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STRATIGRAPHY OF CENTRAL AND EASTERN ELLESMERE ISLAND, ARCTIC CANADA
PART III. UPPER ORDOVICIAN (RICHMONDIAN), SILURIAN AND DEVONIAN

J. Wm. Kerr

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PREFACE

An analysis of Upper Ordovician to Upper Devonian sediments is presented in this report. It is the third and final report in a series by the author that summarizes the history of that part of the Franklinian Miogeosyncline on central Ellesmere Island.

The three reports together stress the pattern of evolutionary development of the Miogeosyncline. The formation of the basin began in Proterozoic time when sediments were deposited unconformably on the eroded Precambrian Shield. For more than 200 million years, the geosyncline became progressively wider and deeper, and reached its maximum width and depth in Late Ordovician time. In the next approximately 100 million years, until Late Devonian time, the geosyncline became progressively narrower and shallower, as it filled with sediments. This was a waning phase, in which deposition in the basin ended and the Late Devonian Ellesmerian Orogeny produced deformation and uplift.

A major role of the Geological Survey is to provide a comprehensive understanding of the nation's territory for purposes of resource evaluation and discovery. This report, used with the author's published maps, contributes substantially to this role by providing data necessary for the understanding of petroleum and other mineral deposits.

D.J. McLaren,
Director General,
Geological Survey of Canada.

Ottawa, December 5, 1975

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ABSTRACT

The Franklinian Miogeosyncline and adjacent Central Stable Region in central and eastern Ellesmere Island contain a succession of Proterozoic to Upper Devonian rocks. The succession has been separated into three divisions for descriptive purposes, and published reports by the writer (Kerr, 1967a, 1968) on the first two divisions comprise information on formations of Proterozoic and Cambrian, and of Ordovician ages, respectively. The third division comprises formations of Late Ordovician (Richmondian), Silurian, and Devonian ages; their composition and general distribution are outlined in this report. This third division represents the final depositional phase of the Franklinian Miogeosyncline in which it was gradually filled, narrowed, and then terminated by folding. The base of the third division lies on a distinctive marker, the Irene Bay Formation. The lower part of the division contains three facies belts. The Allen Bay Formation and overlying Read Bay Formation together range in age from Late Ordovician to Early Devonian and consist largely of carbonate rocks. Westward, these carbonates grade upward to graptolitic shale of the Cape Phillips Formation and then to fine-grained, deep-water clastic rocks of the Imina Formation. Major bodies of carbonate strata occur partly or completely isolated in the shale belt.

During deposition of the lower part of this division, the Franklinian Miogeosyncline was very broad and included the entire study-area. In Early Devonian time, the Central Stable Region was expanded westward at the expense of the miogeosyncline by the development of a flexure within the study-area. From that time on, there was a substantial thickness increase westward over the flexure. The Bache Peninsula Arch is a westward projection of the Central Stable Region into the miogeosyncline.

In Early through Late Devonian time, the miogeosyncline was progressively infilled with clastic sediments from both sides. From the west came flysch-like sediments of the Imina Formation and molasse-like sediments of the Okse Bay Formation. From the east came sediments comprising the Vendom Fiord Formation and, perhaps, part of the Okse Bay Formation. The Blue Fiord Formation is an Early and possible Middle Devonian reefal carbonate that was surrounded and finally enveloped by clastic sediments.

The sedimentary column in the study-area represents the last depositional stages of the Franklinian Miogeosyncline as that belt was filled and ceased to be a sedimentary basin. Devonian clastic rocks in the upper part of this column are precursors of the Ellesmerian Orogeny. This entire column was finally folded by southeastward-directed deformation of that orogeny.

RÉSUMÉ

Le miogéosynclinal du Franklinien et la région stable du centre, qui lui est adjacent dans le centre est de l'île Ellesmere comportent une série de roches allant de l'Algonkien au Dévonien supérieur. Pour faciliter la description, on distingue dans cette série trois divisions; l'auteur a publié des rapports (Kerr, 1967a, 1968) sur les deux premières divisions où il donne des renseignements sur les formations de l'Algonkien, du Cambrien et de l'Ordovicien, respectivement. La troisième division comprend les formations datant de la fin de l'Ordovicien (Richmondien), du Silurien et du Dévonien; le présent rapport en indique la répartition géographique et la composition. Cette troisième division représente la phase finale de sédimentation du miogéosynclinal du Franklinien pendant laquelle celui-ci s'est comblé peu à peu, s'est resserré, et finalement s'est plissé. La base de la troisième division repose sur un repère stratigraphique précis, la formation d'Irene Bay. La partie inférieure de la division comporte trois zones de faciès. L'ensemble de la formation d'Allen Bay et de la formation de Read Bay qui la recouvre s'échelonne de l'Ordovicien supérieur au Dévonien inférieur et est constitué principalement de roches carbonatées vers l'ouest, ces roches carbonatées passent progressivement vers le haut aux schistes argileux à graptolithes de la formation de Cape Phillips, puis aux roches clastiques à grain fin, déposées en eau profonde, de la formation d'Imina. On trouve dans la zone des schistes argileux en partie ou complètement isolées, des couches importantes de roches carbonatées.

Pendant la phase de sédimentation de la partie inférieure de cette division, le miogéosynclinal du Franklinien était très large et englobait l'ensemble de la région étudiée ici. Au Dévonien inférieur, la région stable du centre s'est étendue vers l'ouest aux dépens du miogéosynclinal, en formant, dans la région étudiée, une flexure. À partir de ce moment-là, il y a eu un accroissement important de l'épaisseur des sédiments, vers l'ouest au niveau de la flexure. L'arche de la péninsule Bache constitue l'avancée occidentale extrême de la région stable du centre dans le miogéosynclinal.

Du Dévonien inférieur au supérieur, le miogéosynclinal a été comblé peu à peu infiltré par des sédiments clastiques provenant des deux rives. De l'ouest venaient les sédiments de type flysch de la formation d'Imina et les sédiments de type molasse de la formation d'Okse Bay. De l'est venaient des sédiments comprenant la formation de Vendom Fiord et, peut-être d'une partie de la formation d'Okse Bay. La formation de Blue Fiord est constituée de roches carbonatées récifales du Dévonien inférieur et peut-être du milieu du Dévonien, qui ont été entourées et finalement enveloppées par des sédiments clastiques.

La colonne stratigraphique dans la région étudiée représente les dernières étapes de sédimentation du miogéosynclinal du Franklinien, car cette zone fut comblée à ce moment-là et cessa d'être un bassin sédimentaire. Les roches clastiques du Dévonien de la partie supérieure de cette série stratigraphique constituent les signes avant-coureurs de la phase tectonique Ellesmérienne. Tous les sédiments de cette série stratigraphique ont finalement été plissés par les mouvements (dirigés vers le sud-est) de cette phase tectonique.

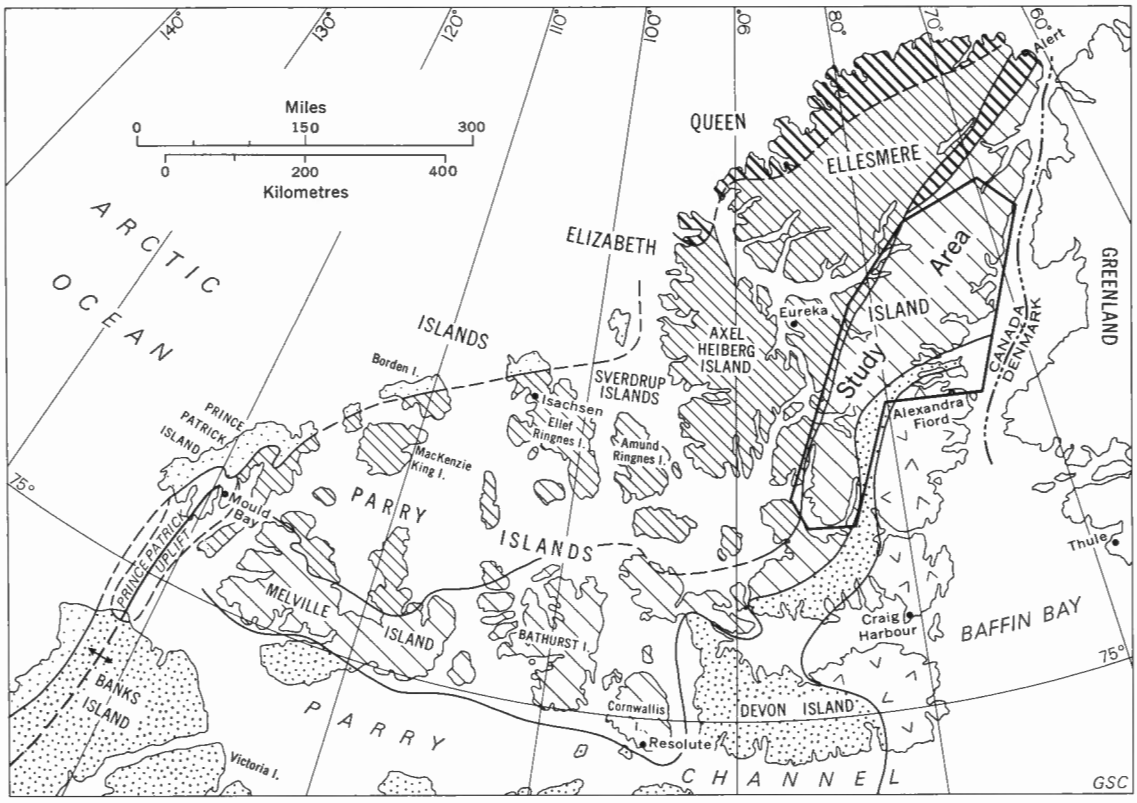

FIGURE 1. Stratigraphic-structural provinces of the Canadian Arctic Archipelago

STRATIGRAPHY OF CENTRAL AND EASTERN ELLESMERE ISLAND, ARCTIC CANADA. PART III. UPPER ORDOVICIAN (RICHMONDIAN), SILURIAN AND DEVONIAN

INTRODUCTION

Upper Ordovician to Devonian rocks of central and eastern Ellesmere Island (Fig. 1) were examined by the writer during the field seasons of 1961 and 1962 as part of Operation Eureka. Three reports by the writer cover the complete Proterozoic through Late Devonian history of the Franklinian Miogeosyncline and adjacent Central Stable Region of central Ellesmere Island. The two earlier reports of this three-part series deal with Proterozoic and Cambrian rocks (Kerr, 1967a) and with Ordovician rocks (Kerr, 1968). The reports are generalized due to the large size of the study-area (Fig. 2), the limited time available, and the lack of good air support at the time field work was done. Rock exposure generally is good and lends itself to future more detailed studies.

The area studied (Fig. 2) is covered by a series of geological maps (Kerr, 1972a, b, c; Thorsteinsson, 1972a, b, c; Kerr and Thorsteinsson, 1972; and Thorsteinsson and Kerr, 1962, 1972). These are, respectively, GSC Maps 1357A, 1358A, 1359A, 1300A, 1307A, 1308A, 1312A, 39-1962, and 1348A. Measured sections are described in the Appendix. The locations of sections of the present Bulletin and the previous Papers are shown on an index map (Fig. 2) as well as on the above-noted geological maps, all having the same numbering system.

PREVIOUS WORK AND ACKNOWLEDGMENTS

Most major geological subdivisions used in this report (Fig. 1) were defined in a compilation by Fortier *et al.* (1954). Salient tectonic features of the region have been included in broader compilations by Thorsteinsson and Tozer (1960), Douglas *et al.* (1963), Thorsteinsson and Tozer (1970), and Trettin *et al.* (1972).

In 1955, widely spaced areas on Ellesmere Island were studied during Operation Franklin (Fortier *et al.*, 1963), an airborne project of the Geological Survey of Canada. The main stratigraphic framework for Upper Ordovician and Silurian rocks was established on Cornwallis Island by Thorsteinsson (1958) and was extended to Ellesmere Island in the Operation Franklin report (Thorsteinsson, 1963a). Thorsteinsson and Tozer (1957) have described the spectacular facies change from carbonate to shale on Ellesmere Island that dominates the Ordovician and Silurian stratigraphy in the Arctic. McLaren (1963) established the framework for the Devonian stratigraphy of Ellesmere Island about 20 miles (32 km) southwest of the present report-area. Some of the results of the work done by Trettin (1971b, in prep. a, b) on the correlation of the clastic rocks have been used in this report.

Able assistance in the field was provided by N. Haimila, D. Morris, T. Frisch, and J. Siddon. J. Jamieson, V. Andreasson and J. Kershaw flew a Piper Cub aircraft, while M. Olsen piloted a helicopter.

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STRATIGRAPHY

The stratigraphy of central and eastern Ellesmere Island (Fig. 2) is characterized by a thick succession of rocks ranging in age from late Proterozoic to Late Devonian. Angular unconformities are present in the succession, but the sequence is not interrupted by major orogenic episodes. The succession overlies Precambrian crystalline rocks unconformably and is truncated at the top by a major unconformity related to the Late Devonian to Middle Pennsylvanian Ellesmerian Orogeny (Thorsteinsson and Tozer, 1970). This Proterozoic and Paleozoic succession has been subdivided into three divisions that are based on three distinctive sedimentary patterns, each persisting throughout a long period of time.

The first division includes upper Proterozoic and Cambrian rocks (Kerr, 1967a) and shows a progressing pattern of sedimentary development that is broadly similar to patterns occurring in the eastern and western miogeosynclinal belts of North America. The basal Cambrian rocks are Lower Cambrian clastic units of cratonic source that encroached onto the craton; they are succeeded by predominantly carbonate rocks of late Early and Middle Cambrian age.

The second division in the study-area embraces Lower to Upper Ordovician rocks (Kerr, 1968) and exhibits a distinctive, persistent depositional pattern, markedly different from the patterns below and above. The base is a regional disconformity. The rocks consist of alternating carbonates and evaporites typical of shallow-marine deposition; facies gradations are very gradual. The sediments of the various rock units were deposited in troughs whose axes are approximately coincident and trend along the miogeosynclinal belt. Thickness variations across the strike are slight in the carbonate units, but more extreme in the intervening evaporite units. It is clear that, throughout Early to Late Ordovician time, the miogeosyncline was a trough bounded by a less negative belt near the eugeosyncline. It is clear also that, in this span of time,

thickness contrasts between the succession of strata in the miogeosyncline and that on the craton had diminished and the flexure separating those provinces was less active.

The third division (treated herein) comprises strata deposited from approximately mid-Richmondian to Late Devonian time (Table 1). It includes all rocks younger than the Irene Bay Formation, which serves as a datum for the base of this division. It extends upward to include the Okse Bay Formation, the youngest unit of the Franklinian Miogeosyncline in this area. In contrast to the two older divisions, the third division is characterized by a great variety of rock types as well as by facies changes and thickness variations that are both extreme and rapid. The column treated in this report spans early stages of the Ellesmerian Orogeny which influenced facies patterns. The final phase of the orogeny was marked by folding, which deformed all rocks treated herein.

Certain aspects of the stratigraphic column treated here have been discussed in earlier reports by the writer (Kerr, 1967b, c, d). In the present report, the writer integrates the data of earlier papers and provides additional information.

The designation of geological provinces in the Arctic is difficult, and the clarification of structural, stratigraphic, and physiographic terminology is overdue. The problem has been confused by the failure to separate types of provinces and is complicated by the fact that boundaries of stratigraphic and structural provinces did not always remain constant. Pending a definitive treatment, few changes in existing province terminology have been made. Accordingly, the stratigraphic-structural provinces (Fig. 1) are mainly those of Thorsteinsson and Tozer (1960); boundaries having been modified slightly only within and north of the study-area. The term Arctic Lowlands, which those authors applied to the region where little-deformed and comparatively thin Paleozoic sediments lie on the Precambrian crystalline complex, has been replaced by the term Central Stable Region of King (1959, p. 57). This province commonly is referred to also as the Arctic Platform. Divisions of the miogeosyncline (Fig. 2) are suggested here mainly for convenience of reference and, only in a general sense, are they meaningful geological divisions of that depositional belt. The divisions and boundaries shown on Figure 2 apply from Proterozoic to earliest Devonian time through deposition of the Read Bay Formation. The boundary between the miogeosyncline and Central Stable Region is the line of flexure, drawn where the thickness change from geosyncline to shelf was judged to be most rapid. From mid-Early Devonian time onward, the Central Stable Region had expanded westward and the flexure had a different location, as shown subsequently (Fig. 4). The belts of the miogeosyncline (Fig. 2) correspond to those shown in the table of formations (Table 1). The index map (Fig. 2) shows the locations of all sections of Proterozoic through Upper Devonian rocks that were examined in the study-area.

A structural feature newly delineated in the course of this study is the Bache Peninsula Arch (Kerr, 1967d). This is a broad, moderately positive, basement arch that extends across the Central Stable Region from Inglefield Land to Bache Peninsula, and continues westward in the miogeosyncline at least as far as eastern Fosheim Peninsula. At present, it is a topographic arch in the crystalline basement. Prior to Cambrian time, it probably was a belt of erosion in the Central Stable Region at Inglefield Land and Bache Peninsula. In Cambrian and later times, it was a belt that subsided less than flanking regions. The westward continuation of the Bache Peninsula Arch into the Franklinian Miogeosyncline also was relatively positive through most of early Paleozoic time. This resulted in thickness variations in Ordovician carbonate rocks (Kerr, 1968), whereby the formations are thinner on the extension of the arch than in flanking regions to the north and south. The arch became more strongly positive from Late Ordovician (Richmondian) to earliest Devonian time, when it affected both thickness and facies patterns in the Upper Ordovician to Devonian shale and carbonate rocks. In late Early Devonian time, the arch became still more positive which resulted in erosion in the eastern part of the report-area prior to deposition of the Vendom Fiord Formation.

UPPER ORDOVICIAN, SILURIAN, AND LOWER DEVONIAN

Allen Bay and Read Bay Formations

The type sections of the Allen Bay and Read Bay Formations are on Cornwallis Island (Thorsteinsson, 1958). The Allen Bay Formation consists almost entirely of dolomite, whereas the overlying Read Bay Formation is more varied; although composed mainly of limestone, it contains several members. Kerr (1975) proposed an intervening new formation, the Cape Storm Formation, made up of upper parts of the former Allen Bay Formation and lower parts of the Read Bay Formation. The Cape Storm Formation extends from southernmost Ellesmere Island to Cornwallis Island but probably is not present as a discrete unit in most of the report-area (Fig. 2).

A thick and varied succession of Upper Ordovician, Silurian and Lower Devonian carbonate rocks occurs in eastern and central parts of the report-area and is equivalent approximately to the combined Allen Bay, Cape Storm and Read Bay Formations. In nearly all sections studied there is a distinct division into a lower dolomite unit, the Allen Bay Formation, and an upper varied, mainly limestone unit, the Read Bay Formation. In some sections, that subdivision was not possible and it was necessary to refer to the entire carbonate succession on maps and cross-sections as the "Allen Bay-Read Bay Formations (undivided)" (*see* Kerr, 1972a, b; Thorsteinsson, 1972b, c). There is little doubt that, with more detailed work, more units ultimately can be mapped in the carbonate succession of the report-area. Generally, the Allen Bay Formation is a sparsely fossiliferous, rather pure and uniform dolomite which is marked at the base by a thin limestone unit. The Read Bay is generally a variable limestone, containing a significant clastic component.

Three restored stratigraphic cross-sections that extend from east to west through the report-area (Kerr, 1967b, d) show the relationships of the carbonate succession to equivalent shales of the

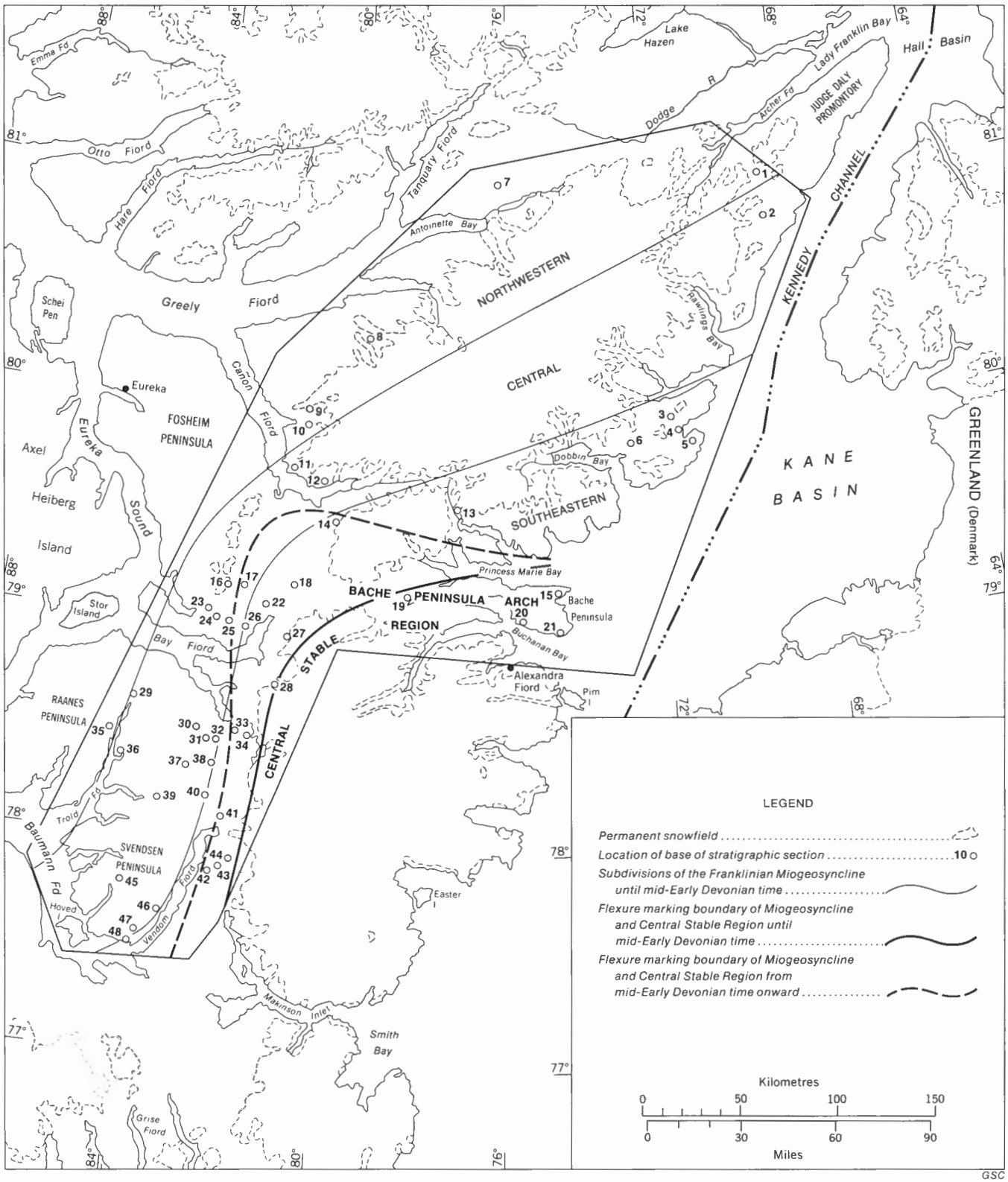

FIGURE 2. The study-area of central and eastern Ellesmere Island showing locations of measured sections

same age. One is presented here with modification (Fig. 4).

Character and thickness

Detailed section descriptions of the Allen Bay-Read Bay carbonate succession are given in the Appendix, but qualifications on these sections are given in the main text. The Allen Bay and overlying Read Bay Formations were separated in most sections and, in most cases, they are described separately. In other sections, no distinct separation of the two formations was possible and they are described as a single, combined unit. In a good section on Darling Peninsula (Sec. 5), the formations were separated and together they are 4725 feet (1440 m) thick. The top is at the present erosion surface, but there seems to have been very little thickness removed because the topmost rocks are as young as any that are known elsewhere in the combined unit. The Allen Bay Formation is 2135 feet (651 m) thick, lies conformably but with sharp contact on the Irene Bay Formation and contains five well-defined conformable units. The Read Bay Formation is 2590 feet (789 m) thick at section 5 and thirteen units are recognizable. It is a variable but concordant succession consisting mainly of limestone, argillaceous limestone and fine-grained sandstone. West of Darling Peninsula (Sec. 6), the Allen Bay Formation alone is present beneath the conformable Cape Phillips Formation and contains three units.

At Copes Bay (Sec. 13), the Allen Bay Formation comprises two units; the lower is composed of 375 feet (266 m) of mixed limestone and dolomite, and the upper is 745 feet (227 m) of dolomite (Thorsteinsson, 1963c, p. 393). Three units of the Read Bay Formation are as follows. Unit 1 is made up of 900 feet (274 m) of dark grey limestone and argillaceous limestone that is cliff-forming and may be equivalent to the Douro Formation. Unit 2 contains 350 feet (106 m) of medium dark grey limestone and calcareous siltstone that is thin bedded, very soft and weathers yellow grey. This unit probably is a southeasterly protruding tongue of argillaceous rock that grades northwesterly into the Eids Formation. Unit 3 comprises 600 feet (182 m) of limestone that is thin to medium bedded, shaly and sandy, with much interbedded calcareous quartz siltstone, and is overlain abruptly but conformably by recessive shales of the Eids Formation.

Northeast of the head of Irene Bay (Sec. 18), the carbonate succession is 3160 feet (963 m) thick, comprising six units. This section could be divided into Allen Bay and Read Bay Formations and, if so, the most reasonable division would be to place the lowermost three units in the Allen Bay Formation (units 15, 16, 17), totalling 2025 feet (607 m) in thickness. The base of the Read Bay Formation is drawn at the base of unit 18, on the basis of an influx of quartz sand. The uppermost unit of the possible Read Bay Formation yielded Wenlock or Ludlow fossils. The top of the Read Bay Formation here is a regional angular unconformity beneath a coarse, dolomite boulder conglomerate at the base of the Vendom Fiord Formation.

A large projection of the Allen Bay-Read Bay carbonate succession extends westward into the shale belt in the central part of the study-area. Most of this body occurs on Fosheim Peninsula and a small projection from that extends northward to cross Cañon Fiord (Fig. 5). The main part of this body of carbonates is evenly bedded and non-reefal. The carbonate appears to result from a shallowing influence produced by a westerly extension of the Bache Peninsula Arch (Secs. 16, 18). Two sections that occur in the main part of the large carbonate body are described in the Appendix. North of Vesle Fiord in Section 16, the carbonate unit totals 3500 feet (1067 m) thick. The lower part, 1500 feet (457 m) thick, is limestone, with some dolomite, and is assigned to the Allen Bay Formation. The upper part, assigned to the Read Bay Formation, is 2000 feet (609 m) thick, dark brownish grey, weathering light grey-brown, lithographic to fine grained, with minor amounts of pink dolomite and greenish weathering shaly limestone at the top. The upper contact with sandstone assigned to the Eids Formation is very sharp; it is presumed to be conformable but possibly could be a regional angular unconformity.

The combined Allen Bay-Read Bay carbonate unit is unusually thick on eastern Fosheim Peninsula. In the east, at Sections 18 and 26, it definitely was reduced by mid-Early Devonian erosion and, possibly, this erosion extended as far west as Section 16.

The narrow, northerly projection of carbonate rocks in southern Cañon Fiord that projects from the main carbonate body is reefal and isolated; it is substantially thicker, more isolated and more reefoid than the main carbonate body on Fosheim Peninsula. It is flanked on the northwest and southwest by shale of the Cape Phillips Formation.

On the thinner southeastern side of the Cañon Fiord carbonate buildup (Sec. 12; *see* Appendix), 600 feet (182 m) of rock were assigned to the combined carbonate formations and were separated into three units (units 3-5). In the uppermost unit (5), black shale increases upward in quantity, until the unit grades into shale of the Cape Phillips Formation. Farther northwest, on what is probably the crest of the Cañon Fiord carbonate buildup (Sec. 11), the Allen Bay-Read Bay Formations (undivided) contain nine units (units 6-14) which are almost entirely limestone. The uppermost rocks grade upward into the overlying Cape Phillips Formation. About 3 miles (4.8 km) to the northwest on the opposite side of the same syncline, on what must be near the crest of the carbonate buildup, Trettin (in prep. a) reports that the thickness obtained photogrammetrically of the undivided Allen Bay and Read Bay Formations was 9400 feet (2865 m). This is the greatest reported thickness of the combined carbonate unit in the report-area. Still farther northwest (Sec. 9; and Sec. 1 of Trettin, 1973), the carbonate buildup comprising the undivided Allen Bay-Read Bay changes facies. The lower part grades to deeper water rocks, comprising carbonate, chert and shale of the Cape Phillips Formation; the upper part of the interval is occupied by flysch deposits, calcareous and dolomitic sandstone, siltstone and shale of the Imina Formation (Trettin, 1973). This narrow band of Cañon Fiord reefal carbonate has been illustrated earlier (Kerr, 1967d;

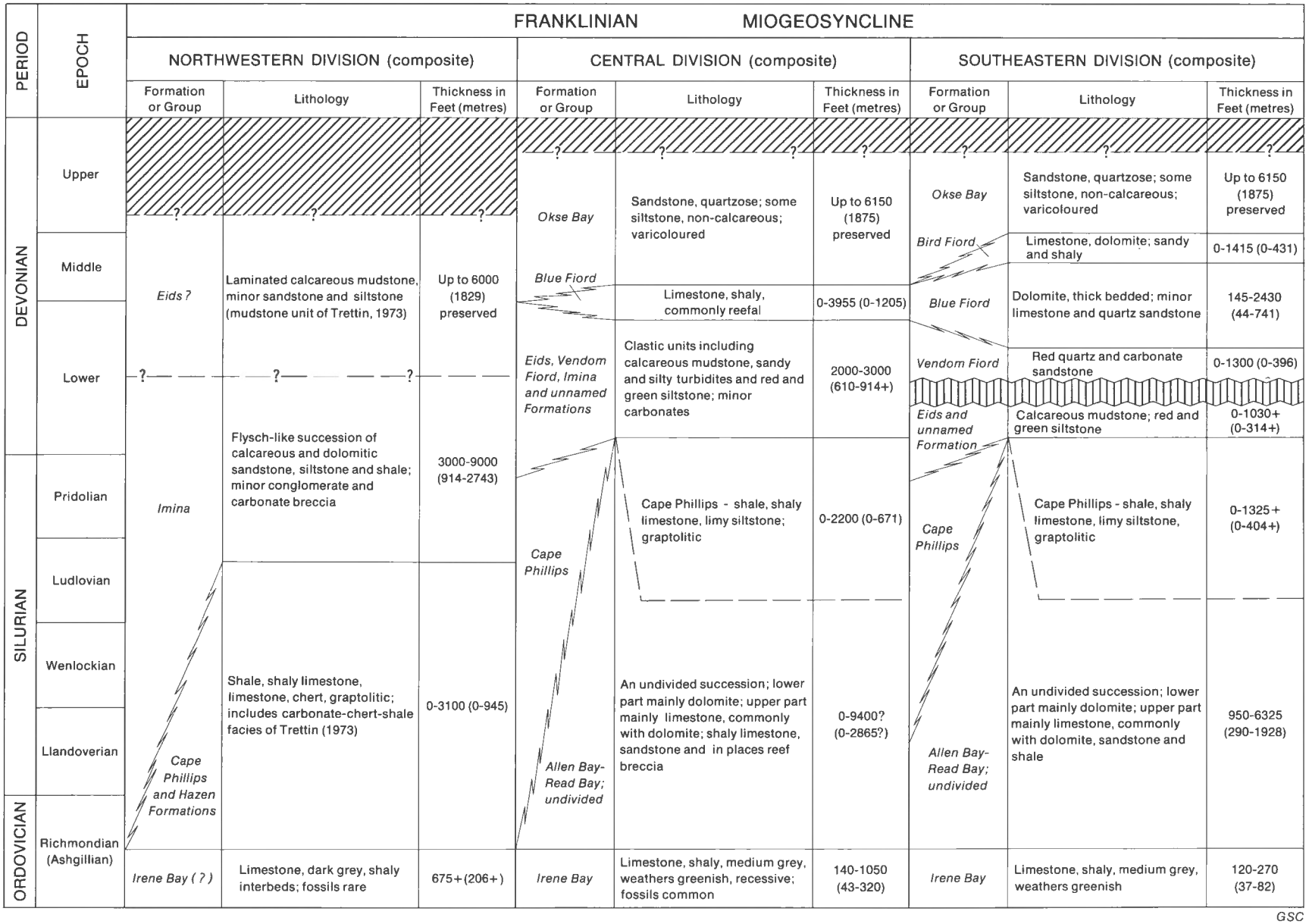

TABLE 1. Correlation chart of Upper Ordovician (Richmondian) to Upper Devonian rock units of central and eastern Ellesmere Island. Divisions of the miogeosyncline are those shown on Figure 2. From the middle Early Devonian (unconformity) onward, part of the southeastern division formed part of the Central Stable Region (*see* Fig. 4). Thicknesses are minimum and maximum depositional thicknesses except for the youngest units, where the maximum preserved thicknesses are shown.

Fig. 3). It appears to trend parallel to depositional strike and facies belts in the miogeosyncline and may be part of a narrow intrabasinal reef development trending for many miles along the depositional basin.

In parts of Svendsen Peninsula and southernmost Fosheim Peninsula, only the Allen Bay Formation is present and, at these places, forms a broad carbonate platform that is overlain conformably by the Cape Phillips Formation. The Read Bay Formation is absent through gradation into the Cape Phillips Formation. This situation is illustrated by Section 39 (Fig. 4). In Section 39, the Allen Bay Formation is 800 feet (243 m) thick and consists mainly of dolomite with limestone in the lower part; it is dark grey to chocolate brown and very shaly throughout.

The area south-southwest of the head of Strathcona Fiord is part of this platform. In Section 32, the Allen Bay Formation alone is present and is 1025 feet (311 m) thick. It is overlain conformably by the Cape Phillips Formation, the contact being drawn where shale becomes predominant upward. Farther west, also (Sec. 31), the Allen Bay Formation alone is present and comprises 325 feet (99 m) of dolomite, resting directly on the Irene Bay Formation. Still farther west (Sec. 30), the carbonates are represented, occurring 200 feet (60 m) above the base of the Cape Phillips Formation. This tongue is composed of very shaly and silty, thin-bedded, dark grey to black limestone, with thin, black, shaly siltstone interbeds that become predominant upward; it also contains minor black chert interbeds.

The carbonate unit south of Fosheim Peninsula has its greatest thickness in the east, diminishing rapidly westward to where it forms a broad, thin platform only slightly exceeding 1000 feet (304 m). On southern Fosheim Peninsula, only a thin Allen Bay Formation is present resting conformably between the Irene Bay and Cape Phillips Formations. Thicknesses are 130 feet (39 m) at Section 23; 160 feet (48 m) at Section 24; and 200 feet (61 m) at Section 25.

Between Sections 25 and 26, there occurs a spectacular facies and thickness change that was illustrated first by Thorsteinsson and Tozer (1957). At Section 26, five miles (8 km) west of the head of Irene Bay, the Allen Bay Formation is reported to be entirely dolomite (Thorsteinsson and Tozer, 1957, p. 19), and is overlain by a green and red gypsum unit. The writer regarded the dolomite as the Allen Bay Formation and possibly part of the Read Bay Formation, and assigned the overlying gypsum to the lower part of the Vendom Fiord Formation (Kerr, 1967c). From vertical aerial photographs, the thickness of the dolomite unit was estimated to be 3800 feet (1158 m). Thus, from Sections 26 to 25, a very thick section of Allen Bay dolomite grades to a very thin section of the Allen Bay dolomite and overlying black shale. This rapid thickness change is shown on the isopach map (Fig. 5).

A rapid change of thickness of the carbonate unit takes place across the depositional belt in the southern part of the report-area (Fig. 4). In the west, only the Allen Bay Formation is present and is relatively thin. In the east, a thicker Allen Bay Formation is present, as well as the Read Bay Formation. In certain eastern parts of the report-area, part or all of the Read Bay Formation appears to be absent due to Early Devonian erosion.

Southeast of the head of Strathcona Fiord (Sec. 34), only the Allen Bay Formation is present. It is 1100 feet (335 m) thick and includes 200 feet (61 m) of limestone at the base. It is overlain with regional angular unconformity by the Vendom Fiord Formation. About 4 miles (6.4 km) farther west (Sec. 33), a unit, composed entirely of dolomite, and tentatively assigned to the Allen Bay Formation, is present. It is about 1250 feet (381 m) thick and is overlain with disconformity or angular unconformity by the Blue Fiord Formation. It is presumed that the Read Bay Formation was deposited at the locations of Sections 33 and 34 and removed by Early Devonian erosion.

East of Vendom Fiord (Sec. 44; *see* Fig. 4), an assemblage of three units, totalling 2500 feet (762 m) in thickness, comprises the combined Allen Bay-Read Bay carbonate succession. The lower unit, tentatively assigned to the Allen Bay Formation, is made up of 1000 feet (305 m) of mainly dolomite, with lesser limestone. At this locality, rocks tentatively assigned to the Read Bay Formation include two units totalling 1500 feet (457 m) of dolomite and sandstone. The lower unit is a deep red, quartzose, non-calcareous, very shaly sandstone, with minor mica, that is ripple-marked and crossbedded on a small scale and contains minor pebble conglomerate. It is 400 feet (122 m) thick with sharp lower and upper contacts and appears to be an intertidal unit. The upper unit is mainly dolomite, with interbeds of fine-grained quartz sandstone. It is 1100 feet (305 m) thick and is succeeded abruptly, but unconformably, by colourful fine-grained clastic rocks of the Vendom Fiord Formation. About 14 miles (22.5 km) to the northwest (Sec. 41), a more distinct formational breakdown was possible in a carbonate succession totalling 4360 feet (1329 m). The Allen Bay Formation is mainly dolomite, possibly with limestone in the poorly exposed lower part. It is 2200 feet (670 m) thick. The overlying Read Bay Formation is limestone with some minor dolomite intervals and is succeeded abruptly and unconformably by boulders of the Vendom Fiord Formation. Near the head of Vendom Fiord on the eastern margin of the miogeosyncline (Fig. 4), there was broad emergence of land which produced a gentle unconformity between the Allen Bay and Read Bay Formations, and clastic strata at the base of the younger Vendom Formation.

At the head of Starfish Bay (Sec. 39), the Allen Bay Formation alone is represented and is overlain by the Cape Phillips Formation. The Allen Bay Formation comprises interbedded dolomite and limestone that is dark grey to chocolate brown and weathers medium grey; it is very shaly throughout. The thickness is 800 feet (244 m), with limestone predominating in the lower, and dolomite in the upper, parts. The formations are absent from Section 35 east of Trold Fiord because of gradation into the Cape Phillips Formation.

The rapid thickness variation and facies change from carbonates in the southeast to shales

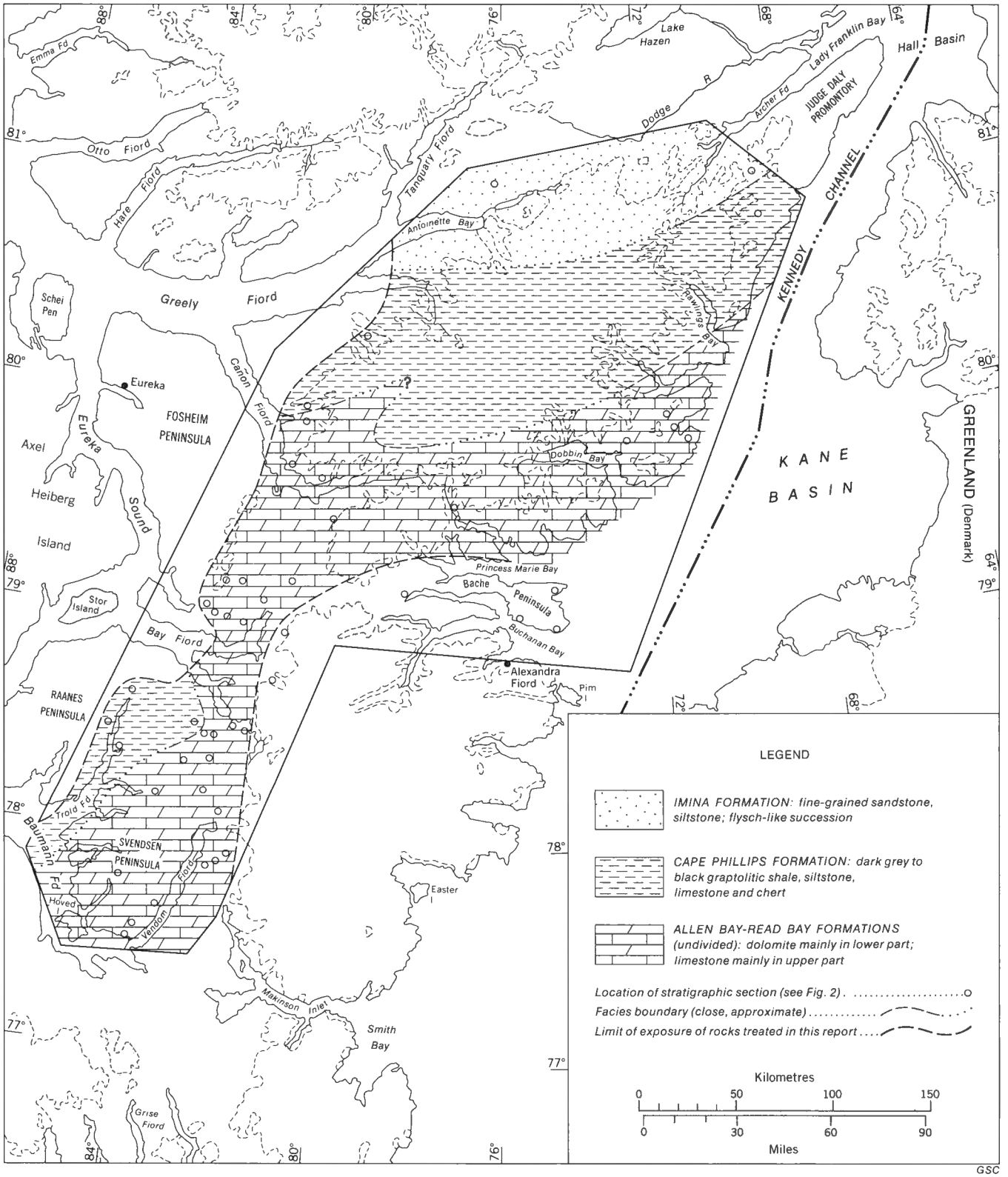

FIGURE 3. Paleogeological map "worm's eye view" showing distribution of facies in late Richmondian (Ashgillian) time resting on the Richmondian Irene Bay Formation and equivalent rocks in central and eastern Ellesmere Island

in the northwest also occurs on southeastern Svendsen Peninsula (Mayr, 1973). In his section 71-K-35 (Sec. 40 on Fig. 2), the Allen Bay and Read Bay Formations combined are 3700 feet (1128 m) thick. About 5 miles (8 km) to the north in his section 71-J-1 (Sec. 47 on Fig. 2), the Read Bay Formation has graded to shale; only the lower part of the Allen Bay Formation is present, and it is 980 feet (294 m) thick. Those thickness values were used in construction of the isopach map (Fig. 5). Mayr (1973) also suggests that there are three isolated carbonate buildups in the shale belt, and these are shown also (Fig. 5). This includes the thickness of 2050 feet (625 m) on Hoved Island and two isolated thicknesses exceeding 1000 feet (305 m) on central Svendsen Peninsula.

Age and correlation

At Darling Peninsula on Ellesmere Island (Sec. 5), the lowest unit of the Allen Bay Formation contains *Catenipora* sp., *Sarcinula* sp. and cf. *Favosites* sp. (GSC loc. 47673), indicating a Late Ordovician or Early Silurian (Llandovery) age, most probably the former. In the next younger unit, a Silurian age is indicated by the presence of *Syringopora verticillata* Goldfuss (GSC loc. 47674). A coquina occurs 1110 feet (338 m) above the base of the formation, containing *Halysites* sp., cf. *Favosites* sp., and cf. *Heliolites* sp. (GSC loc. 47675); these indicate a Silurian age. The above faunas were identified and dated by B.S. Norford. Thus, the Allen Bay Formation on Darling Peninsula (Sec. 5) is of Late Ordovician and Silurian ages.

Faunas collected in the Read Bay Formation on Darling Peninsula (Sec. 5) have been studied only partially. *Hemiarges bigener* Bolton occurs in the formation at heights of 1265-1285 feet (385-391 m) (GSC loc. 47678) and 1975 feet (602 m) (GSC loc. 47681) above the base. Bolton (1965, p. 12) considers the species to be of very late Silurian or possibly Early Devonian age. The upper units of this Read Bay section contain abundant brachiopods and corals (GSC locs. 47679, 47680, 47681, 47682, 47683) that have not yet been studied in detail. It seems likely on stratigraphic grounds that the Read Bay Formation on Darling Peninsula is of Silurian and probable Early Devonian age, but the intersystemic boundary in the section cannot be placed at this time.

At Copes Bay (Sec. 13), Thorsteinsson (1963c, p. 393) assigned 1650 feet (503 m) of rock to the Allen Bay Formation on the basis of lithology and stratigraphic position, for it yielded no diagnostic fossils. The overlying rocks, of which only the lower 900 feet (274 m) were then examined, were assigned to the Douro Formation. The type section of the Douro Formation on Grinnell Peninsula (Thorsteinsson, 1963b, p. 228) was considered equivalent to Member A of the Read Bay Formation. Since the writer found that the Read Bay Formation at Copes Bay included an additional 900 feet (274 m) of younger rocks, and because the stratigraphy of these rocks is only broadly understood, it was preferred to disregard the name Douro here and use the earlier name, Read Bay Formation. The Read Bay Formation at Copes Bay includes two mainly carbonate units that are separated by a southeasterly projecting tongue of calcareous shaly siltstone typical of the Eids Formation. *Atrypella* cf. *A. scheii* (Holtedahl) occurs at 400 feet (120 m) above the base of the formation in the lower limestone unit (Thorsteinsson, 1963c, p. 394). Five hundred feet (152 m) below the top of the formation in the upper limestone unit, there occur cf. *Mesodouvillina* sp., *Gypidula* sp., *Atrypella* sp. (GSC loc. 51971), and this collection is considered by B.S. Norford to be of Ludlow age. The Read Bay Formation at Copes Bay, therefore, is restricted largely to a Ludlovian age, but still higher parts of the formation are possibly of Devonian age.

At Schei Summit, northeast of Irene Bay (Sec. 18), a unit, 1825 feet (556 m) thick, and consisting mainly of unfossiliferous dolomite, rests conformably on the Irene Bay Formation of the Cornwallis Group and is assigned to the Allen Bay Formation because of its stratigraphic position. It is overlain by a mixed sandy dolomite and limestone succession assigned to the Read Bay Formation. Assignment of the latter rocks to the Read Bay Formation is based on the occurence near the base of the uppermost unit of an ostracode, a meristellid brachiopod, solitary corals, cf. *Cystiphyllum* sp., and *Syringopora* sp. (GSC loc. 51950); these fossils were identified by B.S. Norford and dated as probably Silurian, Wenlock or Ludlow.

A restored section showing typical relationships of these formations extends throughout the southern part of the report-area, from east of Vendom Fiord to east of Trold Fiord (Fig. 5). In the most easterly parts (Sec. 44), the Allen Bay and Read Bay Formations yielded no diagnostic fossils and were dated by their stratigraphic position. A few miles farther west (Sec. 41), there is a section of the two formations that is almost entirely carbonate and probably spans almost the complete age range of the combined unit. The lower age limit of the Allen Bay Formation was established as Late Ordovician (Ashgillian) by lateral gradation to the basal Cape Phillips Formation and by the age of the underlying Irene Bay Formation. Three units were recognized in the Read Bay Formation. The following fossils occur at the base of the middle unit or 760 feet (231 m) above the base of the formation (GSC loc. 51945):

stromatoporoids
solitary coral
Syringopora sp.
Favosites sp.
pentamerid brachiopod
?Atrypella sp.

These fossils were identified by B.S. Norford and dated as Silurian or Devonian, probably Ludlow.

At a height of 50 feet (15.2 m) in the upper unit or 810 feet (247 m) above the base of the formation, GSC locality 51946 contains:

brachiopod
Atrypella sp.
Favosites sp.

These are dated as Silurian (Ludlow).

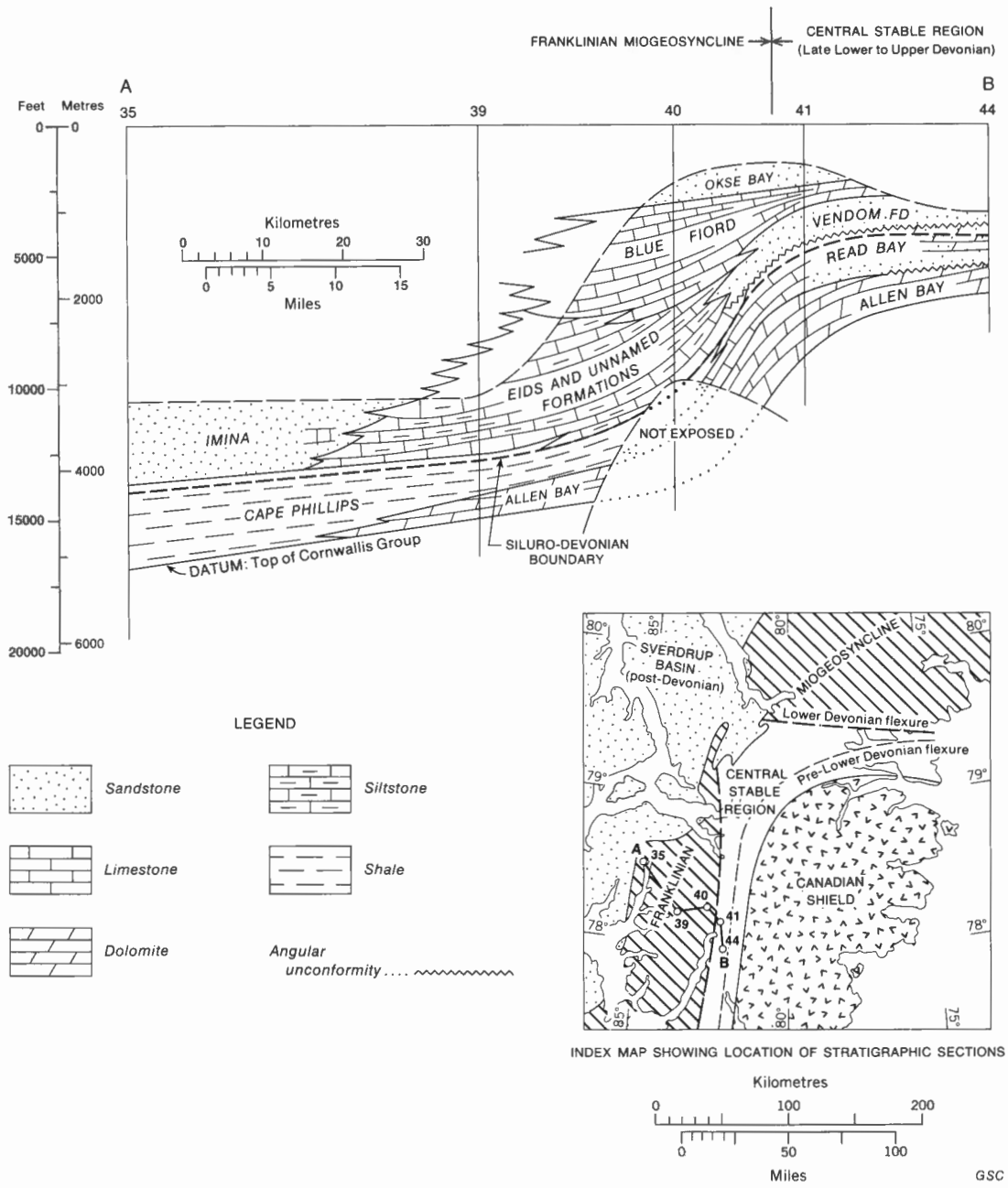

FIGURE 4. Restored stratigraphic cross-section showing Upper Ordovician (Richmondian) to Upper Devonian rocks of the Franklinian Miogeosyncline and adjacent Central Stable Region, Ellesmere Island. The cross-section shown was entirely within the Franklinian Miogeosyncline until the mid-Early Devonian (pre-Vendom Fiord) time; at that time, the Central Stable Region was extended westward to include Sections 41 and 44

In Section 39 at the head of Starfish Bay, only the Allen Bay Formation is present and it is 800 feet (244 m) thick (Fig. 4). It yielded an asaphid trilobite of probable Ordovician age (GSC loc. 51913; dated by B.S. Norford, 1963), 90 feet (27.4 m) above the base. At a height of 4 feet (1.2 m) in the overlying Cape Phillips Formation, GSC locality 51915 contains graptolites. The age range of the Allen Bay Formation is Ashgillian to Llandoverian based on the age of the underlying Irene Bay Formation and the overlying Cape Phillips Formation. Farther west (Sec. 35), the Allen Bay and Read Bay Formations both grade into shale of the Cape Phillips Formation, for Ashgillian rocks of the Cape Phillips rest directly on the Irene Bay Formation.

The type section of the Allen Bay Formation of Cornwallis Island (Thorsteinsson, 1958) is almost entirely dolomite; although indeterminable moulds and casts of fossils are common, good fossil collections are few. A dating of the formation as Late Ordovician (Ashgillian) to Middle Silurian (Wenlockian) was based largely on its conformable position between the Cornwallis and Read Bay Formations, and its lateral gradation into the Cape Phillips Formation. The type section of the Read Bay Formation (Thorsteinsson, 1958) was divided into Members A, B, C, and D, and its age was later determined by Thorsteinsson and Kerr (1968) as ranging from Middle Silurian (Wenlockian) to Early Devonian (Gedinnian). Subsequently, Kerr (1975) established a new formation, the Cape Storm, which contains equivalents of upper parts of the original Allen Bay Formation and lower parts of the original Read Bay Formation. The Cape Storm Formation extends from southern Ellesmere Island to southern Cornwallis Island; however, the formation does not appear to be present in the report-area. Accordingly, these units were correlated with the original Allen Bay and Read Bay Formations of Cornwallis Island.

The datum for the base of the Allen Bay-Read Bay carbonate succession is the top of the Irene Bay Formation (Kerr, 1968), which extends throughout nearly all of the report-area. According to Barnes (1973), the Irene Bay Formation is late Maysvillian to Richmondian in age, so the upper boundary of the Irene Bay Formation falls within Richmondian (Ashgillian) time (Table 1).

The Allen Bay and Read Bay Formations together constitute a carbonate unit that ranges in age from Late Ordovician (Richmondian) to probable Early Devonian in eastern parts of the report-area. The carbonate unit is complementary to and grades westward into the largely equivalent shaly Cape Phillips Formation. Where great thicknesses of carbonate occur the shale is thin or absent, and vice versa (cf. Figs. 5 and 6). In some places, the line of facies change is sharp and narrowly defined but, for the most part, a tongue of the basal part of the Allen Bay-Read Bay succession extends a varying distance westward beneath the Cape Phillips Formation. For the most part, the carbonates grade westward to black shales of the Cape Phillips Formation but, in the upper part, they grade westward in places to argillaceous limestone of the Eids Formation without intervening black shales. The major exception to this facies relationship occurs in central parts of the report-area, where a projection of the carbonate bank occurs, extending westward to the limit of exposures of the miogeosyncline, and separates two shale basins to the north and south. This projection probably reflects a mild positive effect of the Bache Peninsula Arch in Late Ordovician to Early Devonian time. Beyond the limit of exposure, the carbonates of this shallowing element may grade westward directly to sandstone and siltstone of the Imina Formation without the usual intervening black shale. The facies boundary of the carbonates with clastic strata to the west migrated eastward with time, the carbonates being progressively less extensive upward and overlapped eastward by clastic rocks. Clastic strata are extremely rare in the Allen Bay Formation and in the lower part of the carbonate succession where it is undivided. They are quantitatively important in the Read Bay Formation and in upper parts of the undivided succession, particularly in eastern sections. A major quartz sandstone wedge of eastern origin occurs in the basal part of rocks assigned to the Read Bay Formation east of Vendom Fiord (Secs. 41, 44).

The most abrupt gradation from carbonate to shale is at Irene Bay where all the lowermost 200 feet (61 m) of carbonate disappear westward in the space of 2 miles (3.2 km) between Sections 26 and 25. In middle parts of the report-area (Fig. 5), the large body of rocks of the Allen Bay-Read Bay succession (undivided) that extends westward into the Cape Phillips shale basin (Fig. 5) has the normal division into Allen Bay and Read Bay Formations (Sec. 16). The extreme northern part of the buildup, however, is almost entirely limestone and reefoid (Sec. 11). The small isolated buildups on and south of Svendsen Peninsula are in the Allen Bay Formation and are primarily dolomite. Thicknesses of carbonate rocks in this buildup reach 4400 feet (1341 m) north of Cañon Fiord (Sec. 11), and 3500 feet (1067 m) north of Vesle Fiord (Sec. 16). Northeast of Cañon Fiord (Sec. 11), the carbonate buildup is reefal and flanked on the southeast and northwest by the Cape Phillips shale basin (*see* Kerr, 1967b, Fig. 4). This buildup in Cañon Fiord may extend an unknown distance along depositional strike to the northeast, and possibly could connect with a similar isolated reef in northern Greenland. Figure 3 is a paleogeographic map (a worm's eye map) showing the lithologies and facies of the first rocks to succeed the Irene Bay Formation. A "worm's eye map" (after the format of Krumbein and Sloss, 1956, p. 241) is a paleogeographic map of the lower surface of a stratigraphic interval.

Within the report-area, the Allen Bay-Read Bay carbonate succession occurs mainly in the central and southeastern belts of the miogeosyncline. These carbonate rocks probably also were deposited farther east in the Central Stable Region but are not now preserved there. The carbonates comprise a wedge-shaped bank that grades and thins northwesterly to graptolitic black shale and thin-bedded shaly limestone of the Cape Phillips Formation (Fig. 4). In some places, the line of facies change is abrupt and occurs over a lateral distance of no more than 2 miles (3.2 km) throughout the entire succession. For the most part, however, a tongue of the basal part of the carbonate succession extends a varying distance westward beneath the Cape Phillips Formation. The boundary between the

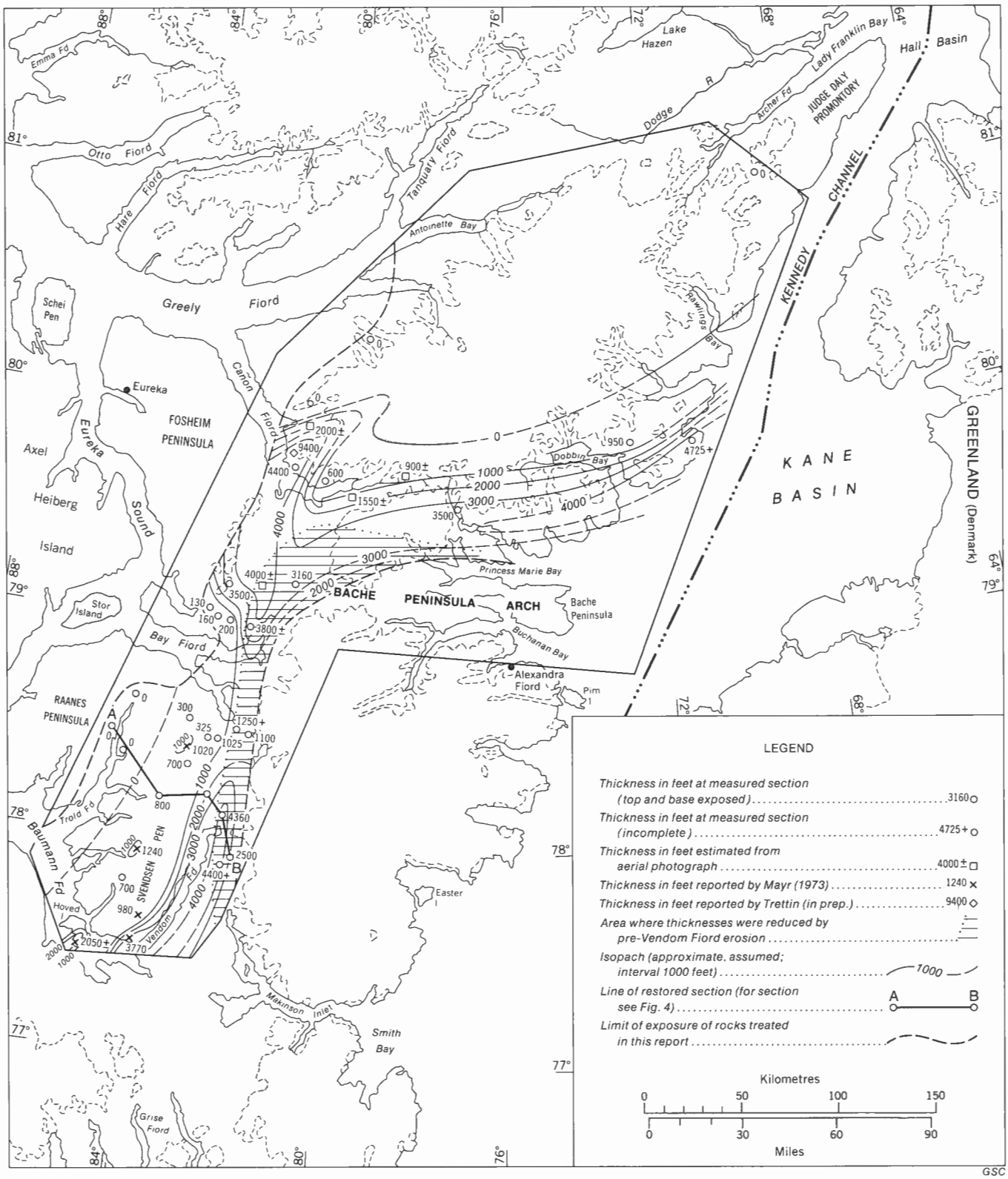

FIGURE 5. Isopach map of Upper Ordovician (Richmondian) to Lower Devonian carbonates of the undivided Allen Bay-Read Bay Formations in central and eastern Ellesmere Island

carbonate and shale is sinuous and had a different location at different times, because the shale progressively onlaps eastward onto the carbonate strata (Fig. 4).

Isopach maps were constructed showing the combined Allen Bay and Read Bay Formations (Fig. 5) and the Cape Phillips Formation (Fig. 6). A zero isopach of the carbonate rocks shows the northwestern limits of distribution. In all places, lower parts of the carbonate succession extend farther westward than upper parts. Throughout most of the interval, the shale-carbonate boundary swings westward in the region between Cañon Fiord and Bay Fiord, where a large, partly reefal, carbonate buildup occurs, surrounded by the Cape Phillips black shale and siltstone. The Allen Bay-Read Bay carbonate unit everywhere rests conformably on the Cornwallis Group. In western parts of the report-area, the unit spans only the earlier part of the total interval and is overlain gradationally by a younger part of the Cape Phillips Formation. Farther east, the carbonate unit is overlain gradationally by and, in the upper part, grades laterally into the Eids Formation. In eastern parts of the study-area, the unit is overlain with regional angular unconformity by the Lower Devonian Vendom Fiord Formation. Thicknesses in the east, then, are preserved thicknesses, the original depositional thicknesses having been an indeterminate amount greater (Fig. 4). In certain of the measured sections there (e.g. Sec. 34, *see* Appendix), the carbonate unit is entirely dolomite, is assigned to the Allen Bay Formation and is overlain unconformably by the Vendom Fiord Formation. If the entire Read Bay Formation in this region was removed prior to deposition of the Vendom Fiord Formation, then erosion at that time was substantial.

In the southern part of the report-area, the carbonate unit again thickens eastward in the geosyncline toward the shelfward margin (Fig. 4). There, however, the original thicknesses of the carbonate unit in eastern exposures are not known because the unit was reduced by Early Devonian (pre-Vendom Fiord) erosion which increased eastward toward the Central Stable Region (*see* Fig. 5).

The gradation from the Cape Phillips shale to equivalent carbonate strata in the southeastern part of this study-area was shown by Mayr (1973). An abrupt change of thickness and facies occurs from shale of his section 71-J-1 (Sec. 47, Fig. 2) to carbonate of his section 71-K-35 (Sec. 48).

Environment of deposition

The Allen Bay and Read Bay Formations are composed of shallow-water carbonate beds deposited mainly in the southeastern part of the Franklinian Miogeosyncline and, locally, in central and northwestern parts where the shallow Bache Peninsula Arch had an influence. The carbonates most commonly grade to limy and cherty black graptolitic shales of the Cape Phillips Formation. The shales are euxinic accumulations deposited on the slope or base of the deeper Hazen Trough environment (Trettin, 1971b). Within the Read Bay Formation there are minor intercalated clastics as a result of shallowing in the east that culminated in Early Devonian emergence and unconformity on the Central Stable Region and southeastern parts of the miogeosyncline (Figs. 4, 5). Tectonic activity in the northwest and west resulted in the progressively wider spread from those directions of fine-grained clastic sediments of the Imina Formation from late Middle Ordovician time onward (Trettin, 1971b), and this apparently continued into Early Devonian time. Continued uplift in the northwest caused eastward and southeastward shifting of and, finally, the elimination of the belt of euxinic deposition. Finally, in earliest Devonian time (Fig. 4), clastic deposition extended entirely across the Franklinian Miogeosyncline in central Ellesmere Island, and was made up of, from west to east, the Imina, Eids and Vendom Fiord Formations.

Cape Phillips Formation

The type section of the Cape Phillips Formation is at Cape Phillips on northern Cornwallis Island. It was first described by Thorsteinsson (1958), who divided it into three members. The lower, Member A, comprises mainly dolomite, argillaceous limestone, fetid shale, and cherty argillaceous limestone. A persistently developed stratum of dolomitic limestone, 30 to 50 feet (9.1-15.2 m) thick, marks the base of the member; this is overlain by fissile shale, and then by argillaceous limestone. Member B, overlying Member A with gradational contact, is composed mainly of cherty argillaceous limestone, argillaceous limestone, cherty clacareous shale, cherty limestone, limestone, calcareous shale, and minor amounts of shale. Member B grades imperceptibly into the overlying Member C, which consists of an extremely monotonous succession of alternating calcareous shale, argillaceous limestone, limestone, and shale. Concretions with graptolites occur throughout this member but are most common in the lower beds. Member C accounts for roughly three quarters of the aggregate thickness of the formation. The thickness of Cape Phillips Formation at its type section on the north coast of Cornwallis Island is 7500 feet (2286 m) with no upper contact exposed (Thorsteinsson and Kerr, 1968). Based on information obtained from correlations with other sections, those authors concluded that the maximum thickness of the Cape Phillips Formation in the general area may be about 9800 feet (2987 m). Graptolites occurring throughout most of the formation indicate that it was deposited under long-persisting euxinic conditions. The age range on Cornwallis Island is from Late Ordovician (Ashgillian) to Early Devonian (Gedinnian). The entire Cape Phillips Formation there grades southward to a still thicker succession of equivalent carbonate formations. In upward succession, these are the Allen Bay (dolomite), Cape Storm (dolomite and limestone) and Read Bay (limestone) Formations. The great thickness of the Cape Phillips Formation on Cornwallis Island is attributed to its proximity to equivalent carbonate formations and large carbonate content.

From Cornwallis Island, the thickness of the Cape Phillips Formation gradually decreases northwestward to Bathurst Island (Kerr, 1974), where it ranges from 2704 to 1020 feet (824-310 m), the thicknest section being in the southeast and the thinnest in the northwest. It is composed of generally dark grey to black calcareous shale and

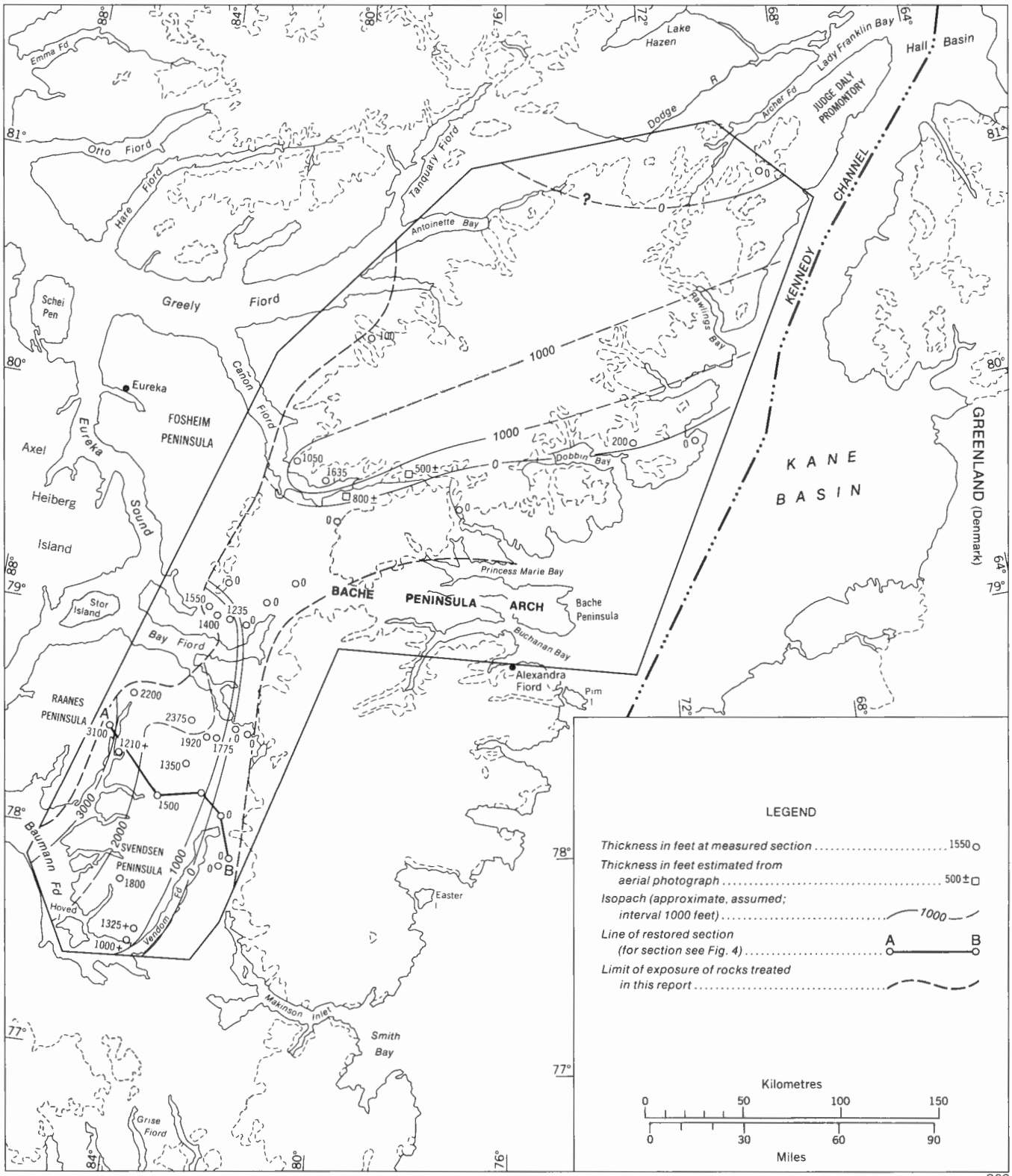

FIGURE 6. Isopach map showing thicknesses of the Upper Ordovician (Richmondian) to Lower Devonian Cape Phillips Formation in central and eastern Ellesmere Island

mudstone with some argillaceous limestone beds and minor amounts of dolomite. The maximum age range of the Cape Phillips Formation on Bathurst Island is at Twilight Creek where it has the same age range as on Cornwallis Island, from Late Ordovician (Ashgillian) to Early Devonian (Gedinnian).

An excellent section of the Cape Phillips Formation at the head of Irene Bay (Sec. 25) was first reported by Thorsteinsson and Tozer (1957). It is a very useful reference section for the study-area since it spans a wide range of time and contains numerous fossil zones. The Cape Phillips Formation lies conformably on the Irene Bay Formation and is overlain by the Vendom Fiord Formation with probable unconformity (*see* Appendix). This section of the Cape Phillips Formation is unusual and particularly instructive because, in the upper part, abundantly fossiliferous coquinal beds alternate with graptolite-bearing beds. The Silurian-Devonian boundary apparently occurs in this interbedded interval; extensive faunas were collected but have not been studied to date. An extremely abrupt change of facies occurs within a distance of 2 miles (3.2 km) from shales of the Cape Phillips Formation (Sec. 25) to carbonates of Allen Bay and Read Bay Formations (Sec. 26). This facies change is the most abrupt and spectacular seen within the report-area (Fig. 2).

The greatest thickness of the Cape Phillips Formation in the study-area occurs in an overturned section west of the head of Trold Fiord (Sec. 35), where it is 3100 feet (945 m) thick. There, it lies conformably between the Cornwallis Group and the Imina Formation. Sections intermediate between the latter section and the carbonate shelf are nearly always similar to Section 39 (Fig. 4) where the Cape Phillips Formation overlies a tongue of Allen Bay Formation which, in turn, lies on the Cornwallis Group. An exception is on north-central Svendsen Peninsula (Sec. 30), where the Cape Phillips shale rests on the Cornwallis Group, but a tongue of limestone 300 feet (91 m) thick projects westward within the lower part of that formation. This tongue of very shaly and silty limestone occurs within the Cape Phillips Formation 200 feet (61 m) above the base of that formation. In the basal 50 feet (15.2 m) of the limestone, there occur *?Pseudogygites*, an isotelid trilobite, and straight cephalopods (2 spp.) (GSC loc. 47724) which B.S. Norford states (pers. com., 1962) indicate a probable Late Ordovician age. At the very top of this limestone, where black shaly siltstone interbeds become predominant, the following graptolites were identified by the writer and indicate an early Llandovery age (GSC loc. 47725):

Diplograptus cf. *D. modestus* Lapworth
Climacograptus cf. *C. rectangularis* McCoy
Dimorphograptus cf. *D. confertus* Nicholson
Monograptus aff. *M. cyphus* Lapworth
Climacograptus cf. *C. innotatus* Nicholson
Climacograptus sp.

In northeastern parts of the report-area, the Cape Phillips Formation is absent (Sec. 1) and the Imina Formation (formerly Cape Rawson Group) rests directly on the Irene Bay Formation. This is shown on the paleogeographic map (Fig. 3). In northwestern parts of the study-area (Sec. 8), only the lower part of the Cape Phillips Formation is present. It consists of 100 feet (30.48 m) of cherty shale, lying conformably between the Cornwallis Group and the Imina Formation. The Cape Phillips shale formation partly surrounds a narrow isolated carbonate reef buildup in the Cañon Fiord area (Secs. 9-12). This has been described and figured by Kerr (1967b, Fig. 3) and is the subject of further study by Trettin (in prep. a).

In the study-area of central and eastern Ellesmere Island, the Cape Phillips Formation is a western facies equivalent of the combined Allen Bay and Read Bay Formations. It is confined to two areas that are separated by carbonates of the Bache Peninsula Arch (Fig. 6). In central and western parts of the study-area, the Cape Phillips Formation has its maximum age range, Late Ordovician (Ashgillian) to Early Devonian (Gedinnian). There, it rests conformably on the Richmondian (i.e. Ashgillian) Irene Bay Formation (e.g. Sec. 35, Fig. 4). Moreover, in the west, the base of the Cape Phillips Formation yields *Pseudogygites* sp. and *Climacograptus* sp., also of Ashgillian age. Farther east, where only younger parts of the Cape Phillips Formation are present, it rests conformably on a westerly projecting tongue of the partly equivalent Allen Bay Formation (Fig. 4). To the northwest and west, the Cape Phillips Formation grades into the partly equivalent Imina Formation. It appears, therefore, that the Cape Phillips Formation is a southeasterly encroaching facies belt that is interposed between Imina Formation in the northwest and carbonates in the southeast. Trettin (1971b, Fig. 37) considers that the Cape Phillips Formation is a slope deposit, laid down in the southeastern side of the Hazen Trough.

Imina Formation

Trettin (1969) proposed the name Imina Formation for a sequence of strata on northern Ellesmere Island. The formation occurs widely in the north and west parts of the present report-area. It has been described at Cañon Fiord (Trettin, 1971a) and west of Trold Fiord (Trettin, 1974) as a flysch-like succession of turbidites composed mainly of calcareous and dolomitic sandstone, siltstone and shale. The Imina Formation includes most of the sedimentary rocks which were included previously in the Cape Rawson Group (Kerr, 1967d, 1968), a very old reconnaissance term of Fielden and de Rance (1878) that now is abandoned. Further study of the Imina Formation is being done by Trettin (in prep. a).

DEVONIAN

Vendom Fiord Formation

The name Vendom Fiord Formation was proposed by Kerr (1967c) and its type section designated in the present report-area (Sec. 25). Four units were recognized in the type section, the total thickness being 1695 feet (516 m). It consists of terrigenous carbonate and quartzose rocks, gypsum, anhydrite and dolomite. The formation is restricted to a narrow belt occupying the eastern margin of the Franklinian Miogeosyncline and nearby parts of the Central Stable Region (Fig. 4). It rests with angular unconformity

on rocks of the Central Stable Region; this angularity decreases northwest and the unconformity disappears in the miogeosyncline. In the southeast, it cuts down as deeply as the Allen Bay Formation (Secs. 33, 34). Farther west, the unconformity diminishes and the Vendom Fiord grades into its partial equivalent, the Eids Formation (Fig. 4) but, elsewhere in the west, it truncates the Eids Formation (Kerr, 1967b, Fig. 3).

The Vendom Fiord Formation originally was considered to be early Middle Devonian in age because of its stratigraphic position, conformable beneath the Blue Fiord Formation which was then considered to be Middle Devonian. Later the Vendom Fiord Formation at Section 14 was dated by McGregor (1974) as late Early Devonian (mid- to late Emsian) from trilete spores. An unnamed red-bed unit that lies unconformably beneath the Vendom Fiord Formation in the same section was dated by McGregor as early Early Devonian (mid- to late Gedinnian). The Vendom Fiord Formation is considered now to be of late Early Devonian (Table 1). The Vendom Fiord Formation is under further and more detailed study by Trettin (in prep. b).

The Vendom Fiord Formation is a post-tectonic Lower Devonian red-bed unit containing abundant clastic material of easterly source. It grades westward into siltstone, limestone, and limy shale in the miogeosyncline. It resulted from a broad emergence of the Central Stable Region and eastern parts of the Franklinian Miogeosyncline and, particularly, the Bache Peninsula Arch. This Early Devonian emergence producing the unconformity coincided with a westward shift of the flexure separating the Central Stable Region from the Franklinian Miogeosyncline (Fig. 4, inset), and with a relative uplift of the Bache Peninsula Arch. From Early Devonian time, when this positive pulse occurred, the narrow Franklinian Miogeosyncline behaved as a narrower basin, having been narrowed at the expense of widening of the Central Stable Region.

Eids Formation

The Eids Formation was named by McLaren (1963), and its type section is near Eids Fiord, about 20 miles (32 km) southwest of the report-area. At the type section, the formation is a very thinly bedded limy siltstone, limy shale and shaly limestone. Kerr and Thorsteinsson (1972) showed that the formation in the type-area lies conformably between the Cape Phillips and the Blue Fiord Formations. Thorsteinsson collected samples from limestone coquina in the type section of the Eids Formation (GSC loc. 57730) that yielded the following fauna:

Pelekysgnathus furnishi → glenisteri Klapper (8)
P. sp. 1 (2)
P. sp. 2 (1)
Pandorinellina exigua philipi (Klapper) → *P. exigua exigua*
P. expansa Uyeno and Mason
Polygnathus? sp. (1) (highly fragmentary)
Panderodus spp. (188)
Neopanderodus? sp. (2)
Acodus spp. (6)
Drepanodus sp. (6)

These were identified and dated by T.T. Uyeno as Emsian, probably middle Emsian. Since the lower part of the Blue Fiord Formation on southern Ellesmere Island is known now to be definitely Early Devonian (Pedder and Klapper, pers. com., 1975), the type section of the Eids Formation is entirely of Early Devonian age.

In the report-area, the Eids Formation is a most complex unit that varies greatly in age and lithology (Table 1). It most commonly is a fine-grained and fissile calcisiltite or limy quartz siltstone of a basinal facies. It is in part transitional laterally between clastic units in the east and west; i.e. the Vendom Fiord and Imina Formations, respectively (Fig. 4). Since this is part of a sedimentological study by Trettin (in prep. a and b), the formation will not be treated extensively in this report, beyond describing certain sections in the Appendix.

Blue Fiord Formation

The type section of the Blue Fiord Formation is at Blue Fiord, southwest of the report-area (McLaren, 1963), where it was reported to consist of 3800 feet (1158 m) of limestone and shale that contained two members. It is abundantly fossiliferous, much of it is reefoid, and it was assigned to the early mid-Devonian (Eifelian Stage). A section of the Blue Fiord Formation at Sör Fiord, about 18 miles (29 km) east of the type-section, was studied by Pedder and Klapper (pers. com., 1975), who measured a total thickness of 3484 feet (1962 m) and did not observe the base. According to Pedder and Klapper (pers. com., 1975, the lower 2000 feet (610 m) of the exposed part of the formation are Early Devonian (Emsian) in age; the upper 1484 feet (450 m) are inconclusively dated. From this evidence, the Sör Fiord section and the type section of the Blue Fiord Formation south of the present report-area are considered in this report to be late Early Devonian (late Emsian) and possibly early Middle Devonian (early Eifelian) in age.

Thick sections of the Blue Fiord Formation occur in southeastern parts of the report-area (Fig. 7). They have approximately the same thickness as the nearby Sör Fiord section and as the type section and may have a similar age range (Table 1). These have not yet received detailed paleontological study.

A cross-section (Fig. 4) shows the setting of the Blue Fiord Formation. At Section 40, the formation is 3995 feet (1205 m) thick and consists of several types of limestone, which are highly fossiliferous and commonly reefal. The formation lies with gradational contact on siltstone of the Eids Formation and grades upward to sandstone of the Okse Bay Formation. At Section 41, 10 miles (16 km) to the southeast, the Blue Fiord Formation is only 800 feet (244 m) thick, or about one fifth of the thickness at Section 40, and is composed mainly of dolomite, thick bedded, medium to light grey. It is calcareous at the base, and both calcareous and sandy at the top. It rests with apparent conformity between quartz sandstone formations, the underlying Vendom Fiord and the overlying Okse Bay. It is clear that, from west to east (Fig. 4), the Blue Fiord Formation is traced over a flexure from the

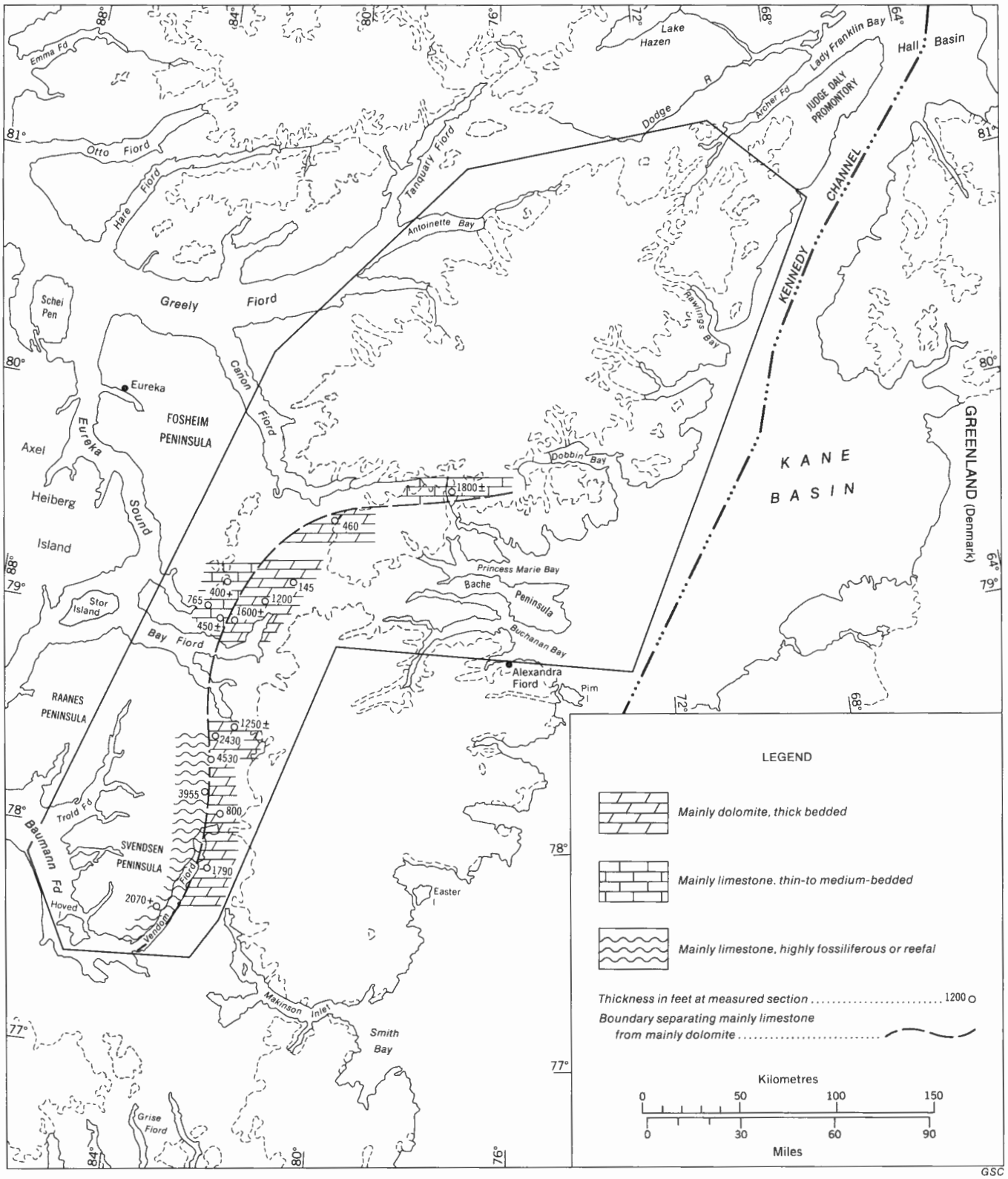

FIGURE 7. Map showing principal rock types and thicknesses in the Lower to Middle Devonian Blue Fiord Formation in central and eastern Ellesmere Island

miogeosyncline to the Central Stable Region. On the margin of the miogeosyncline, subsidence was great and a thick reefal carbonate buildup accumulated, primarily limestone. To the east on the Central Stable Region, evenly bedded carbonates accumulated, mainly dolomite. It appears that the reefs developed along the inner margin of the Franklinian Miogeosyncline, while restricting circulation on the Central Stable Region and causing lagoonal carbonates to be deposited there shortly before deposition of the Blue Fiord Formation. The line of flexure, which is the boundary between the Franklinian Miogeosyncline and Central Stable Region, was located west of Section 41 during deposition of the Blue Fiord Formation. Up to the time when the unconformity developed at the base of the Vendom Fiord Formation, it had been located east of Section 44.

On the Bache Peninsula Arch (Secs. 14, 18), the Blue Fiord Formation is also dolomitic and thin. In Section 18, it is 145 feet (44.2 m) thick, and in Section 14, 460 feet (140 m) thick (*see* Kerr, 1967b, Fig. 3). In the miogeosyncline to the northeast at the head of Copes Bay, the Blue Fiord comprises 1800 feet (548 m) of limestone and the top is not preserved. The limestone-dolomite boundary observed elsewhere apparently also exists here. Three very generalized facies of the Blue Fiord Formation can be recognized. The predominant facies as well as thicknesses of the Blue Fiord Formation are shown in Figure 7. In the report-area, the Blue Fiord Formation probably is restricted entirely to an Early Devonian age (Table 1).

Bird Fiord Formation

The Bird Fiord Formation was named by McLaren (1963), the type section being at Bird Fiord on southwestern Ellesmere Island, about 30 miles (48 km) southwest of the report-area. It is 2950 feet (899 m) thick, comprising limestone, dolomitic limestone, sandy limestone, sandy mudstone, and quartzose sandstone; fossils are common. The formation rests conformably between the Blue Fiord and Okse Bay Formations and was dated as Middle Devonian.

The Bird Fiord Formation occurs only in the extreme southeastern part of the report-area (Sec. 46, *see* Appendix). It is 1415 feet (442 m) thick, composed mainly of sandy limestone and is of probable Middle Devonian age. The entire formation grades northward apparently into the Okse Bay Formation, and is not present in Section 40 or 42.

Okse Bay Formation

The Okse Bay Formation was named after Okse Bay on southwest Ellesmere Island (McLaren, 1963) where the type section is 10 000 feet (3048 m) thick; it was divided into four members. It has been eroded at the top but lies conformably on the Bird Fiord Formation. The formation consists of a varicoloured succession of largely nonmarine quartzose sandstone, sandy mudstone and shale, with very thin coal seams at certain horizons. The four members in the type area were mapped separately by Kerr and Thorsteinsson (1972). Embry (pers. com., 1975) proposes to apply formational names to these four units and elevate the Okse Bay to group status. Embry considers that the Okse Bay "Group" on southern Ellesmere Island ranges in age from late Middle Devonian (Givetian) to late Early Devonian (Frasnian).

The greatest thickness of the Okse Bay Formation preserved in the Central Stable Region is 2800 feet (853 m) (Sec. 18). The greatest thickness preserved in the miogeosyncline [6150 ft (1894 m)] is located 7 miles (11 km) south of the head of Strathcona Fiord (Sec. 32). The complete depositional thickness of the Okse Bay Formation is unknown, for it is the youngest formation of the Franklinian Miogeosyncline and Central Stable Region on Ellesmere Island. The Okse Bay Formation in central Ellesmere Island rests gradationally on the Blue Fiord Formation whose top is of probable very early Middle Devonian age. It grades southward into the Bird Fiord Formation of late Middle Devonian age. The base of the Okse Bay Formation, therefore, probably includes upper Middle Devonian (Givetian) rocks. The formation in central Ellesmere Island, therefore, is late Middle Devonian (Givetian) and early Late Devonian (Frasnian) in age (Table 1).

In the extreme southern part of the report-area (Sec. 46, Fig. 2), the Okse Bay Formation rests on the Bird Fiord Formation. However, from there northward throughout the report-area, it rests everywhere on the Blue Fiord Formation. In the region of the restored section (Fig. 4), the Okse Bay Formation rests directly on the Blue Fiord Formation, and is equivalent laterally to the Bird Fiord Formation farther south.

Deposition of the Okse Bay Formation spanned most or all of Late Devonian time. It represents a great influx of clastic rocks into the Franklinian Miogeosyncline that was associated with the Ellesmerian Orogeny. Deformation by that orogeny continued, coeval with deposition of the Okse Bay clastic rocks and culminated with folding of the miogeosynclinal belt, including the Okse Bay Formation. The Okse Bay Formation is the youngest formation of the Franklinian Miogeosyncline in the study-area and its folding as a result of the Ellesmerian Orogeny marked the end of that feature as a depositional basin.

SUMMARY

The Franklinian Miogeosyncline and adjacent Central Stable Region of central and eastern Ellesmere Island (Fig. 1) had a long history of development from late Proterozoic to Late Devonian time. The succession is bounded at the base by the nonconformity with the Precambrian crystalline basement complex. Its depositional history was terminated by the Late Devonian to Middle Pennsylvanian Ellesmerian Orogeny (Thorsteinsson and Tozer, 1970) which folded the Franklinian Miogeosyncline. The column in the miogeosyncline is at least 40 000 feet (12 192 m) thick and its development is amenable to breakdown into three natural divisions that are treated in a series of three reports by the writer. Proterozoic and Cambrian rocks comprise the first division (Kerr, 1967a). These rocks show an early stage in development

of the miogeosyncline in which it apparently began as a downwarp in the granitic crust. This phase may be thought of as a deepening phase in which the miogeosyncline took on its overall shape. The pattern is a progressing one rather similar to patterns occurring in the eastern and western miogeosynclinal belts of North America. There is a thick section of Proterozoic sediments, followed by Lower Cambrian clastic strata of cratonic source that encroached onto the craton. These are succeeded by predominantly carbonate rocks of Early, Middle and possibly Late Cambrian age. During this phase, the Arctic depositional basin was becoming progressively deeper and broader; by its end, carbonates had become predominant in the miogeosyncline and lapped onto the Central Stable Region.

Lower to Upper Ordovician rocks comprise the second division (Kerr, 1968). This phase exhibits a distinct depositional pattern that is persistent yet markedly different from the patterns above and below. The rocks are carbonates and evaporites which are widespread and in which facies and thickness variations are gradual. The sediments of the various rock units were deposited in slight troughs whose axes were co-incident and trend along the miogeosynclinal belt. A less negative belt occurred in the northwest near the eugeosyncline. The separation between miogeosyncline and Central Stable Region became quite indistinct in the Ordovician, there being no clearly recognizable line of flexure. Sediments comprise mainly fine-grained carbonates deposited in broad stable seas that encroached widely onto the continental interior. This was a long phase of continental even subsidence, a relatively stable mid-period in the life of the miogeosyncline when it was at its widest development.

Upper Ordovician to Upper Devonian rocks comprise the third division of the sedimentary column in the study-area. This represents the final phase of deposition in the Franklinian Miogeosyncline, and these rocks are the subject of the present report. This phase may be thought of as the gradual filling, narrowing and terminating of the miogeosyncline. In contrast to the two older divisions, the third division is characterized by progressively increasing instability that culminated in the Ellesmerian Orogeny. The division includes a great variety of rock types, facies changes and thickness variations that were both extreme and gradual. A summary of Upper Ordovician (Richmondian) to Upper Devonian stratigraphy of the study-area showing the evolution of the final phase of the Franklinian Miogeosyncline follows.

The lower part of the Allen Bay and Read Bay carbonate successions of the eastern part of the study-area grades laterally westward into shale of the Cape Phillips Formation. The shale to limestone facies change represents a sudden change, in Richmondian time, from the pre-existing sedimentary pattern of widespread uniform units, typified by the Irene Bay Formation of the miogeosyncline.

Thick carbonate formations occur on the shelfward side in the Allen Bay, Read Bay, and Blue Fiord Formations. They grade in part northwestward to thinner deeper water euxinic rocks of the Cape Phillips and Eids Formations, that were deposited on the slope or basin of the Hazen Trough. A moderate topographic high along the western margin of the miogeosyncline, that had been persistent through the second division deposition, apparently disappeared prior to deposition of sediments of the third division, for total thicknesses appear to increase westward toward the eugeosyncline. The influx of clastic material culminated with the Ellesmerian Orogeny which deformed the Franklinian Miogeosyncline, and ended deposition therein. An orogenic welt was active in the direction of the eugeosyncline (Trettin *et al.*, 1972) and, apparently, was a source of clastic material throughout deposition of the entire division. This clastic material, now comprising mainly the Imina Formation (which comprises most of the now-abandoned Cape Rawson Group), was deposited in the deep Hazen Trough (Trettin, 1971b) and, in time, overlapped progressively farther to the southeast across the miogeosyncline.

In Early through Late Devonian time, the miogeosyncline was progressively infilled by clastic sediments from both sides. From the eugeosyncline to the west came flysch-like sediments of the Imina Formation and molasse-like sediments of the Okse Bay Formation. From the east came the Vendom Fiord Formation and perhaps part of the Okse Bay Formation. The Blue Fiord Formation is an early reefal carbonate unit that is up to 3995 feet (1205 m) thick. It was surrounded by clastic rocks and, apparently, finally enveloped by them.

The sedimentary record in the study-area displays the last stages of the Franklinian Miogeosyncline as that belt was filled and ceased to be a sedimentary basin. The sedimentary column of the geosyncline was finally folded by southeastward-directed deformation of the Ellesmerian Orogeny.

REFERENCES

Barnes, C.R.
1973: Ordovician conodont biostratigraphy of the Canadian Arctic *in* Proceedings of the Symposium on the Geology of the Canadian Arctic, J.D. Aitken and D.J. Glass, eds.; Geol. Assoc. Can. and Can. Soc. Petrol. Geologists, p. 221-240.

Bolton, T.E.
1965: Trilobites from Upper Silurian rocks of the Canadian Arctic Archipelago: *Encrinurus (Frammia)* and *Hemiarges in* Contributions to Canadian Paleontology; Geol. Surv. Can., Bull. 134.

Douglas, R.J.W., Norris, D.K., Thorsteinsson, R. and Tozer, E.T.
1963: Geology and petroleum potentialities of northern Canada; Geol. Surv. Can., Paper 63-31.

Fielden, H.W. and de Rance, C.D.
1878: Geology of the coasts of the Arctic lands visited by the late British expedition under Captain Sir George Nares; Quart. J. Geol. Soc. London, v. 34, p. 556-567.

Fortier, Y.O., McNair, A.H. and Thorsteinsson, R.
1954: Geology and petroleum possibilities in the Canadian Arctic Archipelago; Bull. Am. Assoc. Petrol. Geologists, v. 38, p. 2075-2109.

Fortier, Y.O., Blackadar, R.G., Glenister, B.F., Greiner, H.R., McLaren, D.J., McMillan, N.J., Norris, A.W., Roots, E.F., Souther, J.G., Thorsteinsson, R. and Tozer, E.T.
1963: Geology of the north-central part of the Arctic Archipelago, Northwest Territories (Operation Franklin); Geol. Surv. Can., Mem. 320.

Kerr, J. Wm.
1967a: Stratigraphy of central and eastern Ellesmere Island, Arctic Canada, Part I, Proterozoic and Cambrian; Geol. Surv. Can., Paper 67-27, Part I.

1967b: Devonian of the Franklinian Miogeosyncline and adjacent Central Stable Region, Arctic Canada; Intern. Symp. on the Devonian System, Alberta Soc. Petrol. Geologists, Calgary, Canada, Sept. 6-8, 1967, v. 1, p. 677-692.

1967c: Vendom Fiord Formation - A new red-bed unit of probable early Middle Devonian (Eifelian) age, Ellesmere Island, Arctic Canada; Geol. Surv. Can., Paper 67-43.

1967d: Nares submarine rift valley and the relative rotation of North Greenland; Bull. Can. Petrol. Geol., v. 15, no. 4, p. 483-520.

1968: Stratigraphy of central and eastern Ellesmere Island, Arctic Canada, Part II, Ordovician; Geol. Surv. Can., Paper 67-27, Part II.

1972a: Geology, Sawyer Bay, District of Franklin; Geol. Surv. Can., Map 1357A.

1972b: Geology, Dobbin Bay, District of Franklin; Geol. Surv. Can., Map 1358A.

1972c: Geology, Kennedy Channel and Lady Franklin Bay, District of Franklin; Geol. Surv. Can., Map 1359A.

1974: Geology of Bathurst Island Group and Byam Martin Island, Arctic Canada (Operation Bathurst Island); Geol. Surv. Can., Mem. 378.

1975: Cape Storm Formation - a new Silurian unit in the Canadian Arctic; Bull. Can. Petrol. Geol., v. 23, no. 1, p. 67-83.

Kerr, J. Wm. and Thorsteinsson, R.
1972: Geology, Baumann Fiord, District of Franklin; Geol. Surv. Can., Map 1312A.

King, P.B.
1959: The evolution of North America; Princeton University Press.

Krumbein, W.C. and Sloss, L.L.
1956: Stratigraphy and sedimentation; W.H. Freeman and Company, San Francisco.

Mayr, U.
1973: Lithologies and depositional environments of the Allen Bay-Read Bay Formations (Ordovician-Silurian) on Svendsen Peninsula, central Ellesmere Island *in* Proceedings of the Symposium on the Geology of the Canadian Arctic, J.D. Aitken and D.J. Glass, eds.; Geol. Assoc. Can. and Can. Soc. Petrol. Geologists, p. 143-158 (1974).

McGregor, D.C.
1974: Early Devonian spores from central Ellesmere Island, Canadian Arctic; Can. J. Earth Sci., v. 11, no. 1, p. 70-78.

McLaren, D.J.
1963: Goose Fiord to Bjorne Peninsula *in* Geology of the north-central part of the Arctic Archipelago, Northwest Territories (Operation Franklin); Geol. Surv. Can., Mem. 320, p. 310-338.

Thorsteinsson, R.
1958: Cornwallis and Little Cornwallis Islands, District of Franklin, Northwest Territories; Geol. Surv. Can., Mem. 294 (1959).

1963a: Ordovician and Silurian stratigraphy *in* Geology of the north-central part of the Arctic Archipelago, Northwest Territories (Operation Franklin); Geol. Surv. Can., Mem. 320, p. 31-50.

1963b: Prince Alfred Bay *in* Geology of the north-central part of the Arctic Archipelago, Northwest Territories (Operation Franklin); Geol. Surv. Can., Mem. 320, p. 221-231.

1963c: Copes Bay *in* Geology of the north-central part of the Arctic Archipelago, Northwest Territories (Operation Franklin); Geol. Surv. Can., Mem. 320, p. 386-395.

1972a: Geology, Eureka Sound South, District of Franklin; Geol. Surv. Can., Map 1300A.

1972b: Geology, Strathcona Fiord, District of Franklin; Geol. Surv. Can., Map 1307A.

1972c: Geology, Cañon Fiord, District of Franklin; Geol. Surv. Can., Map 1308A.

Thorsteinsson, R. and Kerr, J. Wm.
1962: Selected area of Ellesmere Island, District of Franklin; Geol. Surv. Can., Map 39-1962 (1963).

1968: Cornwallis Island and adjacent smaller islands, Canadian Arctic Archipelago; Geol. Surv. Can., Paper 67-74.

1972: Geology, Greely Fiord east, District of Franklin; Geol. Surv. Can., Map 1348A.

Thorsteinsson, R. and Tozer, E.T.
1957: Geological investigations in Ellesmere and Axel Heiberg Islands, 1956; Arctic, J. Arctic Inst. North America, v. 10, no. 1, p. 2-31.

1960: Summary accound of structural history of the Canadian Arctic Archipelago since Precambrian time; Geol. Surv. Can., Paper 60-7.

1970: Geology of the Arctic Archipelago *in* Geology and economic minerals of Canada, R.J.W. Douglas, ed.; Geol. Surv. Can., Econ. Geol. Rept. No. 1, 5th ed., p. 548-590 (1972).

Trettin, H.P.
1969: Pre-Mississippian geology of northern Axel Heiberg and northwestern Ellesmere Island, Arctic Archipelago; Geol. Surv. Can., Bull. 171.

1971a: Stratigraphy and sedimentology of lower Paleozoic clastic units, Tanquary and Cañon Fiord regions, Ellesmere Island; Geol. Surv. Can., Paper 71-1, Pt. A, p. 236-241.

1971b: Geology of lower Paleozoic formations, Hazen Plateau and southern Grant Land Mountains, Ellesmere Island, Arctic Archipelago; Geol. Surv. Can., Bull. 203.

Trettin, H.P.
1973: Stratigraphy and sedimentology of Upper Ordovician to Lower Devonian clastic formations, Cañon Fiord region, Ellesmere Island; Geol. Surv. Can., Paper 73-1, Pt. A, p. 273-277.

in prep. a: Middle Ordovician to Lower Devonian deep-water succession east of Cañon Fiord, Ellesmere Island: sedimentation and tectonic development at margin of miogeocline; Geol. Surv. Can., Bull.

in prep. b: Investigations of Devonian clastic formations, west-central Ellesmere Island; Geol. Surv. Can., Bull.

Trettin, H.P., Frish, T.O., Sobczak, L.W., Weber, J.R., Niblett, E.F., Law, L.K., DeLaurier, J.M. and Whitham, K.
1972: The Innuitian Province *in* Variations in tectonic styles in Canada, R.A. Price and R.J.W. Douglas, eds.; Geol. Assoc. Can., Spec. Paper 11, p. 83-179.

APPENDIX

MEASURED SECTIONS

SECTION 5. DARLING PENINSULA

Located on northeastern Darling Peninsula, Ellesmere Island, Latitude 79°49'N, Longitude 71°00'W. Thicknesses were estimated from aerial photograph A-16611-114, by scale in combination with a pocket altimeter. This is the upward continuation of Section 5 in GSC Paper 67-27, Part II.

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
	SILURIAN AND POSSIBLY LOWER DEVONIAN		
	Read Bay Formation [2590 ft (789.4 m)]		
	Upper limit of exposure.		
24	Limestone, medium grey; medium bedded to massive; weathers yellowish grey, some flat pebble conglomerate	60 (18.3)	8795 (2694.3)
23	Limestone, same as below; GSC locs. 47683, 47688, abundant *Hexagonaria* sp.	200 (60.9)	8735 (2676.1)
22	Limestone, medium light grey, very fine grained; thin to medium bedded; shaly interlayers are yellowish grey. GSC loc. 47681 at 35 ft above base; GSC loc. 47682 throughout	395 (120.4)	8535 (2615.1)
21	Limestone, shaly	100 (30.5)	8140 (2481.0)
20	Sandstone, quartzose, very fine grained, yellowish; weathering yellow-orange	45 (13.7)	8040 (2450.5)
19	Limestone, shaly, light to medium grey; thin to medium bedded; weathering yellowish grey, shaly layers greenish; recessive; GSC loc. 47680	345 (105)	7995 (2436.8)
18	Limestone, light grey, thin bedded; weathers yellowish; stromatoporoids approximately 50% of rock; GSC loc. 47678	10 (3.05)	7650 (2331.7)
17	Limestone, medium grey; weathering yellowish grey; thin to medium bedded; abundant silicified fossils; GSC loc. 47679	98 (29.9)	7640 (2328.6)
16	Sandstone, quartzose, slightly calcareous, very fine grained; yellowish grey; weathering yellowish orange, vertical worm burrows distort bedding	62 (18.9)	7542 (2298.8)
15	Limestone, variable medium grey, thin bedded; massive light grey brecciated; thin bedded, grey-brown coquinal; GSC loc. 47678	20 (6.1)	7480 (2279.9)
14	Limestone, light to medium grey, lithographic to fine grained; thin to medium bedded; weathering yellowish grey; ledge forming	200 (60.9)	7460 (2273.8)
13	Limestone, shaly and silty, medium grey to yellowish grey; thin to medium bedded; weathering yellowish grey; interbeds of slightly calcareous quartz sandstone with salt crystals and desiccation cracks; GSC loc. 47677	400 (122)	7260 (2212.8)

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
12	Limestone; very light grey, fine grained, thick bedded; weathering very light grey; ledge forming; contains dark grey laminated limestone intervals; breccia intervals; petroliferous odour; reefal at top; GSC loc. 47676	655 (199.6)	6860 (2090.9)
	Contact conformable.		
	LATE ORDOVICIAN AND SILURIAN		
	Allen Bay Formation [2135 ft (650.7 m)]		
11	Dolomite; light grey, medium grained; weathering very light grey; thin to medium bedded; commonly porous to vuggy; petroliferous odour; alternating with several bands of dark greyish brown dolomite, 35 to 100 ft thick	890 (271)	6205 (1891)
10	Dolomite, greyish brown, weathering greyish brown; medium grained, sugary; coquina at base; GSC loc. 47675	135 (41.1)	5315 (1620)
9	Dolomite, medium grained, sugary, medium grey, weathering light grey; petroliferous odour	500 (152.4)	5180 (1578.8)
8	Limestone, medium grey; weathering medium grey; partly replaced by dolomite; interbedded with dolomite; GSC loc. 47674	170 (88)	4680 (1426.4)
7	Limestone, medium grey; weathering medium greyish brown with rough surfaces; thin bedded; resistant; GSC loc. 47673	440 (134)	4510 (1374.6)
	Contact conformable.		
	ORDOVICIAN		
	CORNWALLIS GROUP		
	Irene Bay Formation		
6	Limestone, shaly, grey-brown, fine grained, thin bedded; weathers rusty, recessive; interlayered shale, greenish weathering, calcareous, fossiliferous; GSC locs. 47671 and 47672	745 (227)	4070 (1240.5)

SECTION 6. SOUTHWEST OF SCORESBY BAY

Located 16 miles due west of the head of Scoresby Bay, Ellesmere Island; Latitude 79°51'N, Longitude 72°40'W. Thicknesses were estimated from aerial photograph A-16604-12, by scale in combination with a pocket altimeter. This is the upward continuation of Section 6 in GSC Paper 67-27, Part II.

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
	LOWER DEVONIAN		
	Eids Formation [1000+ ft (304.8+ m); preserved thickness]		
	Upper limit of exposure.		
11	Siltstone, sandy quartzose, brownish grey to chocolate brown; weathers dusky yellow; minor calcareous interbeds; minor pebble layers	1000+ (304.8+)	8580 (2615.2)
	SILURIAN		
	Cape Phillips Formation [200 ft (60.9 m)]		
10	Siltstone, quartzose, slightly calcareous, fine grained; dark chocolate brown to black; weathers black; some graptolitic shale; occasionally pyritic, some concretions	200 (60.9)	7580 (2310.4)
	Contact conformable.		
	ORDOVICIAN AND SILURIAN		
	Allen Bay Formation [950 ft (289.5 m)]		
9	Dolomite, slightly calcareous, dark grey-brown; weathers medium grey; fine grained, medium bedded	300 (91.4)	7380 (2249.4)
8	Dolomite, fine grained, very light grey; weathers very light grey; slightly vuggy	200 (60.9)	7080 (2157.9)
7	Limestone, dolomitic, medium dark grey, in places mottled brownish where dolomitic; fine grained; weathers medium grey-brown; thin to medium bedded; dolomite increases toward top	450 (137)	6880 (2097)
	Contact conformable.		
	ORDOVICIAN		
	CORNWALLIS GROUP		
	Irene Bay Formation		
6	Limestone, shaly, medium grey, thin bedded; greenish weathering; recessive; fossils of "Arctic Ordovician fauna" abundant	150 (45.7)	6430 (1959.8)

SECTION 8. SOUTH OF TANQUARY FIORD

Located at Latitude 80°19'N, Longitude 79°30'W, and is shown on GSC Map 1348A. Thicknesses were estimated from aerial photograph A-16693-152, in combination with a pocket altimeter.

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
	SILURIAN AND DEVONIAN		
	Imina Formation [2500+ ft (762+ m); preserved thickness]		
	Upper limit of exposure.		
3	Sandstone, typical of the formation, dark grey, calcareous, fine to medium grained, weathers brown, flaggy, thin to medium bedded, with minor black, non-calcareous, shaly interlayers. One of these layers at 2000 ft from base yields graptolites	2500+ (762+)	5600 (1706.9)
	Contact conformable.		
	LATE ORDOVICIAN TO SILURIAN		
	Cape Phillips Formation [100 ft (30.5 m)]		
2	Chert, black, dark brownish green, medium bedded, very shaly, shaly interbeds with graptolites; grades up to overlying Imina Formation; intensely folded	100 (30.5)	3100 (944.9)
	Contact conformable.		
	ORDOVICIAN		
	CORNWALLIS GROUP (undivided)		
1	Limestone, very shaly, fine grained, thin to medium bedded, medium to dark grey, weathers medium grey and yellow-grey; abundant yellow-grey shaly and silty interlayers	3000+ (914+)	3000 (914)
	Base of section at lower limit of exposure.		

SECTION 11. CAÑON FIORD, SOUTH

A northwest-dipping section on the north side of Cañon Fiord, at the southern extremity of that fiord; Latitude 79°44'N, Longitude 81°10'W. Thicknesses were estimated from aerial photograph A-16690-51, by scale in combination with a pocket altimeter. This is the upward continuation of Section 11 in GSC Paper 67-27, Part II. About three miles to the northwest on the opposite limb of the same syncline, Trettin (in prep. a) reports that the undivided Allen Bay and Read Bay Formations in his Section 4-2 was measured photogrammetrically as 9400 ft (2865 m) thick.

Unit	Lithology	Thickness feet	(metres)	Height Above Base feet	(metres)
	DEVONIAN				
	Eids Formation [1250 ft (381 m); preserved thickness]				
	Upper limit of exposure.				
16	Siltstone, medium grey at base becoming greenish grey at top, weathers light green-brown, platy, micaceous, small brachiopods, bryozoa	1250	(381)	9000	(2743.2)
	Contact conformable.				
	SILURIAN AND POSSIBLY LOWER DEVONIAN				
	Cape Phillips Formation [1050 ft (320 m)]				
15	Siltstone, black, siliceous, calcareous, thin bedded to fissile, weathers yellow-grey to black, minor sandstone interbeds, very fine grained, light brown, weathers yellow-brown	1050	(320)	7750	(2362.2)
	Contact conformable.				
	ORDOVICIAN AND SILURIAN				
	Allen Bay-Read Bay Formations (undivided) [4400 ft (1341 m)]				
14	Limestone, silty and shaly, medium dark grey, thin to medium bedded, weathers olive-grey, interbed of dark grey calcareous siltstone and black calcareous shale	300	(91.4)	6700	(2042)
13	Limestone, dark grey, fine grained, thick bedded to massive with shaly intervals, weathers olive-grey, colonial corals common	300	(91.4)	6400	(1950.7)
12	Limestone, fine grained, dark	60	(18.3)	6100	(1859.3)
11	Limestone, fine grained, very light grey, weathers rusty yellow with streaks of iron staining	40	(12.2)	6040	(1840.9)
10	Limestone, dark grey-brown, weathers grey-brown, thin to medium bedding, petroliferous odour	500	(152.4)	6000	(1828.8)
9	Limestone, fine grained, medium grey, thick bedded, partly replaced by dolomite, silty in places, partly replaced by chert; lower 200 ft has about 10 coquinas of brachiopods	2360	(719.3)	5500	(1676.4)

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
8	Limestone, medium grey, weathers medium grey, partly replaced by dolomite, weathers light brown overall, mottled and rough, grades to dolomite in upper part; chert replacement minor	430 (131)	3140 (957)
7	Limestone, silty, carbonaceous, black, orthocone nautiloids and trilobites	70 (213)	2720 (844.3)
6	Limestone, medium grey, weathers olive-grey and rough; thick bedded, partly replaced by dolomite, stromatoporoids, *Halysites*	340 (103.6)	2650 (807.7)
	Contact conformable.		
	ORDOVICIAN		
	CORNWALLIS GROUP		
	Irene Bay Formation		
5	Limestone, shaly, medium grey, weathers greenish grey, thin bedded, interlayered, greenish shale recessive, abundantly fossiliferous; fossils from scree include *Catenipora* sp., *Foerstephyllum* sp., *Calapoecia* sp., *Receptaculites* sp., *Cyrtogomphoceras* sp., *Diestoceras* sp., and *"Spyroceras"* sp.	140 (42.6)	2310 (704)

SECTION 12. CAÑON FIORD, HEAD

Composite section of a lower part (12a) and an upper part (12b) whose locations at the south end of Cañon Fiord are shown on GSC Map 1308A. Unit 5 is common to both parts. Thicknesses were estimated on aerial photograph A-16678-19 in combination with a pocket altimeter.

	DEVONIAN		
	Imina Formation [1000+ ft (304.8 m); preserved thickness]		
	Upper limit of exposure.		
11	Sandstone, medium grey, often muscovite grains, occasionally slightly calcareous; fine grained; medium bedded; weathering light yellowish grey; at base it is siltstone becoming coarser upward; ripple-marks, small-scale cross-lamination, flow casts, few 1 inch thick coquinal interbeds	1000+ (304.8+)	4385+ (1336.5+)
	Contact conformable.		
	SILURIAN AND POSSIBLY LOWER DEVONIAN		
	Cape Phillips Formation [1635 ft (498 m)]		
10	Siltstone, shaly, dark grey, becoming lighter in upper parts; minor interbeds of fine-grained sandstone and flat-pebble conglomerate of siltstone fragments in rusty weathering, sandy matrix; minor concretions	175 (53.3)	3385 (1031.7)

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
9	Shale, silty, black; thin bedded; weathers dark grey; some thin, shaly, fine-grained sandstone interbeds	410 (124.9)	3210 (978.4)
8	Siltstone, shaly, dark greenish grey; thin to medium bedded; weathers to form rod-shaped fragments; authigenic radiating crystals of pyrite; weathers greenish grey, stained rusty; two 2 ft thick brown weathering mudstone layers 30 and 45 ft above base	250 (76.2)	2800 (853.4)
7	Siltstone and silty shale, dark grey to black; thin bedded; weathers dark grey, graptolites present	300 (91.4)	2550 (777.2)
6	Siltstone and silty shale, calcareous, dark grey to black; thin bedded; weathers yellowish grey	500 (152.4)	2250 (685.8)
	Contact conformable.		
	SILURIAN		
	Allen Bay-Read Bay Formations (undivided) [600 ft (182.8 m)]		
5	Limestone, shaly, dark grey, fine grained; medium bedded, weathers yellow-grey; alternating with massive calcareous sandstone containing crinoid columnals and angular fragments of fine-grained limestone; limestone partly replaced by irregular interbeds and nodules of black chert; interbeds of black shale; grades up to shale by increase in interbeds	150 (68.6)	1750 (533.4)
4	Limestone, very shaly, carbonaceous, dark grey, medium bedded, weathers grey-brown, black shaly interlayers weather dark grey	300 (91.4)	1600 (487.7)
3	Limestone, dolomitic, dark grey and greyish brown mottled, massive, weathers greyish brown with rough surfaces	150 (45.7)	1300 (396.2)
	Contact conformable.		
	ORDOVICIAN		
	CORNWALLIS GROUP		
	Irene Bay Formation [550 ft (167.6 m)]		
2	Limestone, slightly shaly, medium to dark grey, fine grained; weathers yellow-grey, slightly greenish; thin to medium bedded; recessive; some resistant, thick-bedded, dark grey limestone interbeds; gradational contact at both top and bottom; shaly layers are abundantly fossiliferous	550 (167.6)	1150 (350.5)
	Contact conformable.		

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
	Thumb Mountain Formation [600+ ft (183+ m); incomplete]		
1	Limestone, slightly dolomitic, shaly; dark grey; fine grained; massive to thick bedded; weathers greyish brown, shaly layers weather yellowish grey; 1000 ft present below observations	600+ (183+)	600 (183)
	Lower limit of exposure.		

SECTION 16. NORTH-NORTHEAST OF VESLE FIORD

A west-dipping section 15 miles north-northeast of the head of Vesle Fiord on Ellesmere Island; Latitude 79°19'N, Longitude 82°40'W. Thicknesses were estimated from aerial photograph A-16676-92, by scale in combination with a pocket altimeter. This is the upward continuation of Section 16 in GSC Paper 67-27, Part II.

	DEVONIAN		
	Blue Fiord Formation [400+ ft (122+ m); preserved thickness]		
	Upper limit of exposure.		
8	Limestone, medium light grey, weathers light olive-grey, thin to medium bedded	400+ (122+)	10 800+ (3291.8+)
	Contact conformable.		
	Eids Formation [2000 ft (609.6 m)]		
7	Sandstone, quartzose, fine grained, generally non-calcareous, thin bedded, light buff, weathering light brownish yellow; commonly dark green sandstone interbedded, weathering light green; moderately recessive	2000 (609.6)	10 400 (3169.9)
	Contact conformable?		
	LATE ORDOVICIAN TO POSSIBLY EARLY DEVONIAN		
	Allen Bay-Read Bay Formations (undivided) [3500 ft (1066.8 m)]		
6	Limestone, dark brownish grey, weathers light grey-brown, lithographic to fine grained, thin to thick bedded, resistant, often petroliferous odour; minor pink dolomite in the upper part; at the top becomes shaly, weathers greenish; grades sharply to overlying unit	2000 (609.6)	8400 (2560.3)
5	Limestone, grey-grown, and dolomite, brown, thin to thick bedded, weathering medium yellow-grey	1500 (457)	6400 (1950.7)
	Contact conformable.		

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
	ORDOVICIAN		
	CORNWALLIS GROUP		
	Irene Bay Formation		
4	Limestone, shaly, thin to medium bedded, recessive; greenish weathering shaly layers; abundantly fossiliferous	200 (60.9)	4900 (1493.5)

SECTION 18. NORTHEAST OF THE HEAD OF IRENE BAY

Located 19 miles northeast of the head of Irene Bay on Ellesmere Island; Latitude 79°18'N, Longitude 80°47'W. Thicknesses were estimated from aerial photograph A-16678-28, by scale in combination with a pocket altimeter. This is the upward continuation of Section 18 in GSC Paper 67-27, Part II.

	LATE CRETACEOUS AND/OR TERTIARY		
	Eureka Sound Formation		
26	Sandstone, sand, siltstone, poorly lithified; pale colours predominate; very recessive	1000+ (304.8+)	20 622+ (6285.6)
	Contact conformable.		
	DEVONIAN		
	Okse Bay Formation [2800+ ft (853+ m); incomplete]		
25	Sandstone, yellow-orange, weathering orange	800+ (243.8+)	19 622 (5980.8)
24	Sandstone, generally green and grey-green; often red; overall weathering colour red, rarely calcareous, gypsiferous in lower 100 ft, ripple-marks, grades to yellow-orange above	2000 (609.6)	18 822 (5736.9)
	Contact conformable.		
	Blue Fiord Formation [145 ft (44.2 m)]		
23	Dolomite, limy, light grey, reddish, shaly, grades to sands above and below	145 (44.2)	16 822 (5127.3)
	Contact conformable.		
	Vendom Fiord Formation [1300 ft (392 m)]		
22	Sandstone; medium grained, thin bedded, recessive, mainly green and much red; slightly gypsiferous throughout, markedly in lower half where white gypsum nodules and interbeds are common; overall weathering colour red	1125 (342.9)	16 677 (5083)

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
21	Dolomite, sandy, reddish, dolomite boulder conglomerate, red sandy matrix, resistant	175 (53.3)	15 552 (4740.2)
	Contact conformable.		
	SILURIAN AND POSSIBLY LOWER DEVONIAN		
	Read Bay Formation [1135 ft (345.9 m)]		
20	Limestone, thick bedded, shaly, lower 35 ft thin bedded, green, shaly and fossiliferous, with Wenlock or Ludlow fossils (GSC loc. 51950)	400 (121.9)	15 377 (4686.9)
19	Dolomite, light grey, weathers yellow-grey, medium to thick bedded	260 (79.2)	14 977 (4564.9)
18	Dolomite, light grey, sandy, thin bedded, weathering yellow-grey; much reddish sandstone interbedded, weathers red, giving red colour to the whole unit	475 (144.8)	14 717 (4485.7)
	Contact conformable.		
	ORDOVICIAN AND SILURIAN		
	Allen Bay Formation [2025 ft (617.2 m)]		
17	Dolomite, shaly dolomite, limestone, shaly limestone, weathers light grey to yellow-grey, medium bedded, minor red shaly interlayers, minor dolomite pebble-conglomerate interbeds	425 (129.5)	14 242 (4340.9)
16	Dolomite, thick bedded, fine to medium grained, light grey, medium grey and medium brown, rough-weathering surfaces, weathers light grey, medium grey, and medium brown	1200 (365.7)	13 817 (4211.4)
15	Limestone, partly dolomitic, argillaceous; fine grained, mottled on fresh surface, dolomitic parts brownish, limy parts dark grey, rough-weathering surface, thick bedded	400 (121.9)	12 617 (3845.6)
	Sharp conformable contact.		
	ORDOVICIAN		
	CORNWALLIS GROUP		
	Irene Bay Formation (type section)		
14	Limestone, argillaceous, thin to medium bedded, fresh surfaces dark gray, weathers yellow-grey, slightly greenish; argillaceous layers abundant and weather greenish; the argillaceous layers produce wavy bedding; recessive interval; large fossils abundant	270 (82.3)	12 217 (3723.7)

SECTION 22. NORTH OF IRENE BAY

Located 7 miles north of the head of Irene Bay; Latitude 79°10'N, Longitude 81°30'W (*see* GSC Map 1308A). Thicknesses were estimated on aerial photograph A-16690-39, in combination with a pocket altimeter.

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
	LATE CRETACEOUS AND/OR TERTIARY		
	Eureka Sound Formation		
7	Sandstone		
	Contact conformable.		
	DEVONIAN		
	Okse Bay Formation [2000+ ft (609+ m); incomplete]		
6	Sandstone, quartzose, mainly red, red weathering, much grey-brown, slightly calcareous in places	2000+ (609+)	4700+ (1432.5+)
	Contact conformable.		
	Blue Fiord Formation [1200 ft (365.7 m)]		
5	Dolomite, limy dolomite, medium grey-brown, weathers medium light grey, thick bedded, becomes limestone in upper part before grading to overlying rock	1200 (365.7)	2700 (822.9)
	Contact conformable.		
	Vendom Fiord Formation [850 ft (259 m)]		
4	Sandstone, quartzose, gypsiferous, thin to medium bedded, light grey-brown, grey-green and red; much bedded sandy gypsum, light grey, weathers very light grey, grades to overlying dolomite; recessive	400 (121.9)	1500 (457.2)
3	Sandstone, quartzose, thin to medium bedded, light grey-brown, weathers light brown; resistant; at base, 25 ft conglomerate of angular light grey dolomite pebbles	450 (137)	1100 (335.3)
	Contact unconformable.		
	LATE ORDOVICIAN AND SILURIAN		
	Allen Bay Formation [650+ ft (198+ m); incomplete]		
2	Dolomite, light grey, weathers light yellow-grey, bluff forming	250 (76.2)	650 (198)

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
1	Limestone, fine grain to lithographic, shaly, grey-brown, weathers yellow-grey, thick bedded	400+ (122+)	400 (122)
	Lower limit of rocks examined.		

SECTION 23. VESLE FIORD

Located 4 miles east of the head of Vesle Fiord; Latitude 79°10'N, Longitude 83°00'W (*see* GSC Map 1308A). Thicknesses were estimated on a vertical aerial photograph in combination with a pocket altimeter.

	DEVONIAN		
	Eids Formation		
6	Siltstone		
	Contact conformable.		
	SILURIAN AND POSSIBLY LOWER DEVONIAN		
	Cape Phillips Formation [1550 ft (472 m)]		
5	Shale-siltstone; black, weathers black, grey or buff (black to grey in upper part of formation, more frequently buff in lower part), generally thin bedded (especially in shaly parts of formation), invariably calcareous and increasingly so near top of formation, where limestone beds occur; some limestone interbeds occur scattered throughout section; rich in graptolites	1380 (420)	1750 (533.4)
4	Limestone, argillaceous, black; weathers black or grey, fine grained, very thin bedded; poorly fossiliferous	55 (16.7)	370 (112.8)
3	Limestone, dark grey; weathers buff; very fine grained, thin to medium bedded, very argillaceous in parts	115 (35)	315 (96)
	Contact conformable.		
	ORDOVICIAN AND SILURIAN		
	Allen Bay-Read Bay Formations (undivided) [165 ft (50.3 m)]		
2	Limestone, brown, weathers buff to orange; very fine grained; petroliferous odour; thick bedded; fossils include corals, brachiopods, crinoids	165 (50.3)	200 (60.9)
	Contact conformable.		

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
	ORDOVICIAN		
	CORNWALLIS GROUP		
	Irene Bay Formation		
1	Limestone, dark grey, weathers greenish; very fine grained; dense, argillaceous, pyritic, thin bedded within calcareous shale interbeds	35 (10.7)	35 (10.7)
	Lower limit of rocks examined.		

SECTION 24. EAST OF VESLE FIORD

Located 10 miles due east of the head of Vesle Fiord, Ellesmere Island; Latitude 79°03'N, Longitude 82°30'W. Thicknesses were estimated from aerial photograph A-16676-96, by scale in combination with a pocket altimeter. This is the upward continuation of Section 24 of GSC Paper 67-27, Part II.

	DEVONIAN		
	Okse Bay Formation		
14	Sandstone		
	Contact conformable.		
	Blue Fiord Formation [450 ft (137 m)]		
13	Limestone, thin to medium bedded, grey-brown, shaly, weathers yellow-grey, interbedded with sands	450 (137)	8145 (2482.6)
	Contact conformable.		
	Eids Formation [2000 ft (609.6 m)]		
12	Siltstone, grey-brown, generally slightly calcareous, little shaly material, weathers yellow-grey and yellow-orange, very recessive	2000 (609.6)	7695 (2345.4)
	Contact conformable.		
	SILURIAN AND POSSIBLY LOWER DEVONIAN		
	Cape Phillips Formation [1400 ft (426.7 m)]		
11	Siltstone, calcareous, shaly, thin bedded, medium brown, weathers yellow-orange and yellow-grey, black shaly interlayers, one near top yields graptolites	260 (79.2)	5695 (1735.8)
10	Siltstone, very shaly, rarely calcareous, chocolate brown to black, thin bedded, weathers yellow-grey and yellow-orange	260 (79.2)	5435 (1656.6)

Unit	Lithology	Thickness feet	(metres)	Height Above Base feet	(metres)
9	Siltstone, chocolate brown, non-calcareous, resistant, weathers yellow-grey, thin bedded	40	(12.2)	5175	(1577.3)
8	Limestone, fine grained, chocolate brown, thin bedded, argillaceous; weathers yellow-grey	425	(137.7)	5135	(1565)
7	Limestone, dark grey-brown; limy, silty shale, dark grey to black interbedded in about equal amounts, thin bedded, graptolites, and where present at base trilobites in shaly interlayers; petroliferous odour common	415	(126.4)	4710	(1435)
	Contact conformable.				
	UPPER ORDOVICIAN AND SILURIAN				
	Allen Bay Formation [110 ft (33.5 m)]				
6	Limestone, medium brown, with grey-brown; fine grained to lithographic	110	(33.5)	4295	(1309.1)
	Contact conformable.				
	ORDOVICIAN				
	CORNWALLIS GROUP				
	Irene Bay Formation				
5	Limestone, thin to medium bedded, argillaceous, dark grey; shaly layers, weathers greenish yellow; recessive; sharp upper and lower contacts; large cephalopods abundant	210	(64)	4185	(1275.6)

SECTION 30. NORTH-CENTRAL SVENDSEN PENINSULA

Located 10 miles west-southwest of the head of Strathcona Fiord on north-central Svendsen Peninsula, Ellesmere Island; Latitude 78°33'N, Longitude 83°10'W. Thicknesses were estimated from aerial photograph A-16706-105, by scale in combination with a pocket altimeter. This is the upward continuation of Section 30 in GSC Paper 67-27, Part II.

Unit	Lithology	Thickness feet	(metres)	Height Above Base feet	(metres)
	DEVONIAN				
	Eids Formation [950+ ft; preserved thickness]				
	Upper limit of preservation.				
16	Siltstone, quartzose, shaly, slightly calcareous, coarse grained; buff-grey; weathering yellow-orange, slightly rusty; thin to medium bedded, interbedded with thin silty shale interlayers	950+	(289.5+)	11 725+	(3573.8+)
	Contact conformable.				

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
	SILURIAN AND POSSIBLY LOWER DEVONIAN		
	Cape Phillips Formation (upper part) [2175 ft (662.9 m)]		
15	Siltstone, quartzose, very shaly, non-calcareous; fine grained, dark grey to black; thin bedded; weathers dark grey	1750 (533.4)	10 775 (3284.22)
14	Siltstone, quartzose, very shaly, calcareous, dark grey to black, thin bedded; weathers dark grey, recessive	425 (128.5)	9025 (2750.8)
	Contact conformable.		
	SILURIAN		
	Allen Bay Formation [300 ft (91.4 m)]		
13	Limestone, shaly and silty, dark grey to black; thin bedded; becomes more clastic upward; transition type, weathers grey-brown; thin black shaly interbeds; minor black chert interbeds	300 (91.4)	8600 (2754.3)
	This is a tongue extending westward into the Cape Phillips Formation.		
	Contact conformable.		
	LATE ORDOVICIAN AND SILURIAN		
	Cape Phillips Formation (lower part) [200 ft (60.9 m)]		
12	Siltstone, very shaly, slightly calcareous, dark grey; fine grained, weathers medium grey, thin bedded	200 (60.9)	8300 (2529.8)
	Total thickness of the Cape Phillips Formation (2 parts)	2375 (723.9)	
	Contact conformable.		
	ORDOVICIAN		
	CORNWALLIS GROUP		
	Irene Bay Formation		
11	Limestone, very shaly, dark grey, thin to medium bedded, shaly layers abundant and weather greenish; abundant large fossils	150 (45.7)	8100 (2468.9)

SECTION 31. SOUTHWEST OF STRATHCONA FIORD (WESTERN LIMB)

Located 8 miles southwest of Strathcona Fiord, Ellesmere Island; Latitude 78°30'N, 82°55'W (*see* GSC Map 1307A). Thicknesses were estimated on aerial photograph A-16676-108, by scale in combination with a pocket altimeter.

Unit	Lithology	Thickness feet	(metres)	Height Above Base feet	(metres)
	DEVONIAN				
	Eids Formation [2550 ft (777.2 m); preserved thickness]				
8	Siltstone, quartzose, slightly calcareous, thin bedded, weathers yellow-grey	1500	(457.2)	6295	(1918.7)
7	Siltstone, quartzose, light green, thin bedded; weathering light greenish grey; interbedded with 10 or 12 interbeds of coquinal limestone of thickness 6 inches to 8 ft; some are conglomerate	525	(160)	4795	(1461.5)
6	Sandstone, quartzose, very fine grained; thin to medium bedded; light green; weathering light greenish grey; interbedded with grey silty shale	525	(160)	4270	(1301.5)
	Contact conformable.				
	SILURIAN AND POSSIBLY LOWER DEVONIAN				
	Cape Phillips Formation [1920 ft (585.2 m)]				
5	Siltstone, shaly, dark grey, thin to medium bedded; weathers greenish grey to yellowish grey; commonly rusty weathering, fine-grained sandy interbeds; minor limestone interbeds only at base; graptolites rare	1470	(448)	3745	(1114.5)
4	Shale, very silty, dark grey, thin bedded; weathers yellowish grey; interbedded with chocolate brown, shaly limestone; graptolitic at base	400	(121.9)	2275	(693.4)
3	Shale, silty, very dark brownish grey; thin bedded, interbeds of chocolate brown dolomite	50	(15.2)	1875	(571.5)
	Contact conformable.				
	UPPER ORDOVICIAN AND SILURIAN				
	Allen Bay Formation [325 ft (99 m)]				
2	Dolomite, fine grained, medium grey-brown to chocolate brown, medium bedded; partly replaced by black chert; weathers light grey at base; predominantly weathers light brown; in upper part interbedded with black silty graptolitic shale	325	(99)	1825	(556.2)
	Contact conformable.				

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
	ORDOVICIAN		
	CORNWALLIS GROUP (undivided)		
1	Limestone, medium grey, fine grained to lithographic, thin to medium bedded; weathers yellowish grey; very petroliferous throughout; upper 250 ft distinctly rusty weathering	1500 (457.2)	1500 (457.2)

SECTION 32. SOUTHWEST OF STRATHCONA FIORD (EASTERN LIMB)

Located 8 miles southwest of the head of Strathcona Fiord (*see* GSC Map 1307A). Thicknesses were estimated on aerial photographs A-16676-108 and A-16728-102, by scale in combination with a pocket altimeter. The Read Bay, Vendom Fiord and Blue Fiord Formations of this section have been studied by Trettin (in prep. b, Section 11-1), and only his formational thicknesses are given below.

	DEVONIAN		
	Okse Bay Formation [6150 ft (1874.5 m); preserved thickness]		
	Upper limit of exposure.		
19	Sandstone, quartzose, coarse grained, very light grey to light cream, minor grey-green; weathers white, light grey, orange and grey-green	2000 (609.6)	15 823 (4822.8)
18	Sandstone, quartzose, thick bedded, in places partly micaceous, medium grained, well rounded; weathering rusty orange; Leisegang structures	1700 (518.1)	13 823 (4213.2)
17	Siltstone, deep red and green, thin bedded; much white quartz sandstone, weathering cream; interbedded with some pebbles	1350 (411.4)	12 123 (3695)
16	Sandstone, medium grained, micaceous; greenish near base becoming reddish higher up; thin bedded; worm trails; interbedded with much siltstone	1100 (335.2)	10 773 (3283.6)
	Contact conformable.		
	Blue Fiord Formation		
15	Limestone	1574 (479.7)	9673 (2948.3)
	Contact conformable.		
	Vendom Fiord Formation		
14	Variable limestone, sandstone, dolostone, siltstone	1808 (551.1)	8099 (2468.6)
	Contact conformable.		

Unit	Lithology	Thickness feet	(metres)	Height Above Base feet	(metres)
	SILURIAN AND POSSIBLY LOWER DEVONIAN				
	Read Bay Formation (tongue)				
13	Limestone	716	(218.2)	6291	(1917.5)
	Contact conformable.				
	SILURIAN				
	Cape Phillips Formation [1775 ft (541 m)]				
12	Siltstone, same as below, interbedded with limestone coquina with abundant echinoderm columnals and brachiopods	350	(106.7)	5575	(1699.3)
11	Siltstone, same as below, near top, minor thin intervals of coquinal limestone and some graptolites	475	(144.8)	5225	(1592.6)
10	Siltstone, quartzose, fine grained, slightly calcareous, dark grey to chocolate brown, thin bedded; minor black shale weathers yellowish grey; graptolites at base	620	(189)	4750	(1447.8)
9	Shale, silty, dark grey to black, slightly calcareous, weathers yellowish grey and greenish grey, minor interbeds of brownish crinoidal limestone, minor boulder conglomerate containing coral fragments	330	(100.6)	4130	(1258.8)
	Contact conformable.				
	UPPER ORDOVICIAN AND SILURIAN				
	Allen Bay Formation [1025 ft (312.4 m)]				
8	Dolomite, chocolate brown, partly replaced by black chert; minor black silty shale interbedded with graptolites	50	(15.2)	3800	(1158)
7	Dolomite, fine grained chocolate brown; weathers light chocolate brown; minor black chert replacement	375	(114.3)	3750	(1143)
6	Dolomite, light grey, fine grained; thick bedded; vuggy; weathers light grey	150	(45.7)	3375	(1028.7)
5	Limestone, medium grey, fine grained; weathers yellowish grey; fossils slightly reddish colour, petroliferous odour; minor chert replacement	450	(137.1)	3225	(982.9)
	Contact conformable.				

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
	ORDOVICIAN		
	CORNWALLIS GROUP		
	Irene Bay Formation [275 ft (83.8 m)]		
4	Limestone, shaly, medium grey; weathers greenish	40 (12.2)	2775 (845.8)
3	Limestone, medium grey, mottled with rust-coloured calcite, vuggy	25 (7.6)	2735 (833.6)
2	Limestone, shaly, medium grey, fine grained, thin bedded, weathers light green, recessive	210 (64)	2710 (826)
	Contact conformable.		
	Thumb Mountain Formation [2500+ ft (762+ m); incomplete]		
1	Limestone, medium grey, fine grained to lithographic, thin to medium bedded, sometimes massive, weathers yellowish grey, rusty in basal part, rusty weathering in upper; very petroliferous throughout; *Receptaculites*, chain corals, *Streptelasma*	2500+ (762+)	2500+ (762+)
	Base of section at lower limit of exposure.		

SECTION 33. SOUTH OF LAKE AT HEAD OF STRATHCONA FIORD

Located 4 miles due southeast of the head of Strathcona Fiord, Ellesmere Island; Latitude 78°32'N, Longitude 82°05'W (*see* GSC Map 1307A). Thicknesses were estimated on aerial photograph A-16606-91, by scale in combination with a pocket altimeter.

	DEVONIAN		
	Okse Bay Formation [600+ ft (182.8+ m); preserved thickness]		
	Upper limit of exposure.		
5	Sandstone, quartzose, thin to medium bedded, recessive; predominantly red and green	600+ (182.8+)	4000 (1219.2)
	Contact conformable.		
	Blue Fiord Formation [1250 ft (381 m)]		
4	Limestone, thin to medium bedded, light to medium light grey, interbedded with minor dolomite	1250 (381)	3400 (1036.3)
	Contact possibly unconformable.		

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
	UPPER ORDOVICIAN AND SILURIAN		
	Allen Bay Formation (or Allen Bay-Read Bay Formations, undivided) [1250 ft (381 m)]		
3	Dolomite, sugary, vuggy cream to light grey-brown, thick bedded to massive, limestone in basal part	1250 (381)	2150 (655.3)
	Contact conformable.		
	ORDOVICIAN		
	CORNWALLIS GROUP		
	Irene Bay Formation [150 ft (45.7 m)]		
2	Limestone, dark grey, thin bedded, shaly, yellow greenish weathering parting surfaces; recessive; large cephalopods	150 (45.7)	900 (274.3)
	Contact conformable.		
	Thumb Mountain Formation [750+ ft (228.6+ m); preserved thickness]		
1	Limestone, thick bedded to massive, light to medium light grey, fine grained, weathers medium light grey; *Receptaculites* observed	750+ (228.6+)	750+ (228.6+)
	Lower limit of exposure at a fault.		

SECTION 34. SOUTHEAST OF LAKE AT HEAD OF STRATHCONA FIORD

Located 4 miles southeast of a small lake southeast of the head of Strathcona Fiord, Ellesmere Island; Latitude 78°30'N, Longitude 81°45'W (*see* GSC Map 1307A). Thicknesses were estimated from aerial photograph A-16690-26, by scale in combination with a pocket altimeter.

	CRETACEOUS AND/OR TERTIARY		
	Eureka Sound Formation		
	Upper limit of exposure.		
9	Sandstone, siltstone, shale, coaly, generally dark grey to black	1000+ (304.8)	6350 (1935.5)
	Contact unconformable.		
	DEVONIAN		
	Vendom Fiord Formation [800+ ft (243.8+ m)]		
8	Sandstone, medium to coarse grained, arkosic, friable	500+ (152.4)	5350 (1630.7)

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
7	Sandstone, quartzose, fine grained, thin bedded, red and green interbedded, much red and green shale and siltstone	300 (91.4)	4850 (1478.3)
	Contact unconformable.		
	UPPER ORDOVICIAN AND SILURIAN		
	Allen Bay Formation (or Allen Bay-Read Bay Formations, undivided) [1100 ft (335.3 m)]		
6	Dolomite, sugary, medium to thick bedded, grey-brown, weathering yellow-grey, minor sandstone, resistant	900 (274.3)	4550 (1386.8)
5	Limestone, thick bedded, fine grained, dark grey, resistant, weathers medium olive-grey, becomes dolomitic upward	200 (60.9)	3650 (1112.5)
	Contact conformable.		
	ORDOVICIAN		
	CORNWALLIS GROUP		
	Irene Bay Formation [150 ft (45.7 m)]		
4	Limestone, medium grey, fine grained, thin bedded, shaly, recessive, weathers yellow-grey; slightly greenish	150 (45.7)	3450 (1051.5)
	Contact conformable.		
	Thumb Mountain Formation [1100 ft (335.3 m)]		
3	Limestone, thick bedded to massive, fine grained, dark grey, resistant, weathers medium grey, slightly rusty	1100 (335.3)	3300 (1005.8)
	Contact conformable.		
	Bay Fiord Formation [1700 ft (518.2 m)]		
2	Limestone, very shaly, dark grey, thin bedded; much dark green shale, in places calcareous; minor chert pebble conglomerate and breccia, minor reddish weathering shaly limestone, in places slightly gypsiferous in lower half; crossbedding observed; recessive	1700 (518.2)	2200 (670.6)
	Contact conformable.		

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
	Eleanor River Formation [500+ ft (152.4+ m); incomplete]		
1	Limestone, dark grey, thick bedded, resistant	500+ (152.4+)	500 (152.4)
	Lower limit of exposure.		

SECTION 35. WEST SHORE OF TROLD FIORD

Located on the west shore of Trold Fiord, Ellesmere Island; Latitude 78°19'N, Longitude 85°05'W. It is overturned and dips at about 50° to the west. Thicknesses were estimated on aerial photograph A-16786, by scale in combination with a pocket altimeter.

	LOWER DEVONIAN		
	Imina Formation [3000+ ft (914.4+ m); incomplete]		
	Limit of exposure.		
8	Sandstone, fine grained, medium grey, weathers olive-grey to grey-brown, medium bedded, calcareous, sericitic in places, abundant lode casts and small-scale crossbedding; at the bottom interbeds of limy shale	3000+ (914.4+)	6600 (2011.7)
	Contact conformable.		
	UPPER ORDOVICIAN TO POSSIBLY LOWER DEVONIAN		
	Cape Phillips Formation [3100 ft (944.9 m)]		
7	Siltstone, slightly calcareous; thin bedded, dark grey to black, weathering dark grey, minor rusty weathering, minor calcareous interbeds, white bloom on weathering	475 (144.8)	3600 (1097.3)
6	Siltstone, slightly calcareous, thin bedded, dark grey to black, weathering dark grey; graptolites at bottom	1000 (304.8)	3125 (952.5)
5	Siltstone and shale, calcareous, dark grey to black, weathering buff to yellow-grey, slightly rusty, graptolites at bottom	300 (91.4)	2125 (647.7)
4	Siltstone and silty shale, calcareous, dark grey to black; weathers medium to dark grey, in places weathers chocolate brown, in places rusty; pencil slate with pyrite nodules	400 (121.9)	1825 (556.2)
3	Siltstone and silty shale, calcareous, dark grey, interbeds of thin bedded silty limestone	600 (182.9)	1425 (434.3)
2	Limestone, thin bedded, very shaly and silty, dark grey, weathers yellow-grey; much shale and siltstone interbedded near base	325 (99)	825 (251.4)
	Contact conformable.		

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
	ORDOVICIAN		
	CORNWALLIS GROUP (undivided) [500+ ft (152.4+ m); preserved thickness]		
1	Limestone, dark grey, weathers grey-brown, medium to thick bedded, minor black shale interbeds in top part; gypsiferous nodules weather out to give vugs	500+ (152.4+)	500+ (152.4+)
	Lower limit of exposure.		

SECTION 36. EAST OF TROLD FIORD

A west-dipping section west of the head of a small hook-shaped bay on the east side of Trold Fiord, Ellesmere Island; Latitude 78°25'N, Longitude 84°40'W. It is the upward continuation of Section 36 in GSC Paper 67-27, Part II. Thicknesses were estimated from aerial photograph A-16778-81, by scale in combination with a pocket altimeter.

	UPPER ORDOVICIAN AND SILURIAN		
	Cape Phillips Formation [1210 ft (368.8 m); preserved thickness]		
	Upper limit of exposure.		
16	Siltstone, shaly, dark grey to black, slightly brownish, thin to medium bedded; weathers medium yellowish grey; minor thin, rusty-weathering, sandy layers	600+ (182.9+)	13 470+ (4105.6+)
15	Siltstone, quartzitic, medium light grey, pyrite nodules, weathers rusty, overall weathers light rusty brown	70 (21.3)	12 870 (3922.7)
14	Shale, very silty quartz; calcareous at base; thin bedded; dark grey to black; weathers medium grey	420 (128)	12 800 (3901.4)
13	Shale, very limy black, fine grained; interbedded with shaly limestone, slightly calcareous; weathers greyish brown, thin bedded, shalier toward top	120 (36.5)	12 380 (3773.4)
	Contact conformable.		
	ORDOVICIAN		
	CORNWALLIS GROUP		
	Irene Bay Formation		
12	Limestone, shaly, very fine grained, dark grey; medium to thick bedded; weathers rust-brown, often streaked rusty; layers of black silty shale, in places greenish shaly layers	1050 (320)	12 260 (3736.8)

SECTION 38. NORTHEASTERN SVENDSEN PENINSULA

Located on northeastern Svendsen Peninsula, Ellesmere Island; Latitude 78°23'N, Longitude 82°50'W (*see* GSC Map 1307A). Thicknesses were estimated on aerial photograph A-16676-110, by scale in combination with a pocket altimeter.

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
	DEVONIAN		
	Okse Bay Formation [3000+ ft (914.4+ m); preserved thickness]		
	Upper limit of preservation.		
8	Sandstone and siltstone, green and red interbedded, weathering green and red, respectively	3000+ (914.4+)	8130+ (2478+)
	Contact conformable.		
	Blue Fiord Formation [4530 ft (1380.7 m)]		
7	Dolomite, fine grained, same as below, sharp contact with thick sandstone above	500 (152.4)	5130 (1563.6)
6	Sandstone, green, weathering green, minor deep red, recessive	300 (91.4)	4630 (1411.2)
5	Dolomite, fine grained, limy, calcite crystals floating, appears replacing limestone, thick bedded to massive, bluff forming	1475 (44.9)	4330 (1319.8)
4	Sandstone, very fine grained, quartzose, resistant, interbedded with thin-bedded dolomite, and limestone, thin bedded	925 (281.9)	2855 (870.3)
3	Siltstone, fine-grained sandstone, greenish grey, slightly calcareous, weathers greenish yellow-grey, recessive	330 (100.5)	1930 (588.3)
2	Limestone, thin bedded, silty, light brown, weathering colour buff, at base brachiopod fragments replaced by dolomite; abundant siltstone and fine-grained quartz sandstone interbedded, calcareous, micaceous; weathering buff and greenish yellow-grey; siltstone in lower part	1000 (304.8)	1600 (487.7)
	Contact conformable.		
	Eids Formation [600 ft (182.9 m); incomplete]		
1	Siltstone, calcareous, sericitic, thin bedded, recessive, grey-brown, weathers greenish yellow-grey, grades up to limestone	600 (182.9)	600 (182.9)
	Lower limit of exposure.		

SECTION 39. HEAD OF STARFISH BAY

An east-dipping section 5 miles northeast of the head of Starfish Bay, Ellesmere Island; Latitude 78°14'N, Longitude 83°40'W. Thicknesses were estimated from aerial photograph A-16676-159, by scale in combination with a pocket altimeter. This is the upward continuation of Section 39 in GSC Paper 67-27, Part II.

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
	DEVONIAN		
	Eids Formation [2250+ ft (685.8+ m); preserved thickness]		
	Upper limit of exposure.		
8	Siltstone, fine-grained sandstone, calcareous, chocolate brown, weathering yellow-brown; very recessive	1500+ (457.2+)	7400+ (2255.5+)
7	Siltstone, fine-grained sandstone, silty limestone, markedly calcareous, light to medium brown, weathers light yellow-brown, brown sandy limestone at base is fossiliferous, recessive	750 (228.6)	5900 (1798.3)
	Contact conformable.		
	SILURIAN AND POSSIBLY LOWER DEVONIAN		
	Cape Phillips Formation [1500 ft (457.2 m)]		
6	Siltstone and silty shale, non-calcareous, thin bedded, dark chocolate brown, weathers dark grey, graptolitic, coarser interbeds make up 10% of rock, calcareous, medium chocolate brown, weathering yellow-brown	500 (152.4)	5150 (1874.5)
5	Siltstone and shale, dark grey, weathers medium grey, mainly calcareous, thin bedded, very petroliferous odour in lower few feet where there are dolomite and cherty interbeds	1000 (304.8)	4650 (1417.3)
	Contact conformable.		
	UPPER ORDOVICIAN AND SILURIAN		
	Allen Bay Formation [800 ft (243.8 m)]		
4	Dolomite and limestone, dark grey to chocolate brown, very shaly throughout, petroliferous odour, weathers medium grey; dolomite increases in upper part	800 (243.8)	3650 (1112.5)
	Contact conformable.		

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
	ORDOVICIAN		
	CORNWALLIS GROUP		
	Irene Bay Formation		
3	Limestone, shaly, thin bedded, medium grey; weathers yellow-grey; slightly greenish; abundant thin, greenish weathering shaly layers; fossils in float include *Streptelasma* cf. *S. rusticum* Billings, *Trochonema* sp., *Maclurites* sp., and *Oncoceras* sp.	400 (121.9)	2850 (868.7)

SECTION 40. EAST-CENTRAL SVENDSEN PENINSULA

Located on east-central Svendsen Peninsula, Ellesmere Island; Latitude 78°11'N, Longitude 83°10'W. Thicknesses were estimated on aerial photograph A-16676-115, by scale in combination with a pocket altimeter.

	DEVONIAN		
	Okse Bay Formation [500+ ft (152.4+ m); preserved thickness]		
	Upper limit of preservation.		
5	Sandstone, medium grained, varicoloured, greenish, red, orange, minor pebble conglomerate	500+ (152.4+)	7355 (2242)
	Contact conformable.		
	Blue Fiord Formation [3955 ft (1205.5 m)]		
4	Limestone, medium brown, fine to medium grained, thin to medium bedded, weathers yellow-grey; much very light grey lithographic to fine grained, commonly with crystalline calcite discretely separated, weathers very light grey, quite sandy in places, calcareous sandstone interbeds increase to top of unit where there is a sharp gradation to the overlying rock of sandstone unit	2580 (786.4)	6855 (2089)
3	Limestone, light brown, weathers light yellow-grey, thin to medium bedded, sandstone makes up about one third of total, fine grained, granular, laminated, in places slightly calcareous, light grey, faintly greenish, weathers yellow-grey	325 (99)	4275 (1303)
2	Limestone, shaly and silty, thin to medium bedded, medium dark brown, weathering medium light brown; calcareous, micaceous sandstone and siltstone common, recessive, slightly greenish, in places crinoidal; limy bands are resistant and often fossiliferous	1050 (320)	3950 (1204)
	Contact conformable.		

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
	Eids Formation [2900 ft (883.9 m); incomplete]		
1	Siltstone, calcareous, chocolate brown, thin bedded to fissile, soft, recessive, weathering light yellow-brown; minor interbeds of hard non-calcareous siltstone, chocolate brown, weathers rusty, more calcareous in upper part, soft rock fossiliferous	2900 (883.9)	2900 (883.9)
	Base of section at lower limit of exposure.		

SECTION 41. VENDOM FIORD, HEAD

Located 3 miles north of the head of Vendom Fiord; Latitude 78°07'N, Longitude 82°12'W (*see* GSC Map 1307A). Thicknesses were estimated from aerial photograph A-16606-100, by scale in combination with a pocket altimeter.

	CRETACEOUS AND/OR TERTIARY		
	Eureka Sound Formation		
12	Sandstone		
	Contact unconformable.		
	DEVONIAN		
	Okse Bay Formation [750± ft (228± m)]		
11	Sandstone, thin bedded, green in lower part becoming red upward, weathering green and red respectively	750± (228±)	9110 (2776.7)
	Contact conformable.		
	Blue Fiord Formation [800 ft (243.8 m)]		
10	Dolomite, thick bedded, medium light grey, weathers light grey, minor chocolate brown, upper part becomes limestone and has red quartz sandstone interbeds	720 (219.4)	8360 (2548.1)
9	Limestone, medium light grey, fine grained, abundant white calcite crystals, thick bedded, weathers medium light grey	80 (24.4)	7640 (2328.7)
	Contact conformable.		
	Vendom Fiord Formation [1300 ft (396.2 m)]		
8	Sandstone, quartzose, varicoloured, in places calcareous, particularly in upper part, gypsiferous in places, grey-green, red, grey-brown, weathering same, reddish conglomerate for 30 ft at base, grades up to coarse sandstone for 50 ft, then grey-green sandstone and siltstone; top reddish sandy limestone	1300 (396.2)	7560 (2304.2)

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
	Contact unconformable.		
	SILURIAN AND POSSIBLY DEVONIAN		
	Read Bay Formation [2160 ft (658.3 m)]		
7	Limestone, shaly, medium grey, weathers yellow-grey to medium grey, medium bedded, minor dolomite	1400 (426.7)	6260 (1908)
6	Dolomite, quartz sandy dolomite, thin to medium bedded, grey-brown, weathering yellow-grey; dolomite is resistant, sandy dolomite is recessive; minor limestone at base yeilds ostracodes	500 (152.4)	4860 (1481.3)
5	Limestone, fine grained to lithographic, medium light grey, weathers medium light grey, massive to thick bedded, very resistant ledge	260 (79.2)	4360 (1328.9)
	Contact conformable.		
	UPPER ORDOVICIAN AND SILURIAN		
	Allen Bay Formation [2200 ft (670.5 m)]		
4	Dolomite, saccharoidal, medium light grey, weathers light grey, chocolate brown, weathering grey-brown, poorly exposed, particularly in the lower part	2200 (670.5)	4100 (1249.7)
	Contact conformable.		
	ORDOVICIAN		
	CORNWALLIS GROUP		
	Irene Bay Formation [200 ft (60.9 m)]		
3	Limestone, thin bedded with abundant greenish weathering shaly interlayers; recessive, fossils common	200 (60.9)	1900 (579.2)
	Contact conformable.		
	Thumb Mountain Formation [1100 ft (335.3 m)]		
2	Limestone, fine grained to lithographic, thick bedded to massive, medium grey, weathering medium light grey, resistant ledge former	1100 (335.3)	1700 (518.2)
	Contact conformable.		

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
	Bay Fiord Formation [600+ ft (182.9 m); incomplete]		
1	Limestone, fine grained, thin to medium bedded, very silty and in places sandy, minor quartz siltstone, medium grey, weathering yellow	600+ (182.9+)	600 (182.9)
	Lower limit of exposure.		

SECTION 44. MEADOW RIVER, EAST

Located 8 miles east of Vendom Fiord, Ellesmere Island in the valley of Meadow River; Latitude 77°53'N, Longitude 82°20'W. Thicknesses were estimated from aerial photograph A-16690-13, by scale in combination with a pocket altimeter.

	DEVONIAN		
	Vendom Fiord Formation [600+ ft (182.9+ m); preserved thickness]		
	Upper limit of preservation.		
6	Siltstone, fine-grained sandstone, quartzose, somewhat calcareous, greenish, weathering grey-green, much deep red also, generally lower 300 ft green, red above	600+ (182.9+)	3720 (1134)
	Contact unconformable.		
	SILURIAN AND POSSIBLY DEVONIAN		
	Read Bay Formation [1500 ft (457.2 m)]		
5	Dolomite, light grey, weathering very light grey, fine grained, thin to medium bedded, inter-bedded with much fine-grained sandstone constituting about one third of unit	1100 (335.3)	3120 (951)
4	Sandstone, quartzose, shaly, non-calcareous, deep red, very shaly, minor mica, ripple-marked, small-scale crossbedding, minor pebble conglomerate, sharp contacts	400 (121.9)	2020 (615.7)
	Contact conformable.		
	UPPER ORDOVICIAN AND SILURIAN		
	Allen Bay Formation [1000 ft (304.8 m)]		
3	Dolomite, medium to chocolate brown, weathering grey-brown and chocolate, saccharoidal, often vuggy, minor limestone at the base and an interval from 600 to 700 ft above base	1000 (304.8)	1620 (439.7)
	Contact conformable.		

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
	ORDOVICIAN		
	CORNWALLIS GROUP		
	Irene Bay Formation [120 ft (36.6 m)]		
2	Limestone, medium dark grey, thin to medium bedded, weathers yellow-grey, slightly greenish, shaly limestone containing "Arctic Ordovician fauna"	120 (36.6)	620 (189)
	Contact conformable.		
	Thumb Mountain Formation [500+ ft (152.4+ m); incomplete]		
1	Limestone, medium bedded, shaly in places, medium grey, weathering light yellow-grey, ledge former	500+ (152.4+)	500 (152.4)
	Lower limit of examination in ravine.		

SECTION 45. HEAD OF SVARTE FIORD

An east-dipping section 4 miles north-northeast of the head of Svarte Fiord, Ellesmere Island; Latitude 77°17'N, Longitude 84°20'W. Thicknesses were estimated from aerial photograph A-16676-8, by scale in combination with a pocket altimeter. This is the upward continuation of Section 45 in GSC Paper 67-27, Part II.

	DEVONIAN		
	Eids Formation [1182 ft (360.3 m); preserved thickness]		
	Upper limit of exposure.		
13	Siltstone, quartzose, coarse grained, sandy, dark grey to chocolate; weathers medium grey, slightly yellowish; thin to medium bedded; slightly calcareous occasionally	1182 (360.3)	7832 (2387.2)
	Contact conformable.		
	SILURIAN AND POSSIBLY LOWER DEVONIAN		
	Cape Phillips Formation [1800 ft (548.6 m)]		
12	Siltstone, quartzose, very shaly, slightly calcareous in places. Thin to medium bedded; dark grey; weathers predominantly medium grey; some yellowish weathering; in upper part interbeds of rusty-weathering grey siltstone; interbeds of black shale	1575 (474.7)	6650 (2026.9)
11	Dolomite, shaly, dark grey-brown; thin to medium bedded, weathers light grey-brown	125 (38.1)	5075 (1546.8)

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
10	Shale, silty, dolomitic, black; very petroliferous odour, interbedded with black chert	100 (30.5)	4950 (1508.7)
	Contact conformable.		
	UPPER ORDOVICIAN AND SILURIAN		
	Allen Bay Formation [700 ft (213.3 m)]		
9	Dolomite, medium grained, light grey to pale brown; weathers pale brown to buff, in places mottled, light grey and brown; medium bedded, resistant	310 (94.5)	4850 (1478.2)
8	Limestone, shaly, medium bedded, dark chocolate brown, weathering light chocolate brown	310 (94.5)	4540 (1377.6)
7	Limestone, very shaly, black, thin bedded; interbedded with black shale	80 (24.4)	4230 (1289.3)
	Contact conformable.		
	ORDOVICIAN		
	CORNWALLIS GROUP		
	Irene Bay Formation [250 ft (76.2 m)]		
6	Limestone, shaly, fine grained, dark grey; thin to medium bedded; interbedded with medium grey weathering limestone; shaly layers richly fossiliferous, containing large cephalopods and other fossils typical of the "Arctic Ordovician fauna"	250 (76.2)	4150 (1264.9)

SECTION 46. SOUTHEASTERN SVENDSEN PENINSULA

Located on southeastern Svendsen Peninsula, and begins 5 miles west of Vendom Fiord; Latitude 77°42'N, Longitude 83°30'W. Thicknesses were estimated on aerial photograph A-16685-38, by scale in combination with a pocket altimeter.

	DEVONIAN		
	Okse Bay Formation [6075 ft (1851.6 m); preserved thickness]		
	Upper limit of preservation.		
15	Sandstone, varied	2000+ (609.6+)	9560+ (2913.8+)
14	Sandstone, medium grained; quartz, clear, subrounded; cement cream, yellow or orange, weathers yellow-orange, cream or white; very minor chert pebble conglomerate	1500 (457.2)	7560 (2304.3)

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
13	Sandstone, red and green; fine to medium grained; thin bedded	50 (15.2)	6060 (1847)
12	Sandstone, salt and pepper, olive-grey, speckled rusty brown	50 (15.2)	6010 (1831.8)
11	Sandstone, deep red, fine to medium grained, thin bedded	350 (106.7)	5960 (1816.6)
10	Conglomerate, yellow-orange; well-rounded pebbles of chert are white, yellow, orange, green, quartz sand matrix; yellow-orange cement	25 (7.6)	5610 (1709.9)
9	Sandstone, arkosic, interbedded deep green and red, thin to medium bedded, laminated, predominantly green at base and red at top	2100 (640)	5585 (1702.3)
	Bird Fiord Formation [1415 ft (431.3 m)]		
8	Limestone, shaly and sandy; medium dark grey to medium light grey; fine grained; medium bedded; weathers buff-grey; in places crinoidal; hemispherical coral colonies; sandy toward top	400 (122)	3485 (1062.2)
7	Dolomite, fine to medium grained; sugary; medium to thick bedded; dark brown to grey-orange; weathers a distinct grey-orange	340 (103.6)	3085 (940.3)
6	Limestone, quartz sandy; dark grey-brown, weathers yellowish brown; thin bedded; much quartz sandstone, calcareous, fine grained, light grey to yellow-grey; weathers banded yellow-grey; 35 ft of coral and stromatoporoid ledge at base; upper 50 ft deep red-purple and dolomitic	675 (205.7)	2745 (836.7)
	Contact conformable.		
	Blue Fiord Formation [2070 ft (630.9 m); incomplete]		
5	Limestone, shaly; dark brown, medium to thick bedded, weathers pale yellowish brown; often beds rich in echinoderm columnals; thin band of shaly limestone near top; trilobites; recessive	1100 (335.2)	2070 (630.9)
4	Limestone, lithographic to fine grained; light grey, thin bedded; minor interbeds of sugary dolomite which weather buff-yellow; forms ledge	300 (91.4)	970 (295.6)
3	Limestone, shaly, dark brown; weathers light brown; thin to medium bedded; petroliferous odour; bitumen observed, hemispherical coral colonies along bedding at 40 ft height; richly fossiliferous below and rarely above	600 (182.9)	670 (204.2)

Unit	Lithology	Thickness feet (metres)	Height Above Base feet (metres)
2	Dolomite, buff-yellow, medium grained, sugary; weathers yellow; brown limestone interbeds; recessive	40 (12.2)	70 (21.3)
1	Limestone, shaly, grey-brown, medium bedded; petroliferous odour; weathers slightly rusty brownish grey	30 (9.1)	30 (9.1)
	Base of section at lower limit of exposure.		