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GEOLOGICAL SURVEY OF CANADA

DEPARTMENT OF ENERGY,
MINES AND RESOURCES

PAPER 67-27
Part II

STRATIGRAPHY OF CENTRAL AND EASTERN ELLESMERE ISLAND, ARCTIC CANADA

Part II ORDOVICIAN

(Report, 10 Figures, 2 Tables)

J. Wm. Kerr

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ABSTRACT

Proterozoic to Devonian rocks of the Franklinian miogeosyncline and adjacent Central Stable Region in central and eastern Ellesmere Island illustrate three successive sedimentary regimes. The succession has been separated into three divisions that are the subjects of separate reports by the writer. Ordovician rocks comprise the second division; they are described in this report and their general distribution is outlined.

Lower Ordovician rocks rest upon a regional disconformity. In the geosyncline the Copes Bay Formation is up to 4,800 feet thick and comprises thin-bedded limestone. Shelf equivalents include thinner successions of similar rocks, the Cass Fiord Formation, Cape Clay Formation, and an unnamed map-unit. The overlying Baumann Fiord Formation is a lens-shaped unit consisting mainly of gypsum-anhydrite up to 2,560 feet thick.

The Lower to early Middle Ordovician Eleanor River Formation is a bluff-forming limestone unit with a maximum thickness of 3,300 feet.

The Cornwallis Group of Middle and Late Ordovician age, includes three formations that, in ascending order, are as follows. The Bay Fiord Formation is divisible into two parts: the lower, consisting of about 1,000 feet of limestone, siltstone, and evaporites, and the upper composed of about 650 feet of shaly siltstone and shale. The Thumb Mountain Formation is a bluff-forming limestone unit, usually about 1,500 feet thick. The Irene Bay Formation, a recessive unit of argillaceous limestone, has a distinctive greenish weathering colour, and is usually about 200 feet thick. This formation is replete with large fossils of the so-called Arctic Ordovician fauna.

The second division of rocks in the area indicates shallow water deposition, and contains several widespread, alternating, carbonate and evaporite units. Carbonate units are gently trough-shaped and the intervening evaporite units are markedly so. Maxima in each unit coincide approximately, and trend along the miogeosyncline. Lesser maxima occur on the westward continuation of the Bache Peninsula arch, which was mildly positive through Ordovician time.

PLATE I (JWK 9-5-62)

View looking northeast at near-vertical Cambrian, Ordovician and Silurian rocks of Section 1, 15 miles east-southeast of the head of Ella Bay. Parrish Glacier Formation (Cpg); Copes Bay Formation (Oco); Eleanor River Formation (Oe); Bay Fiord Formation (Ocb); Thumb Mountain Formation (Oct); Irene Bay Formation (Oci); Cape Rawson Group (O-Dcr). Disconformity shown by wavy line.

STRATIGRAPHY OF CENTRAL AND EASTERN ELLESMERE ISLAND, ARCTIC CANADA. PART II: ORDOVICIAN

INTRODUCTION

Ordovician 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. The rocks described in this report occur in the Franklinian miogeosynclinal belt and the adjacent Central Stable Region. This report is the second of three by the writer, designed together to cover the complete Proterozoic through Upper Devonian history of the Franklinian miogeosyncline and adjacent Central Stable Region on Ellesmere Island.

The report is generalized due to the large size of the region (Fig. 2) and the limited time available. Rock exposure is generally good and lends itself to more detailed study.

PREVIOUS WORK

Early collections of Ordovician rocks and faunas were made along the east coast of Ellesmere Island by Fielden on the British Expedition under Sir George Nares (Fielden and De Rance, 1878), and were studied by Etheridge (1878). Per Scheii (1903, 1904) as geologist on the Second Norwegian Arctic Expedition in the Fram, collected from Ordovician rocks in the vicinity of Bache Peninsula and on the south coast of Ellesmere Island in the years 1898-1902. After the early death of Scheii in 1905, Olaf Holtedahl (1913, 1917) extended the studies and, in particular, discussed the Cambro-Ordovician beds of the Bache Peninsula region (Holtedahl, 1913). Bentham (1936) collected Ordovician rocks of Bache Peninsula and southern Ellesmere Island while attached to the Oxford University Ellesmereland Expedition in 1935. These collections were studied by Poulsen (1946). Ordovician formations were defined in North Greenland by Koch (1929, 1933) and Poulsen (1927), and the same names were used by Troelsen (1950) for equivalent formations in the Bache Peninsula region.

Most major geologic subdivisions of the region (Fig. 1) were defined in a compilation by Fortier, McNair and Thorsteinsson (1954). Salient tectonic features of the region have been included in broader compilations by Thorsteinsson and Tozer (1960), and by Douglas, Norris, Thorsteinsson and Tozer (1963).

In 1955, widely spaced areas of Ellesmere Island were studied during Operation Franklin (Fortier et al., 1963), an airborne project of the Geological Survey. The main stratigraphic framework for the Ordovician succession was established at that time by Thorsteinsson (1963a), and three widely spaced sections within the present report area were described by Thorsteinsson (1963b), and Norris (1963a, 1963b). The writer was engaged in field work in the region in 1961 and 1962 and subsequently, preliminary maps of selected areas were published (Thorsteinsson and Kerr, 1962). A report by Kerr (1967) clarified miscorrelations of Ordovician units in the Queen Elizabeth Islands, and set up type and reference sections of new

units in the present study area. The Bache Peninsula and Flager Bay sections are those of Christie (in press), while the remainder of the area was studied by the writer.

ACKNOWLEDGMENTS

The stratigraphic and structural provinces recognized in this report (Fig. 1) are mainly those of Thorsteinsson and Tozer (1960). The stratigraphic framework of Ordovician rocks used herein, (Kerr, 1967) is based to a large extent upon work of Thorsteinsson (1959, 1963a). Ordovician faunas were identified by M.J. Copeland, B.S. Norford, and G.W. Sinclair.

Able assistance in the field was given by N. Haimila, D. Morris, T. Frisch, and J. Siddon. J. Jamieson, V. Andreasson and J. Kershaw flew the fixed-wing aircraft and M. Olsen piloted the helicopter.

STRATIGRAPHY

In the study area of central and eastern Ellesmere Island (Fig. 2) there is a long, essentially continuous, succession of rocks ranging in age from Late Proterozoic to Late Devonian, that includes no severe orogenic breaks or extreme angular unconformities. This succession is bounded below by the nonconformity with the Precambrian crystalline basement complex, and above by the tremendous unconformity of the Late Devonian to Middle Pennsylvanian Ellesmerean orogeny (Thorsteinsson and Tozer, in press). This Proterozoic and Palaeozoic succession is amenable to breakdown into three natural divisions that are based upon three distinctive, long-persistent sedimentary patterns. These three divisions are treated in a series of three separate papers by the writer. The papers will appear in order; the treatment of the rocks being from oldest to youngest. This is the second report.

Late Proterozoic and Cambrian rocks comprise the first division of rocks in the study area and are the subject of an earlier report by the writer (Kerr, 1967a). The first division 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 clastics of cratonic source that encroached onto the craton; they are succeeded by predominantly carbonate rocks of late Lower and Middle Cambrian age. Upper Cambrian rocks are apparently unrepresented in the study area.

The second division in the study area (Table 1), embraces Lower to Upper Ordovician rocks and is the subject of this report. This division exhibits a distinctive depositional pattern that is persistent yet markedly different from the patterns below and above. The division is bounded at the base by a regional disconformity. The rocks, consisting of alternating carbonates and evaporites, are typical of shallow water deposition. Facies variations are extremely gradual. The carbonate units vary little in thickness though each is slightly trough-shaped. The intervening evaporite units vary greatly in thickness and are also trough-shaped.

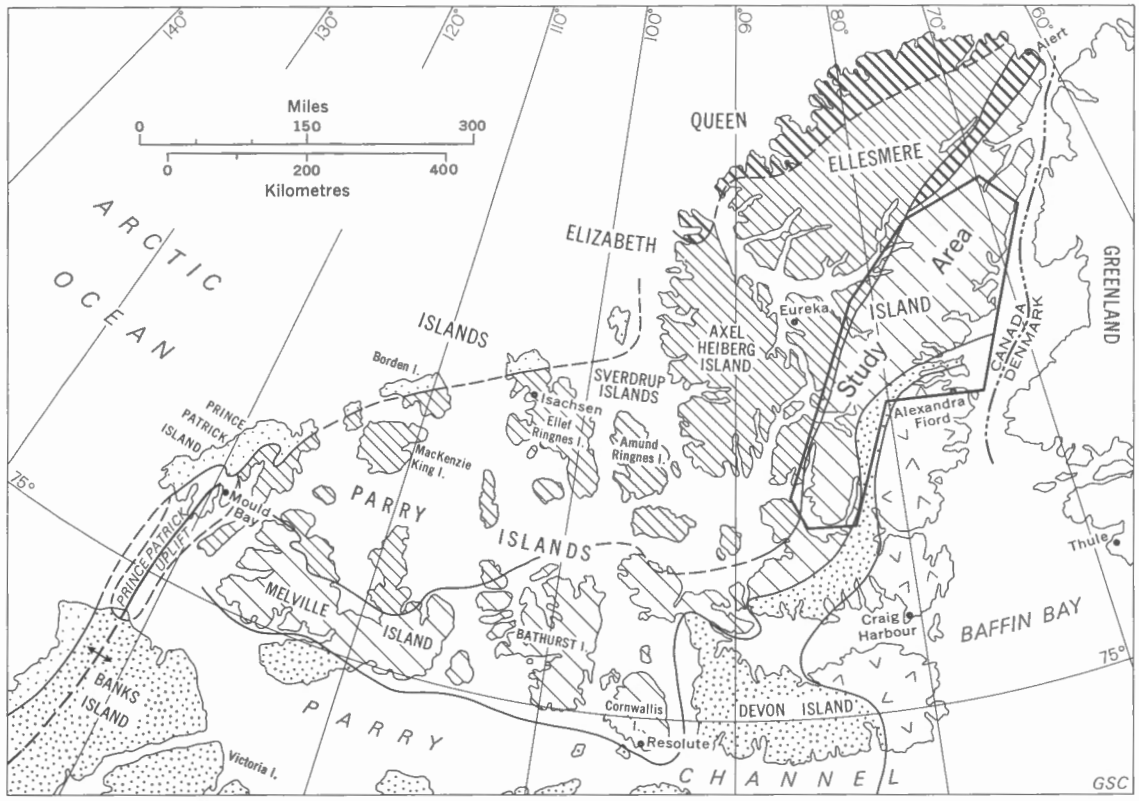

Figure 1. Stratigraphic - structural provinces of the Canadian Arctic Archipelago and index map.

The sediments of the various rock units were deposited in troughs whose axes are approximately co-incident and trend along the miogeosynclinal belt (Figures 3 to 10). It is clear that throughout the time span of the second division that includes Lower to Upper Ordovician rocks, the miogeosyncline continuously acted as 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 (Kerr, in preparation) comprises strata deposited from approximately Ashgillian to Late Devonian time and includes rocks younger than the Cornwallis Group. 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 were both extreme and rapid. A source of clastic material was active in the direction of the eugeosyncline throughout the entire division and this material (mainly the Cape Rawson Group) overlapped progressively farther to the southeast across the miogeosyncline. In the miogeosyncline there were thick carbonate banks on the craton side (Allen Bay, Read Bay, and Blue Fiord Formations) grading northwestward, in part, to thinner strata (Cape Phillips and Eids Formations) occupying euxinic basins. The gentle topographic high within the geosyncline that had been persistent through the second division, had disappeared prior to deposition of sediments of the third division for thicknesses appear to increase westward toward the eugeosyncline.

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, but is greatly 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 will be made herein. Accordingly the Stratigraphic-Structural provinces (Figure 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, Palaeozoic sediments lie upon the Precambrian crystalline complex, is replaced by the term Central Stable Region of King (1959, p. 57). Divisions of the miogeosyncline (Fig. 2) are suggested here mainly for convenience of reference and, only broadly speaking, are they meaningful geological divisions of that depositional belt which persisted through Palaeozoic time. The index map (Fig. 2) shows all sections of Proterozoic through Upper Devonian rocks that were examined in the study area.

A new structural feature delineated in the course of this study is the Bache Peninsula arch. This is a broad, mildly positive, basement arch that extends across the Central Stable Region from Inglefield Land to Bache Peninsula, and continues westward in the miogeosyncline as far as eastern Fosheim Peninsula. It is a present topographic arch in the crystalline basement. It probably was a belt of erosion prior to Cambrian time in the Central Stable Region at Inglefield Land and Bache Peninsula. In Cambrian and later times it has been a belt of less net subsidence than flanking

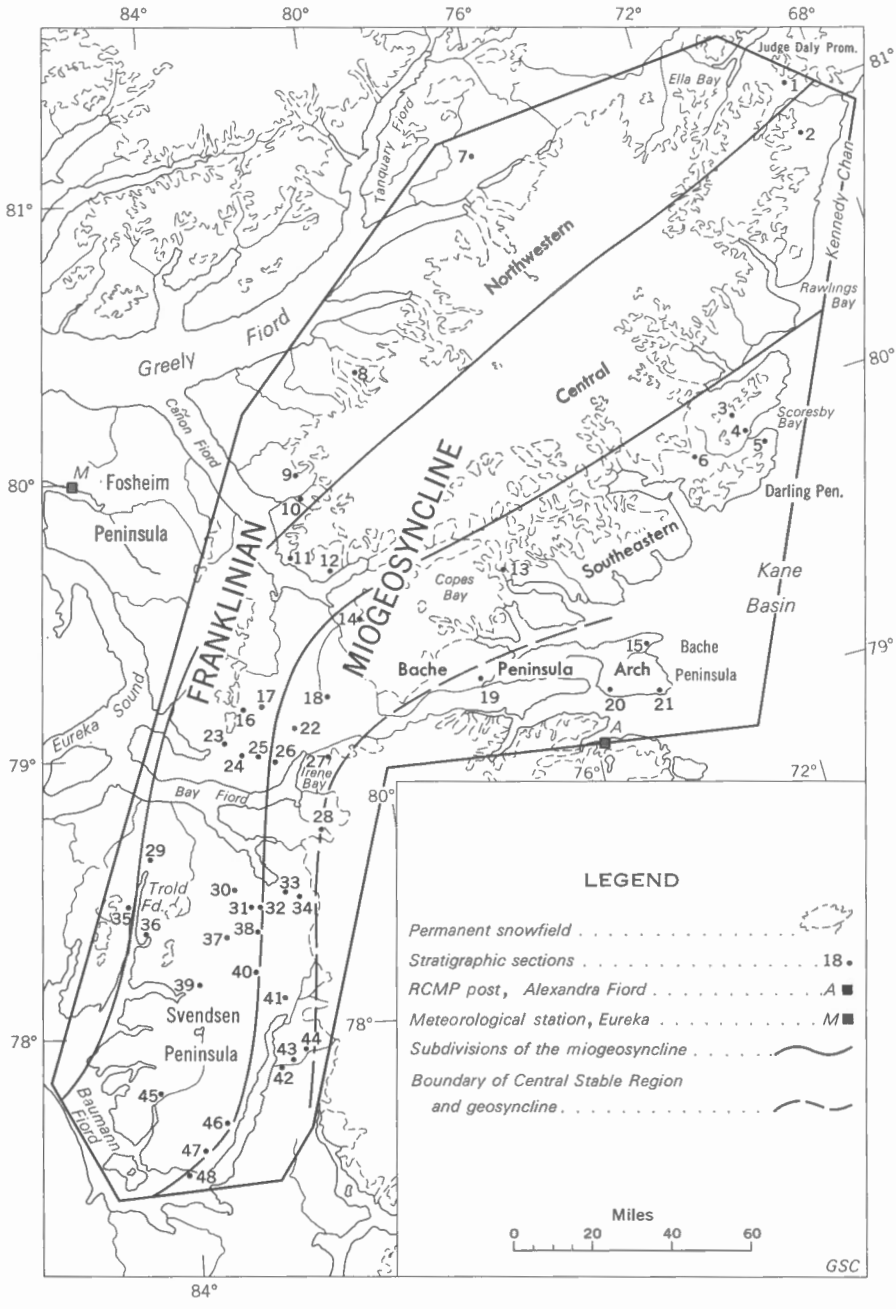

Figure 2. The study area of central and eastern Ellesmere Island.

regions. The westward continuation of the Bache Peninsula arch into the Franklinian miogeosyncline was also relatively positive through most of Early Palaeozoic time. It has been delineated there by thickness distribution in the Ordovician rocks (this report) and facies distributions in the Ordovician to Devonian rocks (Kerr, in preparation). A geological map of the area under discussion is in preparation.

The Ordovician succession in the study area (Table 1) is very similar to the succession that occurs throughout the miogeosynclinal belt from Melville Island to Greenland. This succession contains two, widespread, major, gypsum-anhydrite units that are intercalated between limestone units. Because of the paucity of fossils at this level in the column and the failure in the past to recognize that there was more than one evaporite formation, Ordovician units were commonly misidentified and erroneously correlated from island to island. A revision of terminology and correlation of these rocks was recently made (Kerr, 1967).

Lower Ordovician rocks in the study area rest with probable regional disconformity upon Middle Cambrian rocks (Fig. 3). The Copes Bay Formation, 1,800 to 4,800 feet of thinly bedded limestone, occurs in the geosyncline and shelf-type equivalents of this formation at Bache Peninsula include the combined Cass Fiord and Cape Clay Formations and an unnamed map unit of Christie (in press), all rather similar in lithology to the Copes Bay. The Lower Ordovician Baumann Fiord Formation (Fig. 5) is preponderantly gypsum-anhydrite. Its type section (Kerr, 1967) is east of Trold Fiord in the present report area (Section 36). The Baumann Fiord Formation occurs widely throughout most of the report area where it outcrops around the spoon-shaped end of a long trough that extends at least as far southwest as Cornwallis Island. There, it is present in the core of the Centre Dome (Thorsteinsson and Kerr, in press). In the report area the formation is absent only in the extreme northeast, probably through a combination of non-deposition and gradation into the enclosing formations.

The Eleanor River Formation is of late Early and early Middle Ordovician (Whiterock-Marmor) age. Its lithologic and stratigraphic relations in most of the study area are similar to the type section on Cornwallis Island (Thorsteinsson, 1958), where it is intercalated conformably between evaporites of the underlying Baumann Fiord Formation and overlying Cornwallis Group. Several sections in the study area that had once been incorrectly assigned to the Cornwallis Formation were reassigned to the Eleanor River Formation by Kerr (1967).

The type section of the Cornwallis Formation was established on northern Cornwallis Island by Thorsteinsson (1958) who recognized three members. The Cornwallis Formation was elevated to group rank by Kerr (1967) and the three members earlier proposed by Thorsteinsson (op. cit.) were raised to formations with their boundaries unchanged. The type section of the Cornwallis Formation on Cornwallis Island was retained as the type section of the new group. Type sections of the three new formations were chosen in the present report area (Section 18) northeast of the head of Irene Bay, and this is regarded as a reference section of the group as a whole. The Cornwallis Group is characterized by widely persistent, shallow water deposition of evaporites and carbonates (mainly limestone) with some

fine-grained clastic rocks. Lateral lithologic changes within the group are gradual and, in the report area, the three-fold subdivision is evident in all but extreme northwesterly localities near the eugeosyncline (Fig. 5).

At the reference section (Section 18) concordant contacts occur between all formations as well as at the top and bottom of the group. The base of the group is probably conformable and is drawn at the abrupt appearance of gypsum-anhydrite. In marginal parts of the miogeosyncline the evaporites are absent and the base of the group is there drawn at a probable disconformity that was, in part, contemporaneous with the miogeosynclinal evaporitic deposition. This disconformity is probably the same as the stratigraphic break beneath late Middle Ordovician rocks on northwestern Baffin Island (Trettin, 1965a, p. 171), and Middle Ordovician rocks of the Challenger Group of northernmost Ellesmere Island (Christie, 1964, p. 22). The top of the group was chosen at the top of a thin, greenish, shaly limestone that was called the Irene Bay Formation and is extremely widespread and uniform in the Queen Elizabeth Islands. In contrast to the Cornwallis Group in which lateral lithologic variations are rather moderate and gradual, the succeeding rocks show extreme and abrupt lateral variability. The overlying rocks comprise the sandy and silty Cape Rawson Group in the northwest; the black, calcareous shales of the Cape Phillips Formation, and carbonate banks of the Allen Bay and Read Bay Formations in central and eastern parts of the miogeosyncline; and the carbonates of the Central Stable Region.

The three formations of the Cornwallis Group occurring in the report area are described briefly in ascending order as follows. The Bay Fiord Formation is of Middle Ordovician age and commonly is divisible into two parts. Where a division is made in the type section (Section 18), the lower unit is composed of limestone, siltstone and evaporite about 1,000 feet thick, and the upper unit comprises shaly siltstone and shale, commonly dark green, about 650 feet thick. The two-fold division is possible only in axial parts of the miogeosyncline. In marginal parts of the miogeosyncline the thicknesses are less, evaporite is absent, and the formation is composed predominantly of thinly bedded limestone and dolomite. The Thumb Mountain Formation is extensive, bluff-forming and composed mainly of limestone of Middle Ordovician age that lies conformably between recessive formations. The type section northeast of Irene Bay (Section 18) is about 1,500 feet in thickness and consists of argillaceous, slightly dolomitic, dark grey-brown limestone, often mottled to a slightly rusty-orange colour. The Irene Bay Formation in the report area is almost everywhere similar in lithology to its type section (Section 18). There it is 270 feet thick, and comprises argillaceous, dark grey, fine-grained, thin- to medium-bedded limestone, containing abundant shaly layers that weather yellow-green and stain the entire formation slightly greenish. It is nearly always recessive. At most places the Irene Bay Formation contains large fossils that are part of the so-called Arctic Ordovician fauna; they are particularly abundant in the intercalated shaly layers and generally weather free of the rock. The age of this fauna is still controversial but, after Norford, Bolton, Copeland, Cumming and Sinclair (in press) it is considered to be about Maysvillian (late Caradocian, see Table 1), and the upper boundary of the Irene Bay Formation is arbitrarily regarded as the boundary of the Caradocian and Ashgillian of the European Standard Section (after Kerr, 1967).

LOWER ORDOVICIAN

Copes Bay Formation

The Copes Bay Formation is a thick succession of shallow water deposits, comprising mainly limestone, argillaceous limestone, flat-pebble conglomerate, and minor amounts of anhydrite and gypsum, that is confined to the Franklinian miogeosyncline. The formation was named for Copes Bay on eastern Ellesmere Island (Thorsteinsson, 1963b, p. 391), and the type section occurs at the head of that bay on the west side of the terminus of the Parrish Glacier (Section 13). Maximum thickness of the formation occurs at the type section and the formation thins from there both toward the Bache Peninsula arch and, also, farther across the geosyncline. It is tentatively regarded as of early Early Ordovician (?) age because it rests with probable regional disconformity upon the Middle Cambrian Parrish Glacier Formation and is overlain conformably and, perhaps, locally disconformably, by the Lower Ordovician Baumann Fiord Formation (Kerr, 1967). Locally it is overlain by the Eleanor River Formation. The presumed disconformity at the base of this formation coincides with an emergence which was widespread in the Arctic Archipelago and Greenland. In deeper parts of the geosyncline on Ellesmere Island a gradational lower contact suggests that the emergence was not effective there.

Distribution and Thickness

The Copes Bay Formation is restricted to the Franklinian geosyncline. Similar and correlative rocks of lesser thickness occurring on the Bache Peninsula arch in the Central Stable Region are referred by the writer to the Cass Fiord and Cape Clay Formations of Troelsen (1950) and the unnamed map-unit 6 of Christie (in press). The Copes Bay Formation is exposed widely in the cores of northerly-trending anticlines in the Svendsen anticlinorium east of Trold Fiord, and to a lesser degree east of Vesle Fiord. It is exposed in east-central Ellesmere Island north of Bache Peninsula by the Parrish Glacier, Scoresby Bay and Rawlings Bay thrust faults. North of Rawlings Bay the formation is exposed extensively on the flanks of the Joliffe Glacier, Ritter Bay and Judge Daly anticlines.

The formation thickens into the geosyncline (Figs. 3 and 4) and reaches a maximum at Copes Bay (Section 13). Slight thinning occurs from there farther across the geosyncline. Measured thicknesses are given below and where minima are given, it is because the base of the formation was not exposed.

Locality	Thickness (feet)
Section 1	2,825
Section 3	3,560
Section 4	2,000+
Section 13	4,800
Section 18	1,800
Section 17	800+
Section 36	2,350

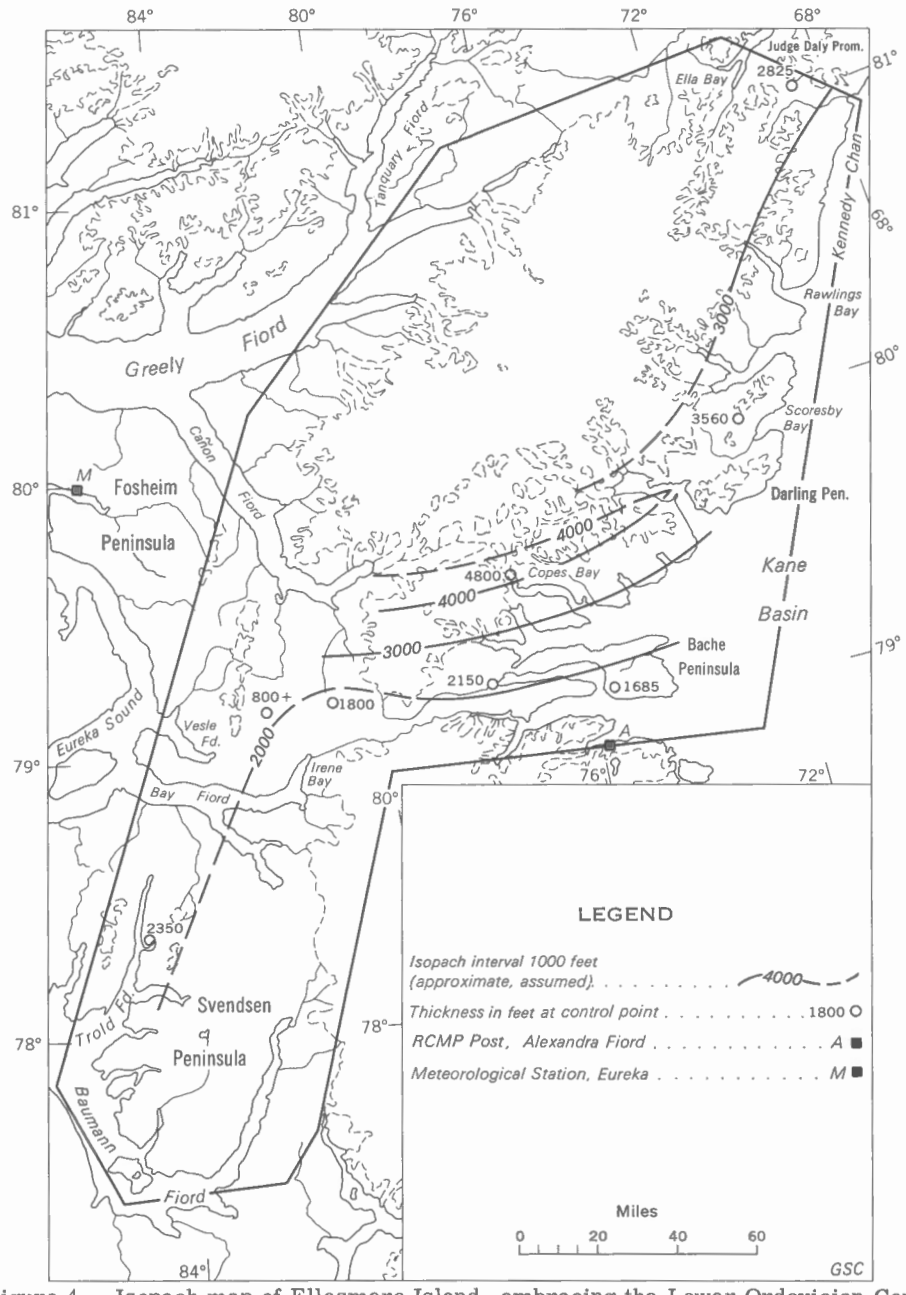

Figure 4. Isopach map of Ellesmere Island, embracing the Lower Ordovician Copes Bay Formation of the geosyncline, and equivalent rocks of the Central Stable Region that include the Cass Fiord Formation, Cape Clay Formation, and unnamed map-unit 6 of Christie (in press).

Lithology and Variation

Thorsteinsson (1963b, p. 391) reports that the type section of the Copes Bay Formation at Copes Bay (Section 13, Fig. 3) comprises a uniform sequence, 4,800 feet thick, of presumed shallow water sediments, comprising mainly limestone, argillaceous limestone, gypsum and shale. The limestone is medium light grey to medium dark grey, fine-grained to aphanitic, medium- to thin-bedded. Ripple-marks and autobreccias (flat-pebble conglomerates) are common features on bedding surfaces. Light grey to dark grey shale and siltstone commonly occur as bedding-plane partings. In the lower part of the formation beds of shale are as much as 12 feet thick. Ten beds of anhydrite ranging in thickness from 6 inches to 5 feet are interbedded in this predominantly carbonate sequence, and near the top of the formation is an eleventh anhydrite unit that measures more than 100 feet. The basal contact with the Parrish Glacier Formation is covered in this region; the upper contact with the Cornwallis Group (formation) is sharp and conformable.

Northwest of Scoresby Bay (Section 3), the writer has assigned 3,560 feet of rock to the Copes Bay Formation. The lithology is much the same as that of the type section, consisting of shaly and silty limestone, with common flat-pebble conglomerates, but with much less anhydrite. Three subdivisions have been made in the section at Scoresby Bay. The lower unit, about 2,100 feet thick, consists of thin- to medium-bedded, dark grey, distinctively shaly and silty limestone with large amounts of interbedded, dark grey mudstone and lesser amounts of fine-grained, quartz sandstone. Flat-pebble conglomerates are common in the sandy limestone beds. Anhydrite beds are not exposed in the measured section, but 12 miles along strike to the southwest two beds, 20 and 5 feet thick occur at about 1,305 feet above the base of this unit. The middle unit is limestone which is medium grey, medium- to thick-bedded, somewhat shaly and sandy, with several very light-grey, massive limestone ledges. At the top of the formation, there occurs 300 feet of medium grey, slightly calcareous, rusty-weathering, quartzose sandstone that is commonly crossbedded and contains beds of flat-pebble limestone conglomerate. The boundary between the Copes Bay Formation and the Parrish Glacier Formation is placed at the position where the interbedded, varicoloured shales cease and are overlain by sandy, quartzose material in a succession of mainly thin-bedded limestones with flat-pebble conglomerates. The upper contact is drawn where sandstone is succeeded conformably by the very light-grey weathering, anhydritic limestone of the Baumann Fiord Formation.

East-southeast of Ella Bay (Section 1, Pl.I), 2,825 feet of rock, including three distinct units, was assigned to this formation. The lowermost unit, 1,050 feet in thickness, comprises interbedded limestone and dolomite that is quartz-sandy, thin- to medium-bedded, light grey, and weathers light yellow-grey. Minor amounts of interbedded, red, silty dolomite, quartz siltstone, and dark grey, limy siltstone occur. The middle unit is 950 feet in thickness and comprises limestone, that is medium- to thick-bedded, medium grey, fine- to medium-grained, shaly, in places saccaroidal, and shows mottling where it is partly dolomitized. The upper unit consists of 825 feet of thin- to medium-bedded, recessive, shaly limestone. It is medium light grey or light grey, and weathers light grey. Neither flat-pebble

conglomerate nor anhydrite intercalations are present in the Copes Bay Formation east-southeast of Ella Bay.. In the Ella Bay region (Section 1), the formations have changed somewhat from their typical occurrences, and a contact was arbitrarily chosen which could be readily traced from the air after control points had been established. The Parrish Glacier and Copes Bay Formations may be gradational in this region. The contact was drawn at the top of a very pronounced, red, siltstone bed which marked the uppermost occurrence of common red siltstone and silty dolomite, although similar beds also occur in small amounts in the lower part of the Copes Bay Formation. In the Ella Bay section the Copes Bay Formation is overlain by the Eleanor River Formation, the Baumann Fiord being absent through gradation or non-deposition. The upper contact is drawn where light grey, shaly limestone is succeeded, with probable disconformity, by ledge-forming, thick-bedded, dark-grey limestone of the Eleanor River Formation.

Northeast of the head of Irene Bay (Section 18) the Copes Bay Formation is poorly exposed. It is only 1,800 feet thick and is comprised rather uniformly of lithographic to fine-grained, thin- to medium-bedded, medium grey and light grey, medium light-grey weathering limestone, commonly with flat-pebble limestone conglomerate and minor amounts of anhydrite and saccharoidal dolomite beds. The basal contact is sharp and is drawn where fine-grained, limy, quartzose sandstone with abundant, varicoloured sandstone and flat-pebble, limestone conglomerate layers are succeeded by thin-bedded limestone and minor amounts of dolomite with abundant flat-pebble conglomerate. The upper contact is poorly exposed and is placed where limestone is succeeded by anhydrite and anhydritic limestone of the Baumann Fiord Formation (Kerr, 1967).

The Copes Bay Formation has been recognized throughout an extensive area south and west of the sections covered by Figure 3 (in pocket). A complete section 2,350 feet thick is exposed east of Trold Fiord (Section 36). The base is marked by a 150-foot thick unit of coarsely crystalline and porous dolomite which is dark grey and partly mottled black and white. The remainder of the formation 2,200 feet thick, is composed of thin- to medium-bedded, dark grev, medium-grey weathering, shaly and silty limestone, containing ripple-marks, flat-pebble conglomerate, and mud cracks. The basal contact is covered and is drawn where dolomite succeeds fine-grained sandstones of the Parrish Glacier Formation. The upper contact is well-exposed and is drawn where anhydrite of the Baumann Fiord Formation overlies shaly limestone abruptly but conformably.

The uppermost 800 feet of the Copes Bay Formation is exposed in the core of a dome northeast of Vesle Fiord (Section 17, Pl. II). It is composed of shaly limestone which is fine-grained thin- to medium-bedded, medium grey, medium light grey, or grey-brown, weathering yellow-grey to medium light grey. A 50-foot thick anhydritic limestone bed occurs between 350 and 400 feet from the top, and flat-pebble, limestone conglomerates are present and are particularly common in the upper part. The upper contact with the anhydrite and anhydritic limestone of the Baumann Fiord Formation is sharp but without apparent break.

The Copes Bay Formation has fairly uniform lithology within the study area. Flat-pebble, limestone conglomerates have been observed in all sections, but are most common in the belt between Irene Bay (Section 18) and Scoresby Bay (Section 3). They decrease in proportion farther from the shelf at Trold Fiord (Section 36) and east of Ella Bay (Section 1). Anhydrite beds are most marked at Copes Bay (Section 13) where the section is thickest, but small amounts have been observed also at Scoresby Bay (Section 6), in the dome northeast of Vesle Fiord (Section 17), and northeast of Irene Bay. Anhydrite is present only in the sections having significant flat-pebble limestone conglomerates, and is most pronounced in the thickest section (Section 13). The sediments of these latter sections indicate shallow water, near shore conditions, and their great thickness indicates fairly rapid subsidence.

Age and Correlation

No fossils have yet been found in the Copes Bay Formation, but "algaloid" structures occur at the base northeast of Irene Bay (Section 18). The age of the formation within the geosyncline is limited by the Middle Cambrian dating of the underlying Parrish Glacier Formation and the early Early Ordovician age of the basal part of the Baumann Fiord Formation (Kerr, 1967). An Early Ordovician age is tentatively assigned to the Copes Bay Formation although it may possibly contain older rocks.

Rocks of the Bache Peninsula arch which are equivalent to the Copes Bay Formation include the Cass Fiord and Cape Clay Formations of Troelsen (1950), and overlying rocks which Christie (in press) refers to his unnamed map-unit 6. Those three units are no younger than Canadian in age according to Troelsen, who considers the entire succession to be Canadian (Early Ordovician). Map-unit 6 of Christie is overlain conformably by the Bauman Fiord Formation, which there contains early Early Ordovician fossils in its middle member (Table 2).

The contact of the Copes Bay Formation with the underlying Parrish Glacier Formation (Fig. 3) is regarded as a regional disconformity coincident with a stratigraphic break that is widespread in this region and adjacent parts of Greenland (see discussion of Parrish Glacier Formation, Kerr, 1967 a). The Formation is succeeded, for the most part, by conformable anhydrite of the Baumann Fiord Formation. However, where the Baumann Fiord Formation disappears laterally, as at Section 1 east-southeast of Ella Bay (Pl. I), the succeeding unit is limestone of the Eleanor River Formation, and the contact is probably disconformable.

Complete sections of the Copes Bay and equivalent formations are few, hence the isopach map (Fig. 4) is largely interpretive. A belt of maximum subsidence trended through the Copes Bay area where the greatest recorded thickness (4,800 feet) of this formation, has been measured. Lesser thicknesses are known farther northward across the geosyncline, and also southwestward at Irene Bay, which is nearer the shelf. The section east of Trold Fiord is of intermediate thickness but appears to be connected in the same depositional basin. Cambrian rocks show a marked increase in thickness from Bache Peninsula (Section 20) to the region northeast of Irene Bay (Section 18) and a marked flexure separates those areas. In Copes

Bay time this great thickness contrast had disappeared suggesting that a projection of the relatively positive Bache Peninsula arch then extended part way across the geosyncline and was the cause of decreased subsidence there. In Copes Bay time, subsidence increased sharply from the arch at Bache Peninsula towards a maximum in the Copes Bay-Scoresby Bay region, then decreased slightly again farther across the belt toward Ella Bay (Fig. 3).

Moderately thin successions of Ordovician and older rocks, predominantly limestones, are known in the stable shelf areas of southeastern Ellesmere and southeastern Devon Islands. At Mackinson Inlet, the writer made a cursory examination of the succession lying on the gneissic basement, and observed a thin limestone and anhydritic limestone unit which may contain equivalents of the Copes Bay Formation. At Sydkap Fiord on the south coast of Ellesmere Island, Glenister (1963a, p. 289), reports in excess of 1,060 feet of Lower Ordovician or older rocks composed predominantly of limestones with some limestone conglomerate. Directly south on Devon Island, he reports (Glenister, 1963b, p. 185) at least 1,380 feet of Lower Ordovician and (?) earlier limestone, dolomitic limestone, limestone-pebble conglomerate, sandstone, and shale, resting nonconformably upon crystalline rocks. At Burnett Inlet Glenister (1963c, p. 180) reports 1,300 feet of Lower Ordovician and (?) earlier limestone, dolomitic limestone, limestone conglomerate, and sandstone, which rests with nonconformity upon the crystalline basement. Kurtz, McNair, and Wales (1952) have reported that at Dundas Harbour, the Mingo River Limestone, 260 feet in thickness, rests unconformably upon Middle Cambrian rocks. The Mingo River Limestone is a probable correlative of the Copes Bay Formation, because both are correlated with beds of Bache Peninsula and northwest Greenland (Table 2).

Lower Ordovician Carbonates of the Bache Peninsula Region

In the Bache Peninsula Region a succession of mutually concordant Lower Ordovician carbonate units includes in ascending order, the Cass Fiord Formation, Cape Clay Formation, and "map-unit 6" of Christie (in press). Flat-pebble, limestone conglomerate is common in each unit, indicating that shallow water conditions prevailed. A disconformity at the base is thought to be part of a widespread disconformity throughout the Arctic Islands and Greenland. The succession is correlated with the Copes Bay Formation of the geosyncline, beneath which there is also a probable disconformity.

Distribution and Thickness

A succession of three, mutually concordant, Lower Ordovician carbonate units which occur in the Central Stable Region around Bache Peninsula and southeast of Irene Bay, were combined for mapping purposes. Each of these units can be traced separately throughout the aforementioned region; moreover, the three have been mapped separately on Bache Peninsula by Christie (in press). Thicknesses of the units at two representative sections are given below:

Unit	Head of Flagler Fiord	Police Post, Bache Peninsula
Map-unit 6	300	465
Cape Clay Formation	300	300
Cass Fiord Formation	1,600	1,000
Total	2,200	1,765

Between these two sections there is noticeable a slight westward thickening of the combined units toward the geosyncline. A good section of these rocks is exposed on the south side of Sverdrup Pass, 8 miles east of the head of Irene Bay (Section 27, Fig. 2). A cursory examination of this section by the writer showed that the three units are recognizable there and the total thickness is about the same as it is farther east. The lower and upper units are characteristically recessive, and the Cape Clay Formation forms a thin limestone ledge.

The three units discussed are together considered to be the shelf equivalent of the Copes Bay Formation of the geosyncline. An isopach map of this interval (Fig. 4) is based upon extremely limited data and is largely interpretive; thicknesses at control points are shown. The amount of control is sufficient to show, however, that the Bache Peninsula arch, a westward projection of the Central Stable Region, was still in existence as a broad positive element. The arch was less extreme than in Cambrian time, but extended farther west as indicated by the extremely thin section of the Copes Bay Formation northeast of Irene Bay (Section 18).

Lithology and Regional Variation

A typical section of the Lower Ordovician carbonate rocks of the Bache Peninsula region occurs north of the abandoned Police Post (Section 20), and is described below in descending order, as measured by the writer.

Map-unit 6 (Christie, in press) -- Thickness 465 feet.

135 feet - sandstone, quartzose, fine- to medium-grained, well-rounded, medium light grey, pale yellow weathering, medium- to thick-bedded; crossbedding common; worm trails; porous toward top; contact gradational at base, possibly disconformable contact at top; resistant.

100 feet - limestone, fine-grained, medium grey, thin-bedded; alternating with medium grey, rusty-weathering, thick-bedded limestone; upper and lower contacts gradational.

230 feet - limestone, fine-grained, medium grey, thin- to medium-bedded; minor flat-pebble conglomerate; silty and sandy layers which weather pale greenish grey are common, and become fewer upwards; upper and lower contacts gradational.

Cape Clay Formation -- Thickness 220 feet.

220 feet - limestone, medium light grey, slightly pinkish, weathering slightly rusty; thin- to medium-bedded; very minor amounts of white anhydrite nodules 180 feet from base; much flat-pebble, limestone conglomerate; increasingly resistant upwards forming sharp ledge.

Cass Fiord Formation -- Thickness 1,000 ± feet.

14 feet - limestone, medium light grey, slightly pinkish, vuggy, massive ledge.

118 feet - limestone flat-pebble conglomerate, buff, yellow-grey weathering, thin- to medium-bedded; some interbedded light green, shaly, limestone; thin, red or green, flat-pebble limestone conglomerate intercalations, shaly and green at the top; resistant generally.

868 ± feet - (largely covered) limestone, shaly, medium grey to olive-grey medium grey weathering, thin- to medium-bedded; flat-pebble conglomerate abundant at the base and scattered throughout; minor rusty-weathering, shaly, limestone at base; upper contact gradational; lower contact probably a disconformity.

Age and Correlation

Cass Fiord Formation -- At the type section of the Cass Fiord Formation at Cape Clay, south of Cass Fiord in Washington Land, Koch (1929) describes the formation as consisting of at least 1,200 feet of limestone interstratified with limestone conglomerates. The fauna in the type section included Lingulella? sp. ind., Eoorthis? sp. ind., Sinuopea? sp. ind., Hystricurus ravni Poulsen, Hystricurus longicephalus Poulsen. Poulsen (1927) identified the fossils and referred the formation to the Upper Ozarkian (Lower Canadian). Troelsen (1950) described similar, but poorly fossiliferous, rocks at Bache Peninsula and assigned them to the Cass Fiord Formation; with some doubt he also referred finer grained, limestone conglomerate in Sverdrup Pass to the same formation. Christie (in press) has collected a few fossils including Grinnellaspis sp. from the Cass Fiord Formation in the Bache Peninsula region, and follows Troelsen in assigning to it an Early Ordovician age.

Cape Clay Formation -- The Cape Clay Formation at its type section in Washington Land (Koch, 1929; Poulsen, 1927) is a fossiliferous, compact limestone of Upper Ozarkian (Lower Canadian) age. A similar fossiliferous unit on Bache Peninsula was considered to be equivalent to the Cape Clay of the type section by Poulsen (1946), who assigned it an Early Canadian age. The formation has been considered similarly by Christie (in press), who has mapped the unit on Bache Peninsula and westward in Sverdrup Pass.

Map-unit 6 -- (Christie, in press). The rocks referred to as map-unit 6 were designated as such by Christie who found in them only fragmentary unidentified trilobite fossils. The formation is of Early Ordovician age, because of its stratigraphic position between the Early Ordovician Cape Clay and Baumann Fiord Formations.

Three conformable units of Early Ordovician age were combined in geologic mapping and comprise, in ascending order, the Cass Fiord Formation, Cape Clay Formation, and map-unit 6 of Christie (in press). The stratigraphic interval containing these three units can be correlated with the Copes Bay Formation of the geosyncline, because of the similarity of age, lithology and stratigraphic position. Rocks of the three units are traced westward in Sverdrup Pass to within 15 miles of Section 18 in which the Copes Bay Formation is exposed. This latter section admittedly lies in a thrust block, but since it is near the merging of the thrust into an anticline, the lateral movement cannot be great and the original separation is considered to be of the order of 15 miles. The Copes Bay Formation there is correlated with the combined Cass Fiord Formation, Cape Clay Formation, Poulsen Cliff Shale and Nygaard Bay limestone of Washington Land (Table 2).

The base of the Cass Fiord Formation on the shelf has generally been considered to be a disconformity (Troelsen, 1950, p. 20; Christie, in press) and it will be considered similarly by the writer. Evidence for this view is as follows: (1) the Cass Fiord Formation, considered to be of Early Ordovician age, rests directly upon the Middle Cambrian Cape Wood Formation. Late Cambrain fossils have not been found anywhere in the Arctic Islands or Greenland and Upper Cambrian rocks are considered to be absent, due to either non-deposition or erosion. (2) The nature of the rocks, which are muddy limestones with many intraformational conglomerates, indicates shallow water conditions with current movement, and suggests that their deposition followed an emergence. Evidence against the possibility of a disconformity is as follows: (1) the underlying thin upper member (Blomsterbaek Member) of the Cape Wood Formation has undergone no erosion at this locality. This is true also of the same formation at Bache Peninsula and Blomsterbaekken (Troelsen, 1950, p. 46), and possibly at Cape Ingersoll(Cowie, 1961, p. 26). (2) The Cass Fiord and Cape Clay Formations have been considered to be entirely of early Early Ordovician age; Ozarkian according to Poulsen (1927).

The suggested regional disconformity at the base of the Cass Fiord Formation of the Bache Peninsula arch, coincides with a similar Early Ordovician disconformity considered to be present in the Arctic Islands and Greenland. A similar disconformable contact occurs at the base of the Copes Bay Formation in the Franklinian miogeosyncline and at the base of the Cass Fiord Formation in Washington Land in northwest Greenland (Troelsen, 1950, p. 43). At Dundas Harbour on southeastern Devon Island (Kurtz, McNair and Wales, 1952), the Mingo River limestone rests disconformably on Middle Cambrian rocks, and the lower part of this limestone unit is equivalent at least in part, to the Cass Fiord Formation (Table 2). The lower Canadian Cass Fiord Formation is reported to be present in east Greenland by Cowie and Adams (1957, pp. 33, 62), and to contain a fauna similar to that of the Cass Fiord and Cape Clay formations of northwest Greenland. Although there is no angular discordance at the

base at this locality, the abrupt change in lithology suggests a stratigraphic break of some magnitude.

Although none have yielded fossils, it is suggested that the rocks referred to as map-unit 6 around Bache Peninsula are roughly equivalent to the Poulsen Cliff Shale and Nygaard Bay Limestone of Washington Land (Troelsen, 1950). Both overlie the distinctive Cape Clay Formation. Whereas map-unit 6 is overlain with apparent conformity by the Baumann Fiord Formation, the upper contact of equivalent rocks on Washington Land is disconformable. The writer is of the opinion that this period of erosion coincides with the deposition of the evaporites of the Baumann Fiord (Table 2). Sandstones at the top of map-unit 6 may reflect shallowing of the sea accompanying this disconformity.

Baumann Fiord Formation

The Lower Ordovician Baumann Fiord Formation, (Kerr, 1967) was named after the location of its type section on the east side of Trold Fiord, an arm of Baumann Fiord in central Ellesmere Island (Section 36, Fig. 6). The formation, bounded by conformable contacts, comprises three members; a lower, thick anhydrite (A), a middle limestone (B), and an upper anhydritic limestone (C). Each member can be recognized throughout the area of occurrence of the formation. The formation is composed predominantly of anhydrite, but alteration to gypsum has taken place at the surface so that it is characteristically gypsum which is exposed. The formation, in the central and shelfward parts of the Franklinian miogeosyncline, is markedly lens shaped (Fig. 6), and reaches a maximum measured thickness of 2,560 feet at the type section. It becomes thinner to the northwest and northeast within the geosyncline; northeastward where it disappears completely, a disconformity may be developed. East of Scoresby Bay and on Bache Peninsula as the shelf is approached, the formation is thinner and contains flat-pebble, limestone conglomerate and quartz sandstone. On the Central Stable Region of Greenland, southeast Ellesmere, Devon and northwestern Baffin Islands, it has become still thinner or disappeared entirely. A Lower Ordovician regression and disconformity in these latter areas developed while deposition was continuous in the basin.

Distribution and Thickness

The Baumann Fiord Formation is exposed in the northerly-trending folds of western Svendsen Peninsula and southeastern Fosheim Peninsula. Farther northeast it is exposed in long belts raised by the Parrish Glacier, Scoresby Bay and Rawlings Bay thrust faults. It is also exposed extensively in the vicinity of Bache Peninsula, where it dips gently to the north and northwest. The original thicknesses have been modified by flowage and, probably, also by removal of anhydrite by solution. In some folds the thickening and thinning can be seen. Those thicknesses which are maintained for a considerable distance along the outcrop belts and those which do not vary appreciably within a structure, are listed below. They are thought, therefore, to be nearly representative of depositional thicknesses and not influenced by folding.

Locality	Thickness (feet)	Thickness of Anhydrite
Section 1	absent	absent
Section 3	250	250
Section 6	500	500
Section 4	860	560
Section 5	300 +	?
Section 10	probably absent	probably absent
Section 15	650	550
Section 13	970	845
Section 18	900	?
Section 17	1,500	1,125
Section 30	1,200 +	800 +
Section 36	2,560	2,200

An isopach map of the Baumann Fiord Formation, on which thicknesses at control points are shown, has been constructed from this very limited data (Fig. 6). Lines of sections across the geosyncline also illustrate the thickness variations (Fig. 5).

Much shaly anhydrite and anhydritic limestone occurring in the region south of Troll Bay and west of Svarte Fiord has been mapped as the Baumann Fiord Formation. This correlation is tentative for the following reasons: the rock does note have the typical aspect of the Baumann Fiord Formation; faunal control is poor; and there is known to be a similar anhydritic zone in the Bay Fiord Formation in this region.

Lithology and Regional Variation

The type section of the Baumann Fiord Formation (Section 36) comprises westerly-dipping strata at 78° 20' N., 84° 40' W., north of a small bay on the east side of Trold Fiord, an arm of Baumann Fiord. Although the rocks are folded, little flowage seems to have taken place, because thicknesses within this structure are all of the same order; 2,560 feet being representative. The three members which comprise this mainly anhydritic formation there can be recognized throughout the present report area. At the base, Member A, 2,000 feet in thickness, rests abruptly but conformably upon the Copes Bay Formation. It consists of light grey to white anhydrite, thin- to medium-bedded, interbedded with minor amounts of medium grey limestone and anhydritic limestone. The entire unit is largely altered to gypsum and is very recessive. Member B, 360 feet thick, rests abruptly and conformably between the evaporite members, and consists of limestone, that is medium grey, fine-grained, medium- to thick-bedded, pale yellowish-brown weathering and resistant. Member C comprises 200 feet of limestone, which is anhydritic, cream to grey, weathers buff-yellow, thin-bedded, laminated and recessive. It is overlain conformably by the bluff-forming Eleanor River Formation.

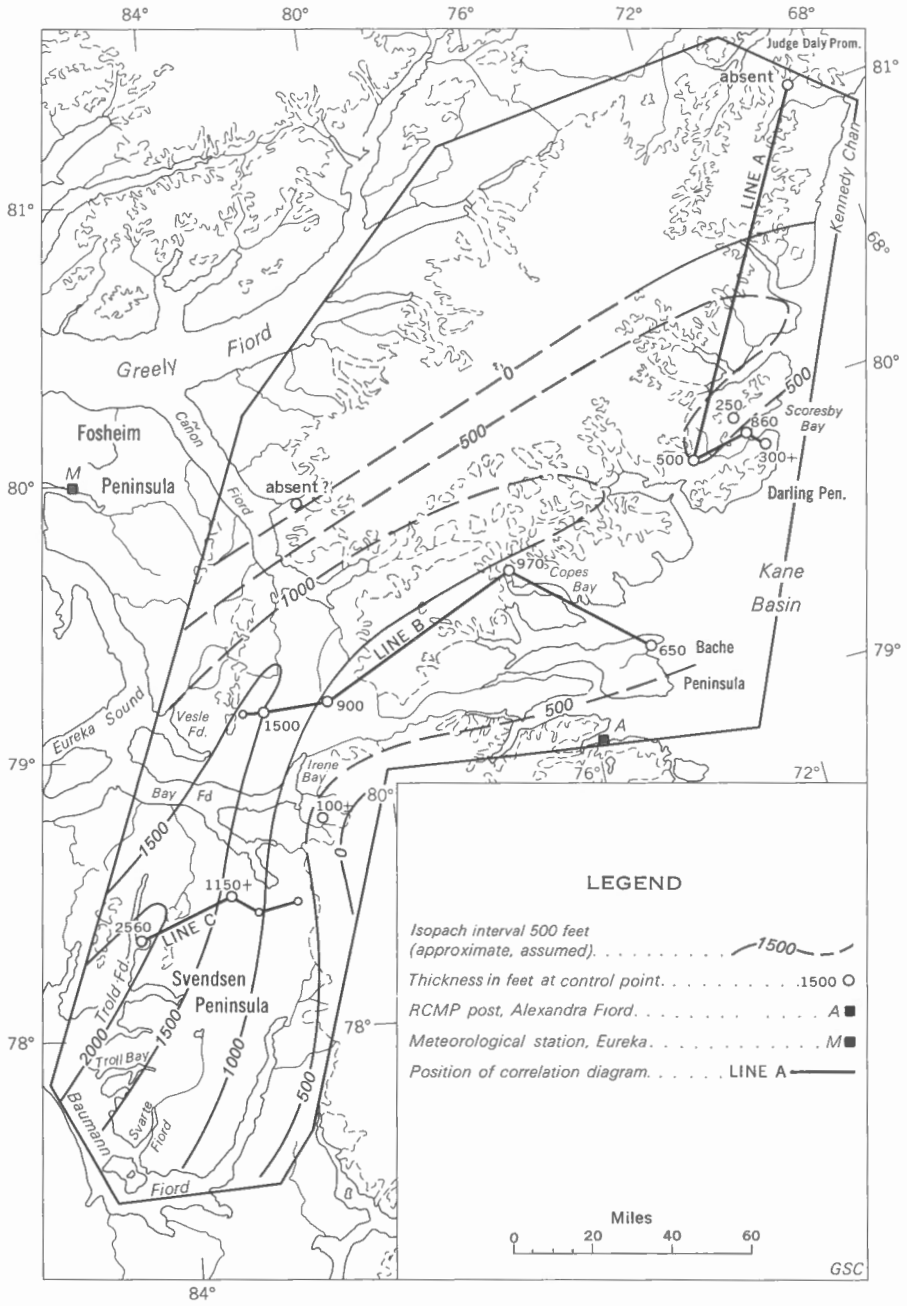

Figure 6. Isopach map of the Lower Ordovician Baumann Fiord Formation, Ellesmere Island.

On north-central Svendsen Peninsula (Section 30), only the uppermost 1,150 feet of the Baumann Fiord Formation are exposed above a northerly-striking reverse fault. Member A, composed characteristically of soft, light grey to white anhydrite and gypsum, with minor amounts of limestone, is represented by the lowermost 600 feet of exposed strata. Member B, lying conformably between the evaporite members, consists of 400 feet of resistant limestone, which is dark grey, thin- to medium bedded, pale yellowish-brown-weathering, and contains flat-pebble conglomerate. Member C comprises 100 to 200 feet of limestone, which is anhydritic, light grey, light grey weathering, thin- to medium-bedded, recessive, and contains minor amounts of flat-pebble conglomerate. It is overlain abruptly by ledges of the Eleanor River Formation.

A complete section of the Baumann Fiord Formation, 1,500 feet thick, is exposed in the dome structure northeast of Vesle Fiord, (Section 17, Pl. II). Member A consists of 900 feet of interbedded anhydrite and anhydritic limestone. This is light grey, weathering very light grey to white, thin-bedded and recessive. Member B comprises 375 feet of resistant, brown, medium-bedded, shaly, light grey-brown-weathering, limestone. Member C comprises 225 feet of soft anhydritic limestone that is light to medium grey in colour and weathers light yellow-brown.

Northeast of the head of Irene Bay (Section 18) the Baumann Fiord Formation is rather poorly exposed and the three members, although probably present, could not be distinguished. The total thickness of the formation is 650 feet. A good section, 970 feet thick, occurs along strike with the section at Copes Bay (Section 13), where Thorsteinsson recognized the threefold division in the evaporite sequence of the Cornwallis Formation (1963b, p. 392). Thicknesses of members A, B, and C, are respectively 675, 125, and 170 feet. The three members in this section are clearly evident in a photograph by Kerr (1967, Pl. II).

Christie (in press) reports a thickness of 650 feet for the formation at Bartlett Bay on Bache Peninsula (Section 15), where he recognizes also the three members. Thicknesses given by him for the Bartlett Bay section are as follows: Member A, 450 feet; Member B, 100 feet; Member C, 100 feet. The total thickness there is fairly constant and only slightly less than that to the northwest, suggesting that the hinge operating north of Bache Peninsula had become inactive in Baumann Fiord time.

At the head of Scoresby Bay (Section 4), the three members of the Baumann Fiord Formation are recognized in a succession totalling 860 feet. Lithologies of the members are typical and the thicknessess of member A, B, and C respectively are 530, 300, and 30 feet. A few miles to the west, in the Scoresby Bay thrust block where the formation is thinner and poorly exposed, it is probable that only Member A of the formation is present. The thickness of the formation ranges from 250 feet (Section 3) to 500 feet 12 miles to the southwest (Section 6). On Darling Peninsula east of Scoresby Bay (Section 5), only the uppermost 300 feet of the formation is exposed, and comprises shaly, medium grey to white, anhydritic limestone with minor amounts of flat-pebble, limestone conglomerate and quartz sandstone. East-southeast of Ella Bay (Section 1, Pl. I), the Baumann Fiord

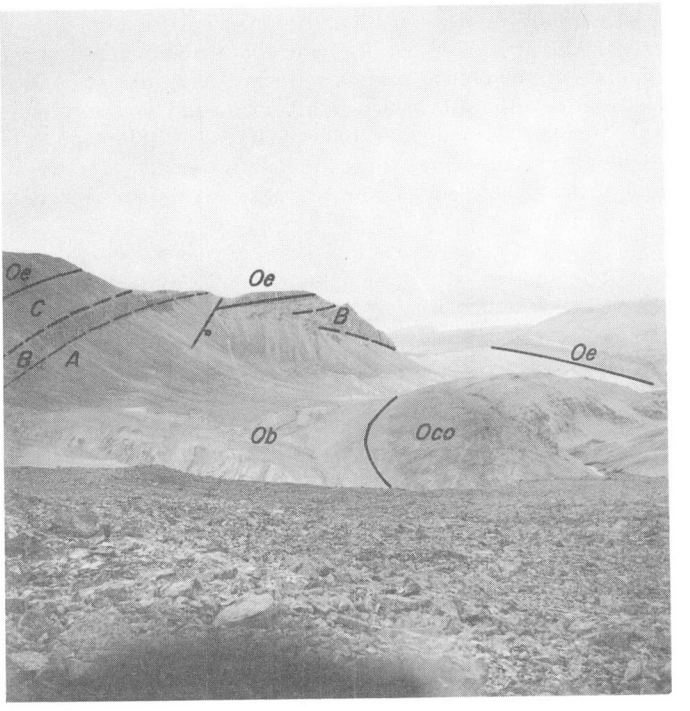

PLATE II (JWK 2-2-62)

View of characteristic exposures of the Copes Bay Formation (Oco), the Baumann Fiord Formation (Ob) and its three members, and the Eleanor River Formation (Oe). The view is north toward Section 17, in a dome 18 miles northeast of Vesle Fiord.

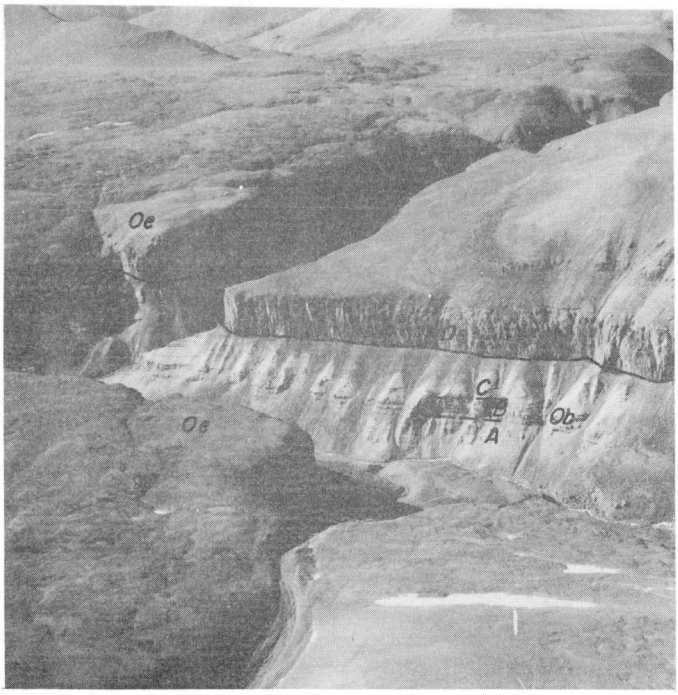

PLATE III (JWK 10-5-62)

View of characteristic exposures of the Baumann Fiord Formation (Ob) and its three members, and the Eleanor River Formation (Oe). About 16 miles northeast of the head of Irene Bay.

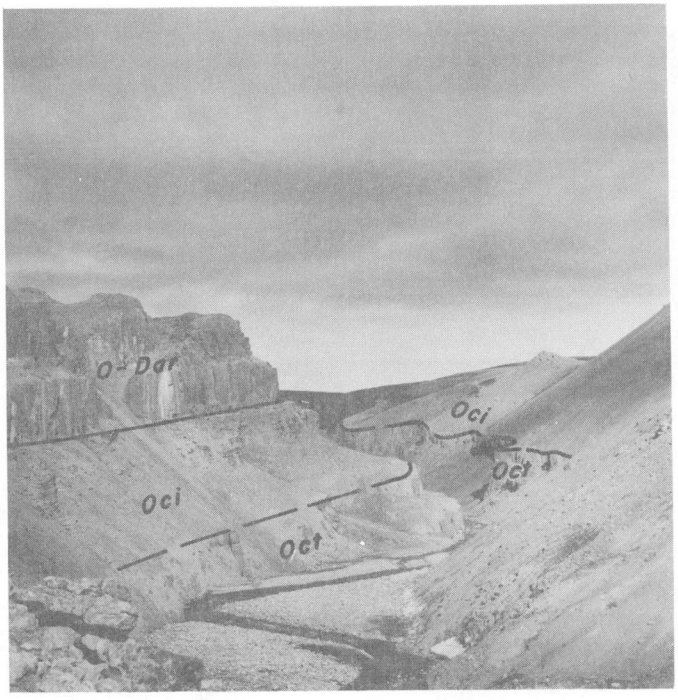

PLATE IV (JWK 7-4-62)

Characteristic exposures of the Thumb Mountain and Irene Bay Formations of the Cornwallis Group and lower parts of the Allen Bay Formation, east of Vendom Fiord, central Ellesmere Island. Thumb Mountain Formation (Oct); Irene Bay Formation (Oci); undivided Allen Bay and Read Bay Formations (O-Dar); Thickness of the Irene Bay Formation is 120 feet.

PLATE V (JWK 5-7-62)

View looking southwest at the north flank of the Archer Fiord anticline and showing intensely folded rocks of the Cornwallis Group (rough topography) and the overlying Cape Rawson Group (subdued topography). Ella Bay on the left coincides with the axis of the anticline.

Formation is absent through lateral pinchout and the Eleanor River Formation rests directly upon the Copes Bay Formation. The Baumann Fiord Formation is, at least in part, laterally gradational into the overlying and underlying formations but, around the margins of the Baumann Fiord evaporite basin, a regional disconformity probably coincides in time with part of the evaporite deposition (Fig. 6). The Formation also appears to be absent by pinchout north of Caledonian Bay on Canyon Fiord (Section 10). There, a thick succession of the Cornwallis Group was observed from the air and it does not appear to contain the persistent recessive interval commonly formed by this formation although thin, light colored, intercalated beds may be anhydritic.

The Baumann Fiord Formation within the report area is the spoon-shaped end of a basin-shaped deposit comprising anhydrite, anhydritic limestone, limestone, and gypsum (Figs. 5 and 6). It was deposited on parts of the formerly active Bache Peninsula arch and in the southeastern and central parts of the Franklinian miogeosyncline. The greatest exposed thicknesses of the formation and of its component members occur in a belt striking northeasterly along the trend of the geosyncline. The entire formation disappears to the north and probably also to the west by pinchout and by gradation into the overlying and underlying formations. Member C, composed largely of anhydritic limestone, disappears first, grading into the overlying and partially equivalent Eleanor River Formation, whereupon Member B becomes indistinquishable from, and is considered part of, the Eleanor River Formation. Member B, composed largely of limestone, retains remarkable uniformity of thickness and lithology over a wide region and is an excellent marker horizon. The great range of thickness of the entire formation is due largely to variations in the thickness of the underlying Member A. Member A comprises pure anhydrite, especially where the thickness is great, as in the region east of Trold Fiord (Section 36). To the northwest and southeast the member becomes increasingly limy and thinner, and finally disappears into the enclosing formations in those directions by gradation and perhaps partly by non-deposition.

Age and Correlation

The age of the Baumann Fiord Formation is Early Ordovician, and perhaps entirely early Early Ordovician. This conclusion is based largely upon the occurrence of the faunas collected by R. L. Christie in Member B of the formation at Bache Peninsula, and identified by J.W. Cowie as Early Ordovician in age. At the base of the middle limestone division (GSC loc. 47271 and GSC loc. 47275) were Hormotoma sp., and Hystricurus sp.; at the top of this unit (GSC loc. 47273) were Helicotoma sp., Hormotoma sp., and ?Grinnellaspis sp. The formation is younger than the Lower Ordovician Cape Clay Formation; moreover, it is in part overlain conformably by, and in part grades laterally into, the Lower to Middle Ordovician Eleanor River Formation. The Baumann Fiord Formation occurs in a part of the succession which has a paucity of fossils. Exposures of anhydrite and gypsum were generally assigned to the formation because of their stratigraphic position, and because of the fact that the widespread persistence of three distinctive members gives the formation a unique appearance. Northward from Scoresby Bay the lithology

of the upper member has changed and the middle member is incorporated into the Eleanor River Formation. Farther north the lower member has also lost its identity. The Lower Palaeozoic succession at the branch of Mackinson Inlet on southeastern Ellesmere Island is that of a stable shelf environment, containing only a few, thin, anhydrite beds within the limestone succession. The Baumann Fiord Formation is not present as a separate formation and the interbedded anhydrite may be partially equivalent to it.

Correlation of the Baumann Fiord Formation of the study area with rocks in other parts of the Archipelago (Table 2) is difficult because of the paucity of fossils at this level in the geologic column. The formation on Ellesmere Island conformably underlies a ledge-forming limestone unit, the Eleanor River Formation, which has yielded Early Ordovician fossils in its lower part. Anhydrite of the Baumann Fiord Formation may be present in a talus-covered interval at least 380 feet thick, which was reported by Glenister (1963a, p. 287), at Sydkap Fiord on southern Ellesmere Island. An occurrence of anhydrite in the core of the centre dome of Cornwallis Island (Thorsteinsson and Kerr, in press) is also part of the Baumann Fiord Formation. An Early Ordovician disconformity in the shelf area far to the southeast may represent a period of regression on the shelf that accompanied the widespread shallowing that resulted in deposition of the Lower Ordovician Baumann Fiord evaporites in the basin. At Dundas Harbour on southeast Devon Island, Kurtz, McNair and Wales, (1952), report a disconformity separating the Lower Ordovician Nadlo Point and Mingo River Formations. According to Trettin (1965b) there is a disconformity at the base of the Lower and early Middle Ordovician Ship Point Formation on northwestern Baffin Island that probably represents Lower Ordovician erosion. Troelsen (1950) described the Lower Palaeozoic rocks of Washington Land in Northwest Greenland (Table 2), and does not report strata that can be assigned to the Baumann Fiord Formation. He does, however, report a poorly exposed interval, apparently about 500 feet thick, which includes the Poulsen Cliff shale and overlying Nygaard Bay Limestone, and which is overlain disconformably by the Cape Weber Formation. The Baumann Fiord Formation of Ellesmere Island is probably not present in northwest Greenland. The disconformity beneath the Cape Weber Formation suggested by Troelsen (1950, p. 51) may be equivalent to part of the Baumann Fiord Formation.

LOWER AND MIDDLE ORDOVICIAN

Eleanor River Formation

The Eleanor River Formation is a distinctive, bluff-forming, fine-grained limestone of Canadian and probably early Mohawkian age, that is exposed widely through the Franklinian miogeosyncline between Cornwallis Island and eastern Ellesmere Island. It was named for the river near the type section of the formation on Cornwallis Island (Thorsteinsson, 1958, p. 31). A new reference section on Ellesmere Island (Kerr, 1967) is better exposed than the type section. On Ellesmere Island the formation has a maximum thickness as great at 3,300 feet in a belt along the eastern side of the geosyncline but, the thickness decreases gradually

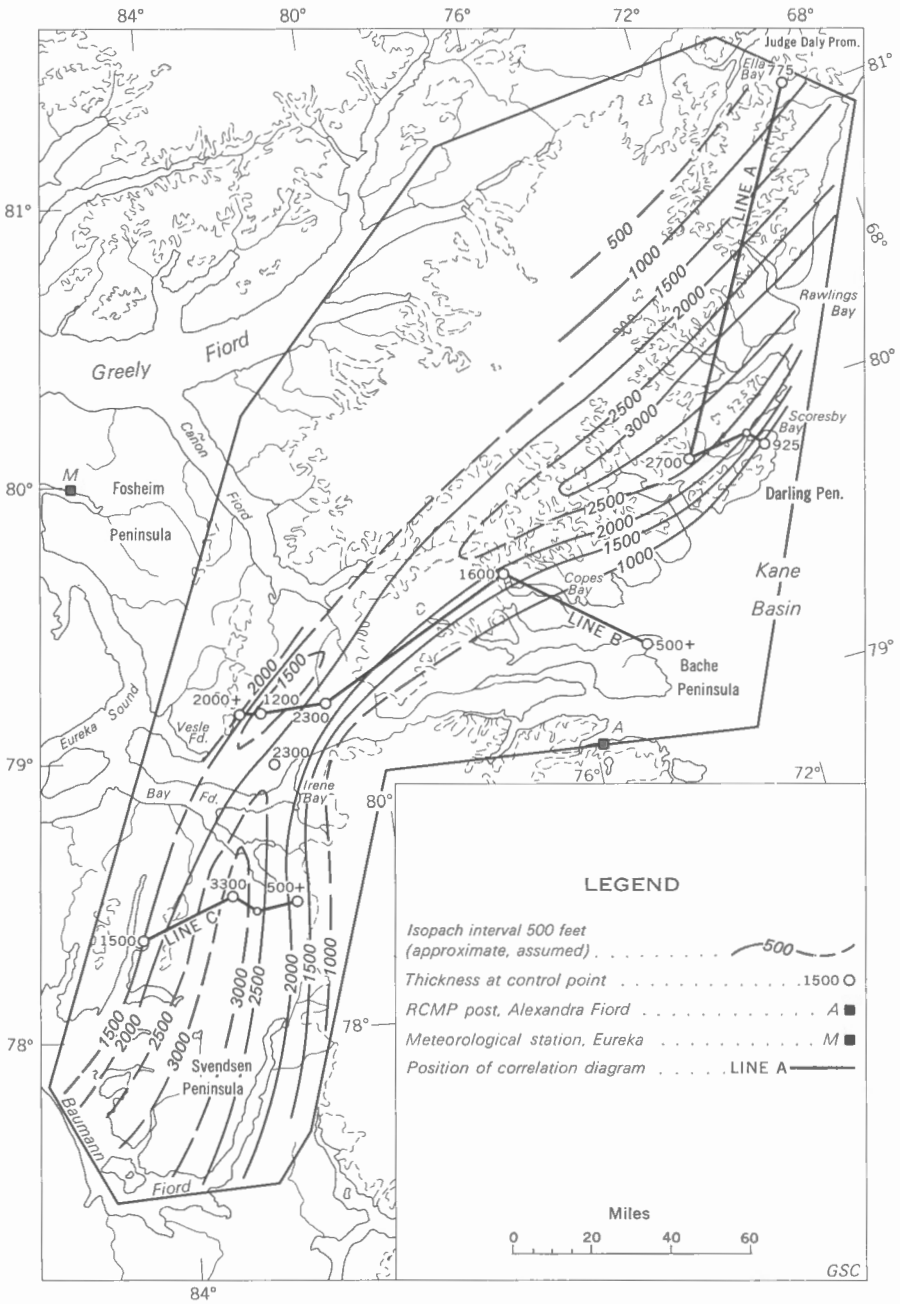

Figure 7. Isopach map of the Lower and early Middle Ordovician Eleanor River Formation, Ellesmere Island.

northward and probably also northwestward across the geosyncline, as well as southeastward toward the shelf (Figs. 5 and 7). The formation rests conformably upon anhydrite of the Baumann Fiord Formation where that formation is present, but where the anhydrite is not present in the shelf areas of Washington Land in north Greenland, and in southeastern Devon Island, the equivalents of the formation rest upon older rocks, probably disconformably. At all sections within the report area, the Eleanor River Formation is overlain concordantly and, probably conformably, by recessive-weathering beds of variable lithology which are assigned to the Bay Fiord Formation.

Distribution and Thickness

The Eleanor River Formation is extensively exposed in the report area. Time did not permit the separation of this formation from the overlying Cornwallis Group at all localities. In areas studied in detail, however, the Eleanor River Formation was separately mapped and is designated Oe on Plates I - III. The formation is present in a long belt on the north flank of the Judge Daly Anticline and on the flanks of the Radmore Harbour Synclinorium. Farther south it occurs in a long belt in the Parrish Glacier thrust block, extending from Irene Bay to Scoresby Bay. In the Bache Peninsula region the formation forms uplands and is the youngest preserved Palaeozoic formation. Between Canyon and Bay Fiords the formation is generally the basal unit exposed in thrust blocks, having been sheared off underlying anhydrite of the Baumann Fiord Formation. The formation is exposed in the cores of anticlines in the Svendsen anticlinorium south of Bay Fiord. Thicknesses of the Eleanor River Formation at measured sections are given below.

Locality	Thickness (feet)
Section 1	775
Section 6	2,700
Section 5	925
Section 13	1,600 ±
Section 15	500 +
Section 18	2,300
Section 16	2,000 +
Section 17	1,200
Section 24	825 +
Section 30	3,300
Section 34	500 +
Section 36	1,500

Isopachs of the Eleanor River Formation (Fig. 7) show the formation to have a pronounced trough shape, with a maximum thickness in excess of 3,000 feet along the eastern side of the miogeosyncline. The zone of maximum thicknesses roughly coincides with that of similar thickness maxima of the Baumann Fiord Formation (Fig. 6),the combined Cornwallis Group and Eleanor River Formation (Fig. 8),and of separate units of the Cornwallis Group. Between Canyon and Bay

Fiords there is noticeable thinning of the Eleanor River Formation and this may be accounted for by the persistence there of the Bache Peninsula arch as a gentle positive element.

Lithology and Regional Variation

A reference section of the Eleanor River Formation for Ellesmere Island (Kerr, 1967) was established northeast of the head of Irene Bay (Section 18). In this section the formation is a succession of resistant, fine-grained, thick-bedded, argillaceous, grey-brown to medium grey, light grey-brown-weathering, limestone, containing, flat-pebble conglomerate near the base. The basal contact is conformable with anhydrite of the Baumann Fiord Formation. The upper contact is conformable with thinly bedded, argillaceous limestone of the Bay Fiord Formation which, in this section, contains interbedded anhydrite.

The lithology of the Eleanor River Formation is rather uniform on Ellesmere Island and consists of a resistant ridge-forming limestone unit (Pl. III) similar to that of the type section on Cornwallis Island. It conformably overlies the anhydrites of the Baumann Fiord Formation where that formation is present. Where the Baumann Fiord is absent, it lies, probably disconformably, upon the Copes Bay Formation. The Eleanor River Formation is itself overlain conformably by the Bay Fiord Formation of which the lower part is limestone, except along a narrow belt where anhydrite forms the base. Three correlation diagrams (Fig. 5) across the deformed belt show variations in the lithology and thickness of the Eleanor River Formation.

Line B, Fig. 5, is a restored section in the central part of the report area through the reference section. North-northeast of Vesle Fiord (Section 16), a fine section of the Eleanor River Formation, about 2,000 feet thick, occurs above a west-dipping thrust fault. It is thought that this represents nearly the total thickness at this locality, the formation having been sheared from evaporites beneath. The formation there consists of resistant, thick-bedded, fine-grained to lithographic, medium light grey to medium dark grey, slightly brownish, buff-weathering limestone. Four miles east a thinner complete section is exposed on the west flank of a dome (Section 17, Pl. II). There it is 1,200 feet thick and comprises thick-bedded, resistant, fine-grained, grey-brown, buff-weathering limestone. Still farther east the thickness has again increased, and the formation consists of 2,300 feet of resistant limestone at the reference section northeast of Irene Bay (Section 18). At Copes Bay (Section 13), Unit (i) of Thorsteinsson (1963b, p. 392) comprises limestone that is cliff-forming, dark grey, aphanitic to fine-grained, and thin- to medium-bedded. It is regarded as the Eleanor River Formation by the writer, and its total thickness, measured from vertical air photos, is estimated to be 1,600 feet. On the eastern side of Bache Peninsula (Section 15) Christie reports the occurrence of a resistant unit which characteristically caps upland areas. Its original thickness is unknown, but the lowermost 500 feet is exposed and consists of interbedded, grey-brown-weathering dolo-limestone, intraformational conglomerate, bioclastic limestone and platy limestone. He reports abundant fossils from this unit which is probably the

Eleanor River Formation.

East-southeast of Ella Bay (Section 1, and Pl. I), the Eleanor River Formation comprises 775 feet of resistant limestone that is thick-bedded, shaly, medium dark grey, medium grey weathering and contains shaly bands. The strata rest directly and probably disconformably upon the Copes Bay Formation, for the Baumann Fiord Formation cannot be differentiated in this region.

The Eleanor River Formation is a trough-shaped body of slightly argillaceous, grey to brownish grey, fine-grained limestone, which was deposited throughout the present study area under widespread, shallow marine conditions. Lateral lithologic and thickness variations are gradual. Maximum accumulation of sediments occurred along the southeastern edge of the geosyncline. To the northwest and southeast (Figs. 5 and 7) the thickness decreased gradually but irregularly. Southeastward, toward the shelf area, there is evidence of decreasing depth of water with the occurrence of interbedded, flat-pebble, limestone conglomerates and dolomite on Bache Peninsula. The trough of maximum deposition has lesser thicknesses between Bay and Canyon Fiords, and may reflect the persistence of the Bache Peninsula arch as a gentle positive element.

Age and Correlation

The Eleanor River was given formational status on Cornwallis Island (Thorsteinsson, 1958, p. 32), where its type section occurs on the southeast side of the Centre Dome. No fossils have been found in the formation, but it was known to be older than Caradocian and was tentatively considered to be Ordovician. The writer has collected a few fossils near the top of the Eleanor River Formation on Cornwallis Island, and these have been studied by M.J. Copeland and G.W. Sinclair. Fossils occurring 600 feet below the top of the formation in the type section (GSC loc. 64869) include gastropoda indet., Hormotoma cf. H. gracilus (Hall), Leperditia? sp. indet., 'Bythocypris' sp., and Isochilina sp. cf. I. seelyi (Whitfield). On the basis of the contained isochelinid the formation is correlated with the Nunatami Formation of Greenland which Poulsen (1937) considers to be Upper Beekmantown. Copeland states that the fauna can only be assumed to be Upper Beekmantown-Chazy (i.e. Upper Canadian or lower Mohawkian). The type section of the Eleanor River Formation on Cornwallis Island consists of limestone that is thin- to thick-bedded, flaggy to massive, hard, light brownish grey to brownish grey, fine-grained. It is a thick, monotonous succession occurring conformably between evaporite units. The underlying evaporite is considered to be the Baumann Fiord Formation, whereas the overlying evaporite is considered to be the lower part of the Bay Fiord Formation (Kerr, 1967).

The Eleanor River Formation of the report area has been correlated with the type section of Cornwallis Island, partly on the basis of fauna and partly because of its stratigraphic position between distinctive evaporite units. Abundant fossils have been collected by R.L. Christie from the lower 500 feet of the formation that is preserved in the Bache Peninsula region.

G.W. Sinclair has identified the collections and considers them all to be Early Ordovician in age. Cycloceras sp., Hormotoma sp., Pliomera sp., and Polytoechia sp. (GSC loc. 47291) were reported from a height of 390 feet above the base on the south side of Bartlett Bay (Christie, in press). Spyroceras sp., Liospira sp., Hormotoma sp., Gyronema sp., Lophospira sp., Maclurites sp., Priscochiton sp., Ceratopea sp., an orthoceraconic cephalopod, and sponge and crinoid fragments (GSC 47289) were reported from the interval between 100 and 200 feet above the base in the Sanddola Creek section (Section 19). At a height of 250 feet above the base in Section 19 there occurs (GSC loc. 47276) Goniotelus sp., crinoid fragments, an orthoid brachiopod, and an asaphid trilobite. Near the Bartlett Bay section in rocks about 70 feet above the base, cf. Bathyurus was collected. Exposures of the Eleanor River Formation in the Bache Peninsula region which comprise the lower part of the formation, are of Early Ordovician age. Loose fossils were collected from the basal 425 feet of the 925-foot thick Eleanor River Formation on Darling Peninsula (Section 5, GSC loc. 47669). The collection included Trochonema sp., Liospira sp., an asaphid trilobite, and Pliomerops (?). G.W. Sinclair states that the age is uncertain, but suggests that it is pre-Wilderness (i.e., pre-Blackriveran). Gastropods and cephalopods collected from the formation on a northwest-facing mesa, five and one-half miles due east of the head of Irene Bay (GSC loc. 51976) are assigned "a very indefinite Early Ordovician age" by Sinclair. Thorsteinsson (1963b, p. 392) reported Liospira sp., Vaginoceras sp., and an asaphid trilobite in his unit (i) at Copes Bay (Section 13), which the writer considers to be the Eleanor River Formation.

The lower part of the Eleanor River Formation, which is present on Bache Peninsula and is of Early Ordovician age, has been followed by outcrops to exposures of the same formation to the west. Poor faunas which occur higher in the formation elsewhere in the report area have been tenuously dated, but are all pre-Blackriveran. The upper part of the Eleanor River Formation in the type section on Cornwallis Island yields fossils of upper Canadian - lower Mohawkian age. It is concluded that the Eleanor River Formation on Cornwallis and Ellesmere Islands is of late Canadian and probably early Mohawkian age.

Ten miles to the northeast and along the strike from Section 1, Norford (1966) reported two Ordovician units of formational rank, but correlation of these units with the nearest sections of the report area is difficult because in this region the Ordovician formations have lost their distinctive characters. The presence of ?Bathyurus sp. 1,855 feet below the top, suggests a Wilderness age for the lower unit. However cf. Bathyurus has also been found in the Eleanor River Formation, so that this lower unit may be equivalent to the Bay Fiord and perhaps also to the Eleanor River Formation of Section 1. The basal 600 feet of the upper unit yielded a Wilderness to Maysville fauna at the base and an Eden or Maysville fauna in the upper part. The contained faunas, combined with the unit's more resistant character, suggest correlation with the Thumb Mountain Formation.

In Washington Land, northwest Greenland, Troelsen (1950, p. 51) reports a succession of ledge-forming limestone formations of late Canadian age, comprising the Cape Weber Formation, 32 feet thick, and the overlying Nunatami Formation,

455 feet thick (Table 2). The fauna occurring in the upper part of the Eleanor River Formation on Cornwallis Island indicates a correlation with the Nunatami Formation. Together, the Cape Weber and Nunatami Formations comprise a succession of ledge-forming limestones, which lie above a disconformity considered to be equivalent to the Baumann Fiord Formation, and below a formation considered to correlate with the Bay Fiord Formation. It is probable that the Cape Weber and Nunatami Formations of nearby Washington Land correlate with the Eleanor River Formation of eastern Ellesmere Island although exact equivalence cannot be shown.

The Eleanor River Formation has been reported on southern Ellesmere Island and Devon Island where its lithology and occurrence are similar to that on Cornwallis Island and that within the study area. At Sydkap Fiord on southern Ellesmere Island, the uppermost 350 feet of the Eleanor River Formation is exposed (Glenister, 1963a, p. 288), and is overlain by a gypsiferous limestone which the writer considers to be the Bay Fiord Formation of the Cornwallis Group. The oldest beds are exposed above a talus-covered slope 380 feet high that possibly contains the recessive Baumann Fiord Formation. At Prince Alfred Bay, northwestern Devon Island, Thorsteinsson (1963c, p. 224) reports that the uppermost 100 feet of the Eleanor River Formation is underlain by the Grinnell thrust fault and is succeeded conformably by evaporite which is considered by the writer to be the Bay Fiord Formation. At Burnett Inlet, southern Devon Island, Glenister (1963c, p. 181) reports that the uppermost 650 feet of the Eleanor River Formation is exposed. It is underlain by a fault and overlain by gypsum which is considered by the writer to be the Bay Fiord Formation. The Eleanor River Formation was provisionally considered to be of Middle Ordovician age in those areas. Because these datings were provisional, and because the base was not observed, it is now considered probable that these outcrops belong to the Eleanor River Formation of late Early to early Middle Ordovician age.

In shelf regions a considerable distance to the south of the study area, rocks regarded to be equivalent to the Eleanor River Formation are underlain by a disconformity (Table 2). These are the Nadlo Point Formation at Dundas Harbour on southeastern Devon Island (Kurtz, McNair and Wales, 1952) and the Ship Point Formation of northwestern Baffin Island (Trettin, 1965b).

The Eleanor River Formation of late Early and early Middle Ordovician age, a thick, resistant, limestone unit, was deposited widely on Cornwallis Island, western Devon Island, and central to eastern Ellesmere Island. In the central regions of the geosyncline, where the thicknesses of this formation are greatest, and in nearby parts of the shelf to the east, it rests conformably upon evaporites of the Baumann Fiord Formation, or upon recessive beds that are probably equivalents of that formation. Farther to the southeast in the shelf regions of southeastern Devon Island and northern Baffin Island and, perhaps, also in the shelf regions of Washington Land, the equivalents of the Eleanor River Formation lie upon a regional disconformity. At Ella Bay, farther across the geosyncline to the north, it may also lie above a disconformity. The formation is overlain with apparent conformity throughout the report area by the recessive Bay Fiord Formation, which consists of thinly bedded, argillaceous, limestones and siltstones, in places containing gypsum in the lower part.

MIDDLE AND UPPER ORDOVICIAN

Cornwallis Group

The name Cornwallis Formation was provisionally used on Cornwallis Island by Thorsteinsson and Fortier (1954). It was later defined by Thorsteinsson (1958, p. 33), and at that time a type section of three members was established on the north tip of the Island. The lower member is evaporite. A thick and widespread evaporite that occurs on Ellesmere Island was subsequently mapped as the Cornwallis Formation (Thorsteinsson, 1963b, p. 386; Norris 1963b, p. 354; Thorsteinsson and Kerr, 1962). It is now known that rocks commonly assigned to the Cornwallis Formation on Ellesmere Island contain two evaporite horizons; the younger (in the Bay Fiord Formation) is equivalent to the basal Cornwallis Formation of the type section on Cornwallis Island and the older (the Baumann Fiord Formation) is distinctly older than any of the original type section. The miscorrelation on Ellesmere Island and elsewhere was corrected by Kerr (1967) who proposed the term Cornwallis Group. It comprises strata identical to rocks formerly regarded as the Cornwallis Formation on Cornwallis Island and its three formations are identical to the three members of the Cornwallis Formation. On Ellesmere Island it includes only the younger of the two evaporites. The three widely exposed formations which comprise the Cornwallis Group now are, in ascending order, the Bay Fiord, the Thumb Mountain, and the Irene Bay (Fig. 5 and Table 1).

A reference section for the Cornwallis Group and type sections of the included three formations is in Section 18, northeast of the head of Irene Bay on Ellesmere Island. Evaporites are rarely present in both the Baumann Fiord and Bay Fiord Formations in a single section although this occurs in Section 26 east of Irene Bay. The two evaporite units were recognized in this section by Thorsteinsson and Tozer (1957, p. 19), but were thought to be the same unit repeated by faulting.

The thickest complete section of the Cornwallis Group in the study area totals 4,450 feet, and occurs east of Trold Fiord (Section 36, Fig. 5). The Cornwallis Group and Eleanor River Formation combined is a trough-shaped body reaching 7,000 feet in thickness. The axis of this trough occurs along the southeastern side of the miogeosyncline; lesser maxima in the trough between Bay and Canyon Fiords reflect the persistence of the Bache Peninsula arch (Fig. 8).

The three formations of the Cornwallis Group can be traced in a belt extending some 600 miles from Bathurst Island through the study area. The formations maintain considerable lateral uniformity in the central and shelfward parts of the miogeosyncline (Kerr, 1967). Characteristic sections of the formations can be seen in Plate IV. The formations in their typical occurrences have distinctive lithologies and topographic expression as follows.

Irene Bay	-	greenish weathering, shaly limestone; recessive.
Thumb Mountain	-	rusty-weathering, dark grey limestone; forms massive bluffs.
Bay Fiord	-	Thinly bedded, shaly limestone, siltstone, anhydrite, dolomite; recessive.

Across the miogeosyncline to the northwest within the study area, a rapid facies change takes place. The entire Cornwallis Group becomes more shaly and silty, and the three formations become at first difficult and then impossible to distinguish. At Section 1, east-southeast of Ella Bay (Pl. I), the formations which were obvious in the central and southeastern parts of the miogeosyncline are barely distinguishable. Farther northwest in the Archer Fiord Anticline (Pl. V), and southeast of Tanquary Fiord (Section 8) the group is still more shaly and the formations could not be separated.

The age of the Cornwallis Group ranges from Middle to early Late Ordovician, according to the North American standard section (Table 1). The lowermost age limit (about Ashby) of the Group, is based upon the probability that the Eleanor River Formation is, in part, of Mohawkian age and also upon the presence of fossils of Wilderness age in the upper part of the Bay Fiord Formation (see below). The uppermost formation, the Irene Bay, is a thin, distinctive, greenish weathering, shaly limestone replete with fossils of the Arctic Ordovician fauna of Caradocian age (about Maysvillian).

Bay Fiord Formation

The Bay Fiord Formation (Kerr, 1967) is an extensive, recessive unit of Middle Ordovician age, which occurs at the base of the Cornwallis Group. Its thickness, at the type section northeast of the head of Irene Bay on Ellesmere Island (Section 18), is 1,650 feet, and thicknesses remain on this order of magnitude within the present study area. Unlike other formations of this group, the Bay Fiord Formation is characterized by mixed rock types and by marked lateral lithologic variations. The most common rock types are silty and shaly, thinly bedded, limestone; fine-grained, dolomitic limestone; light grey anhydrite; quartz siltstone and shales. Strata in the lower part of the Bay Fiord Formation indicate that deposition occurred in an evaporitic basin located along the shelfward side of the miogeosyncline. This evaporite basin seems to have been very broad in the region from southern Ellesmere Island to Cornwallis and Bathurst Islands, where halite may have been the major deposit. A narrow, restricted, arm of the evaporite basin extended into the study area (Figs. 5 and 9). Where evaporites occur in the lower part of the formation in the study area, the upper part of the formation is generally characterized by grey-green shales and siltstones; where evaporites are not present the formation generally consists of carbonate throughout. In isolated outcrops this association of grey-green shale and siltstone aids in distinguishing the formation from the Baumann Fiord Formation, which consists of a purer anhydrite, and is not associated with such shales and siltstones.

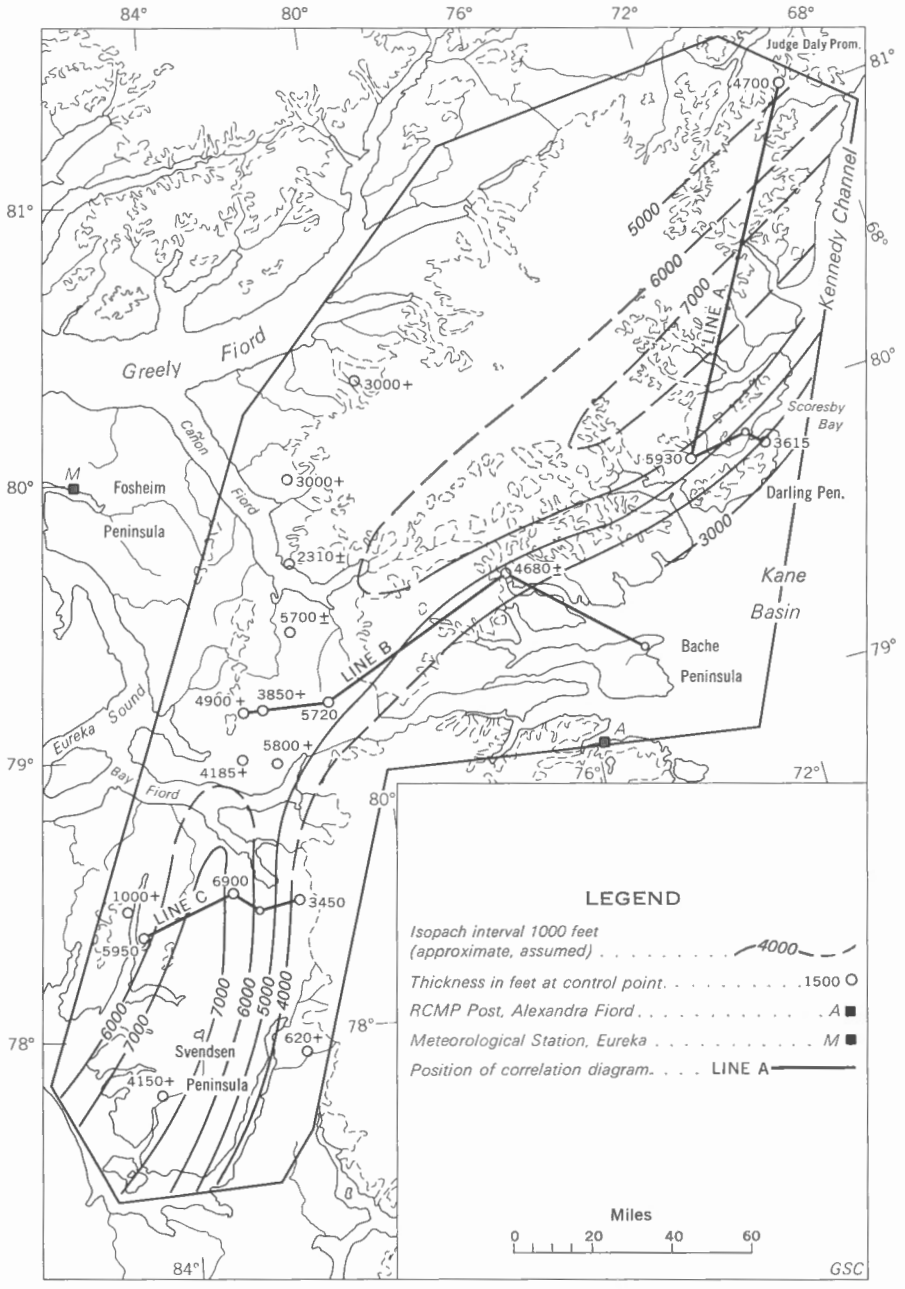

Figure 8. Isopach map of the combined Eleanor River Formation and Cornwallis Group, Ellesmere Island.

Distribution and Thickness

The Bay Fiord Formation usually was not separated from the undivided Cornwallis Group in geologic mapping because of the limited time available, but it was mapped separately in certain areas that were studied in detail. It is present as a distinct formation of the Cornwallis Group throughout the report area, except in the extreme northwest near Greely Fiord. In that region (Section 8) the group is undivided, although equivalents of the formation are probably represented. The Bay Fiord Formation could not be separately distinguished because of the preponderance of fine-grained clastic rocks in the Cornwallis Group. Thicknesses of the formation are listed below.

Locality	Thickness (feet)
Section 1	1,450
Section 6	1,700
Section 5	1,100
Section 8	?
Section 9	2,000 +
Section 10	?
Section 11	780 +
Section 13	1,300 ±
Section 18	1,650
Section 16	1,000
Section 17	1,800 ±
Section 24	1,550
Section 26	1,800 ±
Section 30	1,500
Section 34	1,700
Section 36	2,100
Section 39	500 +
Section 41	600 +
Section 45	1,300 +

Lithology and Variation

The Bay Fiord Formation, unlike the other formations of the Cornwallis Group in the study area, is comprised of various rock types, and exhibits marked lateral, as well as vertical, changes in lithology. It is a recessive unit lying conformably between competent limestone units of the underlying Eleanor River Formation and the overlying Thumb Mountain Formation. The Bay Fiord Formation is composed predominantly of fine-grained limestones that are thin-bedded, very shaly and silty, contain varying amounts of interbedded dolomitic limestone, mudstone, and anhydritic limestone. Lithologic variations in the formation are shown in Figure 5 (in pocket) and Figure 9. The anhydrite occurs only in the lower half of the formation and is restricted to a very narrow belt.

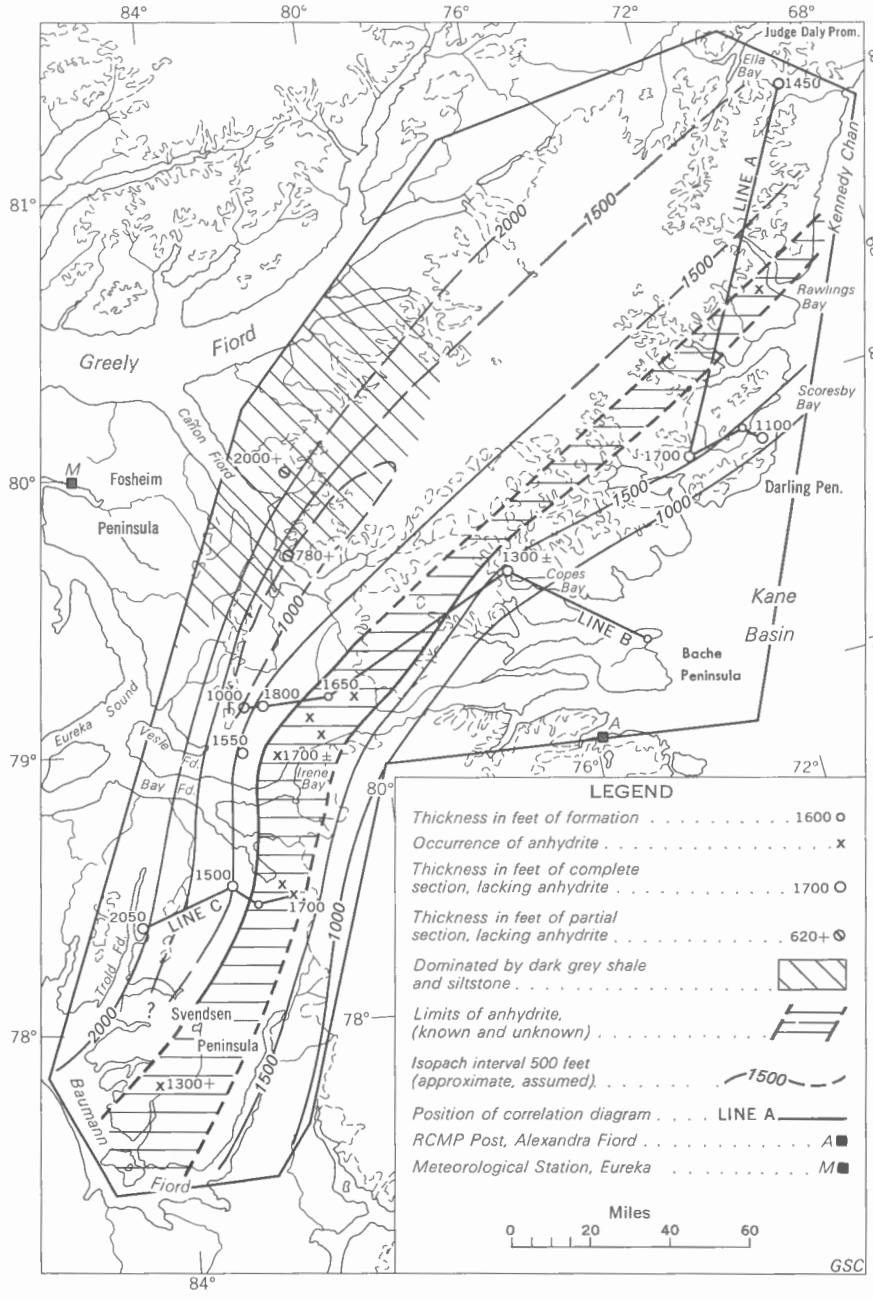

Figure 9. Isopach map of the Middle Ordovician Bay Fiord Formation of the Cornwallis Group, Ellesmere Island.

At the type section, northeast of the head of Irene Bay (Section 18), the Bay Fiord Formation is 1,650 feet thick, and occupies a poorly exposed, recessive interval between resistant limestone formations. The basal part, apparently conformable with the Eleanor River Formation, consists of 1,000 feet of argillaceous, fine-grained, thin-bedded, medium grey, yellow-grey-weathering limestone. Although anhydrite does not outcrop, it is considered to be present because gypsum is exposed along strike to the southwest. The limestone grades upward into the thin-bedded, medium dark green, non-calcareous, shaly siltstone and shale which comprises the uppermost 650 feet of the formation. It is overlain conformably by the Thumb Mountain Formation.

Restored sections of the Cornwallis Group, have been drawn at three places across the miogeosyncline in the study area (Fig. 5). Line A is farthest north. East of Ella Bay (Section 1, and Pl. I), the Bay Fiord Formation consists of 1,450 feet of recessive, very sandy and shaly, medium light grey, light yellow-grey-weathering, thin-bedded to laminated limestone. Southwest of Scoresby Bay (Section 6), the formation comprises 1,700 feet of limestone that is shaly and silty, dark grey, fine-grained, and thin- to medium-bedded. Although it is not present in the formation at either of the above sections, anhydrite is present in the formation between the sections in the vicinity of Rawlings Bay (Fig. 5). On Darling Peninsula (Section 5), the formation is composed of limestone, which is recessive, dark grey, fine-grained, shaly, thin- to medium-bedded, and contains shaly layers that weather yellowish.

Line B (Fig. 5) transects the central part of the report area. In the dome northeast of Vesle Fiord (Section 17) the Bay Fiord Formation comprises 1,800 feet of fine-grained, very shaly and silty, medium grey to grey-brown, yellow-grey-weathering, thin- to medium-bedded, limestone, with dark grey-green shaly intercalations. The entire succession is recessive. Anhydrite has not been observed within the Bay Fiord Formation in this vicinity and probably does not occur. North of Vesle Fiord (Section 16), the formation is a recessive unit 1,000 feet thick, comprising, fine-grained, very shaly and silty, thin-bedded, dark brownish grey, grey-brown-weathering limestone, interbedded with shale and siltstone. Near this line of section, 25 miles due south of the head of South Bay in Canyon Fiord, the Bay Fiord Formation was briefly examined. There it is recessive and is estimated to be 1,400 feet thick, comprising mainly medium grey, thinly bedded, shaly limestone with minor amounts of pinkish grey, limy mudstone. The type section northeast of the head of Irene Bay (Section 18) occurs on this line and has been described above. Southwest of, and on strike with, the type section to the southwest, anhydrite has been observed in the Bay Fiord Formation (Kerr, 1967). The anhydrite is part of a narrow belt which is also present a few miles to the east of Section 18 (Fig. 9). At Copes Bay (Section 13) Thorsteinsson (1963b, p. 392) reports that his unit (ii) comprises recessive-weathering, light grey, calcareous shale, interbedded with medium light grey to dark grey limestone and argillaceous limestone, with minor amounts of light olive-grey to medium dark-grey, fine-grained dolomite. The writer considers that unit to be the Bay Fiord Formation, and estimates from

vertical air photographs that its thickness there is about 1,300 feet. West of Copes Bay the narrow belt of evaporites is not present.

Line C is in the southern part of the report area (Fig. 5). East of Trold Fiord (Section 36), 2,100 feet of beds that can be separated into two units have been assigned to the Bay Fiord Formation. The lower, 1,250 feet in thickness, is recessive and comprises light grey, fine-grained, thin- to medium-bedded limestone, interbedded with much medium grey, quartz siltstone, and minor amounts of light-grey, slightly pinkish, lithographic limestone. The upper unit. 850 feet thick, consists of dolomite that is sugary, medium-grained, light grey or light grey-brown, medium-bedded, light yellowish grey weathering. Intercalated beds of black, vuggy, medium-grained limestone are common. The upper unit was assigned to the Bay Fiord Formation because it consists mainly of dolomite, even though it is quite resistant and occurs in the lower part of a bluff that is formed mainly by the overlying Thumb Mountain Formation. On north-central Svendsen Peninsula (Section 30) 1,500 feet of rock have been assigned to the Bay Fiord Formation. It is recessive, sugary, thin- to medium-bedded, dark grey-brown, yellow-orange-weathering dolomite. Erosion is not deep enough to expose the formation south of the head of Strathcona Fiord (Section 32). Farther east (Section 34) the Bay Fiord Formation is 1,700 feet in thickness and, as elsewhere, is recessive. The lower half is composed of limestone that is shaly, fine-grained, dark grey, thin-bedded, anhydritic, containing minor amounts of chert-pebble conglomerate, and exhibits brecciation and crumpling. The upper half is also composed of limestone but with much non-calcareous, dark grey shale. Between these two latter sections anhydrite occurs as a narrow band in the lower part of the Bay Fiord Formation. The anhydrite unit within the formation outcrops above the high-angle reverse fault southeast of the head of Strathcona Fiord.

The Bay Fiord Formation comprises a heterogeneous assemblage of generally recessive-weathering, shallow-water rocks, consisting of shaly and silty limestone, siltstone, greenish shale, dolomite and anhydrite. It is overlain and underlain conformably by thick, resistant limestone units. Isopachs (Fig. 9) indicate that the formation is trough-shaped. Thicknesses of the formation in this trough reach a maximum of 1,650 feet (Section 18), whereas the thickness decreases to as little as 1,100 feet towards the east (Section 5) and 1,000 feet towards the west (Section 16). In early Bay Fiord time anhydrite was deposited in a narrow, partially-restricted belt along the eastern margin of the miogeosyncline. Figure 9 shows the occurrences of anhydrite and their limits in the Bay Fiord Formation. Thicknesses south of Bay Fiord suggest that the depositional basin was open to the southwest and that the Bay Fiord evaporites connect with evaporite occurrences in the region of Grinnell Peninsula, Cornwallis Island and Bathurst Island. Normal sections of the Bay Fiord Formation in the study area consist almost entirely of thinly bedded limestone with some dolomite. However, along the narrow belt where anhydrite and anhydritic limestone comprise the lower one-half of the formation, the upper one-half is composed of calcareous and non-calcareous siltstone and shale, generally grey-green and soft.

In the Canyon Fiord region the formation can be traced farther to the northwest where the shaly and silty clastic components become predominant. In that region

the lithology of the formation changes to dark grey and dark grey-green, dolomitic, siliceous mudstone in Section 11, and to thin, interbedded, very shaly, dark grey limestone and black calcareous shale in Section 9. In the region south of Bay Fiord the evaporite trough is again bounded on the west by carbonates consisting mainly of thinly bedded dolomite. There the clastic component is small and the relative proportions of dolomite and limestone are the reverse of that to the north. In the Archer Fiord anticline far to the north, the Cornwallis Group is undivided (Pl. V). There, equivalents of the Bay Fiord Formation like other parts of the group, are probably dark grey, calcareous shale and siltstone.

In Bay Fiord time broad, shallow seas prevailed throughout most of the report area and thinly-bedded, shaly and silty limestones with some dolomite were deposited extensively. Along the eastern side of the miogeosyncline there developed a more restricted linear belt. In this region the lower part of the formation now contains anhydrite and the upper part mainly grey-green shale and siltstone. Variable amounts of limestone and dolomite border this line or belt on the west and east. In the extreme northwestern regions the entire formation grades into shaly limestone and argillite, and that region is interpreted as one of deeper water deposition near the eugeosyncline.

Age and Correlation

The Bay Fiord Formation is sparsely fossiliferous, but is considered to be of Middle Ordovician and about Ashby to Wilderness age. It has yielded a fauna including Arcturia sp. ?, Maclurites sp., and Gonioceras sp., from talus about 400 feet from the top on Darling Peninsula (Section 5, GSC loc. 47670), and this fauna has been dated as of Wilderness age by G.W. Sinclair. Bryozoans, Rafinesquina sp., Hebertella sp., and indeterminate cephalopods occur in place at a height of 400 feet below the top of the formation at the head of Svarte Fiord (Section 45; GSC loc. 47711). This fauna has been dated by Sinclair as Middle or Late Ordovician. A collection from talus thought to come from close to the top of the Bay Fiord Formation at the head of Starfish Bay (Section 39, GSC loc. 51911), contains Rhinidictya sp., Rafinesquina sp., and Liospira sp. Sinclair considers that this fauna is of Middle Ordovician age, and that it is probably Trentonian. Gonioceras sp. occurs in talus of this recessive formation in Section 6, and in Section 13 (Thorsteinsson, 1963b, p. 393) and, within the report area, Gonioceras has been found in no other formation. Identification of the Bay Fiord Formation within the report area has been made largely by the walking out of beds, and from the position of this formation within a very distinctive stratigraphic succession. Because of the sparseness of fossils and the variability of the lithology, these two latter criteria have been used to a lesser degree.

At Sydkap Fiord on southern Ellesmere Island Glenister (1963a, p. 287) reported a succession of carbonates (700 feet thick) containing some gypsum and shale and he considered the succession to be a lower member of the Cornwallis Formation. It occupies a similar stratigraphic position to the Bay Fiord Formation and strongly resembles the lithology of that formation at its nearest locality at the

head of Svarte Fiord (Section 45). Moreover, a species of Gonioceras occurs in the talus of this formation or slightly above it at Sydkap Fiord. He reports a similar gypsiferous member in the same stratigraphic position at Burnett Inlet on southern Devon Island (Glenister, 1963c, p. 182). The present writer considers the gypsiferous member described by Glenister at Sydkap Fiord and at Burnett Inlet to be the Bay Fiord Formation. At Prince Alfred Bay on Grinnell Peninsula Thorsteinsson (1963c, p. 223) reports the presence of a thin-bedded succession, his units 1 to 3, which, in stratigraphic position and sequence of lithology, are remarkably like the Bay Fiord Formation of central Ellesmere Island. At Prince Alfred Bay, the sequence, in ascending order is: 270 feet of thin-bedded gypsum; 610 feet of gypsum interbedded with greenish grey siltstone, the gypsum decreasing upwards; 195 feet of greenish grey to dark grey, calcareous siltstone, grey, calcareous, shale and argillaceous limestone. No fossils were found, but because of the lithology and stratigraphic position, the writer regards these three units as the Bay Fiord Formation. Greiner, (1963, p. 210), reports a "Gypsiferous Member" of the Cornwallis at Haughton Dome on northern Devon Island, where it is 690 feet thick. The lowermost 390 feet is mainly gypsum, and the remainder is composed largely of dolomite, dolomitic shale, and gypsiferous shale. Because of its age and stratigraphic position the writer considers this member to be the Bay Fiord Formation.

On Cornwallis Island the basal 800 feet or so of the Cornwallis Formation is recessive (Thorsteinsson, 1958, p. 35). It comprises, at the base, 100 feet of interbedded gypsiferous shale, gypsum, and limestone, overlain by approximately 200 feet of relatively pure gypsum which, in turn, is overlain by discontinuous exposures of greyish green siltstone and shale. Elsewhere this interval is marked by a collapse breccia, beneath which Thorsteinsson (1958, p. 38) believes salt may have been removed by solution. On the basis of its distinctive lithology and stratigraphic position, the writer considers this part of the original Cornwallis Formation to be equivalent to the Bay Fiord Formation of the re-defined Cornwallis Group. The Bathurst Caldonian well R.J.-34, drilled at Long. 98° 30' W., Lat. 75° 40' N. on Bathurst Island by Dominion Explorers - Canso et al., passed through 3,273 feet of halite below a depth of 6,727 feet[1]. This halite is probably part of the Bay Fiord Formation. In western Melville Island rocks equivalent to the Bay Fiord Formation are represented in the Ibbett Bay Formation (Tozer and Thorsteinsson, 1964). That formation consists of dark grey to black shale, calcareous shale, argillite, dolomite, chert, and minor amounts of limestone, about 3,000 feet thick, and spans early Ordovician to late Silurian time (Table 2).

At Dundas Harbour on southeastern Devon Island, the Middle Ordovician Crocker Bay Limestone is at least 1,390 feet thick (Kurtz, McNair, and Wales, 1952, p. 642). The lower 290 feet is shaly and recessive, commonly containing flat-pebble conglomerates and some beds of well-rounded, limestone pebbles. This lower part is probably the equivalent of the Bay Fiord Formation (Table 2). In Washington Land of northwest Greenland, Koch (1929) reports the Cape Webster Formation to be of

[1]This information is courtesy of United Canso Oil and Gas Ltd., Calgary, Alberta.

Chazyan age. The formation is a recessive unit comprising limestones, shales, and minor amounts of intraformational conglomerates, that occurs between resistant limestone units. It is probably the lateral equivalent of the Bay Fiord Formation.

The Bay Fiord Formation in the southeastern Queen Elizabeth Islands and northwest Greenland comprises thinly bedded, shaly limestones, shales and silty dolomites, indicating that seas were shallow but widespread. In early Bay Fiord time anhydrite was deposited in a broad evaporite basin in the region occupied by Cornwallis Island, western Devon and southwestern Ellesmere Islands. The basin was restricted to a narrow belt in the present report area (Fig. 9). In southern parts of the present report area the formation changes westward, to consist predominantly of dolomite and minor amounts of limestone. In the central and northern parts of the report area it changes westward to shaly limestone, interbedded with abundant shale and siltstone and minor amounts of dolomite. Where anhydrite is present in the lower half of the formation, greenish grey shale and siltstone comprise the predominant part of the upper half of the formation, indicating that shallow waters were still prevalent in that locality. This evaporitic basin, which was a more restricted part of the Franklinian miogeosyncline, narrowed considerably to the northeast in central and eastern Ellesmere Island, and does not appear to have been present in Washington Land, or southeastern Devon Island. However, limestone flat-pebble conglomerate and beds of rounded limestone pebbles in equivalent rocks of these two latter areas, suggest a shallowing of the sea accompanying the development of an evaporitic basin to the north and west. Rocks equivalent to the Bay Fiord Formation may be absent from northwestern Baffin Island, where uplift and erosion took place during this time. Trettin (1965b) reports uplift and unconformity between the early Middle Ordovician Ship Point Formation, and the late Middle Ordovician Baillarge Formation (Table 2).

Thumb Mountain Formation

The Thumb Mountain Formation (Kerr, 1967) is an extensive, bluff-forming limestone unit of Middle Ordovician (Caradocian) age, which occurs in the middle part of the Cornwallis Group and lies conformably between recessive formations. The name was chosen because Thumb Mountain, a prominent, isolated peak at the head of Irene Bay, is composed of the formation. The Thumb Mountain Formation is discernible in the type section of the Cornwallis Formation on northern Cornwallis Island (Thorsteinsson, 1958, p. 35), where it comprises the larger part of a 1,700-foot unit of limestone and dolomite. It also is widely exposed on eastern Bathurst Island. A type section for the Thumb Mountain Formation (Section 18) occurs in the report area northeast of the head of Irene Bay, where the formation is 1,500 feet thick. Normally the formation is characterized in the central part of the miogeosyncline by rather uniform lithology comprising thick-bedded, dark grey-brown, argillaceous limestone, which weathers slightly rusty grey and forms bluffs (Pl. IV). In westerly exposures (Section 9), north of Caledonian Bay, the lithology of the formation has changed to thin-bedded, dark grey, argillaceous, and extremely cherty limestone. Fossils, always sparse in the formation, were collected mainly from the upper part, and all are representatives of the so-called Arctic Ordovician fauna, of Middle or Late Ordovician age. In this report the formation is considered to be of

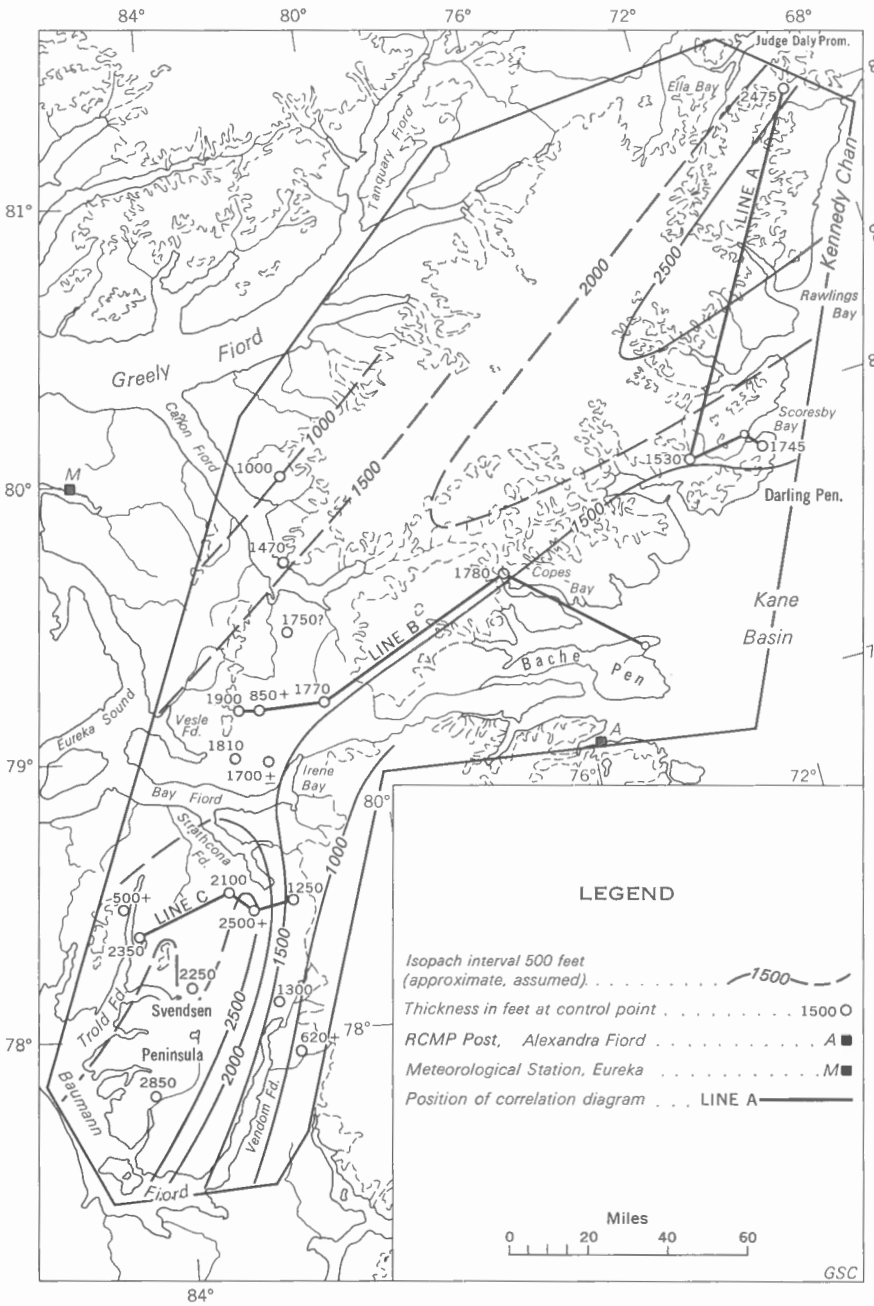

Figure 10. Isopach map of the combined Thumb Mountain and Irene Bay Formations of the Cornwallis Group, Ellesmere Island.

late Middle and early Upper Ordovician age in North American terminology and late Caradocian in European terminology (Table 1), partly because of the ages of underlying and overlying rocks.

Distribution and Thickness

The Thumb Mountain Formation, a thick, bluff-forming limestone, can be recognized as a distinct formation of the Cornwallis Group throughout most of the report area. The formation is overlain conformably by the Irene Bay Formation, a thin, shaly, recessive limestone unit. Shale intercalations in the Thumb Mountain Formation increase in abundance across the geosyncline to the north and west, effectively thickening the Irene Bay Formation at the expense of the Thumb Mountain Formation. Where this change is extreme (Sections 1, 9, and 36), it is difficult or impossible to separate the two formations, and together they outcrop as a limestone bluff. Farther across the geosyncline the group becomes even more shaly, and none of the comprising formations are distinguishable (Archer Fiord anticline, Pl. V)and Section 8. The Thumb Mountain Formation is absent in the region of Bache Peninsula, because rocks of this age have been removed by erosion. Thicknesses of the Thumb Mountain are listed below.

Locality	Thickness (feet)
Section 1	2,475 (probably includes Irene Bay equivalents)
Section 6	1,380
Section 5	1,000
Section 8	(Cornwallis Group undivided here)
Section 9	1,000 (probably includes Irene Bay equivalents)
Section 10	?
Section 11	1,330
Section 12	600 +
Section 13	1,600 ±
Section 18	1,500
Section 16	1,400 ±
Section 17	850 ±
Section 24	1,600
Section 26	1,500 ±
Section 30	1,950
Section 32	2,500 ±
Section 33	750 +
Section 34	1,100
Section 35	1,000 (probably includes Irene Bay equivalents)
Section 36	2,350
Section 39	1,850

Locality	Thickness (feet)
Section 41	1,100
Section 44	500 +
Section 45	2,600
Section 48	700 +

An isopach map of the combined Thumb Mountain and Irene Bay Formations has been constructed (Fig. 10). These two formations are intimately related and, in places, the Irene Bay Formation grades into the Thumb Mountain and is indistinguishable from it. Isopachs of the combined formations show a trough-shaped pattern with a belt of maximum thickness trending northeasterly along the miogeosyncline. The measured thicknesses of the formation in this trough reach 2,850 feet at the head of Svarte Fiord (Section 45), and are probably equally great south of Ella Bay. The formation becomes markedly thinner between Canyon and Bay Fiord, where maximum combined thicknesses are on the order of 1,800 feet (Section 24). The decreased thickness in the central part of this trough, which approximately coincides in position with a thinning of the entire Cornwallis Group and Eleanor River Formation (Figs. 5 and 8), probably reflects a westward continuation of the small positive influence of the Bache Peninsula arch.

Lithology and Variation

At the type section northeast of Irene Bay (Section 18) the Thumb Mountain Formation forms a bluff, comprising 1,500 feet of argillaceous, slightly dolomitic, dark grey-brown, generally thick-bedded, medium grey-brown-weathering limestone, that is often mottled to a slightly rusty orange colour. It rests conformably upon the Bay Fiord and is overlain conformably by the Irene Bay, both of which formations are recessive. The gross lithology and topographic expression of the Thumb Mountain Formation in central and southeastern parts of the miogeosyncline (Pl. IV) remains similar to that of the type section, although to the northwest it becomes more shaly and less resistant.

Restored sections have been drawn across the miogeosyncline (Fig. 5) at three places to show the lithology and variations of the Thumb Mountain Formation. East-southeast of Ella Bay (Section 1, Pl. I), the Thumb Mountain Formation is 1,800 feet thick, and comprises thick-bedded and bluff-forming, argillaceous limestone and minor amounts of dolomitic limestone. It is dark grey in colour, or mottled dark grey and grey-brown, weathers yellow-grey, and is difficult to separate from the overlying Irene Bay Formation which is thicker than usual in this section. Southwest of Scoresby Bay (Section 6), a typical section of bluff-forming limestone, 1,380 feet thick, has been assigned to the Thumb Mountain Formation. These strata consist of limestone which is medium dark grey, fine-grained, thin-bedded to massive, slightly rusty grey-brown-weathering, and slightly greenish along shaly layers. On Darling Peninsula (Section 5), the formation is 1,000 feet thick and exhibits the typical lithology consisting of rusty-weathering, bluff-forming limestones.

The Thumb Mountain Formation shows considerable constancy in thickness and lithology along Line C, which trends through the reference section in the central part of the report area. It consists of about 1,400 feet of bluff-forming limestones north of Vesle Fiord (Section 16), and 1,500 feet of the same rocks at the reference section (Section 18). At Copes Bay (Section 13), Thorsteinsson (1963b, p. 393) reports that his unit (iii), which the writer assigns to the Thumb Mountain Formation, comprises limestone that is dark grey, aphanitic to fine grained, thin-bedded to massive, and weathers pale yellowish orange and dark grey.

Southward from the type section the Thumb Mountain continues as a resistant formation and generally retains its uniform lithology; however, thicknesses vary considerably across the geosyncline. A line of columnar sections (Fig. 5, Line C), has been drawn across Svendsen Peninsula. Southeast of Strathcona Fiord (Section 34), the formation comprises 1,100 feet of bluff-forming, thick-bedded to massive, fine-grained, dark grey, slightly rusty medium-grey-weathering limestone. On northeastern Svendsen Peninsula (Section 32), 2,500 feet of rock have been assigned to the formation, and the base is not exposed. It consists of medium grey, lithographic to fine-grained, thin- to medium-bedded, sometimes massive, yellowish-grey-weathering limestone. These beds are rusty-weathering in the basal and upper parts, and very petroliferous throughout. On north-central Svendsen Peninsula (Section 30),1,950 feet of limestone and dolomite have been assigned to the formation and there, can be separated into four units, all of which are bluff-forming. Unit 1 at the base consists of 250 feet of limestone, that is medium to dark grey, coarse, fucoidal, thin- to medium-bedded, medium grey weathering, and faintly rusty. Unit 2 consists of dolomite, that is dark grey-brown, medium-bedded, and dark chocolate brown weathering. Unit 3 comprises 700 feet of limestone, that is dark grey, fine-grained, medium-bedded, medium light grey weathering with marked rusty orange staining. Unit 4, the uppermost, consists of 550 feet of shaly, dark grey, medium- to thick-bedded, yellowish-orange-weathering limestone, containing some interbedded green shaly layers. East of Trold Fiord (Section 36), the Thumb Mountain Formation is a 1,300-foot thick, bluff-forming unit composed of argillaceous, very fine-grained, medium- to thick-bedded, dark grey, rusty-brown-weathering limestone with rusty streaks. It can be barely distinguished from an overlying limestone bluff, in which are interbedded abundant black or greenish shale layers containing large fossils, and which has been assigned to the Irene Bay Formation. The abnormally thin succession assigned to the Thumb Mountain Formation east of Trold Fiord is due to the increase in thickness of the Irene Bay Formation at the expense of the Thumb Mountain. However, the thickness of the two formations combined is normal. Farther west in an overturned section (Section 35), a considerable thickness of strata of the Cornwallis Group is exposed, but only the uppermost 500 feet was examined. These beds consist of bluff-forming, dark grey, shaly limestone interbedded with black shale which is particularly common at the top. These strata have been assigned to the undivided Thumb Mountain and Irene Bay Formations.

East of Vendom Fiord (Section 44, and Pl. IV), the uppermost 500 feet of the Thumb Mountain Formation is exposed and consists of typical bluff-forming, medium grey limestone. It is overlain by the thin, recessive, Irene Bay Formation. At the head of Vendom Fiord (Section 41), the Thumb Mountain Formation comprises 1,100

feet of bluff-forming, lithographic to fine-grained, thick-bedded to massive, medium grey, medium light-grey-weathering limestone. Westward at the head of Starfish Bay (Section 39), the 1,850 feet of bluff-forming limestone which comprises the formation, is medium- to thick-bedded, medium grey, and weathers yellow grey. At the head of Svarte Fiord (Section 45), the formation has increased in thickness to its maximum of 2,600 feet. It is there divisible into three units and has retained its resistant nature. The lowermost unit is 700 feet thick and is composed of limestone, which is fine-grained, very shaly to silty, dark greyish brown, dark chocolate-brown-weathering, ledge-forming, medium-bedded, with interbedded thin, shaly layers that weather yellowish grey. The middle and main unit forms the most pronounced bluffs and is composed of thick-bedded to massive limestone that is fine-grained, medium grey-brown, rusty medium-grey-weathering, and often exhibits rusty streaks. An upper unit comprises 400 feet of resistant limestone that is fine-grained, medium-bedded, rusty-weathering, with a small amount of interbedded, thin, greenish shaly layers

Age and Correlation

Fossils are rare in the Thumb Mountain Formation of the study area but are most common near the top. The following collections were identified and dated by Sinclair. A collection from beds 250 feet from the top of the formation in Canyon Fiord south (Section 11, GSC loc. 47656), includes Arcturia sp., Calapoecia sp., and an indeterminate ostracod. Streptelasma sp., Receptaculites sp., and trilobite fragments were collected from within a few feet of the top of the formation southeast of the head of Strathcona Fiord (Section 33, GSC loc. 51967). In the southeastern part of Svendsen Peninsula (Section 48, GSC loc. 47714), beds 400 feet below the top of the formation yielded Catenipora sp., and Calapoecia ?. Receptaculites sp. and Maclurites sp. have been found sporadically in float throughout the formation at a number of localities, but were rarely collected. From its contained faunas Sinclair could date the formation only as Middle or Upper Ordovician in age. These genera have all been reported in the so-called Arctic Ordovician fauna. According to Thorsteinsson (1963a, p. 38), this fauna usually appears first in the upper few hundred feet of the middle member of the Cornwallis Formation, a position that is identical with the upper few hundred feet of the present Thumb Mountain Formation of the Cornwallis Group. He also reports that the fauna is abundantly represented and generally well preserved in rock which the writer has named the Irene Bay Formation of the Cornwallis Group (Kerr, 1967). The writer follows Thorsteinsson (1963a, p. 39), who regarded the Arctic Ordovician fauna as late Caradocian (about Maysvillian) in age. The abrupt upper contact of the Cornwallis Group (Formation) is considered to represent the approximate boundary between the Middle Ordovician (Caradocian) and the Upper Ordovician (Ashgillian) of the European standard section. Since the Thumb Mountain Formation rests with conformity upon the Middle Ordovician Bay Fiord Formation, is overlain by the Irene Bay Formation, and contains the Arctic Ordovician fauna, its age is considered to be of about Barnveld and Edenian, or late Middle and early Upper Ordovician with respect to the North American standard section (Table 1).

Mapping and correlating of the Thumb Mountain Formation within the study area is based to some degree upon its containing the Arctic Ordovician fauna in its upper part. It is based to a much larger degree upon its distinctive lithology and bluff-forming topographic expression (Pl. IV), as well as upon its stratigraphic position conformable beneath the distinctive Irene Bay Formation.

Rocks equivalent in age to the Thumb Mountain Formation are not exposed in the shelf region on Bache Peninsula and may have been removed by erosion. Lower Palaeozoic rocks of a thin shelf succession on the south side of Mackinson Inlet in southeastern Ellesmere Island were examined briefly. A unit about 500 feet thick of dark grey, shaly limestone, was tentatively assigned to the Thumb Mountain Formation.

The Thumb Mountain Formation is recognizable from the descriptions in several reported occurrences of the Cornwallis Group elsewhere in the islands (Kerr, 1967). At Sydkap Fiord mid-way along the south coast of Ellesmere Island, Glenister (1963a, p. 289) reports the presence of a Limestone Member of the Cornwallis Formation, which from its lithology, stratigraphic position, and fauna, appears to be the Thumb Mountain Formation. The Thumb Mountain Formation is represented at Haughton Dome on northern Devon Island by the Carbonate Member of Greiner (1963, p. 211), and at Prince Alfred Bay by unit 4 of the Cornwallis Formation of Thorsteinsson (1963c, p. 224). At Burnett Inlet about midway along the south coast of Devon Island, Glenister (1963c, p. 182) reports the presence of the lowermost 510 feet of a unit which he refers to as the Limestone Member of the Cornwallis Formation, and which the writer considers to be the lower part of the Thumb Mountain Formation. Between Herschel Bay and Rigby Bay on southwestern Devon Island the uppermost 733 feet of the Thumb Mountain Formation comprises intermixed limestone and dolomite as well as limestone, and represents subdivisions 1 and 2 of Glenister and Thorsteinsson (1963, p. 197).

The Thumb Mountain Formation is the most widely exposed formation of the Cornwallis Group. It is present on northern Cornwallis Island in the type section of the original Cornwallis Formation where it comprises a bluff-forming succession of tan, sugary dolomite, about 1,500 feet thick. It rests gradationally upon greenish shales and siltstones of the upper part of the Bay Fiord Formation, and is overlain abruptly but conformably by the Cape Phillips Formation. It is locally overlain unconformably by the Disappointment Bay Formation. Elsewhere on Cornwallis Island the formation consists of bluff-forming limestone with minor amounts of dolomite. A preponderance of dolomite in the formation on northernmost Cornwallis Island is considered to be the result of surficial dolomitization in Disappointment Bay time for, where the formation is overlain by the Disappointment Bay Formation, it is generally composed of dolomite. Rocks on Cornwallis Island presently assigned to the Thumb Mountain Formation have yielded faunas from the uppermost 500 feet, and these are representative of the Arctic Ordovician fauna.

The Thumb Mountain Formation is widely exposed on eastern Bathurst Island (Kerr and Temple, in preparation) where it lies conformably below the recessive Irene Bay Formation and, again characteristically, forms bluffs. The formation generally comprises dolomitic limestone with some dolomite, except in the southern

end of the Driftwood Bay structure, where the formation consists entirely of dolomite and is overlain unconformably by the Disappointment Bay Formation. No complete section is exposed on Bathurst Island but. at Driftwood Bay, the thickness is 1,800 feet. The Dominion Explorers -- Canso et al., Bathurst-Caledonian well R.J.-34 penetrated a 2,020-foot section composed mainly of dolomite with some limestone and shale [1], and the writer considers this to be the Thumb Mountain Formation.

At Dundas Harbour Kurtz, McNair, and Wales (1952, p. 640), report the presence of at least 1,390 feet of beds belonging to the Middle or possibly Upper Ordovician Crocker Bay limestone. The uppermost 1,100 feet of their measured section, which is a bluff-forming, fine-grained, light brownish grey, medium- to thin-bedded limestone yielding Maclurites sp., and Receptaculites arcticus, may be the lateral equivalent of the Thumb Mountain Formation (Table 2). Troelsen (1950) examined Ordovician rocks of Washington Land in northwest Greenland, and summarized earlier reports on the basis of his new investigations. He restricted the Cape Calhoun Formation to the upper part of that formation as it was originally considered by Koch, (1929) and Troedsson (1926); and he assigned the lower part to the Gonioceras Bay Formation, enlarging that formation which was originally described by Troedsson. At this time the Gonioceras Bay Formation appears to embrace 240 meters (about 970 feet) of dense, bluff-forming rocks which include the Gonioceras Bay Formation and the lowermost two units of the Cape Calhoun Formation of Koch (1929). Troelsen (1950, p. 57), feels that this formation is of Mohawkian (i.e., Middle Ordovician) age. A thin, unique succession of rock at Irene Bay which Troelsen (1950, p. 58) considers to the Cape Calhoun Formation in the restricted sense, is the Irene Bay Formation of this report. The Irene Bay Formation comprises a thin, recessive, greenish-weathering, fossiliferous, shaly limestone, resting conformably upon the Thumb Mountain Formation. The writer considers that the Thumb Mountain Formation, based on its age, lithology, and stratigraphic position both beneath and above distinctive formations, is correlative with, co-extensive with, and lithologically similar to the re-defined Gonioceras Bay Formation of Troelsen (1950).

Irene Bay Formation

The Irene Bay Formation (Kerr, 1967) is the name applied to a thin succession of generally recessive, thinly bedded limestone with some interbedded shale, which is extensively exposed in the Arctic Islands. It yields good collections of very large fossils of the so-called Arctic Ordovician fauna of about Maysvillian age. In the central and eastern parts of the study area the occurrences are considered typical of the formation. The strata have a distinctive greenish colour where weathered, a recessive nature (Pl. IV), and a consistent thickness of about 200 feet. Rarely, local abnormally thick sections are as much as 745 feet. The formation gradually increases in thickness at the expense of the Thumb Mountain Formation westward and northward across the geosyncline.

[1] This information is courtesy of United Canso Oil and Gas Ltd., Calgary, Alberta.

Distribution and Thickness

The Irene Bay Formation is present as a distinct formation of the Cornwallis Group throughout the report area (Fig. 5), except in the extreme north at Ella Bay (Archer Fiord Anticline, Pl. V) and west near Greely Fiord (Section 8). In those areas both the Irene Bay and Thumb Mountain Formations include increasing amounts of black shale, and the two formations are inseparable in the undivided Cornwallis Group. The Thumb Mountain and Irene Bay Formations are everywhere intimately related, and were combined in the construction of an isopach map (Fig. 10). Thicknesses of the Irene Bay Formation are listed below.

Locality	Thickness (feet)
Section 1	675
Section 6	150
Section 5	745
Section 8	? (included in the undivided Cornwallis Group)
Section 9	? (included in the undivided Thumb Mountain and Irene Bay Formations)
Section 11	140
Section 12	550
Section 13	180
Section 18	270
Section 16	200 ±
Section 24	210
Section 25	200
Section 30	150
Section 32	275
Section 33	150
Section 34	150
Section 35	? (included in the undivided Cornwallis Group)
Section 36	1,050
Section 39	400
Section 41	200
Section 43	100 +
Section 44	120
Section 45	250
Section 47	200
Section 48	550

Lithology and Variation

The type section of the Irene Bay Formation in the reference section of the Cornwallis Group (Section 18) occurs about 21 miles north 25 degrees east of the

head of Irene Bay on central Ellesmere Island. It is there included as part of a conformable succession. The type section of the formation comprises 270 feet of limestone which is dark grey, fine-grained, thinly bedded and contains abundant interbedded thin, shaly layers which weather yellow-green and stain the entire formation faintly greenish. The formation is soft and forms a pronounced recessive part of the succession between bluffs of the underlying Thumb Mountain Formation and the overlying undivided Allen Bay and Read Bay Formations. Abundant large fossils weather out and are particularly numerous in the shaly layers.

The same lithology and topographic expression that is present in the type section of the Irene Bay Formation occurs in exposures of the formation in central and southeastern parts of the miogeosyncline within the report area, where the formation is generally uniform throughout and cannot be separated into units (Pl. IV). At two localities within those regions, however, the formation is abnormally thick and contains more than the usual amounts of greenish-weathering, soft, limy shale. Section 12 at the head of Canyon Fiord is such a locality and the formation there consists of 550 feet of thinly bedded limestone with large amounts of greenish, calcareous shale. On Darling Peninsula (Section 5), the formation has an abnormal thickness of 745 feet, and is typically very shaly. The recognizable units in the Darling Peninsula section are as follows, unit 1 being at the base:

Unit 5. 90 feet of limestone, grey-brown; some greenish-weathering shale layers; (GSC loc. 47672).
Unit 4. 100 feet of limestone, very shaly, thinly bedded; interbedded with much limy, dark grey shale; interval weathers grey-green and is very recessive; (GSC loc. 47671).
Unit 3. 305 feet of limestone, thinly bedded, shaly; with green shale layers weathering grey-green, recessive.
Unit 2. 125 feet of limestone, grey-brown, rusty-weathering, resistant.
Unit 1. 125 feet of limestone, shaly, dark grey, thinly bedded, greenish-grey weathering, fairly resistant; with recessive shale intercalations.

In the northwestern and western parts of the miogeosyncline in the report area, the Irene Bay Formation becomes thicker and often is indistinguishable as a separate formation of the Cornwallis Group. The interbedded greenish, shaly layers are replaced westward by beds of dark grey to black shale, which suggests a closer approach to the eugeosyncline. East-southeast of Ella Bay (Section 1), and east of Trold Fiord (Section 36), the lithology of the Irene Bay Formation is transitional between the normal occurrences in central to eastern parts of the miogeosyncline, and sections farther across the miogeosyncline in the western part (Sections 8 and 9). East of Ella Bay (Section 1, and Pl. I) the formation can be separated from the underlying Thumb Mountain Formation because of the presence in the Irene Bay of more shaly beds, more abundant fauna, and because it is more readily weathered. It there comprises 675 feet of moderately resistant, medium-bedded limestone which is shaly, fine- to medium-grained, dark grey, and weathers medium grey. East of Trold Fiord (Section 36), the Irene Bay Formation is 1,050 feet thick and is a resistant, medium- to thick-bedded, dark grey limestone which weathers rusty-brown and contains interbedded fossiliferous, silty shale layers. It is separable from the under-

lying Thumb Mountain Formation there because of its contained black and, in places, greenish silty shale layers, and the more common occurrence of fossils. On the north side of Caledonian Bay (Section 9), the Irene Bay and Thumb Mountain Formations are indistinguishable and together comprise 1,000 feet of rock. Equivalents of the Irene Bay Formation are probably represented in the upper part of the unit, which comprises thinly-bedded, silty and cherty, dark grey to black, medium grey-weathering, limestone, interbedded with very cherty black shale. This unit is overlain conformably by cherty, black shale of the Cape Phillips Formation. Southeast of Greely Fiord (Section 8), a 3,000-foot succession whose base is not exposed, had been assigned to the undivided Cornwallis Group. It is a recessive uniform succession of limestone which is very shaly, fine-grained, thin- to medium-bedded, medium to dark grey, medium grey or yellow-grey weathering, with abundant interbedded, yellow-grey, shaly and silty layers.

The Irene Bay Formation in central parts of the report area is a thin, widespread sheet of soft limestone with abundant, interbedded, greenish shale layers that conformably overlies less shaly limestone bluffs of the Thumb Mountain Formation. Westward and northward the formation thickens and the Thumb Mountain Formation becomes correspondingly thinner. Farther west and north the shale becomes dark grey in colour and increases in quantity to the point where the Irene Bay and Thumb Mountain Formations are inseparable from each other within a shaly limestone bluff. Still farther west and north they are together inseparable within the very shaly, undivided, Cornwallis Group.

The top of the Irene Bay Formation marks a pronounced change in the sedimentary pattern in the study area and is the top of the second division of rocks in this area. The upper boundary of the Irene Bay Formation is considered to coincide closely with a time horizon, and is everywhere a conformable contact. Below this boundary rocks within the miogeosyncline comprise widespread carbonate and fine clastic formations, in which lateral variations in lithology and thickness are gradual. Above the Irene Bay Formation the rocks of the basin show far greater, and more abrupt, lateral variation (Kerr, in preparation). The formation is succeeded by rocks of three markedly contrasting facies. Generally, it is succeeded in southeastern parts of the miogeosyncline by carbonates of the undivided Allen Bay and Read Bay Formation (Section 18), in the central parts by black shales of the Cape Phillips Formation, (Section 12), and in northwestern parts by sandstones of the Cape Rawson Group (Section 1).

Age and Correlation

The Irene Bay Formation has yielded excellent collections of large fossils of the so-called Arctic Ordovician fauna. All collections have been identified by G.W. Sinclair, with the exception of GSC loc. 47672, which was identified by B.S. Norford. Collections from various sections and the section numbers are listed below. Each includes specimens collected in float.

Section 1, East of Ella Bay, GSC loc. 51964

Catenipora sp.
Streptelasma sp.
Palaeophyllum sp.
Maclurites, with deep whorl
cephalopod

Section 5, Darling Peninsula, GSC loc. 47671; 555 to 655 feet above the formation base

Lyellia sp.
Catenipora sp.
Streptelasma sp.
Arcturia sp.
Calapoecia sp.
Foerstephyllum sp.
Receptaculites sp.
bryozoans
Sowerbyella sp.
Dinorthis sp.
Cyrtogomphoceras sp.
Plectoceras sp.
Charactoceras sp.

Section 5, Darling Peninsula, GSC loc. 47672; 635 to 745 feet above the formation base

echinoderm columnals
gastropod
clam
cephalopod
bryozoa
strophеodontid and other brachiopods
trilobite fragments
Streptelasma sp.
Favistina sp.
Catenipora sp.

Section 11, Southern Canyon Fiord, GSC loc. 47676

Catenipora sp.
Foerstephyllum sp.
Calapoecia sp.
Receptaculites sp.
Cyrtogomphoceras sp.
Diestoceras sp.
"Spyroceras" sp.

Section 11, Southern Canyon Fiord, GSC loc. 32227 (collected by R. Thorsteinsson)

cf. Favistella
Streptelasma, trilobate form
Oncoceras sp.
Probillingsites sp.
Endoceras sp.
Catenipora sp.

Section 12, Head of Canyon Fiord, GSC loc. 47664

Streptelasma sp.
Foerstephyllum sp.
Catenipora sp.
Arcturia sp.
Lyellia sp.
Receptaculites sp.
Cyrtogomphoceras sp.
Cyclendoceras sp.
Endoceras sp.
"Spyroceras" sp.
Apsidoceras sp.
Trochonema sp.
asaphid trilobite

Section 14, Copes Bay, GSC loc. 26388 (see R. Thorsteinsson, 1963b, p. 393)

Calapoecia n. sp.
C. cf. C. arctica Troedsson
Catenipora sp.
Plasmopora sp.
Palaeophyllum cf. P. halysitoides (Troedsson)
Streptelasma cf. S. robustum Whiteaves
S. cf. S. trilobatum Lamke
Foerstephyllum sp.
Manipora sp.
Receptaculites sp.
Trochonema sp.
Maclurites cf. M. triangularis Teichert
M. cf. M. attus Wilson
Hormotoma cf. H. trentonensis Ulrich and Scofield
Cyrtogomphoceras sp.
Apsidoceras sp.
Cyclendoceras sp.
Diestoceras sp.
Charactoceras sp.
Billingsites sp.
Probillingsites sp.
Actinoceras sp.

Section 34, Southeast of head of Strathcona Fiord, GSC loc. 51968

Streptelasma cf. S. rusticum Billings
small Streptelasma
Paleofavosites sp.
syringoporoid coral
Calapoecia? sp.
Catenipora sp.
Receptaculies sp.
Cyclocrinites sp.
Rynchotrema sp.
Sowerbyella cf. sericea (Sowerby)
cf. Hesperorthis sp.
Rhinidictya sp.
Fusispira sp.
Liospira sp.
Hormotoma sp.
Wilsonoceras sp.
ostracods indet.
Ceraurus? sp., large labrum
Bumastoides sp.
crinoid fragments

Section 39, Head of Starfish Bay, GSC loc. 51912

Streptelasma cf. rusticum Billings
Trochonema sp.
Maclurites sp. with very deep whorl
Oncoceras sp.

The above collections, variously dated as of Middle or Late Ordovician age, belong to the so-called Arctic Ordovician fauna, which has been discussed at length by Thorsteinsson (1963a, p. 38). This fauna, which is generally considered boreal in origin, is typified by the faunas of the Red River Formation of Manitoba, Cape Calhoun Formation of northwest Greenland, Bighorn Formation of Wyoming, and several other well-known formations in North America. In view of the uncertainty of precise dating of shelly faunas at this level of the geologic column, the writer follows Thorsteinsson (1963a, p. 39), who tentatively regards the Arctic Ordovician fauna as Late Caradocian in age, and the top of the upper limestone and shale member (Irene Bay Formation) as the boundary between the Caradocian and Ashgillian. According to the North American terminology the formation is of Late Ordovician age about Edenian and Maysvillian.

Rocks which are co-extensive with the Irene Bay Formation, and have similar lithology, stratigraphic position, and fauna, are widespread in the Arctic Islands, and were re-assigned to that formation by Kerr (1967). The Irene Bay Formation is

recognizable at Prince Alfred Bay on Grinnell Peninsula (Thorsteinsson, 1963c, p. 224, unit 5), and in the vicinity of Herschel and Rigby Bays on southern Devon Island (Glenister and Thorsteinsson, 1963, p. 198, unit 3). At each locality the formation is about 60 feet thick and abundantly fossiliferous. The Irene Bay Formation has been recognized in the type section of the Cornwallis Formation on Cornwallis Island and has been more widely mapped on that island by Thorsteinsson and Kerr (in press). In northeastern parts of Bathurst Island the formation is widely represented but is generally recessive, poorly exposed, (Kerr and Temple, in preparation), and ranges from 30 to 125 feet in thickness. The Irene Bay Formation is distinguishable in the McCormick Inlet area of Melville Island where it is represented by about 60 feet of soft limestone and shale, which Tozer and Thorsteinsson (1964, p. 52) assign because of lithology and stratigraphic position to the upper member of the Cornwallis Formation. Although the Arctic Ordovician fauna has been reported to occur in rocks on Victoria Island (Thorsteinsson and Tozer, 1962, p. 44), and on Somerset Island (Blackadar and Christie, 1963, p. 10), the Irene Bay is not distinguishable there as a separate formation.

The Irene Bay Formation is probably stratigraphically higher than any rocks described by Kurtz, McNair and Wales (1952) at Dundas Harbour. On northwestern Baffin Island, Trettin (1965a p. 15) reports the presence of a 65-foot thickness of recessive-weathering rock which occurs between 285 and 350 feet above the base of Member B of the Baillarge Formation. Because it occurs in a similar stratigraphic position, bears the Arctic Ordovician fauna, and strongly resembles the Irene Bay Formation in lithology, it is considered likely that these strata are equivalent to and co-extensive with that formation (Table 2). The Irene Bay Formation is equivalent in age to the Cape Calhoun Formation of Washington Land, northwest Greenland, in the restricted sense of Troelsen (1950, p. 57). This equivalence was anticipated by Troelsen (op. cit., p. 58), for he considers unnamed rocks near the head of Bay Fiord, which were examined by Thorlaksson, to be the Cape Calhoun Formation. The writer has mapped these rocks as the Irene Bay Formation.

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APPENDIX

Measured Sections

Section 1. East-Southeast of Ella Bay

The following section occurs on the north flank of the Judge Daly anticline; it begins at 81° 00' N., 68° 35' W., 15 miles east-southeast of the head of Ella Bay on Ellesmere Island. This is the upward continuation of Section 1 in GSC Paper 67-27, Part I. Thicknesses were measured on air-photo A-16610-128, by scale in combination with a pocket altimeter.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	CAPE RAWSON GROUP		
	Sandstone, dark grey, tan-brown weathering; recessive.		
	CORNWALLIS GROUP		
	Irene Bay Formation contact conformable		
20	Limestone, dark grey, shaly, fine- to medium-grained, medium grey weathering, medium-bedded; fossils include Catenipora sp., Streptelasma sp., Palaeophyllum sp., Maclurites sp., and a cephalopod.....	675	17,110
	Total thickness of the Irene Bay Formation	675	
	Thumb Mountain Formation contact conformable		
19	Limestone, dark grey, shaly, thick-bedded; in places mottled dark grey and grey-brown, yellow-grey weathering; resistant; Maclurites sp. common	1,800	16,435
	Total thickness of the Thumb Mountain Formation.....	1,800	
	Bay Fiord Formation contact conformable		
18	Limestone, very sandy and shaly, medium light-grey, thin-bedded, often laminated, light yellow-		

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	grey weathering.....	1,450	14,635
	Total thickness of the Bay Fiord Formation ...	1,450	
	Eleanor River Formation contact conformable		
17	Limestone, medium dark grey, shaly, thick-bedded, medium grey weathering; the shaly parts weather yellow-grey, Maclurites sp. ...	775	13,185
	Total thickness of Eleanor River Formation...	775	
	Copes Bay Formation contact regional disconformity		
16	Limestone, shaly, medium light grey and light grey, light grey weathering; thin- to medium-bedded, recessive.....	825	12,410
15	Limestone, shaly, fine- to medium-grained, often saccharoidal, medium grey, yellow-grey weathering, in a few places mottled where partly dolomitized, medium- to thick-bedded.....	950	11,588
14	Limestone and dolomite interbedded; quartz sandy, light grey, light yellow-grey weathering, thin- to medium-bedded; contains quartz sand, minor red, silty dolomite, and quartz siltstone; minor dark grey, limy silt-stone, grades to overlying rock by increase in limestone beds	1,050	10,635
	Total thickness of Copes Bay Formation	2,825	
	Parrish Glacier Formation contact regional disconformity?		
13	Dolomite, limestone, siltstone		9,585

Section 3. Northwest of Scoresby Bay

The following section occurs above the Scoresby Bay thrust fault; it begins at 79° 57' N., 71° 40' W., 4 miles northwest of the head of Scoresby Bay on Ellesmere Island. This is the upward continuation of Section 3 in GSC Paper 67-27, Part I. Thicknesses were measured from air-photo A-16609-9, by scale in combination with a pocket altimeter.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Eleanor River Formation		
20	Limestone, medium grey, shaly, medium-bedded; pale yellowish-brown weathering		
	Baumann Fiord Formation contact probably conformable		
19	Limestone, gypsiferous, thin- to medium-bedded, medium grey, medium-grained, weathers very light grey; recessive	250	13,681
	Total thickness of the Baumann Fiord Formation ..	250	
	Copes Bay Formation contact probably conformable		
18	Sandstone, quartzose, slightly calcareous; medium grey; medium-grained; thin- to medium-bedded; cross-laminated; rusty-weathering; flat-pebble conglomerates	300	13,431
17	Limestone, medium grey, fine-grained, medium- to thick-bedded; ledges of massive, very light grey, fine-grained limestone; minor shaly and sandy limestone	1,160	13,131
16	Limestone, very shaly and silty, medium to dark grey, thin- to-medium bedded; weathers medium grey, slightly yellowish where shaly and silty; large amounts of dark grey mudstone interbedded; lesser fine-grained, quartz sandstone; flat-pebble conglomerate common, particularly in sandy rocks;		

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	gypsiferous beds 20 and 5 feet thick about 800 feet from top of interval along strike to the S.W.	2,100	11,971
	Total thickness of the Copes Bay Formation	3,560	
	Parrish Glacier Formation contact regional disconformity?		
15	Limestone, shale and sandstone interbedded; flat-pebble conglomerate		9,871

Section 4. Head of Scoresby Bay

The following section occurs two miles northwest of the head of Scoresby Bay on Ellesmere Island. Thicknesses were measured from air-photo A-16609-9 by scale in combination with a pocket altimeter.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Eleanor River Formation upper limit of exposure		
5	Limestone, shaly, medium grey, weathers dark yellowish brown, rough-weathering surfaces....	200	3,260
	Measured thickness of Eleanor River Formation.	200	
	Baumann Fiord Formation contact conformable		
4	Gypsum-anhydrite, limy, very light grey, recessive (Unit C).....	30	2,860
3	Limestone, shaly, medium grey, medium-bedded; pale yellowish brown weathering (Unit B)	300	2,830
2	Gypsum-anhydrite, white, thin-bedded; some interbedded grey-brown, gypsiferous, calcareous shale (Unit A)	530	2,530
	Total thickness of Baumann Fiord Formation....	860	
	Copes Bay Formation contact conformable		
1	Limestone, quartz sandy, medium dark grey, medium-bedded; yellowish grey weathering; rough surfaces; flat-pebble conglomerate and crossbedding present.....	2,000	2,000
	Exposed thickness of the Copes Bay Formation Lower limit of exposure	2,000	

Section 5. Darling Peninsula

The following section begins at 79° 49' N., 71° 00' W., on northeastern Darling Peninsula of Ellesmere Island. Thicknesses were measured from air-photo A-16611-114, by scale in combination with a pocket altimeter.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Allen Bay		
	Limestone and dolomite		
	CORNWALLIS GROUP		
	Irene Bay Formation contact conformable		
6	Limestone, shaly, grey-brown, fine-grained, thin-bedded; weathers rusty, recessive; interlayered shale, greenish weathering, calcareous, fossiliferous GSC locs. 47671 and 47672.....	745	4,070
	Total thickness of the Irene Bay Formation	745	
	Thumb Mountain Formation contact conformable		
5	Limestone, grey-brown, medium-bedded, rusty-weathering, rough-weathering, bluff-forming	1,000	3,325
	Total thickness of Thumb Mountain Formation ...	1,000	
	Bay Fiord Formation contact conformable		
4	Limestone, dark grey, fine-grained, shaly; thin- to medium-bedded; interlayered shale weathers yellowish or rusty and increases toward the top; strongly petroliferous; talus yielded Arcturia sp. ? Maclurites sp. and Gonioceras sp.	1,100	2,325
	Eleanor River Formation contact conformable		
3	Limestone, dark grey, shaly, thin- to medium-bedded, resistant.....	500	1,225

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
2	Limestone, dark grey, fine-grained; thin-bedded; yellowish shaly partings; some black chert bands; loose fossils include Trochonema sp., Liospira sp., an asaphid trilobite, and Pliomerops sp. ?	425	725
	Total thickness of the Eleanor River Formation.	925	
	Baumann Fiord Formation contact probably conformable		
1	Limestone, gypsiferous, shaly, medium grey; yellowish grey weathering, in places white; minor amounts of flat-pebble conglomerate and quartz sandstone	300	300
	Exposed thickness of the Baumann Fiord Formation	300	
	Lower limit of exposure		

Section 6. Southwest of Scoresby Bay

The following section begins at 79° 51' N., 72° 40' W., 16 miles due west of the head of Scoresby Bay on Ellesmere Island. The Baumann Fiord Formation in this section can be traced by outcrops into the same formation in Section 3 (see above). Thicknesses were measured from air-photo A-16604-12, by scale in combination with a pocket altimeter.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Allen Bay Formation		
	Limestone, dolomitic		
	CORNWALLIS GROUP		
	Irene Bay Formation contact conformable		
6	Limestone, shaly, medium grey, thin-bedded; greenish weathering; recessive; fossils of "Arctic Ordovician fauna" abundant.....	150	6,430
	Thumb Mountain Formation contact conformable		
5	Limestone, medium dark-grey, fine-grained; thin-bedded to massive; weathers rusty, slightly greenish along interlayered shale; fossils of "Arctic Ordovician fauna" common; bluff-forming.....	1,380	6,280
	Bay Fiord Formation contact conformable		
4	Limestone, shaly and silty, dark grey, fine-grained, thin- to medium-bedded; Gonioceras sp...	1,700	4,900
	Eleanor River Formation contact conformable		
3	Limestone, shaly and silty, fine-grained, medium dark grey; medium-bedded; medium grey weathering with yellowish weathering shaly layers; minor amounts of quartz sandstone; minor flat-pebble conglomerate.....	2,300	3,200

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
2	Limestone, medium grey, shaly, medium-bedded; pale yellowish-brown weathering.....	400	900
	Baumann Fiord Formation contact probably conformable		
1	Limestone, gypsiferous, medium grey; medium-grained; thin- to medium-bedded; weathers very light grey, recessive.....	500	500
	Total thickness of the Baumann Fiord Formation..	500	
	Copes Bay Formation contact probably conformable		

Section 9. North of Caledonian Bay

The following is a southeast-dipping section that begins at 80° 00' N., 81° 10' W., four miles northeast of the head of Caledonian Bay in Canyon Fiord, Ellesmere Island. Thicknesses were measured from air-photo A-16690-57, by scale in combination with a pocket altimeter.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Cape Phillips Formation		
	Shale, silty, cherty		
	CORNWALLIS GROUP		
	Thumb Mountain Formation contact conformable		
4	Limestone, silty, cherty, dark grey to black, weathers medium grey, thin-bedded; interbedded with cherty black shale.....	550	1,750
3	Chert, black, shaly, thin-bedded; weathers rusty; interbedded with grey, fine- to coarse-grained, shaly limestone which increases upward; some of chert is replacement.....	250	1,200
2	Limestone, silty, medium grey, thin-bedded; weathers medium yellowish grey; much interbedded black chert; some dark grey, calcareous shale, limestone boulder conglomerate and flat-pebble conglomerate.....	200	950
1	Limestone, very shaly, dark grey, fine-grained, weathers medium grey, thin-bedded; interlayered with dark grey, calcareous shale; rhythmic alternations of limestone and shale, partly slaty, crenulate bedding.....	750	750
	Examined thickness of the Bay Fiord Formation	750	
	Probable thickness of unexamined rocks	1,250	

Section 11. Canyon Fiord South

The following section that begins at 79° 44' N., 81° 10' W., is a northwest-dipping section on the north side of Canyon Fiord, at the southern extremity of that fiord. Thicknesses were measured from air-photo A-16690-51, by scale in combination with a pocket altimeter.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Allen Bay Formation		
	Limestone		
	Irene Bay Formation contact conformable		
5	Limestone, shaly, medium grey, weathers greenish grey, thin-bedded, interlayered, greenish shale recessive, abundantly fossiliferous; loose fossils include Catenipora sp., Foerstephyllum sp., Calapoecia sp., Receptaculites sp., Cyrtogomphoceras sp., Diestoceras sp., and "Spyroceras" sp.....	140	2,310
	CORNWALLIS GROUP		
	Thumb Mountain Formation contact conformable		
4	Limestone, dark grey, fine-grained, partially dolomitized and slightly cherty, weathers olive-grey and to a rough surface, thick- to medium-bedded, ledge former; common black shale and black siltstone are interbedded; at a height of 300 feet from top occurs Arcturia sp., and Calapoecia sp.....	630	2,170
3	Dolomite, dark grey-brown, fine- to medium-grained, massive to porous and vuggy, calcareous at the top; alternating with recessive dolomitic siltstone, medium- to thick-bedded, dark grey-brown, slightly pink, in places grey brown weathering; in the siltstone are ripple-marks, worm trails, intraformational flat-pebble conglomerate.....	700	1,540

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Bay Fiord Formation contact conformable		
2	Mudstone, silty, siliceous, dolomitic, dark grey and grey-green at surface, olive-grey to medium grey weathering; resistant ledges 10 feet thick alternate with recessive intervals 20 feet thick; some nodules and thin beds of chert.....	780	840
1	Limestone, very fine-grained, light olive-grey, weathering olive-grey, laminated, minor amounts of black limestone.....	60	60
	Exposed thickness of the Bay Fiord Formation	840	
	Lower limit of exposure		

Section 16. North-Northeast of Vesle Fiord

The following section that begins at 79° 19' N., 82° 40' W., is a west-dipping section 15 miles NNE of the head of Vesle Fiord on Ellesmere Island. Thicknesses were measured from air-photo A-16676-92, by scale in combination with a pocket altimeter.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Allen Bay Formation		
	Limestone and dolomite		
	CORNWALLIS GROUP		
	Irene Bay Formation contact conformable		
4	Limestone, shaly, thin- to medium-bedded, recessive; greenish weathering shaly layers; abundantly fossilferous.....	200	4,900
	Thumb Mountain Formation contact conformable		
3	Limestone, dark brownish grey, thick-bedded to massive, fine-grained, shaly, medium grey weathering, resistant.....	1,700	4,700
	Bay Fiord Formation contact conformable		
2	Limestone, fine-grained to lithographic; thin-bedded; shaly and silty, dark brownish grey, grey-brown weathering; numerous interbedded, slightly calcareous, quartz siltstone and shale beds, brown, thin-bedded, fine-grained; the formation is recessive.....	1,000	3,000
	Eleanor River Formation contact conformable		
1	Limestone, shaly, thick-bedded, fine-grained to lithographic, medium light grey to medium dark grey; buff weathering, resistant.....	2,000	2,000

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Exposed thickness of the Eleanor River Formation.....	2,000	
	Limit of exposure at a major thrust fault		

Section 17. Dome Northeast of Vesle Fiord

The following section is in a stream on the west flank of a dome and begins at 79° 19' N., 82° 10' W., 18 miles northeast of the head of Vesle Fiord on Ellesmere Island. Thicknesses were measured from air-photo A-16728-85, by scale in combination with a pocket altimeter.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	CORNWALLIS GROUP		
	Thumb Mountain Formation faulted contact		
7	Limestone, grey-brown, fine-grained, weathers medium grey with slight rusty staining, thick-bedded; resistant	850	6,150
	Bay Fiord Formation contact conformable		
6	Limestone, medium grey, grey-brown, very shaly and silty, thin- to medium-bedded, weathers yellow-grey; much calcareous quartz siltstone weathering yellow-grey; commonly green and dark grey shaly layers; formation is recessive	1,800	5,300
	Eleanor River Formation contact conformable		
5	Limestone, grey-brown, fine-grained, argillaceous, thick-bedded, resistant	1,200	3,500
	Baumann Fiord Formation contact conformable		
4	Gypsiferous limestone, light to medium grey, weathers light yellow-brown, recessive (Unit C)	225	2,300
3	Limestone, brown, medium-bedded, shaly, weathers grey-brown, resistant (Unit B)	375	2,075
2	Gypsum-anhydrite, gypsiferous limestone, light grey, weathers very light grey to white, thin-bedded, recessive (Unit A)	900	1,700

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Total thickness of the Baumann Fiord Formation.....	1,500	
	Copes Bay Formation contact sharp but probably conformable		
1	Limestone, shaly, fine-grained, thin- to medium-bedded, medium light grey or grey-brown; weathers yellow-grey to medium light grey; at 400 feet from the top is 50-foot thick gypsiferous, limestone bed; flat-pebble conglomerate in places, particularly common toward top.....	800	800
	Exposed thickness of the Copes Bay Formation.....	800	
	Lower limit of exposure		

Section 18. Northeast of the Head of Irene Bay

The following section begins at 79° 18' N., 80° 47' W., 19 miles northeast of the head of Irene Bay on Ellesmere Island. This is the upward continuation of Section 18 in GSC Paper 67-27, Part I. Thicknesses were measured from air-photo A-16678-28, by scale in combination with a pocket altimeter.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Allen Bay Formation		
15	Dolomite and limestone		
	Irene Bay Formation (type section) sharp conformable contact		
14	Limestone, argillaceous, thin- to medium-bedded, fresh surfaces dark grey, weathers yellow-grey, slightly greenish; argillaceous layers abundant and weather greenish; the argillaceous layers produce wavy bedding; recessive interval; large fossils abundant.....	270	12,217
	Thumb Mountain Formation (type section) conformable contact		
13	Limestone, dark greyish brown, slightly rusty, medium greyish brown weathering, thick-bedded to massive; slightly argillaceous, bluff-forming; gradational at top.....	1,500	11,947
	Bay Fiord Formation (type section) conformable contact		
12	Siltstone, argillaceous, dark greenish grey, very dark green weathering, non-calcareous, very recessive.....	650	10,447
11	Limestone, argillaceous, anhydritic, medium grey, fine-grained, thin-bedded, recessive; along strike to the southwest large amounts of anhydrite.....	1,000	9,797
	Total thickness of the Bay Fiord Formation....	1,650	

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Eleanor River Formation (reference section)		
	sharp contact, probably conformable		
10	Limestone, argillaceous, grey-brown or medium grey, light grey-brown weathering; thick-bedded often fucoidal, resistant, near base flat-pebble, limestone conglomerate common.....	2,300	8,797
	Baumann Fiord Formation		
	contact gradational		
9	Gypsum-anhydrite, gypsiferous limestone, thin-bedded, very light grey to white, poorly exposed, recessive.....	900	6,497
	Copes Bay Formation		
	contact conformable		
8	Limestone, medium grey and light grey; lithographic to fine-grained, thin- to medium-bedded, weathers medium light grey, minor amounts of sugary dolomite and a few gypsiferous limestone bands, flat-pebble limestone conglomerate common.....	1,800	5,597
	Parrish Glacier Formation		
	contact disconformable		
7	Sandstone, limestone.....		3,797

Section 24. East of Vesle Fiord

The following section begins at 79° 03' N., 82° 30' W., 10 miles due east of the head of Vesle Fiord on Ellesmere Island. Thicknesses were measured from air-photo A-16676-96, by scale in combination with a pocket altimeter.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Cape Phillips Formation		
	Basal limestone, overlain by siltstone and shale		
	CORNWALLIS GROUP		
	Irene Bay Formation contact conformable		
5	Limestone, thin- to medium-bedded, argillaceous, dark grey; shaly layers, weather greenish yellow; recessive; sharp upper and lower contacts; large cephalopods abundant.....	210	4,185
	Thumb Mountain contact conformable		
4	Limestone, medium dark grey, argillaceous, medium- to thick-bedded, bluff-forming, medium grey weathering slightly rusty.....	1,600	3,975
	Bay Fiord Formation contact conformable		
3	Limestone, dark grey and dark grey-brown, argillaceous; thin- to medium-bedded, much interbedded, non-calcareous, black mudstone and siltstone; weathers light yellow-grey, recessive...	1,550	2,375
	Eleanor River Formation contact conformable		
2	Limestone, grey-brown, fine-grained, weathers medium grey, slightly yellow, resistant.....	375	825
1	Limestone, argillaceous, dark grey, medium-bedded.....	450	450

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Exposed thickness of the Eleanor River Formation..	825	
	Limit of exposure at a reverse fault		

Section 30. North Central Svendsen Peninsula

The following section begins at 78° 33' N., 83° 10' W., 10 miles WSW of the head of Strathcona Fiord on north central Svendsen Peninsula of Ellesmere Island. Thicknesses were measured from air-photo A-16706-105, by scale in combination with a pocket altimeter.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Cape Phillips Formation		
	Siltstone		
	CORNWALLIS GROUP		
	Irene Bay Formation contact conformable		
11	Limestone, very shaly, dark grey, thin- to medium-bedded, shaly layers abundant and weather greenish; abundant large fossils.....	150	8,100
	Thumb Mountain Formation contact conformable		
10	Limestone, shaly, dark grey, medium- to thick-bedded; yellowish orange weathering; thin, green, shaly layers are recessive and contain some fossils of the "Arctic Ordovician fauna".....	550	7,950
9	Limestone, dark grey, fine-grained, medium-bedded, weathers medium light grey with marked rusty-yellow to yellow-orange staining; very resistant.....	700	7,400
8	Dolomite, dark grey-brown, medium-bedded; dark chocolate-brown weathering	450	6,700
7	Limestone, medium to dark grey, coarse, fucoidal, thin- to medium-bedded, weathers medium grey, faintly rusty.....	250	6,250

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Bay Fiord Formation contact conformable		
6	Dolomite, dark grey-brown, slightly bluish, medium-grained, sugary, thin- to medium-bedded; rusty-yellow weathering.....	1,500	6,000
	Eleanor River Formation contact conformable		
5	Limestone, thin- to medium-bedded; grey-brown; weathers medium grey; slightly shaly in places; several black chert beds at base; resistant; ledge-forming.....	450	4,500
4	Limestone, shaly, fine-grained, medium to dark grey; weathers medium grey, thin- to medium-bedded; in places thin beds of sugary, buff-yellow dolomite, yellow-grey weathering; shaly beds weathering yellow-orange; ledges of massive light grey limestone.....	2,850	4,050
	Total thickness of the Eleanor River Formation..	3,300	
	Baumann Fiord Formation contact conformable		
3	Limestone, gypsiferous, light grey; thin- to medium-bedded; weathers light grey; minor amounts of flat-pebble conglomerate (Unit C)....	200	1,200
2	Limestone, dark grey, thin- to medium-bedded; weathers pale yellowish brown; slightly gypsiferous towards top; minor amounts of flat-pebble conglomerate (Unit B).....	400	1,000
1	Gypsum, very light grey to white, weathers very light grey, thin- to medium-bedded, recessive (Unit A).....	600	600
	Exposed thickness of the Baumann Fiord Formation	1,200	
	Limit of exposure at a reverse fault		

Section 36. East of Trold Fiord

The following is a west-dipping section that begins at 78° 25' N., 84° 40' W., west of the head of a small hook-shaped bay on the east side of Trold Fiord, Ellesmere Island. It is the upward continuation of Section 36 in GSC Paper 67-27, Part I. Thicknesses were measured from air-photo A-16778-81, by scale in combination with a pocket altimeter.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Cape Phillips Formation		
	Shale, siltstone		
	CORNWALLIS GROUP		
	Irene Bay Formation contact conformable		
12	Limestone, shaly, very fine-grained, dark grey; medium- to thick-bedded; weathers rusty brown, often streaked rusty; layers of black, silty shale, in places greenish shaly layers; large fossils of the "Arctic Ordovician fauna" common, particularly in the greenish shaly layers.....	1,050	12,260
	Thumb Mountain Formation contact conformable		
11	Limestone, very fine-grained, dark grey; medium- to thick-bedded; weathers rusty-brown, streaked with rust; resistant.....	1,300	11,210
	Bay Fiord Formation contact conformable		
10	Dolomite, medium-grained, sugary, light grey, or light grey-brown; medium-bedded; light yellowish grey weathering; slightly petroliferous; sometimes interbedded with vuggy, black, medium-grained, limestone.....	850	9,910

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
9	Limestone, light grey, fine-grained; thin- to medium-bedded, weathers buff-grey; interbedded with medium grey, calcareous, quartz siltstone, buff-grey weathering; minor light grey slightly pinkish lithographic limestone.....	1,250	9,060
	Total thickness of the Bay Fiord Formation.....	2,100	
	Eleanor River Formation contact conformable		
8	Limestone, medium dark grey, fine-grained; thin- to medium-bedded; weathers buff-grey, dark yellowish brown in lower part; Maclurites sp.....	1,500	7,810
	Total thickness of the Eleanor River Formation..	1,500	
	Baumann Fiord Formation (type section) sharp conformable contact		
7	Limestone, anhydritic, gypsiferous, cream to grey, weathers buff-yellow; thin-bedded to laminated; minor amounts of flat-pebble conglomerate; moderately recessive (Member C).....	200	6,310
6	Limestone, medium grey, fine-grained, weathers pale yellowish brown, medium- to thick-bedded; resistant bluff; gradational at top (Member B).....	360	6,110
5	Anhydrite, gypsum, light grey to white, light grey to white weathering; thin- to medium-bedded; interbedded with minor amounts of medium grey limestone and gypsiferous limestone; very recessive; thickness ranges from 1,700 ft. on flank of anticline to 2,300 ft. on crest because of flowage, estimated depositional thickness is 2,000 ft., gradational at top (Member A).....	2,000	5,750

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Total thickness of Baumann Fiord Formation.....	2,560	
	Copes Bay Formation sharp conformable contact		
4	Limestone, shaly, dark grey, weathers medium grey; shaly layers weather yellowish, thin- to medium-bedded; alternating with slightly calcareous, quartz siltstones; becomes more calcareous upwards; ripple-marks, flat-pebble conglomerates, mud cracks.....	2,200	3,750
3	Dolomite, dark grey, partly mottled black and white, coarse-grained, crystalline, porous.....	150	1,550
	Parrish Glacier Formation contact conformable		
2	Sandstone and siltstone; quartzose, calcareous, dark grey, buff-grey weathering with rough surfaces, medium- to thick-bedded; minor amounts of dolomite and flat-pebble conglomerate.....	1,100	1,400
1	Sandstone, quartzose, calcareous matrix, medium-grained, thick-bedded, light to medium grey, buff-yellow weathering; laminated and cross-laminated, ripple-marks; interbedded with shaly limestone.....	300	300
	Exposed thickness of Parrish Glacier Formation. Lower limit of exposure	1,400	

Section 39. Head of Starfish Bay

The following is an east-dipping section that begins at 78° 14' N., 83° 40' W., 5 miles northeast of the head of Starfish Bay on Ellesmere Island. Thicknesses were measured from air-photo A-16676-159, by scale in combination with a pocket altimeter.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Allen Bay Formation		
	Dolomite and limestone		
	Irene Bay Formation contact conformable		
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	2,850
	Thumb Mountain Formation contact conformable		
2	Limestone, shaly, medium- to thick-bedded, medium grey, weathers yellow-grey; bluff-forming in lower part, less so in upper part.....	1,850	2,350
	Bay Fiord Formation contact conformable		
1	Siltstone, mudstone, silty and shaly limestone, thin- to medium-bedded, dark grey, tan-yellow weathering; talus collection near top yields Rhinidictya sp., Rafinesquina sp., and Liospira sp.....	500	500
	Exposed thickness of the Bay Fiord Formation..	500	
	Limit of exposure at a fault		

Section 45. Head of Svarte Fiord

The following is an east-dipping section that begins at 77° 17' N., 84° 20' W., 4 miles north-northeast of the head of Svarte Fiord on Ellesmere Island. Thicknesses were measured from air-photo A-16676-8, by scale in combination with a pocket altimeter.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Allen Bay Formation		
	Limestone, shaly		
	CORNWALLIS GROUP		
	Irene Bay Formation contact conformable		
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	4,150
	Thumb Mountain Formation contact conformable		
5	Limestone, fine-grained, medium grey; medium-bedded; rusty weathering; greenish shaly beds toward top.....	400	3,900
4	Limestone, fine-grained, medium greyish brown, thick-bedded to massive, weathers medium grey, slightly rusty, streaked rusty; bluff-forming.....	1,500	3,500
3	Limestone, very shaly to silty, fine-grained, dark greyish brown; weathers dark chocolate-brown; medium-bedded; thin shaly beds weather yellowish grey; ledge forming.....	700	2,000
	Total thickness of the Thumb Mountain Formation..	2,600	

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Bay Fiord Formation contact conformable		
2	Limestone, shaly, medium to dark grey, fine-grained, thin- to medium-bedded, weathers pale yellowish brown; dark grey shaly layers; a collection occurring at a height of 400 feet in this unit includes bryozoans, Rafinesquina sp. ? Hebertella sp. ? and an indeterminate cephalopod.....	800	1,300
1	Gypsum, very shaly, slightly calcareous, medium dark grey, fine-grained; thin- to medium-bedded, interbedded with shaly limestone.....	500	500
	Exposed thickness of the Bay Fiord Formation.	1,300	
	Lower limit of exposure		

Section 48. Southeast Svendsen Peninsula

The following is an east-dipping section that begins at 77° 32' N., 84° 07' W., 3½ miles northwest of the southeasternmost tip of Svendsen Peninsula, Ellesmere Island. Thicknesses were measured from air-photo A-16723-30, by scale in combination with a pocket altimeter.

Unit	Lithology	Thickness (feet)	Height Above Base (feet)
	Allen Bay Formation		
	Limestone		
	CORNWALLIS GROUP		
	Irene Bay Formation contact conformable		
5	Limestone, very shaly, grey-green, weathers greenish, fissile to thin-bedded; recessive, fossils rare.....	250	1,250
4	Limestone, medium dark grey, weathers medium grey; thin- to medium-bedded.....	250	1,000
3	Limestone, very shaly, thin-bedded; dark grey, weathers pale green, recessive, very fossiliferous.....	50	750
	Total thickness of the Irene Bay Formation....	550	
	Thumb Mountain Formation contact conformable		
2	Limestone, shaly, thin- to medium-bedded, dark grey; weathers medium light grey; irregular pale greenish weathering shaly layers.....	400	700
1	Limestone, grey brown, lithographic to fine-grained; medium-bedded to massive; very petroliferous.....	300	300
	Exposed thickness of the Thumb Mountain Formation.....	700	
	Lower limit of exposure		