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STRATIGRAPHY AND CONODONTS OF UPPER SILURIAN AND LOWER DEVONIAN ROCKS IN THE ENVIRONS OF THE BOOTHIA UPLIFT, CANADIAN ARCTIC ARCHIPELAGO

PART I
CONTRIBUTIONS TO STRATIGRAPHY

R. Thorsteinsson
(with contributions by T.T. Uyeno)

PART II
SYSTEMATIC STUDY OF CONODONTS

T.T. Uyeno

Energy, Mines and Resources Canada
Énergie, Mines et Ressources Canada

1980

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Preface

Boothia Uplift is a major structural feature that extends north from Boothia Peninsula to the northwestern extremity of Devon Island. On Somerset Island and Boothia Peninsula it consists of Precambrian crystalline rocks and Proterozoic sediments that are flanked by Cambrian to Lower Devonian platform-type sedimentary rocks. This report deals with strata of Late Silurian to Early Devonian age, the time of the principal crustal movements that produced the Uplift.

Part I of the report provides new information on the ages of formations in the vicinity of Boothia Uplift and proposes revisions in nomenclature of the strata. It is shown that the southern and northern parts of the Uplift, separated by Barrow Strait, had different early deformational histories. Part II is devoted to a detailed systematic study of Late Silurian to Early Devonian conodonts which provided much of the new age data interpreted in the first part of the report.

This new understanding of the strata and their history is economically important in an area of the Arctic Islands that contains proven lead-zinc deposits and has evident petroleum potential. The study will also help refine calibration of the geological time scale in other parts of the world.

D.J. McLaren
Director General
Geological Survey of Canada

OTTAWA, October 1979

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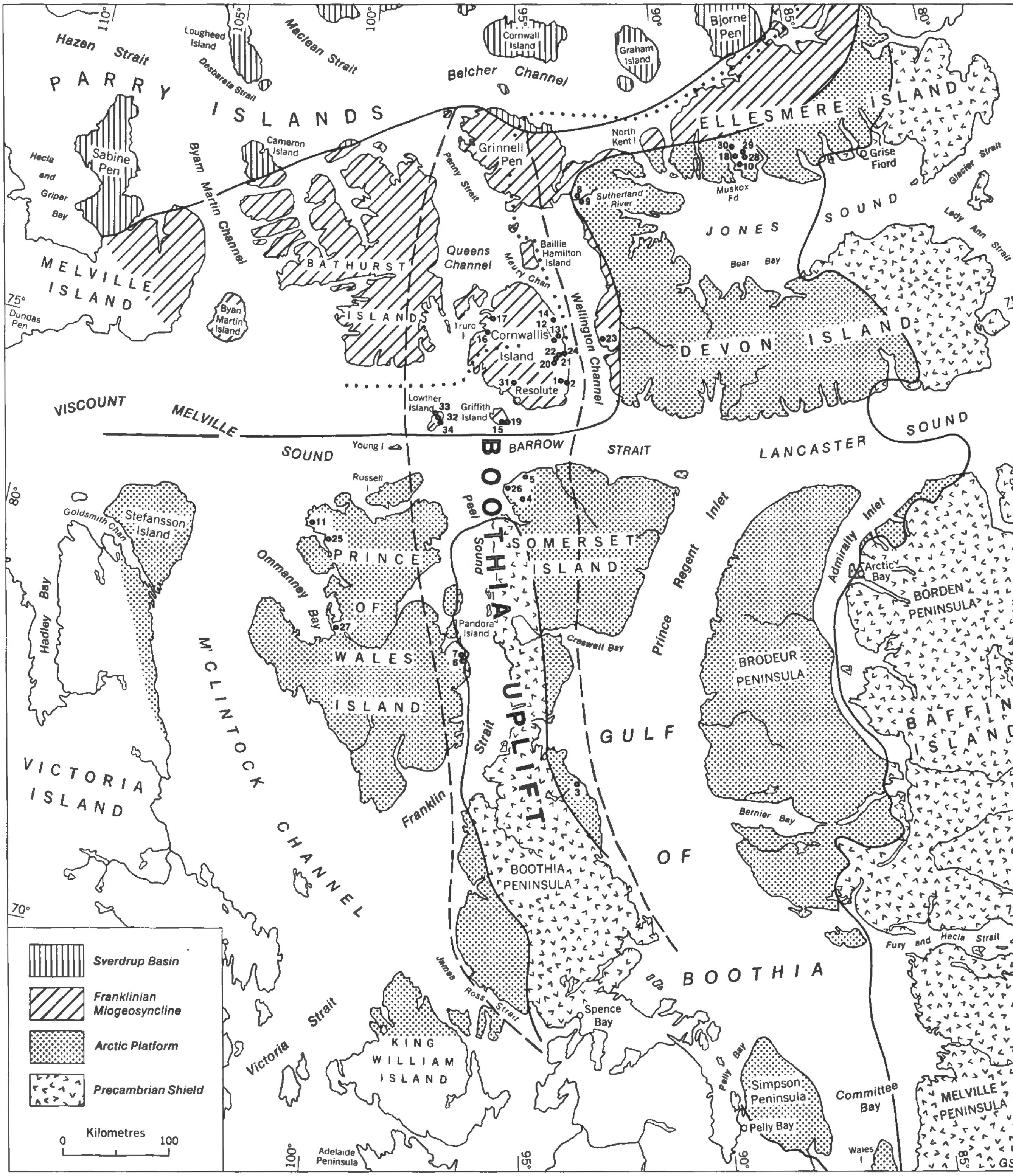

FIGURE 1. Index map of report area showing major geological provinces. Numbers 1 to 33 mark locations of measured sections and isolated fossil localities referred to in text. Precise locations of these are given in the appendix. Dotted line marks approximate facies boundary of the main body of Upper Ordovician to Lower Devonian graptolitic rocks to the northwest and equivalent carbonate rocks to the southwest.

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PART I

CONTRIBUTIONS TO STRATIGRAPHY

Abstract

The cratonic Boothia Uplift constitutes a major geological province in the Canadian Arctic. It is 800 km long and 150 km wide and extends from Boothia Peninsula on the continental mainland to about the geographic centre of the Canadian Arctic Archipelago. Rocks of Precambrian and Phanerozoic ages are included in the Uplift. The principal crustal movements by which the uplift achieved its present areal extent and many of its present structural characteristics occurred in Late Silurian and Early Devonian times. These movements exerted a profound influence on local sedimentation, effecting complex and diverse facies changes that have necessitated the establishment of different formational successions in rocks of Late Silurian to Early Devonian ages in most of the major islands and Boothia Peninsula that comprise the uplift. Uncertainty has surrounded the ages of several formations within this interval of time, and this has precluded a clear understanding of correlations, as well as the timing and areal extent of the crustal movements that produced the Boothia Uplift.

The present study deals mainly with the litho- and biostratigraphy of Upper Silurian to Lower Devonian rocks in the environs of the Boothia Uplift. It commences with the Upper Silurian Cape Storm Formation which was deposited shortly before the onset of crustal movements in the Boothia Uplift in Paleozoic time and ends with the Lower Devonian Disappointment Bay Formation that lies with angular unconformity on the bevelled and truncated rocks of the uplift, and thus provides a firm upper age limit to principal crustal movements that produced the uplift. Much new information is provided on the ages of the various Upper Silurian to Lower Devonian formations in the environs of the uplift, and this is based largely on the study of conodonts (by T.T. Uyeno) and graptolites. The present study has also indicated a need for revisions to the formational nomenclature of rocks in the report area. The Cape Storm Formation is now recognized in the Cornwallis Island area where its basal part is made up of beds included previously in the Allen Bay Formation while its upper part includes beds assigned previously to the lower part of member A of the Read Bay Formation. The remainder of member A, as defined in Cornwallis Island, is herein assigned to the Douro Formation. Rocks referred to the Read Bay Formation in Somerset and Prince of Wales Islands and Boothia Peninsula, and those formerly included in the lower part of the Read Bay in Devon Island are assigned also to the Douro Formation. The rocks formerly considered as members B and C of the Read Bay Formation are included in a single formation for which the new name Barlow Inlet is proposed, whereas member D, which previously constituted the uppermost part of the Read Bay Formation is raised to the rank of formation and given the name Sophia Lake. The Read Bay Formation is raised to the status of group, and includes in order upward the Douro, Barlow Inlet and Sophia Lake Formations. As so defined, the Read Bay Group is distributed only in the Cornwallis Island area and adjacent parts of Devon Island.

Southern and northern parts of the Boothia Uplift, which are separated by Barrow Strait, are characterized by different deformational histories within the Late Silurian to Early Devonian interval of time. Diastrophism commenced south of the strait (Somerset and Prince of Wales Islands, and Boothia Peninsula) in the late Ludlovian, whereas north of the strait (Cornwallis Island, northwestern Devon Island, and eastern Bathurst Island), it commenced in the early Lochkovian. From the early Lochkovian to the early Zlichovian, diastrophism appears to have proceeded simultaneously in both parts of the uplift.

Résumé

Le soulèvement de Boothia constitue une des principales provinces géologiques de l'Arctique canadien. Il a 8 km de longueur et 150 km de largeur et s'étend de la presqu'île de Boothia, sur le continent, jusqu'aux environs du centre géographique de l'archipel Arctique canadien. Il comprend des roches du Précambrien et du post-Précambrien. Les mouvements crustaux majeurs qui ont donné au soulèvement son étendue et bon nombre de caractéristiques structurales actuelles ont eu lieu au Silurien supérieur et au Dévonien inférieur. Ces mouvements ont exercé une profonde influence sur la sédimentation locale, entraînant des changements de faciès complexes et variés; aussi, il a fallu établir des successions différentes de formations dans les roches datant du Silurien supérieur au Dévonien inférieur dans la plupart des grandes îles et dans la presqu'île de Boothia, qui fait partie du soulèvement. L'âge de plusieurs formations de cette période n'a pu être nettement determinée, ce qui a empêché de bien faire la corrélation, la chronologie et l'étude d'étendue des mouvements crustaux qui ont provoqué le soulèvement de Boothia.

Ce rapport traite principalement de la biostratigraphie et de la lithostratigraphie des roches datant du Silurien supérieur au Dévonien inférieur, des environs du soulèvement de Boothia. Il commence avec la formation de Cape Storm, du Silurien supérieur, dont la sédimentation a eu lieu peu avant le début des mouvements crustaux dans le soulèvement de Boothia au Paléozoique, et se termine avec la formation de Disappointment Bay, du Dévonien inférieur, qui présente une discordance de stratification angulaire et qui repose sur les roches biseautées et tronquées du soulèvement, fournissant ainsi une limite d'âge supérieure précise pour les grands mouvements crustaux qui ont formé le soulèvement. Un grand nombre de nouveaux renseignements sont donnés sur l'âge de différentes formations qui s'étendent du Silurien supérieur au Dévonien inférieur dans les environs du soulèvement, et ils sont tirés principalement de l'étude des conodontes (par T.T. Uyeno) et des graptolites. La présente étude souligne aussi la nécessité de reviser la nomenclature des roches dans la région concernée. On reconnaît maintenant que la formation de Cape Storm est présente dans la région de l'île Cornwallis, où sa base est faite de lits compris auparavant dans la formation d'Allen Bay, alors que sa partie supérieure comprend des lits attribués antérieurement à la partie inférieure du niveau A de la formation de Read Bay. Le reste du membre A, tel que défini pour l'île Cornwallis, est attribué ici à la formation de Douro. Les roches assignées à la formation de Read Bay dans l'île Somerset et l'île du Prince-de-Galles, ainsi que dans la péninsule de Boothia, et celles autrefois assignées à la partie inférieure de la formation de Read Bay dans l'île Devon sont aussi placées dans la formation de Douro. Les roches que l'on considérait autrefois comme les membres B et C de la formation de Read Bay se trouvent maintenant réunies dans une formation unique, à laquelle on propose de donner le nom de formation de Barlow Inlet tandis que l'on élève la portion la plus récente de la formation de Read Bay au rang de formation, en la nommant formation de Sophia Lake. La formation de Read Bay est rebaptisée groupe de Read Bay, et comprend de bas en haut, les formations de Douro, de Barlow Inlet et de Sophia Lake. Ainsi défini, le groupe de Read Bay se retrouve uniquement dans le secteur de l'île Cornwallis et les parties attenantes de l'île Devon.

Les parties du sud et du nord du soulèvement de Boothia, qui sont séparées par le détroit de Barrow, sont caractérisées par diverses déformations qui ont eu lieu du Silurien supérieur au Devonien inférieur. Dans le sud du détroit (les îles Somerset et Prince-de-Galles et la presqu'île de Boothia), le diatrophisme a commencé au Ludlovien supérieur, alors que dans le nord, il a commencé au Lochkovien inférieur. Du Lochkovien inférieur au Zlichovien inférieur, le diatrophisme semble avoir suivi la même évolution dans les deux parties du soulèvement.

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PART I

CONTRIBUTIONS TO STRATIGRAPHY

INTRODUCTION

Location and scope of study

The Boothia Uplift is a major cratonic feature, characterized by north-trending structures, that extends from Boothia Peninsula in the south to the northwestern extremity of Devon Island in the north (Fig. 1). South of Barrow Strait, the uplift consists of Precambrian crystalline rocks and Proterozoic sediments that are flanked by Cambrian to Lower Devonian platform-type sedimentary rocks, whereas north of the strait, the uplift includes Cambrian to Lower Devonian miogeosynclinal rocks. The principal crustal movements that produced the Boothia Uplift occurred in Late Silurian and Early Devonian times (Kerr, 1977), and the upper age limit of these movements is marked by a widespread, concordant sequence of Lower to Upper Devonian sediments (i.e. Disappointment Bay to Hecla Bay Formations) that lies with angular unconformity on the uplift.

The Late Silurian to Early Devonian crustal movements of the Boothia Uplift exerted a profound influence on local sedimentation, effecting diverse and complex facies changes that are reflected in the fact that different formational successions appear to characterize the sedimentary columns of these ages in most of the major islands and Boothia Peninsula that comprise the uplift. Uncertainty has for long surrounded the age of several formations within this interval of time, and this has in turn precluded a clear understanding of correlations, as well as the timing and areal extent of the tectonic events.

This study deals mainly with the lithostratigraphy and biostratigraphy of Upper Silurian to Lower Devonian formations in the environs of the uplift, commencing with the upper Ludlovian Cape Storm Formation, and ending with the upper Zlichovian to lower Dalejan Disappointment Bay Formation. Much new information is provided on the ages of several of the formations included within this interval of time, and this is based largely on the evidence of conodonts and graptolites, and to a lesser extent on other fossil groups. The study has also indicated a need for some revisions in formational nomenclature which have been made necessary by the new age determinations, changes in the evaluation of stratigraphical characters, and new knowledge concerning the distribution of rock-units. The probable ages and correlations of the rocks with which we are here concerned are given in Table 1.

The study deals also with the structural history of the Boothia Uplift, and the new stratigraphical, structural and paleontological information presented herein provides a clearer insight into the timing and areal extent of the Late Silurian and Early Devonian movements that affected the uplift.

The basis of the present study was T.T. Uyeno's decision to undertake a systematic study of a number of conodont faunas collected and prepared mainly by the writer from rocks of Late Silurian to Early Devonian age in the report area, and the need to provide him with the necessary stratigraphic information to which these faunas could be related. Uyeno's study constitutes a companion report in this bulletin.

Field observations leading to the present study were carried out over a period of several field seasons (1970-77). The study represents a part of the results arising out of other projects.

Unless otherwise acknowledged, the conodont zonations used in the present account are those of North America by Klapper and Murphy (1975) and Klapper et al. (1978). The identifications and age determinations of the conodonts are by T.T. Uyeno, and those of the graptolites and heterostracans are by the writer.

Acknowledgments

Thanks are expressed to D.W. Morrow who discovered and drew the writer's attention to a section of the Devon Island Formation in northwestern Devon Island (*see* Fig. 18), and to J.Wm. Kerr for assistance in collecting the faunas obtained from that section. Thanks are extended also to H.P. Trettin for his identifications and descriptions of several rock specimens from the Devon Island Formation.

Identifications and age determinations of the faunas, other than conodonts and graptolites, dealt with in the present account are by the following: corals, A.E. Pedder; brachiopods, J.C. Johnson and R.E. Smith; trilobites, B.S. Norford and A.R. Ormiston.

STRATIGRAPHY

Cape Storm Formation

Definition and distribution

In 1975, Kerr, on the basis of field investigations conducted in 1967 in southwestern Ellesmere Island, established the Cape Storm Formation for a unit of mainly dolomite and limestone that is interposed conformably between the underlying Allen Bay Formation and overlying Douro Formation. He noted that the formation was present also in northwestern Devon Island, where its surface of separation with the Allen Bay Formation is locally an angular unconformity (*see* Morrow and Kerr, 1978). The Cape Storm is now known to be distributed also in Boothia Peninsula and Somerset Island (Reinson et al., 1976; Miall and Kerr, 1977) and, on the basis of field studies by the writer, to be present in Prince of Wales Island, Cornwallis Island, and parts of western Devon Island that are situated opposite Cornwallis Island. Throughout its distributive area, the Cape Storm includes beds that were regarded in earlier works as belonging either to the upper part of the Allen Bay Formation (Devon and Prince of Wales Islands), or to the lower part of the Read Bay Formation (Boothia Peninsula and Somerset Island), or to both of these formations (Ellesmere and Cornwallis Islands). The Leopold Formation that was erected in northeastern Somerset Island by Jones and Dixon (1975) was considered by Reinson et al. (op. cit.) as another, and unnecessary name for the Cape Storm, though this has been disputed by Jones and Dixon (1977).

TABLE 1

Correlation of representative sections in report area. Diagonally ruled areas denote absence of strata owing to unconformities in sections. Vertically ruled areas denote strata not present because of present day unconformity.

SYSTEM	STAGE	Southwestern Ellesmere Island	Northwestern Devon Island	Baillie Hamilton Island and northern Cornwallis Island	Southern Cornwallis Island	Boothia Peninsula and Somerset Island	Eastern Prince of Wales Island	Western Prince of Wales Island	Central Bathurst Island	Graptolite zones based mainly on works by H. Jaeger, Berlin, Germany	North American conodont zones modified after Klapper (1977) and Klapper and Murphy (1975)	European conodont zones adapted from Walliser (1964), Jaeger (1975) and Weddige (1977)
DEVONIAN	DALEJAN	The classification of Lower Devonian rocks that are presumed to overlie the Goose Fiord Formation in southwestern Ellesmere Island is unsettled.	'BLUE FIORD' FORMATION; DISAPPOINTMENT BAY FORMATION	'BLUE FIORD' FORMATION; DISAPPOINTMENT BAY FORMATION	'BLUE FIORD' FORMATION; DISAPPOINTMENT BAY FORMATION				'BLUE FIORD' FORMATION; 'EIDS' FORMATION; STUART BAY FORMATION; ?		serotinus; inversus	patulus; serotinus; laticostatus
	ZLICHOVIAN								?		gronbergi; dehiscens	gronbergi; dehiscens
	PRAGIAN							DRAKE BAY FORMATION	BATHURST ISLAND FORMATION	*Monograptus yukonensis*	*sulcatus* n. subsp.; *sulcatus*	?
	LOCHKOVIAN	?	PRINCE ALFRED FORMATION; ?; SUTHERLAND RIVER FM; ?	?; SOPHIA LAKE FORMATION	SNOWBLIND BAY FM; SOPHIA LAKE FM	PEEL SOUND FORMATION (Upper member)	PEEL SOUND FORMATION (Upper member)			*Monograptus hercynicus*; *Monograptus praehercynicus*; *Monograptus uniformis*	*pesavis*; *Ozarkodina* n. sp. D *eurekaensis*; *hesperius*	*Ancryodelloides Pedavis pesavis*; *postwoschmidti*; *woschmidti*
SILURIAN	PRIDOLIAN late	GOOSE FIORD FORMATION	DEVON ISLAND FORMATION	CAPE PHILLIPS FORMATION	READ BAY GROUP: BARLOW INLET FM	PEEL SOUND FORMATION (Lower member)	PEEL SOUND FORMATION (Lower member)		CAPE PHILLIPS FORMATION	*Monograptus transgrediens* with subzones (d) *M. transgrediens* (c) *M. perneri* (b) *M. bouceki* (a) *M. lochkovensis*	uppermost *eosteinhornensis*; *eosteinhornensis*; *Pelekysgnathus* index fauna	*eosteinhornensis*
	PRIDOLIAN early	DEVON ISLAND FORMATION				SOMERSET ISLAND FM				*Monograptus ultimus*; ?	*crispa*; *latialata*	*crispa*; *latialata*
	LUDLOVIAN late	DOURO FORMATION	DOURO FORMATION		DOURO FM	DOURO FORMATION	DOURO FORMATION	DOURO FORMATION		*Monograptus bohemicus tenuis*	*siluricus*	*siluricus*
	LUDLOVIAN early	CAPE STORM FORMATION	CAPE STORM FORMATION; ALLEN BAY FORMATION		CAPE STORM FORMATION; ALLEN BAY FORMATION	CAPE STORM FORMATION; ALLEN BAY FORMATION	CAPE STORM FORMATION; ALLEN BAY FORMATION	CAPE STORM FORMATION; ALLEN BAY FORMATION		*Monograptus fritschi linearis*; *Monograptus chimaera*; *Monograptus nilssoni*	*ploeckensis*	*ploeckensis*; *crassa*
	WENLOCKIAN									*Monograptus ludensis*	*sagitta*	*sagitta*

GSC

Throughout most of its distributive area, the Cape Storm overlies the Allen Bay Formation, but in northeastern Somerset Island the formation overlies a varied assemblage of evaporitic rocks which Miall and Kerr (1977) assign to the Cape Crauford Formation.

Lithology

The formation maintains a gross homogeneous lithology extending over great distances. The predominant rock types include dolomite, dolomitic limestone and limestone, with lesser amounts of dolomitic or calcareous quartzose siltstone, sandstone and shale. The rocks are mainly light to medium grey and finely crystalline, and the weathering colours are various shades of grey, yellow and especially brown. The contact of the Cape Storm and underlying Allen Bay Formation, which is almost entirely dolomite, is seldom sharply defined. In most places, the contact is gradational, but generally it can be located with a fair degree of certainty. Criteria useful in differentiating these formations are as follows: 1) The Cape Storm is mainly very thin to medium bedded, and presents a characteristic finely banded appearance as viewed from the air or on aerial photographs, which contrasts rather markedly from the mainly thick-bedded to massive rocks of the Allen Bay Formation. 2) Vuggy porosity is a common feature in Allen Bay rocks, whereas most of the Cape Storm is dense. 3) Allen Bay rocks tend to be medium to coarsely crystalline whereas Cape Storm rocks are ordinarily cryptocrystalline to finely crystalline. 4) The Allen Bay is more resistant to erosion than the Cape Storm, and tends to form more rugged landscapes, whereas the Cape Storm commonly weathers to smoothly rounded slopes.

Some characteristics of the Cape Storm Formation in the Cornwallis Island area are worthy of special comment. The contact of the Cape Storm and overlying Douro Formation is sharply defined at the base of a persistent unit of shale in the latter formation. In some places the Cape Storm is made up entirely of dolomite, but in others it includes significant amounts of limestone, particularly in the upper 150 m or more of the formation which commonly consists entirely of limestone and subordinate amounts of calcareous shale that are strikingly similar to rocks that characterize the Douro Formation. Moreover, locally, as in Griffith Island, a small island situated south of Cornwallis Island, the Cape Storm exhibits numerous intervals of light red dolomite and dolomitic siltstone.

Thickness

The greatest known thickness of the Cape Storm is in northwestern Devon Island where Morrow and Kerr (1978) have recorded 600 m for the formation. The formation is 520 m thick in southeastern Cornwallis, and 540 m thick in Griffith Island. The thinnest developments of the formation are in Somerset Island (120-260 m; *see* Miall and Kerr, 1977), and in Prince of Wales Island (47 m; *see* Fig. 21). Moreover, in Somerset and Prince of Wales Islands, fine-grained quartzose sandstone, and siltstone, which are commonly planar laminated, are more common than elsewhere, suggesting that much of the quartzose clastic materials in the Cape Storm was derived from a southern source.

Biofacies and age

The Cape Storm is typically poor in fossils, and most exposures appear to be devoid of megafossils. It has, nevertheless, yielded stromatolites, brachiopods, bryozoans, stromatoporoids, corals, conodonts and vertebrates, and in some places, notably in the upper part of the formation on Cornwallis Island, invertebrate fossils are commonly abundant.

The Cape Storm ranges from Llandoverian to Ludlovian in southwestern Ellesmere Island (Kerr, 1975), but throughout all other parts of its distributive area the formation appears to range from early to late Ludlovian in age.

Origin

Desiccation fractures, intraclast breccia and cross-laminated beds are generally rare, but notable, features in the Cape Storm. These features, including the overall lithological and faunal characteristics of the formation, suggest deposition in relatively shallow, marine waters that were dominantly subtidal, but at times and places intertidal and supratidal.

Douro Formation

History of study

Consisting mainly of rubbly weathering, grey limestone, the Douro Formation has been interpreted as occurring only in northwestern Devon Island and neighbouring parts of southwestern Ellesmere Island. Present field investigations however, have indicated the need to extend the name of this formation considerably beyond this limited area, and to apply it to rocks formerly interpreted as belonging partially or entirely to the Read Bay Formation. It is, therefore, appropriate at this juncture to review briefly the original bases on which the Douro and Read Bay Formations were defined, and to note also some other studies that contributed to knowledge of the character and distribution of these formations as understood up to the present time.

The Read Bay Formation was defined by Thorsteinsson and Fortier (1954) for a relatively thick sequence of mainly shelf-type limestone and dolomite interposed between the underlying Allen Bay Formation and overlying Snowblind Bay Formation in Cornwallis Island. A more detailed account of the Read Bay Formation in this island was given by Thorsteinsson (1958), who recognized that it included four well-defined, mappable lithologic units named, in order upward, members A to D and who suggested that further field studies on Cornwallis and neighbouring islands might indicate the desirability of raising these units to the rank of formations. The Read Bay Formation was dated as Silurian, and its type section was designated in the southeastern coastal region of Cornwallis Island.

Thorsteinsson (1963a) proposed the name Douro Formation for a relatively thin succession of mainly limestone in northwestern Devon Island where the formation overlies rocks then regarded as the Allen Bay Formation, and underlies graptolitic rocks of the Devon Island Formation. In this study, Thorsteinsson (op. cit.) noted that the Douro Formation was similar in lithology and faunal characteristics to member A of the Read Bay Formation in Cornwallis Island. That same year, Greiner (1963b) applied the name Douro Formation to rocks occupying a similar stratigraphic position in southwestern Ellesmere Island; and Thorsteinsson (1963b) described and mapped rocks as the Douro Formation that overlie the Allen Bay Formation in central-east Ellesmere Island. The three above-mentioned papers are included in Fortier et al. (1963) as are several other papers in which the Read Bay Formation was identified for the first time outside of Cornwallis Island. Rocks classified as this formation were described in: Somerset Island by Blackadar (1963a, b), McMillan (1963), Norris (1963a), and Thorsteinsson and Tozer (1963); Prince of Wales Island by Thorsteinsson and Tozer (op. cit.); southwestern Devon Island by Greiner (1963b); and northwestern Baffin Island by Norris (1963b). Here it should be noted that the rocks identified as the Read Bay Formation on Somerset Island by Norris (1963a) are now in part distributed in the Cape Storm and Cape Crauford Formations by Miall and Kerr (1977); the rocks that Norris (1963b) referred to the Read Bay on Baffin Island were later referred to the Cape Crauford Formation by Trettin (1969); and the rocks that Thorsteinsson (1963b) referred to the Douro in central-east Ellesmere Island, are very probably not assignable to that formation, and in fact have been described by Kerr (1976) as being part of his undivided Allen Bay - Read Bay rock unit. Thorsteinsson and Tozer (1962) described under the name of Read Bay Group, three lithologic units (11a, 11b and 11c) in Stefansson Island, and recognized the presence of map-unit 11a in Victoria Island. Christie (in Blackadar and Christie, 1963) was the first to identify the Read Bay Formation in Boothia Peninsula.

Proposed revisions in formational nomenclature

The following are proposed revisions to rocks classified hitherto as the Douro and Read Bay Formations: 1) As noted earlier, the Cape Storm Formation is a fairly well-defined map-unit in Cornwallis Island, where its basal part is made up of beds included previously in the upper part of the Allen Bay Formation, while its upper part includes beds assigned previously to the lower part of member A of the Read Bay Formation. The upper, remaining part of member A appears to represent, for all practical purposes, the stratigraphical and chronological equivalent of the type section of the Douro Formation. Member A as so revised is referred to the Douro Formation. The contact of the Cape Storm and Douro Formations at Goodsir Creek in southeastern Cornwallis Island is shown in Figure 2 (cf. Fig. 2 and Pl. VIII in Thorsteinsson, 1958). It should be noted also that this contact coincides with the base of unit 46 in Thorsteinsson's (op. cit., p. 51) described section of member A, and as such 335.19 m of beds in that section represent the whole of the Douro Formation, and 236.4 m[1] of beds are now assigned to the Cape Storm. 2) The Read Bay Formations in Boothia Peninsula and Somerset Island, as redefined by Miall and Kerr (1977), appear to equate lithologically and chronologically with the Douro Formation, and this is true also of all beds referred to the Read Bay on Prince of Wales Island. It is therefore proposed that the name Douro Formation be substituted for the beds hitherto referred to the Read Bay Formations in these areas. Very probably the rocks referred to as map-unit 11a of the Read Bay Group in Stefansson and Victoria Islands by Thorsteinsson and Tozer (1962) are also best referred to the Douro Formation, though this cannot be settled without further field studies. 3) Members B and C of the Read Bay Formation, as defined originally by Thorsteinsson (1958) in Cornwallis Island, are together included in a single formation for which the name Barlow Inlet is herein given. As so defined, the Barlow Inlet Formation is confined mainly to Cornwallis Island and to adjacent parts of Devon Island that were studied by Greiner (1963b), and where, moreover, stratigraphic and mapping studies by the writer in 1976 have shown that these rocks overlie a clearly definable Douro Formation. 4) Member D of the Read Bay Formation of Thorsteinsson (op. cit.) is raised to the rank of formation and named the Sophia Lake Formation. 5) The Read Bay Formation is elevated to the status of group. In order upward the Read Bay Group includes the formations Douro, Barlow Inlet and Sophia Lake.

Revisions in the stratigraphic nomenclature of rocks in Ellesmere Island referred to by Kerr (1976) as "Allen Bay - Read Bay Formations (undivided)" must await further field investigations.

Contact relationships

The Douro Formation lies conformably on the Cape Storm Formation. In some places, as for example the Cornwallis Island area, the contact of the formation is sharp and relatively easy to define, whereas in most other places it is gradational with as much as 10 m or more of beds being in doubt. The Douro is overlain variously by: the Devon Island Formation in northwestern Devon Island (Fig. 3) and southwestern Ellesmere Island; the Barlow Inlet Formation on Cornwallis Island, and adjacent parts of western Devon Island; the Peel Sound Formation on Prince of Wales Island, and the Somerset Island Formation on Boothia Peninsula and Somerset Island. In all of these areas where the upper contact of the Douro has been studied by the writer, the contact is sharply defined, conformable and without physical or faunal evidence to indicate that it might represent a disconformity.

Thickness and lithology

The thickness of the Douro Formation varies from a minimum of 95 m, as recorded by Morrow and Kerr (1978) in northwestern Devon Island, to a maximum of 460 m in Griffith Island.

The Douro Formation maintains relatively uniform characteristics throughout its distributive areas. It consists mainly of two rock types which have been described in detail by Jones and Dixon (1977): mottled dolomite consisting of cryptocrystalline, medium grey limestone occurring as irregular-shaped masses in a yellowish dolomite matrix; and rubbly-weathering argillaceous limestone (Fig. 3). The latter rock is commonly very thin, to thin bedded, and consists of irregular-shaped masses of cryptocrystalline, medium grey limestone in a matrix of calcareous shale. This rock tends to weather to masses of irregular-shaped limestone pebbles and cobbles, whereas fresh broken surfaces exhibit a mottled appearance. The formation includes also subordinate amounts of calcareous quartzose siltstone and calcareous shale that occur mainly as thin interbeds, or as bedding plane partings in the carbonate rocks, and thin to thick units of medium crystalline dolomite and bioclastic limestone.

The outstanding distinguishing features of the Douro are its overall light medium grey to greenish grey weathering colours, the occurrence in most exposures of commonly well-preserved shells of Atrypella, and the rubbly-weathering argillaceous limestone. Although rocks of similar character occur in the underlying Cape Storm Formation, and in the formations of Read Bay, Peel Sound and Somerset Island that variously overlie the Douro, it is only in the latter formation that they are commonly an important constituent.

[1] Within this 236 m interval of beds at Goodsir Creek, Thorsteinsson (1958) identified new genus A and new species B of the family Cyathaspididae, which he considered to be Wenlockian in age because this species was thought to occur also in the Cape Phillips Formation in Cornwallis Island associated with late Wenlockian graptolites. A restudy of the cyathaspid materials in question reveals that the specimens at Goodsir Creek are a new species of Vernonaspis, a genus that is particularly common in Cape Storm beds, and that the specimens from the Cape Phillips Formation probably represent a different genus, and certainly a different species. As pointed out earlier, the Cape Storm in Cornwallis Island is entirely Ludlovian in age.

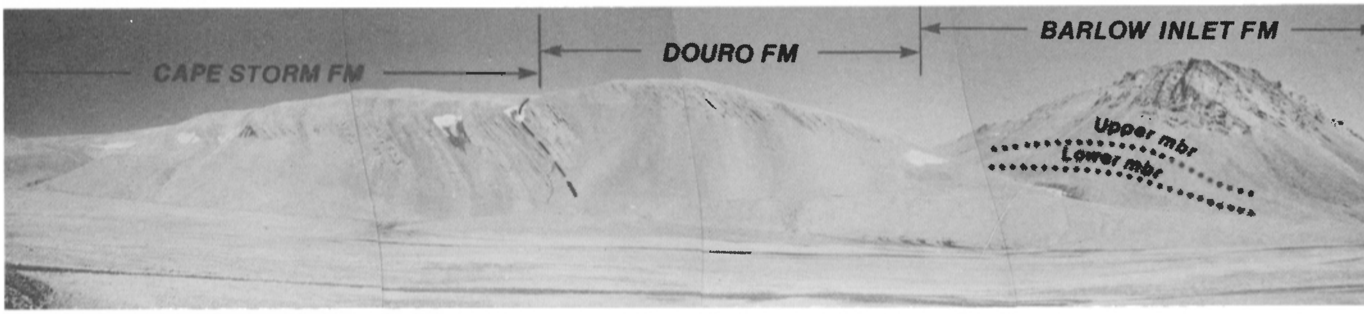

FIGURE 2. Outcrops of Cape Storm, Douro and Barlow Inlet Formations at Goodsir Creek near central-east coast of Cornwallis Island. View is to north and across Goodsir Creek. The recessive lower member of the Barlow Inlet Formation on north side of creek is completely covered by talus from the upper member, but is well exposed on the south side of the creek.

FIGURE 3. Basal contact of Devon Island Formation with Douro Formation in northwestern Devon Island, opposite Cornwallis Island (UTM Zone 15X, 538200E, 8381600N). Note sharply defined nature of contact which separates rubbly weathering, medium light grey, argillaceous limestone of the Douro from regularly bedded, medium dark grey, graptolitic rocks of the Devon Island.

Two unusual developments of the Douro are worthy of special comment. The formation in southeastern Cornwallis Island is notable for a unit of interbedded, dark grey dolomitic siltstone and limestone, some 40 m thick, that is characterized throughout by Monograptus bohemicus tenuis Bouček (Fig. 16). This unit clearly represents a southerly directed tongue of the correlative, graptolitic Cape Phillips Formation that outcrops in northern parts of the island. In parts of eastern Prince of Wales Island the uppermost 60 m or more of the Douro Formation are made up of thick-bedded to massive, resistant, coarsely crystalline limestone that varies from light grey to light red in colour, and stromatoporoids.

Biofacies and age

The Douro is commonly fossiliferous, and includes in particular, brachiopods, corals, stromatoporoids, trilobites, bryozoans, conodonts, acanthodian remains, and crinoidal debris.

The formation is late Ludlovian in age.

Origin

In view of the overall characteristics of the formation as outlined above, and the general absence of sedimentary structures indicative of shallow-water deposition, it would appear that the Douro was deposited in a shelf environment, well below wave-base.

Barlow Inlet Formation

Definition and distribution

The Barlow Inlet Formation consists principally of shelf-type carbonate rocks. It is named after a small inlet on the east coast of Cornwallis Island (*see* Fig. 5). The Formation lies on the Douro Formation, and is overlain by the Sophia Lake Formation, both contacts being sharply defined and conformable. Outcrops of the Barlow Inlet Formation are limited to southeastern Cornwallis Island, western parts of Devon Island, and to the smaller islands of Griffith and Lowther that are situated in Barrow Strait, southeast of Cornwallis Island. Complete thicknesses of the formation occur in Cornwallis and Devon Islands, whereas the lower part of the formation only is exposed in Griffith and Lowther Islands. The type section is along an unnamed stream that enters the southeast side of Read Bay on the central east coast of Cornwallis Island (Fig. 4). This has been fully described elsewhere (Thorsteinsson, 1958) as members B and C of the Read Bay Formation.

Thickness and lithology

The Barlow Inlet in Cornwallis Island is divisible into two distinct members of disproportionate thicknesses. The lower member has a maximum thickness of 65 m as determined in Goodsir Creek in southeastern Cornwallis Island (Fig. 17). It consists mainly of soft-weathering shale that is calcareous and quartzose silty and, in places, includes minor amounts of fine-grained quartz sandstone and thin beds of nodular limestone. The shale is medium dark grey, and commonly displays a greenish overcast, particularly as viewed in bright light. There are some notable regional variations in the composition of this member in Cornwallis Island. As the member is followed from Goodsir Creek northward to where it passes laterally into the graptolitic rocks of the Cape Phillips Formation at Snowblind Creek (Fig. 4), the siltstone

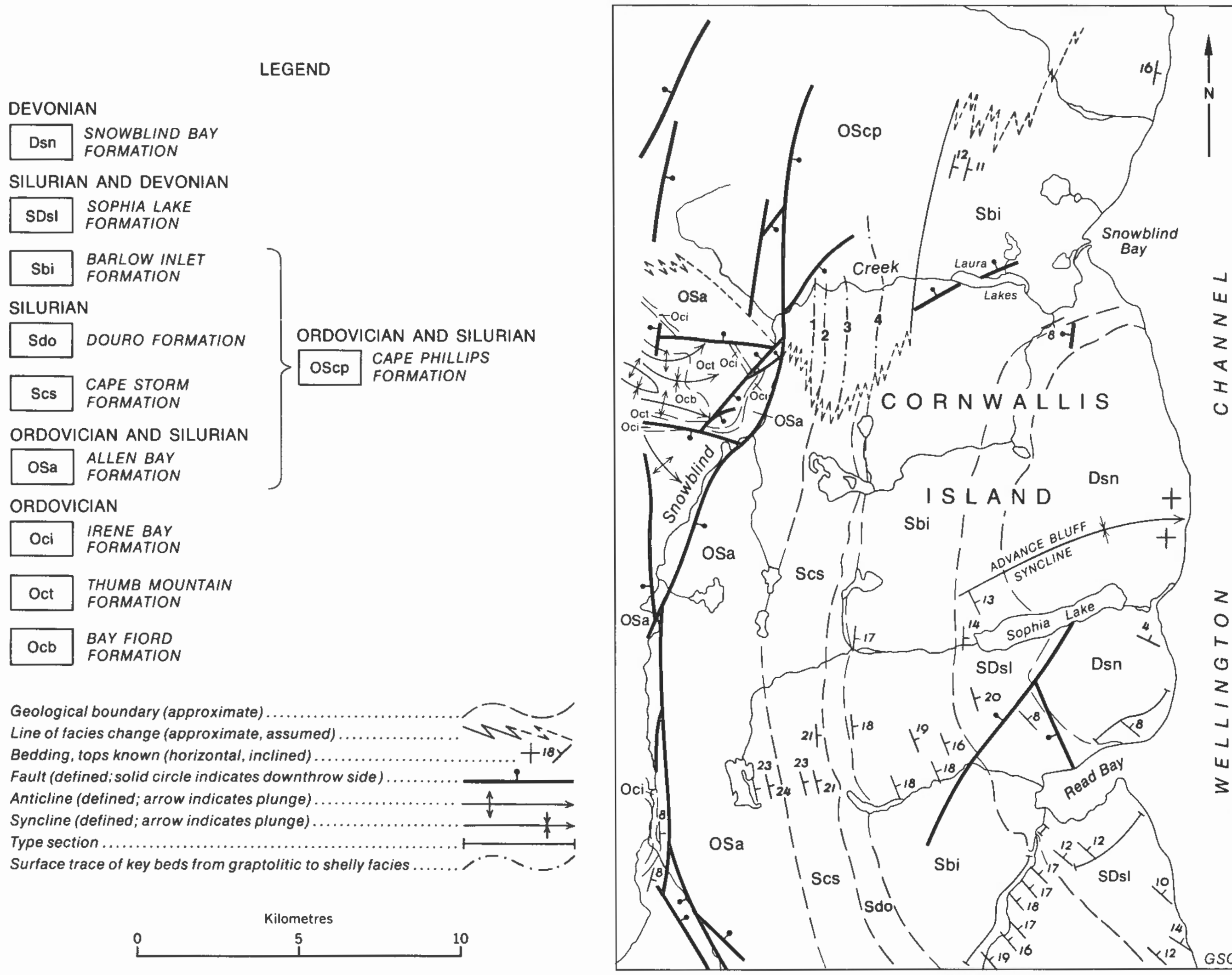

FIGURE 4. Geological sketch map of central-east coast of Cornwallis Island in the vicinity of facies change from the graptolitic rocks of the Cape Phillips Formation to shelly rocks of the Allen Bay, Cape Storm, Douro and Barlow Inlet Formations. Circled numbers mark: 1. surface trace of beds bearing Monograptus nilssoni; 2. contact between Cape Storm and Allen Bay extrapolated into graptolitic rocks; 3. surface trace of beds bearing Monograptus fritschi linearis; 4. surface trace of contact between Douro and Barlow Inlet Formations extrapolated into graptolitic rocks.

and sandstone components gradually diminish until the member becomes a relatively pure, medium grey calcareous shale about 10 m thick.

The upper member is 1345 m thick at the type locality in Cornwallis Island. Its lithology resembles in many respects that of the underlying Douro Formation, although there are notable differences in detail. The member consists principally of limestone, subordinate amounts of dolomite, and rare interbeds of shale, quartzose siltstone and sandstone. The most common limestone is a cryptocrystalline to finely crystalline, variably dolomitic and/or argillaceous rock that occurs in thin, planar or irregular beds. Other types of limestone include thick-bedded to massive cryptocrystalline rocks that contain no recognizable organic structures; coarsely crystalline, thick-bedded to massive rocks consisting almost entirely of crinoidal limestone; massive stromatoporoidal rocks; and mottled, thin-bedded, intermixed limestone and dolomite rocks that are lithologically identical to one of the principal lithologies in the underlying Douro Formation. The limestones are notable for a large variety of fresh surface colours that include various shades of grey, yellow, green and brown. There are two principal types of dolomite: finely crystalline, regularly-bedded rocks that are variably argillaceous and quartzose silty; and medium crystalline, thick-bedded to massive rocks. In contrast to the limestone, but in keeping with most dolomites, the prevailing fresh surface colours of these rocks are lighter shades of grey and yellow only.

Aside from its thickness, the outstanding general features of the upper member of the Barlow Inlet, as a whole, are the rather unusual thickness of individual rock units (up to about 60 m), the rare, but notable occurrences of thick stromatoporoidal and crinoidal limestones, and the overall weathering colours that vary from yellowish grey to greyish yellow and light brown.

The Barlow Inlet has not been been studied in detail in Devon Island, but it is of some interest to note here that the lower shale member is absent in that island.

Biofacies and age

The shale of the lower member generally contains a few well-preserved brachiopods, mainly species of Atrypella, while the limestone interbeds are rich in conodonts, and the scales of thelodonts and acanthodians. In addition, the sandstone interbeds usually display comminuted remains of heterostracans. The upper member exhibits a great variety of fossils of which corals, stromatoporoids, bryozoans, brachiopods, trilobites and particularly acanthodian scales are perhaps the most common elements, but it also yields conodonts, and the disarticulated remains of heterostracans, thelodonts and acanthodians.

The formation ranges from late Ludlovian to early Lochkovian in age.

Origin

The overall characteristics of the Barlow Inlet, just summarized, indicate that both members of the formation were deposited in a shelf environment that was dominantly subtidal. The provenance of the terrigenous materials represented by the lower member is of particular interest, and two main reasons may be advanced to suggest that this member represents the distal end of a tongue of detritus derived from uplands developed on the Boothia Uplift south of Barrow Strait. The member is correlative with late Ludlovian basal beds of the largely terrigenous Peel Sound Formation, as developed in Prince of Wales Island, which were clearly derived from the rise of the uplift south of the strait. Furthermore, the fact that the sandstone and siltstone content increases southward, suggests strongly that sediments of this member came from that direction.

Sophia Lake Formation

Definition and distribution

The rock-unit formerly referred to as member D of the Read Bay Formation in Thorsteinsson (1958) is now known to comprise a mappable unit of correlative beds distributed in the environs of Wellington Channel, and to be sufficiently contrasted lithologically from correlative formations in neighouring parts of the archipelago to warrant a new name. It is here named the Sophia Lake after a feature of that name near the central-east coast of Cornwallis Island (Fig. 4). The type section of the formation is that designated by Thorsteinsson (1958) for member D of the Read Bay Formation at the head of Read Bay on Cornwallis Island, and is shown in Figure 4.

The Sophia Lake Formation is made up mainly of planar-bedded limestone and lesser amounts of dolomite, quartzose siltstone and sandstone, shale and, in Devon Island only, it includes also gypsum and gypsiferous shale. It is distributed in three principal areas (Fig. 5): the central-east coast of Cornwallis Island; and west coast of Devon Island that is situated opposite Cornwallis Island; and the east coast of Baillie Hamilton Island. In Cornwallis and Devon Islands, the formation lies with a sharp, yet conformable contact on the Barlow Inlet Formation, as redefined in the present account, the contact being drawn where mainly thin-bedded impure limestone and subordinate, interbedded, varicoloured quartzose sandstone overlie the more resistant, purer and dominantly thick-bedded limestone that marks the top of the Barlow Inlet. The contact of the Sophia Lake with the Cape Phillips on Baillie Hamilton Island is gradational, and arbitrarily established at the change from a thick sequence of siltstone at the top of the latter formation to limestone in the former. Where exposures are good the contact may be picked within about 10 m. In Cornwallis Island, the Sophia Lake is overlain by the Snowblind Bay Formation, but in Devon and Baillie Hamilton Islands its upper surface is represented by the present day erosional surface.

Thickness

The Sophia Lake is about 560 m thick in southern parts of its distributive area in Cornwallis Island. Its thickness is in excess of about 980 m in Baillie Hamilton Island whereas in Devon Island the thickness can, as yet, only be estimated as about 300 m.

Age and correlation

The Sophia Lake Formation ranges from early to about middle Lochkovian in age. As such the nearest correlative rocks in the archipelago include the Devon Island Formation to the north and northeast, Bathurst Island Formation to the west, and Drake Bay Formation to the southwest (Mayr, 1978). Here it should be noted that all of those formations span greater intervals of time than does the Sophia Lake Formation.

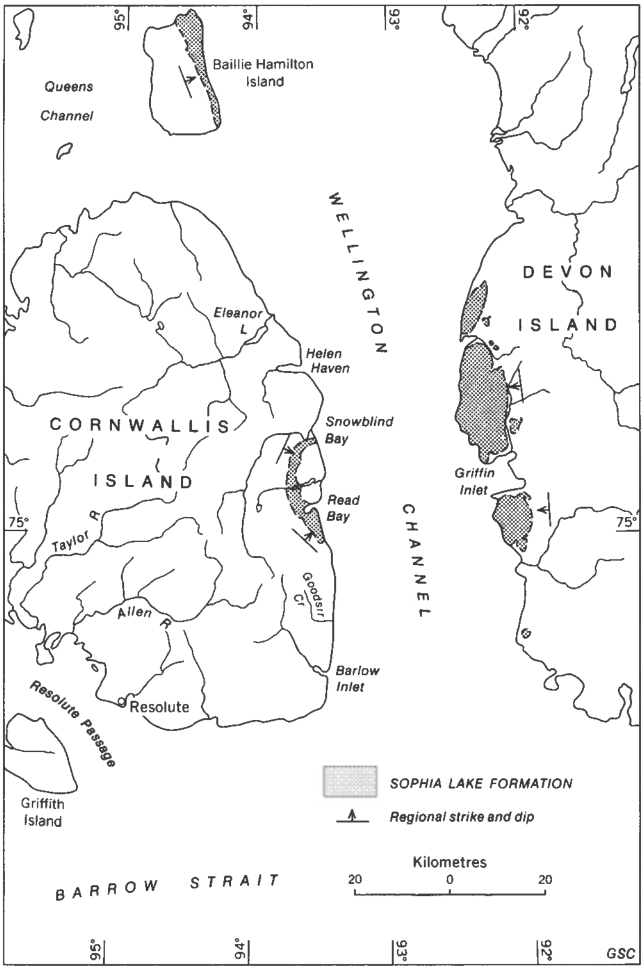

FIGURE 5. Sketch map showing distribution of Sophia Lake Formation.

The rocks in Baillie Hamilton Island that are here included in the Sophia Lake Formation were referred originally to the Stuart Bay Formation by Thorsteinsson and Kerr (1968), and later to the Sutherland River Formation (Kerr et al., 1977). Reference to either of these formations is now judged to be impractical, on the basis of age and lithology. The Sophia Lake is older than the Stuart Bay Formation and, in fact, older than the upper part of the Bathurst Island Formation which underlies the Stuart Bay (*see* Kerr et al., 1977). Although it is possible that the Sutherland River Formation is correlative with the upper part of the Sophia Lake Formation, this cannot be proven since the Sutherland River has not yielded diagnostic fossils.

Lithology and biofacies

The Sophia Lake Formation exhibits considerable regional variation in lithology. The type section in Cornwallis Island consists mainly of limestone that is commonly argillaceous, quartzose silty or sandy. This rock is ordinarily cryptocrystalline to finely crystalline and thin bedded, though medium to thick beds are also present, and it is occasionally planar laminated. Interbeds of dolomite, dolomitic limestone, and calcareous quartzose siltstone and sandstone are rather common, particularly near the bottom and top of the formation, and silty shale, mainly in the form of bedding plane partings, occurs throughout the formation.

The formation has been examined cursorily only, in Devon Island, where it appears to be divisible into two broadly defined parts: a lower sequence of beds similar in most respects to the rocks described above in Cornwallis Island; and an upper sequence consisting of alternating units of very thin bedded gypsum and gypsiferous shale, silty shale, limestone and dolomite.

In Cornwallis and Devon Islands the only common megafossils in Sophia Lake beds are leperditicopid ostracodes and fragmentary remains of heterostracans. However, most of the carbonate rocks that were dissolved in acetic acid yielded acanthodian scales and at least traces of conodonts.

The Sophia Lake exhibits a broad three-part subdivision in Baillie Hamilton Island: 1) A lower unit, 290 m thick, consisting mainly of thin-bedded limestone with subordinate interbeds of siltstone and sandstone. These rocks are similar in most respects to those in the lower part of the formation on Cornwallis Island, but differ in being rich in brachiopods, trilobites and conodonts (*see* Kerr et al., 1977). 2) A middle unit, 200 m thick, consisting of thick- to mainly medium-bedded limestone with abundant corals and stromatoporoids. 3) An upper unit, 490 m thick, composed mainly of thin-bedded limestone and lesser amounts of dolomite and dolomitic limestone. These rocks are characterized by abundant leperditicopid ostracodes and rare conodonts. The upper 60 m or so of this unit contains thin interbeds of siltstone and sandstone, and a single unit of chert pebble conglomerate, which may indicate stratigraphic proximity to the Snowblind Bay Formation, and therefore that a nearly complete thickness of Sophia Lake Formation is preserved on the island.

A noteworthy feature of the Sophia Lake is the presence of alternating hard- and soft-weathering units that impart a banded appearance to the formation. There is thus a marked difference in the weathering characteristics of the Sophia Lake and the formations that underlie it, so that the basal contact can be followed with comparative ease from the air or on aerial photographs. The principal fresh surface and weathering colours of the rocks vary from light to medium grey but, in Cornwallis and Devon Islands, they also include various hues of green, red, purple and brown, all of which accentuate further the banded appearance of exposures as viewed from a distance.

Origin

The lithological and faunal characteristics of the lower half of the Sophia Lake suggest that this part of the formation, as developed in Cornwallis and Devon Islands, was deposited in a shallow, subtidal to intertidal, near-shore environment with a relatively nearby source of quartzose clastic materials, but that the sea-floor deepened northward to well below wave-base in Baillie Hamilton Island. Similar shallow-water conditions appear to have characterized the upper half of the formation in Cornwallis and Baillie Hamilton Islands, whereas the presence of evaporites in this part of the formation in Devon Island probably attests to a restricted marine environment with lagoons.

Snowblind Bay Formation

Definition, age and distribution

The Snowblind Bay Formation was erected by Thorsteinsson and Fortier (1954) for a body of rock consisting largely of conglomerate. Outcrops of the formation are limited to a single locality on the central-east coast of Cornwallis Island. The location of the type section is shown in Figure 4. The Snowblind Bay lies gradationally on the Sophia Lake Formation, the contact being arbitrarily established at the base of the stratigraphically lowest conglomerate layer. It represents the top of the remarkably thick, conformable succession of Lower Ordovician to Lower Devonian formations (about 5850 m) that is exposed in Cornwallis Island, and no formation is known to overlie it.

The Snowblind Bay has yielded a single fauna consisting of vertebrates. It was obtained from the lower part of the formation, and is dated tentatively as late Lochkovian.

Thorsteinsson and Kerr (1968) correlated tentatively with the Snowblind Bay two relatively thin units of clastic rocks that are lithologically similar to rocks in the type section of that formation, but which occur as isolated exposures in various parts of Cornwallis and Little Cornwallis Islands. The older unit is dominantly carbonate conglomerate, and varies from zero to about 100 m thick, whereas the younger is interbedded, variably quartzose dolomite and limestone, and siltstone, sandstone and conglomerate, and varies from zero to about 50 m thick. The units occur singly or in sequence, and collectively they lie with angular unconformity on rocks ranging from Ordovician to Late Silurian in age. Where they occur in sequence they are separated from each other by a disconformity, and in places they are overlain disconformably by the Disappointment Bay Formation of late Zlichovian to early Dalejan age.

The two rock units are here excluded from the Snowblind Bay Formation for the following reasons. Though lithologically similar to the Snowblind Bay, neither rock unit has yielded diagnostic fossils by which its age relationship to that formation can be precisely established. Moreover, the fact that both units, taken together, lie on older rocks with angular unconformity and are separated from the Disappointment Bay Formation by a disconformity, indicates that Cornwallis Island area had undergone a major episode of deformation prior to their deposition, followed by widespread peneplanation to such an extent that the pre-Disappointment Bay erosional surface was in an advanced state of development. It therefore seems reasonable to conclude that the age (or ages) of these rock units is closer to that of the Disappointment Bay Formation than to that of the Snowblind Bay, and that the major unconformity that underlies the units postdates the rocks in the type section of the Snowblind Bay. The two rock units are left unnamed, and will be dealt with in a later report.

Lithology and thickness

The formation coarsens upward. It is about 450 m thick and is divisible into two broadly defined parts. The lower part is about 120 m thick and comprises interbedded dolomite, limestone, pebble conglomerate, and lesser amounts of siltstone and sandstone. The carbonate rocks are typically quartzose, silty and sandy, finely crystalline, and occur in thin to thick beds. The siltstone and sandstone are commonly calcareous or dolomitic and red coloured.

The clasts of the conglomerate consist principally of limestone and dolomite that are varying hues of grey, green, red and yellow, and minor amounts of chert, and other kinds of sedimentary rocks. The components range in size from granules to pebbles, and vary from angular to well rounded. The matrix is composed mainly of finely crystalline limestone, and grains of chert and quartz that are commonly coated with limonite. Typically these rocks occur in medium to thick beds. Ripple marks and crossbedding are rare. The upper part is about 330 m thick and consists almost entirely of limestone and dolomite conglomerate with subordinate interbeds of limestone, dolomite and fine-grained sandstone. In general the lithology of these rocks is similar to that of the underlying part, but the conglomeratic units tend to be thick bedded to massive. Moreover the clasts range up to cobble size, and chert clasts are more common.

A characteristic feature of the Snowblind Bay, particularly as viewed from a distance, is the dusky red to moderate red weathering colours that dominate most outcrops and the soil that has developed on the formation. Although the fresh surface colours include also dusky red and moderate red, other colours such as pastel shades of grey, green, yellow and brown are even more prominent upon close inspection.

Origin

Three circumstances indicate that much of the detritus in the Snowblind Bay Formation was derived from the west or northwest, probably from uplands developed, in part at least, on Cornwallis Island itself. 1) The much varied lithologies represented in the clasts of the conglomerate match well the lithologies exhibited in the predominantly carbonate succession of lower Paleozoic formations exposed in Cornwallis Island. 2) Two Silurian graptolite-bearing concretions occurring as clasts in the conglomerate have been found, and these could only have come from the Cape Phillips Formation, outcrops of which are limited to territory situated to the west and northwest of Snowblind Bay exposures. 3) The most probable nearby source of the chert clasts is also the Cape Phillips Formation. Nevertheless, the virtual absence of any significant amount of sandstone in pre-Devonian rocks in Cornwallis Island would seem to indicate that the sandstone in the Snowblind Bay was derived from the Precambrian crystalline rocks of Somerset and Prince of Wales Island.

The overall characteristics of the Snowblind Bay, just summarized, indicate that the formation represents, for the most part at least, a deltaic deposit. Question arises, however, as to whether any part of the formation was deposited subaerially. With regard to the lower part of the formation, the regular-bedded aspect of these beds, the general absence of sedimentary structures indicative of subaerial deposition, and the marine origin of the single fauna collected from it are factors leading to judgment that this part of the Snowblind Bay was deposited under marine conditions. On the other hand, the upper, mainly thick-bedded to massive part of the Snowblind Bay might seem, on casual inspection, to be most reasonably interpreted as having been deposited subaerially. This, however, is probably not the case. A series of conglomerate rocks from the upper part of the formation has been analyzed for fossils by digestion in acetic acid. The insoluble residues thereby obtained yielded a number of fossils including conodonts, which were obviously derived from the clasts, since some are of Ordovician age, while others are Silurian (Uyeno, pers. com.), and a surprisingly large number of scales and spines of acanthodians. Acanthodians are relatively rare fossils, and unfortunately their disarticulated remains are, as yet, of little or no use as index fossils. They are generally held to have been entirely marine and are notably independent of facies, occurring, for example, in deep-water graptolitic rocks, shelf-type carbonates, and near-shore deposits. What is of particular interest with regards to the occurrence of the acanthodian remains in the Snowblind Bay conglomerate is that at least some of the scales and spines are demonstrably derived from matrix, and not from clasts. Although the presence of these fossils in matrix does not rule out the possibility that they are derived from elsewhere, the general absence of indications of wear and their relative abundance suggest rather strongly that these animals were living in the waters that were receiving Snowblind Bay sediments. It therefore seems reasonable to conclude that most, if not all, of the Snowblind Bay represents the submarine portion of a deltaic mass that prograded eastward.

Somerset Island Formation

Definition, distribution and thickness

The name Somerset Island was introduced by Miall et al. (1978) for a unit of mainly carbonate rocks that overlies the Douro Formation and underlies the Peel Sound Formation in Somerset Island. As so defined, the Somerset Island Formation consists mainly of rocks that were previously included in the Read Bay Formation, but it includes also beds that were formerly considered as constituting the basal part of the Peel Sound Formation. Incomplete sections of the Somerset Island occur also in Boothia Peninsula where the formation constitutes the uppermost part of the lower Paleozoic succession. Sections including the upper part of the Douro Formation and the lower part of the Somerset Island Formation that were studied by the writer in eastern Boothia Peninsula and northwestern Somerset Island are shown in Figures 18 and 19, respectively. In both of these sections the basal contact of the Somerset Island is marked by an abrupt change from the dominantly rubbly-weathering argillaceous limestone, with subordinate units of generally thick-bedded, bioclastic limestone that characterizes the Douro Formation in this area, to the mainly planar-bedded, variably quartzose silty and sandy dolomitic rocks of Somerset Island Formation. Of particular interest is the fact that the Douro-Somerset Island contacts at these two rather widely separated localities appear to be synchronous, as will be discussed later. However, according to Miall and Kerr (1977), the contact of these formations in eastern parts of Somerset Island is diachronous. Also according to these authors (op. cit.), the thickness of the Somerset Island Formation varies from 150 to 300 m.

Lithology

The dominant lithology is planar-bedded dolomite and dolomitic limestone that are variably quartzose silty and sandy. Included also are lesser amounts of limestone, shale, and dolomitic quartzose siltstone and sandstone. A notable feature of the formation, particularly in eastern parts of Somerset Island, is the presence in the lower part of the formation of rock types similar to those typical of the Douro Formation (Miall et al., 1978). The rocks of the Somerset Island are mainly cryptocrystalline to finely crystalline, and medium to mainly thin bedded. The quartz content of the formation increases from east to west, suggesting that this material was derived from the initial rise of the Boothia Uplift. The dominant weathering colour is medium light grey, but westernmost exposures include some beds that weather to pastel shades of red, purple and green. Ripple marks, desiccation fractures and salt casts are relatively rare but noteworthy features.

Biofacies and age

The Somerset Island is rather poor in fossils, but sparse vertebrates (mainly heterostracans), conodonts, leperditicopid ostracodes and gastropods occur here and there throughout the formation. The vertebrates are commonly represented by disarticulated and broken remains, and in some places they form bone beds. Brachiopods, corals and stromatoporoids are rare constituents.

The formation is late Ludlovian in age.

Origin

The overall characteristics of the formation suggest deposition in a dominantly shallow subtidal, and relatively near-shore environment, but with intertidal and supratidal conditions occurring at various times and places.

Peel Sound Formation

Definition and distribution

The Peel Sound Formation consists mainly of red-weathering clastic rocks that crop out in the islands of Prince of Wales and Somerset. It overlies the Somerset Island Formation in Somerset Island, and the Douro Formation in Prince of Wales Island, and it represents the youngest formation in the Paleozoic successions of both islands. The upper limit of the formation is nowhere preserved.

The Peel Sound is made up mainly of detritus derived from exposed parts of the Boothia Uplift, and deposited along both the eastern and western flanks of the uplift. In Prince of Wales Island, the formation occupies a relatively narrow strip of territory about 40 km wide and 290 km long (Fig. 6), but in Somerset Island the distribution of the formation is discontinuous (see Christie in Blackadar and Christie, 1963). The formation is divisible into two well-defined members which, in Prince of Wales Island, grade westward into predominantly carbonate rocks of the Drake Bay Formation.

The present account deals mainly with the Peel Sound in Prince of Wales Island, and only a brief reference is made to the formation in Somerset Island.

History of study

The Peel Sound was originally described and defined by Thorsteinsson and Tozer (1963) on the basis of field studies

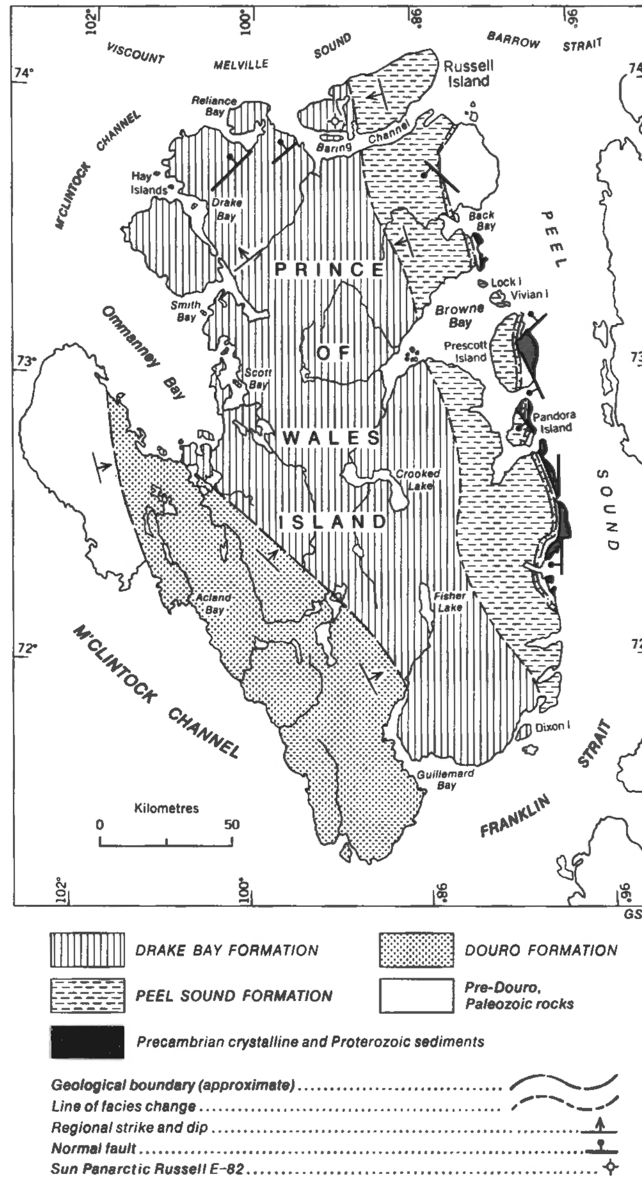

FIGURE 6. Geological map of Prince of Wales Island and neighbouring smaller islands. The eastern side of Prince of Wales Island marks the western limit of the Boothia Uplift, and there the lower Paleozoic succession is mostly steeply dipping and, in places, overturned to the west (see Figs. 8, 9). The rocks throughout the remainder of the island are characterized by mainly shallow dips. The rocks referred to as "pre-Douro, Paleozoic rocks" in eastern parts of Prince of Wales Island include an undivided succession of mainly dolomitic rocks that overlies Precambrian basement, ranges from Early Ordovician to Late Silurian in age, and includes at the top the Allen Bay and Cape Storm Formations. In western parts of the island, only the Allen Bay and Cape Storm Formations are exposed in the "pre-Douro Paleozoic rocks". Although the lower member and the upper member of the Peel Sound Formation are not differentiated on this map, it may be noted that the greater part of the territory mapped as the Peel Sound Formation is underlain by the upper member, whereas the lower member forms a narrow belt of exposures immediately overlying the Douro Formation, and more or less coextensive with it. The map is based on field work in eastern parts of Prince of Wales Island by Christie (in Blackadar and Christie, 1963), and on field work by the writer in western parts of the island in 1970.

carried out in Somerset and Prince of Wales Islands in 1955. These authors designated exposures in northwestern Somerset Island as the type section (*see* Fig. 7), recognized a two-fold subdivision of the formation into a lower, mainly sandstone unit, and an upper unit of conglomerate with clasts consisting largely of Precambrian basement rocks, and concluded that the Boothia Uplift had provided the source of these sediments. In 1963, Christie (in Blackadar and Christie, 1963), on the basis of physical stratigraphy and regional mapping in eastern Prince of Wales Island, was able to show that the upper conglomeratic unit of the Peel Sound constituted a relatively narrow, north-trending belt of exposures that graded westward into another, equally narrow belt consisting of sandstone, and that still farther to the west the sandstone passed laterally into sandy limestone and limestone. Christie interpreted all of these facies belts as belonging to the Peel Sound Formation, and the sandy limestone and limestone facies is shown on his geological map as constituting surface exposures over all of western Prince of Wales Island. The stratigraphy of the Peel Sound Formation was discussed in a paper by Kerr and Christie (1965) that deals mainly with the structural history of the Boothia Uplift. That same year, Bolton (1965) described as a new species of trilobite Hemiarges bigener from Peel Sound beds in Prince of Wales Island. In 1966 Dineley presented a description of the Peel Sound in northwestern Somerset Island in which the formation is subdivided into four members. Further contributions to knowledge of the Peel Sound Formation are given in Broad et al. (1968) and Brown et al. (1969). The most detailed accounts of the stratigraphy and sedimentology of the Peel Sound in Prince of Wales Island are those of Miall (1970a, b). Miall (1970a) applied the terms lower member and upper member to what previous workers had regarded the lower sandstone and upper conglomerate units of the formation and he recognized five facies belts within the upper member. These works by Miall (op. cit.) deal mainly with the upper member. Broad (1973) erected Boothiaspis as a new heterostracan genus and described three new species of that form on the basis of material collected from the lower member of the Peel Sound Formation. Broad and Dineley (1973) were concerned mainly with a systematic description of their new genus and species Torpedaspis elongata, also a heterostracan, from the lower member. Their paper presents a description of the stratigraphy of a section of the lower member that is exposed in a stream gorge in eastern Prince of Wales Island, and it includes a list of preliminarily identified faunas from several stratigraphic levels in the section that are of particular interest in demonstrating the unusual abundance of vertebrate fossils that commonly characterize the lower member. Miles (1973) described a new genus and species of an arthrodire as Baringaspis dineleyi from the sandstone-carbonate facies belt of the upper member of the Peel Sound Formation in northern Prince of Wales Island. Miall and Kerr (1977) described the stratigraphy and sedimentology of the Peel Sound Formation in Somerset Island. In this work the base of the Peel Sound, as defined in northwestern Somerset Island by Thorsteinsson and Tozer (1963), is revised upward so that it now separates dominantly dolomitic rocks of the Somerset Island from mainly quartzose sandstone at the base of the Peel Sound Formation, and revised descriptions are given for the four members of the formation that were outlined originally in this area by Dineley (1966). In 1977, Dineley described three new species of the heterostracan genus Ctenaspis from the upper member of the Peel Sound Formation in Prince of Wales Island.

Lower Member, Prince of Wales Island

Lithology and thickness

A complete section of the lower member studied by the writer in eastern Prince of Wales Island, and shown graphically in Figure 22, serves well to illustrate the lithology and faunal characteristics of this member in that island. The contact of the lower member with the underlying Douro Formation is placed at the stratigraphically lowest quartzose sandstone bed and, as thus defined, it marks the surface of separation between dominantly carbonate rocks below, and dominantly clastic rocks above. The lower member, as preserved at this locality, is 450 m thick and its upper limit is marked by a pronounced unconformity (Figs. 9, 10).

FIGURE 7. Type section of Peel Sound Formation in northwestern Somerset Island. Dashed line marks sharp contact between red-weathering sandstone of the lower member of the Peel Sound Formation, and the underlying green- and pink-weathering, mainly dolomite rocks of the Somerset Island Formation. View is to west. About 70 m of beds are exposed in field of view.

Lithologically variable, the lower member consists principally of regularly bedded quartzose sandstone and conglomerate that are sparingly interbedded with limestone, dolomite and siltstone. Moreover, the member is broadly divisible into two parts of about equal thickness. The lower part consists mainly of sandstone and lesser amounts of limestone, dolomite and siltstone, and its overall weathering colour varies from medium grey to light red. The upper part is made up mainly of conglomerate, conglomeratic sandstone and sandstone, with minor amounts of limestone and dolomite, and its principal weathering colours are light red and moderate red.

The sandstone is variably calcareous and dolomitic, fine to coarse grained, and commonly poorly sorted. It occurs in thin to thick beds, but is ordinarily medium bedded. The dominant fresh surface and weathering colours are light to medium grey, but include also various shades of red, green and brown. The limestone is of two main types: rubbly-weathering limestone and mottled limestone and dolomite that are similar to rocks in the underlying Douro Formation and which are fairly common near the base of the member; and limestone that is usually variably quartzose, cryptocrystalline to finely crystalline, medium bedded, light grey to medium light grey in colour, and occasionally stromatoporoids. The dolomite is similar in most respects to the latter rocks. It is a noteworthy fact that many of the carbonate and sandstone beds are composed of nearly equal parts of carbonate and clastic materials. The conglomerate layers contain granules, pebbles and cobbles consisting mainly of limestone and dolomite embedded in a matrix of quartzose sandstone and limestone, including, in some cases limonite. The principal colours of the conglomerate are varying shades of grey and red. Other types of clasts include chert, gneiss and gabbro. The gneiss and gabbro clasts make their appearance in the stratigraphically lowest conglomerate beds, but are extremely rare. Towards the top of the member the incidence of these clasts increases somewhat but never exceeds about 2 per cent. Typically the clasts are subrounded to rounded. The member as a whole appears to consist of alternating hard- and soft-weathering units, and presents a banded appearance as viewed from a distance (Figs. 8, 9).

Biofacies and age

The sandstone and carbonate layers are commonly rich in heterostracans, and these are usually associated with marine invertebrates. Although the latter are not especially abundant, most major Silurian phyla are represented at one place or another in the distributive area of this member. Moreover, most carbonate rocks yield conodonts and acanthodian remains when dissolved in acetic acid, and fragmentary remains of heterostracans occur in some of the conglomerate beds.

The lower member ranges in age from late Ludlovian to early Pridolian in Prince of Wales Island.

Origin

Consideration of the extraordinary linear character of the lower member in Prince of Wales Island (Fig. 6), in conjunction with the fact that the member grades westward into the dominantly carbonate rocks of the Drake Bay Formation, can leave little doubt that the terrigenous materials which constitute most of this member were derived from uplands developed on exposed parts of the Boothia Uplift to the east. The member is, however, composed of such a diversity of materials that it cannot be assigned to a single environment of deposition, except in a general way. The evenly bedded nature of the rocks, faunal record, and presence of intercalated marine carbonates are indicative of a marine deposition, and this generalization is supported by the notable

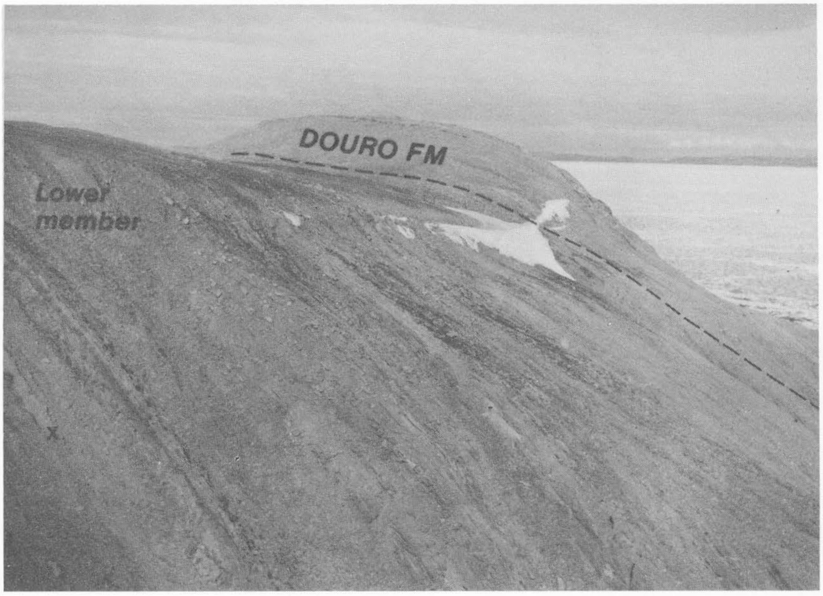

FIGURE 8. *Lower part of lower member of Peel Sound Formation and Douro Formation in eastern Prince of Wales Island. View is to northeast, with Peel Sound and Somerset Island in background. Douro and Peel Sound rocks dip at about 75° to east, and are overturned. The part of the lower member shown here consists mainly of sandstone, and lesser amounts of limestone, dolomite, and siltstone. X marks bed from which fauna C-38583 (see Fig. 22) was collected in creek bed just below base of photograph.*

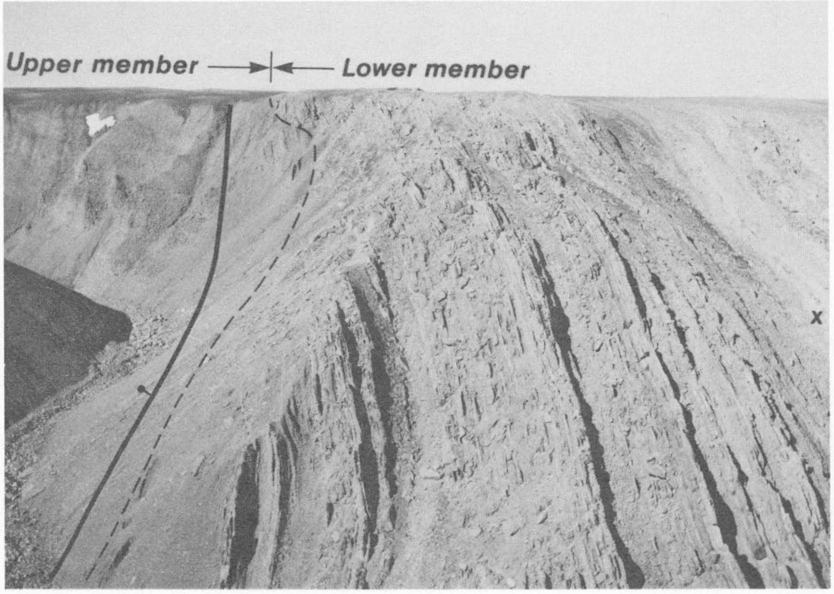

FIGURE 9. *Upper part of lower member of Peel Sound and reverse faulted upper member of same formation in eastern Princé of Wales Island. View is to north. The part of lower member shown here consists mainly of oligomict conglomerate, conglomeratic sandstone and sandstone, and minor amounts of limestone and dolomite. This photograph and the one shown as Figure 8 represent different views from a single position on south side of stream gorge. X marks bed from which fauna C-38583 (see Fig. 22) was collected in stream bed at base of exposures. Note deeply eroded nature of upper surface of lower member.*

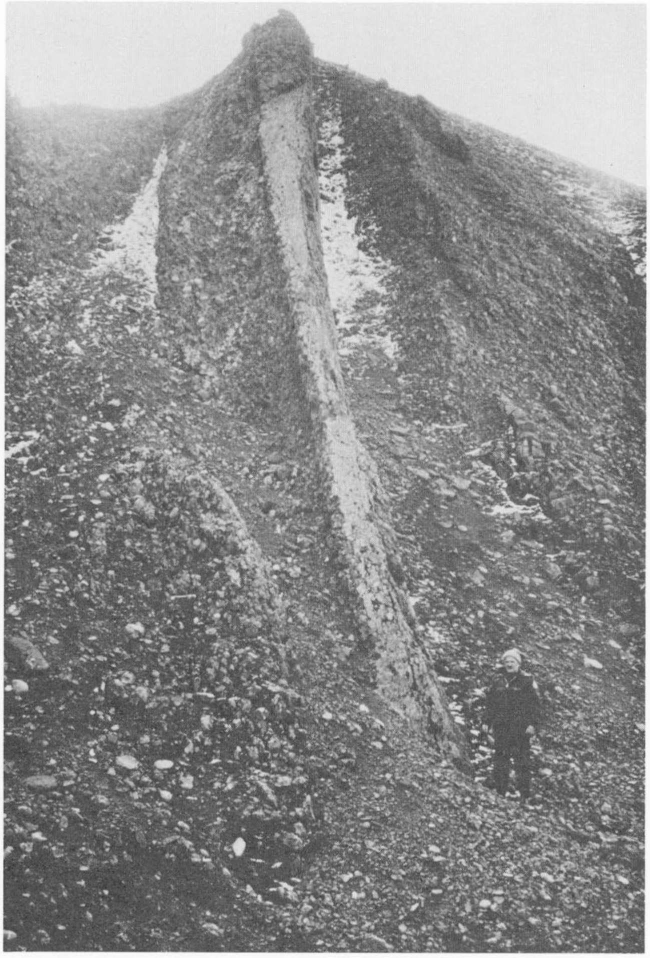

FIGURE 10. Contact of lower and upper members of Peel Sound Formation in eastern Prince of Wales. Man is standing at contact; lower member is to left. View is to south, and illustrates contact relations on opposite side of stream gorge shown in Figure 9 (see also Fig. 11). Note sharply defined and bevelled nature of uppermost conglomeratic unit in lower member. Here clasts of gneiss and gabbro may be observed to comprise less than 2 per cent of the conglomerate in lower member and more than 90 per cent of the conglomerate in upper member.

scarcity of crossbedding, filled channels, and other features indicative of subaerial deposits. Presumably, therefore, these rocks represent, for the most part, the seaward extension of a linear series of coalesced deltas, and the fact that they coarsen upward indicates a westward progradation. But the possibility that some of the clastic units in the member were deposited subaerially cannot be entirely discounted.

Upper Member, Prince of Wales Island

Easternmost exposures of the upper member of the Peel Sound consist of a remarkably uniform succession of coarse, polymict conglomerate that is sparingly interbedded with lens- and tabular-shaped bodies of red sandstone and conglomeratic sandstone (Fig. 11). The clasts of the conglomerate consist mainly of gneiss and gabbro, with minor amounts of quartzite, dolomite and chert. The conglomerate is poorly sorted with clasts ranging from granules to boulders well over 1 m in diameter. The matrix is largely quartzose sand, calcite and limonite. The conglomerate attains a maximum thickness of about 300 m.

The outstanding characteristics of these rocks are the enormous size attained by some of the clasts, their overall dusky red weathering colour, and the fact that great thicknesses of the conglomerate appear to be devoid of bedding. Moverover, what bedding is present is commonly vaguely defined and discontinuous.

Miall (1970a, b) has recognized five northerly-trending facies belts within the upper member of the Peel Sound. The salient lithologies and depositional environments of each of these belts, from east to west, as outlined in the abstract of his (1970a) paper, are given below. (It should be noted here that Miall's conglomerate facies refers to the easternmost exposures of the upper member as described above.)

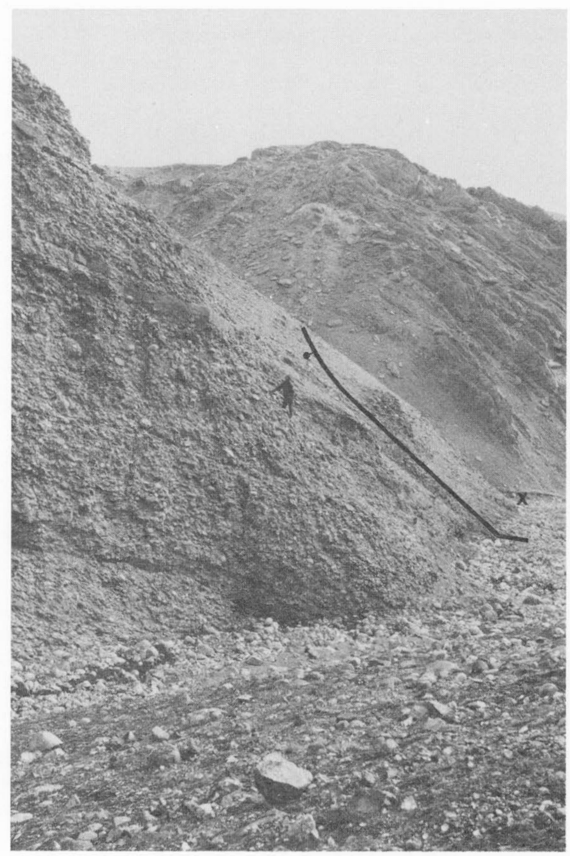

FIGURE 11. Upper member of Peel Sound Formation in eastern Prince of Wales Island. View is to northeast, and steeply dipping, overturned beds in background are those of lower member seen in foreground of Figure 9. Note massive nature of conglomerate beds in upper member, vaguely defined bedding, and discontinuous beds of sandstone in upper part of exposure. Boulders in stream bed and on slope in foreground are clasts consisting mainly of gneiss and gabbro that have weathered out of upper member. X marks position from which photograph shown as Figure 10 was taken. The fault shown here is the eastward continuation of the reverse fault shown in Figure 9.

"1) Conglomerate Facies: cobble and boulder conglomerate deposited on alluvial fans mainly by the action of debris floods. 2) Conglomerate-sandstone Facies: interbedded conglomerate, fine to coarse red sandstone and red siltstone in a repeated fining-upward succession, deposited by low sinuosity braided streams. Cyclic sedimentation is attributed to channel migration and infill. 3) Sandstone Facies: the presence of laterally extensive planar cross sets suggests point bar deposition in high sinuosity streams. Tabular bedded sandstone was deposited by stream floods in upper regime flow. 4) Sandstone-Carbonate Facies: streams flowing westward formed small deltas, accumulating red, pink and buff sandstones as topset deposits, interbedded with dolomites containing marine fossils, and clean washed grey sandstone, shale and dolomites with ostracodes, pelecypods, gastropods, and Lingula, indicating an estuarine environment. 5) Carbonate Facies: dolomite with abundant marine fauna and limited clastic content. Sedimentary structures indicate quiet, shallow water conditions."

The correlations of the various facies belts outlined above are based solely, though reasonably securely, on the lateral continuity of exposures along numerous stream gorges and sea-cliffs in eastern parts of Prince of Wales Island and the smaller islands, Russell, Prescott and Pandora.

The carbonate facies belt of Miall (1970a) is now excluded from the Peel Sound Formation, and included in the Drake Bay Formation.

The upper member of the Peel Sound is late Lochkovian in age.

Peel Sound Formation, Somerset Island

The most complete exposures of the Peel Sound occur in the northwestern part of the island where the formation outcrops in the core of the broad, open Cape Anne syncline (Thorsteinsson and Tozer, 1963). These exposures, which include the type section of the formation (Fig. 7), were restudied by the writer in 1971.

The distribution, physical characteristics and environment of deposition of the Peel Sound in Somerset Island have been dealt with in a preliminary report by Miall and Kerr (1977), and only a brief summary of the salient features of the formation in the Cape Anne syncline will be given here. Revised descriptions of the four members of Peel Sound rocks in this structure as originally delineated by Dineley (1966) are given in Miall and Kerr (op. cit). The members, in ascending stratigraphic order, are characterized as follows: sandstone and siltstone, 60-400 m; dolomitic conglomerate, 280 m; pebbly sandstone and conglomerate, 240 m; and polymict conglomerate, 120 m. According to these authors the contact of the Somerset Island Formation and Peel Sound Formation in the Cape Anne syncline is diachronous with the latter formation becoming younger as followed from west to east. However, field studies by the writer indicate that the contact is everywhere sharply defined and more or less synchronous throughout the syncline and, furthermore, that the contact is about correlative with the Ludlovian-Pridolian boundary (*see* p. 26).

The polymict conglomerate in northwestern Somerset Island may be reasonably correlated with the upper member of the Peel Sound Formation, as developed in Prince of Wales Island, on the basis of lithology and stratigraphic position. Moreover, the lower three members of the Peel Sound in this area, as described by Miall and Kerr (1977), appear to equate with the lower member of the Peel Sound in Prince of Wales Island on the basis of their stratigraphic position below the unit of polymict conglomerate, gross lithological similarity, and the presence of a single fauna that is dated as Pridolian (*see* p. 26). It is, however, apparent that the lower member of the Peel Sound in these islands does not represent wholly contemporaneous rock units, as the lower member in Somerset Island is apparently entirely Pridolian in age, whereas this member in Prince of Wales Island includes at its base, beds of late Ludlovian age which are correlative with the Somerset Island Formation in Somerset Island.

Contact relations of lower and upper members

Christie (in Blackadar and Christie, 1963) and Miall (1970a) have stated that the contact between the lower and upper members of the Peel Sound Formation in Prince of Wales Island is gradational. These authors have also contended that the contact of the lower member of the Peel Sound and the Douro Formation is locally unconformable, citing as an example of this locality 11 km south of Bellot Cliff in northwestern Prince of Wales Island where the rock-units are separated by an angular discordance. In 1977, the writer studied this locality briefly and concluded that the angular unconformity in question is at the base of the upper member of the Peel Sound Formation. Furthermore, the lower member of the Peel Sound is absent at this locality, and the rocks immediately underlying the unconformity are assigned tentatively to the Douro Formation. In a cross-section of the Cape Anne syncline of northwestern Somerset Island, Miall and Kerr (1977, Fig. 22.4) depict westernmost exposures of the upper member as lying unconformably on the lower member, and easternmost exposures of the upper member as intertonguing with the lower member. Observation of these exposures in 1972 by the writer led to the conclusion that the base of the upper member in the Cape Anne syncline is everywhere unconformable. Moreover, other circumstances support judgment that the contact between the lower and upper members is an unconformity throughout all of Somerset and Prince of Wales Islands: the radical difference in lithology between the polymict conglomerate facies of the upper member and the oligomict conglomerate of the lower member; the apparent absence of any faunal record of late Pridolian to middle Lochkovian time in either the upper part of the lower member or in the lower part of the upper member; and the fact that, where exposed, the contact between the lower and upper members is an unconformity.

The probability that the lower and upper members of the Peel Sound Formation are separated everywhere by a regional unconformity indicates the desirability of raising each member to formational status. It seems reasonable, however, that this procedure should await further field investigations, and the choice of the best possible type section for the upper formation.

Correlative formations

In order to understand more fully the depositional environment of the formation, as well as the paleogeography in Peel Sound time of regions situated immediately to the west and north, it is necessary to consider the formations that are correlative with Peel Sound rocks in these regions.

The carbonate facies belt of the upper member of the Peel Sound Formation in Prince of Wales Island, as defined by Miall (1970a), which is the same as the sandy limestone and limestone facies belt as outlined by Christie (in Blackadar and Christie, 1963), is now included in the Drake Bay Formation (Mayr, 1978). The Drake Bay Formation is the western facies equivalent of both members of the Peel Sound Formation, and the zone of facies change that separates Miall's sandstone-carbonate facies belt from his carbonate facies belt is thus the boundary of the Peel Sound and Drake Bay Formations (Fig. 6). The transition from one formation to the other takes place along a fairly definite line and is more or less coincident with a change from dominantly red-weathering clastic rocks of the upper member of the Peel Sound in the east to dominantly grey-weathering carbonate rocks in the upper part of the Drake Bay Formation in the west. Although the transition from the lower member of the Peel Sound to the lower part of the Drake Bay is largely hidden in the subsurface, it appears to occur along the same linear front as the facies change of the upper member, or somewhat farther to the east.

Outcrops of the Drake Bay Formation, which consist mainly of carbonate rocks, are limited to western parts of Prince of Wales Island and Russell Island (Fig. 6). The formation overlies the Douro Formation with an abrupt, conformable contact, and no formation is known to overlie it. The type section, as chosen by Mayr (1978), is in the Sun Panarctic Russell E-82 well in Russell Island where the formation is 1239 m thick. The greatest thickness of the Drake Bay is near the northwestern extremity of Prince of Wales Island where the formation is estimated to be 1550 m thick.

The summary description of the formation that follows is based on field studies made by the writer in 1970.

The Drake Bay is lithologically variable and consists mainly of alternating units of limestone and dolomite with lesser amounts of siltstone, sandstone and shale. Typically the limestone is variably dolomitic, thin to medium bedded, cryptocrystalline to finely crystalline, and its predominant fresh surface colours are various shades of light to dark grey. Also represented are lesser amounts of coarse-textured bioclastic limestone, and mottled rocks consisting of intermixed limestone and dolomite that resemble closely rocks of similar composition in the Douro Formation. The dolomite is of two main types: 1) Thin- to medium-bedded and finely crystalline rocks with fresh surface and weathering colours that are varying shades of grey and green. Commonly this dolomite, as well as the above described limestone, is finely laminated and variably quartzose with fine silt to fine sand sized particles. 2) Medium- to thick-bedded and massive dolomite that is medium to coarse textured, variably porous, and weathers to shades of grey, yellow and brown. The shale, siltstone and sandstone are commonly calcareous or dolomitic, and the latter rock is generally very fine to medium grained and mainly light to medium grey in colour.

The carbonate and shale rocks are relatively fossiliferous, and most major groups of Paleozoic marine fossils are represented at one place or another. The lower age range of the Drake Bay is late Ludlovian (*see* p. 27), while the youngest fossils, obtained near the top of the formation, include Monograptus yukonensis (C-8256[1]; *see* Fig. 1, Loc. 11) that indicate a late Pragian age. Moreover, other fossil collections indicate that Pridolian and Lochkovian times are represented also, and there is thus no faunal evidence for any significant hiatus within the span of Drake Bay beds. Consequently, whatever the regional extent of the unconformity that occurs between the lower and upper members of the Peel Sound Formation, the unconformity apparently dies out within the distributive area of that formation, or within a short distance beyond reaching the Drake Bay Formation.

[1] This and all subsequent numbers prefixed by C refer to GSC localities.

Next to be considered are equivalent rocks of the Drake Bay Formation that occur northeast and north of Prince of Wales Island. To the northeast, correlative rocks of the Drake Bay are represented in the relatively thick carbonate successions of the Barlow Inlet and Sophia Lake Formations that outcrop in Cornwallis and Devon Islands, and the dominantly coarse clastic rocks of the Snowblind Bay that are limited to a relatively small area in Cornwallis Island (Figs. 12-14). As already noted, the Barlow Inlet and Sophia Lake Formations have a cumulative time span of late Ludlovian to about mid-Lochkovian, whereas the Snowblind Bay is late Lochkovian in age. In Bathurst Island, which is situated some 125 km north of Prince of Wales Island, rocks correlative with the Drake Bay are included in the upper part

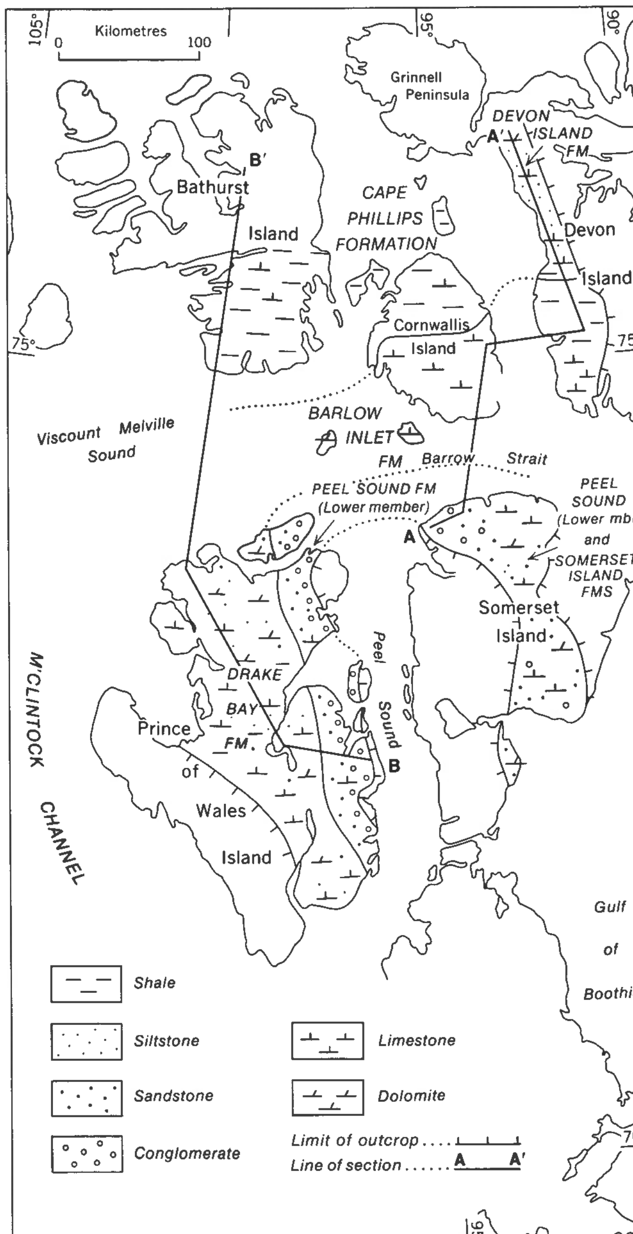

FIGURE 12. Distribution of Barlow Inlet Formation (late Ludlovian to early Lochkovian) and correlative rock-units in the central parts of archipelago. For section along A-A[1] see Figure 14. For section along B-B[1] see Figure 15.

of the Cape Phillips Formation, which is mainly shale, and all of the Bathurst Island Formation, which consists largely of sandstone, siltstone and shale (Figs. 12, 13, 15). The age of the Cape Phillips is Late Ordovician to early Lochkovian, whereas that of the Bathurst Island is about early Lochkovian to Pragian. Both of these formations are graptolitic and were deposited in the Franklinian geosyncline. Of some interest, therefore, is the occurrence in Drake Bay exposures of northwestern Prince of Wales Island, of interbedded units of graptolitic shale and dark grey limestone with such graptolites as Monograptus uniformis (*see* Kerr et al., 1977) and M. yukonensis, because it suggests that the transition from the Devonian part of that formation to rocks of the Bathurst Island was probably situated closer to Prince of Wales than to Bathurst Island (Fig. 15). The paleogeographic setting that thus emerges throughout much of Drake Bay time is one of shelf-type sediments (Drake Bay, Barlow Inlet and Sophia Lake strata), tracing a southwesterly course from Devon Island across Cornwallis Island to western Prince of Wales, that were situated between terrigenous sediments (Peel Sound strata) derived from Somerset and Prince of Wales Islands and terrigenous sediments (upper part of Cape Phillips, and Bathurst Island strata) that came from a northerly direction, probably from tectonic lands within the Franklinian geosyncline. Question arises, however, as to whether the upper member of the Peel Sound Formation and the Snowblind Bay Formation constituted a continuous body of terrigenous sediments extending along axial regions of the Boothia Uplift in late Lochkovian time, or whether these formations were separated by an intervening body of carbonate rocks (*see* Fig. 14). No satisfactory answer to this problem can be provided on the basis of available information.

Kerr (1974) originally proposed that the clastic sediments of the Bathurst Island Formation were derived from the north, but later Miall and Kerr (1977) suggested that the source of these sediments was the Boothia Uplift. The weight of evidence would now seem to indicate that much, if not all, of this formation came from a northerly source.

Devon Island Formation

Definition, distribution, thickness and age

The Devon Island is a relatively thin, dark-coloured body of interbedded clastic and carbonate rocks that overlies the Douro Formation with a sharp, yet conformable contact in northwestern Devon Island and southwestern Ellesmere Island. The type section is in Devon Island where it was originally defined by Thorsteinsson (1963a). The formation is overlain by the Sutherland River Formation in Devon Island, and by the Goose Fiord Formation in Ellesmere Island. The thickness ranges from 109 to 305 m in Devon Island (Morrow and Kerr, 1978) to 90 m in Ellesmere Island (Kerr, 1970), but these thicknesses are not of wholly contemporaneous beds as the span of the formation is late Ludlovian to early Lochkovian in Devon Island, and only late Ludlovian to early Pridolian in Ellesmere Island.

The lower part of the Devon Island Formation, as followed southeastward in Devon Island, grades laterally into the Barlow Inlet Formation, while the upper part of the formation appears to equate with the Sophia Lake Formation (Fig. 14).

Lithology

The formation as exhibited in the section in Devon Island shown as Figure 23 (and supplemented by another nearby section, Fig. 24) is divisible into two parts: A lower unit, about 182 m thick, consisting of a remarkably homogeneous appearing succession of siltstone that is variably calcareous and dolomitic, with lesser amounts of interbedded dolomite, mudstone and wackestone. These rocks vary from medium grey to medium dark grey in colour, and occur mainly as thin planar beds[1]. An upper unit, about 48 m thick, consists mainly of dolomite and subordinate interbeds of siltstone. The dolomite is commonly medium dark grey in colour, finely crystalline, and occurs in medium to mainly thin beds and some beds are characterized by vuggy porosity. The siltstone is as described in the lower unit.

A two-fold subdivision of the formation is observed also in Ellesmere Island. The lower unit, about 20 m thick, is made up of siltstone that is variably dolomitic and calcareous, and subordinate amounts of argillaceous and silty

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[1] H. Trettin has kindly provided the following description of this unit based on thin section studies and X-ray diffraction analysis (Table 2) of 11 rock specimens.

"The rocks submitted to me for study are very similar in appearance, being medium grey to predominantly medium dark grey in colour, and planar-laminated. Moreover, thin section study shows that they all consist of the same kind of silicate and carbonate materials, but in different proportions.

"The silicate fraction is mainly of silt grade, but includes some very fine grained sand and probably also some submicroscopic clay-grade material. It consists mainly of quartz and a few per cent (of the whole rock composition) each of plagioclase, K-feldspar (in about equal proportion), muscovite and chlorite.

"The carbonate fraction is divisable into matrix and granular materials. The latter consist mostly of skeletal grains (derived mainly from ostracodes and to a lesser extent from calcareous sponges and echinoderms and possibly also from trilobites and brachiopods), with lesser amounts of intraclasts. The matrix consists of calcite which is commonly cryptocrystalline (i.e. of clay grade) and anhedral, and of dolomite that is microcrystalline (of silt grade) and euhedral or subhedral. In addition, some of the specimens contain trace amounts of phosphatic grains, at least partly derived from fish.

"Unfortunately, there is no single rock name that is applicable to this suite as a whole. Five specimens, containing between 30 and slightly less than 50 per cent of carbonate material are classifiable as dolomitic and calcareous siltstone. The carbonate rocks contain anywhere from about 40 to 50 per cent silicate impurities. Two are classified as silty and calcareous dolostones, three as silty and dolomitic lime mudstones, and one is a silty dolomitic wackestone.

"The lamination is due to vertical variations in the content of organic carbonaceous matter, accompanied in some cases by very subtle differences in grain size and mineral composition. The laminae range in thickness from about 0.1 mm to about 1.6 mm.

"The relatively large content of carbonaceous matter, which is generally more than 1 per cent, combined with the thin lamination suggest deposition by settling in an environment somewhere below wave base.

"The presence of plagioclase and K-feldspar in about equal proportions would, according to my studies in west-central Ellesmere Island (Trettin, 1978), suggest derivation both from northerly sources and from the Canadian Shield."

TABLE 2

Semi-quantitative X-ray diffraction analysis of rock samples from Devon Island Formation (by H.P. Trettin).

Results of semi-quantitative X-ray diffraction analysis											
Catalogue specimen number	C-53216	C-53220	C-53222	C-53223	C-53225	C-53219	C-53224	C-53218	C-53221	C-53217	C-53226
Quartz %	48.1	40.9	43.0	40.9	57.1	30.4	36.9	35.1	30.7	33.6	29.9
K-feldspar %	2.9	3.1	3.1	2.2	4.2	2.3	1.8	2.9	3.6	2.6	2.6
Plagioclase %	2.9	4.0	3.6	3.0	6.0	1.8	1.9	1.7	1.5	2.9	2.1
Mica and/or illite % [1]	3.4	3.5	3.1	3.5	2.2	2.9	3.7	1.5	2.7	3.1	1.7
Chlorite and/or kaolinite % [2]	2.1	1.4	2.6	2.1	1.6	1.4	1.8	3.3	1.9	1.4	0
Calcite %	3.1	23.8	24.7	13.1	2.0	29.0	20.8	31.5	41.4	32.4	49.2
Dolomite %	37.5	23.1	19.9	35.1	27.0	32.1	33.1	23.9	18.2	24.0	14.5
Plagioclase/plagioclase and K-feldspar %	50.0	56.8	53.1	57.8	58.8	44.7	52.5	37.1	29.1	52.8	52.8
Dolomite/dolomite and calcite %	92.3	49.3	44.6	72.7	93.3	52.5	61.5	43.2	30.5	42.6	42.6
Dolomite/ dolomite and calcite %, corrected [3]	94.6	51.6	46.9	75.0	95.6	54.8	63.8	45.5	32.8	44.9	44.9
Dolomite and calcite %	40.6	46.9	44.6	48.2	29.0	61.1	53.9	55.4	59.6	56.4	63.7
Dolomite and calcite %, corrected [4]	40.1	45.8	43.7	46.9	29.6	58.5	52.1	53.4	57.2	54.3	61.0
Classification	Siltstone	Siltstone	Siltstone	Siltstone	Siltstone	Dolostone	Dolostone	Lime mudstone	Lime mudstone	Lime mudstone	Lime mudstone

GSC

1. Mica and illite cannot be distinguished in the diffractograms, but thin section analysis indicates that most of this material is muscovite
2. Most, if not all of this material consists of chlorite, but the possible presence of kaolinite cannot be excluded
3. A correction of +2.3% has been added, according to studies by Royse et al., 1971
4. This correction amounts to 0.9044 (calcite and dolomite) +3.341. It is based on a regression analysis of 154 pairs of X-ray diffraction and carbon analysis on similar rocks from the Cañon Fiord area (Trettin, 1978)

limestone and dolomite, and silty shale. The upper unit, about 70 m thick, is composed mainly of irregularly bedded limestone that is variably dolomitic, silty and argillaceous, and minor amounts of silty shale, mainly in the form of bedding plane partings. All of these rocks are characteristically medium grey to medium dark grey and thin-bedded; planar-laminated beds are common. The contact between the units is transitional. A striking feature of the Devon Island Formation in Ellesmere Island is the presence of a few small biohermal mounds, some of which extend from the bottom to the top of the formation (Kerr, 1968, 1970).

The dominant weathering colours of the formation in both Ellesmere and Devon Islands, particularly as viewed from a distance, appear to include a mixture of medium grey and yellowish grey. Moreover, the Devon Island tends to be less resistant to erosion than the rock units that underlie and overlie it, so that it is generally well marked in the topography.

Biofacies and origin

The commonest fossils are graptolites, nautiloids, conodonts, and lesser amounts of vertebrates. The formation has also yielded a few well-preserved shelly faunas composed mainly of brachiopods and other benthonic forms, but these are commonly embedded in bioclastic matrixes and occur as thin tabular or lenticular bodies, suggesting transportation as mass flow deposits from correlative shelf-type carbonate formations, or possibly from reefoid build-ups within the formation itself.

Sutherland River Formation

Outcrops of the Sutherland River Formation are limited to northwestern Devon Island, and excellent exposures of the formation that occur on the Sutherland River (Fig. 23) were designated as the type section by Thorsteinsson (1963a). There the formation is made up of a uniform succession of irregularly-bedded dolomite, about 135 m thick, that lies conformably on the Devon Island Formation, the contact being drawn where the alternating dark-coloured dolomite and siltstone beds that comprise the upper unit of the Devon Island give place upward to the lighter coloured and more resistant dolomite of the Sutherland River. The dolomite of the latter formation is thin to thick bedded, but mainly medium bedded, and it is mainly finely crystalline and dense, though a few beds near the base of the formation exhibit vuggy porosity. The principal fresh surface colours are light grey and medium light grey, and the rocks weather to greyish yellow and olive-grey. The Sutherland River Formation is notably barren of fossils, and its age is uncertain. Grounds for considering it Lochkovian are discussed under the heading of the Prince Alfred Formation.

Prince Alfred Formation

The Prince Alfred Formation was established by Thorsteinsson (1963a) for rocks in northwestern Devon Island that overlie the Sutherland River Formation and are overlain by the Disappointment Bay Formation. The distribution of the Prince Alfred is more or less co-extensive with that of the Sutherland River. Both the lower and upper contacts of the Prince Alfred are marked by disconformities. Typically, the formation consists of quartzose sandstone and minor amounts of siltstone and dolomite. The sandstone and siltstone are commonly slightly dolomitic, and vary from light grey to pastel shades of red and yellow, and from medium bedded to thick bedded and massive. The sandstone is ordinarily very fine grained. The dolomite is variably quartzose silty, light grey and finely crystalline. The type section of the formation is on the Sutherland River where about 53 m of beds representing the lower part of the formation are exposed (Fig. 23). The formation is markedly recessive compared with the underlying and overlying

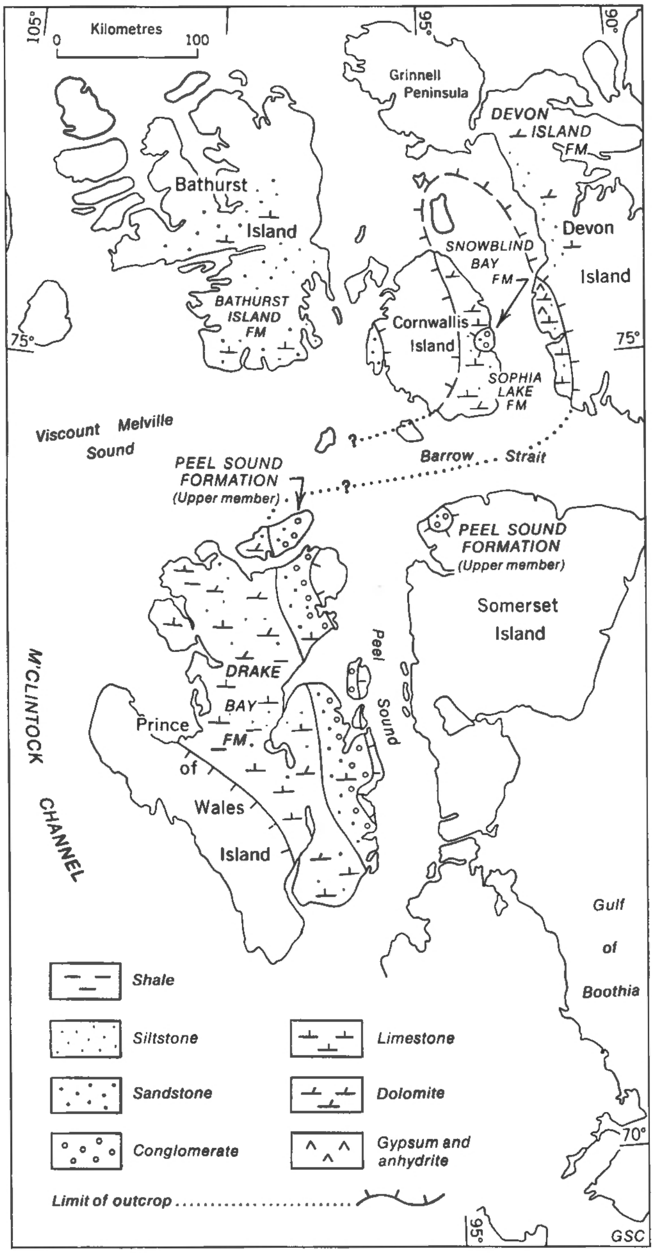

FIGURE 13. Distribution of Sophia Lake Formation (early to middle Lochkovian) and Snowblind Bay Formation (late Lochkovian), and correlative rock-units in central parts of archipelago.

formations, and it would therefore appear that the covered interval between the 53 m of Prince Alfred rocks and the Disappointment Bay on the Sutherland River is underlain by Prince Alfred rocks, and that the total thickness of the formation on the river is about 125 m. The contact of the Prince Alfred and Sutherland River Formations is not exposed at the type locality, and there the lower 16 m of exposures of the Prince Alfred consist of alternating sandstone and subordinate amounts of dolomite, including a single bed of conglomerate, about one metre thick, consisting of limestone and dolomite pebbles embedded in a dolomite matrix. The remainder of the formation consists of a uniform succession of light grey sandstone.

The thickness of the Prince Alfred is highly variable, ranging from a feather edge to more than 610 m (Morrow and Kerr, 1978), a character that is clearly related to differential erosion at the sub-Disappointment Bay erosion surface and to relative distance from the source area. Of particular interest is the fact that the thickest known sections of the Prince Alfred occur near the eastern limit of the Boothia Uplift in Grinnell Peninsula, and include conspicuous amounts of conglomerate made up of limestone and dolomite clasts, suggesting a possible correlation of the formation with Snowblind Bay rocks in Cornwallis Island.

Like the Sutherland River Formation, the Prince Alfred has not yielded diagnostic fossils. Both formations are, however, clearly of Early Devonian age on the basis of their stratigraphic position between the Devon Island and Disappointment Bay Formations, a fact that adds further credence to the suggestion that the Prince Alfred is correlative with upper Lochkovian Snowblind Bay rocks. Moreover, if this correlation is true, the Sutherland River Formation is probably about middle Lochkovian in age.

For a comprehensive description of the distributions, lithologies and depositional environments of the Sutherland River and Prince Alfred Formations, the reader is referred to Morrow and Kerr (1978).

Goose Fiord Formation

The formation was named by Greiner (1963a) for a unit of dolomitic siltstone and sandstone, silty dolomite and dolomite but, according to Kerr (1970), the formation is made up entirely of dolomite. The type section of the formation, which is about 300 m thick, is at Goose Fiord in southwestern Ellesmere Island. There the formation overlies a unit of dark coloured argillaceous limestone that Greiner (op. cit.) designated as an unnamed formation, but which Kerr (op. cit.) has rightly included in the upper part of the Devon Island Formation. Goose Fiord rocks are of limited distribution, and are not known to occur outside of southwestern Ellesmere Island.

The writer has examined briefly outcrops of the Goose Fiord Formation that occur on the east side of Muskox Fiord which is situated about 20 km east of Goose Fiord. There the formation consists of a remarkably homogeneous unit of resistant dolomite that appears to lie with gradational contact on the Devon Island Formation. The dolomite is dominantly fine to medium grained, and varies from thin to thick bedded, but is mainly medium bedded. It is typically dense, but some beds exhibit vuggy porosity. The colour of freshly broken rock surfaces varies from medium light grey to yellowish grey, and the overall weathering colour is medium light grey.

The Goose Fiord Formation at Muskox Fiord appears to be completely devoid of megafossils. Now, however, conodonts have been collected at Muskox Fiord, and these indicate an age range of early Pridolian to possibly Early Devonian.

At the head of Muskox Fiord, the Goose Fiord Formation is overlain conformably by a unit of dolomite that appears to differ from Goose Fiord rocks only insofar as it is pale yellowish brown. The brown dolomite was not examined in detail, but is estimated as between 150 and 200 m thick. The rocks that overlie the Goose Fiord have been generally assigned to the Blue Fiord Formation (Greiner, 1963a; McLaren, 1963; Kerr, 1968), but this may be in error as these rocks have not been studied in detail, and what is known

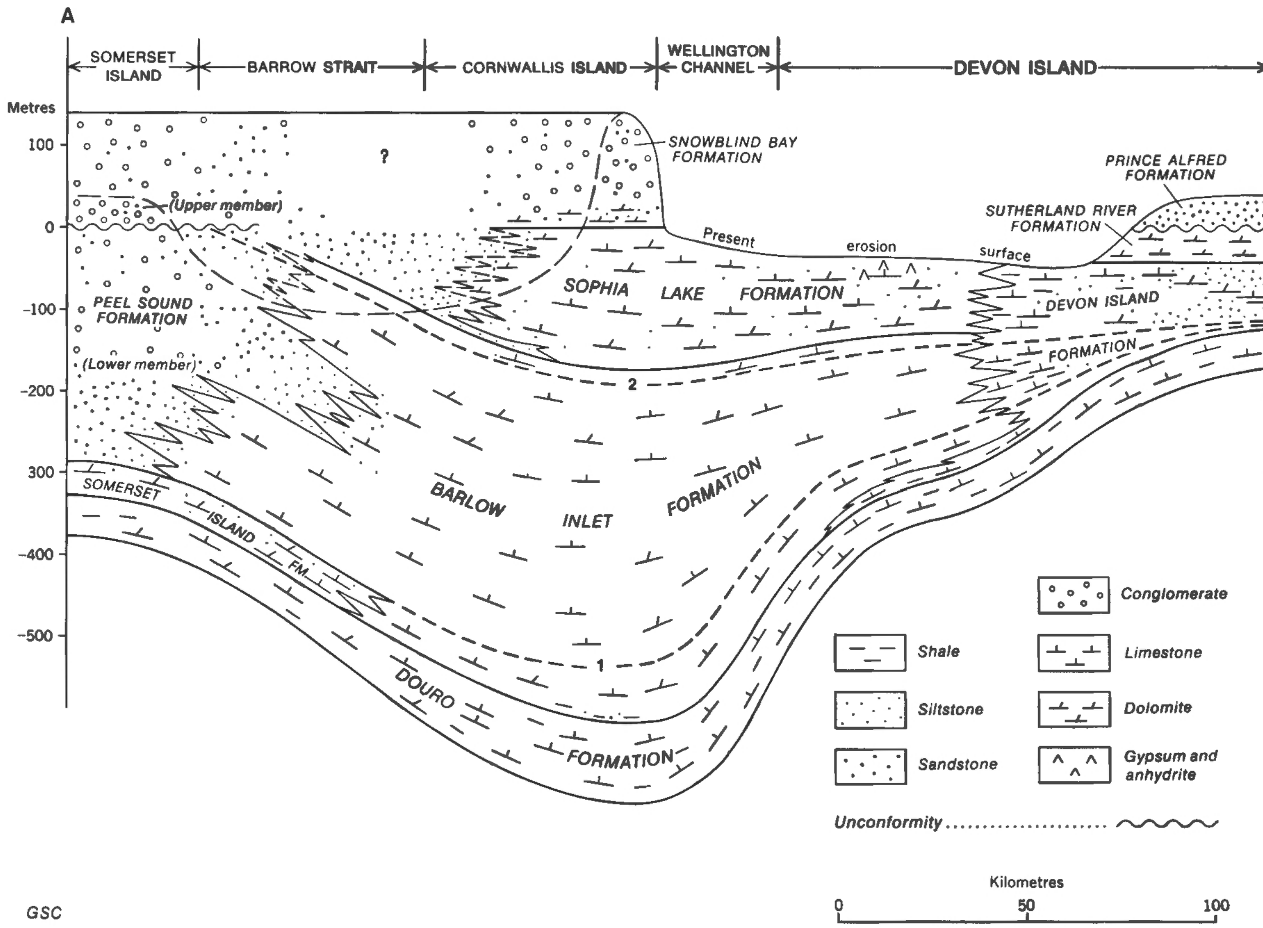

FIGURE 14. Diagrammatic restored sections of upper Ludlovian to upper Lochkovian rocks from Somerset Island to Devon Island along line A-A[1] of Figure 12. Datum is base of Peel Sound (upper member), Snowblind Bay and Prince Alfred Bay Formations. Circled numbers mark approximate positions of: 1. Ludlovian-Pridolian boundary; 2. Pridolian-Lochkovian boundary.

about them suggests that they cannot be assigned to the Blue Fiord on lithological grounds. Furthermore, there is no faunal evidence to support such an assignment.

Disappointment Bay Formation

Definition and distribution

The Disappointment Bay Formation consists mainly of dolomite and commonly includes a distinctive basal conglomerate. The distributive area of the formation is centred on the Boothia Uplift. The formation is widely distributed throughout Cornwallis Island and neighboring smaller islands (Thorsteinsson and Kerr, 1968). It occurs in eastern Bathurst Island (Kerr, 1974), northwestern Devon Island, and as far south as the small islands of Young and Lowther in Barrow Strait. Throughout most of this distributive area, the basal contact of the Disappointment Bay is an angular unconformity but, near the western (Bathurst Island) and northern limits (Devon Island) of the Boothia Uplift, the contact becomes a disconformity.

A unit of limestone that lies with apparent disconformity on the Dissapointment Bay Formation in Cornwallis Island has been referred to the Blue Fiord Formation by Thorsteinsson and Kerr (1968). The same limestone formation overlies the Disappointment Bay in Bathurst Island, and has been also assigned to the Blue Fiord by Kerr (1974). However, the fact that this limestone is Eifelian in age, whereas the type section of the Blue Fiord in southwestern Ellesmere Island is now known to range in age from late Zlichovian to early Dalejan, suggests that the limestone is probably best considered as representing a new and as yet unnamed formation. The Disappointment Bay in Lowther Island is overlain conformably by an unnamed formation[1] consisting of anhydrite, gypsum, sandstone, siltstone and dolomite. A somewhat similar rock unit appears to overlie the Disappointment Bay Formation in northwestern Devon Island (*see* Morrow and Kerr, 1978, Map 1412A, map-unit Du3).

The Disappointment Bay was defined originally by Thorsteinsson (1958), and the type section is in sea-cliffs on the north coast of Cornwallis Island where the formation lies with angular unconformity on the Cape Phillips Formation (Thorsteinsson, op. cit., Pl. VII, Fig. 2).

[1] These beds were at one time interpreted by the writer to comprise the uppermost member of the Disappointment Bay Formation (*see* Johnson, 1975).

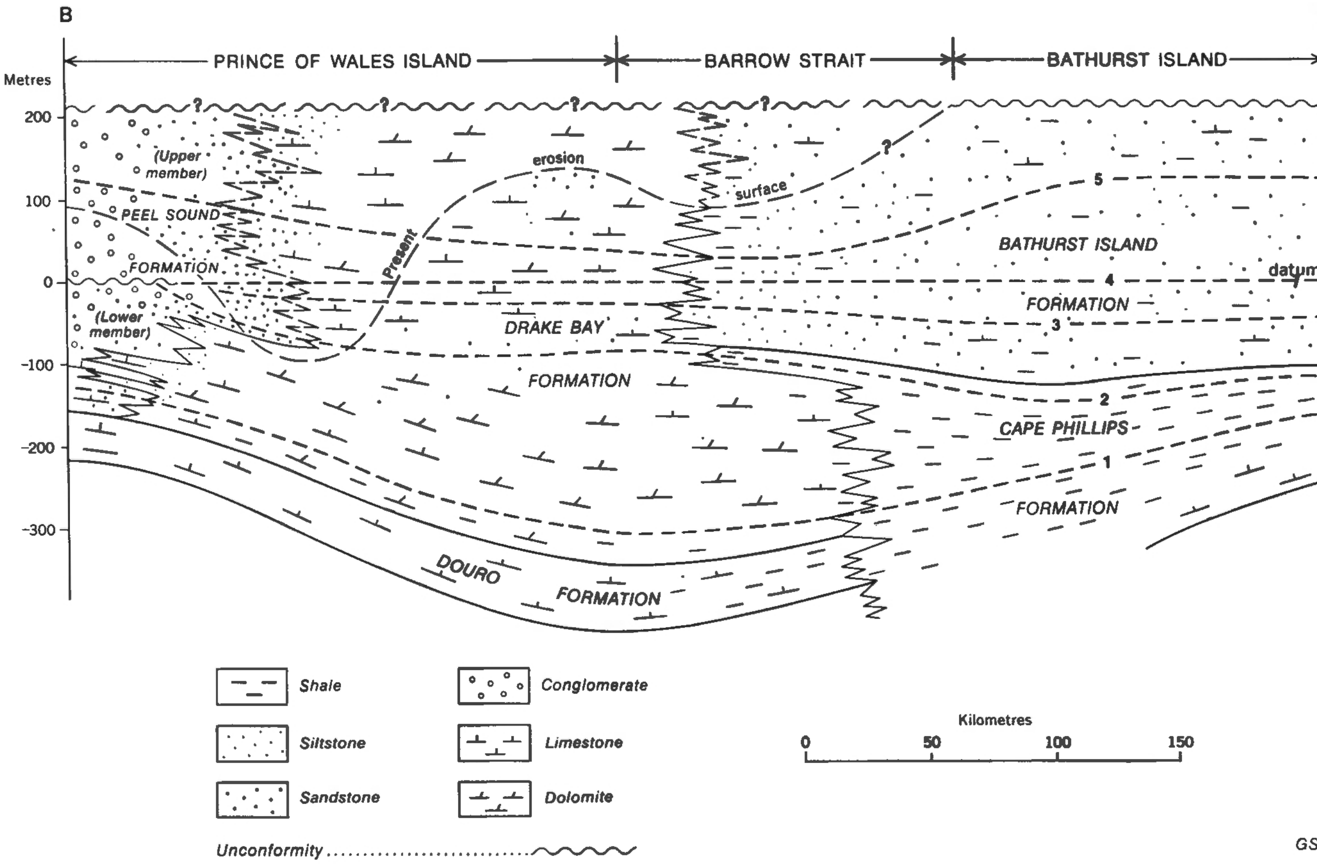

FIGURE 15. Diagrammatic restored section of late Ludlovian to Pragian rocks from Prince of Wales Island to Bathurst Island along line B-B[1] of Figure 13. Circled numbers mark approximate positions of the boundaries: 1. Ludlovian-Pridolian; 2. Pridolian-Lochkovian; 3. lower-middle Lochkovian; 4. middle-upper Lochkovian (also datum); 5. Lochkovian-Pragian.

Lithology and thickness

In the Cornwallis Island area, the Disappointment Bay is a dominantly recessive formation and exposures are generally poor. The best exposed section in Cornwallis Island is the type section, and rather good exposures occur also in Truro Island, which is situated between Cornwallis and Bathurst Islands, and in Lowther Island.

The Disappointment Bay, as typically developed in Cornwallis Island, is divisible into three main rock units: 1) A basal pebble conglomerate consisting mainly of subangular chert and lesser amounts of dolomite and limestone clasts embedded in a matrix of variably quartzose dolomite or limestone. In some places, the clasts are mainly dolomite, and they may range up to cobble size. The unit varies from less than 1 m to over 10 m thick. 2) A middle unit of thin-bedded dolomite, dolomitic quartzose sandstone, and minor amounts of dolomite-pebble conglomerate. The colour of these rocks are various shades of brown and green. The unit varies from 1 m to about 15 m thick. 3) An upper unit consisting almost entirely of dolomite, but including also rare beds of limestone. The dolomite is of two principal types: (a) Thin, irregularly-bedded rocks that vary from cryptocrystalline to finely crystalline, commonly characterized by irregular laminations, thick to mainly thin bedded, and commonly greyish yellow to pale yellowish brown and dark yellowish brown. (b) Thick-bedded to massive rocks that vary from very fine to coarse grained, and are ordinarily yellowish grey to greyish colour, and commonly porous to vuggy. The porous and vuggy beds are commonly impregnated with bitumen, an excellent example of which occurs throughout about 14 m of beds near the base of the upper unit in Truro Island. In places units 1 and 2 appear to be absent, and the Disappointment Bay consists only of unit 3, which lies directly on the unconformity.

The outstanding distinguishing characteristics of the Disappointment Bay, throughout the Cornwallis Island area, are: the basal chert-pebble conglomerate; the prevailing brownish fresh surface, and weathering colours, the recessive nature of the formation as a whole, and the vuggy dolomite beds that commonly present the appearance of worm-burrowed wood.

An atypical development of the Disappointment Bay occurs in Lowther Island where the formation is also represented by three rock-units: 1) A basal unit of poorly-exposed red beds that lie unconformably on dolomite of Late Silurian age. The unit appears to consist mainly of red-weathering quartzose sandstone, siltstone, shale, dolomite and gypsum. It is about 45 m thick. The unit has not yielded fossils and, though the writer at one time considered it to probably represent the Snowblind Bay

Formation (*see* Johnson, 1975), it seems more reasonable to assign it tentatively to the Disappointment Bay. 2) A middle unit of irregularly-bedded, argillaceous limestone that is cryptocrystalline, thin bedded, and contains shale partings. This unit is about 38 m thick. 3) An upper unit of dolomite that is very fine to medium grained, and mainly greyish yellow and yellowish grey in colour. A striking feature of this unit is the presence of several small, reef knolls ranging from about 75 to 275 m in diameter that appear to be based near the bottom of the unit. One of these knolls consists entirely of limestone and it is replete with fossil algae, and brachiopods; others consist of both limestone and dolomite, while still others are completely dolomitized. The upper unit is about 100 m thick.

The Disappointment Bay constitutes surface exposure over the whole of nearby Young Island, and it is apparent that the formation there is represented by the upper two rock units as described above in Lowther Island.

The thickness of the Disappointment Bay Formation in the Cornwallis Island area varies from about 170 to 200 m.

For a description of the Disappointment Bay Formation in Bathurst Island the reader is referred to Kerr (1974). The stratigraphy of northwestern Devon Island, including Grinnell Peninsula, has been studied by J.Wm. Kerr, and will be the subject of a forthcoming report, but it may be noted here that an incompletely exposed section of the Disappointment Bay in the lower reaches of Sutherland River includes a lower unit of limestone that is overlain by vuggy dolomite of typical Disappointment Bay aspect (Thorsteinsson, 1963a).

Biofacies and age

The Disappointment Bay Formation was dated originally as Silurian or Devonian by Thorsteinsson (1958), and its Early Devonian age was recognized first by J.G. Johnson (in Berdan et al., 1969) on the basis of brachiopods from Cornwallis and Bathurst Islands. The formation generally contains few identifiable megafossils, but in places it yields abundant and well-preserved brachiopods such as those described by Johnson (1975) from Lowther Island. The formation is dated as late Zlichovian to early Dalejan on the basis of conodonts.

Origin

On the basis of lithology and faunas, it appears that the Disappointment Bay Formation in the Cornwallis Island area was deposited in a dominantly shallow marine environment. The laminated cryptocrystalline to fine-grained dolomite is strongly suggestive of shallow-water deposition with restricted circulation. Furthermore, the sporadic distribution of the lower clastic units suggests that initial deposition of the formation occurred on an irregular surface, and that these dominantly clastic sediments were laid down only in topographically low areas.

BIOSTRATIGRAPHY

Co-authored with T.T. Uyeno

Cape Storm, Douro, and Barlow Inlet Formations

In southeastern Cornwallis Island, the Cape Storm, Douro and Barlow Inlet Formations, including the Allen Bay Formation which underlies the Cape Storm, comprise a northerly-trending and easterly-dipping belt of exposures that can be traced laterally into a single rock unit, the graptolitic Cape Phillips Formation (Fig. 4). The zone of facies change occurs in the vicinity of Snowblind Creek near the mid-latitude of the island, and it is here that a combination of physical stratigraphy and graptolite paleontology provides important evidence as to the age range of Cape Storm, Douro and Barlow Inlet rocks. Pertinent to the present discussion are the characters of the Cape Phillips Formation, and the nature of the facies boundary as shown in the above cited figure.

The Cape Phillips consists chiefly of siltstone that is variably argillaceous, calcareous and dolomitic, limestone that is cryptocrystalline to finely crystalline and variably argillaceous, silty and dolomitic, and dolomite that is commonly finely crystalline and variably argillaceous, silty and calcareous. All of these rocks are ordinarily medium dark grey, thin bedded, and commonly laminated. Also present are lesser amounts of shale and calcareous siltstone that are commonly represented as bedding plane partings. Other notable features of the formation include the occasional bed of fossil debris, probably representing mass-flow deposits, and soft-sediment deformation.

The change from one facies to the other takes place along a fairly definite east-west line and, though irregular in detail, it was sufficiently fixed through a substantial period of time (Late Ordovician to Early Devonian) to suggest control by a structural feature of deep-seated crustal origin. The facies boundary is most readily apparent when viewed from the air on the basis of differences in the weathering colours of the rocks on either side of it. To the south of the boundary are the lighter-coloured rocks of the shelly facies, and to the north the darker-coloured rocks of the graptolitic facies. On the ground, the change in facies is observed to be mainly one of intergradation, accompanied by an overall attenuation of the sedimentary column. Moreover, here as elsewhere on Cornwallis Island, surficial deposits are thin to virtually absent, and it is therefore possible to follow equivalent rock units of each of the shelly formations northward and well beyond the zone of facies change, and to thereby establish some rather precise age limits to these formations in terms of graptolite zonation. The extrapolation of the contact of the Douro and Barlow Inlet Formations north of the facies boundary is particularly easy because the relatively thin unit of shale that constitutes the lower member of the latter formation passes into the Cape Phillips with only minor change in character, and is traceable for a distance of some 20 km within Cape Phillips outcrops north of the principal zone of facies change.

The basal contact of the Cape Storm can be extrapolated north of the zone of facies change into beds of the Cape Phillips in Snowblind Creek that are situated a few tens of metres stratigraphically above beds that yield Monograptus nilssoni (Barrande) (C-34716; Fig. 1, Loc. 12), index species of the lowermost early Ludlovian graptolite zone (Fig. 4). Somewhat higher stratigraphically in the Cape Phillips in the same creek is a 3.5 m unit of beds replete with graptolites that include Monograptus fritschi linearis Bouček (C-34725; Fig. 1, Loc. 13), which represents the index species of the uppermost early Ludlovian, and these beds can be followed south to the facies boundary where they pass into about the middle of the Cape Storm (Fig. 4). On the basis of the relationships just summarized, the Allen Bay-Cape Storm contact is early Ludlovian in age.

Between the occurrence in Snowblind Creek of M. fritschi linearis and the unit of shale which, as noted earlier, equates with the lower member of the Barlow Inlet

Formation, are about 470 m of Cape Phillips that are characterized throughout by M. bohemicus tenuis Bouček. The contact of the Douro and Cape Storm Formations, as extrapolated north of the zone of facies change, passes into about the middle of the 470 m interval of beds, and thus the stratigraphically lower half or so of this interval equates with about the upper half of the Cape Storm Formation, whereas the upper half equates with the entire Douro Formation.

The age range of M. bohemicus tenuis is clearly important in attempting to establish the age of the contact between the Cape Storm and Douro as well as the age of the Douro Formation as a whole, and it is therefore necessary at this juncture to discuss the biostratigraphic significance of this graptolite. Monograptus bohemicus sensu lato is undoubtedly the most widely distributed graptolite in the archipelago, where it ranges from the Zone of M. nilssoni almost to the Zone of M. ultimus, which marks the base of the Pridolian. In other words it ranges throughout all of Ludlovian time. Moreover, of the M. bohemicus group in the archipelago, the specimens that occur stratigraphically below the Zone of M. fritschi linearis appear to be all referable to M. bohemicus bohemicus, whereas forms occurring in, and stratigraphically above, that zone appear to represent M. bohemicus tenuis only. This apparent situation is by no means settled. For one thing the two subspecies are exceedingly alike morphologically and difficult to differentiate, particularly in the case of flattened specimens. For another, the forms that Thorsteinsson ascribes to M. bohemicus tenuis in the archipelago occur in prodigious numbers throughout tens and even hundreds of metres of beds, and the problem in such a circumstance of attempting to determine whether some specimens on any given bedding plane might not be referable to M. bohemicus bohemicus is a difficult one indeed. In addition, the stratigraphic distribution of these subspecies in Europe is unsettled. In Richards (1976) the range of M. bohemicus tenuis is shown as extending from the early Ludlovian Zone of M. scanicus to beds just above the Zone of M. leintwardinensis (= Zone of M. fritschi linearis). But in Poland, according to Teller (1969), the earliest appearance of M. bohemicus tenuis is in the Zone of M. leintwardinensis from whence it ranges stratigraphically upward through five discrete zones that represent all of late Ludlovian time. These zones, in order upward are: M. bohemicus bohemicus, M. cornutus, M. auriculatus, M. inexpectatus, and M. kozlowskii. None of the index species that characterize these latter zones, nor species other than M. bohemicus tenuis that are associated with them in Poland have been found to date in beds above M. fritschi linearis in the archipelago, but their equivalence appears to be represented by M. bohemicus tenuis only, and this is affirmed indirectly by the relationship of beds containing this graptolite to established late Ludlovian conodont zones, which will be discussed later. For the purposes of the present report, M. bohemicus tenuis is considered to represent the zonal marker of the entire late Ludlovian substage in the archipelago. To sum up, the Cape Storm-Douro contact as extrapolated northward to Snowblind Creek is situated within upper Ludlovian graptolitic beds, and the age range of the Cape Storm Formation is therefore early to late Ludlovian, and furthermore the Douro Formation is entirely late Ludlovian in age.

About 15 km north of Snowblind Creek, Monograptus formosus Bouček (C-53227; Fig. 1, Loc. 14) was collected from Cape Phillips beds 60 m stratigraphically above the top of the shale unit that represents the continuation of the lower member of the Barlow Inlet Formation into the Cape Phillips. This graptolite is correlative with the Zone of M. ultimus[1] which marks the base of the Pridolian stage. The significance of this graptolite at this stratigraphic level in the Cape Phillips is that it indicates that the Ludlovian-Pridolian boundary is probably situated relatively close to the base of the Barlow Inlet Formation. As will be pointed out on a later page, the evidence of conodonts adds further refinement of the position of this boundary within the report area.

The Cape Storm Formation appears to fall within the siluricus Zone of the conodont zonation. This judgment is based on the fact that the siluricus Zone is firmly established in the overlying Douro Formation and on the occurrence in Cape Storm beds of Ozarkodina douroensis and O. confluens gamma morphotype (*see* for example, Fig. 16). The former species was described originally as O. n. sp. B by Klapper and Murphy (1975) and the lower range of both species, as established by these authors in the Roberts Mountains Formation in Nevada is in direct association with Polygnathoides siluricus. That the lowermost beds of the Cape Storm are within the range of the siluricus Zone is indicated by a fauna including both of the above-mentioned species that were collected from the Allen Bay Formation in Griffith Island. The fauna was obtained from a level 9.1 m below the Allen Bay-Cape Storm contact, which is sharply defined in this island, and it is the oldest known occurrence of these species in the formations that represent the shelly facies equivalents of the Cape Phillips Formation. The fauna is as follows:

GSC locality C-55414 (Fig. 1, Loc. 15).

Ozarkodina douroensis Uyeno
O. confluens (Branson and Mehl) gamma morphotype
O. excavata excavata (Branson and Mehl)
O. ? n. sp.
Panderodus sp.

According to Klapper and Murphy (1975), the lower extent of the siluricus Zone overlaps with the upper range of the Zone of Monograptus chimaera. It is therefore of some interest to note that the stratigraphically lowest occurrence in the Cape Phillips Formation of a species that probably represents O. douroensis occurs in that graptolite zone in western Cornwallis Island. The fauna, which occurs 1.2 m above M. nilssoni and 85 m below M. fritschi linearis at this locality, is listed below:

GSC locality C-67669 (Fig. 1, Loc. 16).

Monograptus bohemicus bohemicus (Barrande)
M. chimaera subsp. cf. M. chimaera chimaera (Barrande)
Ozarkodina sp. cf. O. douroensis Uyeno
Oulodus sp.
Panderodus sp.

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[1] The graptolite identified as M. ultimus from the Cape Phillips Formation in Snowblind Creek by Thorsteinsson (1958, p. 72) is not that species, but a closely related form that occurs stratigraphically above M. bohemicus tenuis and just below M. ultimus in the archipelago. Thorsteinsson had correctly reasoned, on the basis of physical stratigraphy, that the beds yielding this species in Snowblind Creek correlated with the lower part of the Barlow Inlet Formation, as defined in the present account and, although he was possibly correct also in correlating these beds with the Zone of M. ultimus, it was for the wrong reason.

Supporting evidence that the lower part of the Cape Storm may equate with the Zone of M. chimaera is provided by the stratigraphic relationship of that formation to the Cape Phillips Formation as established in Snowblind Creek. As discussed earlier, the basal contact of the Cape Storm, as extrapolated north of the zone of facies change, passes into beds of the Cape Phillips that are a few tens of metres stratigraphically above the Zone of M. nilssoni, and the Zone of M. fritschi linearis in the Cape Phillips can be followed south into about the middle of the Cape Storm at the facies boundary. On the basis of this relationship the Zone of M. chimaera, though apparently not represented, or not exposed at Snowblind Creek, might well be included in the lower half or so of the Cape Storm Formation.

There are noteworthy differences in the correlation of the crassa, ploeckensis and siluricus Zones with graptolite zones in Nevada, as presented in Klapper and Murphy (1975), and the correlation of these zones in the Carnic Alps as given by Jaeger (1975), the latter being a modification of the correlation proposed originally by Walliser (1964) (see Table 1). According to Klapper and Murphy (op. cit.), the ploeckensis Zone brackets a fauna containing the Zones of Monograptus nilssoni and M. chimaera, and the lower range of the siluricus Zone is also within the range of the latter zone. The crassa Zone is apparently not represented in Nevada. Jaeger (op. cit.), on the other hand, shows the crassa Zone as overlapping the upper part of the Zone of M. nilssoni and as including the Zone of M. chimaera; in effect, Jaeger's crassa Zone equates with Klapper and Murphy's ploeckensis Zone. The ploeckensis Zone is correlated with the Zone of M. fritschi linearis, while the top of the latter zone is correlated with the separation of the ploeckensis and siluricus Zones.

The present study does not resolve any of these problems, but some additional problems and comments pertaining to the ploeckensis and siluricus Zones as applied to rocks in the present report seem worth recording here. 1) The earliest appearance of Ancoradella ploeckensis in the report area is in a fauna (C-76121) from the Cape Phillips Formation in western Cornwallis Island (Fig. 1, Loc. 17) where this species occurs without Polygnathoides siluricus immediately below M. fritschi linearis and above beds with Monograptus nilssoni. About 10 m stratigraphically higher in the same sequence of beds A. ploeckensis occurs in direct association with M. fritschi linearis and, again, P. siluricus is absent (C-67658). (By implication, the latter fauna should equate with about the middle of the Cape Storm Formation as developed near Snowblind Creek.) Except for the fact that the lower range of P. siluricus overlaps the Zone of M. chimaera in Nevada (Klapper and Murphy, 1975), faunas C-76121 and C-67658 would seem to add support to Jaeger's (1975) correlation of M. fritschi linearis with the separation of the ploeckensis and siluricus Zones, which was based on Walliser's (1964) discovery that the earliest occurrence of P. siluricus in Europe was immediately above the Zone of M. fritschi linearis, and at the same time prompts question as to whether the lower range of P. siluricus in Europe and the archipelago differs from that of Nevada. 2) The earliest appearance of P. siluricus in the stratigraphic record of the report area is from the Douro Formation in Cornwallis Island, 125 m above the base of the formation (Fig. 16). Consequently, the fact that the only direct

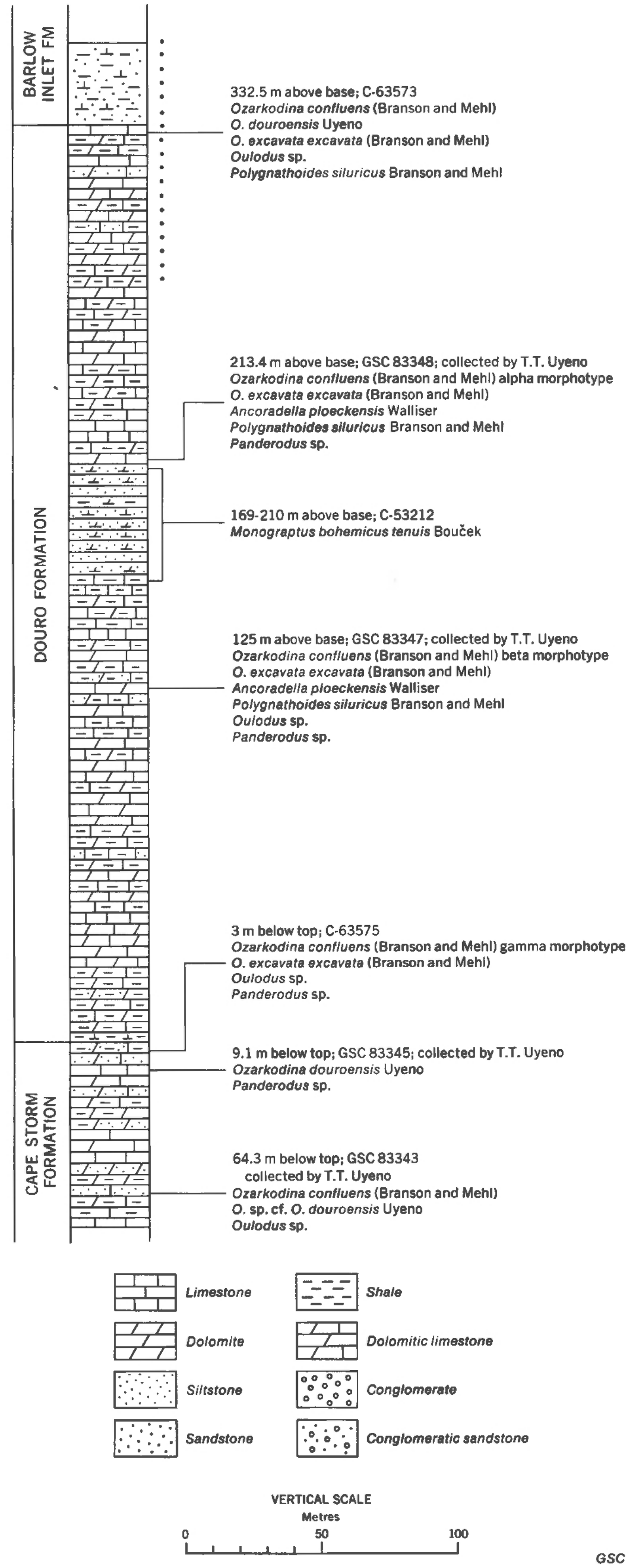

FIGURE 16. Section of upper part of Cape Storm Formation to lower part of Barlow Inlet Formation at Goodsir Creek in Cornwallis Island (see Fig. 1, Loc. 1). Dotted line indicates part of section measured on south side of creek valley. Remainder of section measured on north side of valley.

evidence for correlating the Cape Storm with the siluricus Zone is the lower age ranges of Ozarkodina douroensis and O. confluens gamma morphotype as determined in Nevada only cannot help but raise questions as to whether the total age ranges of these species are as yet established. 3) As will be pointed out later, there is well-documented evidence to indicate that almost all of the Douro Formation correlates with the overlap of the index species A. ploeckensis and P. siluricus, a situation that must therefore apply also to the Cape Storm if it is rightly assigned to the siluricus Zone. As such, the thickness of carbonate beds included in the overlap of these species in both formations, in, for example, the Cornwallis Island area, amounts to about 1000 m. This is an astonishing thickness in view of the fact that only a few metres of beds are involved in the overlap of these species in Europe and Nevada.

The evidence of the conodonts indicates that the siluricus Zone spans the entire Douro Formation and, furthermore, that most of the formation equates with the overlap of the index species Ancoradella ploeckensis and Polygnathoides siluricus. Both species are associated at Goodsir Creek in Cornwallis Island (Fig. 16) in collections GSC 83347 and 83348, obtained from levels that are respectively 125 m and 213.4 m above the base of the section. That the overlap of these species continues stratigraphically upward to near the top of the Douro is indicated by a conodont fauna collected 7.0 m below the top of the formation at Muskox Fiord in Ellesmere Island. The fauna is as follows:

GSC locality C-63559 (Fig. 1, Loc. 18).

- Ozarkodina confluens (Branson and Mehl) alpha morphotype
- O. excavata excavata (Branson and Mehl)
- Ancoradella ploeckensis Walliser
- Polygnathoides siluricus Branson and Mehl
- Panderodus sp.

At the same locality as C-63559, another fauna collected 0.3 m below the top of the Douro is of special interest because of the presence of P. siluricus and the absence of A. ploeckensis. The fauna is as follows:

GSC locality C-63558.

- Ozarkodina excavata excavata (Branson and Mehl)
- Kockelella variabilis Walliser
- "Neoprioniodus" latidentatus Walliser
- Polygnathoides emarginatus (Branson and Mehl)
- P. siluricus Branson and Mehl
- Panderodus sp.

Further evidence that the range of Polygnathoides siluricus above Ancoradella ploeckensis is probably confined to the uppermost beds of the Douro is afforded by faunas including the former species, and excluding the latter, that were collected from the top of that formation in Devon Island (Fig. 24) and at Goodsir Creek in Cornwallis Island (Fig. 16).

Neither Ancoradella ploeckensis nor Polygnathoides siluricus occurs in sections of the Douro Formation studied in Somerset[1] and Prince of Wales Islands and Boothia Peninsula, and the evidence that these sections are correlative with the Douro Formation as developed in Cornwallis and Ellesmere Islands is based largely on the upper age limit of Ozarkodina douroensis which appears to coincide with the upper range of P. siluricus in both Nevada (Klapper and Murphy, 1975) and the archipelago. In the latter region, O. douroensis ranges throughout the Cape Storm and Douro Formations, and is associated with P. siluricus at the very top of the Douro Formation at Goodsir Creek in Cornwallis Island (Fig. 16); O. douroensis occurs at the top of the Douro in Boothia Peninsula (Fig. 18) and ranges from about the middle of the Cape Storm to about the middle of the Douro in Prince of Wales Island (Fig. 21). Further evidence from the study of conodonts that the top of the Douro is probably correlative everywhere throughout the report area comes from the fact that basal beds of the various formations - Barlow Inlet, Somerset Island, Peel Sound and Devon Island - that overlie the Douro are, with one possible exception, correlative with the latialata Zone. The possible exception is eastern Somerset Island where the contact of the Douro and Somerset Island Formations is considered by Miall and Kerr (1977) to be diachronous, though this is based on mapping and physical stratigraphy only.

A sample of conodonts obtained from 6 m above the base of the lower member of the Barlow Inlet Formation in Griffith Island is listed below:

GSC locality C-76051 (Fig. 1, Loc. 19).

- Ozarkodina n. sp. A of Klapper and Murphy, 1975
- Pedavis sp. aff. P. thorsteinssoni Uyeno

This fauna appears to equate with the latialata Zone on the grounds that O. n. sp. A ranges from the latialata Zone to the Pelekysgnathus index fauna in Nevada, and P. sp. aff. P. thorsteinssoni is associated with P. latialata in the upper member of the Barlow Inlet Formation, as discussed below.

The presence of the latialata Zone in the lower part of the upper member of the Barlow Inlet at Goodsir Creek, Cornwallis Island (Fig. 17), is clearly indicated by the zonal name bearer associated with Ozarkodina n. sp. A and Pedavis sp. aff. P. thorsteinssoni, 80.2 m above the base of the formation (C-63576). Still higher in the section, at the 239 m level, is another collection of conodonts (C-19837) distinguished by the only known occurrence thus far of the new species Pedavis thorsteinssoni. Definite assignment of this fauna to a zone does not seem warranted. The fauna may be coeval with either the crispa Zone or the Pelekysgnathus index fauna, but there is nothing to commend this idea except its stratigraphic position.

Two collections of conodonts from the upper part of the type section of the Barlow Inlet on Cornwallis Island are important insofar as they establish the upper range of the formation. One of these is from 24.4 m below the top of the formation and includes the following:

GSC locality C-54046 (Fig. 1, Loc. 20).

- Ozarkodina confluens (Branson and Mehl) alpha morphotype
- O. sp. cf. O. eurekaensis Klapper and Murphy (of Klapper and Murphy, 1975)
- O. remscheidensis remscheidensis (Ziegler)
- Pelekysgnathus sp.

This fauna is assigned to the uppermost eosteinhornensis Zone on the basis of O. remscheidensis remscheidensis and O. confluens. It may be noted, however, that Ozarkodina sp. cf. O. eurekaensis has been reported previously only in the Birch Creek II section of Nevada, where it occurs in the underlying eosteinhornensis Zone (Klapper and Murphy, op. cit.).

[1] It is of interest to note here that A. ploeckensis (determined by Uyeno) is reported from the Read Bay Formation (=Douro Formation) in northwestern Somerset Island by Jones and Dixon (1977).

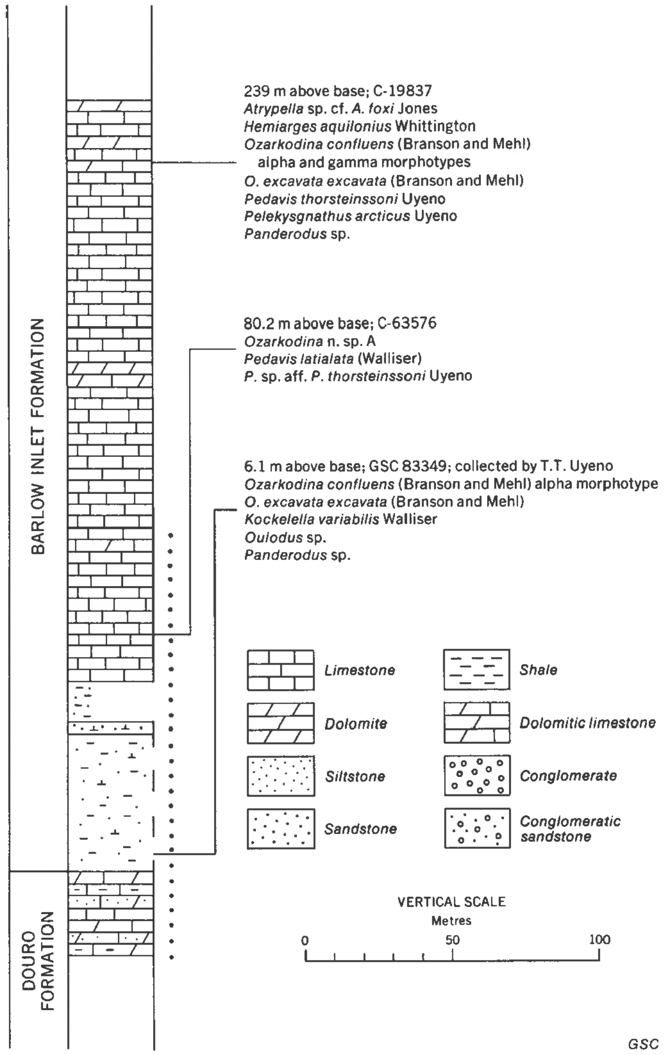

FIGURE 17. Section of upper part of Douro Formation and lower part of Barlow Inlet Formation at Goodsir Creek in Cornwallis Island (see Fig. 1, Loc. 2). Dotted line indicates part of section measured on south side of creek valley. Remainder of section measured on north side of valley. Identifications of brachiopod and trilobite by R.E. Smith and B.S. Norford, respectively.

The other collection is from the uppermost 3 m of the Barlow Inlet Formation, with the following:

GSC locality C-76085 (Fig. 1, Loc. 21).

> Ozarkodina n. sp. G of Uyeno (1977)
> Pelekysgnathus n. sp. B of Uyeno (1977)

Ozarkodina n. sp. G. occurs also in the "Delorme" Formation in southwestern District of Mackenzie, where it is bracketed by the brachiopod Gypidula pelagica lux Johnson, Boucot, and Murphy (Norris and Uyeno, in press). According to Johnson (1977), the G. pelagica Zone equates with the hesperius and eurekaensis Zones of Klapper (1977) and Klapper and Murphy (1975), and is of early Early Devonian age.

In view of the lower age limit of the Sophia Lake Formation which overlies the Barlow Inlet and which is discussed below, it is probable that fauna C-76085 equates with the hesperius Zone and not with the eurekaensis Zone. At any rate the age span of the Barlow Inlet Formation is late Ludlovian to early Lochkovian.

As a point of interest, the Siluro-Devonian boundary would appear to be bracketed by faunas C-54046 and C-76085, and therefore, to be situated close to the top of the Barlow Inlet Formation.

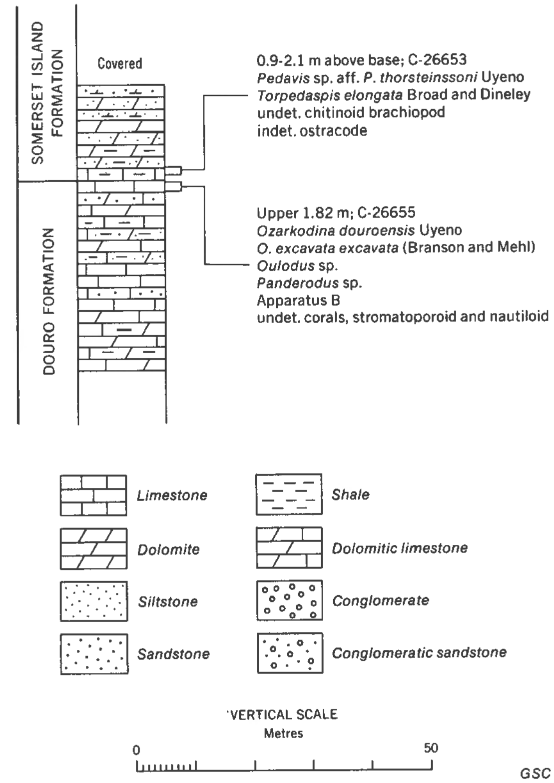

FIGURE 18. Section of upper part of Douro Formation and lower part of Somerset Island Formation in western Boothia Peninsula (see Fig. 1, Loc. 4).

Sophia Lake Formation

The lower part of this formation, as developed in Baillie Hamilton Island, is relatively fossiliferous and includes such notable zonal name-bearers as Monograptus uniformis, Icriodus woschmidti hesperius and Warburgella rugulosa which indicate an early Lochkovian age (see Kerr et al., 1977). Although rocks assigned to this formation in Cornwallis and Devon Islands have thus far proven relatively poor in diagnostic fossils, they have yielded two noteworthy conodont faunas. One collection was obtained from a level 21.3 m above the base of the type section of the Sophia Lake Formation in Cornwallis Island and included the following:

GSC locality C-49976 (Fig. 1, Loc. 22).

> Ozarkodina n. sp. G of Uyeno (1977)
> Pelekysgnathus n. sp. B of Uyeno (1977)

As noted earlier, the same two species occur throughout the upper 3 m of the underlying Barlow Inlet Formation and probably equate with the late Pridolian-early Lochkovian hesperius Zone. The other collection was obtained near the west coast of Devon Island and is as follows:

GSC locality C-54044 (Fig. 1, Loc. 23).

Ozarkodina remscheidensis remscheidensis (Ziegler)
O. n. sp. F of Klapper and Murphy (1975)
O. sp. cf. O. n. sp. F of Klapper and Murphy (1975)
Oulodus sp.

The stratigraphic position of this fauna within the Sophia Lake can be estimated only as about 275 m above the base, and therefore relatively close to the youngest beds of the formation in Devon Island. The earliest occurrence of O. n. sp. F in Nevada is in the upper part of the hesperius Zone, from whence the species continues stratigraphically upward into the eurekaensis Zone (Klapper and Murphy, 1975).

On the basis of above evidence, the age of the Sophia Lake Formation is early to possibly middle Lochkovian age.

Snowblind Bay Formation

A vertebrate fauna collected from 25.3 m above the base of the type section of the formation in Cornwallis Island includes the following:

GSC locality C-23623 (Fig. 1, Loc. 24).

Cyathaspididae, gen. et sp. nova (new genus similar to Anglaspis)
Ctenaspis n. sp.
indet. pteraspids
fragments of ?crossoptergian
acanthodian scales and spines

In the absence of associated diagnostic invertebrates, the age of the above fauna is difficult to assess. There are, however, reasons for considering the fauna as probably late Lochkovian in age. Another new species of the cyathaspids that is morphologically close to Anglaspis is known, and it occurs in the Drake Bay Formation of western Prince of Wales Island where it is associated with Pedavis pesavis pesavis (Bischoff and Sannemann) (C-8223; Fig. 1, Loc. 25), index species of the latest Lochkovian conodont zone. Ctenaspis n. sp. is morphologically closest to C. obruchevi that Dineley (1977) has described from the upper member of the Peel Sound Formation, and which is probably also latest Lochkovian in age. The indeterminate pteraspids that occur in this fauna appear to include small- to medium-sized forms that resemble more closely known Lochkovian pteraspids than such relatively large pteraspids as Althaspis leachi White and Rhinopteraspis dunensis (Roemer) that characterize rocks of Pragian age in Europe. It is also of interest to note here that the oldest possible age of this fauna is provided by the underlying Sophia Lake Formation which ranges from early to possibly middle Lochkovian.

Somerset Island Formation

The occurrence of Pedavis sp. aff. P. thorsteinssoni in basal beds of this formation in Boothia Peninsula (Fig. 18) suggests a latest Ludlovian age (latialata Zone) on the basis of the association of that species with P. latialata in the lower part of the Read Bay Formation in Cornwallis Island (Fig. 17).

Neither of the conodont faunas C-54002 nor C-54003 that were collected from the lower part of the Somerset Island Formation in northwestern Somerset Island, and which are listed in Figure 19, can be interpreted with more precise age assignment than Ludlovian or Pridolian. Nevertheless, the presence in C-54003 of the heterostracan Torpedaspis

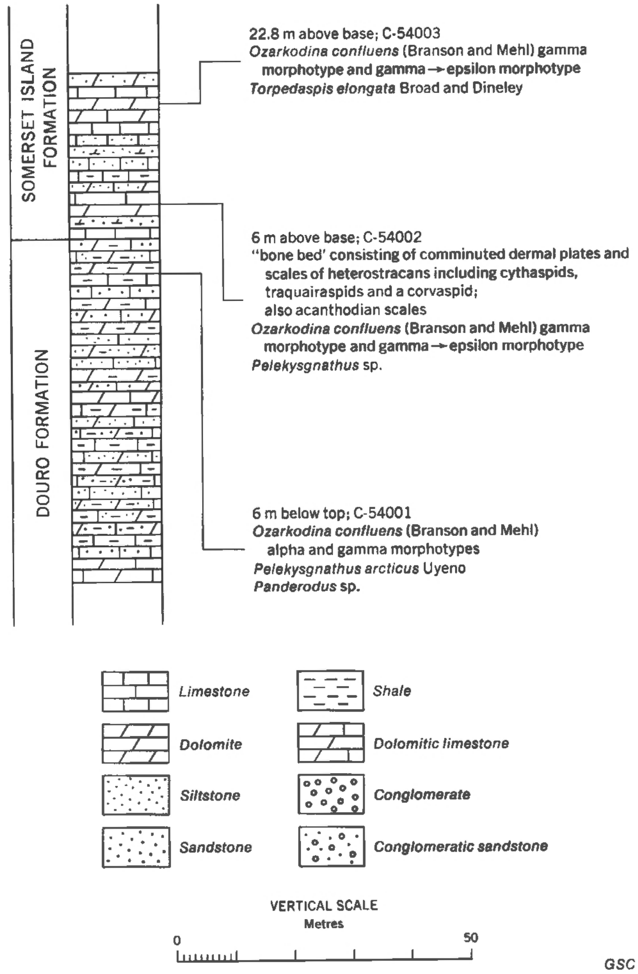

FIGURE 19. Section of upper part of Douro Formation and lower part of Somerset Island Formation in northwestern Somerset Island (see Fig. 1, Loc. 4).

elongata which occurs also in the base of Somerset Island Formation in Boothia Peninsula (Fig. 18), where it is associated with Pedavis sp. aff. P. thorsteinssoni, suggests that the basal beds of the Somerset Island at both localities are probably correlative.

The two samples of conodonts (C-26656, C-25927) that are shown in Figure 20 as occurring in the upper part of the Somerset Island Formation in northwestern Somerset Island cannot be dated more precisely than Ludlovian or Pridolian. There is, however, rather good evidence that no part of this formation (at least as it is developed in northwestern Somerset Island) is younger than late Ludlovian, and this is based on the occurrence of the osteostracan, Hemicyclaspis murchisoni (Egerton) in the lower part of the overlying Peel Sound Formation, which will be discussed under the heading of the latter formation. To sum up, it appears that all of the Somerset Island Formation is correlative with the latialata Zone.

Peel Sound Formation

Hemicyclaspis murchisoni represents the only diagnostic fossil obtained thus far from the Peel Sound Formation in Somerset Island. It was collected and described by Dineley (1968) from an interval 15.25 to 18.29 m above the base of

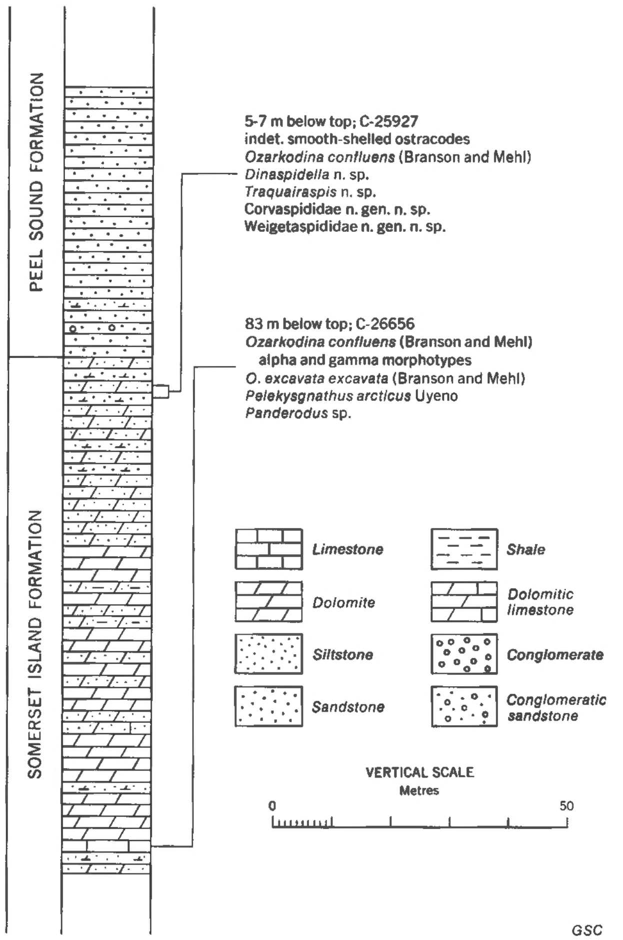

***FIGURE 20.** Section of upper part of Somerset Island Formation and lower part of Peel Sound Formation (type section) in northwestern Somerset Island (see Fig. 1, Loc. 5).*

the lower member of the formation, near the northwestern corner of the island (Fig. 1, Loc. 26). Hemicyclaspis murchisoni is the index fossil of the basal zone of the Downtonian Stage of Great Britain, and the base of that stage is generally held to equate with the base of the Pridolian, though this should be viewed with some reserve insofar as the Zone of H. murchisoni cannot be related precisely to the Zone of M. ultimus that constitutes the base of the standard Pridolian succession in Czechoslovakia. Nevertheless, it seems reasonably safe to consider the basal beds of the Peel Sound in Somerset Island as about early Pridolian in age.

Although conodonts have been collected from several levels in the sections (Figs. 21, 22) of the lower member of the Peel Sound Formation studied on the west side of the Boothia Uplift in Prince of Wales Island, diagnostic species are absent and none of the conodonts can be dated more closely than Ludlovian or Pridolian. There is, however, other paleontological evidence to indicate that the lower part of the lower member is late Ludlovian in age and correlative with the Somerset Island Formation on the eastern flank of the uplift.

1) Pedavis sp. aff. P. thorsteinssoni, which is late Ludlovian in age (latialata Zone) and occurs in the basal beds of the Somerset Island Formation in Boothia Peninsula (Fig. 18), has been collected also from basal beds of the Drake Bay Formation in western Prince of Wales Island (Fig. 1, Loc. 27), and the basal beds of the latter formation are stratigraphically equivalent to the basal beds of the lower member of the Peel Sound in eastern Prince of Wales Island.

2) Torpedaspis elongata is recorded at several levels in the lower part of the lower member of the Peel Sound in a section studied by Broad and Dineley (1973) in eastern Prince of Wales Island, and as noted in a previous discussion, this species is represented also in basal beds of the Somerset Island Formation in Somerset Island and Boothia Peninsula.

3) Corvaspididae, gen. et sp. nova, which occurs 172 m above the base of the lower member in the section shown on Figure 22, is the same species that occurs in the uppermost beds of the Somerset Island Formation (Fig. 20), where it is considered latest Ludlovian in age.

The occurrence of Hemiarges bigener Bolton[1] in the stratigraphically highest fauna (C-38583) obtained from a level 318 m above the base of the lower member of the Peel Sound, shown in Figure 22, is of particular significance. This trilobite is known to occur in various correlative formations, and at widely separated localities in the archipelago, and wherever it can be related to diagnostic fossils it appears to be confined to beds of Pridolian age. The occurrence of H. bigener in the Devon Island Formation in Ellesmere Island (Fig. 25) is a case in point. There the trilobite occurs stratigraphically above Monograptus ultimus, index species of the basal Pridolian, and in association with conodonts that appear to equate with the Pelekygnathus index fauna of Pridolian age. The association of H. bigener with Ozarkodina confluens gamma morphotype in fauna C-38583 is probably indicative also of an early Pridolian age, insofar as the highest range of O. confluens gamma morphotype in Nevada (Klapper and Murphy, 1975) is in the P. index fauna. The age range of the lower member of the Peel Sound Formation in Prince of Wales Island thus appears to be late Ludlovian to early Pridolian.

There is no paleontological evidence to indicate the presence of beds younger than early Pridolian in the lower member of the Peel Sound Formation and, furthermore, there is no evidence of beds of early or middle Lochkovian age in the upper member.

The only evidence as to the age of the upper member of the Peel Sound Formation comes from one general fossil locality in Miall's (1970a) "sandstone-carbonate facies" near the north coast of Prince of Wales Island. The fossils are represented mostly by vertebrates and were collected in 1966 and 1967 by members of the University of Ottawa group under the direction of Dineley (1977; *see* also Broad et al., 1968). They were obtained from two principal levels separated by an undisclosed thickness of beds. The upper level yielded a cephalaspid, a large unidentified cyathaspid, Ctenaspis obruchevi Dineley (1977), a small unidentified pteraspid, and Baringaspis dineleyi Miles (1973); while the lower yielded undetermined cyathaspids, Ctenaspis russelli Dineley (1977), pteraspids and Baringaspis dineleyi. By themselves, the vertebrates cannot be dated more precisely than about Early Devonian, but they are probably not younger than Lochkovian because cyathaspids are not known to have

[1] The precise locality of the holotype of Hemiarges bigener was not given in Bolton (1965). The writer has learned from U. Mayr (pers. com.) the holotype was collected at UTM Zone 14X; 584875E, 8051350N, which locates it 4.5 km south of the section shown herein as Figure 16. Very probably the specimen is from the same stratigraphic level in the lower member of the Peel Sound Formation as the occurrence of this species which is shown in Figure 22.

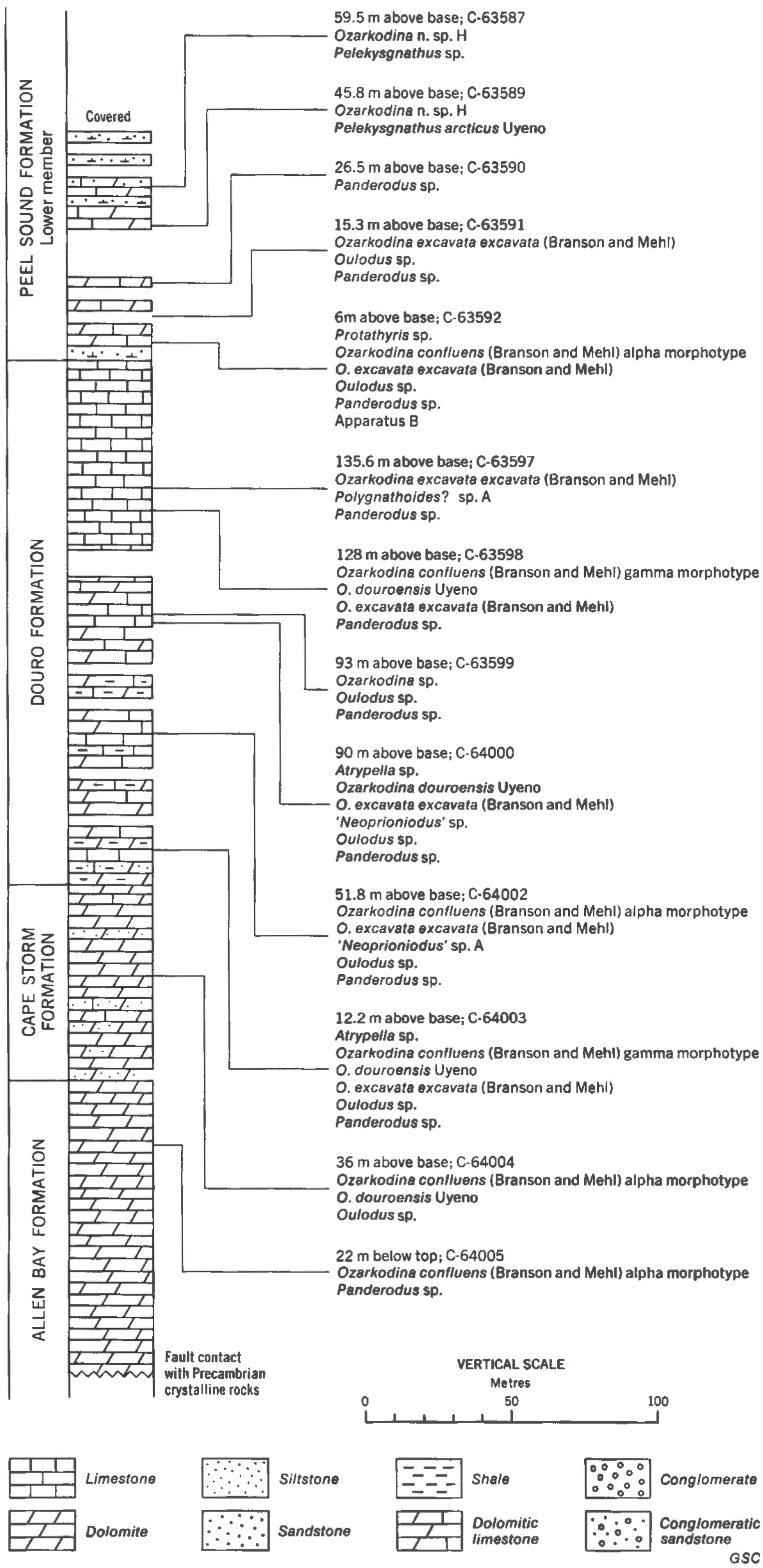

FIGURE 21. *Section of upper part of Allen Bay Formation to lower part of Peel Sound Formation in eastern Prince of Wales Island (see Fig. 1, Loc. 6).*

survived that stage. This locality was recollected in 1975 by H.P. Schultze (in litteris), who collected Pelekysgnathus serratus serratus Jentzsch from between the vertebrate-bearing levels collected earlier by Dineley (Schultze, per. com., 1977). This conodont was identified by O.H. Walliser, who suggested a late Lochkovian age for it.

Devon Island Formation

The faunas tabulated in the section of the Devon Island Formation on the Sutherland River in northwestern Devon Island (Fig. 23), and those in another section of the formation measured about 5 km southeast of the river (Fig. 24), complement each other in demonstrating an age range of late Ludlovian to early Lochkovian for the formation in this particular part of the archipelago. A late Ludlovian age is indicated by Pedavis latialata, index species of the latest Ludlovian conodont zone, that occurs in richly fossiliferous limestone boulders strewn about the 27.4 m of covered interval at the base of the section on the Sutherland River (Fig. 23). The abundance of these boulders, and their uniformity in faunal and lithological characters, can leave little doubt that they represent a single bed of limestone, some 15 cm thick, derived from bedrock beneath the covered interval. That all of Pridolian time is probably represented in the Sutherland River section is indicated by a talus collection with Monograptus formosus of earliest Pridolian age (=Zone of M. ultimus), and by M. transgrediens, name bearer of the highest Pridolian graptolite zone, which occurs *in situ* at two separate levels near the bottom of the section. Still higher in the Sutherland River section is M. uniformis, index species of the earliest Devonian graptolite zone.

Worthy of special comment here is the condensed nature of the Pridolian Series in northwestern Devon Island, which is particularly well documented in the section (Fig. 24) of the Devon Island Formation east of Sutherland River. At this locality, Monograptus formosus occurs at 4.25 m above the base of the Devon Island, while M. transgrediens occurs at levels 4.5 and 8.8 m. A mainly covered interval separates the highest occurrence of the latter graptolite from a relatively abundant brachiopod and conodont fauna (C-33700) at the 30.5 m level. Although the conodonts in C-33700 cannot be dated more precisely than latest Pridolian or earliest Devonian, the presence of Cyrtina among the brachiopods indicates a Lochkovian age. Apparently, therefore, the entire span of Pridolian time is represented at this locality by something less than 30.5 m of beds (*see* Fig. 14).

The presence of late Ludlovian beds in the base of the incomplete section of the Devon Island Formation measured in southwestern Ellesmere Island (Fig. 25) is indicated by Monograptus bohemicus tenuis at a level of 2.4 m. Higher in this section, and occupying an interval 22 to 24.4 m above the base, is M. ultimus, index species of the earliest Pridolian graptolite zone. According to Jaeger's (1975) collation of graptolite and conodont zonations, the Zone of M. ultimus equates with the crispa Zone.

Some 7 km northwest of the section discussed above, a sample of conodonts that represents the youngest fossils collected thus far from Devon Island rocks in Ellesmere Island was obtained from a level 7 m below the top of the formation. The conodonts are listed below:

GSC locality C-76069 (Fig. 1, Loc. 28).

Ozarkodina confluens (Branson and Mehl) delta morphotype
O. excavata excavata (Branson and Mehl)
"Neoprioniodus" sp.
Panderodus sp.
Oulodus sp.

The range of O. confluens delta morphotype in Nevada brackets the Pelekysgnathus index fauna and eosteinhornensis Zone (Klapper and Murphy, 1975). However, in view of the presence of O. confluens gamma morphotype in a fauna from the overlying Goose Fiord Formation, which is discussed later, it appears that the present fauna is correlative with the P. index fauna and not the eosteinhornensis Zone.

To sum up, the Devon Island Formation in southwestern Ellesmere Island appears to range from late Ludlovian to early Pridolian. Moreover, although the base of the formation is essentially a time plane as traced from Devon Island to Ellesmere Island, the upper contact is markedly diachronous.

Goose Fiord Formation

Until now the Goose Fiord Formation has not yielded diagnostic fossils, and its age assignment by Greiner (1963b) as Silurian and (?)Devonian, by Kerr (1970) as Early Devonian, and by Thorsteinsson and Tozer (1970) as early Middle Devonian was based on presumed age limits of the underlying and overlying formation. A collection of conodonts from 1 m above the basal contact of the formation in southwestern Ellesmere Island yielded the following:

GSC locality C-76083 (Fig. 1, Loc. 29).

Ozarkodina confluens (Branson and Mehl) gamma morphotype
O. excavata excavata (Branson and Mehl)
Panderodus sp.

The total range of Ozarkodina confluens gamma morphotype is relatively long, extending from the early Ludlovian to the Pelekysgnathus index fauna. The occurrence of this species in basal beds of the Goose Fiord, however, assumes a greater stratigraphical significance in view of the occurrence of O. confluens delta morphotype, with a more restricted range of P. index fauna to eosteinhornensis Zone, in the uppermost part of the underlying Devon Island Formation (C-76069). The occurrences of these two morphotypes considered together suggest that both fauna C-76083 and C-76069 are correlative with the P. index fauna, and consequently that the base of the Goose Fiord Formation is early Pridolian in age.

A sample of rock collected for conodont analysis from a level 7 m below the upper contact of the Goose Fiord Formation, as mapped by Kerr (1968) at the head

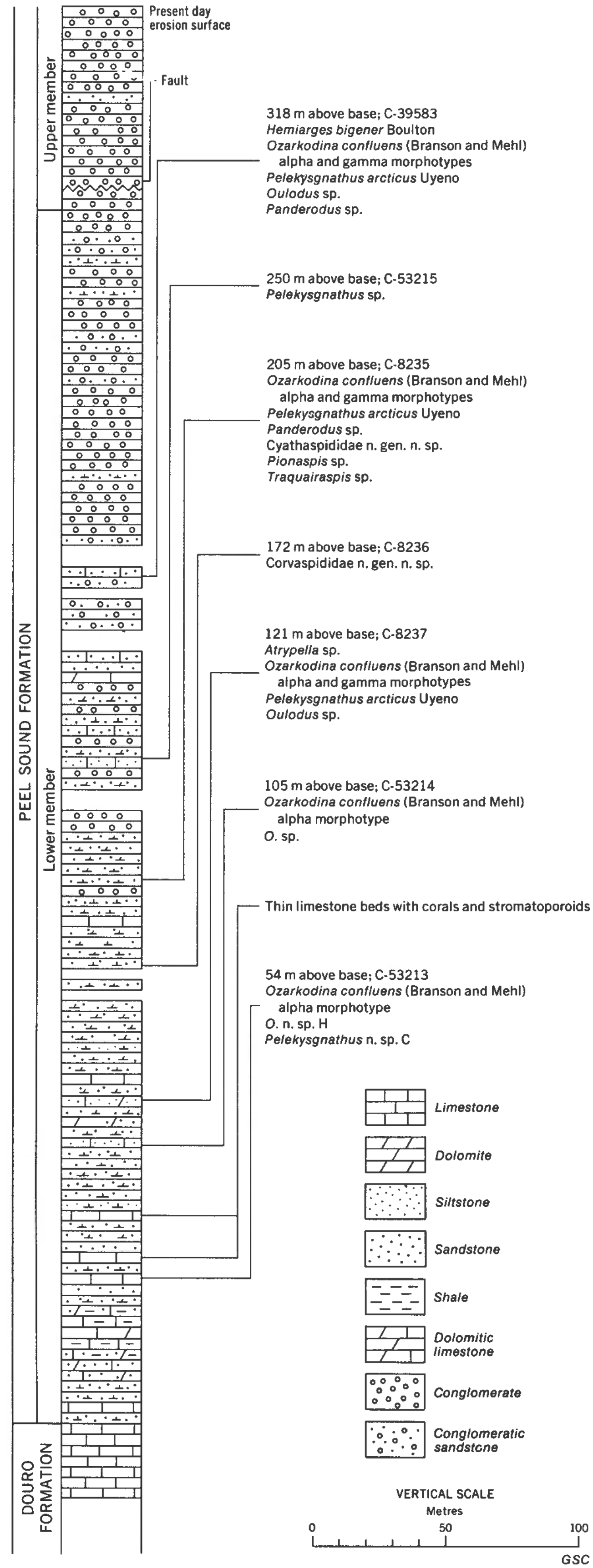

FIGURE 22. Section of upper part of Douro Formation to Peel Sound Formation in eastern Prince of Wales Island (see Fig. 1, Loc. 7). Hemiarges bigener identified by B.S. Norford, Atrypella sp. by J.G. Johnson.

of Muskox Fiord in southwestern Ellesmere Island, yielded ?Pandorinellina sp. (juvenile forms) (GSC locality C-76072; Fig. 1, Loc. 30), indicating a possible Early Devonian age. The upper age limit of the Goose Fiord is therefore still poorly understood, and consequently the age range of the formation cannot be given more precisely than early Pridolian to possibly Early Devonian.

Disappointment Bay Formation

The formation has yielded several collections of conodonts, all of which indicate correlation with the inversus Zone of late Zlichovian to early Dalejan age (Klapper et al., 1978; Fig. 3), and the conodont fauna obtained from 1 m above the base of the formation in northwestern Devon Island (Fig. 17) is a case in point. Some other collections of conodonts from the formation are listed below:

GSC locality C-11477 (Fig. 1, Loc. 31), Cornwallis Island; 9 m above base of upper dolomite unit of formation.

- Pandorinellina exigua (Philip)
- Pandorinellina expansa Uyeno and Mason
- Polygnathus inversus Klapper and Johnson
- Panderodus spp.
- Scandodus sp.

GSC locality C-2681 (Fig. 1, Loc. 32), Lowther Island; 75 m above base of formation.

- Sannemannia glenisteri (Klapper);

GSC locality 2682 (Fig. 1, Loc. 33), Lowther Island; about 85 m above base of formation.

- Polygnathus inversus Klapper and Johnson
- Sannemannia glenisteri (Klapper)
- Pandorinellina exigua (Philip)

GSC locality C-3217 (Fig. 1, Loc. 34), Lowther Island; 121 m above base of formation.

- Polygnathus inversus Klapper and Johnson
- Panderodus spp.
- Belodella sp.

According to Klapper and Johnson (1975), the Blue Fiord Formation, in the vicinity of the type section of this formation in southwestern Ellesmere Island, includes the probable gronbergi Zone [with the occurrence of Polygnathus aff. P. perbonus (Philip)] and ranges upward into the serotinus Zone (late Zlichovian to early Dalejan) (Klapper et al., 1978; Fig. 3). It may therefore be confidently asserted that the Disappointment Bay is correlative with the lower part of the Blue Fiord of that area. In Bathurst Island, the Disappointment Bay represents, for the most part, the eastern facies equivalent of the Stuart Bay Formation, which consists largely of quartzose siltstone and sandstone. Kerr (1974), in his study of the geology of Bathurst Island, correlated the Disappointment Bay with the Eids Formation, but this appears to be at least partly in error in the light of Uyeno's (in McGregor and Uyeno, 1972) discovery that the inversus Zone occurs in the Stuart Bay and not in the Eids.

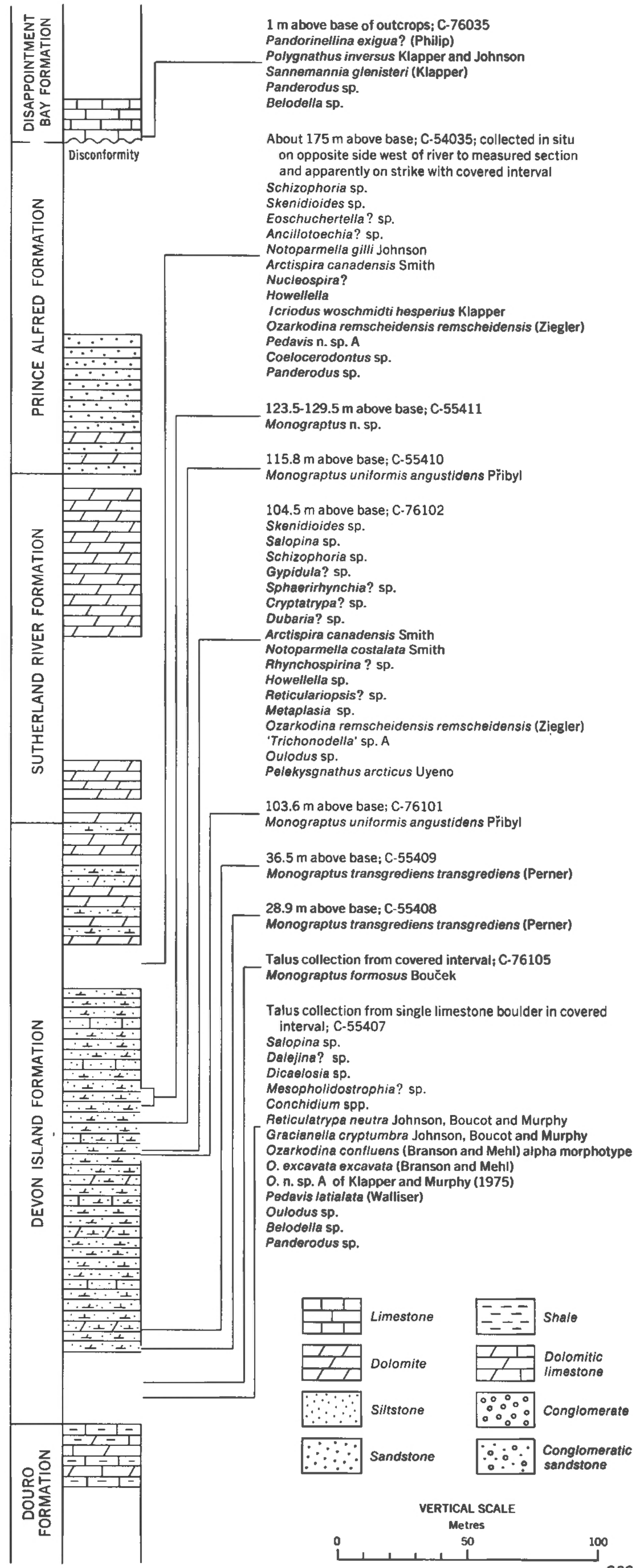

FIGURE 23. Section of upper part of Douro Formation to lower part of Disappointment Bay Formation at Sutherland River in northwestern Devon Island (see Fig. 1, Loc. 8). Identification of brachiopods in fauna C-76102 is by J.G. Johnson. Identification of other brachiopods by R.E. Smith.

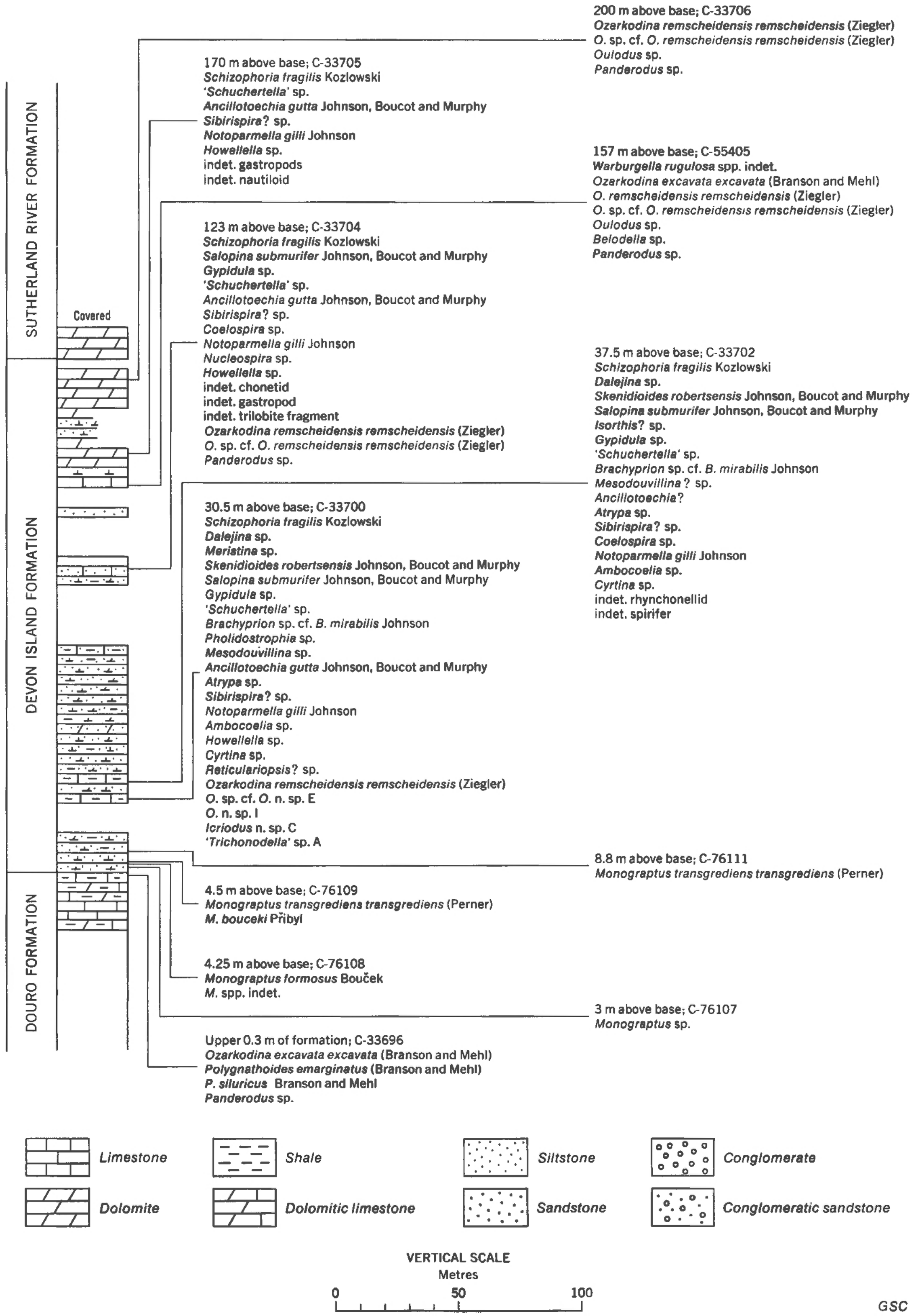

FIGURE 24. Section of upper part of Douro Formation to lower part of Sutherland River Formation about 5 km southeast of Sutherland River in northwestern Devon Island (see Fig. 1, Loc. 9). Identification of brachiopods by R.E. Smith, Warburgella rugulosa subsp. indet. by A.R. Ormiston.

LATE SILURIAN AND EARLY DEVONIAN HISTORY OF THE BOOTHIA UPLIFT

Geographical and structural setting

The Boothia Uplift, which constitutes one of the more prominent cratonic uplifts in North America, traces a northerly path from Boothia Peninsula on the continental mainland to about the geographic centre of the Canadian Arctic Archipelago (Fig. 1). It has a length of about 800 km and a maximum width of about 150 km, and includes much if not all of Boothia Peninsula, western Somerset Island, eastern Prince of Wales, Cornwallis Island, eastern Bathurst Island,

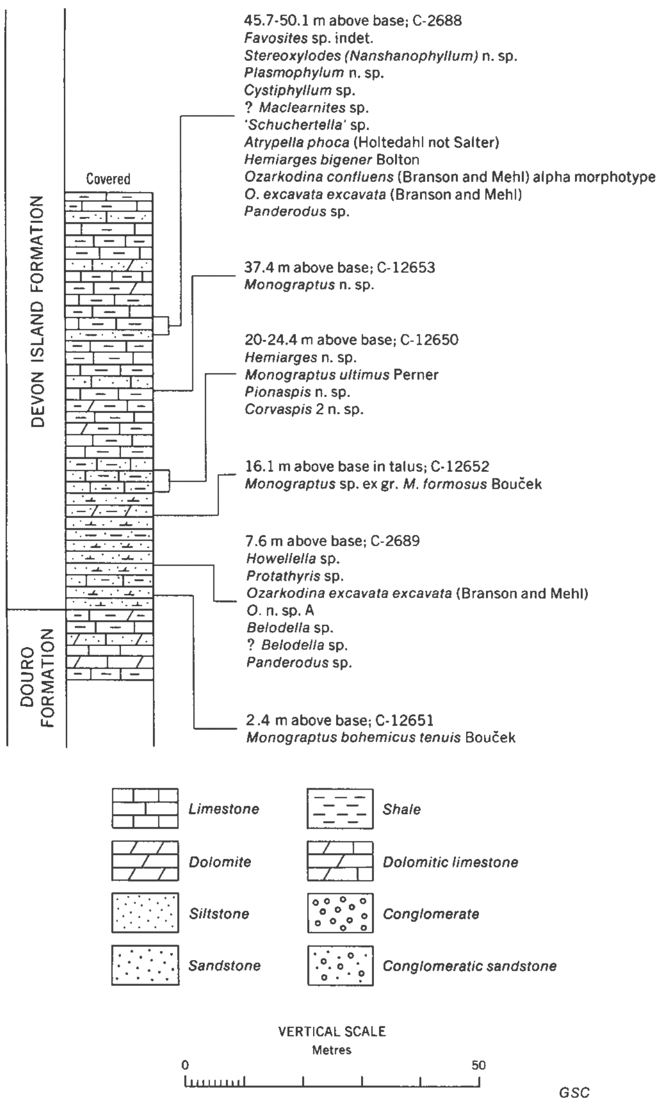

FIGURE 25. Section of upper part of Douro Formation to Devon Island Formation in southwestern Ellesmere Island (see Fig. 1, Loc. 10). Identification of corals by A.E.H. Pedder; brachiopods by J.G. Johnson; and trilobites by B.S. Norford.

and western Grinnell Peninsula. The overall trend of the uplift is more or less at diametric variance with the depositional strike of the lower Paleozoic rocks of the Arctic Platform south of Barrow Strait, as well as with correlative rocks of the Franklinian miogeosyncline north of the strait. Marking the core of the uplift are rocks of the Canadian Shield that are exposed as a prominent northerly-trending and northerly-plunging salient into the platform sediments in Boothia Peninsula and Somerset and Prince of Wales Islands. Steeply dipping faults that originate deep within the earth's crust and attendant folding have caused the rise of the uplift. The regional strike of these structures is northerly, as is the plunge of the uplift as a whole (see Kerr, 1977; Fig. 2). The maximum structural relief of the uplift is in the order of 6300 m as determined in Cornwallis Island. Followed northward, the Boothia Uplift passes from view beneath an unconformable cover of Sverdrup Basin sediments (upper Paleozoic to Tertiary) at the latitude of northern Grinnell Peninsula and, consequently, its northern limit is an open question. Nevertheless, the fact that the uplift has narrowed to about 75 km in width just before reaching this latitude suggests that it probably ends a short distance to the north, probably beneath the waters of Belcher Channel.

Sequence and ages of crustal movements

Various episodes of diastrophism, including the Ellesmerian orogeny of latest Devonian or earliest Carboniferous age, have affected the Boothia Uplift intermittently over a long period of geologic time, commencing in the Precambrian and ending in the Tertiary. However, the principal crustal movements by which the uplift achieved its present areal extent and most of its present structural characteristics involved essentially vertical movements (epeirogeny) that occurred in the Late Silurian and Early Devonian (Kerr, 1977). One of the significant aspects of the present study is that southern and northern parts of the uplift that are separated by Barrow Strait have undergone different deformational histories. The sequence and ages of the Silurian and Early Devonian crustal movements that affected the Boothia Uplift, as inferred from the stratigraphic record and unconformities, are reconstructed in the following account.

Silurian crustal movements in the Boothia Uplift were limited to Somerset and Prince of Wales Islands, and Boothia Peninsula. Throughout this territory the remarkable time plane represented by the upper contact of the Douro Formation, which is late Ludlovian (top of siluricus Zone), marks the end of crustal quiescense in Paleozoic time. The first evidence of uplift is the deposition of the mainly deltaic sediments represented by the lower member of the Peel Sound Formation (as developed in Prince of Wales Island) that ranges in age from late Ludlovian to about early Pridolian (latialata Zone to Pelekysgnathus index fauna). These sediments were presumably derived from northerly-trending fault-line scarps extending along axial parts of the Boothia Uplift[1]. That movements on these faults probably increased in intensity from their inception in the late Ludlovian to the Pridolian is indicated by the fact that these deltaic sediments in Prince of Wales Island coarsen upward and prograde westward. Similar conditions almost certainly existed on the east side of these faults in Somerset Island, though conditions there are somewhat less clear owing to the

[1] An earlier Silurian crustal movement is, in fact, indicated by an angular unconformity reported by Kerr (1977) between the Allen Bay and Cape Storm Formations in Grinnell Peninsula. Only a small part of the Boothia Uplift appears to have been affected by this event, and no further reference will be made to it here.

discontinuous nature of Peel Sound outcrops. Here it should be noted that, because of the unconformity between the lower and upper members of the Peel Sound and the fact that beds of late Pridolian to early Lochkovian age are apparently not represented in either member, there is a possibility that beds younger than the early Pridolian were once represented in the top of the lower member and later removed by erosion and, therefore, that the diastrophic event that gave rise to the clastic materials in the lower member extended into the late Pridolian or even into the Lochkovian. This subject is discussed below.

The unconformity at the base of the upper member of the Peel Sound appears to mark the inception of two important, interrelated events in the development of the Boothia Uplift south of Barrow Strait: the uplands that had been actively eroding during the deposition of the lower member of the Peel Sound appear to have experienced an episode of renewed uplift causing a large area of Precambrian basement rocks to be exposed to erosion; and the width of the uplift increased in both an easterly and a westerly direction. The former event is inferred from the predominance of Precambrian crystalline clasts in the subaerially deposited conglomerate facies of the upper member that contrasts markedly with the composition of the clasts in the conglomerate of the lower member which consist chiefly of Paleozoic carbonate rocks. The latter event is evidenced by the fact that the entire conformable lower Paleozoic succession, which includes rocks as young as the lower member of the Peel Sound, is in place on both the east and west flanks of the uplift, upturned and overlain unconformably by the upper member. It is evidenced also by erosional destruction of much if not all of the subaerially deposited portions of the deltas that might be reasonably assumed to have at one time comprised landward facies equivalents of the lower member.

The long unbridged gap of early Pridolian to late Lochkovian age in the fossil record between the lower and upper members of the Peel Sound precludes a precise age determination of the inception of the diastrophic event that produced the unconformity separating these members. There is, however, a possibility that this event was coeval with the lower age limit of the Sophia Lake Formation. This suggestion is based on the following circumstances. The Sophia Lake Formation (early to mid-Lochkovian) in Cornwallis Island and the Somerset Island Formation (late Ludlovian) appear to have developed in similar depositional environments and, since the latter formation is clearly related tectonically to the initial rise of the Boothia Uplift and to the deposition of the lower member of the Peel Sound Formation, it is suggested that the Sophia Lake Formation is similarly related to the second rise of the uplift and the sequential deposition of the upper member of the Peel Sound Formation. The striking similarity in the lithology and biofacies of the Sophia Lake and Somerset Island must certainly indicate similar depositional environments, namely that of dominantly shallow, subtidal conditions, that were at times and places intertidal. Moreover, some aspects of the tectonic setting of both formations were strikingly similar. The Somerset Island overlies the Douro Formation and grades upward into the Peel Sound Formation, whereas the Sophia Lake overlies the Read Bay Formation and grades upward into the Snowblind Bay Formation. Thus both the Somerset Island and Sophia Lake overlie beds that were deposited in open-marine, subtidal environments, and pass upward into red beds. A further aspect of the tectonic setting of the Somerset Island is readily apparent and of particular importance to the present argument. Because this formation is late Ludlovian in age (latialata Zone), and is therefore correlative with the lower part of the lower member of the Peel Sound on the west side of the Boothia Uplift (i.e. Prince of Wales Island), it is difficult to escape the conclusion that the Somerset Island is the near-shore facies equivalent of deltaic deposits that must have at one time existed on the east side of the uplift - just as they did on the west - but which have since been removed by erosion. Further support to this conclusion is provided by the fact that the quartz content of the Somerset Island Formation increases from east to west and, in this connexion, it is of interest to note that the quartz content of the Sophia Lake Formation increases from north (Baillie Hamilton Island) to south (Cornwallis Island), indicating that these clastics were probably derived also from the south.

A summation of the foregoing evidence suggests that the Sophia Lake Formation probably represents the northern, near-shore facies equivalent of the upper member of the Peel Sound and, if this is true, the early Lochkovian age (hesperius Zone) of the basal contact of the Sophia Lake marks the age of the inception of the crustal movement that produced the unconformity at the base of the upper member. There are noteworthy corollaries of these assumed relationships, namely that the basal contact of the Sophia Lake passes southward into the unconformity between the lower and upper members of the Peel Sound, and the deposition of the lower member of the Peel Sound probably continued into early Lochkovian time (Fig. 14).

The first evidence that an episode of crustal movement had commenced in parts of the Boothia Uplift that are situated north of Barrow Strait is recorded by coarse clastic deposits of the late Lochkovian (pesavis Zone) Snowblind Bay Formation in eastern Cornwallis Island and the fact that these deposits were derived from a west to northwesterly provenance, probably within Cornwallis Island itself. That this movement extended into northwestern Devon Island also is suggested by the probable correlation of the Prince Alfred Formation of that island with the Snowblind Bay Formation.

The upper Zlichovian to lower Dalejan (inversus Zone) Disappointment Bay Formation that overspread the bevelled edges of the rocks in the Boothia Uplift provides a firm upper age limit to the Early Devonian diastrophism that affected the uplift north of and probably also south of the strait.

There are reasons to believe that the Boothia Uplift north of Barrow Strait evolved in much the same manner as south of the strait, in that the initial episode of diastrophism indicated by the upper Lochkovian Snowblind Bay Formation affected axial parts of the uplift only, and that the width of the uplift was increased by a later diastrophic event. The transitional relationship of the Snowblind Bay to the underlying Sophia Lake Formation and the fact that Snowblind Bay beds are folded in conformity with the underlying rock units in eastern Cornwallis Island indicate that the width of the uplift was increased in an easterly direction by a diastrophic event that clearly postdates the Snowblind Bay. The age of this event is uncertain, but there is a possiblility that it is correlative with the deformation of westernmost parts of the Boothia Uplift in eastern Bathurst Island (*see* Kerr, 1974) that occurred considerably later than the late Lochkovian diastrophism indicated by the Snowblind Bay Formation itself. In eastern Bathurst Island, the Bathurst Island Formation appears to represent the youngest rock unit in the conformable lower Paleozoic succession beneath the angular unconformity at the base of the Disappointment Bay

Formation. The upper age limit of the Bathurst Island Formation is late Pragian or early Zlichovian (dehiscens Zone)[1], and it is therefore apparent that the diastrophism that affected eastern Bathurst Island occurred in about middle Zlichovian time (probably about gronbergi Zone).

The correlative ages of the upper member of the Peel Sound Formation and Snowblind Bay Formation indicate that the Early Devonian diastrophism of the Boothia Uplift was at least partly contemporaneous in the territories south and north of Barrow Strait and, although there is no conclusive evidence as to when this diastrophism terminated south of the strait, there is reason to believe that it may have occurred at about the same time as north of the strait. As noted in an earlier discussion, the Drake Bay and Peel Sound Formations are lateral equivalents of one another in Prince of Wales Island; the present day erosion surface marks the upper contact of both rock units; and the youngest fossils found to date in the upper member of the Peel Sound are late Lochkovian in age while those of the Drake Bay are late Pragian. Although interbeds of sandstone are a relatively subordinate constituent in the Drake Bay, they occur at one place or another throughout the entire thickness of the formation, and are commonly observed to pinch out or grade into shale or carbonate rocks in a westerly direction. Of interest in this regard also is the fact that a unit of unfossiliferous, fine grained grey sandstone, about 200 m thick appears to represent the youngest preserved part of the Drake Bay near the northwestern extremity of Prince of Wales Island. On the basis of the above evidence it seems reasonable to conclude that red beds of Pragian age were probably at one time present in the upper member of the Peel Sound and were subsequently removed by erosion (*see* Fig. 15). Comparable circumstances may well have applied to lower Zlichovian beds in both formations. In addition, the southernmost outcrops of the unconformable cover of Disappointment Bay rocks occur in Young Island, some 25 km north of Russell Island, suggesting that this formation and particularly the unconformity that it overlies probably at one time extended as far south as Russell and Prince of Wales Islands.

It should be pointed out that there is no positive evidence that those parts of the Boothia Uplift now separated by Barrow Strait were each deformed by two separate episodes of diastrophism within the Late Silurian to Early Devonian interval of time, other than the fact that both parts of the uplift appear to have been widened by movements that appear to postdate the initial movements. The possibility that more than two episodes of diastrophism were involved in each region, or that diastrophism once initiated was a more or less continuing affair that finally resulted in east and west widening cannot be discounted on the basis of available evidence.

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[1] T.T. Uyeno informs the writer (pers. com.) that he has collected Polygnathus dehiscens Philip and Jackson from a level of 12.20 m below the top of the type section of the Bathurst Island Formation in Bathurst Island. [Klapper and Johnson (1975) have also identified P. dehiscens in the upper part of the Eids Formation in southwestern Ellesmere Island. It would thus appear that the Eids Formation of southwestern Ellesmere, which is where this formation was defined originally by McLaren (1963), is correlative with the Bathurst Island Formation of Bathurst Island, and that it probably has nothing to do with the so-called Eids Formation of Bathurst Island.]

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APPENDIX

Precise locations of measured sections and isolated fossil localities shown in Figure 1

Locality 1. Centre of line of traverse for measured section shown in Figure 16 is at UTM Zone 15X, 486800E, 8305800N.

Locality 2. Centre of line of traverse for measured section shown in Figure 17 is at UTM Zone 15X, 487400E, 8305800N.

Locality 3. Measured section shown as Figure 18 is at UTM Zone 15X, 483700E, 7931750N.

Locality 4. Measured section shown as Figure 19 is at UTM Zone 15X, 447000E, 8201300N.

Locality 5. Lower fauna of measured section shown as Figure 20 is at UTM Zone 15X, 452300E, 8212000N. Upper fauna is at UTM Zone 15X, 451500E, 8214250N.

Locality 6. Centre of line of section for measured section shown as Figure 21 is at UTM Zone 14X, 586000E, 8054300N.

Locality 7. Base of measured section shown as Figure 22 is at UTM Zone 14X, 585700E, 8055500N. Top section at UTM Zone 14X, 585150E, 8055375N.

Locality 8. Base of measured section shown as Figure 23 is at UTM Zone 15X, 505300E, 8471400N. Top section at UTM Zone 15X, 504650E, 8471100N.

Locality 9. Base of measured section shown as Figure 24 is at UTM Zone 15X, 508000E, 8468000N. Top of section is at UTM Zone 15X, 507375E, 8467900N.

Locality 10. Measured section shown as Figure 25 is at UTM Zone 16, 492400E, 8492500N.

Locality 11. Monograptus yukonensis (C-8256) from Drake Bay Formation, northwestern Prince of Wales Island. UTM Zone 14X, 438600E, 8179150N.

Locality 12. Monograptus nilssoni (C-34716) from Cape Phillips Formation, Snowblind Creek, eastern Cornwallis Island. UTM Zone 15X, 475125E, 8344800N.

Locality 13. Monograptus fritschi linearis (C-34725) from Cape Phillips Formation, Snowblind Creek, eastern Cornwallis Island. UTM Zone 15X, 476200E, 8344800N.

Locality 14. Monograptus formosus (C-53227) from Cape Phillips Formation, eastern Cornwallis Island. UTM Zone 15X, 477750E, 8359800N.

Locality 15. Conodont fauna (C-55414) from top of Allen Bay Formation, Griffith Island. UTM Zone 15X, 431175E, 8271000N.

Locality 16. Conodont and graptolite fauna (C-67669) from Cape Phillips Formation, western Cornwallis Island. UTM Zone 15X, 422800E, 8351175N.

Locality 17. Ancoradella ploeckensis (C-67658, C-76121) from Cape Phillips Formation, western Cornwallis Island. UTM Zone 15X, 422000E, 8365800N.

Locality 18. Conodont faunas (C-63559, C-63558) from Douro Formation, 7.0 m and 0.3 m below the top of formation, respectively, southwestern Ellesmere Island. UTM Zone 16X, 489200E, 8499250N.

Locality 19. Conodont fauna (C-76051) from lower member of Barlow Inlet Formation, Griffith Island. UTM Zone 15X, 432100E, 8270350N.

Locality 20. Conodont fauna (C-54046) from upper member of Barlow Inlet Formation, 24.4 m below top of formation, eastern Cornwallis Island. UTM Zone 15X, 481750E, 8327500N.

Locality 21. Conodont fauna (C-76085) from upper member of Barlow Inlet Formation, eastern Cornwallis Island. UTM Zone 15X, 481700E, 8327650N.

Locality 22. Conodont fauna (C-49976) from lower part of Sophia Lake Formation, eastern Cornwallis Island. UTM Zone 15X, 481850E, 8327750N.

Locality 23. Conodont fauna (C-54044) from Sophia Lake Formation, western Devon Island. UTM Zone 15X, 516000E, 8345350N.

Locality 24. Vertebrate fauna (C-23623) from Snowblind Bay Formation, Eastern Cornwallis Island. UTM Zone 15X, 484000E, 8330800N.

Locality 25. Pedavis pesavis pesavis (C-8223) from Drake Bay Formation in northwestern Prince of Wales Island. UTM Zone 14X, 451150E, 8161750N.

Locality 26. Hemicyclaspis murchisoni from the lower member of the Peel Sound Formation in northwestern Somerset Island. About UTM Zone 15X, 431125E, 8212000N.

Locality 27. Pedavis sp. aff. P. thorsteinssoni (C-8245) from basal beds of Drake Bay Formation in western Prince of Wales Island. UTM Zone 14X, 458750E, 8079250N.

Locality 28. Conodont fauna (C-76069) from upper part of Devon Island Formation in southwestern Ellesmere Island. UTM Zone 16X, 489350E, 8498400N.

Locality 29. Conodont fauna (C-76083) from basal beds of Goose Fiord Formation in southwestern Ellesmere Island. UTM Zone 16X, 496175E, 8499800N.

Locality 30. Conodont fauna (C-76072) from upper beds of Goose Fiord Formation in southwestern Ellesmere Island. UTM Zone 16X, 489400E, 8498500N.

Locality 31. Conodont fauna (C-11477) from Disappointment Bay Formation in southern Cornwallis Island. UTM Zone 15X, 425150E, 8317900N.

Locality 32. Conodont fauna (C-2681) from Disappointment Bay Formation in Lowther Island. UTM Zone 14X, 547250E, 8274050N.

Locality 33. Conodont fauna (C-2682) from Disappointment Bay Formation in Lowther Island. UTM Zone 14X, 544300E, 8279500N.

Locality 34. Conodont fauna (C-3217) from Disappontment Bay Formation in Lowther Island. UTM Zone 14X, 547600E, 8272300N.

STRATIGRAPHY AND CONODONTS OF UPPER SILURIAN AND LOWER DEVONIAN ROCKS IN THE ENVIRONS OF THE BOOTHIA UPLIFT, CANADIAN ARCTIC ARCHIPELAGO

PART II

SYSTEMATIC STUDY OF CONODONTS

Abstract

This work includes the systematic paleontology and illustrations of conodonts of Late Silurian to Early Devonian age from the Allen Bay, Cape Storm, Douro, Barlow Inlet, Sophia Lake, Somerset Island, Peel Sound, Devon Island, and Sutherland River(?) Formations, sampled over a relatively wide area, including Cornwallis, Devon, Ellesmere, Prince of Wales, and Somerset Islands, and the Boothia Peninsula, of the Canadian Arctic Archipelago.

Newly introduced taxa include Pedavis thorsteinssoni and Pelekysgnathus arcticus.

The biostratigraphic significance of these conodonts and associated megafossils is given in Part I of this bulletin.

Résumé

Ce rapport comporte une étude paléontologique systématique et des illustrations des conodontes datant du Silurien supérieur au Dévonien inférieur, trouvés dans les formations d'Allen Bay, Cape Storm, Douro, Barlow Inlet, Sophia Lake, Somerset Island, Peel Sound, Devon Island et Sutherland River(?), répartis sur une superficie relativement vaste, y compris les îles Cornwallis, Devon, Ellesmere, Prince-de-Galles et Somerset et la presqu'île de Boothia, dans l'archipel Arctique canadien.

Les nouveaux taxa comprennent le Pedavis thorsteinssoni et le Pelekysgnathus arcticus.

La partie I du Bulletin donne l'importance biostratigraphique de ces conodontes et des megafossiles associés.

INTRODUCTION

This study is an expansion of an earlier summary of the conodont biostratigraphy of the type sections of the Barlow Inlet and Sophia Lake Formations on eastern Cornwallis Island (Uyeno, 1977). Included in it are conodonts of Late Silurian to Early Devonian age from the Allen Bay, Cape Storm, Douro, Barlow Inlet, Sophia Lake, Somerset Island, Peel Sound, Devon Island and Sutherland River(?) Formations, sampled over a relatively wide area, including Cornwallis, Devon, Ellesmere, Prince of Wales and Somerset Islands, and the Boothia Peninsula. Only the systematic paleontology and illustrations of conodonts are included in this second part of the volume. The appendix at the end provides detailed information on the number of specimens recovered.

The geological setting and lithostratigraphy of the area and strata related to the conodont study are discussed by Thorsteinsson in the first part of this volume. Also included in the first part is a discussion by Thorsteinsson and Uyeno on the biostratigraphic significance of the conodonts and associated megafossils. Where possible, attempts have been made to collate the graptolite and conodont zonations.

The conodonts discussed herein were derived from samples collected primarily by R. Thorsteinsson over a period of several field seasons, and are supplemented by a smaller collection made by the author at Goodsir Creek on eastern Cornwallis Island in 1968 (*see* McGregor and Uyeno, 1969).

The conodont specimens are generally extremely well preserved, and in their coloration fall mainly in the category of CAI 1 1/2 to 2 of Epstein et al. (1977).

Acknowledgments

Deep gratitude is expressed to R. Thorsteinsson who has provided the author with most of the conodont collections described and discussed herein. G. Klapper, University of Iowa, has kindly reviewed the manuscript.

Previous conodont studies

Previous investigations of conodonts in strata equivalent in time to the Douro and the type Barlow Inlet Formations include the following: Weyant's (1971) study of what was then referred to as member C, of the Read Bay Formation to the south of Laura Lakes on eastern Cornwallis Island, and the Douro Formation east of Camp Creek and in an area north of Prince Alfred Bay, both on Devon Island. Conodont species from these localities were listed (Weyant, 1971, Table 8, p. 40). Of the three critical platform elements (all spathognathodontan) on the list, only one was illustrated and described. Correlation of Weyant's faunas with those of the present report, consequently, is extemely difficult. Mirza (1976) studied the conodonts of the Cape Storm and Cape Phillips Formations at Vendom Fiord, southwestern Ellesmere

Island. In that study, parts of the Cape Phillips Formation are shown as correlatives of the Douro Formation (in revised sense, allowing for the Cape Storm Formation; Fig. 4, p. 12, Sec. B, p. 191-193) but, unfortunately, no conodonts were recovered from this interval.

Systematic paleontology

The types and figured specimens are deposited in the collections of the Geological Survey of Canada, Ottawa.

CONODONTA

Family Polygnathidae Bassler, 1925

Type genus. Polygnathus Hinde, 1879.

Genus Ozarkodina Branson and Mehl, 1933

Type species. Ozarkodina confluens (Branson and Mehl, 1933) [= Ozarkodina typica Branson and Mehl, 1933].

Ozarkodina confluens (Branson and Mehl)

Plate 1, figures 1-34

Spathodus primus Branson and Mehl, 1933, p. 46, Pl. 3, figs. 25-30 (Pa).

Ozarkodina confluens (Branson and Mehl), Klapper and Murphy, 1975, p. 30-33, Pl. 3, figs. 1-23, Pl. 4, figs. 1-27, Pl. 8, figs. 11-15 (multielement) (includes synonymy); Cooper, 1977a, p. 187-188, Pl. 16, figs. 1-7 (multielement).

Remarks. Klapper and Murphy (1975) distinguished five informal morphotypes of Ozarkodina confluens, based on the differences in the Pa element. Of these, alpha, gamma and delta morphotypes, and a form transitional between gamma and epsilon morphotypes, were found in the present study. In addition, the Cape Storm Formation yielded a form that is left undesignated. The gamma-epsilon transitional form (Pl. 1, figs. 24, 25, 27, 28) is a blade with a moderately arched lower margin, and with a high denticle located in the anterior third, preceded anteriorly, in some specimens, by one or two, and as many as four, minute denticles. A reclining second high denticle is situated posteriorly, separated from the first by two to four smaller denticles.

Some of the Peel Sound specimens assignable to Ozarkodina confluens gamma morphotype have a series of minute, closely spaced denticles in the posterior two-thirds of the blade (Pl. 1, figs. 22, 23). In this respect, these are morphologically similar to the form referred to O. confluens multidentatus, described from the lower Wills Creek Formation in the central Appalachian Mountains, by Helfrich (1975, Appendix p. 1-59).

The morphotype from the Cape Storm Formation at Goodsir Creek, eastern Cornwallis Island (GSC locs. 83334, 83335; *see* Pl. 1, figs. 26, 29, 30) cannot be assigned readily to any of Klapper and Murphy's (1975) morphotypes, but it is still considered to fall within the concept of Ozarkodina confluens. One of these (Pl. 1, fig. 29) morphologically approaches the Pa element of O. interposita (Mashkova), but differs slightly in the width of the denticles. The latter may belong to O. confluens (*see* Fåhraeus, 1974, p. 31).

Consideration has been given to the possibility that the Cape Storm morphotype may be more correctly assignable to Oulodus sp. 1 as its Pa element. There are some differences between this morphotype and the elements herein assigned to Oulodus sp. 1, however, in the pattern of denticulation and in the peculiarly consistent small size of the Oulodus elements.

The delta morphotype is not illustrated, nor is its locality given in the Appendix, as it was recovered after Part II of this volume was almost completed. It is listed in Part I, however, with those conodonts recovered from the Devon Island Formation, 7 m below the top of the formation, on Ellesmere Island (GSC loc. C-76069, loc. 28 on Figure 1 of Part I).

Figured specimens. GSC 49787, 55545 to 55576.

Ozarkodina douroensis, n. sp.

Plate 2, figures 18-39

Spathognathodus n. sp., Weyant, 1971, p. 117, Pl. 12, figs. 1, 2 (Pa).

Ozarkodina n. sp. B, Klapper and Murphy, 1975, p. 44, Pl. 8, figs. 1-4, 7-9 (Pa).

Ozarkodina n. sp. B of Klapper (in Klapper and Murphy, 1974)[sic], Uyeno, 1977, p. 214, Pl. 41.1, fig. 32 (Pa).

Diagnosis. A species of Ozarkodina the Pa element of which is characterized by a lateral accessory set(s) of denticles on one or both sides of the blade, and a large bifurcated pit. The anterior one third of the blade is slightly offset to the right side.

Description. Pa element. The straight blade has an anterior one third that is slightly offset to the right side. The secondary set of denticles extends from the anterior edge of the pit to near the posterior end of the blade, and may be located on either side of the blade and, in rare specimens, occurs on both sides. The accessory denticles consist of two components: (a) an anterior set of 3 to 4 denticles arranged in a row on a platform that diverges outwardly at the anterior end, and (b) 2 to 4 isolated sets of denticles that may be connected to the blade by thin ridges. Both components are separated from the blade by a deep adcarinal groove, although the thin ridges noted above may traverse this gap. The large bifurcated pit is situated immediately anteriorly of the midlength of the blade; its outer extension is 2 to 3 times longer than the inner. Narrow grooves are also extended under the free blade and the main part of the blade. The pit and its posterior extension are enveloped by an inverted basal cavity.

The Pb, M and Sb elements of Ozarkodina douroensis are similar to those of O. confluens (Branson and Mehl), illustrated herein and by others (e.g., Jeppsson, 1969, Text-fig. 2; Klapper and Murphy, 1975, Pl. 4, figs. 1-6, 8-13). The Sa element of O. douroensis differs slightly in having denticles that are spaced more widely apart than in its counterpart of O. confluens; in this respect it approaches the morphology of Oulodus.

Remarks. The Pa elements of Ozarkodina douroensis and O. confluens are morphologically similar, as already noted by Klapper and Murphy (1975, p. 44). The new species may have evolved from the latter through and intermediary stage such as that represented by O. cf. O. douroensis (Pl. 4, figs. 13, 14). This conjecture is supported by the fact that at Goodsir Creek, eastern Cornwallis Island, O. cf. O. douroensis occurs near the top of the Cape Storm Formation, below the first occurrence of the new species.

Stratum typicum and locus typicus. Douro Formation, 12.2 m above the base of the formation, eastern Prince of Wales Island, GSC locality C-64003 (*see* Fig. 21 of Part I).

Holotype. The specimen illustrated on Plate 2, figures 36-38 (GSC 55589).

Paratypes. GSC 49788, 55587, 55588, 55590 to 55597.

Derivation of name. From the Douro Formation.

Material. Number of specimens of Pa element (135), Pb (29), M (10), Sc (1), Sb (6), Sa (5).

Ozarkodina cf. O. douroensis, n. sp.

Plate 4, figures 13, 14

Ozarkodina cf. O. n. sp. B of Klapper (in Klapper and Murphy, 1974)[sic], Uyeno, 1977, p. 214, Pl. 41.1, figs. 7, 8 (Pa).

Remarks. Only the spathognathodontan element of Ozarkodina cf. O. douroensis has been recovered thus far. It is similar to the Pa element of O. douroensis but possesses only an abbreviated platform. It may be an intermediary form between Ozarkodina confluens and O. douroensis, as suggested by its morphology and stratigraphic position. See also remarks under O. douroensis.

An identical form is also present 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 3300 to 3400 feet (1005.8 - 1036.3 m). The well is located on Bjorne Peninsula in southwestern Ellesmere Island (77°15'27.00"N, 86°18'07.08"W) (*see* Mayr et al., 1978, for further details on stratigraphy and geological setting).

Figured specimen. GSC 49772.

Ozarkodina cf. O. eurekaensis Klapper and Murphy

Plate 2, figures 1-5

Ozarkodina cf. O. eurekaensis Klapper and Murphy, Klapper and Murphy, 1975, p. 34, Pl. 5, figs. 18-23 (Pa); Uyeno, 1977, p. 215, Pl. 41.1, figs. 3-6 (Pa).

Remarks. The Read Bay specimens are similar in denticulation pattern to those reported from the Roberts Mountains Formation in Nevada (Klapper and Murphy, 1975, p. 34, Pl. 5, figs. 18-23). The latter form has a more asymmetrical outline of the lobes and, in this respect, the present specimens are closer to O. eurekaensis.

Figured specimens. GSC 49770 and 49771.

Ozarkodina excavata excavata (Branson and Mehl)

Plate 2, figures 6-13, 17

Prioniodella inclinata Rhodes, 1953, p. 324, Pl. 23, figs. 233-235 (Pa).

Spathognathodus inclinatus inclinatus (Rhodes), Link and Druce, 1972, p. 88-90, Pl. 9, figs. 12-19, Text-fig. 57 (Pa).

Hindeodella excavata excavata (Branson and Mehl), Jeppsson, 1972, p. 25-31, Pl. 4, figs. 1-17 (multielement) (includes synonymy).

Ozarkodina excavata excavata (Branson and Mehl), Klapper and Murphy, 1975, p. 34-37, Pl. 6, figs. 1-20 (multielement).

Ozarkodina excavata Fåhraeus[sic], Mehrtens and Barnett, 1977, p. 497, Pl. 1, figs. 11, 12, 14, 18, 21 (multielement).

Ozarkodina excavata (Branson and Mehl), Cooper, 1977a, p. 188, Pl. 16, figs. 8-15 (multielement).

Remarks. Jeppsson (1972, p. 29-31) recently gave a detailed account of O. excavata excavata and its comparison with closely related forms. The Sc element of this nominate subspecies may have been identical to that of O. n. sp. A (*see* under remarks of the latter).

Figured specimens. GSC 55577 to 55585.

Ozarkodina remscheidensis remscheidensis (Ziegler)

Plate 3, figures 1-12, 21-23, 29-38

Spathognathodus remscheidensis Ziegler, 1960, p. 194-196, Pl. 13, figs. 1, 2, 4, 5, 7, 8, 10, 14 (Pa); Link and Druce, 1972, p. 92-93, Pl. 10, figs. 1-7, Text-fig. 60 (Pa).

Hindeodella steinhornensis remscheidensis (Ziegler), Jeppsson, 1974, p. 35.

Ozarkodina remscheidensis remscheidensis (Ziegler), Klapper in Ziegler, 1973, p. 241-242, Ozarkodina Pl. 2, fig. 4 (Pa) (includes synonymy); Klapper and Murphy, 1975, p. 41-43, Pl. 7, figs. 22, 25-30 (Pa) (includes synonymy); Mehrtens and Barnett, 1977, p. 497, Pl. 1, figs. 7, 10 (Pa).

Ozarkodina remscheidensis (Ziegler), Savage, 1976, p. 1182, Pl. 1, figs. 1-15 (multielement).

Remarks. An apparatus of a "late" form of Ozarkodina remscheidensis remscheidensis (= "Spathognathodus" canadensis Walliser; *see* Klapper et al., 1971, Fig. 1) was recovered from the upper part of the Devon Island Formation on Devon Island (GSC loc. C-55404; *see* Fig. 24 of Part I). The Sa element of this particular apparatus appears to be diplododellan, as it has a short, denticulated posterior process, accompanied by an extremely small pit. Other constituent elements are similar to those of the apparatus of the nominate subspecies illustrated previously by others and herein (*see* synonymy). If the Devon Island reconstruction is correct, it suggests an early evolving trend towards Pandorinellina. Pandorinellina optima (Moskalenko), a late Lochkovian-Pragian form, has been suggested as the earliest development of the diplododellan element (Klapper and Philip, 1972, p. 99; Klapper in Ziegler, 1973, p. 324).

An apparatus was recovered from higher up in the same section, in either the basal Sutherland River or upper Devon Island Formations (GSC loc. C-33707*), and is herein

* The exact stratigraphic interval of GSC locality C-33707 is not known. R. Thorsteinsson has informed the author that it is probably either the basal 3 to 4 m of the Sutherland River Formation, or the uppermost 3 to 4 m of the Devon Island Formation.

illustrated on Plate 3, figures 13-15, 18-20, 24-28. The Pa element of this reconstruction is remotely similar to that of the "late" form of Ozarkodina remscheidensis remscheidensis, but differs in having an anterior third of the blade that is distinctly higher than the remainder of the blade. In this regard it more closely resembles the Pa element of Pandorinellina optima. The Sa element of this apparatus is trichonodellan, and the species is assignable to Ozarkodina.

Figured specimens. GSC 49774, 55598 to 55607, 55618 to 55626.

Ozarkodina cf. O. remscheidensis remscheidensis (Ziegler)

Plate 4, figures 1-10

cf. Spathognathodus remscheidensis Ziegler, 1960, p. 194-196, Pl. 13, figs. 1, 2, 4, 5, 7, 8, 10, 14 (Pa).

Remarks. Fourteen Pa elements that are only remotely similar to the "late" form of Ozarkodina remscheidensis remscheidensis have been recovered from the upper part of the Devon Island Formation at a section near the Sutherland River, Devon Island (GSC locs. C-33704, C-55405, C-33706; see Fig. 24 of Part I). They are from the same samples that yielded forms that are assigned to the "late" form of O. remscheidensis remscheidensis without reservation, and differ from the latter in the following features: the denticulation of O. cf. O. remscheidensis remscheidensis is broader, fewer in number, and less symmetrically arranged; the anterior third of the blade tends to be higher. The Devon Island specimens also have wide areas of the blade with white matter in contrast to O. remscheidensis remscheidensis. The Pb element is morphologically similar to the Pa element in its denticulation characteristics, i.e., wide, few in number, and bluntly pointed, and with its lateral sides that are broadly convex. The remaining elements of the apparatus remain unknown although there is a remote possibility that they may be vicarious with the apparatus of O. remscheidensis remscheidensis.

Figured specimens. GSC 55627 to 55632.

Ozarkodina n. sp. A of Klapper and Murphy (1975)

Plate 4, figures 11, 12, 19-37

Ozarkodina n. sp. A, Klapper and Murphy, 1975, p. 43-44, Pl. 2, figs. 7, 9-12 (Pa); Uyeno, 1977, p. 215, Pl. 41.1, figs. 21, 26 (Pa).

Remarks. The Pa elements referred to Ozarkodina n. sp. A are similar to those reported from the Roberts Mountains Formation in Nevada by Klapper and Murphy (1975, p. 43-44). Some of the features that are common to these two groups are the broad, closely spaced denticles that are of fairly uniform height, extending from the anterior edge of the blade to a position above the posterior edge of the basal cavity; the 3 to 4 lower denticles immediately posterior of the basal cavity, and the peculiarly shaped lobes above the basal cavity. In the present material, there are 3 to 4 additional slightly larger denticles, but which are still smaller than those on the anterior part of the blade, that are situated immediately to the posterior of these lower denticles. The extreme posterior ends of all three illustrated Nevada specimens are broken, so a detailed comparison of this particular feature is difficult to make but, according to Klapper and Murphy's description, there are 5 to 6 denticles posterior of the cavity. This compares with 5 to 7 denticles on this part of the blade in the present collection.

One set of apparatus of Ozarkodina n. sp. A has been reconstructed from a talus collection from the lower part of the Devon Island Formation at Sutherland River on Devon Island (GSC loc. C-55407; see Fig. 23 of Part I), which also yielded Ozarkodina confluens and O. excavata excavata. All three apparatuses from this locality are illustrated herein on Plate 1, figures 8, 10, 12-15, Plate 2, figures 8, 9, 11-13, 17, and Plate 4, figures 21-29, 33-37. The Pb, Sb and Sa elements are readily distinguished in these species. The M element of O. n. sp. A differs only slightly from that of O. excavata excavata in having a shorter process, with one and possibly two denticles, anterior of the cusp; like the latter, however, the anterior process is sharply bent outward. The Sc element may be vicarious in O. n. sp. A and O. excavata excavata, and in the abundance chart the total has been divided equally between these species. This division is probably not accurate in view of the fact that there are 116 Pa elements of O. n. sp. A as opposed to only 70 of O. excavata excavata.

Figured specimens. GSC 49780, 55633, 55634, 55637 to 55649, 56147.

Ozarkodina cf. O. n. sp. E of Klapper and Murphy (1975)

Plate 3, figures 16, 17

cf. Ozarkodina n. sp. E, Klapper and Murphy, 1975, p. 44-45, Pl. 7, figs. 6, 9, 10 (Pa).

Remarks. A single Pa element has been recovered from the basal Devon Island Formation at a section near the Sutherland River, Devon Island (GSC loc. C-33700; see Fig. 24 of Part I) that morphologically approaches that of Ozarkodina n. sp. E of Klapper and Murphy (1975, p. 44-45) from the Roberts Mountains Formation in Nevada. Like the latter, the Devon Island specimen has an anterior blade that consists of uniform denticles, followed by an isolated cusp located above the basal cavity, just posterior of midlength. At the extreme posterior end of the blade it likewise has two denticles of similar size to those on the anterior blade. Immediately posterior of the cusp, however, the present form has only a single minute denticle, whereas the Nevada form exhibits 3 to 4 minute denticles at this site.

Figured specimen. GSC 55617.

Ozarkodina n. sp. F of Klapper and Murphy (1975)

Plate 4, figures 15-18; Plate 5, figures 1-7

Ozarkodina n. sp. F, Klapper and Murphy, 1975, p. 45, Pl. 5, figs. 24-26 (Pa); Uyeno, 1977, p. 215.

Remarks. A single sample from Sophia Lake Formation on western Devon Island (GSC loc. C-54044; Loc. 23 on Fig. 1 of Part I) yielded 34 Pa elements that are referable to Ozarkodina n. sp. F of Klapper and Murphy (1975) and to O. remscheidensis remscheidensis (Ziegler). Some are morphologically transitional between these species, as illustrated by a form on Plate 5, figure 1. The remaining elements (including the Pb, illustrated on Pl. 4, fig. 18, and Pl. 5, figs. 6, 7) of Ozarkodina n. sp. F may have been shared with O. remscheidensis remscheidensis.

Figured specimens. GSC 55635, 55636, 55650 to 55654.

Ozarkodina n. sp. G

Plate 5, figures 8-20

Ozarkodina n. sp. G, Uyeno, 1977, p. 215, Pl. 41.1, figs. 22-24 (Pa).

Remarks. The Pa element of Ozarkodina n. sp. G is characterized by large, slightly asymmetrical lobes over the basal cavity, the outer side of which protrudes more than the inner side. The anterior margin of the two lobes is abruptly expanded, and located just anterior of the midlength of the blade. The posterior margin is similarly abrupt in most specimens, although in a few it comes to a more gradual tapering, producing a heart-shape (compare Pl. 5, figs. 10, 13). In other respects, the Pa element is similar to its counterpart of Ozarkodina confluens (Branson and Mehl) gamma morphotype of Klapper and Murphy (1975, p. 32). The remaining constituent elements, especially the Pb element, are similar to those of Ozarkodina eurekaensis Klapper and Murphy, illustrated previously by Klapper and Murphy (1975, Pl. 5, figs. 1-6, 8).

The Pa element of Ozarkodina n. sp. G is similar to that of O. n. sp. F of Klapper and Murphy in the shape and position of the basal cavity. The differences in the denticulation readily serve to distinguish the two.

Figured specimens. GSC 49782, 49783, 55655 to 55662, 58362.

Ozarkodina n. sp. H

Plate 5, figures 21-31

Remarks. Forty-nine Pa elements of Ozarkodina are placed in open nomenclature. The element is characterized by the small, closely spaced denticles of uniform height that extend from the anterior edge of the blade to a position above the posterior edge of the basal cavity. Posteriorly of the basal cavity are 4 to 5 denticles that are broad, widely spaced, and about twice the size of the anterior denticles. The lobes above the basal cavity are similar to those of Ozarkodina n. sp. A of Klapper and Murphy (1975) (also illustrated herein on Pl. 4, figs. 32, 36), i.e., they are short, restricted and "ear-shaped". In contrast to the Pa element of Ozarkodina n. sp. A, the present form has denticles that are small anteriorly of the basal cavity, and large posteriorly of it.

In some specimens at least, there is a very shallow and narrow groove developed on the upper surface of the denticles that lie immediately above and anterior of the basal cavity (*see* Pl. 5, figs. 21, 24). This may be an incipient development of a feature that is more prominently displayed in later species, such as Eognathodus sulcatus Philip. That Eognathodus may have evolved from Ozarkodina has already been suggested by Klapper and Philip (1972, p. 98) and Klapper (in Ziegler, 1977, p. 112).

The Pb elements of Ozarkodina n. sp. A and O. n. sp. H are similar, i.e., both are assignable to form-species "Ozarkodina" denckmanni Ziegler. Other elements are still unknown.

Figured specimens. GSC 55663 to 55669.

Ozarkodina n. sp. I

Plate 2, figures 14-16

Remarks. Three Pa elements of Ozarkodina are placed in open nomenclature. The Pa element is characterized by evenly arched lower and upper margins. The lobes above the basal cavity, situated posteriorly of midlength, are asymmetrical with the larger of the two on the outer side. Wide, tapering grooves follow anteriorly and posteriorly from the basal cavity, and extend to the extremities of the blade. The remaining elements of the apparatus have not been identified, but may have been shared with Ozarkodina remscheidensis remscheidensis. A complete apparatus of the latter species, based on previous reconstructions in literature and on material described herein, has been found in the same sample (Devon Island Formation on Devon Island, GSC loc. C-33700; *see* Fig. 24 of Part I).

Figured specimen. GSC 55586.

Family Icriodontidae Müller and Müller, 1957

Type genus. Icriodus Branson and Mehl, 1938.

Genus Icriodus Branson and Mehl, 1938

Type species. Icriodus expansus Branson and Mehl, 1938.

Remarks. Bultynck (1976) reassigned some species previously referred to Icriodus to two new genera, Caudicriodus and Praelatericriodus, and reintroduced Latericriodus, previously proposed by Müller (1962). In the present study, this procedure is not followed, and the term Icriodus is used in its former concept.

In the following discussions of the I elements, those morphological terms suggested by Bultynck (1976, p. 19, Text-fig. 1) are used.

Icriodus woschmidti hesperius Klapper and Murphy

Plate 5, figures 41-46

Icriodus woschmidti hesperius Klapper and Murphy, 1975, p. 48-49, Pl. 11, figs. 1-19 (multielement); Klapper, 1977, p. 51.

Icriodus woschmidti woschmidti Ziegler, Chatterton and Perry, 1977, p. 793, Pl. 3, figs. 18-22 (I).

Remarks. In terms of the three morphotypes of Caudicriodus woschmidti as distinguished by Bultynck (1976, p. 22, 24), Icriodus woschmidti hesperius may possibly be assignable to the alpha morphotype.

Figured specimens. GSC 55677 to 55680.

Icriodus n. sp. C

Plate 5, figures 32, 33

Remarks. A single, small I element was recovered from the Devon Island Formation on Devon Island. Its middle row denticles in the central part of the principal platform are weakly developed, and are connected to lateral row denticles by low, sagging ridges. The only well-developed transverse crest is located immediately anterior of the posterior denticles. A thin ridge occurs on the upper surface of the very abbreviated principal process.

Figured specimen. GSC 55670.

Genus Pedavis Klapper and Philip, 1971

Type species. Icriodus pesavis Bischoff and Sannemann, 1958.

Remarks. In the following descriptions of species of Pedavis, those morphological terms suggested by Bultynck (1976, p. 19, Text-fig. 1) for Caudicriodus have been used where applicable. In addition, the term "junction points" refers to the sites where the lateral processes meet the principal platform, and the "angle of divergence" refers to the angle measured between the lateral processes.

Pedavis latialata (Walliser)

Plate 6, figures 23, 24, 30-38

Icriodus latialatus Walliser, 1964, p. 38, Pl. 9, fig. 1, Pl. 11, fig. 13 (I).

Pedavis latialata (Walliser), Klapper and Philip, 1971, p. 439, fig. 9, (multielement); Klapper and Murphy, 1975, p. 49-50, Pl. 12, figs. 16, 18, 19 (I); Mehrtens and Barnett, 1977, p. 496, Pl. 1, fig. 17 (I).

Remarks. The junction points of the lateral processes are offset, with the inner one located at the anterior principal denticle, and the outer one slightly anterior of it. In the large specimens, this relationship is generally obscured owing to crenulation of the upper surface. The angle of divergence of the lateral processes ranges from about 100 to 110 degrees. The posterior process is long, with a generally sharp inward bend just behind the posterior principal denticle.

The S_1 element is highly costate with only weakly serrated upper surfaces on its anterior and posterior processes. The M_2 element is similarly costate, and ranges from a simple cone to a cusp with one or two smaller denticles near the base.

The I element of Pedavis latialata exhibits a rather wide range of morphological variation. Walliser's (1964, Pl. 11, fig. 13) illustration shows a sigmoidal outline of the principal platform and the posterior process, with a long, wide outer principal process and a much shorter inner secondary process. Klapper and Murphy (1975, p. 50) have noted that the variation extends to those specimens with lateral processes of about equal length. Also, Klapper and Philip (1971, p. 438, fig. 9) and Mehrtens and Barnett (1977, Pl. 1, fig. 17) have illustrated I elements from the uppermost Kopanina beds of Bohemia, that have an almost straight outline. As a sidenote, it appears that this spectrum of variations also holds for Pedavis pesavis pesavis (Bischoff and Sannemann) (compare, e.g., Klapper and Philip, 1971, p. 447, fig. 14, and Klapper and Philip, 1972, Pl. 4, fig. 10).

Figured specimens. GSC 49773, 55700 to 55707.

Pedavis thorsteinssoni, n. sp.

Plate 6, figures 1-22, 25-29

Pedavis n. sp. T, Uyeno, 1977, p. 215, Pl. 41.1, figs. 27-29 (I).

Diagnosis. A species of Pedavis the I element of which has a pair of anteriorly-directed lateral processes; a second pair of posteriorly-directed lateral processes is incipiently developed. The junction points are opposite for both pairs.

Description. I element. In upper view, the main platform has icriodontan denticulation, i.e., with the median row flanked by two lateral rows. Individual nodes may be distinctive (as illustrated on Pl. 6, figs. 4, 17, 20) or suppressed (Pl. 6, figs. 1, 7, 16), but in both cases a longitudinal ridge runs throughout the median row and all three rows are laterally interconnected by ridges. The ridges tend to bi- and trifurcate over the lateral rows. The two principal denticles, which are of similar size, are situated immediately posterior of the platform. These denticles are followed posteriorly by a long posterior process which may form a smooth, slightly sinuous curve with the main platform, or which may be deflected sharply at midpoint. The denticles on the posterior process are multicostate, are considerably smaller than the principal denticles, and are interconnected by a median ridge which runs throughout the length of the process.

The lateral processes are short, with the outer one only slightly longer. The upper surface usually exhibits a simple ridge which may split distally. The junction points are opposite and occur at the anterior principal denticle. The angle of divergence is 130 to 135 degrees.

An incipiently developed pair of posteriorly-directed lateral processes is usually present. Its junction points are also opposite, located at the posterior principal denticle. As with the anteriorly-directed pair, the outer process is slightly longer. The upper surface is generally smooth, but may show incipiently developed ridges (e.g., *see* Pl. 6, fig. 7).

In lateral view, the denticles of the three rows on the principal platform are of the same height. The two principal denticles are prominent and the lower margin is straight.

S_1 element. The S_1 element is similar to that of Pedavis latialata (Walliser), but may have finely costate to almost smooth surfaces. The upper ridges of the anterior and posterior processes are smooth or only weakly serrated.

M_2 element. The M_2 element is represented by a rather variable set of cones, both smooth and costate. Some cones are similar to those of Pedavis pesavis pesavis (Bischoff and Sannemann), illustrated by Klapper and Philip (1972, Pl. 3, figs. 2-6). In these cones, one or two accessory denticles may be present near the base of the cusp. Other cones have a drepanodontan morphology.

Remarks. Small specimens of the I element of Pedavis thorsteinssoni have a relatively short posterior process, and are morphologically close to those individuals herein referred to P. aff. P. thorsteinssoni. They can be distinguished by the denticulation pattern on the upper surface of the principal platform; in the former, the lateral row denticles are well developed even at this early growth stage, and extend posteriorly as far as the first median row denticle. In the case of P. aff. P. thorsteinssoni, however, the median row may extend from one to three denticles posteriorly beyond the first lateral row denticles. Furthermore, the two principal denticles of P. thorsteinssoni are very similar in size, whereas in P. aff. P. thorsteinssoni the posterior principal denticle is always larger.

Pedavis thorsteinssoni differs from other species of Pedavis in its characteristic, weakly-developed lateral processes.

Stratum typicum and locus typicus. Sophia Lake Formation, 239 m above the base of the formation, Goodsir Creek, eastern Cornwallis Island, GSC locality C-19837 (*see* Fig. 17 of Part I).

Holotype. The specimen illustrated on Plate 6, figures 1-3 (GSC 49785).

Paratypes. GSC 49786, 55681 to 55699.

Derivation of name. After Dr. R. Thorsteinsson, Geological Survey of Canada.

Pedavis aff. P. thorsteinssoni, n. sp.

Plate 5, figures 34-40, 47-49

Remarks. The I element of Pedavis aff. P. thorsteinssoni differs from the same element of P. thorsteinssoni in the following feature: the short, anteriorly-directed lateral processes are only incipiently developed, with an inconspicuous ridge on the upper surface of one or both processes. As with the latter species, however, the junction points are opposite, and are located at the anterior principal denticle. The posterior principal denticle is the largest, which is followed posteriorly by a sharply-deflected process that has a serrated upper edge.

The stratigraphic positions of Pedavis aff. P. thorsteinssoni and P. thorsteinssoni at Goodsir Creek, eastern Cornwallis Island (*see* Fig. 17 of Part I), and the morphological similarities of the former with the small specimens of the latter suggest a possible phylogenetic linkage between these species.

Figured specimens. GSC 55671 to 55676.

Pedavis n. sp. A

Plate 7, figures 41-48

? Pedavis n. sp. C, Klapper and Murphy, 1975, p. 50, Pl. 12, fig. 12 (I).

Diagnosis. A species of Pedavis the I element of which has lateral processes of almost equal length, and with an angle of divergence of 110 to 120 degrees. The junction points of these processes are opposite. The posterior process is short, and is strongly deflected laterally and downward at midlength.

Description. I element. The platform has icriodontan denticulation with dominant lateral rows and a suppressed median row. The median row is represented by a thin longitudinal ridge, and the lateral row nodes are interconnected with the median row by a series of thin cross ridges. The ridges split over lateral row nodes. The outline of the principal platform to midlength of the posterior process is gently curved; the posterior half of the posterior process, however, is abruptly curved laterally outward and downward. The upper surface of the posterior process exhibits only a median row of nodes. The lateral processes are of almost equal length, with the outer process being slightly longer. The upper surface of the lateral processes has a similar denticulation to the principal platform. The junction points are opposite, located at the anterior principal denticle; the angle of divergence is 110 to 120 degrees.

The M_2 element consists of costate cones, similar to those of other species of Pedavis. No S_1 element has been recovered.

Remarks. The I element of Pedavis n. sp. A differs from previously described forms in its characteristic posterior process. An I element identified as Pedavis n. sp. C by Klapper and Murphy (1975, p. 50, Pl. 12, fig. 12) may belong to P. n. sp. A. The Nevada specimen is a small form and it is difficult to further assess this problem with the currently available literature.

Figured specimens. GSC 55734 to 55739.

Genus Pelekysgnathus Thomas, 1949.

Type species. Pelekysgnathus inclinatus Thomas, 1949.

Pelekysgnathus arcticus n. sp.

Plate 7, figures 1-27

Pelekysgnathus n. sp. A, Uyeno, 1977, p. 215, Pl. 41.1, figs. 13, 14 (I).

Description. The I element is characterized by a large reclining posterior principal denticle which is about twice the size of the remaining denticles. The anterior half of its upper margin is convex, whereas the posterior part is nearly flat. The lower margin is slightly arched to straight. The posterior one third of the basal cavity is widely expanded, with a blunt apex at the posterior end and a tapering point at the anterior end. Anteriorly of the posterior principal denticle, the upper surface carries 7 to 9 denticles of almost uniform size.

The S_2 element is acodinan. The M_2 element is a simple cone that is weakly costate or smooth. The base of the unit varies considerably from circular to elliptical to lachrymiform outline. Some of these include forms that are transitional between M_2 and S_2 elements, similar to those illustrated by Chatterton and Perry (1977, p. 792-799, Pl. 4, figs. 14, 15) for Icriodus hadnagyi Chatterton and Perry.

Remarks. To date the oldest known species of Pelekysgnathus is P. index Klapper and Murphy of Pridolian age. Although the age of P. arcticus cannot be stated in precise terms, it appears to be at least as old, if not older, than P. index.

The I element of Pelekysgnathus arcticus differs from its counterpart of P. klamathensis Savage (Early Devonian, Klamath Mountains, California; Savage, 1977, p. 59, 61) as follows: P. arcticus has a much broader basal cavity, a more prominent cusp, and more distinct denticles along the blade.

Stratum typicum and locus typicus. Sophia Lake Formation, 239 m above the base of the formation, Goodsir Creek, eastern Cornwallis Island, GSC locality C-19837 (*see* Fig. 17 of Part I).

Holotype. The specimen illustrated on Plate 7, figures 4-7 (GSC 55708).

Paratypes. GSC 49775, 55709 to 55724.

Material. Number of specimens of I elements (249), S_2 (97), and M_2 (621).

Pelekysgnathus n. sp. B

Plate 7, figures 28-34, 39, 40

Pelekysgnathus n. sp. B, Uyeno, 1977, p. 215, Pl. 41.1, figs. 15, 16 (I).

Remarks. Four I elements and accompanying cone elements of Pelekysgnathus are placed in open nomenclature. The I element is characterized by a large reclining posterior principal denticle that is almost twice the size of the anterior principal denticle. The remaining 3 to 4 denticles are extremely minute. The anterior margin is concave and meets the lower margin of the unit at a sharp angle. The posterior half of the basal cavity outline is widely expanded with a slight indentation on the outer side of the flare.

The accompanying elements of Pelekysgnathus n. sp. B are atypical of the genus, and are morphologically close to those of some species of Pedavis. The S_2 element, for example, has a highly expanded anterior face, producing an almost triangular outline of the basal cavity. It therefore approaches a modified sagittodontan (S_1) element in appearance. One M_2 element has an accessory denticle near the base of the cusp, again, similar to some cone elements that accompany Pedavis.

Figured specimens. GSC 55725 to 55730.

Pelekysgnathus n. sp. C

Plate 7, figures 35-38, Plate 8, figures 1-8

Remarks. Eight I elements of Pelekysgnathus are placed in open nomenclature. The I element is characterized by a dominant reclining posterior principal denticle 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 denticles, other than the posterior principal denticle, are of similar size, making the upper marginal outline flat to slightly convex. The posterior half of the basal cavity is widely expanded.

The S_2 and M_2 elements of Pelekysgnathus n. sp. C are all costate, some more coarsely so than others.

Pelekysgnathus n. sp. C differs from P. arcticus in its more prominent posterior principal denticle and an almost perpendicular anterior margin.

Figured specimens. GSC 55731 to 55733, 55740 to 55745.

Family Uncertain

Genus Ancoradella Walliser, 1964

Type species. Ancoradella ploeckensis Walliser, 1964.

Ancoradella ploeckensis Walliser

Plate 8, figures 17, 18, 19?, 20, 21

Ancoradella ploeckensis Walliser, 1964, p. 28-29, Pl. 16, figs. 16-21 (Pa); Klapper and Murphy, 1975, p. 52, Pl. 9, figs. 12-14 (Pa) (includes synonymy); Uyeno, 1977, p. 214, Pl. 41.1, fig. 25 (Pa).

Remarks. An unassigned M element was recovered from the upper part of the Douro Formation on Ellesmere Island (GSC loc. C-63359; Loc. 18 on Fig. 1 of Part I), in the same sample that yielded Pa elements of Ancoradella ploeckensis. It may belong to the same apparatus as the latter, and is herein illustrated on Plate 8, figure 19. Because only the Pa element is known thus far, it is difficult to compare the possible M element with published information.

Figured specimens. GSC 49784, 55752 to 55754.

Genus Kockelella Walliser, 1957

Type species. Kockelella variabilis Walliser, 1957.

Kockelella variabilis Walliser

Plate 8, figures 9-16

Kockelella variabilis Walliser, 1957, p. 35-36, Pl. 1, figs. 3-10 (Pa); Barrick and Klapper, 1976, p. 77-78, Pl. 3, figs. 12-17 (Pa) (includes synonymy); Uyeno, 1977, p. 215, Pl. 41.1, fig. 17 (Pb); Cooper, 1977a, p. 188, Pl. 17, figs. 1-7 (multielement).

Remarks. An almost complete apparatus of Kockelella variabilis was recovered from the upper part of the Douro Formation on Ellesmere Island (GSC loc. C-63558; Loc. 18 on Fig. 1 of Part I). Only the Sc element is missing in this reconstruction.

Figured specimens. GSC 49777, 55746 to 55751.

Genus Polygnathoides Branson and Mehl, 1933

Type species. Polygnathoides siluricus Branson and Mehl, 1933.

Polygnathoides emarginatus (Branson and Mehl)

Plate 9, figures 24, 25

Polygnathellus emarginatus Branson and Mehl, 1933, p. 49, Pl. 3, fig. 38.

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

Remarks. The arched specimen (*see* Pl. 9, fig. 25), from the upper part of the Douro Formation on Ellesmere Island (GSC loc. C-63558; Loc. 18 on Fig. 1 of Part I) appears to be morphologically close to that illustrated by Rexroad and Craig (1971, Pl. 82, fig. 27). The latter is from topotype material from the Bainbridge Formation of Missouri. The other specimen of Polygnathoides emarginatus (Pl. 9, fig. 24), from the Douro Formation on Devon Island (GSC loc. C-33696; *see* Fig. 24 of Part I) is more typical of the species, and is similar to the holotype specimen, reillustrated by Rexroad and Craig (1971, Pl. 82, fig. 25).

Figured specimens. GSC 55775 and 55776.

Polygnathoides siluricus Branson and Mehl

Plate 9, figures 22, 23, 26-29

Polygnathoides siluricus Branson and Mehl, 1933, p. 50, Pl. 3, figs. 39-42; Klapper and Murphy, 1975, p. 56, Pl. 8, figs. 16-21 (includes synonymy); Uyeno, 1977, p. 214, Pl. 41.1, figs. 19, 20.

Remarks. As previously suggested by Klapper and Murphy (1975, p. 56), Polygnathoides siluricus and P. emarginatus may be the Pa and Pb elements, respectively, of a single apparatus. From the same locality that yielded these two forms (Douro Formation, Ellesmere Island, GSC loc. C-63558; Loc. 18 on Fig. 1 of Part I), four specimens of M element were recovered (*see* Pl. 9, figs. 18, 19). This element is assignable to "Neoprioniodus" latidentatus Walliser, a form that Klapper and Murphy (*ibid.*) had suggested earlier as being a possible constituent of the P. siluricus apparatus.

Figured specimens. GSC 49779, 55777 to 55780.

Polygnathoides? sp. A

Plate 8, figures 22-25

Description. The unit is geniculate at about midlength, with the anterior and posterior processes making an angle of 120 to 130 degrees. The anterior process bears 9 denticles that gradually increase in size posteriorly, except for the last two that are abruptly smaller in one specimen and, in both specimens, this process is offset to the left side. The denticles on the posterior process are similar in size to the smaller ones on the anterior process. The denticles on both processes are broad, bluntly pointed, with wide, U-shaped intervening spaces. A thin ridge is developed on the outer side of the posteriormost denticle of the anterior process, which then continues on to the outer lateral platform, forming a ridge over the crest(s) of the denticle(s) on the lateral platform. The inner lateral platform is slightly to considerably smaller than the outer one, and has an unornamented upper surface. A broad ridge runs throughout both lateral sides of the blade. A small triangular pit is located at the geniculation point, and ridges extend from it to beneath each process. The entire lower surface is an inverted basal cavity.

Remarks. Only two specimens of Polygnathoides? sp. A have been recovered and both are fragmented, with the parts rejoined for illustrative purposes. They are tentatively assigned to Polygnathoides because of their overall similarity to the "arched form" of P. emarginatus (*see* under the latter). In specifics, they differ significantly from P. emarginatus in the denticulation pattern and the development of the outer lateral platform. The keeled lower surface is similar to that of P. siluricus (e.g., *see* Pl. 9, fig. 23).

Figured specimens. GSC 55755 and 55756.

Genus Oulodus Branson and Mehl, 1933

Type species. Oulodus serratus (Stauffer, 1930).

Oulodus spp.

Plate 9, figures 7-11, 14-17, 20, 21,

Plate 10, figures 1-5, 23-34

Remarks. As many as seven different species of Oulodus may be represented in the collection at hand. In the following brief discussions, they are designated only by numbers. Where possible, attempts have been made to compare these species with published literature. In the abundancy chart, they are only referred to as Oulodus spp.

Oulodus sp. 1 (Pl. 9, figs. 7-11) is characterized by small forms, which are assignable to Pb, M, Sc, Sb and Sa elements. The species seems to be related to Oulodus excavata novoexcavata (Jeppsson) (Jeppsson, 1972, p. 59, Pl. 1, figs. 21-24, Text-fig. 3) and may be its forerunner. Oulodus sp. 1 is from the Cape Storm Formation, 398 m below the top of the formation, at Goodsir Creek, eastern Cornwallis Island (GSC loc. 83335; *see* Uyeno, 1977, Fig. 41.2). *See* also remarks under Ozarkodina confluens.

Oulodus sp. 2 (Pl. 9, figs. 14-17, 20, 21) is represented by all six elements, the Pb constituent of which has a peculiarly flat lower margin. It is from the basal part of the Sutherland River Formation on Devon Island (GSC loc. C-33707*).

Oulodus sp. 3 (Pl. 10, figs. 1-3) is only known by its Pb and M elements. The species is characterized by a small pit surrounded by a wide, deeply inverted basal cavity that occupies the entire lower surface. Extending from the pit are keels underneath the entire length of the processes. The interface of the lower and upper surfaces is marked by a sharp, protruding ridge that surrounds all sides of the unit. It remotely resembles Oulodus jeannae Schönlaub, a Llandoverian species from western Karawanken Alps, Austria (Sweet and Schönlaub, 1975, p. 49-51). Oulodus sp. 3 is from the lower part of the Peel Sound Formation on Prince of Wales Island (GSC loc. C-63592; *see* Fig. 21 of Part I). This locality also yielded forms that probably represent the Pa and Pb elements of another apparatus, herein tentatively referred to Apparatus B. This assignment is based principally on the similarity of the Pb element to the homologous element of Apparatus B, as reconstructed from another locality.

Oulodus sp. 4 (Pl. 10, figs. 31-34) has Pa, Sa and Sa-Sb transitional elements, and a possible Pb element. The species may be related to Oulodus confluens n. subsp. 1 of Jeppsson (1972, p. 60). The species originates from the upper part of the lower member of the Peel Sound Formation on Prince of Wales Island (GSC loc. C-39583; *see* Fig. 22 of Part I).

Oulodus sp. 5 (Pl. 10, figs. 27-30) consists of Pa, Pb, Sa and Sb elements. It is from the upper part of the Douro Formation at Boothia Peninsula (GSC loc. C-26655, *see* Fig. 18 of Part I).

Oulodus sp. 6 (Pl. 10, figs. 23-26) has Pa, Sc, Sb and Sa elements. It originates from the lower part of the lower member of the Peel Sound Formation on Prince of Wales Island (GSC loc. C-8237; *see* Fig. 22 of Part I).

Oulodus sp. 7 (Pl. 10, figs. 4, 5) is known only by its Pb and Sc elements. It is from the lower part of the Devon Island Formation at Sutherland River, Devon Island (GSC loc. C-55407; *see* Fig. 23 of Part I).

Figured specimens. GSC 55762 to 55772, 55781 to 55785, 55803 to 55809, 56142 to 56146.

* *See* footnote on page 41.

Apparatus A

Plate 9, figures 1-6, 12, 13

Asymmetrical palmate element, Uyeno, 1977, p. 214, Pl. 41.1, figs. 1, 2 (Pa?).

Remarks. Associated together in a single sample from the Cape Storm Formation, 398 m below the top of the formation, at Goodsir Creek, eastern Cornwallis Island (GSC loc. 83335; *see* Fig. 41.2 of Uyeno, 1977) are morphologically similar elements that may possibly be parts of a single apparatus. Superficially at least, some of the elements resemble those of Rhipidognathus symmetricus symmetricus Branson, Mehl and Branson, a Late Ordovician species, described by Kohut and Sweet (1968, p. 1474, Pl. 185, figs. 21, 22, 25, 26, 29-31). The symmetrical form (Pl. 9, fig. 3), for example, remotely resembles the trichonodellan (Sa?) element of R. symmetricus symmetricus. Another form closely resembles the trichonodellan element that has been laterally skewed (Pl. 9, figs. 1, 2, 5, 6), and this may be homologous to the bryantodinan (Pa?) element. The third form (Pl. 9, figs. 4, 13) differs slightly from the first two in having less denticles. It is also less skewed than the bryantodinan element, and has a cusp that is considerably larger than the others. This form may be homologous with the ozarkodinan (Pb?) element. Finally, the fourth form (Pl. 9, fig. 12) may represent an M element which does not have a homologous constituent in the R. symmetricus symmetricus apparatus.

Figured specimens. GSC 49769, 55757 to 55761.

Apparatus B

Plate 10, figures 6, 7, 10-12, 18-22

Remarks. Included in Apparatus B are those elements with an extremely small pit and wide, inverted basal cavity. The peg-like denticles are lens-shaped in cross-section with rounded sides and have U-shaped intervening spaces. A sample from the upper part of the Douro Formation at Boothia Peninsula (GSC loc. C-26655; *see* Fig. 18 of Part I) has yielded three different forms that have these features in common. They are assigned to Pb and Sa elements and a third element that does not fit easily into any known position. The last element (Pl. 10, figs. 20, 21) consists simply of two slightly reclined denticles on a common base and, superficially at least, resembles the unnamed elements referred to Distomodus dubius (Rhodes) by Jeppsson (1972, Pl. 1, figs. 11-13). The present apparatus cannot be assigned to Distomodus, however, nor to any known genus at this time.

Specimens that may be referable to Apparatus B are known from the lower part of the Peel Sound Formation on Prince of Wales Island (GSC loc. C-63592; *see* Fig. 21 of Part I), and are illustrated on Plate 10, figures 6, 10, 12. The Pb elements are identical to those from Boothia Peninsula. A second form may represent the Pa element of this apparatus.

Apparatus B differs from Oulodus sp. 3 in lacking the characteristic sharp, ridge-like protrusion at the interface of the lower and upper surfaces.

Figured specimens. GSC 55786 to 55795.

Simple cone elements

Plate 10, figures 13-16

Remarks. Some simple cone elements are illustrated herein but are identified only to generic level. Although all these illustrated specimens are from a single locality (GSC loc. C-2689; *see* Fig. 25 of Part I) from the lower part of the Devon Island Formation at Ellesmere Island, similar forms are present in other stratigraphic intervals. They are mentioned here primarily to complete the record of their occurrence.

One form (Pl. 10, fig. 14) is probably new, although it would fall within the concept of Belodella as amended by Cooper (1974, p. 1121). It is a bilaterally symmetrical form with a triangular cross-section, which, in lateral view, remotely resembles Belodella resima (Philip), a Lower Devonian species from Victoria, Australia (Philip, 1965). (Specimens that are morphologically close to B. resima are illustrated on Pl. 10, figs. 13 and 15). The present form differs from B. resima in a number of important features: the lateral sides of the lower margin are weakly serrated, the more prominent cusp has lateral costae which continue posteriorly on the upper part of the unit and converge near the posterior margin, and that part of the costae between the cusp and the point of convergence is similarly serrated.

Figured specimens. GSC 55798 to 55801.

"Neoprioniodus" sp. A

Plate 10, figures 8, 9

Remarks. "Neoprioniodus" sp. A is an M element whose affinity is as yet unknown. It is characterized by a small pit at the extreme anterior end, followed posteriorly by a shallow groove that extends to the extremity. The cusp and the immediately adjacent denticles are slightly reclined and the remaining denticles are progressively more reclined posteriorly. The lower margin is either straight or slightly arched. In upper view, the entire unit is slightly to moderately convex outward.

"Neoprioniodus" sp. A is from the Douro Formation at Prince of Wales Island (GSC loc. C-64002; *see* Fig. 21 of Part I).

Figured specimens. GSC 55796 and 55797.

"Trichonodella" sp. A

Plate 10, figure 17

Remarks. "Trichonodella" sp. A is an Sa element whose affinity is as yet unknown. It is characterized by its lateral processes that bear numerous minute denticles that are randomly oriented, i.e., they may be bent anteriorly or posteriorly, or erect. The cusp is sharply bent posteriorly although the lateral processes are more or less in a single plane. The lower surface of the lateral processes is marked by an extremely shallow groove with an inverted basal cavity. The nature of the pit is obscured by a basal filling.

In gross morphology, "Trichonodella" sp. A resembles a monocuspid variety of "Apatognathus" varians Branson and Mehl, a Late Devonian form-species. Unlike the former, however, "Apatognathus" varians has a definite cyclical arrangement of denticles on its lateral processes.

"Trichonodella" sp. A originates from the basal part of the Devon Island Formation on Devon Island (GSC loc. C-33700; *see* Fig. 24 of Part I).

Figured specimen. GSC 55802.

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APPENDIX

List of localities studied for conodonts

Locational notations are after Klapper and Philip (1971, 1972) for icriodontid elements, and Cooper (1975, 1976, 1977a, 1977b) for others. Figures in parentheses indicate the number of identifiable specimens recovered. Form-genera are placed in quotation marks. With the exception of Figure 1, all references to figures are those included under the heading "Biostratigraphy" in Part I. Figure 1 is the general geological index map under the heading "Introduction" in Part I and detailed information of the geographic positions of the localities on this figure are given in the Appendix of Part I. Where records are available, the weights of samples processed are placed in parentheses after their GSC locality numbers.

Goodsir Creek, Cornwallis Island (*see* Figs. 16, 17)

Cape Storm Formation, 443.8 m below top of formation, GSC loc. 83334 (1.5 kg):

- Ozarkodina confluens Pa (2)
- Oulodus sp. Sb (1), Sa (1)
- Apparatus A Pb? (1), M? (1)

Cape Storm Formation, 398.1 m below top of formation, GSC loc. 83335 (1.5 kg):

- Ozarkodina confluens Pa (35)
- Oulodus sp. Pb (3), M (3), Sc (7), Sb (1), Sa (5)
- Apparatus A Pa? (18), Pb? (10), Sa? (1), M? (1)

Cape Storm Formation, 64.3 m below top of formation, GSC loc. 83343 (1.3 kg):

- Ozarkodina confluens Pa (1)
- O. cf. O. douroensis Pa (3)
- Oulodus sp. Pb (6)

Cape Storm Formation, 9.1 m below top of formation, GSC loc. 83345 (1.3 kg):

- Ozarkodina douroensis Pa (2), M (1)
- Panderodus sp. (1)

Cape Storm Formation, 3 m below top of formation, GSC loc. C-63575:

- Ozarkodina confluens gamma morphotype Pa (3), M (1), Sc (2)
- O. excavata excavata Pa (1), Sc (1), Sb (2), Sa (2)
- Oulodus sp. Pa (1)
- Panderodus sp. (22)

Douro Formation, 125.0 m above base of formation, GSC loc. 83347 (1.6 kg):

- Ozarkodina confluens beta morphotype Pa (2), Pb (1), Sc (1)
- O. excavata excavata Pa (6), Pb (2), Sc (2), Sb (4)
- Ancoradella ploeckensis Pa (1)
- Polygnathoides siluricus (1)
- Oulodus sp. Pb (1)
- Panderodus sp. (4)

Douro Formation, 213.4 m above base of formation, GSC loc. 83348 (1.4 kg):

- Ozarkodina confluens alpha morphotype Pa (20), Pb (4), M (3), Sc (1), Sb-Sc (1), Sb (2), Sa-Sb (1), Sa (3)
- O. excavata excavata Pa (6), Sb (5), Sa (2)
- Ancoradella ploeckensis Pa (3)
- Polygnathoides siluricus (2)
- Panderodus sp. (218)
- unassigned Pb element (2)

Douro Formation, 332.5 m above base of formation, GSC loc. C-63573:

- Ozarkodina confluens alpha morphotype Pa (3), Pb (2), M (1)
- O. douroensis Pa (20), Pb (3), M (1), Sc (1), Sb (3), Sa (1)
- O. excavata excavata Pa (5), M (1), Sb (1)
- Oulodus sp. Pb (1), M (2), Sb (2)
- Polygnathoides siluricus (1)

Barlow Inlet Formation, 6.1 m above base of formation, GSC loc. 83349 (2.1 kg):

- Ozarkodina confluens alpha morphotype Pa (7), M (2), Sc (1), Sa (3)
- O. excavata excavata Pa (1), Pb (3), M (4), Sb (2)
- Kockelella variabilis Pb (2), M (3)
- Oulodus sp. Pa (1), Pb (2), Sc (2), Sb (5), Sa (1)
- Panderodus sp. (122)

Barlow Inlet Formation, 80.2 m above the base of formation, GSC loc. C-63576:

- Ozarkodina n. sp. A Pa (5), Pb (3), M (2), Sc (1), Sb (2)
- Pedavis latialata I (4), S_1 (6), M_2 (33)
- P. aff. P. thorsteinssoni I (5)
- unassigned elements Pb (1), Sa (1)

Barlow Inlet Formation, 239 m above base of formation, GSC loc. C-19837:

- Ozarkodina confluens alpha morphotype Pa (62), gamma morphotype Pa (9), Pb (15), M (9), Sc (7), Sb (2), Sa (6)
- O. excavata excavata Pa (18), Pb (4), M (1), Sc (3), Sb (2), Sa (2)
- Pedavis thorsteinssoni I (17), S_1 (16), M_2 (round base) (190), M_2 (drepanodontan) (77), M_2 (cone with small basal denticles) (15)
- Pelekysgnathus arcticus I (233), S_2 (86), M_2 (31)
- Panderodus sp. (12)

The following localities are isolated outcrops on eastern Cornwallis Island:

Barlow Inlet Formation, isolated outcrop, stratigraphically near the top of the formation, located at UTM Zone 15X, 480250mE, 8339600mN, eastern Cornwallis Island, GSC loc. C-19839 (*see* Uyeno, 1977, Fig. 41.2):

- Ozarkodina confluens gamma morphotype Pa (55), alpha morphotype Pa (2), gamma transitional to epsilon morphotype Pa (1), Pb (1), M (1), Sa (2)
- O. cf. O. eurekaensis Pa (19)
- Oulodus sp. Pa (1), Sb (1), Sa (4)
- Panderodus sp. (4)
- unassigned M element (31)

Barlow Inlet Formation, type section, 24.4 m below top of formation, located at UTM Zone 15X, 481750mE, 8327500mN, Read Bay, eastern Cornwallis Island, GSC loc. C-54046 (Loc. 20 on Fig. 1):

Ozarkodina confluens alpha morphotype Pa (3)
O. cf. O. eurekaensis Pa (4)
O. remscheidensis remscheidensis Pa (71), Pb (9), M (1), Sc (2), Sa (1)
Pelekysgnathus sp. I (2), M_2 (28)

Sophia Lake Formation, type section, 21.3 m above base of formation located at UTM Zone 15X, 481850mE, 8327750mN, Read Bay, eastern Cornwallis Island, GSC loc. C-49976 (Loc. 22 on Fig. 1):

Ozarkodina n. sp. G Pa (49), Pb (9), M (2), Sc (2), Sb (1), Sa (1)
Pelekysgnathus n. sp. B I (4), S_2 (2), M_2 (62)

Boothia Peninsula (see Fig. 18)

Douro Formation, 0 to 1.82 m below top of formation, GSC loc. C-26655:

Ozarkodina douroensis Pa (16), Pb (4), M (8), Sb (2), Sa (3)
O. excavata excavata Pa (8), Pb (4), M (5), Sc (1), Sb (3), Sa (3)
Oulodus sp. Pa (1), Pb (1), Sa (1), Sb (4)
Panderodus sp. (212)
Apparatus B Pb (9), Sa (3), undesignated element (2)

Somerset Island Formation, 0.9 to 2.1 m above base of formation, GSC loc. C-26653:

Pedavis aff. P. thorsteinssoni I (3), M_2 (20)

Somerset Island (see Fig. 19)

Douro Formation, 6 m below top of formation, GSC loc. C-54001:

Ozarkodina confluens alpha morphotype Pa (13), gamma morphotype Pa (1), gamma transitional to epsilon morphotype Pa (1), Pb (3), Sc (5), Sa (5)
Pelekysgnathus arcticus I (3), S_2 (2), M_2(54)
Panderodus sp. (39)
unassigned elements Sb (2), Sa (1)

Somerset Island Formation, 6 m above base of formation, GSC loc. C-54002:

Ozarkodina confluens gamma morphotype Pa (3), gamma transitional to epsilon morphotype Pa (2), Sc (3), Sa (5)
Pelekysgnathus sp. I (1), S_2 (1), M_2 (8)

Somerset Island Formation, 22.8 m above base of formation, GSC loc. C-54003:

Ozarkodina confluens gamma morphotype Pa (3), gamma transitional to epsilon morphotype Pa (3), Pb (1), Sc (4), Sa (4)
unassigned elements S_2 (3), M_2 (3), Sb (3), Sa (3)

Somerset Island (see Fig. 20)

Somerset Island Formation, 83 m below top of formation, GSC loc. C-26656:

Ozarkodina confluens alpha morphotype Pa (7), gamma morphotype Pa (9), gamma transitional to epsilon morphotype Pa (1), Pb (5), M (1), Sc (1), Sb (3), Sa (2)
O. excavata excavata Pa (1), M (1), Sc (1), Sb (2)
Pelekysgnathus arcticus I (2), S_2 (3), M_2 (124)
Panderodus sp. (3)
unassigned Pa element (1)

Somerset Island Formation, 5 to 7 m below top of formation, GSC loc. C-25927:

Ozarkodina confluens Pa (1)

Somerset Island

Somerset Island Formation, 33.5 m above base of formation, in a section located approximately 10 km north of Creswell Bay (Lat. 72°52'N, Long. 93°45'W), collected by J.M. Savelle, University of Ottawa; GSC loc. C-30342:

Ozarkodina n. sp. H Pa

Prince of Wales Island (see Fig. 21)

Allen Bay Formation, 22 m below top of formation, GSC loc. C-64005:

Ozarkodina confluens alpha morphotype Pa (1), Sc? (1)
Panderodus sp. (2)

Cape Storm Formation, 36 m above base of formation, GSC loc. C-64004:

Ozarkodina confluens alpha morphotype Pa (3), Pb (1), M (1), Sb (1)
O. douroensis Pa (3), Pb (3)
Oulodus sp. Pa (4), Pb (2), Sc (2), Sb (2), Sa (1)

Douro Formation, 12.2 m above base of formation, GSC loc. C-64003:

Ozarkodina confluens gamma morphotype Pa (14), Pb (1), Sc (2), Sb (1), Sa (4)
O. douroensis Pa (92), Pb (17)
O. excavata excavata Pa (1), Sb (1)
Oulodus sp. Pa (3), Pb (6), M (2), Sc (4), Sa (1)
Panderodus sp. (40)

Douro Formation, 51.8 m above base of formation, GSC loc. C-64002:

Ozarkodina confluens alpha morphotype Pa (1)
O. excavata excavata Pa (1), Sc (1), Sb (1)
"Neoprioniodus" sp. A (2)
Oulodus sp. Pa (1), Sb (2)
Panderodus sp. (4)

Douro Formation, 90 m above base of formation, GSC loc. C-64000:

Ozarkodina douroensis Pa (1), Pb (2), Sb (1), Sa (1)
O. excavata excavata Pa (2), Pb (1), M (1), Sc (2), Sb (2), Sa (1)
"Neoprioniodus" sp. (2)
Oulodus sp. Pa (1), Pb (7), M (1), Sc (3), Sb (1), Sa (2)
Panderodus sp. (88)

Douro Formation, 93 m above base of formation, GSC loc. C-63599:

Ozarkodina sp. Pa (1), Pb (1), M (1), Sc (1)
Oulodus sp. Sa (1), Sb (1)
Panderodus sp. (38)

Douro Formation, 128 m above base of formation, GSC loc. C-63598:

Ozarkodina confluens gamma morphotype Pa (1), M (1)
O. douroensis Pa (1), M? (1)
O. excavata excavata Pa (1), M (2), Sc (1), Sb (1)
Panderodus sp. (18)

Douro Formation, 135.6 m above base of formation, GSC loc. C-63597:

Ozarkodina excavata excavata Pa (2), Pb (1), M (1)
Polygnathoides? sp. A (2)
Panderodus sp. (11)

Peel Sound Formation, lower member, 6 m above base of formation, GSC loc. C-63592:

Ozarkodina confluens alpha morphotype Pa (1), Pb (1), Sc (1)
O. excavata excavata Pa (4), Pb (1), M (1), Sb (4), Sa (1)
Oulodus sp. Pa (5), Pb (2)
Panderodus sp. (126)
Apparatus B Pb (3), M? (1)

Peel Sound Formation, lower member, 15.3 m above base of formation, GSC loc. C-63591:

Ozarkodina excavata excavata Pa (1), M (1)
Oulodus sp. Pa (1), M (1), Sb (1), Sc (1)
Panderodus sp. (25)

Peel Sound Formation, lower member, 26.5 m above base of formation, GSC loc. C-63590:

Panderodus sp. (6)
unassigned elements M (2), Sa (1)

Peel Sound Formation, lower member, 45.8 m above base of formation, GSC loc. C-63589:

Ozarkodina n. sp. H Pa (2)
Pelekysgnathus arcticus I (2), S_2 (3), M_2 (37)

Peel Sound Formation, lower member, 59.5 m above base of formation, GSC loc. C-63587:

Ozarkodina n. sp. H Pa (3), Pb (1)
Pelekysgnathus sp. S_2 (1), M_2 (31)

Prince of Wales Island (see Fig. 22)

Peel Sound Formation, lower member, 54 m above base of member, GSC loc. C-53213:

Ozarkodina confluens alpha morphotype Pa (1), Sb (1), Sc (1)
O. n. sp. H Pa (44), Pb (8)
Pelekysgnathus n. sp. C I (8), S_2 (11), M_2 (255)

Peel Sound Formation, lower member, 105 m above base of member, GSC loc. C-53214:

Ozarkodina confluens alpha morphotype Pa (1), Sa (1)
O. sp. Pa (1)
unassigned M_2 elements (7)

Peel Sound Formation, lower member, 121 m above base of member, GSC loc. C-8237:

Ozarkodina confluens alpha morphotype Pa (46), gamma morphotype Pa (3), gamma transitional to epsilon morphotype Pa (1), Pb (6), M (19), Sc (1), Sa (22)
Oulodus sp. Pa (1), Sc (19), Sb (9), Sa (6)
Pelekysgnathus arcticus I (5), S_2 (2), M_2 (57)

Peel Sound Formation, lower member, 205 m above base of member, GSC loc. C-8235:

Ozarkodina confluens alpha morphotype Pa (1), gamma morphotype Pa (36), Pb (7), M (3), Sc (1), Sb (4), Sa (2)
Pelekysgnathus arcticus I (8), S_2 (4), M_2 (371)
Panderodus sp. (6)

Peel Sound Formation, lower member, 250 m above base of member, GSC loc. C-53215:

Pelekysgnathus sp. I (1), M_2 (28)

Peel Sound Formation, lower member, 318 m above base of member, GSC loc. C-39583:

Ozarkodina confluens alpha morphotype Pa (6), gamma morphotype Pa (1), Pb (1), Sc (1), Sa (1)
Pelekysgnathus arcticus I (3), S_2 (2), M_2 (41)
Oulodus sp. Pa? (1), Pb? (1), Sb-Sa (1), Sa (1)
Panderodus sp. (1)

Sutherland River, Devon Island (see Fig. 23)

Devon Island Formation, talus sample from basal part of the formation, GSC loc. C-55407:

Ozarkodina confluens alpha morphotype Pa (26), Pb (10), M (6), Sc (3), Sb (7), Sa (9)
O. excavata excavata Pa (71), Pb (25), M (21), Sc (9), Sb (17), Sa (19)
O. n. sp. A Pa (119), Pb (29), M (20), Sc (9), Sb (8), Sa (12)
Pedavis latialata I (21), S_1 (1), M_2 (22)
Oulodus sp. Pb (1), Sc (1)
Belodella sp. (3)
Panderodus sp. (23)

Devon Island Formation, about 175 m above base of formation, GSC loc. C-54035:

Ozarkodina remscheidensis remscheidensis Pa (56), Pb (20), M (26), Sc (7), Sb (3), Sa (1)
Icriodus woschmidti hesperius I (3), S_1 (3)
Pedavis n. sp. C I (7), M_2 (42)
Belodella sp. (19)
Coelocerodontus sp. (10)
Panderodus sp. (435)

Devon Island Formation, 104.5 m above base of formation, GSC loc. C-76102:

- Ozarkodina remscheidensis remscheidensis Pa (201), Pb (95), M (29), Sc (20), Sb (16), Sa (8)
- Oulodus sp. Pa (1), Pb (1), Sc (3), Sb (5), Sa (5)
- Pelekysgnathus arcticus n. sp. I (1), S_2 (6), M_2 (17)
- "Trichonodella" sp. A (1)

Devon Island (*see* Fig. 24)

Douro Formation, 0.3 m below top of formation, GSC loc. C-33696:

- Ozarkodina excavata excavata Pa (1), M (1), Sc (1), Sb (1), Sa (3)
- Polygnathoides emarginatus (1)
- P. siluricus (4)
- Panderodus sp. (24)
- unassigned Pb (aversiform) element (1)

Devon Island Formation, 30.5 m above base of formation, GSC loc. C-33700:

- Ozarkodina remscheidensis remscheidensis Pa (29), Pb (14), M (8), Sc (6), Sb (5), Sa (4)
- O. cf. O. n. sp. E Pa (1)
- O. n. sp. I Pa (3)
- Icriodus n. sp. C I (1)
- "Trichonodella" sp. A (7)
- unassigned elements Sc (1), Sb (2)

Devon Island Formation, 123 m above base of formation, GSC loc. C-33704:

- Ozarkodina remscheidensis remscheidensis Pa (22), Pb (3)
- O. cf. O. remscheidensis remscheidensis Pa (7), Pb (2)
- Panderodus sp. (1)
- unassigned M element (1)

Devon Island Formation, 157 m above base of formation, GSC loc. C-55405:

- Ozarkodina excavata excavata Pa (2)
- O. remscheidensis remscheidensis Pa (24), Pb (9), M (10), Sc (4), Sb (2), Sa (2)
- O. cf. O. remscheidensis remscheidensis Pa (5), Pb (3)
- Oulodus sp. M (1), Sb (1), Sa (1)
- Belodella sp. (5)
- Panderodus sp. (58)
- unassigned elements M_2 (smooth cone) (2), M_2 (costate cone) (14), M_2 (cone with small basal denticles) (2)

Devon Island Formation, 200 m above base of formation, GSC loc. C-33706:

- Ozarkodina remscheidensis remscheidensis Pa (4), Pb (3), M (1)
- O. cf. O. remscheidensis remscheidensis Pa (2)
- Oulodus sp. Pb (1), M (1), Sc (1), Sa (1)
- Panderodus sp. (2)

A collection from the section illustrated in Figure 24 but representing an interval the exact stratigraphic position of which is unknown. According to R. Thorsteinsson, who collected the sample, it is probably from the basal 3 to 4 m of the Sutherland River Formation, or the uppermost 3 to 4 m of the Devon Island Formation; GSC loc. C-33707:

- Ozarkodina remscheidensis subsp. Pa (16), Pb (10), M (10), Sc (2), Sb (4), Sa (2)
- Icriodus sp. I (1)
- Oulodus sp. Pa (1), Pb (2), M (1), Sc (4), Sb (2), Sc (2)
- Belodella sp. (2)

The following locality is an isolated outcrop on southwestern Devon Island: Sophia Lake Formation, stratigraphically about 300 m above base of formation, located at UTM Zone 15X, 516000mE, 8345350mN, southwestern Devon Island, GSC loc. C-54044 (Loc. 23 on Fig. 1):

- Ozarkodina remscheidensis remscheidensis Pa (7), Pb (6), M (1), Sc (2), Sb (3), Sa (5)
- O. n. sp. F Pa (27), Pb (14)
- Oulodus sp. Pa (4), M (5), Sc (2), Sa (4)

Ellesmere Island

Douro Formation, 7.0 m below top of formation, at UTM Zone 16X, 489200mE, 8499250mN, GSC loc. C-63559 (Loc. 18 on Fig. 1):

- Ozarkodina confluens alpha morphotype Pa (4), Pb (1), M (1), Sc (2), Sb (1), Sa (1)
- O. excavata excavata Pa (2)
- Ancoradella ploeckensis Pa (4), M? (1)
- Polygnathoides siluricus (1)
- Panderodus sp. (74)
- unassigned elements Pb (2), M (2), Sa (1)

Douro Formation, 0.3 m below top of formation, same locality as GSC loc. C-63559, GSC loc. C-63558 (Loc. 18 on Fig. 1):

- Ozarkodina excavata excavata Pa (29), Pb (7), M (6), Sc (4), Sb (4), Sa (4)
- Kockelella variabilis Pa (14), Pb (12), M (4), Sb (1), Sa (6)
- "Neoprioniodus" latidentatus Walliser (4)
- Polygnathoides emarginatus (8)
- P. siluricus (8)
- Panderodus sp. (113)
- unassigned elements Sc (11), Sb (3), Sa (1)

Devon Island Formation, 7.6 m above base of formation, GSC loc. C-2689 (*see* Fig. 25):

- Ozarkodina excavata excavata Pa (7), Pb (10), M (13), Sc (17), Sb (9), Sa (9)
- O. n. sp. A Pa (3)
- Belodella sp. (26)
- Belodella? sp. (1)
- Panderodus sp. (6)

Devon Island Formation, 45.7 to 50.1 m above base of formation, GSC loc. C-2688 (*see* Fig. 25):

- Ozarkodina confluens alpha morphotype Pa (1)
- O. excavata excavata Pa (3), M (4), Sc (5), Sb (6), Sa (2)
- Panderodus sp. (27)

PLATES 1-10

PLATE 1

All figures x40. All figures are lateral views unless otherwise noted.

Figures 1-7, 9, 11. Ozarkodina confluens (Branson and Mehl), alpha morphotype.

1. GSC 49787, Pa element (previously illustrated on Pl. 41.1, fig. 31 by Uyeno, 1977).
2. GSC 55545, Pb element.
3, 4. GSC 55546 and 55547, two M elements.
5. GSC 55548, posterior view of an Sa element.
6. GSC 55549, Sc element.
7. GSC 55550, Sb-Sc transitional element.
9. GSC 55551, Sa-Sb transitional element.
11. GSC 55552, Sb element.

All specimens from Douro Formation, 213.4 m above base of formation, Goodsir Creek, eastern Cornwallis Island, GSC loc. 83348 (*see* Fig. 16).

Figures 8, 10, 12-15. Ozarkodina confluens (Branson and Mehl), alpha morphotype.

8. GSC 55553, Sb element.
10. GSC 55554, posterior view of an Sa element.
12. GSC 55555, Sc element.
13. GSC 55556, Pb element.
14. GSC 55557, Pa element.
15. GSC 55558, M element.

All specimens from Devon Island Formation, talus sample from basal part of the formation, Sutherland River, Devon Island, GSC loc. C-55407 (*see* Fig. 23).

Figures 16-23. Ozarkodina confluens (Branson and Mehl), gamma morphotype, all Pa elements.

16. GSC 55559, Somerset Island Formation, 22.8 m above base of formation, Somerset Island, GSC loc. C-54003 (*see* Fig. 19).
17. GSC 55560, lower member, Peel Sound Formation, 318 m above base of formation, Prince of Wales Island, GSC loc. C-39583 (*see* Fig. 22).
18. GSC 55561, Douro Formation, 6 m below top of formation, Somerset Island, GSC loc. C-54001 (*see* Fig. 19).
19. GSC 49778, Barlow Inlet Formation, 239 m above base of formation, Goodsir Creek, eastern Cornwallis Island, GSC loc. C-19837 (*see* Uyeno, 1977, Fig. 41.2) (previously illustrated on Pl. 41.1, fig. 18 by Uyeno, 1977).
20. GSC 55562, Somerset Island Formation, 83 m below top of formation, Somerset Island, GSC loc. C-26656 (*see* Fig. 20).
21. GSC 55563, lower member, Peel Sound Formation, 121 m above base of formation, Prince of Wales Island, GSC loc. C-8237 (*see* Fig. 22).
22, 23. GSC 55564 and 55565, lower member, Peel Sound Formation, 205 m above base of formation, Prince of Wales Island, GSC loc. C-8235 (*see* Fig. 22).

Figures 24, 25, 27, 28. Ozarkodina confluens (Branson and Mehl), gamma transitional to epsilon morphotype, all Pa elements.

24. GSC 55566, Sophia Lake Formation, isolated outcrop but stratigraphically near top of formation, east coast of Cornwallis Island (UTM Zone 15X, 480250mE, 8339600mN), GSC loc. C-19839 (*see* Uyeno, 1977, Fig. 41.2).
25. GSC 55567, GSC loc. C-8237 (*see* Fig. 21 above).
27. GSC 55568, GSC loc. C-54001 (*see* Fig. 18 above).
28. GSC 55569, GSC loc. C-54003 (*see* Fig. 16 above).

Figures 26, 29, 30. Ozarkodina confluens (Branson and Mehl), morphotype undesignated, all Pa elements.

26. GSC 55570, Cape Storm Formation, 443.8 m below top of formation, Goodsir Creek, eastern Cornwallis Island, GSC loc. 83334.
29, 30. GSC 55571 and 55572, Cape Storm Formation, 398.1 m below top of formation, Goodsir Creek, eastern Cornwallis Island, GSC loc. 83335 (*see* Uyeno, 1977, Fig. 41.2).

Figures 31-34. Ozarkodina confluens (Branson and Mehl), alpha morphotype, all Pa elements.

31. GSC 55573, Douro Formation, 7.0 m below top of formation, Ellesmere Island (UTM Zone 16X, 489200mE, 8499250mN), GSC loc. C-63359; Loc. 18 on Fig. 1).
32. GSC 55574, GSC loc. C-19837 (*see* Fig. 19 above).
33. GSC 55575, GSC loc. C-26656 (*see* Fig. 20 above).
34. GSC 55576, Devon Island Formation, 45.7 to 50.1 m above base of formation, Ellesmere Island, GSC loc. C-2688 (*see* Fig. 25).

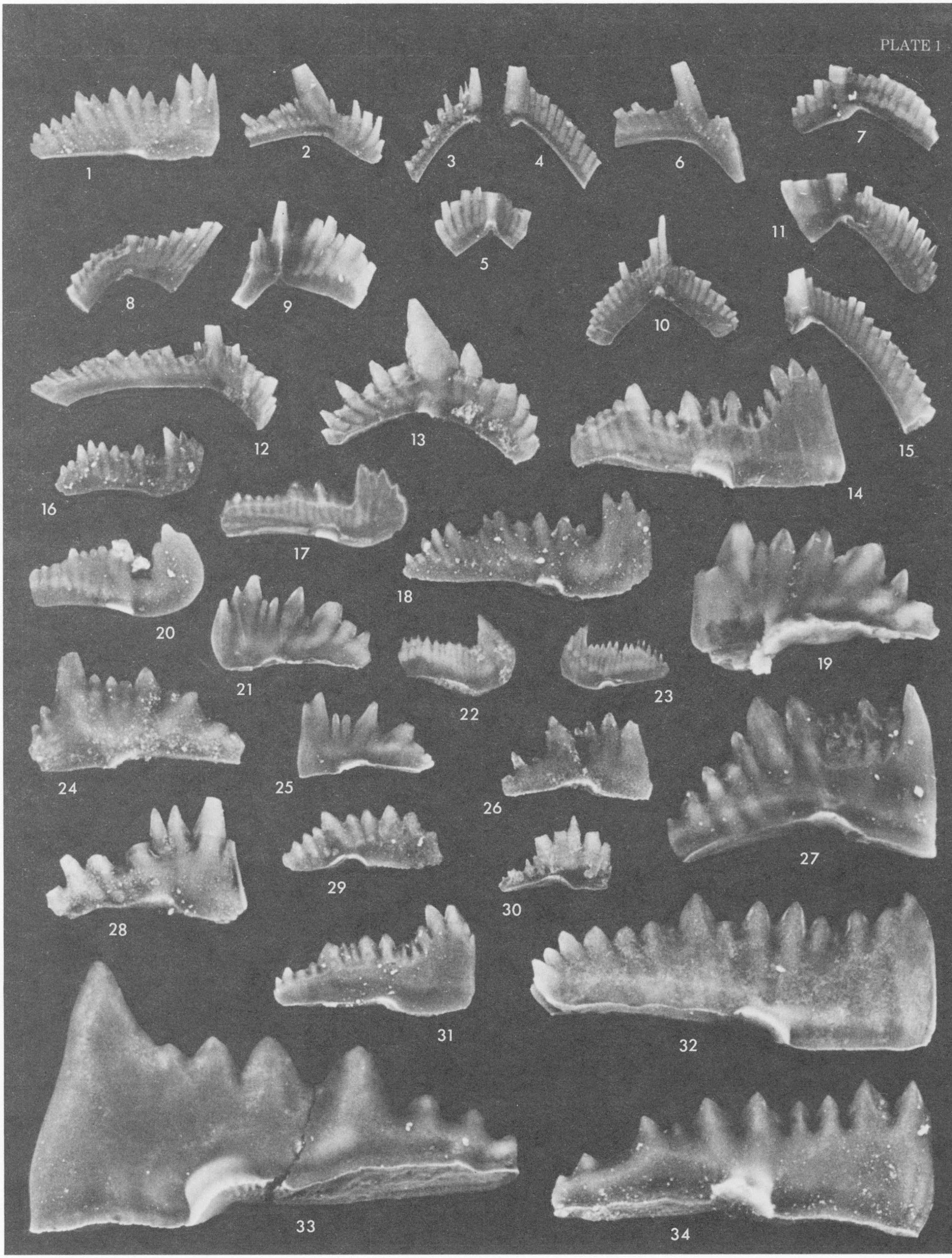
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PLATE 2

All figures x40. All figures are lateral views unless otherwise noted.

Figures 1-5. Ozarkodina cf. O. eurekaensis Klapper and Murphy.

1-3. GSC 49771, upper, lateral and lower views of a Pa element, Sophia Lake Formation, isolated outcrop but stratigraphically near top of formation, east coast of Cornwallis Island (UTM Zone 15X, 480250mE, 8339600mN), GSC loc. C-19839 (*see* Uyeno, 1977, Fig. 41.2) (previously illustrated on Pl. 41.1, figs. 4-6 by Uyeno, 1977).

4, 5. GSC 49770, upper and lateral views of a Pa element, GSC loc. C-19839 (*see* figs. 1-3 above) (previously illustrated on Pl. 41.1, fig. 3 by Uyeno, 1977).

Figures 6, 7, 10. Ozarkodina excavata excavata (Branson and Mehl).

6. GSC 55577, Pa element.
7. GSC 55578, Sb element.
10. GSC 55579, Pb element.

All specimens from Douro Formation, 125.0 m above base of formation, Goodsir Creek, eastern Cornwallis Island, GSC loc. 83347 (*see* Fig. 16).

Figures 8, 9, 11-13, 17. Ozarkodina excavata excavata (Branson and Mehl).

8. GSC 55580, Pa element.
9. GSC 55581, Sb element.
11. GSC 55582, posterior view of an Sa element.
12. GSC 55583, Sc element.
13. GSC 55584, Pb element.
17. GSC 55585, M element.

All specimens from Devon Island Formation, talus sample from basal part of the formation, Sutherland River, Devon Island, GSC loc. C-55407 (*see* Fig. 23).

Figures 14-16. Ozarkodina n. sp. I.

14-16. GSC 55586, upper, lateral and lower views of a Pa element, Devon Island Formation, 30.5 m above base of formation, Devon Island, GSC loc. C-33700 (*see* Fig. 24).

Figures 18-20, 32, 36-38. Ozarkodina douroensis n. sp.

18-20. GSC 55587, upper, lateral and lower views of paratype Pa element.
32. GSC 55588, paratype Pb element.
36-38. GSC 55589, upper, lateral and lower views of holotype Pa element.

All specimens from Douro Formation, 12.2 m above base of formation, Prince of Wales Island, GSC loc. C-64003 (*see* Fig. 21).

Figures 21-31. Ozarkodina douroensis n. sp.

21-23, 27-29. GSC 55590 and 55591, upper, lateral and lower views of two paratype Pa elements.
24. GSC 55592, paratype Pb element.
25, 26. GSC 55593 and 55594, two paratype M elements.
30. GSC 55595, paratype Sb element.
31. GSC 55596, posterior view of paratype Sa element.

All specimens from Douro Formation, 0 to 1.82 m below top of formation, Boothia Peninsula, GSC loc. C-26655 (*see* Fig. 18).

Figures 33-35, 39. Ozarkodina douroensis n. sp.

33-35. GSC 55597, upper, lateral and lower views of paratype Pa element, Douro Formation, 90 m above base of formation, Prince of Wales Island, GSC loc. C-64000 (*see* Fig. 21). Note basal plate material covering part of pit.

39. GSC 49788, upper view of paratype Pa element, Douro Formation, 332.5 m above base of formation, Goodsir Creek, eastern Cornwallis Island, GSC loc. C-63573 (*see* Fig. 16) (previously illustrated on Pl. 41.1, fig. 32 by Uyeno, 1977).

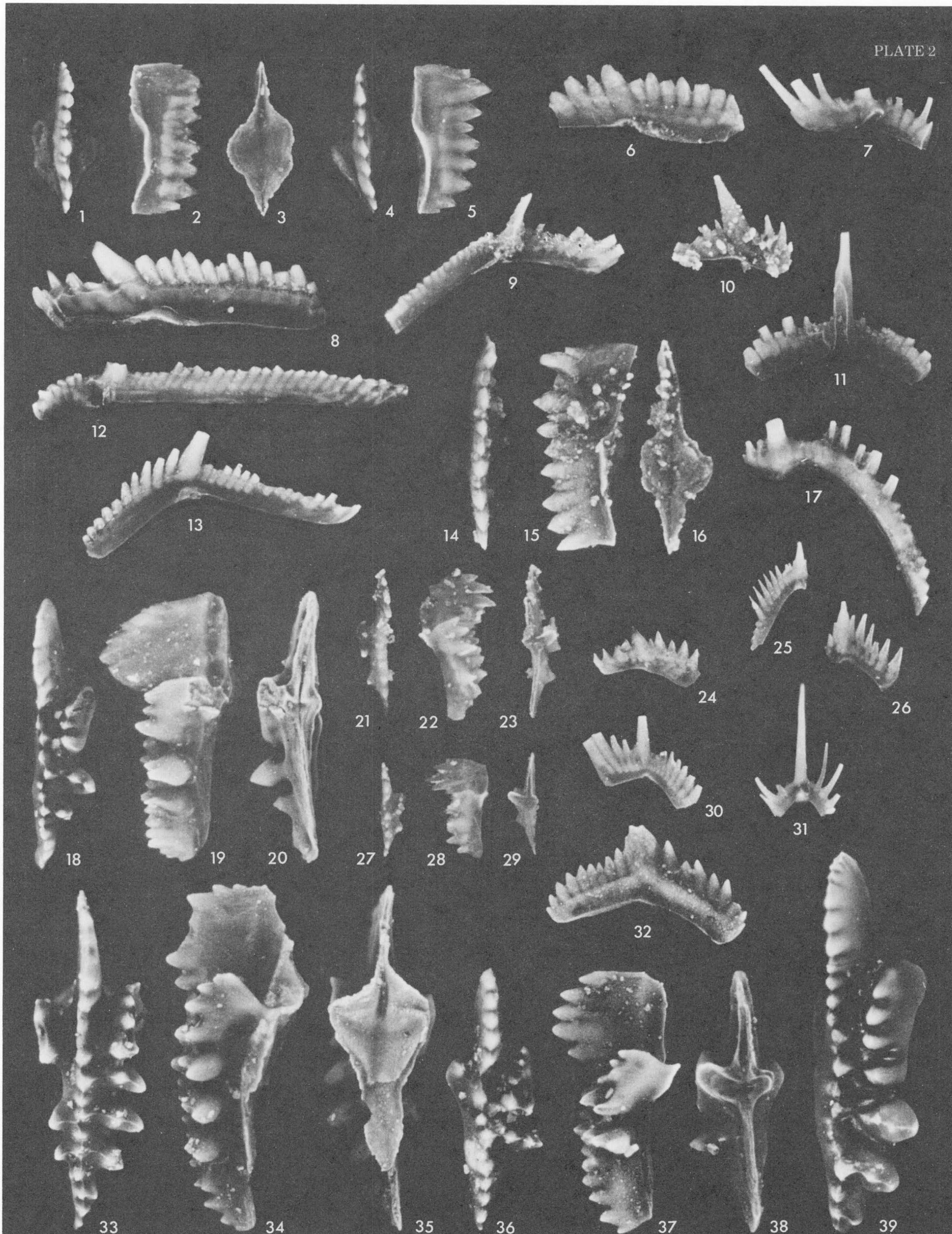
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PLATE 3

All figures x40. All figures are lateral views unless otherwise noted.

Figures 1-4. Ozarkodina remscheidensis remscheidensis (Ziegler).

1, 2. GSC 49774, lateral and lower views of a Pa element (previously illustrated on Pl. 41.1, figs. 11, 12 by Uyeno, 1977).
3, 4. GSC 55598 and 55599, two Pa elements.

All specimens from Barlow Inlet Formation, 24.4 m below top of formation, Read Bay area, eastern Cornwallis Island (UTM Zone 15X, 481750mE, 8327500mN), GSC loc. C-54046 (Loc. 20 on Fig. 1).

Figures 5-12. Ozarkodina remscheidensis remscheidensis (Ziegler).

5-7. GSC 55600, 55601 and 55602, respectively, three Pa elements.
8. GSC 55603, posterior view of an Sa element.
9. GSC 55604, Sb element.
10. GSC 55605, Pb element.
11. GSC 55606, Sc element.
12. GSC 55607, M element.

All specimens from Devon Island Formation, 30.5 m above base of formation, Devon Island, GSC loc. C-33700 (*see* Fig. 24).

Figures 13-15, 18-20, 24-28. Ozarkodina remscheidensis (Ziegler).

13-15. GSC 55608, upper, lateral and lower views of a Pa element.
18-20. GSC 55609, 55610 and 55611, respectively, three Pa elements.
24. GSC 55612, Pb element.
25. GSC 55613, M element.
26. GSC 55614, posterior view of an Sa element.
27. GSC 55615, Sc element.
28. GSC 55616, Sb element.

All specimens from the basal beds of the Sutherland River Formation, Devon Island, GSC loc. C-33707* (*see* Fig. 24).

Figures 16, 17. Ozarkodina cf. O. n. sp. E of Klapper and Murphy (1975).

16, 17. GSC 55617, upper and lateral views of a Pa element, GSC loc. C-33700 (*see* Figs. 5-12 above).

Figures 21-23. Ozarkodina remscheidensis remscheidensis (Ziegler).

21. GSC 55618, Pa element ("late" form).
22, 23. GSC 55619, lateral and lower views of a Pa element.

Both specimens from Devon Island Formation, 123 m above base of formation, Devon Island, GSC loc. C-33704 (*see* Fig. 24).

Figures 29-38. Ozarkodina remscheidensis remscheidensis (Ziegler).

29-31. GSC 55620, upper, lateral and lower views of a Pa element ("late" form).
32, 33. GSC 55621 and 55622, two Pa elements ("late" form).
34. GSC 55623, Pb element.
35, 36. GSC 55624, posterior and lateral views of an Sa element.
37. GSC 55625, M element.
38. GSC 55626, Sc element.

All specimens from Devon Island Formation, 157 m above base of formation, Devon Island, GSC loc. C-55405 (*see* Fig. 24).

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* The exact stratigraphic interval of GSC locality C-33707 is not known. R. Thorsteinsson has informed the author that it is probably either the basal 3 to 4 m of the Sutherland River Formation, or the uppermost 3 to 4 m of the Devon Island Formation.

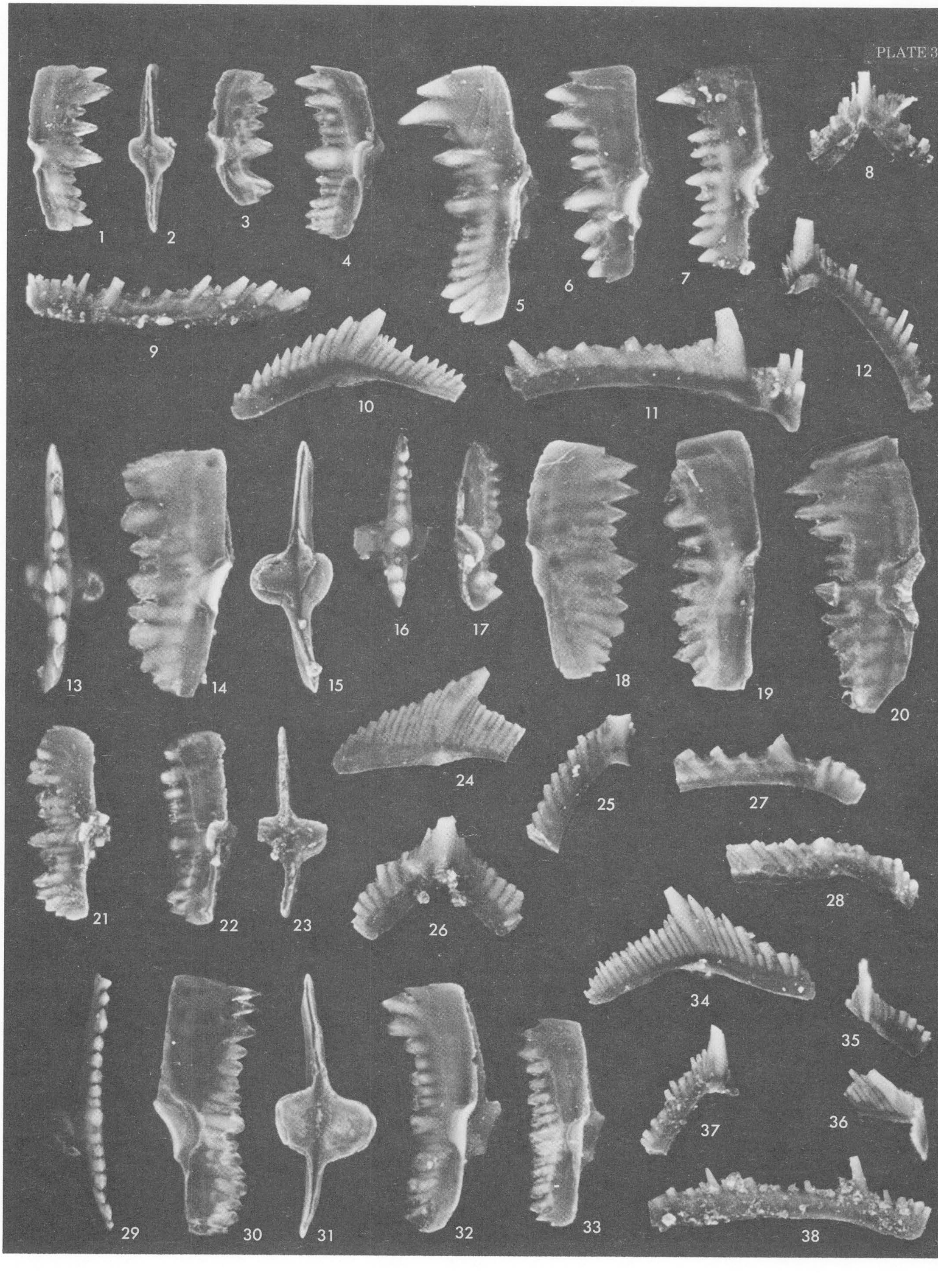
PLATE 3
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PLATE 4

All figures x40. All figures are lateral views unless otherwise noted.

Figures 1-3, 7, 8. Ozarkodina cf. O. remscheidensis remscheidensis (Ziegler).

1-3. GSC 55627, upper, lateral and lower views of a Pa element.
7, 8. GSC 55628 and 55629, two Pa elements.

All specimens from Devon Island Formation, 123 m above base of formation, Devon Island, GSC loc. C-33704 (*see* Fig. 24).

Figures 4-6, 9, 10. Ozarkodina cf. O. remscheidensis remscheidensis (Ziegler).

4-6. GSC 55630, upper, lateral and lower views of a Pa element.
9. GSC 55631, Pa element.
10. GSC 55632, Pb element.

All specimens from Devon Island Formation, 157 m above base of formation, Devon Island, GSC loc. C-55405 (*see* Fig. 24).

Figures 11, 12. Ozarkodina n. sp. A of Klapper and Murphy (1975).

11, 12. GSC 55633 and 55634, two Pa elements, Devon Island Formation, 7.6 m above base of formation, Ellesmere Island, GSC loc. C-2689 (*see* Fig. 25).

Figures 13, 14. Ozarkodina cf. O. douroensis n. sp.

13, 14. GSC 49772, lateral and upper views of a Pa element, Cape Storm Formation, 64.3 m below top of formation, Goodsir Creek, eastern Cornwallis Island, GSC loc. 83343 (*see* Fig. 16) (previously illustrated on Pl. 41.1, figs. 7, 8 by Uyeno, 1977).

Figures 15-18. Ozarkodina n. sp. F of Klapper and Murphy (1975).

15-17. GSC 55635, upper, lateral and lower views of a Pa element.
18. GSC 55636, Pb element.

All specimens from Sophia Lake Formation, stratigraphically about 300 m above base of formation, isolated outcrop, western Devon Island (UTM Zone 15X, 516000mE, 8345350mN), GSC loc. C-54044 (Loc. 23 on Fig. 1).

Figures 19, 20, 30-32. Ozarkodina n. sp. A of Klapper and Murphy (1975).

19, 20. GSC 49781 and 55637, two Pa elements.
30-32. GSC 49780, upper, lateral and lower views of a Pa element (GSC 49780 and 49781 previously illustrated on Pl. 41.1, figs. 21, 26, respectively, by Uyeno, 1977).

All specimens from Barlow Inlet Formation, 80.2 m above base of formation, Goodsir Creek, eastern Cornwallis Island, GSC loc. C-63576 (*see* Fig. 17).

Figures 21-29, 33-37. Ozarkodina n. sp. A of Klapper and Murphy (1975).

21, 22. GSC 55638 and 55639, two Pb elements.
23. GSC 55640, Sc element.
24, 25. GSC 55641 and 55642, two M elements.
26, 27. GSC 55643 and 55644, two Sb elements.
28, 29. GSC 55645 and 55646, posterior view of two Sa elements.
33, 34. GSC 55647 and 55648, two Pa elements.
35, 36. GSC 56147, lateral and lower views of a Pa element.
37. GSC 55649, Pa element.

All specimens from Devon Island Formation, talus sample from the basal part of the formation, Sutherland Formation, Devon Island, GSC loc. C-55407 (*see* Fig. 23).

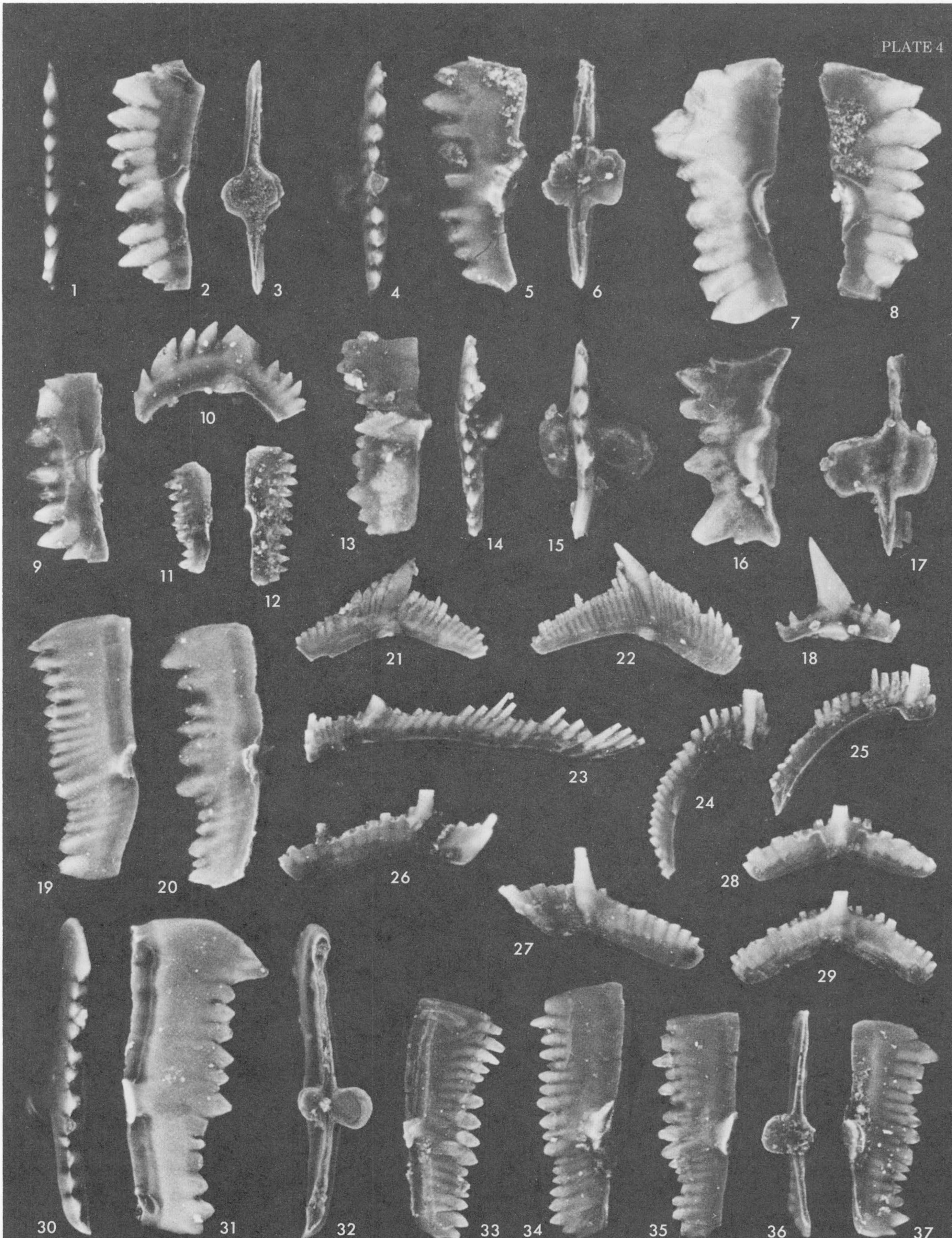
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PLATE 5

All figures x40. All figures are lateral views unless otherwise noted.

Figures 1-7. Ozarkodina n. sp. F of Klapper and Murphy (1975).

1. GSC 55650, Pa element morphologically transitional to Ozarkodina remscheidensis remscheidensis (Ziegler).
2. GSC 55651, Pa element.
3-5. GSC 55652, upper, lateral and lower views of a Pa element.
6, 7. GSC 55653 and 55654, two Pb elements.

All specimens from Sophia Lake Formation, stratigraphically about 300 m above base of member, isolated outcrop, western Devon Island (UTM Zone 15X, 516000mE, 8345350mN), GSC loc. C-54044 (Loc. 23 on Fig. 1).

Figures 8-20. Ozarkodina n. sp. G.

8. GSC 58362, upper view of a Pa element.
9, 10. GSC 55655, lateral and lower views of a Pa element.
11. GSC 49783, Pa element (previously illustrated on Pl. 41.1, fig. 24 by Uyeno, 1977).
12, 13. GSC 49782, lateral and lower views of a Pa element (previously illustrated on Pl. 41.1, figs. 22, 23 by Uyeno, 1977).
14. GSC 55656, Pb element.
15. GSC 55657, M element.
16. GSC 55658, posterior view of an Sa element.
17. GSC 55659, Sc element.
18-20. GSC 55660, 55661, and 55662, respectively, three Pa elements.

All specimens from Sophia Lake Formation, 21.3 m above base of formation, Read Bay area, eastern Cornwallis Island (UTM Zone 15X, 481850mE, 8327750mN), GSC loc. C-49976 (Loc. 22 on Fig. 1).

Figures 21-26. Ozarkodina n. sp. H.

21-26. GSC 55663 and 55664, upper, lateral and lower views of two Pa elements, both from Peel Sound Formation, 59.5 m above base of formation, Prince of Wales Island, GSC loc. C-63587 (*see* Fig. 21).

Figures 27-31. Ozarkodina n. sp. H.

27-29. GSC 55665, 55666 and 55667, respectively, three Pa elements.
30, 31. GSC 55668 and 55669, two Pb elements.

All specimens from lower member, Peel Sound Formation, 54 m above base of formation, Prince of Wales Island, GSC loc. C-53213 (*see* Fig. 22).

Figures 32, 33. Icriodus n. sp. C.

32, 33. GSC 55670, upper and lower views of an I element, Devon Island Formation, 30.5 m above base of formation, Devon Island, GSC loc. C-33700 (*see* Fig. 24).

Figures 34, 35. Pedavis aff. P. thorsteinssoni n. sp.

34. GSC 55671, I element (fragmentary).
35. GSC 55672, upper view of an I element.

Both specimens from Barlow Inlet Formation, 80.2 m above base of formation, Goodsir Creek, eastern Cornwallis Island, GSC loc. C-63576 (*see* Fig. 17).

Figures 36-40, 47-49. Pedavis aff. P. thorsteinssoni n. sp.

36, 37. GSC 55673 and 55674, two M_2 elements.
38-40, 47-49. GSC 55675 and 55676, upper, lower and lateral views of two I elements.

All specimens from Somerset Island Formation, 0.9 to 2.1 m above base of formation, Boothia Peninsula, GSC loc. C-26653 (*see* Fig. 18).

Figures 41-46. Icriodus woschmidti hesperius Klapper and Murphy.

41, 42. GSC 55677 and 55678, two S_2 elements.
43-46. GSC 55679 and 55680, upper and lower views of two I elements.

All specimens from Devon Island Formation, 175 m above base of formation, Sutherland River, Devon Island, GSC loc. C-54035 (*see* Fig. 23).

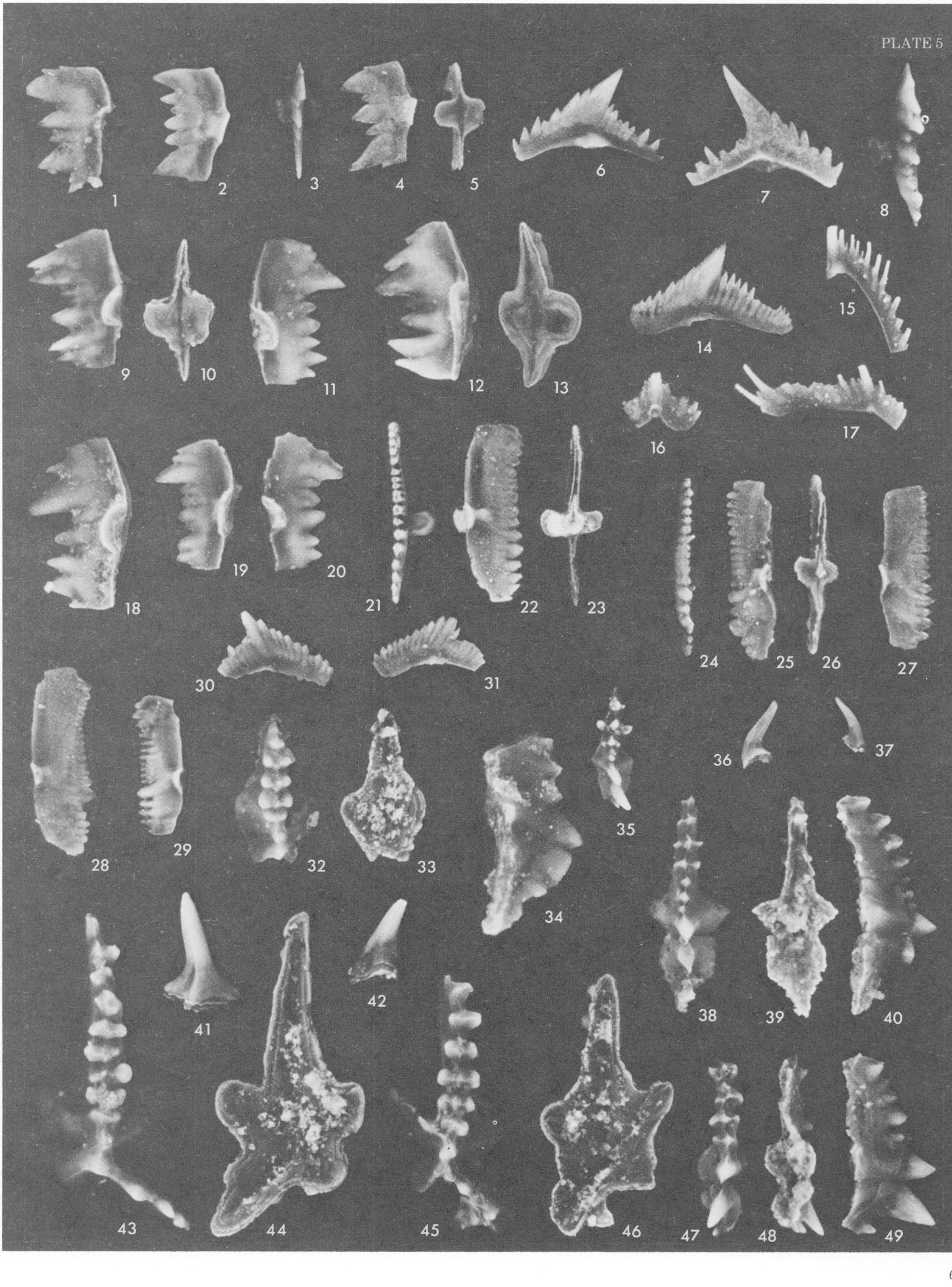
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PLATE 6

All figures x40. All figures are lateral views unless otherwise noted.

Figures 1-22, 25-29. Pedavis thorsteinssoni n. sp.

- 1-3. GSC 49785, upper, lateral and lower views of holotype I element.
- 4-6. GSC 55681, upper, lateral and lower views of paratype I element.
- 7, 16, 20. GSC 55682, 49786 and 55683, respectively, upper views of three paratype I elements.
- 8. GSC 55684, paratype S_1 element.
- 9, 10. GSC 55685 and 55686, two paratype M_2 elements (acodinan).
- 11. GSC 55687, paratype M_2 element.
- 12. GSC 55688, posterior view of paratype M_2 element.
- 13-15, 21, 22, 29. GSC 55689 to 55694, respectively, all paratype M_2 elements.
- 17-19. GSC 55695, upper, lateral and lower views of paratype I element.
- 25-28. GSC 55696 to 55699, respectively, all paratype M_2 elements (drepanodontan).

All specimens from Barlow Inlet Formation, 239 m above base of formation, Goodsir Creek, eastern Cornwallis Island, GSC loc. C-19837 (*see* Fig. 17).

Figures 23, 24. Pedavis latialata (Walliser).

- 23, 24. GSC 49773, upper and lower views of an I element, Barlow Inlet Formation, 80.2 m above base of formation, Goodsir Creek, eastern Cornwallis Island, GSC loc. C-63576 (*see* Fig. 17) (previously illustrated on Pl. 41.1, figs. 9, 10 by Uyeno, 1977).

Figures 30-38. Pedavis latialata (Walliser).

- 30, 38. GSC 55700 and 55701, upper views of two I elements.
- 31, 32, 36, 37. GSC 55702 and 55705, respectively, all M_2 elements.
- 33. GSC 55706, S_1 elements.
- 34, 35. GSC 55707, upper and lower views of an I element.

All specimens from Devon Island Formation, talus sample from basal part of the formation, Sutherland River, Devon Island, GSC loc. 55407 (*see* Fig. 23).

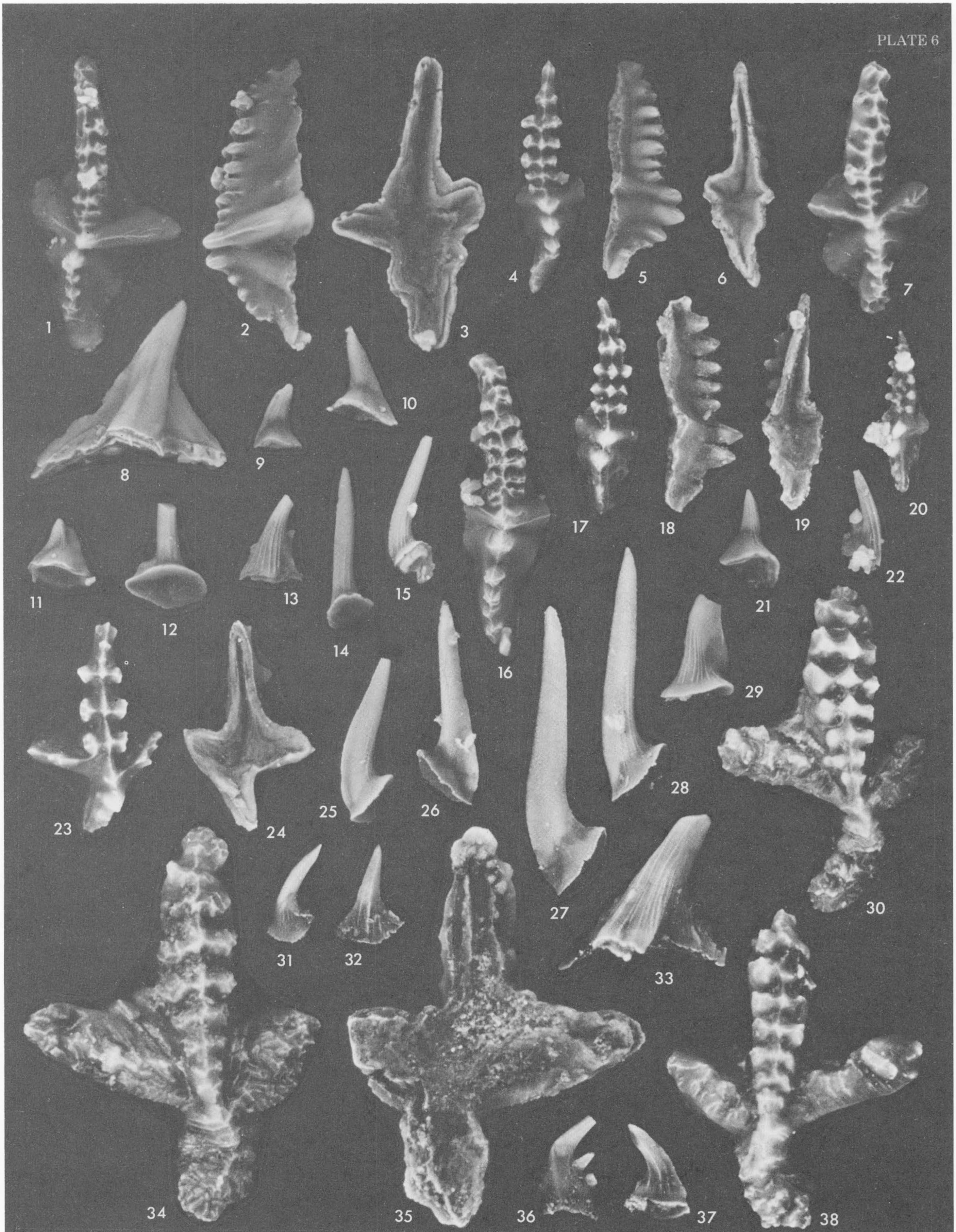
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PLATE 7

All figures x40. All figures are lateral views unless otherwise noted.

Figures 1-9. Pelekysgnathus arcticus n. sp.

1-6. GSC 49775 and 55708, upper, lateral and lower views of paratype and holotype I elements, respectively (GSC 49775 previously illustrated on Pl. 41.1, figs. 13, 14 by Uyeno, 1977).

7. GSC 55709, paratype M_2 element.

8, 9. GSC 55710 and 55711, two paratype S_2 elements.

All specimens from Barlow Inlet Formation, 239 m above base of formation, Goodsir Creek, eastern Cornwallis Island, GSC loc. C-19837 (*see* Fig. 17).

Figures 10-17. Pelekysgnathus arcticus n. sp.

10-12. GSC 55712, upper, lateral and lower views of paratype I element.

13. GSC 55713, paratype S_2 element.

14-17. GSC 55714 to 55717, all paratype M_2 elements.

All specimens from lower member, Peel Sound Formation, 318 m above base of formation, Prince of Wales Island, GSC loc. C-39583 (*see* Fig. 22).

Figures 18, 26, 27. Pelekysgnathus arcticus n. sp.

18. GSC 55718, paratype S_2 element.

26, 27. GSC 55719, upper and lateral views of paratype I element.

Both specimens from Somerset Island Formation, 83 m below top of formation, Somerset Island, GSC loc. C-26656 (*see* Fig. 20).

Figure 19. Pelekysgnathus arcticus n. sp.

19. GSC 55720, paratype I element, lower member, Peel Sound Formation, 205 m above base of formation, Prince of Wales Island, GSC loc. C-8235 (*see* Fig. 22).

Figures 20-25. Pelekysgnathus arcticus n. sp.

20-22. GSC 55721, upper, lateral and lower views of paratype I element.

23. GSC 55722, paratype S_2 element.

24, 25. GSC 55723 and 55724, posterior and lateral views of two paratype M_2 elements.

All specimens from Peel Sound Formation, 45.8 m above base of formation, Prince of Wales Island, GSC loc. C-63589 (*see* Fig. 21).

Figures 28-34, 39, 40. Pelekysgnathus n. sp. B.

28, 29. GSC 55725, upper and lateral views of an I element.

30-32. GSC 55726, upper, lateral and lower views of an I element.

33, 39. GSC 55727 and 55728, two S_2 elements.

34, 40. GSC 55729 and 55730, two M_2 elements.

All specimens from Sophia Lake Formation, 21.3 m above base of formation, Read Bay area, eastern Cornwallis Island (UTM Zone 15X, 481850mE, 8327750mN), GSC loc. C-49976 (Loc. 22 on Fig. 1).

Figures 35-38. Pelekysgnathus n. sp. C.

35, 36. GSC 55731, lateral and upper views of an I element.

37, 38. GSC 55732 and 55733, two I elements.

All specimens from Peel Sound Formation, 54 m above base of formation, Prince of Wales Island, GSC loc. C-53213 (*see* Fig. 22).

Figures 41-48. Pedavis n. sp. A.

41, 43, 44, 48. GSC 55734 and 55735, upper and lower views of two I elements.

42, 45-47. GSC 55736 to 55739, all M_2 elements.

All specimens from Devon Island Formation, 175 m above base of formation, Sutherland River, Devon Island, GSC loc. C-54035 (*see* Fig. 23).

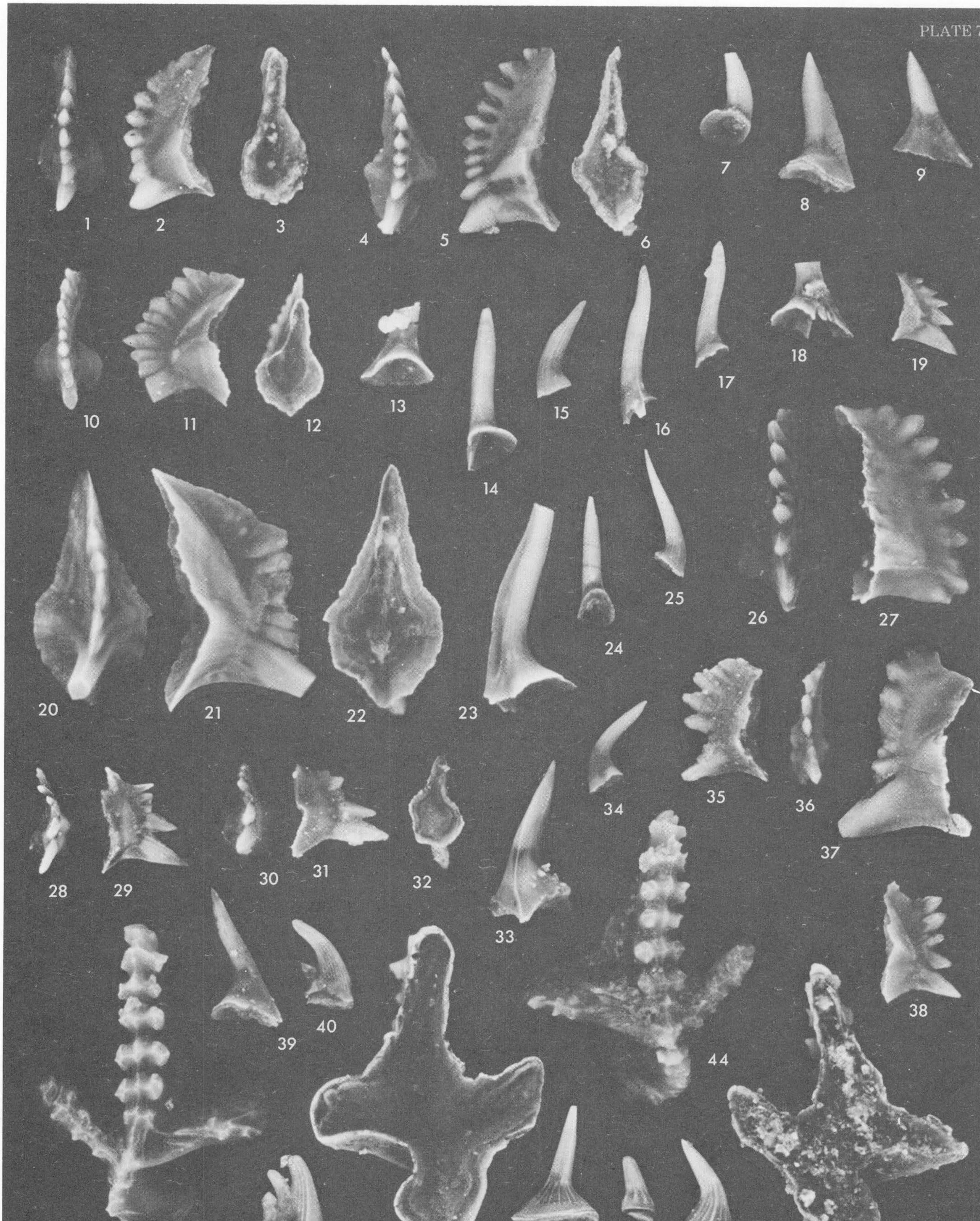
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PLATE 8

All figures x40. All figures are lateral views, unless otherwise noted.

Figures 1-8. Pelekysgnathus n. sp. C.

1-3. GSC 55740, upper, lateral and lower views of an I element.
4, 5. GSC 55741 and 55742, two S_2 elements.
6-8. GSC 55743, 55744 and 55745, three M_2 elements.

All specimens from Peel Sound Formation, 54 m above base of formation, Prince of Wales Island, GSC loc. C-53213 (*see* Fig. 22).

Figures 9-14. Kockelella variabilis Walliser.

9, 10. GSC 55746, upper and lateral views of a Pa element.
11. GSC 55747, Pb element.
12. GSC 55748, M element.
13. GSC 55749, Sb element.
14. GSC 55750, posterior view of an Sa element.

All specimens from Douro Formation, 0.3 m below top of formation, Ellesmere Island (UTM Zone 16X, 489200mE, 8499250mN), GSC loc. C-63558 (Loc. 18 on Fig. 1).

Figures 15, 16. Kockelella variabilis Walliser.

15. GSC 49777, Pb element (previously illustrated on Pl. 41.1, fig. 17 by Uyeno, 1977).
16. GSC 55751, M element.

Both specimens from Barlow Inlet Formation, 6.1 m above base of formation, Goodsir Creek, eastern Cornwallis Island, GSC loc. 83349 (*see* Fig. 17).

Figures 17, 18. Ancoradella ploeckensis Walliser.

17, 18. GSC 49784, lower and upper views of a Pa element, Douro Formation, 125.0 m above base of formation, Goodsir Creek, eastern Cornwallis Island, GSC loc. 83347 (*see* Fig. 16) (previously illustrated on Pl. 41.1, fig. 25 by Uyeno, 1977).

Figure 19. ?Ancoradella ploeckensis Walliser.

19. GSC 55752, a possible M element, Douro Formation, 7.0 m below top of formation, Ellesmere Island (UTM Zone 16X, 489200mE, 8499250mN), GSC loc. C-63559 (Loc. 18 on Fig. 1).

Figures 20, 21. Ancoradella ploeckensis Walliser.

20, 21. GSC 55753 and 55754, upper view of two Pa elements, GSC loc. C-63559 (*see* Fig. 19 above).

Figures 22-25. Polygnathoides? sp. A.

22-24. GSC 55755, upper, lateral and lower views.
25. GSC 55756, upper view.

Both specimens from Douro Formation, 135.6 m above base of formation, Prince of Wales Island, GSC loc. C-63597 (*see* Fig. 21).

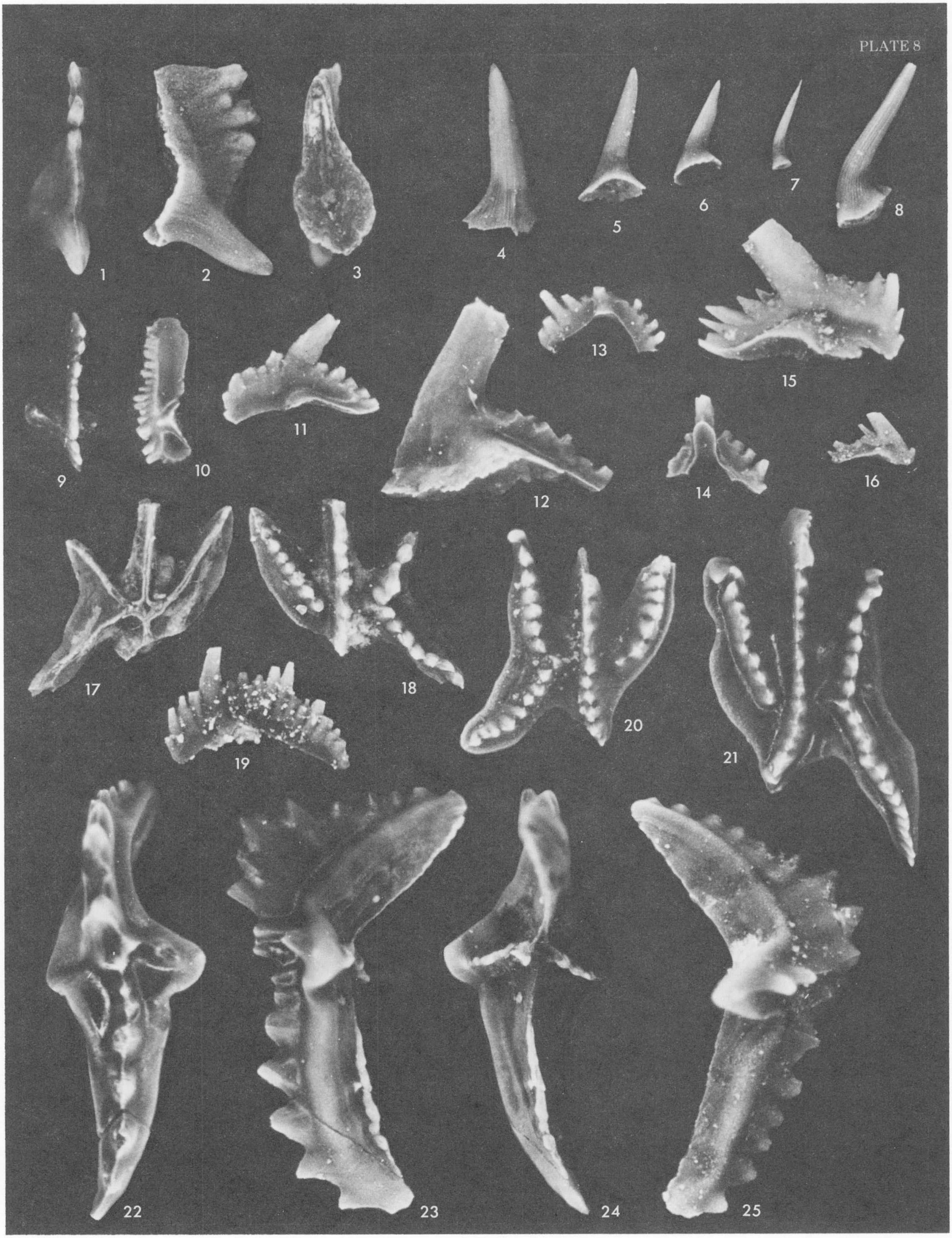
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PLATE 9

All figures x40. All figures are lateral views, unless otherwise noted.

Figures 1-6, 12, 13. Apparatus A.

1, 2. GSC 49769, posterior and anterior views of a Pa? element (previously illustrated on Pl. 41.1, figs. 1, 2 by Uyeno, 1977).
3. GSC 55757, posterior view of an Sa? element.
4, 13. GSC 55758 and 55759, two Pb? elements.
5, 6. GSC 55760, anterior and posterior views of a Pa? element.
12. GSC 55761, M? element.

All specimens from Cape Storm Formation, 398.1 m below top of formation, Goodsir Creek, eastern Cornwallis Island, GSC loc. 83335 (*see* Uyeno, 1977, Fig. 41.2).

Figures 7-11. Oulodus sp. 1.

7. GSC 55762, Pb element.
8. GSC 55763, M element.
9. GSC 55764, Sc element.
10. GSC 55765, Sb element.
11. GSC 55766, posterior view of an Sa element.

All specimens from GSC loc. 83335 (*see* Figs. 1-6, 12, 13 above).

Figures 14-17, 20, 21. Oulodus sp. 2.

14. GSC 55767, Pb element.
15. GSC 55768, Pa element.
16. GSC 55769, M element.
17. GSC 55770, Sc element.
20. GSC 55771, Sb element.
21. GSC 55772, posterior view of an Sa element.

All specimens from the basal beds of the Sutherland River Formation, Devon Island, GSC loc. C-33707* (*see* Fig. 24).

Figures 18, 19. "Neoprioniodus" latidentatus Walliser.

18, 19. GSC 55773 and 55774, two M elements, Douro Formation, 0.3 m below top of formation, Ellesmere Island (UTM Zone 16X, 489200mE, 8499250mN), GSC loc. C-63358 (Loc. 18 on Fig. 1). (*See* under Polygnathoides siluricus Branson and Mehl in the Systematics.)

Figures 22, 23. Polygnathoides siluricus Branson and Mehl.

22, 23. GSC 49779, upper and lower views, Douro Formation, 332.5 m above base of formation, Goodsir Creek, eastern Cornwallis Island, GSC loc. C-63573 (previously illustrated on Pl. 41.1, figs. 19, 20 by Uyeno, 1977).

Figures 24, 25. Polygnathoides emarginatus (Branson and Mehl).

24. GSC 55775, Douro Formation, 0.3 m below top of formation, Devon Island, GSC loc. C-33696 (*see* Fig. 24).
25. GSC 55776, GSC loc. C-63558 (*see* Figs. 18, 19 above).

Figures 26-29. Polygnathoides siluricus Branson and Mehl.

26, 27. GSC 55777 and 55778, upper views of two specimens, both from GSC loc. C-33696 (*see* Fig. 24 above).
28. GSC 55779, upper view, from GSC loc. C-63558 (*see* Figs. 18, 19 above).
29. GSC 55780, upper view, Douro Formation, 7.0 m below top of formation, Ellesmere Island, GSC loc. C-63559 (Loc. 18 on Fig. 1).

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* *See* Footnote on Plate 3.

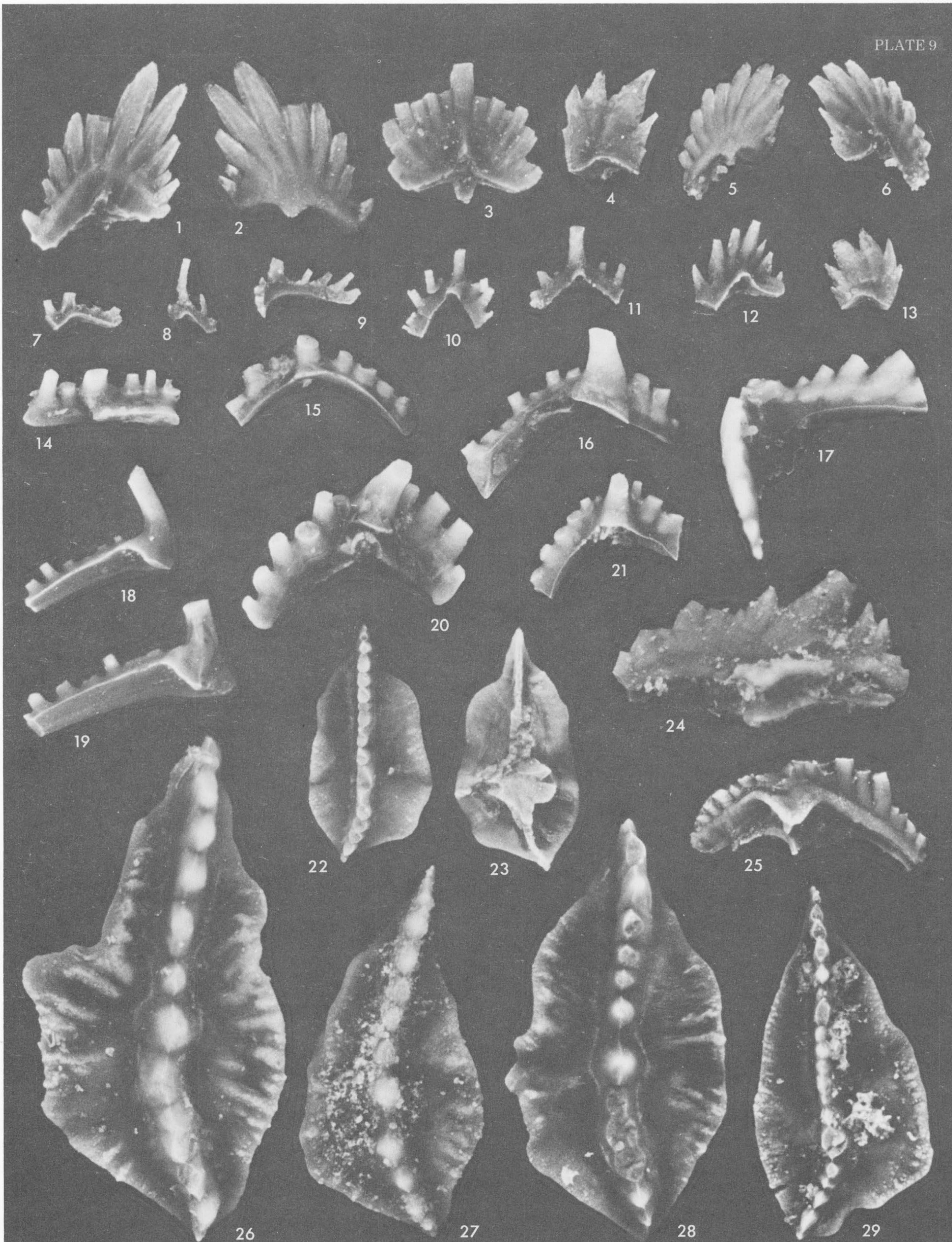
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PLATE 10

All figures x40. All figures are lateral views, unless otherwise noted.

Figures 1-3. Oulodus sp. 3.

1, 2. GSC 55781 and 55782, two Pb elements.
3. GSC 55783, M element.

All specimens from Peel Sound Formation, 6 m above base of formation, Prince of Wales Island, GSC loc. C-63592 (*see* Fig. 21).

Figures 4, 5. Oulodus sp. 7.

4. GSC 55784, Pb element.
5. GSC 55785, Sc element.

Both specimens from Devon Island Formation, talus sample from basal part of the formation, Sutherland Creek, Devon Island, GSC loc. C-55407 (*see* Fig. 23).

Figures 6, 10, 12. Apparatus B.

6, 12. GSC 55786 and 55787, two Pb elements.
10. GSC 55788, M? element.

All specimens from GSC loc. C-63592 (*see* Figs. 1-3 above).

Figures 7, 11, 18-22. Apparatus B.

7, 18, 19. GSC 55789, 55790 and 55791, respectively, three Pb elements.
11, 22. GSC 55792 and 55793, posterior view of two Sa elements.
20, 21. GSC 55794 and 55795, two undesignated elements.

All specimens from Douro Formation, 0 to 1.82 m below top of formation, Boothia Peninsula, GSC loc. C-26655 (*see* Fig. 18).

Figures 8, 9. "Neoprioniodus" sp. A.

8, 9. GSC 55796 and 55797, Douro Formation, 51.8 m above base of formation, Prince of Wales Island, GSC loc. C-64002 (*see* Fig. 21).

Figures 13, 15. Belodella sp.

13, 15. GSC 55798 and 55799, Devon Island Formation, 7.6 m above base of formation, Ellesmere Island, GSC loc. C-2689 (*see* Fig. 25).

Figure 14. Belodella? sp.

14. GSC 55800, from GSC loc. C-2689 (*see* Figs. 13, 15 above).

Figure 16. Panderodus sp.

16. GSC 55801, from GSC loc. C-2689 (*see* Figs. 13, 15 above).

Figure 17. "Trichonodella" sp. A.

17. GSC 55802, posterior view, Devon Island Formation, 30.5 m above base of formation, Devon Island, GSC loc. C-33700 (*see* Fig. 24).

Figures 23-26. Oulodus sp. 6.

23. GSC 55803, Pa element.
24. GSC 55804, Sc element.
25. GSC 55805, Sb element.
26. GSC 55806, posterior view of an Sa element.

All specimens from lower member, Peel Sound Formation, 121 m above base of formation, Prince of Wales Island, GSC loc. C-8237 (*see* Fig. 22).

Figures 27-30. Oulodus sp. 5.

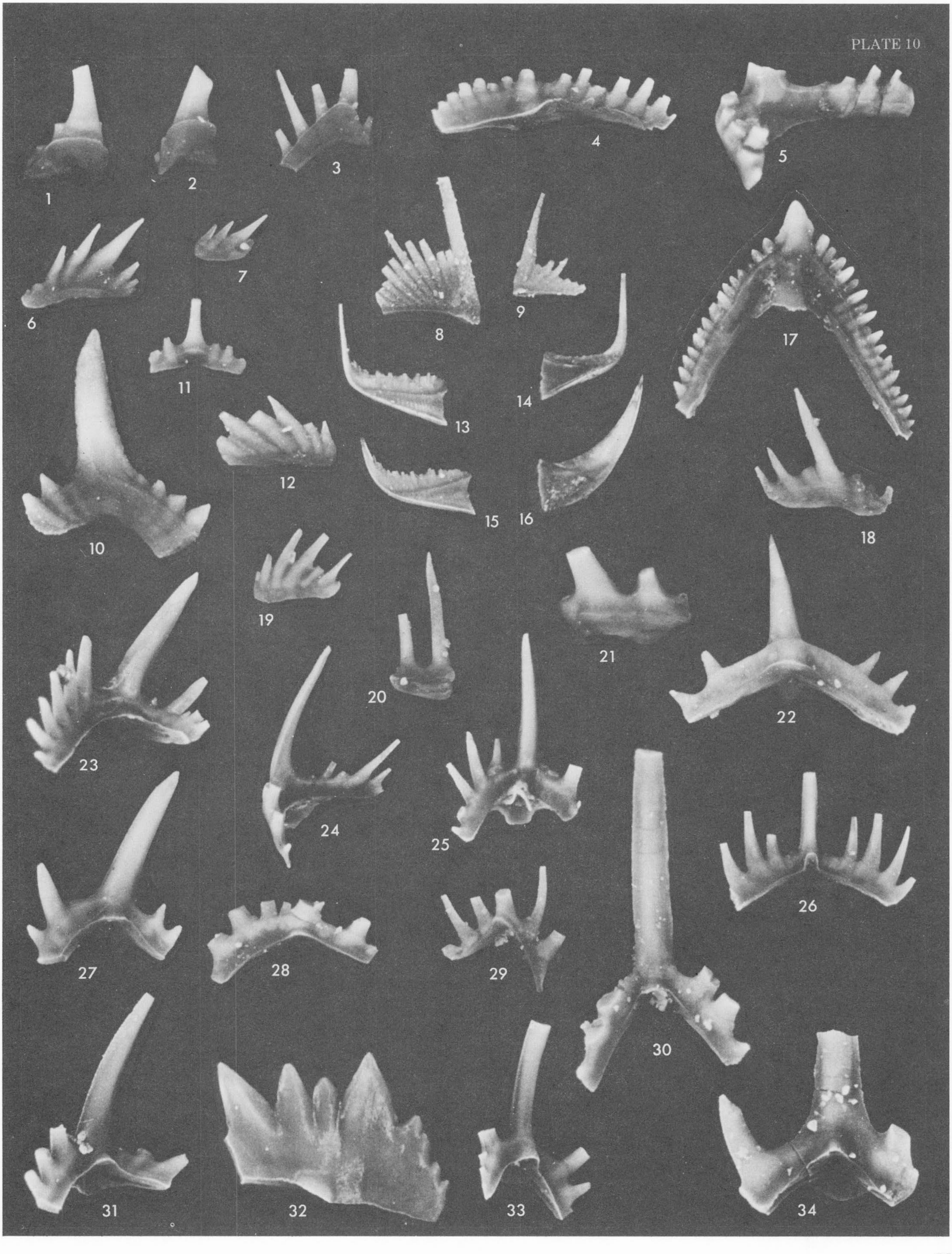
27. GSC 55807, Pa element.
28. GSC 55808, Pb element.
29. GSC 55809, Sb element.
30. GSC 56142, posterior view of an Sa element.

All specimens from Douro Formation, 0 to 1.82 m below top of formation, Boothia Peninsula, GSC loc. C-26655 (*see* Fig. 18).

Figures 31-34. Oulodus sp. 4.

31. GSC 56143, Pa? element.
32. GSC 56144, Pb? element.
33. GSC 56145, Sb-Sa transitional element.
34. GSC 56146, posterior view of an Sa element.

All specimens from lower member, Peel Sound Formation, 318 m above base of formation, Prince of Wales Island, GSC loc. C-39583 (*see* Fig. 22).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