.

Figure 10. "*Neoprioniodus*" sp. A. (GSC loc. 83675).

GSC 86476, inner lateral view, x 100.

Figures 11, 12. *Oulodus* sp. 5 of Uyeno (1981a). (GSC loc. 83675).

11. GSC 86477, inner lateral view of Pb element.
12. GSC 86478, inner lateral view of Pa element.

Figures 13-25, 27-30, 34, 35. *Amydrotaxis chattertoni* n. sp. (GSC loc. 83676).

- 13-15. GSC 86479, upper, lower, and lateral views of holotype Pa element.
- 16-20. GSC 86480 to 86484, respectively, all lateral views of five paratype Pa elements.
- 21, 22. GSC 86485 and 86486, inner lateral view of two paratype Pb elements.
- 23, 30. GSC 86487 and 86488, inner lateral view of two paratype Sb elements.
- 24. GSC 86489, inner lateral view of paratype M? element.
- 25. GSC 86490, inner lateral view of paratype M element.
- 27. GSC 86491, inner lateral view of paratype Sc element.
- 28. GSC 86492, inner lateral view of paratype Sb element.
- 29. GSC 86493, inner lateral view of paratype Sb-Sc transitional element.
- 34, 35. GSC 86494 and 86495, posterior view of two paratype Sa elements.

Figures 26, 33. *Oulodus* sp. 8. (GSC loc. 83676).

- 26. GSC 86496, inner lateral view of Sb element.
- 33. GSC 86497, posterior view of Sa element.

Figures 31, 32, 36-40. *Pelekysgnathus* n. sp. G. (GSC loc. 83676).

- 31, 32. GSC 86498 and 86499, lateral view of two M_2 elements.
- 36. GSC 86500, lateral view of S_2 element.
- 37. GSC 86501, lateral view of I element.
- 38-40. GSC 86502, upper, lower, and lateral views of I element.


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PLATE 13

All figures x 50, unless otherwise noted

All localities are from Sutherland River (Section 3A).

The following localities are from the Sutherland River Formation: GSC loc. 83676, 74 m above base of formation. GSC loc. C-136452, 116 m above base of formation.

The following localities are from the Blue Fiord Formation: GSC loc. 83680, 15 m above base of formation. GSC loc. 83681, 30 m above base of formation. GSC loc. 83683, 70 m above base of formation. GSC loc. 83684, 85 m above base of formation. GSC loc. 83687, 123 m above base of formation. GSC loc. 83688, 184 m above base of formation.

Figures 1-4. *Polygnathus inversus* Klapper and Johnson.

1, 2. GSC 86503, lower and upper views of Pa element. (GSC loc. 83688).
3, 4. GSC 86504, upper and lower views of Pa element. (GSC loc. 83684).

Figures 5-8. *Polygnathus inversus* Klapper and Johnson transitional to *P. serotinus* Telford.

5, 6. GSC 86505, upper and lower views of Pa element. (GSC loc. 83683).
7, 8. GSC 86506, lower and upper views of Pa element. (GSC loc. 83687).

Figures 9, 10. *Erika* cf. *E. divarica* Murphy and Matti. (GSC loc. 83676).

9. GSC 86507, inner lateral view of Sb element.
10. GSC 86508, inner lateral view of Sc element.

Figures 11, 12, 20. *Ozarkodina remscheidensis remscheidensis* (Ziegler). (GSC loc. C-136452).

GSC 86509, 86510, and 86511, all lateral view of three Pa elements (x 125, x 150, and x 50, respectively).

Figures 13, 14, 21-24, 30, 31, 35, 36. *Steptotaxis glenisteri* (Klapper). (GSC loc. 83681).

13. GSC 86512, lateral view of S_{2a} element.
14. GSC 86513, lateral view of S_{2b} element.
21. GSC 86514, lateral view of M_2 element.
22, 24. GSC 86515, lateral and upper views of S_{2c} element.
23. GSC 86516, lateral view of S_{2c} element.
30, 31. GSC 86517 and 86518, upper view of two I elements.
35, 36. GSC 86519, upper and lower views of I element.

Figures 15-17. *Steptotaxis*? n. sp. S (GSC loc. 83684).

GSC 86520, lateral, upper, and lower views of I element.

Figures 18, 19, 25-29, 32-34. *Steptotaxis*? n. sp. S. (GSC loc. 83680).

18, 29. GSC 86521 and 86522, upper and lateral views of two I elements.
19. GSC 86523, lateral view of S_{2b} element.
25, 26. GSC 86524, upper and lower views of S_{2c} element.
27. GSC 86525, posterior view of S_{2a} element.
28. GSC 86526, lateral view of M_2 element.
32-34. GSC 86527, upper, lower, and lateral views of I element.

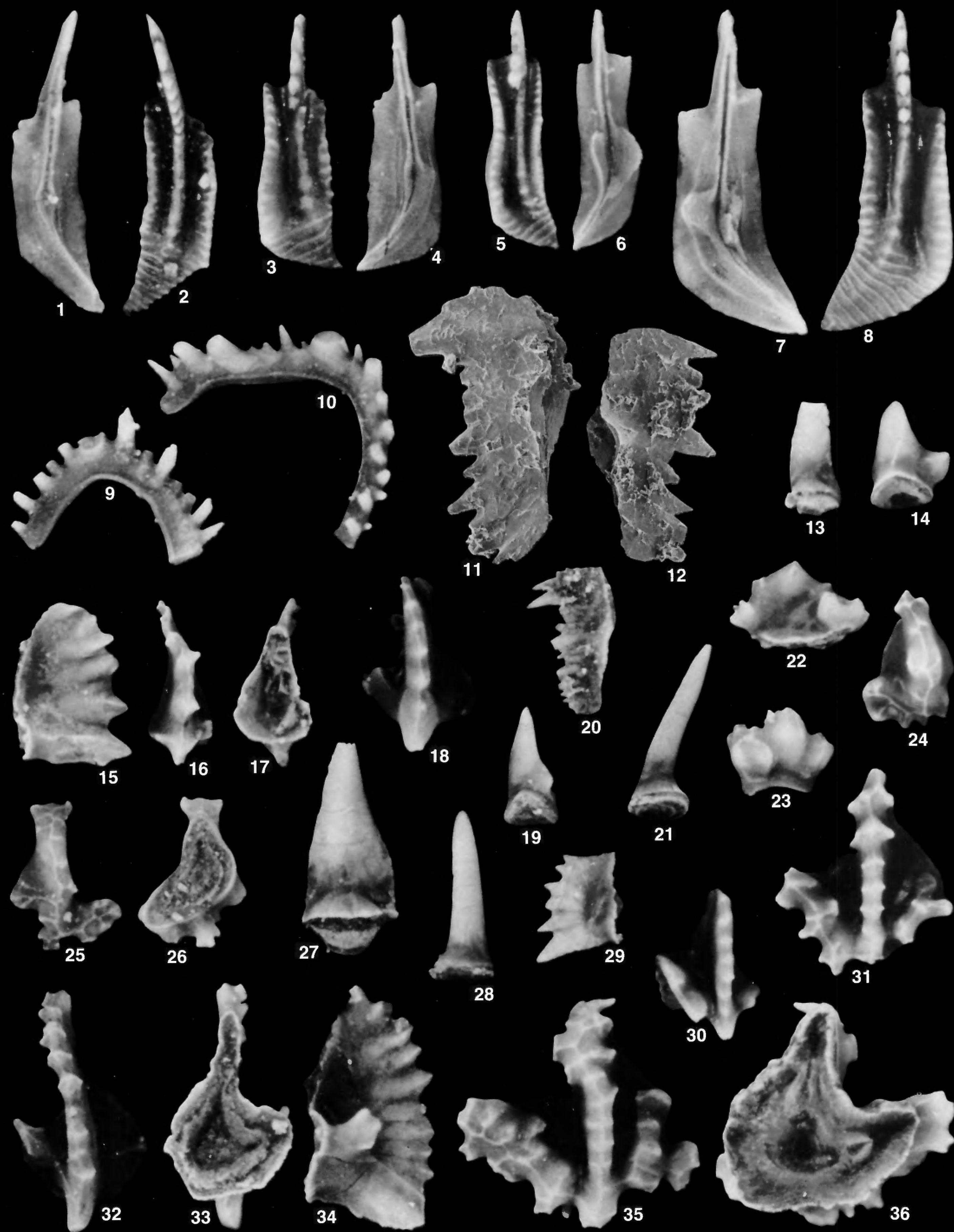
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PLATE 14

All figures x 50, unless otherwise noted

The following localities are from the Blue Fiord Formation at Sutherland River (Section 3A): GSC loc. 83681, 30 m above base of formation. GSC loc. 83683, 70 m above base of formation.

The following localities are from the Douro Formation at Sutherland River (Section 3B): GSC loc. 83661, 186 m below top of formation. GSC loc. 83663, 131 m below top of formation. GSC loc. 83666, 66 m below top of formation. GSC loc. 83667, 28 m below top of formation. GSC loc. 83668, 9 m below top of formation. GSC loc. 83669, 0-0.3 m below top of formation.

Figure 1. *Ozarkodina confluens* (Branson and Mehl). (GSC loc. 83666).

GSC 86528, lateral view of Pa element.

Figures 2, 3, 5, 9, 10. *Ozarkodina confluens* (Branson and Mehl). (GSC loc. 83667).

2. GSC 86529, lateral view of Pa element.
3. GSC 86530, inner lateral view of Pb element.
5. GSC 86531, inner lateral view of Sb element.
9. GSC 86532, inner lateral view of M element.
10. GSC 86533, inner lateral view of Sc element.

Figures 4, 6. "*Neoprioniodus*" sp. A. (GSC loc. 83669).

GSC 86534 and 86535, inner lateral view.

Figures 7, 8, 12, 13, 20. *Ozarkodina confluens* (Branson and Mehl). (GSC loc. 83669).

7. GSC 86536, inner lateral view of Pb element.
8. GSC 86537, lateral view of Pa element.
12. GSC 86538, inner lateral view of M element.
13. GSC 86539, posterior view of Sa element.
20. GSC 86540, inner lateral view of Sb element.

Figures 11, 15-19, 23-25. *Ozarkodina excavata excavata* (Branson and Mehl). (GSC loc. 83663).

11. GSC 86541, inner lateral view of Pb element.

15, 16. GSC 86542 and 86543, lateral view of two Pa elements.

17, 19. GSC 86544 and 86545, inner lateral view of two M elements.

18. GSC 86546, posterior view of Sa element.

23, 24. GSC 86547 and 86548, inner lateral view of two Sb elements.

25. GSC 86549, inner lateral view of Sc element.

Figure 14. *Ozarkodina excavata excavata* (Branson and Mehl). (GSC loc. 83669).

GSC 86550, lateral view of Pa element.

Figures 21, 22. *Pandorinellina exigua exigua* (Philip). (GSC loc. 83683).

GSC 86551, lateral and upper views of Pa element, x 40.

Figures 26, 27, 32-34. *Ozarkodina douroensis* Uyeno. (GSC loc. 83661).

26. GSC 86552, lateral view of Pa element, x 40.
27. GSC 86553, lateral view of Pb element, x 40.

32-34. GSC 86554, lower, outer lateral, and upper views of Pa element, x 40.

Figures 28-30. *Pandorinellina exigua exigua* (Philip). (GSC loc. 83681).

GSC 86555, upper, lower, and outer lateral views of Pa element, x 40.

Figure 31. *Ozarkodina excavata excavata* (Branson and Mehl). (GSC loc. 83668).

GSC 86556, lateral view of Pa element.

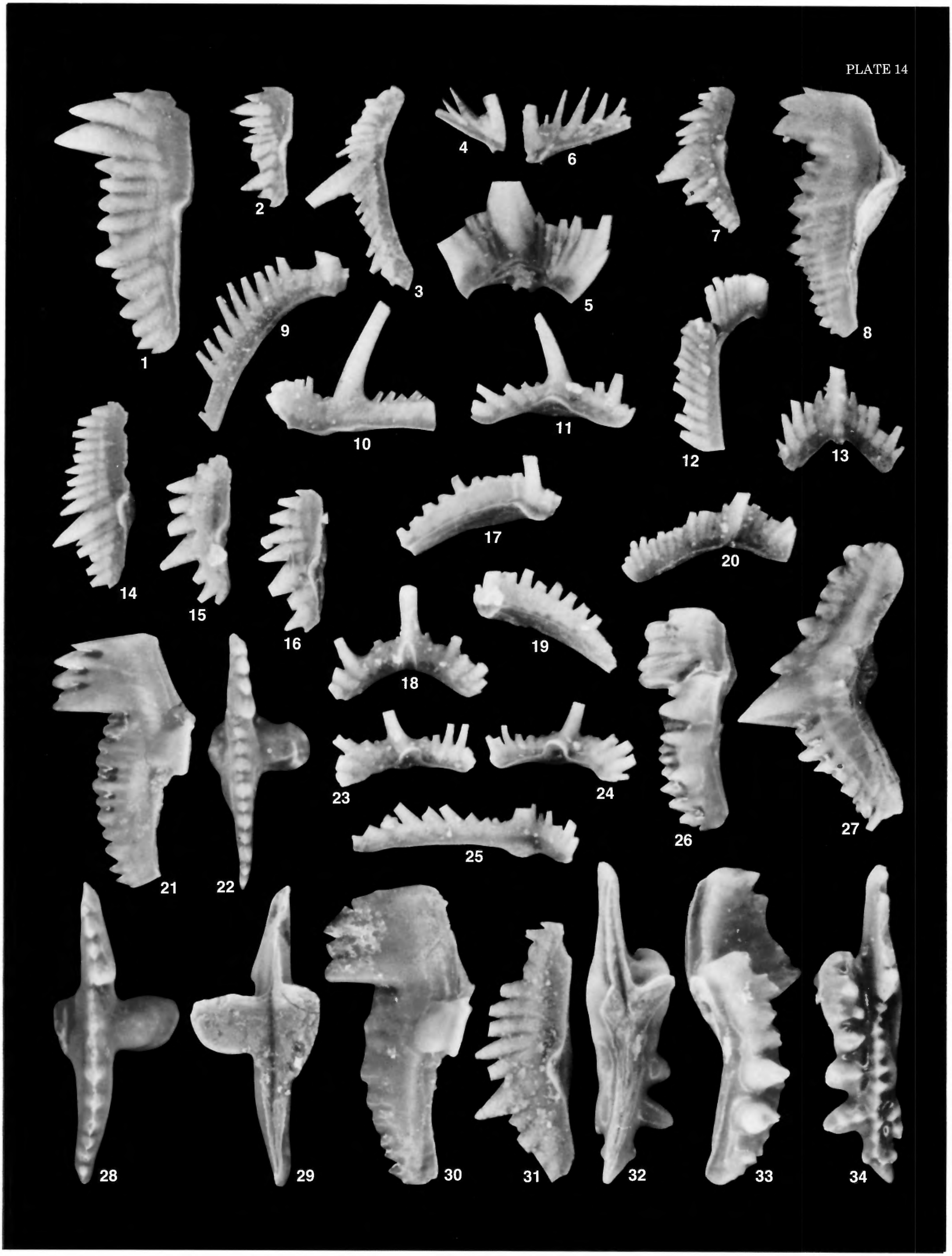
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PLATE 15

All figures x 50

The following localities are from the Douro Formation at Sutherland River (Section 3B): GSC loc. 83661, 186 m below top of formation. GSC loc. 83664, 104 m below top of formation. GSC loc. 83667, 28 m below top of formation. GSC loc. 83668, 9 m below top of formation.

The following localities are from the Ptarmigan Lake area (Section 3C): GSC loc. 83670, Douro Formation, 0-0.3 m below top of formation. GSC loc. 83672, Sutherland River Formation, 8 m above base formation.

Figure 1, 2, 6-10. *Ozarkodina* cf. *O. excavata excavata* (Branson and Mehl). (GSC loc. 83667).

1. GSC 86557, posterior view of Sa element.
2. GSC 86558, inner lateral view of Sc element.
6. GSC 86559, inner lateral view of Pb element.
7. GSC 86560, inner lateral view of Sb-Sa transitional element.
8. GSC 86561, inner lateral view of Sb element.

9, 10. GSC 86562 and 86563, inner lateral view of two M elements.

Figure 3. "*Neoprioniodus*" *latidentatus* Walliser. (GSC loc. 83670).

GSC 86564, inner lateral view [see under *Polygnathoides emarginatus* (Branson and Mehl) in text.]

Figures 4, 5. *Polygnathoides emarginatus* (Branson and Mehl). (GSC 83670).

GSC 86565 and 86566, lateral view of two Pa elements.

Figures 11, 12. Apparatus B of Uyeno (1981a). (GSC loc. 83668).

GSC 86567 and 86568, outer lateral view of Pb and M? elements.

Figures 13, 14. Apparatus B of Uyeno (1981a). (GSC loc. 83661).

GSC 86569 and 86570, inner and outer lateral views of two Pa elements.

Figures 15-18. *Ozarkodina excavata excavata* (Branson and Mehl). (GSC loc. 83664).

15. GSC 86571, inner lateral view of M element.
16. GSC 86572, lateral view of Pa element.
17. GSC 86573, inner lateral view of Sb element.
18. GSC 86574, inner lateral view of Pb element.

Figures 19-22. *Oulodus* sp. 8. (GSC loc. 83672).

19. GSC 86575, inner lateral view of Sc element.
20. GSC 86576, posterior view of Sa element.
21. GSC 86577, inner lateral view of Pa element.
22. GSC 86578, inner lateral view of Pb element.

Figures 23-26. *Oulodus* sp. 9. (GSC loc. 83667).

23. GSC 86579, inner lateral view of M element.
24. GSC 86580, lateral view of Pa element.
25. GSC 86581, posterior view of Sa element.
26. GSC 86582, inner lateral view of Sb? element.

Figures 27, 28, 32-34. *Ozarkodina remscheidensis remscheidensis* (Ziegler). (GSC loc. 83672).

27, 28. GSC 86583 and 86584, lateral view of two Pa elements.

32-34. GSC 86585, lower, upper, and lateral views of Pa element.

Figures 29, 30. *Oulodus* sp. 3. (GSC loc. 83668).

29. GSC 86586, posterior view of Sa element.
30. GSC 86587, inner lateral view of Sc? element.

Figure 31. *Ancoradella ploeckensis* Walliser. (GSC loc. 83670).

GSC 86588, upper view of Pa element.


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PLATE 16

Magnification of figures as indicated

The following locality is from the Ptarmigan Lake area (Section 3C): GSC loc. 83671, Devon Island Formation, 0-0.3 m below top of formation.

The following localities are not on the main measured sections: GSC loc. C-76074, Bird Fiord Formation, approximately 640 m above base of formation, near Section 2A. GSC loc. C-76075, Bird Fiord Formation, approximately 590 m above base of formation, near Section 2A. GSC loc. C-92466, Devon Island Formation, stratigraphically about middle of formation, midway between Section 1 and Composite Section R-A.

Figures 1-13. *Steptotaxis maclareni* n. sp. (GSC loc. C-76074, x 50)

- 1-4. GSC 64496, upper, outer lateral, inner lateral, and lower views of holotype I element. (Pl. 8.2, figs. 1-4 of Uyeno and Klapper, 1980).
- 5, 6. GSC 86589, upper and lower views of paratype I element.
- 7, 8. GSC 64501, lower and upper views of paratype I element. (Pl. 8.2, figs. 9, 10 of Uyeno and Klapper, 1980).
- 9. GSC 86590, upper view of paratype I element.
- 10. GSC 64498, lateral view of paratype M_2 element. (Pl. 8.2, fig. 6 of Uyeno and Klapper, 1980).
- 11, 13. GSC 86591 and 64497, lateral view of two paratype S_{2b} elements. (GSC 64497 in Pl. 8.2, fig. 5 of Uyeno and Klapper, 1980).
- 12. GSC 64499, lateral view of paratype S_{2a} element. (Pl. 8.2, fig. 7 of Uyeno and Klapper, 1980).

Figures 14-17. *Steptotaxis* n. sp. C of Uyeno and Klapper (1980). (GSC loc. C-76075, x 50).

- 14, 16. GSC 64505, upper and lower views of I element. (Pl. 8.2, figs. 18, 19 of Uyeno and Klapper, 1980).
- 15, 17. GSC 86582 and 64504, upper view of two S_{2c} elements. (GSC 64504 in Pl. 8.2, fig. 14 of Uyeno and Klapper, 1980).

Figures 18-22, 25. *Belodella* cf. *B. resima* (Philip). (GSC loc. 83671).

- 18. GSC 86593, lateral view of possible Sb to Sa transitional element, x 100.
- 19. GSC 86594, outer lateral view of Sa? element, x 100.
- 20, 21. GSC 86595 and 86596, inner lateral view of two M elements, x 125.
- 22. GSC 86597, inner lateral view of Sc element, x 100.
- 25. GSC 86598, inner lateral view of Sb element, x 125.

Figures 23, 24, 26-33. *Icriodus woschmidti hesperius* Klapper and Murphy. (GSC loc. C-92466, x 50).

- 23, 24. GSC 86599, outer and inner lateral views of S_{2c} element.
- 26, 27. GSC 86600, outer and inner lateral views of S_{2a} element.
- 28. GSC 86601, inner lateral view of S_{2b} element.
- 29, 30. GSC 86602, upper and lower views of I element.
- 31, 32. GSC 86603, lower and upper views of I element.
- 33. GSC 86604, upper view of I element.

Figures 34-40. *Ozarkodina remscheidensis remscheidensis* (Ziegler). (GSC loc. 83671).

- 34, 35. GSC 86605 and 86606, lateral view of two Pa elements, x 100.
- 36. GSC 86607, inner lateral view of Pb element, x 75.
- 37. GSC 86608, posterior view of Sa element, x 100.
- 38. GSC 86609, inner lateral view of M element, x 100.
- 39. GSC 86610, inner lateral view of Sb element, x 75.
- 40. GSC 86611, inner lateral view of Sc element, x 75.

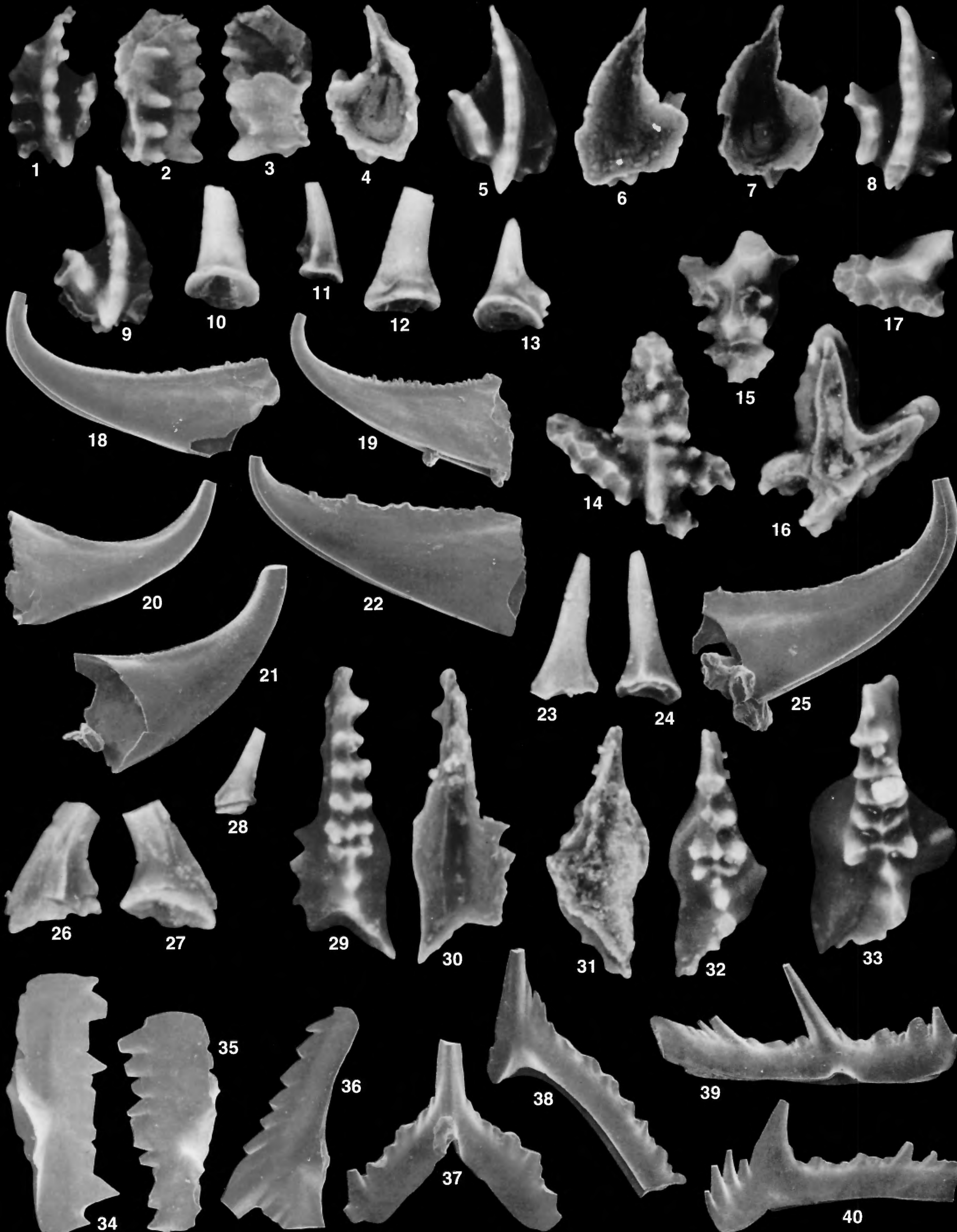
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PLATE 17

All figures x 50, unless otherwise noted

The following localities are not on the main measured sections: Ellesmere Island: GSC loc. C-84882, Devon Island Formation, 10 m below top of formation, near the junction of Vendom and Baumann fiords.

Grinnell Peninsula, Devon Island, from the Undivided Devonian carbonates (Du) of Morrow and Kerr (1977): GSC loc. C-7680, probably Du4 or D5 Member. GSC loc. C-22971, Dul Member. GSC loc. C-23045, Du. GSC loc. C-33644, Du. GSC loc. C-33660, Du.

Devon Island, from the Devon Island Formation: GSC loc. C-11969, 0-30 cm above base of formation. GSC loc. C-22970, exact stratigraphic position unknown, from near Ptarmigan Lake.

Figures 1, 2. *Polygnathus dehiscens dehiscens* Philip and Jackson (GSC loc. C-84882).

GSC 86612, upper and lower views of Pa element.

Figures 3-5. *Pandorinellina exigua exigua* (Philip). (GSC loc. C-22971).

GSC 86613, outer lateral, upper, and lower views of Pa element, x 30.

Figures 6-9. *Icriodus taimyricus* Kuzmin. (GSC loc. C-84882).

6, 7. GSC 86614, lower and upper views of I element.
8. GSC 86615, upper view of I element.
9. GSC 86616, lateral view of S_{2c} element.

Figure 10. ?*Ozarkodina remscheidensis remscheidensis* (Ziegler) (GSC loc. C-22970).

GSC 86617, lateral view of Pa element.

Figures 11, 21. *Steptotaxis glenisteri* (Klapper) (GSC loc. C-33644).

11. GSC 86618, upper view of I element.
21. GSC 86619, lateral view of S_{2b} element.

Figures 12-14. *Steptotaxis glenisteri* (Klapper). (GSC loc. C-23045).

12, 13. GSC 86620, upper and lower views of I element.
14. GSC 86621, lateral view of S_{2c} element.

Figure 15. *Pedavis latialata* (Walliser). GSC loc. C-11969).

GSC 86622, upper view of I element, x 32.

Figures 16-20, 22, 24-28. *Icriodus norfordi* Chatterton. (GSC loc. C-7680).

16. GSC 86623, lateral view of S_2 element.
17-20. GSC 86624 to 86627, respectively, lateral view of four M_2 elements.
22. GSC 86628, upper view of I element.
24, 25. GSC 86629, lower and upper views of I element.
26-28. GSC 86630, upper, lower, and lateral views of I element.

Figure 23. *Panderodus* cf. *P. unicostatus* (Branson and Mehl). (GSC loc. C-33660).

GSC 86631, inner lateral view of Sa element, x 30.

Figures 29-34. *Ozarkodina remscheidensis remscheidensis* (Ziegler). (GSC loc. C-22970).

29. GSC 86632, inner lateral view of Sc element.
30. GSC 86333, posterior view of Sa element.
31. GSC 86634, inner lateral view of Sb element.
32. GSC 86635, lateral view of Pa element.
33. GSC 86636, inner lateral view of Pb element.
34. GSC 86637, inner lateral view of M element.

Figures 35-38. *Polygnathus inversus* Klapper and Johnson. (GSC loc. C-23045).

35, 36. GSC 86638, upper and lower views of Pa element.
37, 38. GSC 86639, lower and upper views of Pa element.


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PLATE 18

All figures x 50, unless otherwise noted

All localities are from the Undivided Devonian carbonates (Du) of Morrow and Kerr (1977) on Grinnell Peninsula: GSC loc. C-7679, probably Du4 and Du5 Member. GSC loc. C-7680, probably Du4 or Du5 Member. GSC loc. C-33714, Du5 Member.

Figures 1, 2, 8. *Polygnathus linguiformis bultyncki* Weddige. (GSC loc. C-33714).

1, 2. GSC 86640, lower and upper views of Pa element.
8. GSC 86641, upper view of Pa element, x 30.

Figures 3, 4, 11, 12. *Polygnathus linguiformis bultyncki* Weddige transitional to *P. linguiformis linguiformis* Hinde gamma morphotype of Bultynck (1970). (GSC loc. C-33714).

3, 4. GSC 86642, lower and upper views of Pa element.
11, 12. GSC 86643, upper and lower views of Pa element.

Figures 5-7, 9. *Polygnathus linguiformis linguiformis* Hinde gamma morphotype of Bultynck (1970). (GSC loc. C-33714).

5, 6. GSC 86644, upper and lower views of Pa element, x 30.
7, 9. GSC 86645, lower and upper views of Pa element.

Figures 10, 13, 14, 18-23. *Eognathodus bipennatus mayri* n. subsp. (GSC loc. C-7680).

10. GSC 86646, upper view of paratype Pa element.
13. GSC 86647, inner lateral view of paratype M element.
14. GSC 86648, posterior view of paratype Sa element.
18-20. GSC 86649, inner lateral, upper, and lower views of holotype Pa element.
21-23. GSC 86650, lower, upper, and outer lateral views of paratype Pa element.

Figures 15-17. *Icriodus* sp. A. (GSC loc. C-7679).

GSC 86651, outer lateral, lower, and upper views of I element.


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PLATE 19

All figures x 50, unless otherwise noted

The following localities are on Crescent Island: GSC loc. C-33621, unnamed formation. GSC loc. C-33680, basal Disappointment Bay Formation.

The following localities are from the Undivided Devonian carbonates (Du) of Morrow and Kerr (1977) on Grinnell Peninsula: GSC loc. C-7677, probably Du4 or Du5 Member. GSC loc. C-7680, probably Du4 or Du5 Member. GSC loc. C-33650, Du5 Member.

Figures 1-4. *Polygnathus dehiscens dehiscens* Philip and Jackson (GSC loc. C-33680).

- 1, 2. GSC 86652, upper and lower views of Pa element.
- 3, 4. GSC 86653, lower and upper views of Pa element.

Figures 5-10, 16, 17. *Pandorinellina* sp. A. (GSC loc. C-33621).

- 5-7. GSC 86654, lateral, lower, and upper views of Pa element.
- 8, 9. GSC 86655, lower and lateral views of Pa element.
- 10. GSC 86656, lateral view of Pa element.
- 16, 17. GSC 86657, lower and lateral views of Pa element.

Figures 11-14. *Pandorinellina exigua exigua* (Philip). (GSC loc. C-33680).

- 11-13. GSC 86658, upper, lower, and inner lateral views of Pa element.
- 14. GSC 86659, lateral view of Pa element, x 30.

Figures 15, 18-22. *Belodella* sp. A. (GSC loc. C-33621).

- 15, 20. GSC 86660 and 86661, inner lateral view of two M elements.
- 18. GSC 86662, lateral view of Sa element.
- 19. GSC 86663, inner lateral view of Sb element.
- 21. GSC 86664, inner lateral view of Sc element.
- 22. GSC 86665, inner lateral view of Sd element.

Figures 23-30, 35. *Icriodus norfordi* Chatterton. (GSC loc. C-33650).

- 23, 24. GSC 86666, lower and upper views of I element.
- 25, 26. GSC 86667, upper and lower views of I element.
- 27, 30. GSC 86668 and 86669, outer and inner lateral views of two S_{2a} elements.
- 28, 29. GSC 86670 and 86671, lateral view of two M_2 elements.
- 35. GSC 86672, upper view of small I element.

Figures 31, 36, 37. *Icriodus* cf. *I. norfordi* Chatterton. (GSC loc. C-7677).

- 31. GSC 86673, upper view of I element.
- 36, 37. GSC 86674, lower and upper views of I element.

Figures 32, 33. *Icriodus* cf. *I. norfordi* Chatterton. (GSC loc. C-33650).

GSC 86675, lower and upper views of I element.

Figure 34. *Icriodus* cf. *I. norfordi* Chatterton. (GSC loc. C-7680).

GSC 86676, upper view of I element.

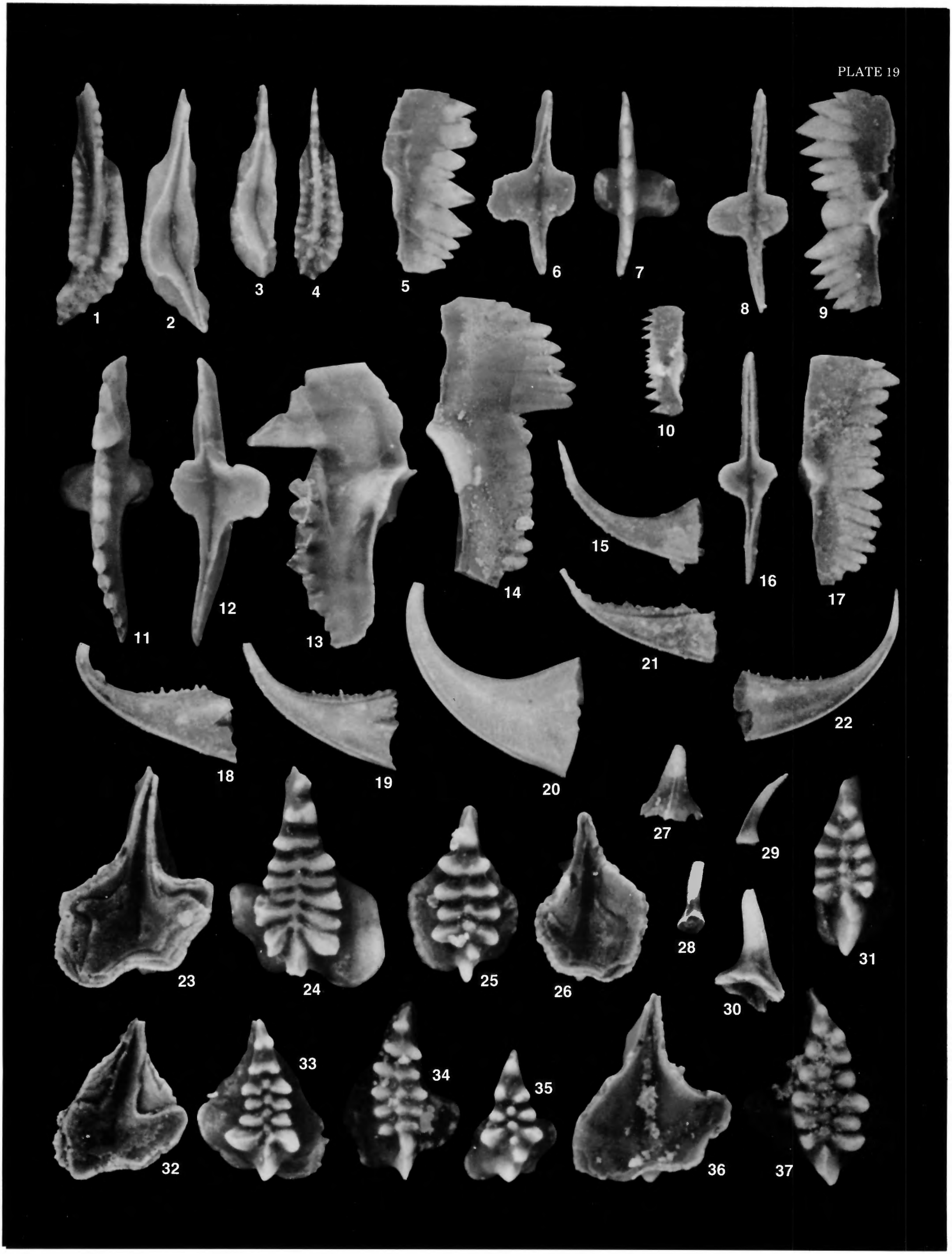
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PLATE 20

All figures x 50, unless otherwise noted

Samples taken from the following localities are from an unnamed formation on Hyde Parker Island: GSC locs. C-33666 and C-33667.

Samples taken from the following locality are from an unnamed formation on Crescent Island: GSC loc. C-33621.

Figures 1-3. *Ozarkodina remscheidensis remscheidensis* (Ziegler) transitional to *O. remscheidensis repetitor* (Carls and Gandl). (GSC loc. C-33667).

1. GSC 86677, lateral view of Pa element.
2, 3. GSC 86678, lateral and lower views of Pa element.

Figures 4-9, 13-15. *Pelekysgnathus csakyi* Chatterton and Perry. (GSC loc. C-33667).

4-6. GSC 86679, upper, lateral, and lower views of I element.
7-9. GSC 86680, outer lateral, lower, and inner lateral views of I element.
13. GSC 86681, lateral view of S_2 element.
14, 15. GSC 86682 and 86683, lateral view of two M_2 elements.

Figures 10-12. *Amydrotaxis chattertoni* n. sp. (GSC loc. C-33667).

10. GSC 86684, lateral view of paratype Pa element.
11. GSC 86685, lateral view of paratype Pb element.
12. GSC 86686, posterior view of paratype Sa element.

Figure 16. *Oulodus*? sp. B. (GSC loc. C-33667).

GSC 86687, posterior view of Sa? element.

Figures 17-22. Apparatus C. (GSC loc. C-33666).

17. GSC 86688, oblique lateral view of Sb element, x 125.
18. GSC 86689, inner lateral view of Pa element, x 125.
19. GSC 86690, posterior view of Sa element, x 175.
20. GSC 86691, oblique lateral view of M element, x 125.
21. GSC 86692, oblique lateral view of Sc element, x 125.
22. GSC 86693, inner lateral view of Pb element, x 125.

Figures 23-29. *Pelekysgnathus* sp. 1. (GSC loc. C-33666).

23, 24. GSC 86694, lateral and lower views of I element.
25. GSC 86695, lateral view of S_2 element.
26, 27. GSC 86696, upper and lateral views of I element.
28. GSC 86697, lateral view of M_2 element.
29. GSC 86698, lateral view of S_2? element.

Figures 30-34. *Pedavis breviramus* Murphy and Matti. (GSC loc. C-33667).

30. GSC 86699, outer lateral view of S_1 element.
31, 32. GSC 86700 and 86701, lateral view of two M_2 elements.
33, 34. GSC 86702, upper and lower views of I element.

Figures 35-37. *Eognathodus sulcatus kindlei* Lane and Ormiston. (GSC loc. C-33621).

35. GSC 86703, upper view of Pa element.
36, 37. GSC 86704, lower and upper views of Pa element.

Figures 38-41. *Ancyrodelloides delta* (Klapper and Murphy).

38. GSC 86705, upper view of Pa element (GSC loc. C-33667).
39-41. GSC 86706, upper, lower, and lateral views of Pa element (GSC loc. C-33666).


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