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Illustrations

VB = Victor Bay Formation *P = Paleozoic strata*
SS = Strathcona Sound Formation *E = Elwin Icecap*
B = Bioherm in Strathcona Sound Formation

Frontispiece: Looking east toward Bylot Island (BI) and Eclipse Sound (ES). NAPL T249R-116.

UPPER PROTEROZOIC SEDIMENTARY AND VOLCANIC ROCKS OF NORTHWESTERN BAFFIN ISLAND

Abstract

About 15 000-20 000 feet (4600-6100 m) of Neohelikian strata consisting of quartzarenites, shales, carbonate strata commonly containing stromatolites and/or bioherms, greywackes, arkoses and conglomerates outcrop east of Admiralty Inlet, Baffin Island. These strata were deposited in environments that ranged from fluvial to subtidal and may include a submarine channel-fan complex in the upper part. Paleocurrent trends for all but the uppermost formation indicate westerly transport, whereas easterly transport is indicated for the uppermost formation. About 300-500 feet (90-150 m) of tholeiitic plateau basalts occur near the base of the sequence.

Faulting was active during deposition that took place in a rift zone which (according to Olson) may be an aulacogen related to early development of the Franklinian Geosyncline.

Résumé

A l'est de l'inlet de l'Amirauté, dans l'île Baffin, affleurent environ 15 000 à 20 000 pieds (4600-6100 m) de strates néohélikiennes composées d'arénites quartziques, de schistes argileux et de couches carbonatées contenant généralement des stromatolites, ou des biohermes, grauwackes, arkoses et conglomérats, ou tous ces éléments à la fois. Ces couches se sont déposées dans des milieux fluviatiles à subtidaux, et dans leur tranche supérieure, peuvent inclure le complexe chenal sous-marin — cône alluvial. Dans toutes les formations, excepté celles situées au sommet de la succession, l'orientation des paléocourants indique un transport vers l'ouest; pour les autres, le transport a eu lieu vers l'est. On rencontre environ 300 à 500 pieds (90-150 m) de basaltes tholéiitiques de plateaux à proximité de la base de la succession.

Les phénomènes de faillage ont été actifs pendant la période de sédimentation, qui a eu lieu dans une aire de fracturation (zone de rifts) qui, d'après Olson, est peut-être un aulacogène, dont l'existence aurait été liée aux premières phases de l'évolution du géosynclinal Franklinien.

INTRODUCTION

Rarely are late Precambrian strata as well exposed as they are in the towering cliffs of the inlets and fiord-like sounds found from Admiralty Inlet to east of Milne Inlet in northwestern Baffin Island. These multicoloured rocks were first reported early in this century, and were mapped in 1954, 1963 and 1968, as part of the Geological Survey's reconnaissance mapping program. Two groups were recognized, the Eqalulik Group — mainly quartzarenites and basic volcanics, and the Uluksan Group — a succession whose diverse lithologies and structures reflect a varied sedimentary history. Remapping of these rocks began in 1977 as part of a study designed to clarify stratigraphic problems, to understand the sedimentary history and provide data for a basin analysis of the area, and to evaluate the economic potential of northern Baffin and Bylot islands. Numerous lead-zinc occurrences are known and the Nanisivik Mine,which lies east of Arctic Bay and began production in 1976, is the most northerly mine in the world other than coal operations in Spitzbergen. This study will also provide data with which to better determine the relationship of these rocks to those of similar age elsewhere in northern Canada, and in western Greenland.

Critical readers

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F.H.A. Campbell

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More than one-third of the area underlain by the Eqalulik and Uluksan groups was remapped in 1977 during a field season of two and a half months. Also, detailed stratigraphic and sedimentological data were collected from the eastern halves of topographic sheets 48B and 48C, from the western third of 48A and from much of the southwest part of 48D. Stratigraphic sections were measured in feet but metric equivalents are quoted throughout the text. A Bell 47G4A helicopter was attached to the 10-man party, which was headed by G.D. Jackson, and Twin Otter support was periodically received from Polar Continental Shelf Project.

Comments concerning the geology of the region are contained in early reports by Bernier (1911), Tremblay (1921), Matthiassen (1933, 1945), Teichert (1937) and Weeks (1926). Geological reconnaissances by Lemon and Blackadar (1963) and by Blackadar (1970) resulted in geological reports and maps and an established stratigraphic succession that has provided an excellent basis not only for subsequent economic explorations by Texas Gulf Sulphur, King Resources (1970), and other companies, but also for subsequent geological studies such as those by Geldsetzer (1973a, 1973b), Olson (1977) and the present study.

This is a preliminary report, and summarizes chiefly data gathered during the 1977 field season, although some conclusions are based in part on previous work. Iannelli worked chiefly on the Adams Sound, Nauyat, Arctic Bay and Fabricius Fiord formations for which he submitted a draft report. Narbonne spent most of his time on the Strathcona Sound and Elwin formations and prepared a draft report on them. Jackson and Wallace distributed field time among all the map units, and Wallace provided a résumé of her summer's work. Carbonate rocks were classified according to Grabau (1904) whereas sandstones were classified according to Pettijohn (1975).

TABLE OF FORMATIONS

Era	Formation		Lithology
Hadrynian	Franklin Intrusions		Diabase
	Intrusive Contact		
	Elwin about 4000 ft (1220 m)		Subarkose, quartz arenite, siltstone
	Gradational		
	Strathcona Sound more than 3000 ft (910 m)		Arkose facies, greywacke facies, grey siltstone facies, red siltstone facies, carbonate facies
	Gradational to Unconformable		
Neohelikian	Victor Bay 2000 ft (610 m)		VB_2 Flat pebble conglomerate, shale VB_1 Shale, siltstone, dolostone
	Gradational? to Unconformable		
	Society Cliffs 2000 ft (610 m)		Stromatolitic dolostones
	Gradational to Unconformable		
	Arctic Bay 1700 ft (520 m)	Fabricius Fiord 5400 ft (1650 m)	AB_5 Stromatolitic dolostone, shale AB_4 Shale, siltstone, dolosiltite AB_3 Shale, siltstone AB_2 Shale, siltstone, dolostone AB_1 Siltstone, shale, quartz arenite FF_3 Siltstone, quartz arenite, quartz-pebble conglomerate FF_2 Shale, siltstone, quartz arenite FF_1 Quartz arenite, shale
	Gradational		
	Adams Sound 2000 ft (610 m)		AS_3 Quartz arenite, minor conglomerate AS_2 Quartz arenite AS_1 Quartz arenite, minor conglomerate, shale
	Conformable		
	Nauyat 1400 ft (430 m)		N_2 Basalt flows N_1 Subarkose, quartz arenite, minor basalt
	Nonconformity		
Archean-Aphebian	Granitic gneiss basement		

The final description and definition of the Adams Sound and Nauyat formations by Blackadar (1970) causes some difficulty in that the sandstones underlying and interbedded with the Nauyat flows, although previously recognized and described (Lemon and Blackadar, 1963), were not clearly distinguished when the Nauyat Formation was set up. Rather than introduce new names at this time the sandstones below and between the flows are considered to be part of the Nauyat Formation. Also, a future revision of group nomenclature may prove advantageous.

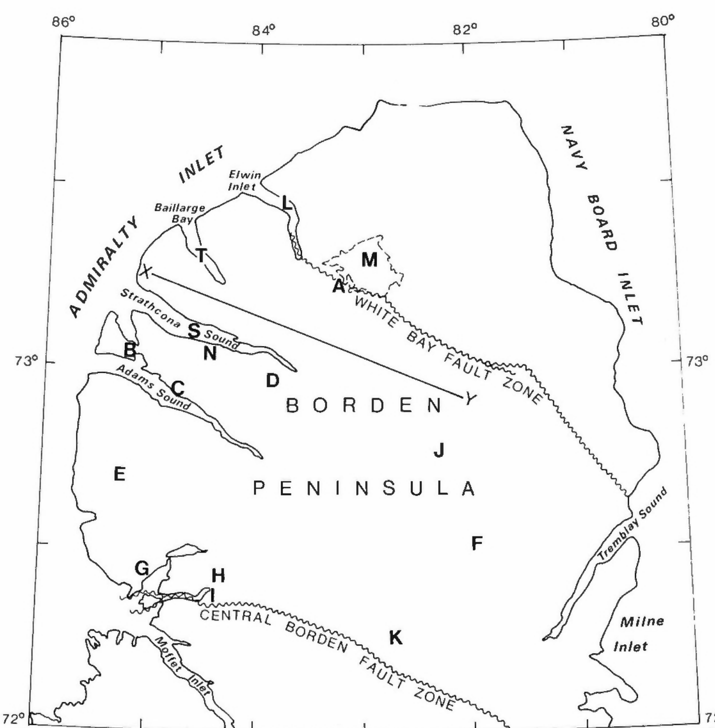
Pending the completion of age determinations in progress, these Upper Proterozoic strata are tentatively considered to be Neohelikian (Jackson et al., 1975).

BASEMENT COMPLEX

A complex assemblage of gneisses is separated from the overlying Neohelikian strata by a nonconformity. A thin regolith may be present in a few places on the gneisses, which are commonly stained red for several feet (a few metres) below the nonconformity. Most exposures of basement gneisses lie south of Adams Sound and are commonly associated with block faulting along the Central Borden and White Bay Fault Zones which bound the Milne Inlet Trough to the south and north respectively (Jackson et al., 1975).

The gneisses are chiefly irregularly banded migmatites commonly cut by more than one generation of granites. The paleosome is chiefly granodiorite to amphibolite of uncertain origin. Biotite-hornblende (± garnet, ± pyroxene) paragneiss paleosome is common; minor feldspathic quartzite and local calc-silicate gneisses were also seen. The neosome is chiefly granite to granodiorite and includes varying amounts of pegmatitic material. Nebulitic and foliated granitic rocks are abundant and white porphyroblastic migmatites and flaser gneisses are common. A few concordant, sill-like, foliated and massive, granite-quartz monzonite and, equivalent, hypersthene-bearing charnockite-monzocharnockite bodies up to a few thousand feet (c. 1000 m) wide occur locally. Rare relict pods of metamorphosed basic and ultrabasic rocks range up to a few hundred feet (c 100 m) in diameter.

The complex is chiefly of upper amphibolite facies but locally contains scattered areas of granulite facies rocks that seem to be more abundant south of the Central Borden Fault Zone than north of it. In addition, although gneissosity trends are highly variable, there is a distinct tendency for gneissosity to parallel adjacent east-west faults. These gneisses are similar to, and lie within the same complex as the gneisses east of the map area (Jackson et al., 1975; Jackson, 1978). They have all probably undergone more than one period of deformation and metamorphism and may include rocks of both Archean and Aphebian ages.



A Elwin River Valley
B Arctic Bay
C Adams Sound
D Adams River
E Eqalulik River Valley
F Surprise Creek
G Nauyat Cliffs
H Fleming Lake
I Fabricius Fiord
J 32 mi. (50 km) east of Adams Sound
K Magda Plateau
L Elwin Inlet
M Elwin Icecap
N Nanisivik
S Strathcona Sound
T Baillarge Bay

0 KILOMETRES 50
0 MILES 30

X-Y section shown in Fig. 9

Figure 1. Map of Borden Peninsula showing locations of field sites.

NAUYAT FORMATION

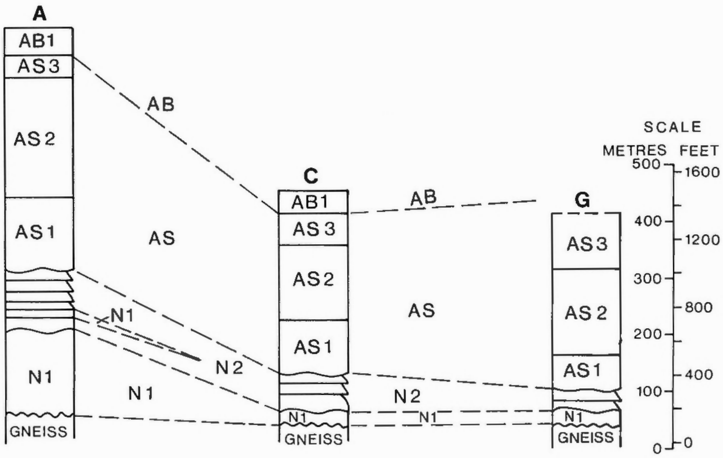
This formation occurs chiefly from the vicinity of Adams Sound south to Fabricius Fiord, but outcrops as far north as the Elwin River Valley, and as far east as the Surprise Creek area (Fig. 1). Best-exposed sections occur along the edges of extensively uplifted fault blocks where basement gneisses, Nauyat volcanics, and Adams Sound quartzarenites commonly form towering, locally castellated cliffs.

The Nauyat Formation has been divided informally into a lower (N_1) member composed predominantly of sandstones, and an upper (N_2) member composed of basic volcanics (Fig. 2). Total thicknesses for the formation are commonly about 800 feet (240 m) or less, but locally may be as much as 1400 feet (430 m). It is difficult to separate the N_1 member from the overlying Adams Sound Formation where the N_2 volcanic member is missing.

N_1 member

Subarkoses and quartzarenites are commonly associated with quartz-pebble conglomerate, siltstone and shale in the southern part of the area; but at Elwin River Valley this member is composed of quartzarenite. The strata are thin- to medium-bedded, planar- to wavy-bedded, and range from grey to white, yellow, orange and brown. Purple tints are common in the vicinity of Nauyat Cliffs. At some localities the strata are arranged in crude fining-upward cycles 10 to 25 feet (3 to 8 m) thick, with basal scour channels filled with conglomerate. Trough crossbeds are relatively abundant in Elwin River Valley where current ripple marks are also present.

This member ranges from 0 to 500 feet (150 m) thick from Adams Sound southward, and is 500 feet (150 m) thick in Elwin River Valley. A conformable volcanic sequence, commonly containing one or two flows, similar to those in the upper (N_2) member, forms part of the N_1 member north of Eqalulik River (200 feet (60 m)) and in Elwin River Valley (87 feet (27 m)) (Fig. 1). This lower sequence of flows is overlain by 50 to 340 feet (15 to 100 m) of quartzarenite and is underlain in most places by 10 to 500 feet (3 to 150 m) of quartzarenite. A nonconformity separates the N_1 member from underlying basement gneisses, but N_1 is conformably overlain by the volcanics of N_2 member. Both the N_1 and N_2 volcanics are underlain by baked and indurated sedimentary strata.



AB = Arctic Bay Formation

Figure 2. Representative sections of Adams Sound (AS) and Nauyat (N) formations. Locations as on Figure 1.

N_2 member

Nauyat volcanics occur in one sequence containing between two and five flows throughout most of the area examined during the past summer. The flows are fine grained, commonly slightly amygdaloidal at their base, and are increasingly amygdaloidal upward. Poor columnar jointing and amygdules and vugs containing calcite, dolomite, quartz, agate, zeolites and minor sulphides, are also common throughout. Chlorite is abundant and most olivine has been altered. Some flows contain partially resorbed clastic quartz grains. Pillows have been reported previously from one locality on the east side of Admiralty Inlet south of Adams Sound (Blackadar, 1970; pers. comm.). Vague pillows and pillow-like structures were seen at only two localities during the past summer, also south of Adams Sound. Brecciated volcanic rock was seen at one locality in the Eqalulik River valley. The top flow of the sequence is massive, finer grained, more resistant, and contains better formed columnar joints than the lower flows. Twelve chemical anlayses indicate that the flows are tholeiitic plateau basalts with alkalic affinities. Thin, baked quartzarenite beds, thinly laminated limestone, ferruginous carbonate and chert, and rare breccia lenses occur locally between flows. Individual flows range from a few feet to about 200 feet in thickness (1 to 60 m) while the member as a whole ranges from 100 feet (30 m) to 330 feet (100 m) in Eqalulik and Elwin River valleys respectively, but may be considerably thicker northwest of Surprise Creek and south of Adams Sound (Fig. 2). N_2 member rests directly on basement gneisses in several places, and in some of these the gneiss surface has considerable local relief.

Interpretation

The Nauyat volcanics are interpreted as a series of dominantly subaerial flows that were extruded rapidly and quietly during a period of fluvial sedimentation. Renewed sedimentation buried the flows before they could be eroded.

ADAMS SOUND FORMATION

Adams Sound strata underlie about half of the area south of Strathcona Sound and occupy relatively small areas at "Surprise Creek" and Elwin River valleys (Fig. 1).

The strata are predominantly varicoloured quartzarenites, most being reddish brown to orange, buff, yellow, pink or grey to white. Minor subarkose, quartz-pebble orthoconglomerate, shale, and siltstone are present. Measured thicknesses range from 550 (170 m) to 960 (290 m) feet. Estimates indicate that 2000 feet (610 m) may be present, but may include the N_1 member of the Nauyat Formation. The basal beds seem sharply conformable with the upper Nauyat volcanic sequence, and do not appear to be baked. However the presence of rare volcaniclasts in basal beds suggests that a disconformity may be present locally. The upper contact with the overlying Arctic Bay Formation is conformable and gradational.

The rocks are thin- to thick-bedded, planar- to wavy-bedded, and display a wide variety of internal sedimentary structures. These include straight and undulatory to lunate ripple marks, planar- and trough-crossbeds, scour and tool marks, load casts, convoluted bedding, channels, clastic dykes, and microfaults. Division into intergradational members (Fig. 2) is based on differences in colour, lithology and dominant contained structures.

AS_1 member

Orange-red to purple quartzarenite predominates, and is associated with minor quartz-granule and quartz-pebble conglomerate, siltstone and shale. The quartzarenite contains abundant trough crossbeds, scour channels and a variety of other sedimentary structures. Well developed, fining-upward cycles 5 to 50 feet (1 to 15 m) thick occur locally. This member is 135 feet (40 m) thick at Surprise Creek, and over 200 feet (60 m) at Adams Sound.

AS_2 member

The AS_1 member grades upward into orange-pink to brown, massive quartzarenites of the AS_2 member, which is 240 feet (73 m) thick at Fabricius Fiord and 340 to 420 feet (103 to 128 m) thick at and south of Adams Sound. The relatively few sedimentary structures present include oscillation and current ripple marks, rill-like marks and mud cracks.

AS_3 member

Grey to white quartzarenites are gradational with the underlying AS_2 member, and are 225 feet (68 m) thick at Fabricius Fiord and 330 feet (100 m) thick at Arctic Bay. Fining-upward cycles 5 to 15 feet (1.5 to 4.5 m) thick with large basal scour channels filled with quartz-pebble and granule conglomerate are common. Coarse grained, graded trough crossbeds and soft-sediment deformation structures overlain by fine grained planar-stratified beds are abundant.

Interpretation

The Adams Sound Formation was deposited in a dominantly fluvial environment. Many of the fluvial sediments were probably deposited by braided streams. Paleocurrent data (Fig. 3) suggest sediment source regions lay to the southeast and east. The massive AS_2 member may have been deposited in a shallow, nearshore environment during a period of marine encroachment.

ARCTIC BAY FORMATION

The Arctic Bay Formation outcrops along Adams Sound southeast to Surprise Creek, from the head of Adams Sound south and southeast to Magda Plateau, and in the Elwin River Valley to the north. The formation is composed chiefly of fissile, micaceous, graphitic black to grey shale and minor interbedded siltstone, dolosiltite and quartzarenite. Thickness of the formation varies from about 590 feet (180 m) at Arctic Bay to about 1700 feet (520 m) in Elwin River Valley. A similar thickness has been estimated for north of the head of Adams Sound, and about 2000 feet (610 m) for northwest of Surprise Creek. The contact with the overlying Society Cliffs Formation is conformable in some places. Elsewhere it is marked by an indistinct to pronounced angular discordance of the upper Arctic Bay beds, possibly due in part to the undulatory nature of the stromatolitic beds.

The formation is recessive and poorly exposed, but has been subdivided informally into five intergradational members (Fig. 4). Sedimentary structures are abundant in the lower three members which contain planar to wavy bedding, undulatory to lunate current ripples, planar- and trough crossbeds, load casts, convoluted beds, synaeresis cracks, molar tooth structure, and rill-like markings.

AB_1 member

This member consists of interbedded grey-green to red siltstone and shale, and similarly coloured, as well as white, quartzarenite.The quartzarenite decreases in abundance upward. Thicknesses of the member range from 45 to 160 feet (14 to 48 m) in the vicinity of Adams Sound. Structures include those noted above and herringbone crossbeds, clastic dykes, and flaser bedding.

AB_2 member

This member consists of coarsening-upward cycles, most of which range from 15 to 70 feet (4.5 to 21 m) in thickness. The lower part of each cycle is composed of a thick shale unit that grades upward into interbedded shale, siltstone, dolosiltite, and fine grained quartzarenite. Either medium grained quartzarenite or finely crystalline dolostone occurs in the upper parts of some cycles. The AB_2 member is 160 to 380 feet (48 to 115 m) thick in the vicinity of Adams Sound and 480 feet in Elwin River Valley.

AB_3 member

The member consists of laminated shale with minor interbeds of dolosiltite, siltstone, and quartzarenite. Near Arctic Bay 290 feet (88 m) are present, whereas 465 feet (142 m) occur in Elwin River Valley. Sedimentary structures are not as abundant as in AB_2 member but include numerous finely crystalline dolostone lenses that disrupt the shale beds, and contain cone-in-cone structures and vugs lined with quartz, calcite, siderite and celestite. Some gypsiferous laminae are interbedded with shale, which may also have a gypsiferous coating on weathered surfaces. Hematite stains are common on the weathered surfaces of the various rock types.

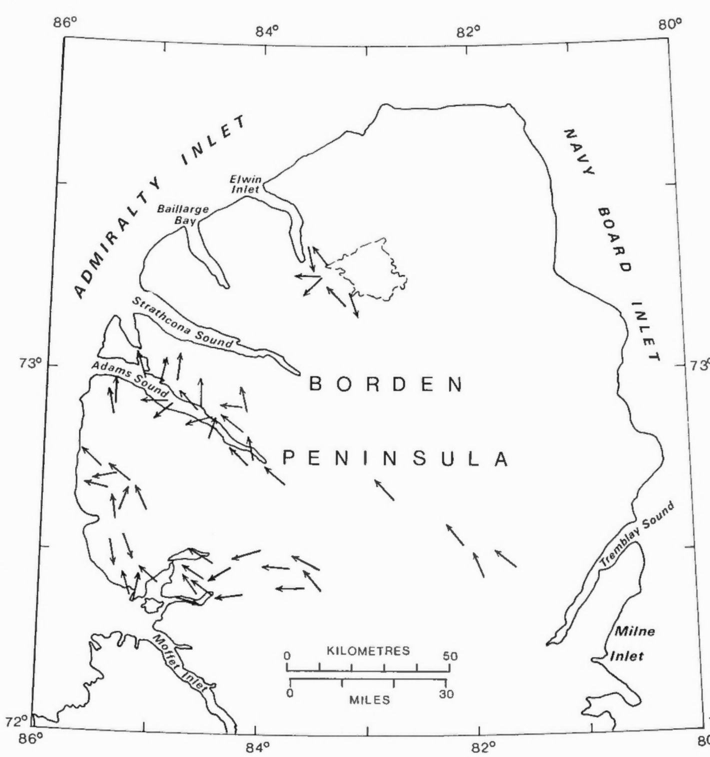


Figure 3. Average paleocurrent trends from crossbeds in the Adams Sound Formation. Total readings — 1120.

AB_4 member

Like the AB_2 member, this member consists of cycles, the nature of which, however, varies from one locality to another. At the head of Adams Sound individual cycles consist of fissile shale overlain by a relatively thin unit of interbedded shale and dolosiltite, or by dolosiltite alone. Individual cycles range in thickness from 20 to 130 feet (6 to 39 m).

In the Elwin River Valley this member has been subdivided informally into three units. The lower unit is composed of cycles similar to those at Adams Sound and shale is overlain by interlayered shale, siltstone and quartzarenite. The middle unit is composed of a lower calcareous bed containing pisolite-like structures, a middle bed of rusty to grey bulbous concretions in a finely crystalline calcareous matrix, and an upper, breccia bed of shale and siltstone clasts in a finely crystalline limestone matrix. The upper unit is composed of shale grading upward into siltstone in cycles 40 to 50 feet (12 to 15 m) thick. The member is 617 feet (188 m) thick at the head of Adams Sound and 635 feet (194 m) thick in the Elwin River Valley.

AB_5 member

This member is composed of thinly laminated, grey, stromatolitic dolostone interbedded with grey-black, finely crystalline argillaceous limestone and calcareous shale. Stromatolites are planar to low domal forms that are locally brecciated. Some of these beds emit a petrolifeorus odour. Thicknesses range from 48 feet (14.5 m) at Arctic Bay to 60 feet (18 m) in Elwin River Valley and 160 feet (49 m) north of the head of Adams Sound.

Interpretation

The Arctic Bay Formation may represent a basin-wide transgression followed by minor regression. Shallow tidal to subtidal marine conditions (AB_1 member) were followed by a progressively deeper subtidal environment (AB_2 and AB_3 members). A reversal of the trend brought on gradually shallower water environments which were accompanied by a gradual increase in the proportion of carbonate strata deposited and a decrease in siltstone and quartzarenite deposition in AB_4 and AB_5 members. Presumably, therefore, at this stage source areas had been worn down, were providing relatively little coarse clastic material, and were in part transgressed by the sea and covered by sediment.

FABRICIUS FIORD FORMATION

The Fabricius Fiord Formation outcrops from Fabricius Fiord eastward at least as far as Magda Plateau (Fig. 1). It is composed of grey to black shale, grey siltstone, sandstone and conglomerate. The sandstone ranges from quartzarenite to arkose, most is grey to white, but some is yellow, orange or mauve. The formation has a total thickness in the west of about 5400 feet (1645 m) which may be its thickest development, and where it has been subdivided into three intergradational members (Fig. 4). The contact with the underlying Adams Sound Formation is both conformable and gradational. The upper part of the Fabricius Fiord Formation is downfaulted against high grade gneisses to the south along the Central Borden Fault Zone. The lower two members grade eastward along strike into more typical Arctic Bay strata. Strata in the lower two members contain abundant sedimentary structures, including load structures, trough- and herringbone-crossbeds, straight, undulatory, lunate, and lingoid ripple marks, convolute bedding, synaeresis cracks, clastic dykes, and rill-like markings.

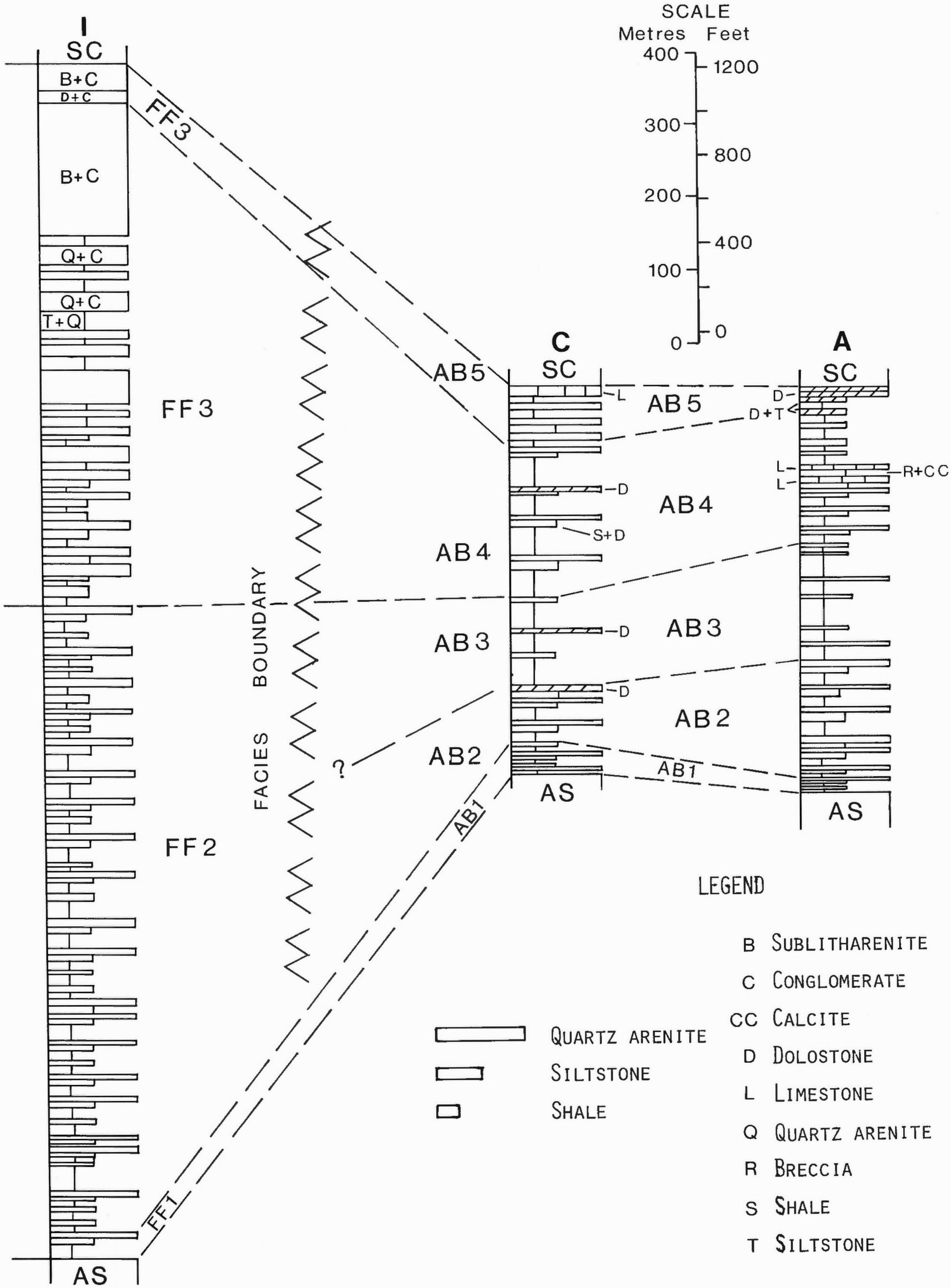


Figure 4. Facies relationships between the Arctic Bay (AB) and Fabricius Fiord (FF) formations.

FF_1 member

This member averages 60 feet (18 m) in thickness. White to hematite-stained quartzarenite beds in the lower part grade upward into interbedded black shale, siltstone and quartzarenite.

FF_2 member

Most strata within this member were deposited in cycles that in the lower part of the unit are composed of brown to black micaceous fissile shale which grades upward into interbedded shale, siltstone, and minor quartzarenite. Some cycles are capped by a thin unit of quartzarenite. Shale makes up over 70 per cent of the lower cycles and decreases in abundance upward to make up 50 per cent or less of the cycles in the upper part of the member. This change is accompanied by an increase in number and thickness of quartzarenite beds upward in the member. Individual cycles range from 30 to 140 feet (9 to 42 m) in thickness, and the member is 2925 feet (892 m) thick.

FF_3 member

Shale-siltstone-quartzarenite cycles in the lower part of this member are similar to those in the upper part of FF_2. However, the shale component decreases upward in the member until the cycles are predominantly interbedded siltstone and quartzarenite. The upper half of this member is predominantly coarse grained quartzarenite, and very coarse grained immature, thick bedded to massive subarkosic arenite. Quartz-granule and quartz-pebble conglomerate is abundant throughout the upper half of the member and is present in the lower half as well. At one locality a 10-foot (3 m) bed near the top of the member contains brown-weathering stromatolitic dolomite interbedded with quartz-pebble conglomerate. West of Magda Plateau, carbonate beds, carbonate bioherm-like mounds, and conglomerate beds containing dolostone boulders also occur in the upper part of this member. All these carbonates resemble Arctic Bay carbonates rather than Society Cliffs carbonates, although Geldsetzer (1973b) considers that the upper part of the Fabricius Fiord Formation can be traced laterally into the Society Cliffs Formation. The FF_3 member is 2415 feet (736 m) thick near Fabricius Fiord.

Interpretation

The Fabricius Fiord Formation is the lateral nearshore marginal facies equivalent of the Arctic Bay Formation. The lower members (FF_1, FF_2) grade eastward along strike into more typical Arctic Bay strata. The FF_1 member was deposited under shallow, nearshore, marine conditions. The FF_2 member may be largely composed of reworked deltaic deposits that were deposited in an intertidal environment. The FF_3 member is considered to be composed largely of sediments deposited at the periphery of a shallow marine basin; the lower, deltaic, deposits grade upward into braided stream deposits. Carbonate deposition probably occurred in protected embayments.

Movement along the Central Borden Fault Zone triggered the influx of clastic material into the basin, possibly from the south (Fig. 7). It has yet to be determined whether or not the upper strata (FF_3) are lateral equivalents of part of the Society Cliffs Formation.

Paleocurrent data indicate westward to northwestward transport of material and east-west trending tidal currents.

SOCIETY CLIFFS FORMATION

The Society Cliffs Formation extends from the mouth of Adams Sound to Nanisivik and southeast to Surprise Creek area, and is characterized by thick bedded to massive, internally regularly laminated, brownish grey to grey stromatolitic dololutite and dolosiltite in crudely cyclic units. Some of the lamination is irregular and beds are highly contorted locally. Planar stromatolites are ubiquitous and low domal varieties up to 3 feet (1 m) in diameter are common and rarely are as large as 10 feet (3 m) across. Cabbage-head types are less common and columnar forms are rare. Large elongate biohermal masses, composed chiefly of stromatolitic dolomite rarely 5000 feet (about 1500 m) long, occur southeast of Nanisivik. Some mounds and bioherms are elongated in a northwest-southeast direction. A strong petroliferous odour is almost always present and trace amounts of bitumen-like material are common.

Dolomite breccias are abundant throughout the formation (Fig. 5) and most are unstained and seem to have been formed during sedimentation. The clasts are very angular. Some interstices seem not to have been filled, and some associated strata contain dessication cracks. Some of these breccias occur between stromatolite mounds and bioherms.

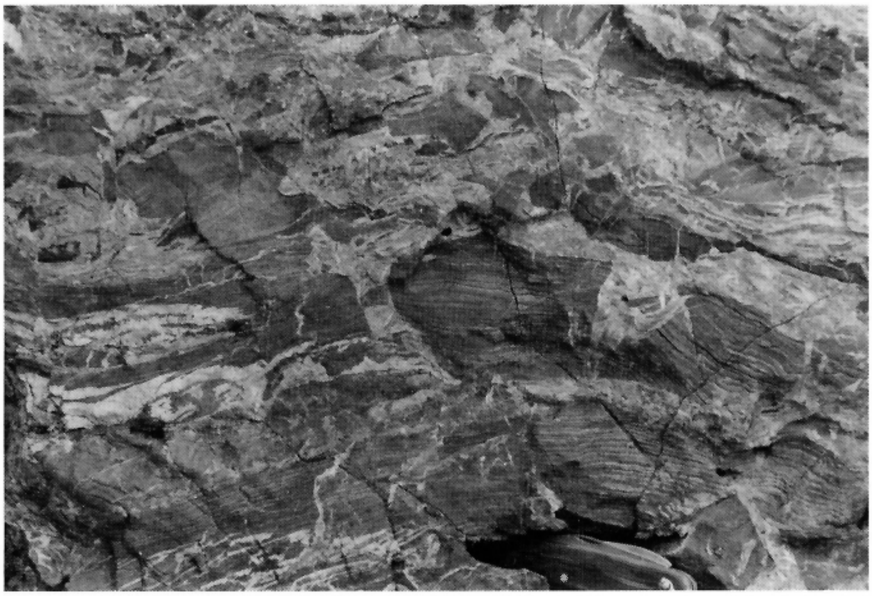


Figure 5.

Society Cliffs breccia east of Nanisivik; clasts of thinly laminated stromatolitic dolostone in a finely crystalline dolomite matrix. Note the 3-inch (8 cm) knife in the vug. Photo by T.R. Iannelli. GSC 172817.

Figure 6.

Society Cliffs dolomite disconformably above Arctic Bay shale southeast of Nanisivik. Photo by G.D. Jackson. GSC 173216.

Much of the brecciation may be related to karstification, particularly in the Arctic Bay-Nanisivik area, south of Baillarge Bay and in the Elwin Inlet-Elwin Icecap region. These breccias are relatively coarse, are stained red, and locally are cavernous. Secondary pods of specular hematite up to about 140 feet (40 m) in diameter occur southeast from Nanisivik for several miles, where some breccias seem to occupy pipes or chutes in unbrecciated dolomite. Minor breccia, chiefly of this type, has been formed along faults.

Other lithologies of widespread but minor occurrence include flat pebble conglomerate, round-clast conglomerate, and grey to black chert lenses and nodules. Nodular, gypsiferous dolomite occurs near Arctic Bay (Gelsetzer, 1973b).

Many of the dolomitic rocks have been recrystallized and are vuggy. Most vugs are less than 2 inches (5 cm) and are commonly lined with calcite, dolomite, a gypsiferous coating, hematite, sulphide minerals, chert, quartz, and possibly barite or celestite.

Quartzarenite, arkose and minor quartz-feldspar dolomitic conglomerate occur in units up to 20 feet (6 m) thick in a north-south-trending belt east of the head of Adams Sound (Fig. 7). Red shale and siltstone are thinly interbedded with what is considered to be Society Cliffs dolomite south and southeast of Elwin Icecap. Vertical fractures 6 feet (2 m) long extend down from the top of the dolomite in the same area and are filled with red siltstone. The correlation of this carbonate with the Society Cliffs Formation is as yet uncertain.

The Society Cliffs Formation is 862-1000 feet (263-305 m) thick near Arctic Bay, up to 1800 feet (550 m) between there and Surprise Creek, and is over 2000 feet (610 m) thick in the Elwin River Valley. The contact with the underlying Arctic Bay Formation is conformable in some places, but disconformable in others (Fig. 6), and is marked by a basal dolomite conglomerate east of the head of Adams Sound where a round pebble and cobble conglomerate occurs at the base. The contact with the overlying Victor Bay Formation is obscured or poorly exposed in most places, but locally seems conformable and in some places somewhat gradational. At one locality near Nanisivik, the shale and silt content increases upward in the top 3 feet (1 m) of thinly-laminated Society Cliffs dolosiltite. Scattered cabbage-head stromatolites and small black chert lenses occur at the top of the formation and are overlain conformably by thinly laminated silty dolomite and shale of the Victor Bay Formation.

Interpretation

Society Cliffs strata were deposited under shallow, subtidal to intertidal conditions. Geldsetzer (1973b) considered the northerly-trending belt containing quartzarenites and arkoses described above to be parallel to a western shoreline and to separate an intertidal zone to the west from a subtidal zone to the east. However, the thinly laminated stromatolitic dolostone, which Geldsetzer considers to be subtidal and could equally well be intertidal, also occurs west of this northerly trending belt. Possibly the terrigeneous material in the northerly-trending belt (Fig. 7) was transported by a stream flowing northward across a tidal flat from the uplifted area to the south that provided the coarse detritus in the Fabricius Fiord Formation. The relative sparseness of breccias east of Milne Inlet (Geldsetzer, 1973b; Olson, 1977; Jackson, et al., 1975) suggests that deposition in that region may have been in a protected lagoonal environment. Abundance of breccias, some of which are associated with bioherms, suggests that deposition in the area to the west took place in a higher-energy, possibly barrier reef, environment, and that Geldsetzer's western shoreline may have been an offshore barrier with associated reefs.

Geldsetzer (1973b) and Olson (1977) argued convincingly that an interval of erosion, karstification, mineralization and dolomitization occurred before the Victor Bay Formation was deposited. Olson also concluded that there were three later karstification episodes. The region in which the Society Cliffs Formation is considered to be extensively brecciated and karsted is shown in Figure 7 (modified from Geldsetzer, 1973b). Within the same region brecciation and karstification occurs to a minor extent in lower Strathcona Sound carbonate strata, and to a limited extent in Victor Bay carbonate.

VICTOR BAY FORMATION

Victor Bay strata outcrop for the most part in the same general area as the underlying Society Cliffs Formation, and consist of thinly bedded shale, siltstone, argillaceous dolostone and limestone, and thinly bedded to massive flat

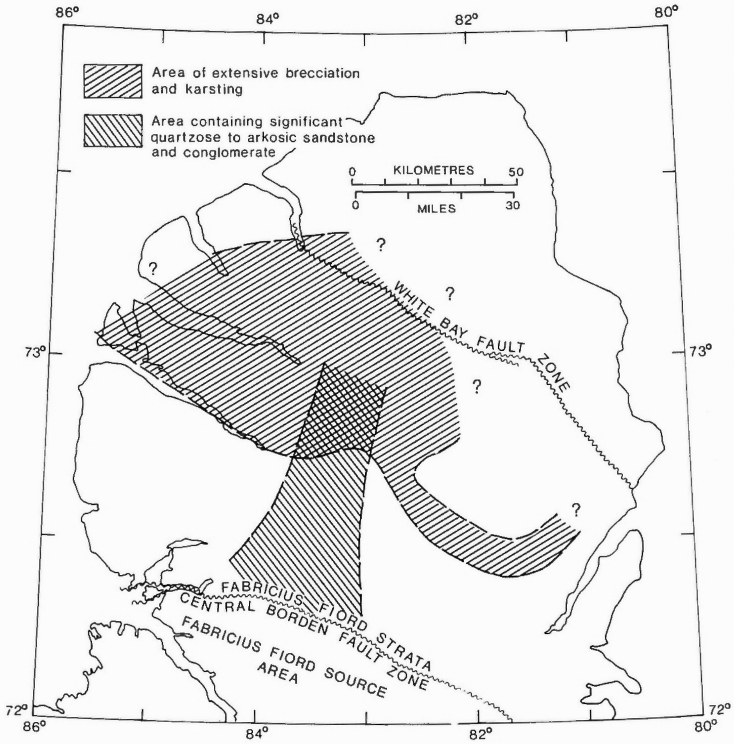


Figure 7. Relationship of quartzose and arkosic sandstones and conglomerates in Society Cliffs Formation to Fabricius Fiord strata and Central Borden Fault Zone. Region of extensive brecciation and karst development, chiefly within Society Cliffs strata, is also shown (modified from Geldsetzer, 1973b).

Figure 8. Victor Bay flat pebble limestone conglomerate southeast of head of Strathcona Sound. Limestone clasts in a dolostone matrix. Photo by P.J. Wallace. GSC 173076.

pebble conglomerate and round-clast conglomerate. The strata are commonly dark grey and the presence of a petroliferous odour is rare, compared with the Society Cliffs Formation. The Victor Bay Formation is about 514 feet (160 m) thick near Arctic Bay, from 1000 to 1500 feet (300 to 460 m) both at and southeast and east of Nanisivik, and is about 2130 feet (640 m) 32 miles (50 km) east of the head of Adams Sound.

The contact relationships between the Victor Bay and the overlying Strathcona Sound Formation are laterally variable. South of the head of Baillarge Bay (Fig. 1) the contact is a low-angle unconformity, marked by a carbonate boulder conglomerate. The Victor Bay Formation seems to have been faulted and folded prior to deposition of Strathcona Sound strata east of Baillarge Bay. The contact is marked by a disconformity overlain by a carbonate boulder conglomerate containing gneiss clasts between the head of Strathcona Sound and a point 10 miles (16 km) to the southeast. For another 25 miles (40 km) to the southeast, as well as in the area north of the head of Strathcona Sound, the contact is conformable and gradational, and interbedded limestone, shale, siltstone and thinly laminated stromatolitic dolostone of the Victor Bay Formation grade upward into interbedded green, red and green, and red shale and siltstone of the Strathcona Sound Formation.

Most of the Victor Bay Formation is divisible into two intergradational members: a lower shale and an upper carbonate member. At a few localities it is not easily subdivided, whereas in others, several subdivisions may be made.

VB_1 member

Dark grey shale, siltstone and argillaceous dolostone are the predominant lithologies in the lower member. They are commonly thinly interbedded in units up to 130 feet (40 m) thick that are separated by fissile, black graphitic shale in units up to 6 feet (2 m) thick, and rarely 20 feet (6 m). Limestone and dolostone beds are rare in the basal 100 feet (30 m) but increase somewhat in thickness and number towards the top of the member. A crude cyclicity is represented in some units by a gradual upward thickening of individual beds and in other units by limestone interbeds in the lower part giving way to dolostone interbeds in the upper part.

The lower member (VB_1) ranges from 90 feet (27 m) thick near Arctic Bay to an average of 700 feet (about 210 m) in the area around and southeast and east of Nanisivik, and about 1200 feet (370 m) 32 miles (50 km) east of the head of Strathcona Sound.

Carbonate-clast breccia and flat-pebble, and round-pebble conglomerate beds occur in the upper part of the member. Concretions, small lenses and masses of black chert, pebble-sized pyrite-marcasite masses, and gypsiferous coatings on weathered surfaces were noted in several places. Slump structures, ripple marks, load structures, possible groove casts, flame structures, ball and pillow structures and cross-beds were noted at various localities.

VB_2 member

The upper Victor Bay member is characterized by units of flat pebble-boulder dolostone and limestone conglomerates (Fig. 8) that alternate with units of variously interbedded dark grey shale, siltstone, dolostone

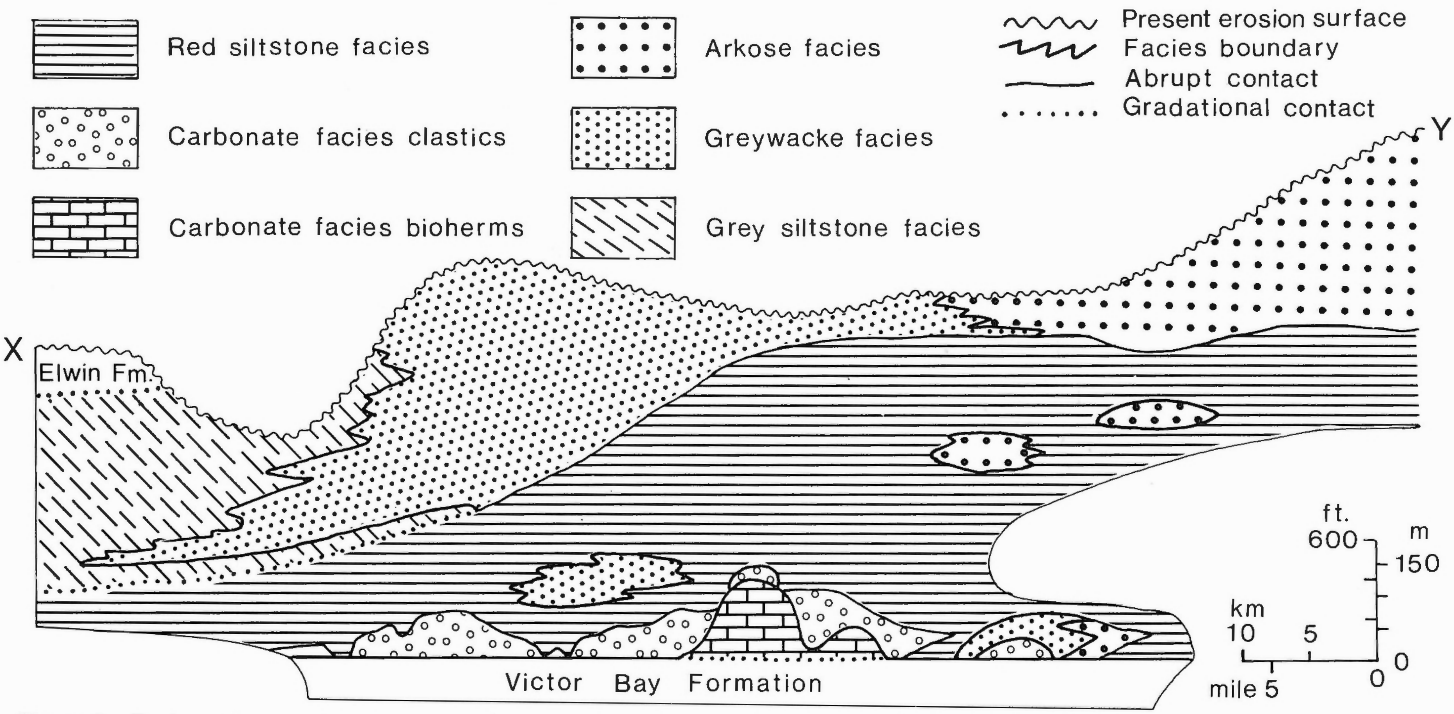


Figure 9. Facies relationships within the Strathcona Sound Formation along a line from north of the mouth of Strathcona Sound east-southeasterly to north of "J" on Figure 1.

and limestone. Some of the latter units are composed of very evenly and thinly interbedded (1 to 6 in) (2 to 15 cm) shale, and either dolostone or limestone. These alternating units range up to 60 feet (18 m) thick. Clasts within the conglomerate units are commonly up to one foot (30 cm) long; one measured 10 feet by 6 feet (3 m by 2 m). Most of the clasts in the flat-pebble conglomerate beds seem to be composed of the same rock types that are interbedded with the conglomerates, and stromatolitic clasts are minor. Some conglomerate beds grade upward into thinly bedded argillaceous carbonate. Minor round cobble-boulder conglomerate is also present.

The upper, VB_2, member ranges from 424 feet (129 m) thick near Arctic Bay to an average of about 250 feet in the area around and southeast and east of Nanisivik and to 940 feet (287 m) 32 miles (50 km) east of Strathcona Sound.

Regularly laminated stromatolitic limestone and dolostone occur in the upper part of this member, east of Strathcona Sound. One bioherm, possibly a reef, about 1200 feet (370 m) long, was identified 32 miles (50 km) east of the head of Adams Sound. Scour channels, chert lenses and clasts, and disseminated pyrite occur at various localities in the member. Load structures and ball and pillow structures are rare. Mud cracks and graded bedding have been reported from the uppermost beds at one locality.

Interpretation

The Victor Bay Formation was probably deposited under subtidal to intertidal conditions. Geldsetzer (1973b) and Olson (1977) have speculated on possible reasons why algal growth did not reach the peak it did during development of the Society Cliffs carbonate. They considered Victor Bay deposition to have taken place during a period of maximum stability. Considering the overlying Strathcona Sound Formation as well as the Victor Bay Formation, it seems likely that the area may not have been as stable as pictured by Geldsetzer (1973b). Some instability and an abundance of fine terrigenous clastic material may have helped to prevent algal growth.

STRATHCONA SOUND FORMATION

The Strathcona Sound Formation outcrops in the vicinity of Strathcona Sound and eastward and northward. The formation is composed of a wide variety of complexly interfingering rock types, which include clastic and stromatolitic dolostone, shale, siltstone, arkose, greywacke, carbonate conglomerate, and granitic gneiss conglomerate. The nature of the strata and presence of faults makes it difficult to determine thicknesses. Individual well exposed sections in excess of 1600 feet (430 m) occur locally and the formation may exceed 3000 feet (910 m). Five major and distinct facies were recognized (Fig. 9). Their variable stratigraphic positions, and the presence of an unconformity locally between the Strathcona Sound Formation and underlying Victor Bay Formation enables representatives of any of the five facies to lie directly on the Victor Bay Formation. The Strathcona Sound Formation is gradational with the overlying Elwin Formation.

Carbonate facies

Detrital dolostones make up most of this facies throughout most of the formation and are predominantly oligomictic to polymictic, boulder orthoconglomerates and breccias (Figs. 10, 11) which occur in irregular lenses and zones, most of which are less than 30 feet (9 m) thick, but are as much as 450 feet (137 m). Most of the clasts are composed of dolostone and are derived from the Victor Bay Formation, although clasts derived from the Society Cliffs Formation and from the upper Victor Bay-lower Strathcona Sound biohermal platform predominate locally. Some Victor Bay dolostone clasts show soft-sediment deformation. Most clasts are one foot (30 cm) or less in diameter, but south of Baillarge Bay range up to 8 feet (2.5 m) in diameter. In the same area there are slump blocks up to 0.6 miles (1 km) long probably derived from Society Cliffs Formation a few miles to the south. Granitic gneiss boulders are abundant locally.

A small algal-dominated carbonate platform was developed initially either directly on or in the uppermost part of the Victor Bay Formation. Most of the contained strata,

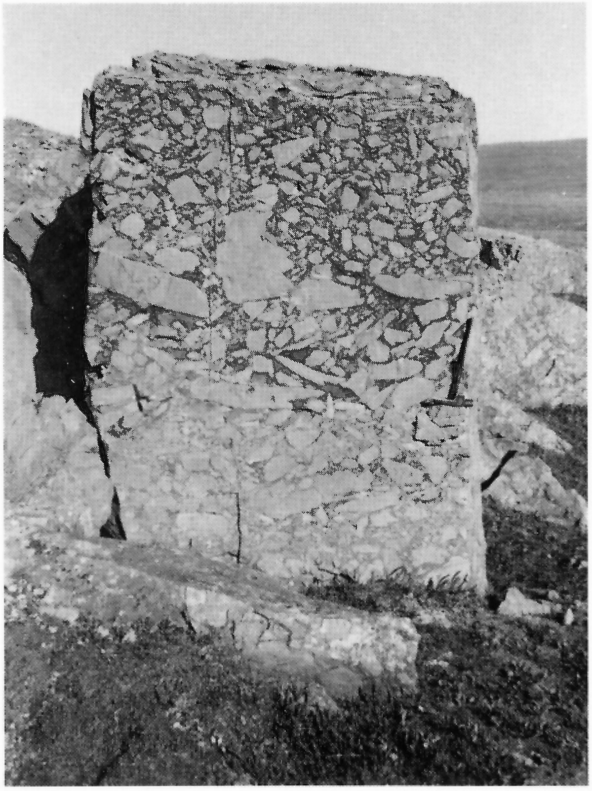


Figure 10. Dolomite breccia-conglomerate in lower Strathcona Sound strata north of head of Strathcona Sound. Photo by G. Narbonne. GSC 173011.

however, seem to lie within the lower Strathcona Sound Formation. Basal platform strata rest conformably on, and in some places interfinger with, Victor Bay strata. However, the platform strata also interfinger with the red shale and siltstone of the lower Strathcona Sound Formation. It is not yet known how much of the red shale now occurring between bioherms originally may have been draped over the bioherms.

The platform is at least 15 miles (24 km) wide and extends for about 30 miles (48 km) in a northeasterly direction, from north of Strathcona Sound to south of the Elwin Icecap. Elliptical, narrow, elongated bioherms are up to 0.6 miles (1 km) long and 400 feet (120 m) thick (Frontispiece). Bioherms have a variety of orientations, but easterly and northeasterly elongations seem to predominate. They are composed largely of vertically stacked and laterally linked hemispheroids with some undulose planar stromatolites, branching columnar stromatolites, and more complex types. Each bioherm is composed of a large number of coalescing growth centres or subbioherms for which slump structures and convex-upward sedimentary laminae suggest a primary topographic relief of several feet.

Stromatolitic dolostone predominates in the platform but in some areas stromatolites are rare and interbeds of breccia, round-clast and flat-pebble conglomerate, and shaly dolostone are present. Synaeresis cracks occur locally. This carbonate platform contains strata similar to some within the Society Cliffs Formation, which makes positive correlation of bedrock and clasts difficult.

Red siltstone facies

These strata occur chiefly in the lower part of the formation and are composed of uniform red shale, siltstone and sandy siltstone. The facies thickens, possibly to more than 1000 feet (305 m) and becomes coarser grained to the east and northeast. Rare asymmetric ripple marks, low angle planar crosslamination, and flute casts were the only sedimentary structures observed.

Figure 11. Dolomtie oligomictic orthoconglomerate in lower Strathcona Sound strata west of Arctic Bay. Photo by G.D. Jackson. GSC 173110.

Grey siltstone facies

This facies grades laterally eastward into the Greywacke facies and comprises a thick sequence of monotonous grey siltstones, at least a few of which are calcareous and have a white efflorescence on the weathered surface. Ripple marks, chiefly asymmetrical, and low-angle planar crosslamination are very rare.

Greywacke facies

This facies is composed predominantly of grey-green arkosic wacke, granule conglomerate, and siltstone with lenses of cobble and boulder conglomerate. It exhibits good cyclicity (Fig. 12), and many cycles begin with a scoured base, some of which exhibit tool marks and flute casts, and grade upward from a granule- or pebble-conglomerate, or coarse arkosic wacke, to a fine- to medium-grained arkosic wacke (Figs. 13, 14). Conglomerate clasts characteristically are composed of granitic gneiss. The cycles are 6 to 30 feet (2 to 10 m) thick and the conglomerate lenses are up to 25 feet (7 m) thick. Some units contain planar-laminated, fine grained greywacke and laminated and massive siltstone. Crosslamination is very rare. In a few places trough and planar crossbeds are faintly discernible and the basal coarse bed of a unit undercuts into, is draped over, and fills

Figure 12. Turbidite-like greywacke and siltstone strata in Strathcona Sound Formation east-southeast from the head of Baillarge Bay. Photo by G. Narbonne. GSC 172992.

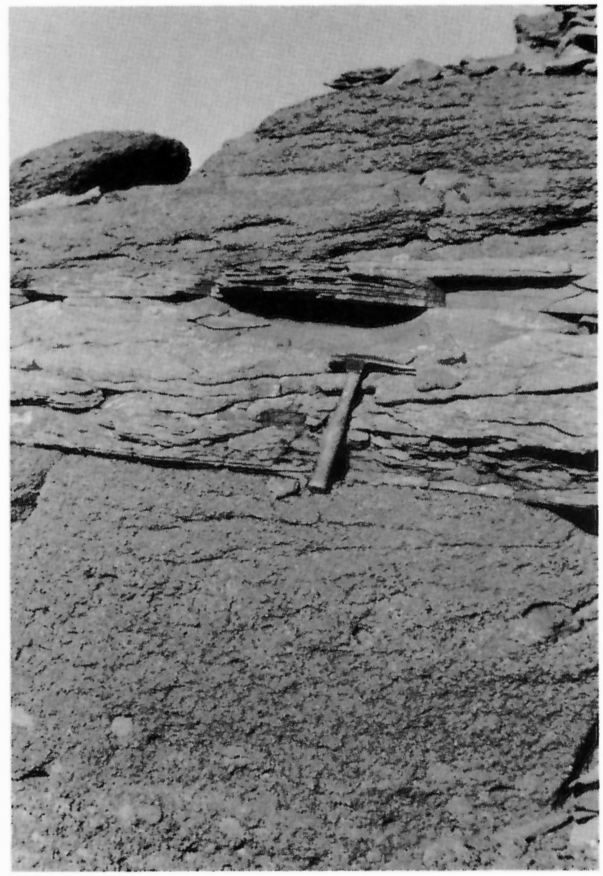


Figure 13. Fining-upward beds of granitic-pebble conglomerate and arkosic wacke in Greywacke facies of Strathcona Sound Formation southeast of head of Strathcona Sound. Photo by G.D. Jackson. GSC 173239.

crevasses in the underlying unit. The fabric of these rocks makes identification of trough crossbeds difficult. Coarsening-upward cycles were rarely seen. At one locality strata of this facies truncate at least 50 feet (15 m) of underlying Red siltstone facies (Fig. 15).

Arkose facies

Buff-red and buff-grey arkose, arkosic wacke and granule conglomerate predominate in this facies, which occurs chiefly in the eastern part of the area examined. Channels up to 50 feet (15 m) deep and infilled with granitic gneiss-cobble and -boulder conglomerate are common. Flute casts, primary current lineation and asymmetric ripple marks are very rare, although excellent graded bedding and erosion-based cycles similar to those in the greywacke facies are common. Rare crossbed determinations suggest southerly to southwesterly transport. The maximum observed thickness is 985 feet (300 m).

Interpretation

The small biohermal platform within the uppermost Victor Bay and lower Strathcona Sound formations was formed in a shallow subtidal to intertidal environment. A sudden influx of sediment, probably related to faulting, seems to have put an end to algal growth. The platform originally was probably more continuous than at present and may have contributed much of the material present in the closely associated carbonate conglomerates. These conglomerates occur in the lower part of the formation. Their universal chaotic nature, and apparently wide lateral extent, suggests a debris-flow mechanism for deposition, possibly on a submarine fan.

Geldsetzer (1973b) and Olson (1977) have correlated the Athole Point Formation in the vicinity of Milne Inlet with the entire Strathcona Sound and Elwin formations to the west. It seems equally possible that the Athole Point represents a small eastern carbonate platform developed in the Milne Inlet area that is temporally and stratigraphically related to the basal Strathcona Sound carbonate platform described above. Geldsetzer (1973b) considered the Strathcona and Elwin formations to be a molasse facies, and possibly fluvial-deltaic.

Deposition of the red siltstone facies may have occurred either in a subtidal environment below storm wave-base, or in an alluvial environment. Interfingering with the biohermal carbonates described above favour the former, although more data concerning this point are needed.

The arkosic wacke cycles within the Greywacke facies are tentatively interpreted as turbidites, and the continued repetition of Zone A of the "Bouma sequence" is characteristic of relatively proximal turbidites (Walker, 1967). The planar-laminated, fine grained greywacke may represent Zone B and the laminated and massive siltstone Zones D-E. Crosslamination characteristic of Zone C is very rare.

The erosionally-based lenses of conglomerate are interpreted as submarine channel deposits. The orientation of channels, rare flute casts and most of the very rare planar crossbeds are consistent and indicate transport from the east or southeast.

Figure 14. Scour channel in medium grained Strathcona Sound arkosic wacke filled by pebbly granule arkosic wacke southeast of head of Strathcona Sound. Photo by G.D. Jackson. GSC 173242.

The Grey siltstone facies was probably deposited in a subtidal environment below storm wave-base, and is considered to be a lateral equivalent of the more proximal Greywacke facies. Rare current indicators suggest westerly transport. The Arkose facies may be a proximal equivalent of the Red siltstone and perhaps the Greywacke facies. Both the Greywacke and Arkose facies may include coarse braided stream deposits in the east.

The rare current indicators and distribution of facies suggest chiefly westerly transport. The occurrence of large granitic gneiss clasts within the various conglomerates, and the immature nature of the Greywacke and Arkose facies strata, strongly suggest that uplift and erosion of source areas such as the Navy Board High, east of the Elwin Icecap (Jackson et al., 1975), was caused by faulting.

ELWIN FORMATION

The Elwin Formation conformably overlies the Strathcona Sound Formation and is the uppermost Proterozoic sedimentary unit on Borden Peninsula. Within the area investigated it outcrops between Strathcona Sound and Baillarge Bay, and north of the Elwin Icecap. This formation is a varicoloured assemblage of sandstones and siltstones, with minor shale and dolostone. In contrast to the matrix-rich sandstones of the Strathcona Sound Formation, the subarkoses and quartzarenites of the Elwin contain very little matrix.

Over 2300 feet (700 m) of strata were measured north of Elwin Icecap, but the formation may be about 4000 feet (1220 m) thick in the same area. Three intergradational units were differentiated.

The basal 1100 feet (330 m) are predominantly subarkose in which symmetric and asymmetric ripple marks and planar crossbeds are common. Herringbone crossbeds and dessication cracks are rare. Beds of dololutite, intraformational dolorudite, and oolitic arenite are present, as are siltstone and shale beds with abundant halite casts (Fig. 16).

The lower unit is overlain by subarkose containing abundant trough and planar crossbeds, asymmetric and symmetric ripple marks, ripple drift crosslamination, and small-scale channels. Although siltstone intraclasts are abundant, discrete beds of siltstone form only 1 per cent of the unit, which is 165 feet (50 m) thick.

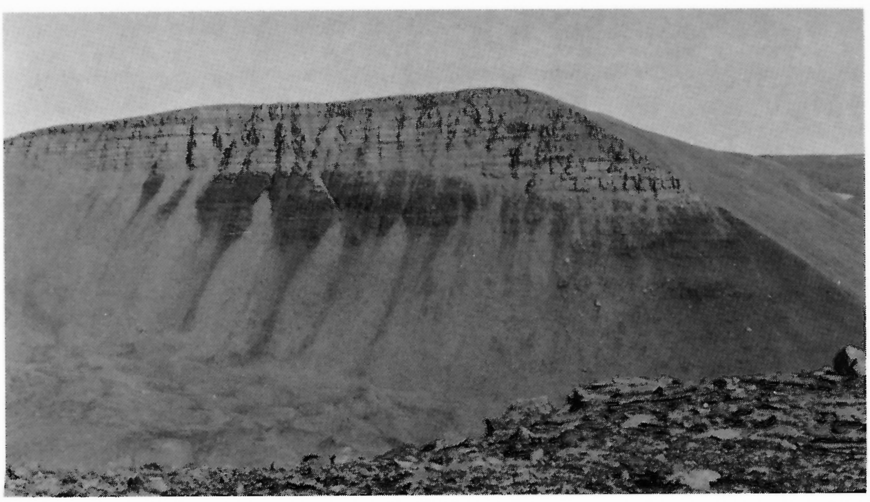


Figure 15. Arkosic wackes of Greywacke facies, Strathcona Sound Formation, shown in Figures 12 and 13, truncating underlying red shale and siltstone of the Red siltstone facies southeast of Strathcona Sound. Same locality as for figures 12, 13. Photo by G.D. Jackson. GSC 173303.

The above unit is overlain by a thick sequence of fine grained quartzarenite and siltstone. Planar crossbeds and synaeresis cracks are common locally. Herringbone crossbeds are very rare.

Interpretation

The basal 1100 feet were probably deposited in very shallow subtidal to intertidal conditions. Halite cast-bearing strata probably accumulated in ephemeral pools on tidal flats. The middle unit probably is of braided fluvial origin. Crossbeds, including trough crossbeds, suggest easterly to southeasterly transport for both units. Deposition of the upper unit probably occurred under chiefly subtidal conditions.

The source area for the Elwin Formation was a predominantly granitic terrain. Although there is much lateral and vertical variability within the Elwin, in general the sediments become increasingly finer gained and less feldspathic upwards.

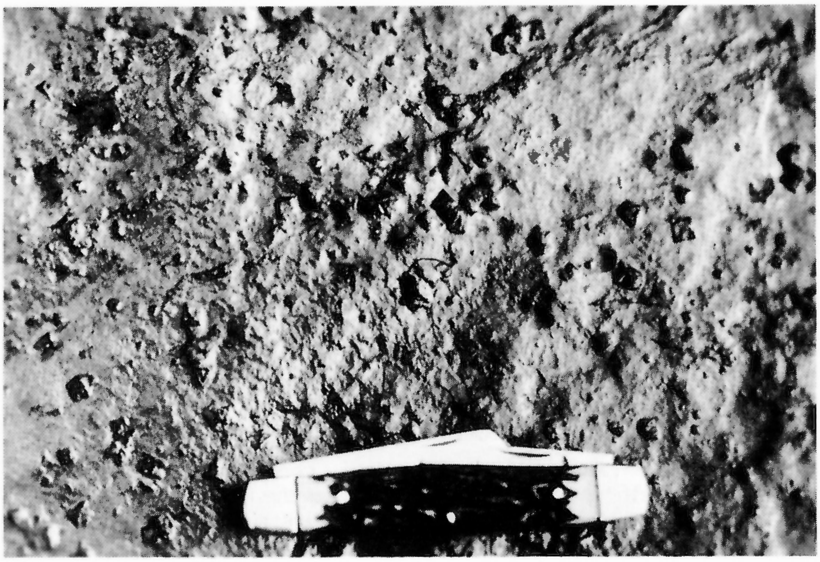


Figure 16.

Halite casts in Elwin Foramtion east of Elwin Inlet. Photo by G.M. Narbonne. GSC 201952-J.

Possible Society Cliffs strata overlie Strathcona Sound, and Arctic Bay-like strata overlie Society Cliffs strata south of Elwin Icecap. However, the units must be identified with greater certainty before this can be ascribed to thrusting.

FRANKLIN INTRUSIONS

West-northwest and north-northwest to north-trending diabase dykes intrude the Neohelikian strata, but are not known to intrude Paleozoic strata. North-northeast trending dykes are minor. Of the two major trends, the north-northwesterly trend seems the younger in the majority of cases. Elsewhere, what appears to be the same dyke changes from a westerly to a northerly trend, or two sub-parallel dykes seem to have extended out from a common focal point. The most reliable K-Ar ages determined indicate an age of 650-700 Ma. for these dykes.

ECONOMIC GEOLOGY

Several lead-zinc occurrences are present within the area, including the producing mine in the Society Cliffs Formation at Nanisivik. During the past summer, only traces of sulphide minerals were seen, and most of these had been previously prospected.

Trace amounts of sphalerite and galena were seen at several localities in carbonate strata, chiefly within the Society Cliffs Formation. Copper minerals are relatively rare. Pods of pure hematite up to 140 feet (42 m) in diameter occur near Nanisivik in Society Cliffs strata. They are remarkably similar in grain size, texture, and in overall appearance to much of the ore in the No. 1 deposit at Mary River (Gross,1966; Jackson, 1966). Possibly they, and part of the Mary River ore, were formed by the same event.

Small amounts of chalcopyrite, bornite, chalcocite and malachite occur locally in the Nauyat volcanics. Trace amounts were also seen in adjacent Adams Sound strata, especially in those immediately overlying the volcanics.

The ubiquitous strong petroliferous odour within the Society Cliffs Foramtion suggests that this might be a satisfactory reservoir rock.

SYNOPSIS AND STRUCTURAL NOTES

About 15 000-20 000 feet (4600-6100 m) of presumably Neohelikian strata outcrop within the area examined. These strata rest nonconformably on an Aphebian-Archean granitic gneiss basement and have been block faulted and gently folded. The block faulting resulted in a series of alternating northwest-trending grabens and horsts (Jackson, et al., 1975), and northwest-trending fold structures. Many minor structures trend northerly and attitudes are steep to vertical adjacent to some of the larger faults. A few small thrust faults occur locally.

Franklin diabase dykes were emplaced along many of these faults and have been subsequently faulted. Fluvial subarkose and quartzarenite marked the beginning of Neohelikian deposition. Quiescent extrusion of plateau basalt flows occurred soon after, with little or no accompanying explosive activity, and the extruded flows were covered by sediments before erosion could take place. The Nauyat volcanics seem to be thickest along a line that trends from Fleming Lake in the south, north-northeast to Elwin River Valley; they thin eastward, and perhaps die out near Surprise Creek. The Arctic Bay, Society Cliffs and Victor Bay formations all thicken eastward, but the thickness patterns of the Adams Sound, Fabricius Fiord, Strathcona Sound, and Elwin formations are undetermined, although the Adams Sound thickens slightly to the north.

Abrupt vertical and lateral changes in lithologies and depositional environments, the cyclic nature of many of the formations, changes in transportation directions, and the presence of interformational unconformities, all indicate that syndepositional faulting played an important role in the sedimentation patterns within the basin. Some major faults may have originated in late Aphebian time and then been reactivated in the Neohelikian or later. However, most of the faulting identified within the map area seems to have occurred after deposition of the Eqalulik and Uluksan groups, both before and after deposition of lower Paleozoic strata in the area.

Jackson, et al. (1975) considered the Milne Inlet Trough to be part of the North Baffin Rift Zone. Olson (1977) has suggested that, more specifically, it represents an aulacogen related to the early development of the Franklinian Geosyncline.

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