GEOLOGICAL SURVEY OF CANADA
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GEOLOGICAL SURVEY
BULLETIN 315

CAMBRIAN TO UPPER SILURIAN STRATIGRAPHY, SOMERSET ISLAND AND NORTHEASTERN BOOTHIA PENINSULA, DISTRICT OF FRANKLIN, N.W.T.

A. D. MIALL
J. WM. KERR

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

1980

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Available in Canada through

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or by mail from

Canadian Government Publishing Centre
Supply and Services Canada
Hull, Québec, Canada K1A 0S9

and from

Geological Survey of Canada
601 Booth Street
Ottawa, Canada K1A 0E8

A deposit copy of this publication is also available
for reference in public libraries across Canada

Cat. No. M42-315E Canada: $5.00
ISBN – 0-660-10639-6 Other countries: $6.00

Price subject to change without notice

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Original manuscript submitted: 1978-5-19

Approved for publication: 1980-2-11

Preface

Boothia Peninsula and Somerset Island are dominated by the Boothia Uplift, a structural feature that extends north from the mainland Canadian Shield. Flanking the core of metamorphic and igneous Aphebian rocks on the west are Proterozoic sedimentary rocks and above these and on both sides of the core are Late Cambrian to Early Devonian sedimentary rocks of the Cornwallis Fold Belt. This study is concerned with the folded and faulted Lower Cambrian to Upper Silurian strata.

Initial studies of the area were made by the Geological Survey of Canada during helicopter-supported reconnaissance mapping operations in 1955 and 1962. This report presents some of the results of "Operation Boothia" a project carried out in 1975 and 1976 with the objectives of producing updated bedrock geological maps and of providing reports on the geology of the area. In addition by extending existing stratigraphic terminology from rocks of adjacent islands the authors have provided correlations that help integrate our knowledge of Lower Paleozoic rocks throughout the Canadian Arctic and thereby assist in evaluating the hydrocarbon and mineral resources of the North. Such information is also fundamental in planning for construction of a proposed natural gas pipeline.

D.J. McLaren
Director General
Geological Survey of Canada

OTTAWA, February 1979

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Abstract

The geology of the report area is dominated by Boothia Uplift, which is cored by Aphebian metamorphic and igneous rocks and by younger Proterozoic sediments, and which extends northward from the Canadian Shield approximately 650 km to near the northern edge of the Arctic Platform. The uplift is flanked and partly overlain by a sequence of Cambrian to Devonian sediments approximately 2000 m thick.

The Upper Cambrian to Upper Silurian rocks described in this report outcrop within Cornwallis Fold Belt, which is a region of deformed strata that makes up the flanks and upper structural levels of Boothia Uplift. The oldest units are two formations which were first described on Baffin Island: Turner Cliffs Formation (Upper Cambrian to Lower Ordovician, 307-360 m), a variegated succession of dolostone and sandstone; and the Ship Point Formation (Lower to Middle Ordovician, 64-250 m), which consists of similar rock types to the Turner Cliffs Formation, but in which dolostone predominates. The Turner Cliffs Formation contains a prominent cherty dolostone unit which is correlated with the cherty member of the Franklin Mountain Formation in the northern Interior Plains. The contact between the Turner Cliffs and Ship Point Formations is probably conformable.

Conformably overlying the Ship Point Formation is the Cornwallis Group, comprising three formations, all of which were first described in the Franklinian Miogeocline and which have not previously been recognized south of Barrow Strait: the Bay Fiord Formation (Middle Ordovician, 6-196 m), consisting mainly of recessive, dark coloured, fissile dolostone; the Thumb Mountain Formation (Middle to Upper Ordovician, 25-115 m), consisting of resistant fossiliferous limestone and dolostone; and the Irene Bay Formation (Upper Ordovocian, 8-43 m), consisting mainly of recessive limestone and dolostone. There is a post-Bay Fiord disconformity, which may extend throughout the Arctic Platform, and possibly a post-Irene Bay disconformity, which may be of more local extent.

The Allen Bay Formation (Upper Ordovician to Middle Silurian, 550-1050 m), which overlies the Cornwallis Group, consists mainly of resistant dolostone.

All these units are present in the subsurface in Prince Regent Basin, east of Boothia Uplift, as shown by the stratigraphic section in the Garnier O-21 well in northeast Somerset Island. Most units thicken into the basin, but there are no major facies changes, except that the upper part of the Allen Bay Formation passes laterally into the Cape Crauford Formation (Lower to Upper Silurian, 580 m), which consists of dolostone with abundant evaporite.

Résumé

Dans le secteur étudié, le trait géologique le plus remarquable est le soulèvement de Boothia, qui contient en sa partie centrale des roches métamorphisées et des roches ignées d'âge aphébien, ainsi que des sédiments plus récents d'âge protérozoïque; cette structure s'étend, en direction du nord, sur environ 650 km, du Bouclier canadien aux approches du bord septentrional de la plate-forme arctique. Ce soulèvement est bordé et partiellement recouvert par une succession, d'environ 2000 m d'épaisseur, de sédiments cambriens à dévoniens.

Les roches d'âge cambrien supérieur à silurien supérieur décrites dans le présent rapport affleurent à l'intérieur de la zone de plissements de Cornwallis, région contenant les strates déformées qui constituent les flancs et les niveau structuraux supérieurs du soulèvement de Boothia. Les unités les plus anciennes sont les deux formations initialement décrites dans la Terre de Baffin: la formation de Turner Cliffs (Cambrien supérieur à Ordovicien inférieur, 230 à 260 m d'épaisseur), succession bariolée de dolomies et grès; et la formation de Ship Point (Ordovicien inférieur à Ordovicien moyen, 150 à 370 m d'épaisseur), qui contient des roches de même type que la formation de Turner Cliffs, mais où les dolostones sont dominantes. La formation de Ship Point contient une importante unité à dolostones cherteuses; une corrélation a été établie entre celle-ci et le membre cherteux de la formation de Franklin Mountain, dans la partie nord de la plaine Intérieure. Le contact entre les formations de Turner Cliffs et de Ship Point est probablement concordant.

Sur la formation de Ship Point repose en concordance le groupe de Cornwallis, qui englobe trois formations, toutes initialement palcées dans le miogéosynclinal Franklinien, et non reconnues auparavant au sud du détroit de Barrow: la formation de Bay Fjord (Ordovicien moyen, épaisseur 6 à 196 m) principalement composée de dolostones récessives, de couleur sombre, fissiles; la formation de Thumb Mountain (Ordovicien moyen à supérieur, épaisseur 25 à 115 m), composée de calcaires et dolostones fossilifères et résistants; et la formation d'Irene Bay (Ordovicien supérieur, épaissuer 8 à 43 m), principalement composée de calcaires et dolostones récessifs. Il existe une discordance d'érosion ultérieure à la formation de Bay Fjord, qui pourrait se prolonger à travers la plate-forme arctique, et peut-être aussi une discordance d'érosion ultérieure à la formation de Irene Bay, qui pourrait avoir une extension plus restreinte.

La formation de Allen Bay, (Ordovicien supérieur à Silurien moyen, 550 à 1050 m d'épaisseur) qui recouvre le groupe de Cornwallis, consiste surtout en dolostone résistante.

On rencontre toutes ces unités dans le sous-sol du bassin du Prince-Régent, à l'est du soulèvement de Boothia, comme l'indique la coupe stratigraphique du puits Garnier 0-21, dans la partie nord-est de l'île Somerset. La plupart des unités augmentent d'épaisseur à mesure qu'on pénètre dans le bassin, mais on n'observe pas d'importantes variations de faciès, excepté que la partie supérieure de la formation d'Allen Bay passe latéralement à la formation de Cape Crawford (Silurien inférieur à Silurien supérieur, 580 m d'épaisseur), qui consiste en dolostone accompagnée d'importantes quantités d'évaporites.

CAMBRIAN TO UPPER SILURIAN STRATIGRAPHY, SOMERSET ISLAND AND NORTHEASTERN BOOTHIA PENINSULA, DISTRICT OF FRANKLIN, N.W.T.

INTRODUCTION

Somerset Island and Boothia Peninsula together comprise a geological and physiographic entity that projects 650 km northward from the mainland into the geographic centre of the Canadian Arctic Archipelago (Figs. 1, 2). Boothia Peninsula is the northernmost extremity of the mainland of North America. It is separated from Somerset Island by Bellot Strait, a narrow strip of water in places as little as 0.75 km wide.

The geology of this area was investigated during Operation Boothia, field work for which was conducted during the summers of 1975 and 1976 (Kerr, 1976a). Detailed work was confined to Somerset Island and northeastern Boothia Peninsula, although some reconnaissance studies were carried out as far south as Spence Bay.

The present report is concerned with the stratigraphy and sedimentology of the rocks comprising the lower part of the Phanerozoic succesion ranging in age from Late Cambrian to Late Silurian (Fig. 2). The report is based on detailed ground studies of stratigraphic sections, carried out mainly by Miall in 1976, and on mapping work by Kerr in 1975 and 1976. Earlier detailed work by Dixon (1973a, b, 1975) on the same succession has been incorporated into the report and forms an essential part of it. The upper part of the Phanerozoic succession (Upper Silurian to Lower Devonian and Tertiary strata) will be described in a separate report.

Previous work

The first systematic geological investigations in the report area were carried out by the Geological Survey of Canada in 1955, during Operation Franklin. The northern part of Somerset Island was studied, and outcrops of the Allen Bay Formation (Table 1) in the vicinity of Aston Bay were visited (Thorsteinsson and Tozer, 1963, p. 119). The youngest part of the succession was studied on the east coast of Somerset Island by Blackadar (1963a), McMillan (1963) and Norris (1963).

Operation Prince of Wales, in 1962, extended the reconnaissance mapping to Prince of Wales and King William Islands, that part of Boothia Peninsula which lies within the District of Franklin (the area north of Spence Bay), and the remainder of Somerset Island. A brief stratigraphic and structural report was published as a result of this work,

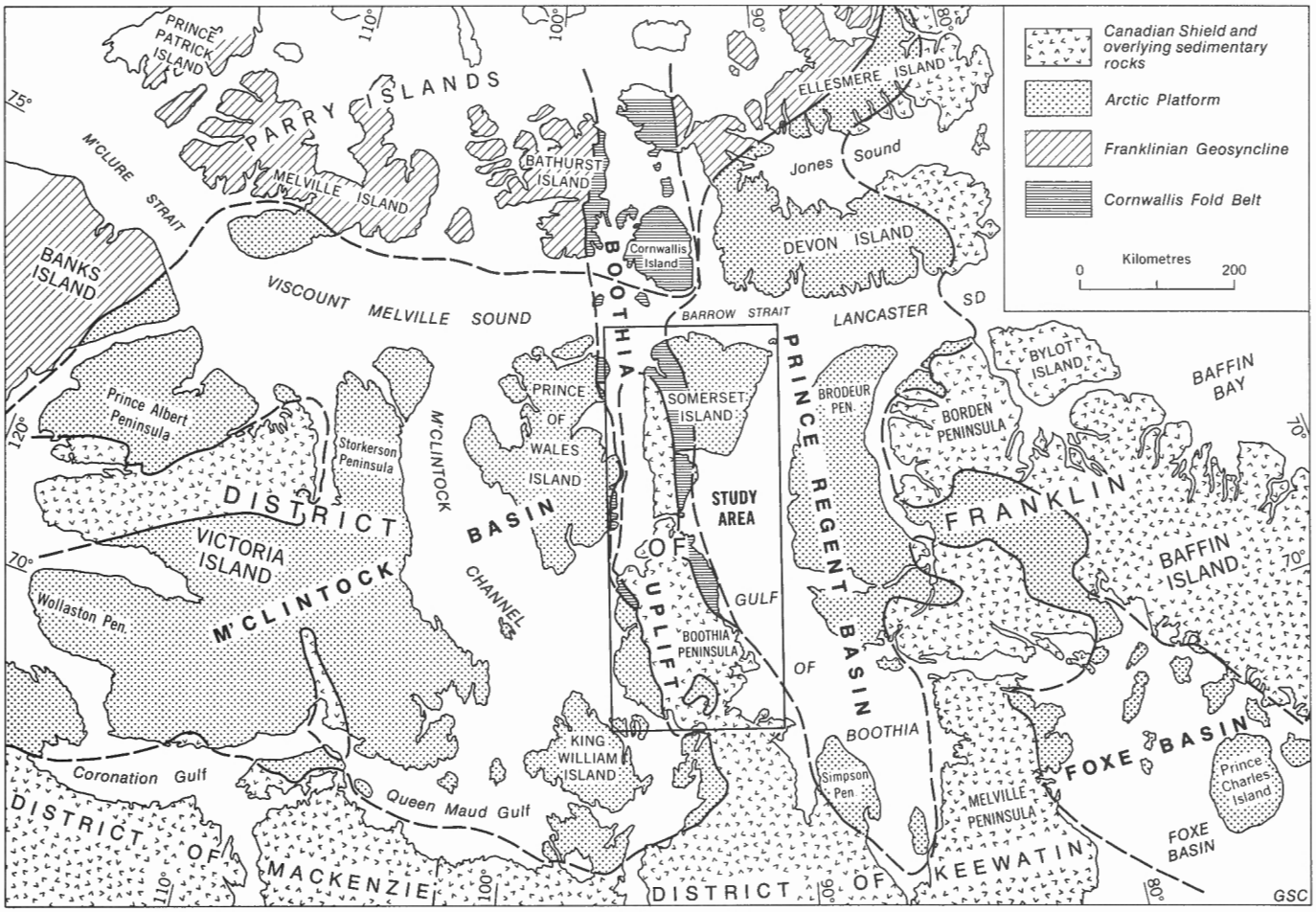


FIGURE 1. Index map showing stratigraphic-structural provinces of the central Canadian Arctic Archipelago, and location of the report area.

including a geological map at the scale of one inch to eight miles (1:506 880) (Blackadar and Christie, 1963). Further stratigraphic work by Christie (1973) resulted in the erection of three new lower Paleozoic formations in the Boothia Peninsula region.

Parties from the University of Ottawa have visited Somerset Island every year since 1964, initially under the leadership of D.L. Dineley. No detailed work was carried out on the rocks described herein until 1970, when J. Dixon studied the Lang River, Creswell Bay and Hunting River areas as part of a Ph.D. thesis project on the lower Paleozoic rocks of Somerset and Prince of Wales Islands (Dixon, 1973a). Dixon (1973a, b) erected a new unit, the Lang River Formation, for the Cambrian(?) to Upper Ordovician rocks in his project area.

The Aston and Hunting Formations of the Aston Bay area in northwestern Somerset Island were studied by members of the University of Ottawa team in 1964 and 1965 (Tuke et al., 1966). In the early descriptions of these rocks (Blackadar in Gill, 1957; Blackadar, 1963b; Blackadar and Christie, 1963), the two units were assigned to the Proterozoic, but Tuke et al. (1966) tentatively reassigned them to the Paleozoic, largely on the basis of what they interpreted as a conformable contact between the Aston-Hunting succession and overlying fossiliferous Ordovician rocks. Dixon (1974) demonstrated that the contact was unconformable and concluded, on the balance of evidence, that the Aston and Hunting are Proterozoic in age. This interpretation is accepted by the writers (*see* also Reinson et al., 1976) and the two units are not discussed in this report.

One exploratory well has been drilled on Somerset Island. The Panarctic Deminex Garnier O-21 well was spudded in Upper Silurian rocks. It was drilled to a depth of 1986 m but failed to penetrate the base of the Paleozoic succession. Mayr (1978) showed that the lowermost rocks in the well are Tremadocian in age. He correlated the section with the surface rocks of northwestern Baffin Island (Trettin, 1969, 1975), a correlation which forms the basis for the revised stratigraphic terminology proposed in the present report.

Preliminary geological notes on the Operation Boothia field work were published by Reinson et al. (1976) and Miall and Kerr (1977).

Acknowledgments

The authors are grateful to Mark Oliver and John Cosgrove for assistance in the field, and to John Pearson and Brian Wilson for skilled piloting of the helicopters. Fixed wing aircraft support and other logistic services were provided by the Polar Continental Shelf Project and by Ed. Zwick, Geological Survey of Canada expediter in Resolute.

This report has benefited from discussions with J. Dixon, H.P. Trettin and R. Thorsteinsson. The latter and U. Mayr critically read the manuscript.

STRATIGRAPHY

Geological setting

The geology of Somerset Island and Boothia Peninsula is dominated by the Boothia Uplift (Fortier et al., 1954; Kerr and Christie, 1965), a positive structural feature that extends from the Precambrian Shield in the south, across the Arctic Platform and the Franklinian Geosyncline (Fig. 1). The core of the Boothia Uplift is the Boothia Horst (Kerr, 1977), composed of Aphebian metamorphic and igneous rocks, and forming part of the Churchill Province of the Canadian Shield. The folded sediments in upper levels and on both sides of the Boothia Uplift constitute the Cornwallis Fold Belt. The oldest rocks of the fold belt are Proterozoic sedimentary rocks of the Aston and Hunting Formations (Table 1), which lie unconformably on the metamorphic core. The Aston is mainly sandstone and the Hunting mainly dolostone. The two units are well exposed south of Aston Bay, where they reach a combined thickness of 2400 m (Reinson et al., 1976) and are overlain unconformably by lower Paleozoic rocks (Pl. 1A). They also are exposed discontinuously along the west flank of Boothia Uplift in Prince of Wales Island, but elsewhere are not exposed as a result of faulting or overstep by Phanerozoic rocks.

The Proterozoic sediments of Boothia Uplift were intruded by dykes in two or more separate events during Proterozoic time (Kerr and deVries, 1976). One of these intrusive events occurred between deposition of the Aston and Hunting Formations, and was accompanied by folding. Another occurred between deposition of the Hunting Formation and the lower Paleozoic column and also was accompanied by folding.

The Phanerozoic rocks of the project area comprise a sequence ranging in age from Late Cambrian to Early Devonian (Table 1) with no marked internal angularity. The present report deals with all the Paleozoic strata below the Cape Storm Formation. Most of the units shown in Table 1 exhibit no obvious evidence of influence by Boothia Uplift during sedimentation in the form of thickness and facies variations. Gentle positive movement occurred during the Middle to Late Ordovician, as indicated by a regional angular unconformity whose angularity is not detectable in single outcrops (Fig. 2). The uplift may have been gently positive at other times as well. Two factors appear to have influenced thickness patterns. The dominant tectonic influence during early Paleozoic time was a gentle northerly tilt of the craton down toward the Franklinian Geosyncline (Miall and Kerr, 1977) and, north of the craton, there was the very large regional thickness increase into the geosyncline itself (Fig. 3). The Boothia Uplift may have been a secondary influence causing shallowing and lesser thicknesses in western Somerset Island and parts of Boothia Peninsula.

A pronounced period of movement of Boothia Uplift occurred in the Late Silurian to Early Devonian, resulting in the development of a clastic wedge marginal to Boothia Uplift (Kerr and Christie, 1965; Brown et al., 1969; Kerr, 1977; Miall and Gibling, 1978). The rocks comprising this clastic wedge are included within the Somerset Island and Peel Sound Formations (Table 1). Several later pulses of Devonian uplift occurred along the same north-south trend (Kerr and Christie, 1965; Kerr, 1977). The evidence for them is confined to areas north of Somerset Island because Paleozoic rocks younger than the Peel Sound Formation are not preserved within the project area.

TABLE 1

Table of formations, northeastern Boothia Peninsula and Somerset Island

Series	Group	Formation and thickness, m	Lithology
Upper Silurian-Lower Devonian		Peel Sound (600)	Conglomerate, sandstone
Upper Silurian-(?)Lower Devonian		Somerset I. (150-400)	Dolostone, limestone, siltstone, shale
Upper Silurian		Read Bay (170-240)	Limestone, minor dolostone
Middle to Upper Silurian		Cape Storm (120-240)	Dolostone
Lower to Upper Silurian		Cape Crauford (580)	Dolostone, evaporite
Upper Ordovician to Middle Silurian		Allen Bay (550-1050)	Dolostone, minor shale, sandstone
UNCONFORMITY?			
Upper Ordovician	Cornwallis Group	Irene Bay (8-43)	Limestone, dolomitic limestone, shale
Middle to Upper Ordovician		Thumb Mountain (25-115)	Limestone, dolostone
UNCONFORMITY			
Middle Ordovician		Bay Fiord (6-196)	Dolostone, minor anhydrite
Lower to Middle Ordovician		Ship Point (64-250)	Dolostone, minor sandstone
Upper Cambrian to Lower Ordovician		Turner Cliffs (307-360)	Sandstone, dolostone

The Cornwallis Fold Belt was named by Thorsteinsson (1958) for the region of deformed, mainly lower Paleozoic rocks that make up the flank and the upper structural levels of the Boothia Uplift. It consists of two narrow belts on east and west sides of the uplift in the south. Because the uplift plunges north, these belts connect with each other to the north, on Cornwallis Island and adjacent areas. All of the outcrops of the Cambrian to Silurian rocks described in this report occur within the Cornwallis Fold Belt, except for those of the Cape Crauford Formation. Origin of the fold belt was related directly to movement of basement rocks of the underlying Boothia Horst, mainly by steeply dipping, normal to high angle reverse faults (Kerr and Christie, 1965; Kerr, 1977). The eastern margin of the fold belt within the report area is defined clearly in some places by a flexure. Elsewhere it is poorly defined, with structural deformation decreasing gradually eastward so that Boothia Uplift passes imperceptibly into virtually undisturbed strata comprising the Arctic Platform (Fig. 1).

Christie (1972) divided the Arctic Platform into a series of structural basins separated from each other by structural highs such as Boothia Uplift. The basin east of Boothia Uplift was named the Prince Regent Basin, and the Garnier O-21 well is located near its axis (Figs. 1, 3). At times during Paleozoic time the Prince Regent Basin may have become a paleogeographic feature, but for much of the Cambrian to Silurian there may have been little distinction between the basin and the Boothia Uplift. The present structural configuration of the Arctic Platform, including that of Prince Regent Basin, reflects latest Silurian and Devonian tectonism.

Upper Cambrian to Middle Ordovician

Lang River Formation (abandoned)

The Lang River Formation was defined by Dixon (1973a, b) as a variegated unit of dolostone, sandy dolostone and sandstone, resting unconformably on Precambrian rocks

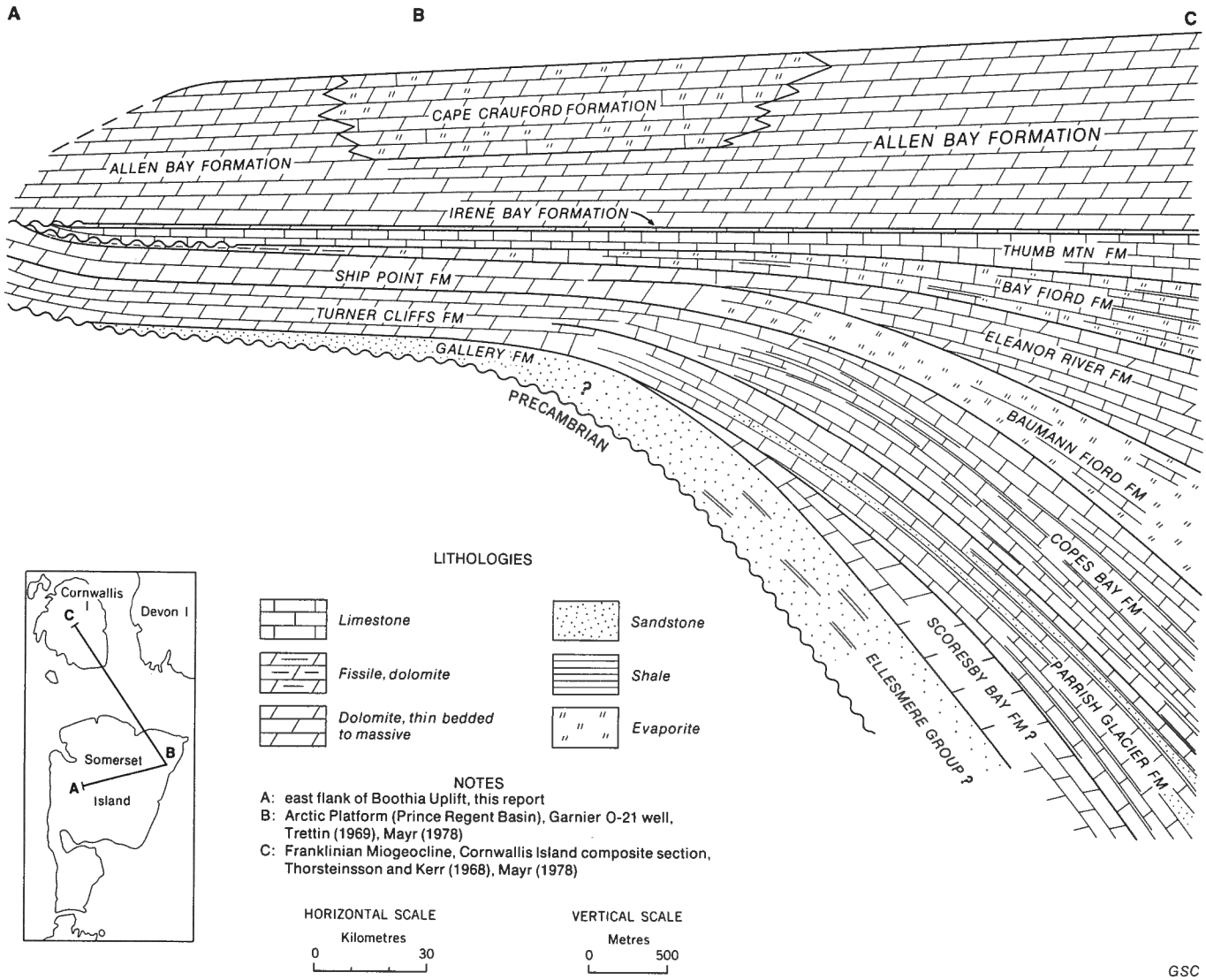


FIGURE 3. *Restored diagrammatic cross-section, Cambrian to Silurian rocks, Boothia Uplift to Franklinian Miogeocline.*

and overlain with apparent conformity by massive, pale-weathering dolostone of the Allen Bay Formation. The type section is at Lang River (Section 6 of this report). Considerable lateral lithologic variation and structural complication prevented Dixon from correlating laterally or recognizing sub-units within the formation. He pointed out that the age range of the Lang River overlaps that of the Gallery, Turner Cliffs, Ship Point and Baillarge Formations of Baffin Island (Lemon and Blackadar, 1963; Trettin, 1969; Table 2 of this report) but did not attempt detailed correlations. Mayr (1978) showed that several Cambrian-Ordovician formations of Baffin Island can be extended to eastern Somerset Island, as exemplified by a single subsurface section through these rocks at the Garnier O-21 well location (Fig. 2).

New mapping data and detailed stratigraphic information collected along the outcrop belt of the Lang River Formation in eastern parts of the Boothia Uplift on Somerset Island and Boothia Peninsula show that the same units can be recognized there also, as can certain units that were first defined in the Franklinian Geosyncline. These names have priority, are widely mapped in the Arctic Islands, and are used here in preference to the Lang River Formation. Apart from this stratigraphic revision, most of Dixon's original work has not been modified, and has been incorporated into this report as an essential part of the regional framework.

The lower part of the Lang River Formation (member 1 in the type section) has been reassigned to two units, the Turner Cliffs and Ship Point Formations (Table 1), which were first defined by Blackadar (1956). Rocks corresponding to the upper part of the Lang River Formation (member 2 in the type section) are herein reassigned to the Bay Fiord, Thumb Mountain and Irene Bay Formations of Kerr (1967a). They include a distinctive marker unit for mapping and stratigraphic correlation, corresponding to the Thumb Mountain Formation (incorrectly assigned to the Irene Bay Formation by Miall and Kerr, 1977).

Strata equivalent to the Gallery Formation (Lemon and Blackadar, 1963) may be present locally at the base of the Turner Cliffs Formation, but the formation has not been formally defined within the report area at this time.

The lower part of the Turner Cliffs Formation includes rocks that were assigned by Christie (1973) to his Boothia Felix and Netsilik Formations, but the detailed relationship of the latter to the Gallery, Turner Cliffs and Ship Point Formations is unclear at the present time (*see* later section).

Turner Cliffs Formation

Definition, distribution and thickness

The Turner Cliffs Formation was defined by Blackadar (1956) and described in detail by Lemon and Blackadar (1963) and Trettin (1969), and redefined by Trettin (1975). The type section is at Turner Cliffs on the west side of Admiralty Inlet, northwestern Baffin Island, and the formation is widely exposed throughout Borden and Brodeur Peninsulas on that island. In those regions it consists of a variegated succession of dolostone and sandstone with minor siltstone, shale, and intraformational conglomerate. In Baffin Island the formation ranges from 29 to 250 m in thickness. Isopachs outline a basin of deposition centred on Borden Peninsula and thinning toward the west (Trettin, 1969, Fig. 4; 1975, Fig. 4).

In Somerset Island the available evidence indicates a less variable thickness (Fig. 2), ranging from 307 m at Hunting River (Section 15, Fig. 2) to 360 m at Lang River (Section 6). An incomplete succession 140 m thick was penetrated in the Garnier O-21 well (Mayr, 1978). The Turner Cliffs Formation includes part or all of the Boothia Felix and Netsilik Formations of southern Boothia Peninsula.

The base of the Turner Cliffs Formation in Somerset Island is the base of the Phanerozoic succession; the underlying rocks being Precambrian sediments or metamorphic basement. The upper contact is drawn at the top of a distinctive, massive, pale weathering, chert-bearing dolostone.

On northeastern Boothia Peninsula the base of the Turner Cliffs Formation includes a predominantly sandstone succession up to 90 m thick (e.g. at Section 4; *see* Pl. 2). This interval is lithologically similar to the Boothia Felix Formation and may correlate with it. For the same reason it also may be correlated in part with the Gallery Formation of Baffin Island. In the absence of biostratigraphic evidence this succession is provisionally included with the Turner Cliffs Formation.

Lithology

The Turner Cliffs Formation contains a varied succession of sandy and dolomitic rocks including quartzose sandstone (Pls. 2B, 4C, 5B), argillaceous sandstone, oolitic, pelletoidal and stromatolitic dolostone, massive, cherty dolostone (Pl. 5A), calcareous dolostone, and dolostone intraclast breccia (Pls. 3B, 4D). Most units are thin bedded to finely laminated, and platy to slabby weathering. Current ripple marks are common in the dolomitic rocks; ripple marks and planar and trough crossbedding are common in the sandstone units (Pl. 2B). Most individual beds do not extend far laterally as illustrated by the differences between Section 7 and 8 (Fig. 3) which are approximately 1 km apart. In Baffin Island, Lemon and Blackadar (1963) and Trettin (1969) recognized five members within the formation, consisting of alternations of two lithologic assemblages, a clastic assemblage, dominated by sandstone, and a dolomitic assemblage (the upper two members were reassigned to the Ship Point Formation by Trettin, 1975). A subdivision of this type was not possible in the report area.

On Somerset Island the Turner Cliffs Formation can be subdivided into two members, a lower, variegated unit and an upper, distinctive, massive, cherty dolostone member (Fig. 2). The latter forms a distinctive marker bed in western Somerset Island and can also be recognized in the Garnier O-21 section (Mayr, 1978). Detailed notes on the other rock types follow.

Sandstone normally is grey to white in colour, weathering pale grey to yellowish grey. An exception is the basal 13 m at Section 4 which has a red-brown colour reminiscent of some units in the Boothia Felix type section (Section 1), although much of the sandstone in Section 1 is dolarenite (Pls. 4A, B) in contrast to the quartz arenite prevalent at Abernethy River. The grain size is fine to medium except in some thin basal units, as at Section 4, where the modal grain size is very coarse sand to granule grade, and small pebbles are present (Pl. 2B). Unstrained to moderately strained monocrystalline quartz grains predominate. The cement typically is finely crystalline dolomite. Crossbedding includes types that grade from straight and sinuous crested ripple marks as small as 2 cm in amplitude, up to solitary and grouped sets of planar and trough crossbedding with a maximum observed set thickness of 42 cm. Crossbed orientation is variable (Fig. 4). Data from Abernethy River (Section 4) indicate random orientation; herringbone cross-stratification is common.

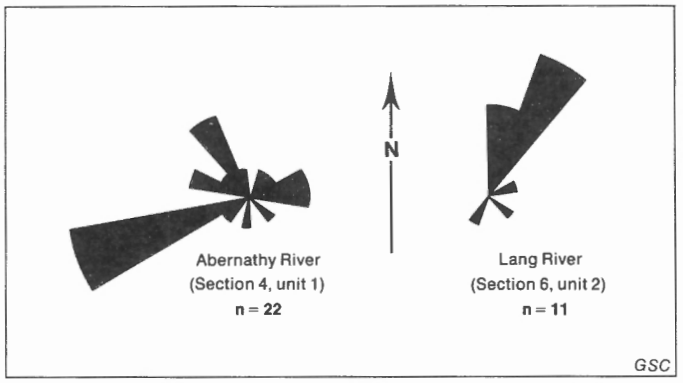


FIGURE 4. *Paleocurrent rose diagrams, planar and trough crossbedding, basal Turner Cliffs Formation (segment radius proportional to number of readings).*

A slightly different sandstone facies is present at Abernethy River in addition to the white quartzose sandstone. Argillaceous and micaceous partings, groove and load casts, and trace fossils (tracks and trails, as in Pl. 3A) are common. Medium to dark greenish grey colours are typical.

Rare glauconitic sandstone beds are present, as near the top of the formation at Section 7.

Fine grained, pale coloured dolostone is the predominant carbonate rock in the Turner Cliffs Formation; it exhibits a wide variety of primary structures. Fine lamination is common, some of it probably algal in origin (similar to cryptalgalaminae described by Aitken, 1967). Ripple marks, low angle cross-stratification and bioturbation are abundant locally. Silt to fine sand size quartz grains occur in many dolostone units, especially near the base of the formation. Bitumen and evaporite mineral casts also may be present.

Minor constituents of the Turner Cliffs Formation include pelletal, oolitic and oncolitic fine-grained dolostone. Medium to coarsely crystalline dolostone also occurs, but contains few recognizable internal structures probably because of diagenetic recrystallisation (neomorphism).

Intervals of intraformational breccia and conglomerate are very common in the Turner Cliffs Formation, occurring generally in units a few centimetres thick (Pl. 3B). Dixon (1973a, p. 45-48) provided a detailed description of these rocks. Clasts vary from rounded, disc shapes to angular, tabular fragments, reflecting the duration of transport. Sand grains may be present in the matrix, rarely with glauconite or chamosite as well. Many breccia units are interbedded with stromatolitic dolomite. The breccias probably originated as laminated dolostone units; the algal growths provided a sediment binding mechanism, and brecciation of the lithified beds probably took place during desiccation. The loose fragments were then transported a short distance and accumulated in discrete lenses (Roehl, 1967).

Dixon (1973a, p. 49) reported rare units of biogenic intraclastic dolostone in which pellets, grapestone, shell debris and dolostone intraclasts are set in a sandy dolostone matrix.

Stromatolitic rocks consist predominantly of small laterally linked domes, with digitate forms and thrombolites being rare (terminology of Logan et al., 1964; Aitken, 1967).

Depositional environment

Stromatolites, intraclast breccias, herringbone crossbedding, bioturbation and trace fossils are characteristic of shallow subtidal to intertidal marine environments. Random crossbed orientation is typical of such environments, where crossbedding may be formed by reversing tidal currents, longshore currents and waves which are subject to varying wind directions. Intertidal waters may be hypersaline and this could account for the scarcity of macrofauna. Conditions were highly variable locally during deposition of the lower member, as indicated by the vertical and lateral variability in lithofacies.

The upper cherty dolostone member may represent deeper water, widespread subtidal conditions.

Siliciclast sediments are most common near the base of the formation, which probably reflects the reworking of a thin veneer of supermature detritus on the Precambrian erosion surface as Paleozoic sedimentation commenced.

Age and correlation

Trettin (1969, 1975) assigned a Cambrian and/or Early Ordovician age to the Gallery and Turner Cliffs Formations of Baffin Island, on the basis of linguloid brachiopods collected in the lower part of the Turner Cliffs Formation. The Gallery and Turner Cliffs sequence was correlated by Trettin with Lower to Middle Cambrian rocks on Devon Island (Kurtz et al., 1952) on the basis of lithology and stratigraphic position. This is virtually the only evidence for the age of the Gallery and Turner Cliffs Formations in their type areas so that, although the age of these units is now better known in Somerset Island as a result of good conodont recoveries, correlations with the type area must still be based on lithologic similarity and stratigraphic position.

Dixon (1975) reported a fauna of gastropods and nautiloids in the Lang River Formation at Creswell Bay. This is in Section 11 (Fig. 3) which is now assigned to the Turner Cliffs Formation. The fauna includes the following genera (GSC loc. 89512):

Caseoceras sp.
Dakeoceras sp.
Ellesmeroceras sp.
ellesmerocerids indet.
Quebecoceras sp.
Schizopea sp.
Liospira sp.
Euconia sp.
Sinuopea sp.

The fauna is assigned an Early Ordovician, probably Tremadocian age by Dixon (1975; pers. com., 1979).

Lower Lower Ordovician (Tremadocian) conodonts were recovered from the upper part of the Turner Cliffs Formation in the Garnier O-21 well (Mayr, 1978). A sample from Hunting River near the middle of the formation (GSC loc. C-60638, Section 15, Unit 5) was processed for conodonts by C.R. Barnes with the following results (pers. com., 1977): the fauna includes Proconodontus muelleri muelleri Miller, which suggests a Late Cambrian (Trempealeauan) age. Units 1 to 4 in this section are unfossiliferous but could include older Upper Cambrian (Franconian) strata. A sample from Turner Cliffs beds below Section 19 at Aston Bay (GSC loc. C-45605) yielded Cordylodus prion Lindstrom, Drepanoistodus sp. and Oneotodus nakamuri Nogami, suggesting an early Early Ordovician (early Tremadocian) age. Finally, the fauna from a sample at Creswell Bay near the top

of the formation, GSC locality C-60646, Section 12, unit 2, includes oneotodiform and drepanodiform elements of probable Early Ordovician age.

The Boothia Felix and Netsilik Formations (Christie, 1973) are regarded as being in part lateral equivalents of the Turner Cliffs Formation of Somerset Island. As noted earlier, the basal Turner Cliffs at Abernethy River (Section 4) contains a sandstone succession similar to that at the Boothia Felix type section, and similar, also, to the Gallery Formation. The base of the Turner Cliffs, therefore, may be older at Abernethy River than elsewhere in the report area. Christie (1973) reported Middle Cambrian trilobites from the Boothia Felix Formation. However, Palmer et al. (in press) re-examined the collections from this unit and re-assigned them to the early Late Cambrian. The trilobites represent a "fauna of the Crepicephalus zone of medial Dresbachian (Late Cambrian) age", which includes Crepicephalus sp., Terranovella dorsalis (Hall), Deusonella intermedia n. sp., and Hyolithes sp.

The Netsilik Formation was dated as Early to Middle Ordovician (Tremadocian to Llanvirnian) by Christie (1973) and correlated with the Ship Point Formation. As discussed in a later section it now seems likely that the Netsilik Formation is confined to the lower part of the Lower Ordovician. Lithologic similarity determined in the present study suggests that the Netsilik Formation correlates with and is traceable into the Turner Cliffs Formation, although the position of Christie's (1973) type section within the Turner Cliffs Formation is uncertain, and tie lines indicated in Figure 2 are tentative.

In this report the Turner Cliffs Formation is assigned an age of Late Cambrian to Early Ordovician (Tremadocian), although conodonts were not recovered from the lower part of the formation which may, therefore, be older. The age of possible Gallery Formation equivalents on Boothia Peninsula is unknown.

Correlations of the Gallery-Turner Cliffs succession in Baffin Island with other units in Devon and Victoria Islands were discussed by Trettin (1969, p. 19-20; 1975) but they must remain speculative until additional biostratigraphic data from these areas are available. The upper cherty member of the Turner Cliffs Formation may correlate with the cherty member of the Franklin Mountain Formation of the northern Interior Plains (Norford and Macqueen, 1975).

Ship Point Formation

Definition, distribution and thickness

The Ship Point Formation was named by Blackadar (1956), and described in detail by Lemon and Blackadar (1963) and Trettin (1969). It was redefined by Trettin (1975) to include older strata that had originally been correlated with the underlying Turner Cliffs Formation. In Baffin Island the formation consists predominantly of "pure dolomite with lesser proportions of argillaceous, silty, and sandy dolomite and dolomitic intraformational conglomerate, and still smaller amounts of dolomitic quartz sandstone, dolomitic siltstone, and shale" (Trettin, 1969, p. 22). The type section is near Ship Point on the east side of Admiralty Inlet. In Baffin Island the formation ranges from 46 to 305 m in thickness; the thinner sections are thought to have been subjected to erosion before deposition of the overlying unit.

In Somerset Island (Fig. 2) the Ship Point Formation ranges in thickness from 64 m at Creswell Bay (Section 14) to 250 m at Hunting River (Section 17). The formation is 250 m thick at the Garnier O-21 well and there is a partially eroded section 40 m thick at Lang River (Section 6). The formation is absent due to truncation by the Cornwallis Group south of Lang River.

The contact of the Ship Point with the underlying Turner Cliffs Formation is drawn at the top of a distinctive, massive, pale weathering, chert-bearing dolostone unit. The consistency in the thickness of the Turner Cliffs Formation on Somerset Island suggests that it was not eroded prior to Ship Point sedimentation. Trettin (1969, 1975) interpreted the contact as a disconformity on Baffin Island on the basis of regional stratigraphic correlations, but the evidence is not strong and this interpretation remains speculative.

The contact of the Ship Point Formation with the overlying Bay Fiord Formation is drawn at the base of the distinctive dark, grey-green, fissile dolostone (Pl. 6A). The contact is sharp but probably is conformable. According to Trettin (1969, 1975), the upper contact of the Ship Point Formation may be a regional disconformity in Baffin Island, although the strongest evidence for the erosional break (solution weathering in the uppermost Ship Point and local thinning of this unit) is limited to parts of Borden Peninsula, and any uplift may have been localized.

Lithology

The characteristic rock of the Ship Point Formation is pale grey or buff, medium to coarsely crystalline, thin to medium bedded dolostone, containing rare chert nodules.

Sandstone units are quartzose and texturally mature. Intraformational dolostone breccia, stromatolitic dolostone, bioclastic and bioturbated dolostone beds and dolomitized oolite (Pl. 5C) are locally common in the Ship Point Formation.

Depositional environment

Shallow subtidal to intertidal environments are interpreted for this unit as for the Turner Cliffs Formation. Mayr (1978) reports the presence of minor evaporites in the Ship Point Formation in the Garnier O-21 well which may be of supratidal origin.

Age and correlation

A sample from the lower Ship Point Formation in Somerset Island yielded conodonts of Early Ordovician age, as follows (identifications and age assignments by C.R. Barnes, pers. com., 1977): GSC loc. C-60596, Section 6, unit 27: Drepanoistodus ?gracilis (Branson and Mehl), Drepanodus parallelus (Branson and Mehl), Eoneoprioniodus ?akpatokensis (Barnes) and Scolopodus quadraplicatus (Branson and Mehl); the fauna is considered to be late Canadian in age.

The Ship Point Formation correlates with the Eleanor River and possibly part of the Baumann Fiord Formation of the Franklinian Geosyncline.

Trettin (1969) assigned an Early and early Middle Ordovician age to the Ship Point Formation of Baffin Island. In his later report, Trettin (1975) refined this to an Arenigian to Porterfieldian age range on the basis of new macrofossil and conodont data. An Arenigian to Llanvirnian age range was assumed by Mayr (1978) on the basis of regional considerations and the age of enclosing strata. The latter age assignment is accepted in the present report. This is similar to the age range of the Eleanor River Formation in the Franklinian Geosyncline.

Boothia Felix and Netsilik Formations (abandoned)

These two units were named by Christie (1973) based on type sections in the central part of Boothia Peninsula. Both type sections were visited by Miall, but the two units have not been mapped in that area. Various stratigraphic problems have become apparent in attempts to extend these two units to northeast Boothia Peninsula and Somerset Island, and they are not used by the writers in the report area. The main points are discussed briefly below:

1. The basal contact of the Boothia Felix Formation was not observed by Christie (1973). At the type section, exposure is very poor and thickness estimates are quite unreliable. Lithostratigraphic information for this unit is thus sparse.

2. Only two fossil collections have been made from the Boothia Felix Formation. These were dated originally as Middle Cambrian (Christie, 1973, p. 12-13), but upon re-examination they were redated as Late Cambrian, Dresbachian (Palmer et al., in press). Christie had suggested that the apparent absence of Upper Cambrian strata in Boothia Peninsula was evidence for a major discontinuity between the Boothia Felix and Netsilik Formations, but the age re-assignments reduce the need for this interpretation. Trempealeauan conodonts have now been identified from the middle of the Turner Cliffs Formation at Hunting River, so that only the Franconian stage remains unrepresented in the Upper Cambrian of the report area and may, indeed, be the age of lowermost Turner Cliffs strata. There is therefore no positive evidence of an Upper Cambrian disconformity in the report area. A widespread disconformity of this age has long been assumed, largely on the basis of work by Kurtz et al. (1952) in Devon Island, but the evidence for it is sparse.

3. The lithology of the type section of the Boothia Felix Formation is very similar to parts of the Gallery and Turner Cliffs Formations, particularly at Abernethy River (Section 4). The age range of the Boothia Felix Formation and the other two units are not far apart and may overlap, the Boothia Felix Formation being early Late Cambrian and the Turner Cliffs Formation being mid- or late Late Cambrian to Early Ordovician (in the report area). The age of the Gallery Formation is not precisely known. The Turner Cliffs Formation has priority, has been mapped more widely and is a better understood unit in the Arctic Platform, and is used herein in preference to the Boothia Felix Formation.

4. Complete sections of the Boothia Felix and Netsilik Formations have nowhere been seen in stratigraphic contact, and the relationship between them remains problematic, as discussed by Christie (1973, p. 9).

5. Biostratigraphic data provided by Christie (1973, p. 18-19) indicate, almost without exception, an Early Ordovician age for the Netsilik Formation. Fossils were collected from high in the Franklin Strait Formation (Christie, 1973, p. 27), but their precise stratigraphic positions were not known because complete sections through the formation were not available. The collections included the Arctic Ordovician Fauna, of Ashgillian-Caradocian age. The Netsilik-Franklin Strait contact was placed by Christie in the lower part of the Middle Ordovician, although the thickness of undated lower Franklin Strait strata below the occurrence of the Arctic Ordovician Fauna might have suggested that the contact was somewhat older. This is now confirmed by a conodont collection made just below the base of a section equivalent to the Franklin Strait Formation at Abernethy River (Section 4, GSC loc. C-60709, rocks reassigned to the Turner Cliffs Formation in this report) which has been assigned a late Tremadocian age. The Netsilik Formation is therefore confined to the lower part of the Lower Ordovician, which overlaps the age range of the Turner Cliffs Formation. The latter is the name used in this report, as it has priority and a better delineated type section.

Bay Fiord Formation

Definition, distribution and thickness

The Bay Fiord Formation was named and described by Kerr (1967a, b) based on outcrops in central Ellesmere Island. It is the lowest of three formations of the Cornwallis Group, all of which have now been identified on Somerset Island. The Cornwallis Group is recognized throughout Franklinian Miogeocline, but this report is the first in which the unit is extended onto the Arctic Platform south of Barrow Strait.

In the type area the formation is a variable unit of fine grained, thin bedded limestone, mudstone and anhydrite ranging up to 640 m in thickness. In Somerset Island the lithology is somewhat different, consisting of recessive, dark grey or greenish grey dolomite.

Bay Fiord Formation can be correlated with part of the Baillarge Formation of Baffin Island. The Baillarge Formation was named by Blackadar (1956) and subdivided by Trettin (1969) into two members (Table 2). Trettin further subdivided the upper member into seven units. The present work, as well as the work of Mayr (1978) shows that equivalents of those members and units are mappable on Somerset Island. It is appropriate, therefore, to designate them as formations. The Bay Fiord Formation corresponds to part of Member A of the Baillarge Formation (Table 2 and Fig. 2).

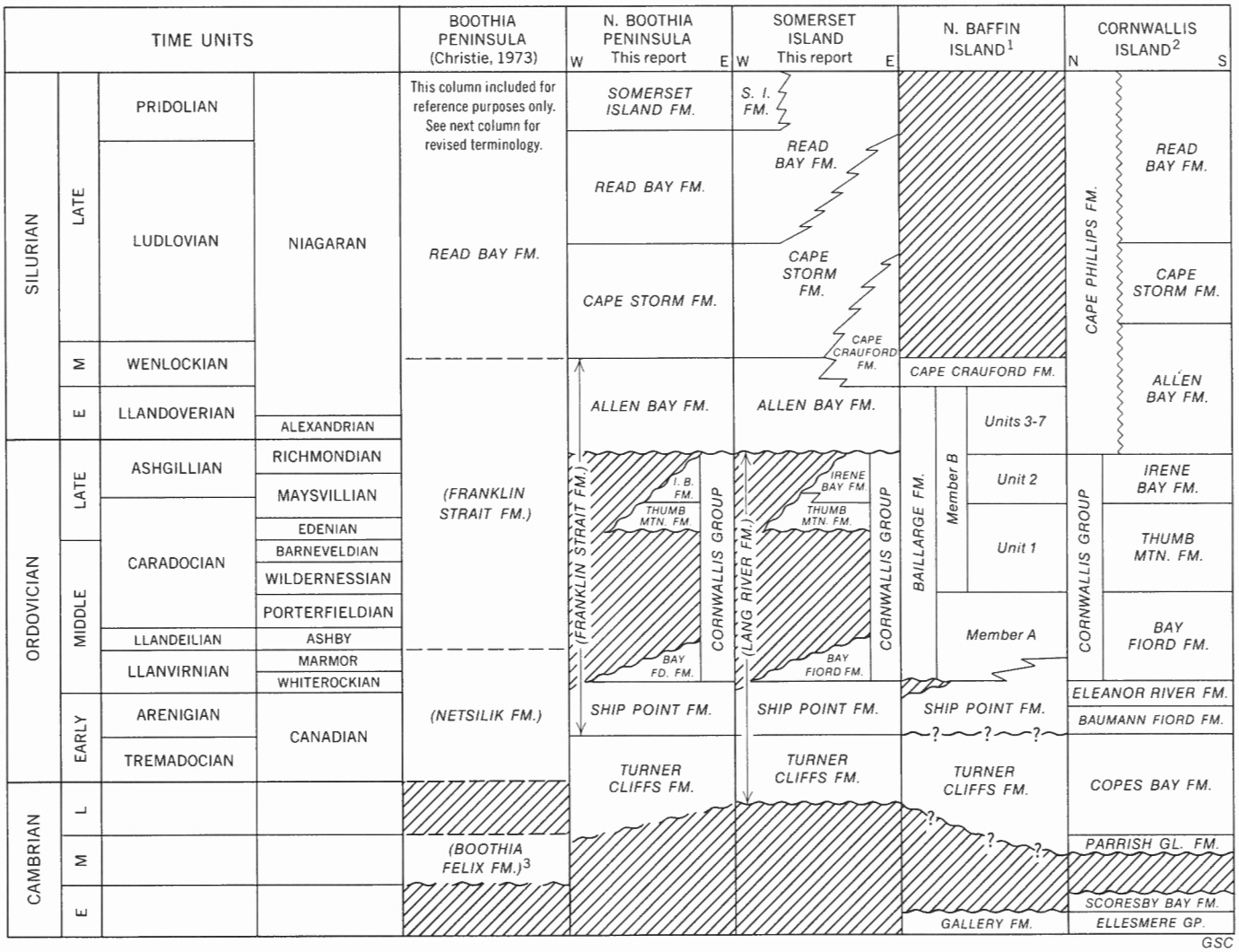
The most complete section of the Bay Fiord Formation in the report area is near Creswell Bay, at Section 13 (Fig. 2), where the formation is 43.5 m thick and has sharp lower and upper contacts (Fig. 2 and Pl. 6). The Bay Fiord Formation thins to 6 m at Section 14, but probably thickens northward from there. An incomplete section of the formation, 21.4 m thick, occurs at the top of Section 17 at Hunting River. Reconnaissance measurements nearby (Section 15) indicate a total thickness in the order of 120 m. Equivalent strata in the Garnier O-21 well (correlated with Member A of the Baillarge Formation by Mayr, 1978) are 196 m thick. The Bay Fiord Formation cannot be traced south of Creswell Bay; the formation is absent at Lang River (Section 6) where the Thumb Mountain Formation rests on the Ship Point Formation with a sharp, disconformable contact.

Lithology

The predominant rock type in the Bay Fiord Formation on Somerset Island is dark grey or greenish grey, recessive, fissile dolostone. The dolomite appears to be argillaceous and to contain thin interbedded shale, but samples analyzed using X-ray diffraction demonstrate that the rock contains minor amounts of quartz but no clay minerals (Dixon, 1973a, p. 54). The grain size is extremely fine (aphanocrystalline) and "the fissility is probably due to closely spaced bedding planes along which clay-sized to silt sized quartz grains are probably concentrated" (Dixon, 1973a, p. 55).

TABLE 2

Stratigraphic correlation, Boothia Peninsula, Somerset Island and adjacent areas



Notes: 1, Based on Trettin (1969), Mayr (1978); 2 Based on Thorsteinsson and Kerr (1968), Barnes et al. (1976), Mayr (1978); 3, The Boothia Felix Formation is now known to be Upper Cambrian at the type section. Names in brackets have been discarded for the purpose of this report.

Minor rock types in the Bay Fiord Formation include intraformational breccia, ripple laminated dolostone and oolitic dolostone.

In the Garnier O-21 well, Mayr (1978) recorded medium brown-grey, partly argillaceous, finely to very finely crystalline dolostone, dark green-black shale, and minor anhydrite in this stratigraphic interval.

Depositional environment

The origin of the fissile dolostone is unclear. Dixon (1973a) interpreted it as the product of sedimentation in a lagoon or sheltered tidal embayment, but it is difficult to envisage geographic features of this type occupying an area at least 100 km in width (the extent of outcrops on the flank of Boothia Uplift). However, a shallow water environment is indicated by the interbedded units of intraformational breccia and oolite. Anhydrite, in the Garnier O-21 well, may indicate temporary supratidal conditions.

Age and correlation

Conodonts obtained from two samples of dolostone from the Bay Fiord Formation in the Creswell Bay region were identified and dated by C.R. Barnes (pers. com., 1977). A fauna at GSC locality C-60645 (Section 14, unit 6) includes Multioistodus cf. M. subdentatus Cullison, and is late Whiterockian (early Middle Ordovician) in age. GSC locality C-60667 (Section 13, unit 11) contains distacodiform and drepanodiform elements, suggesting a Canadian to Whiterockian age.

Mayr (1978) recorded conodonts of late Porterfieldian or early Wildernessian (early Caradocian) age from a core which spans the contact between Members A and B of the Baillarge Formation in the Garnier O-21 well (this contact is therefore older than had been reported by Trettin, 1975). Mayr suggested a Llanvirnian to Caradocian age range for Baillarge Member A, and correlated this unit with the Bay Fiord Formation of Devon and Cornwallis Islands (Kerr, 1967a, b; Thorsteinsson and Kerr, 1968).

Both the conodont samples obtained from the Somerset Island sections were collected from near the base of the formation. The absence of faunas of Marmor to Wildernessian age, and the thinness of the Bay Fiord Formation in Somerset Island suggest that the upper part of the formation is missing. This is discussed in the next section.

Post-Bay Fiord unconformity

Dixon (1973a, Pl. 1) reported a sharp contact at Lang River between rocks he assigned to Members 1 and 2 of the Lang River Formation. He later (Dixon, 1978) suggested that this is an unconformity. The present writers also consider it as a probable unconformity between rocks now assigned to the Ship Point and Thumb Mountain Formations. The basal Thumb Mountain Formation contains several hard-ground horizons, indicating temporary cessation of deposition, or very slow sedimentation during part or all of early Thumb Mountain sedimentation. The Thumb Mountain Formation at this locality contains the Arctic Ordovician Fauna, of Caradocian to Ashgillian age, whereas Arenigian conodonts have been obtained from the underlying Ship Point Formation, 40 m below the contact. The Llanvirnian and Llandeilian stages are therefore unrepresented, and this confirms the existence of a major disconformity (or a condensed sequence) in the Lang River area.

The thickest section of the Bay Fiord Formation is at the Garnier O-21 well (196 m), and there is no evidence there of a sedimentary break. In the Aston Bay area, the lower 120 m of the formation only are exposed. In the Creswell Bay region the thickness varies and it appears that an upper part of the formation was eroded. From Lang River southward the formation is absent, it was either not deposited, or eroded away. Alternatively it might be represented in part by a condensed sequence. The same may also have occurred on Boothia Peninsula. On Baffin Island there appears to be a facies change between the upper Ship Point and the lower Bay Fiord Formations, a conclusion based mainly on biostratigraphic evidence (Trettin, 1975; Mayr, 1978). There is no such evidence for a similar relationship in the report area.

The evidence from the Ordovician section on the flanks of Boothia Uplift is interpreted herein in terms of a regional post-Bay Fiord unconformity that may not be present in the immediately adjacent Prince Regent Basin to the east (Fig. 3). This unconformity may be due to a rise of the Boothia Uplift, and be a precursor of the Cornwallis Disturbance of Kerr (1977). Alternatively the unconformity may be of more regional extent as suggested by Dixon (1978). He suggests that it can be traced to Victoria Island, and also to the northern Interior Plains, where a disconformity exists between the Franklin Mountain and Mount Kindle Formations (Norford and Macqueen, 1975). Thorsteinsson (pers. com., 1978) suspects a disconformity at this level on Devon Island. The most likely situation is a combination of these two. There probably was a regional mid-Ordovician emergence and perhaps exposure that affected much or all of Arctic Canada. Shallowing associated with it caused widespread evaporites in the Bay Fiord Formation of the Franklinian Geosyncline (Kerr, 1967a). The Boothia Uplift, which throughout its long history has generally been a positive feature, may have been slightly more positive than flanking basins, with erosion at Lang River, Creswell Bay and Aston Bay. Elsewhere, as in the Garnier O-21 well, there may have been shallowing, a disconformity, or a hiatus with no angularity (Fig. 2).

Middle to Upper Ordovician

Thumb Mountain Formation

Definition, distribution and thickness

This is the middle of three units comprising the Cornwallis Group of the Franklinian Miogeocline. It was defined by Kerr (1967a) as a bluff-forming unit of thick bedded, dark grey-brown, argillaceous limestone. The type section is located near Irene Bay in central Ellesmere Island, and in the miogeocline the formation ranges up to 760 m in thickness (Kerr, 1967b). The formation has not previously been recognized south of Parry Channel.

The Thumb Mountain Formation is thin on western Somerset Island, and forms a distinctive marker bed (Pls. 1B, 6). In the Creswell Bay area the thickness ranges from 25 m (Section 9) to 3.8 m (Section 13). At Lang River it is 97 m thick (Section 6 and Pl. 1B). The Irene Bay Formation is absent at this locality or it grades into the Thumb Mountain Formation, such that those two formations could not be differentiated. The Thumb Mountain Formation extends southward from Lang River to northeastern Boothia Peninsula, but is missing in the region of Lost River (Section 5) then reappears farther south near Abernethy River, where it lies between dolomite units. The Thumb Mountain Formation extends as far north as Hunting River and is missing farther north. Its absence appears to be due to either non-deposition, or erosion, as the Allen Bay Formation lies directly, and unconformably, on the Bay Fiord Formation in the Aston Bay region (Fig. 2). Complete, detailed sections have not been measured through the formation in northern Somerset Island, but reconnaissance measurements indicate a thickness of 78 m at Section 15.

The Thumb Mountain Formation is present in the Garnier O-21 well and is 115 m thick (Fig. 3). These rocks were correlated by Mayr (1978) with the lower part of Member B of the Baillarge Formation (unit 1 in Table 2).

The lower contact of the Thumb Mountain Formation is interpreted as a regional unconformity in western Somerset Island, as discussed earlier (compare Pls. 1B and 6). This unconformity may be related to the Boothia Uplift and die out away from that structure (Figs. 2, 3). The upper contact, with the Irene Bay Formation, is sharp where that formation is present (Pl. 6). Elsewhere the two formations appear to grade into each other. The upper contact of the Thumb Mountain Formation is considered to be conformable in most places, except as shown (Fig. 2).

Lithology

A detailed petrographic description of rocks in the Thumb Mountain Formation was provided by Dixon (1973a, his loc. Z, member 2). The principal lithologies are pale grey, thin bedded dolomitic biomicrite, and calcareous biogenic dolostone. Fossil fragments include numerous colonial corals, cephalopods and stromatoporoids, and are set in a matrix of micrite or very finely crystalline dolomite (Pl. 5D). Dolomite has replaced the micrite in amounts that vary. Minor fossil components include gastropods, brachiopds, trilobites, bryozoans, crinoids and trace fossils. Up to 50 per cent of the rock consists of fossils or fossil fragments larger than 5 mm. The majority of colonial corals and stromatoporoids are in growth positions. The presence of abundant specimens of the suite of large invertebrate fossils known as the Arctic Ordovician Fauna is very characteristic of the Thumb Mountain Formation (and of the overlying Irene Bay Formation).

Depositional environment

The abundant macrofauna in this unit indicates relatively uniform subtidal conditions. Energy levels were not high, as indicated by the predominance of micritic lithologies (Pl. 5D).

Age and correlation

Three samples from near Hunting River, 15 km southeast of Aston Bay (GSC locs. C-45626, 7, 8) yielded abundant conodonts, including the following forms (identifications and age assignments by C.R. Barnes, pers. com., 1977).

Belodina compressa (Branson and Mehl)
Drepanoistodus suberectus (Branson and Mehl)
Panderodus gracilis (Branson and Mehl)
P. spp.
P. panderi (Stauffer)
Plectodina sp
Acodus mutatus Branson and Mehl
Belodina profunda (Branson and Mehl)
Plegagnathus dartoni (Stone and Furnish)

The fauna is assigned a Maysvillian (early Late Ordovician) age. According to Barnes, several of the taxa are very characteristic of the upper Thumb Mountain Formation and the Irene Bay Formation of the Franklinian Miogeocline.

A sample collected north of Creswell Bay, near Section 12 (GSC loc. C-53100) yielded the following fauna:

Acodus mutatus Branson and Mehl
Aphelognathus politus (Hinde)
Belodina compressa (Branson and Mehl)
B. dispansa (Glenister)
Drepanoistodus suberectus (Branson and Mehl)
Oistodus venustus Stauffer
Panderodus gracilis (Branson and Mehl)
P. panderi (Stauffer)
Staufferella lindstroemi (Ethington and Schumacher)

A late Middle Ordovician to Late Ordovician age is indicated. Near Abernethy River (GSC loc. C-64206) the Thumb Mountain Formation yielded the following fauna:

Belodina compressa (Branson and Mehl)
Drepanoistodus suberectus (Branson and Mehl)
Panderodus gracilis (Branson and Mehl)
Plectodina sp.

A middle Middle to Late Ordovician age is indicated.

Dixon (1973a, 1975) made several large collections of the Arctic Ordovician Fauna on Somerset Island, provided detailed faunal lists, and discussed the age of the assemblage. Several additional, smaller collections were made by the writers, but the reader is referred to Dixon (1975) for a more complete treatment of the biostratigraphy (two of his collections, GSC locs. 89513, 89519, are noted on Fig. 2). Collections of the Arctic Ordovician Fauna from Somerset Island have come from both the Thumb Mountain and Irene Bay Formation. They indicate that the age of the fauna is Late Ordovician, Maysvillian to Richmondian (late Caradocian to Ashgillian).

Mayr (1978) assigned a unit in the Garnier O-21 well to the lower part of Member B of the Baillarge Formation and correlated it with the Thumb Mountain Formation (Fig. 2). He reported in it brachiopod faunas of similar age to the Arctic Ordovician Fauna, and conodonts from a core of the Thumb Mountain-Bay Fiord contact of late Porterfield or early Wilderness age.

Kerr (1967a, b) reported collections of the Arctic Ordovician Fauna from the upper part of the Thumb Mountain and the Irene Bay Formation in Ellesmere Island.

The Thumb Mountain Formation of Somerset Island is presumed to correlate with strata on Prince of Wales Island and Northwest Boothia Peninsula that Christie (1973) assigned to the Franklin Strait Formation (*see* later discussion of this unit).

The Arctic Ordovician Fauna has been found throughout the Thumb Mountain Formation on Somerset Island, whereas the fauna is present only in the upper few hundred feet of the formation in the Miogeocline (Thorsteinsson, 1963; Kerr, 1967b). No faunas older than Maysvillian have been identified positively in conodont collections from the report area. It is suggested that the Thumb Mountain Formation of the report area is equivalent in age to only the upper part of that formation elsewhere. This may partly explain the thinness of the Thumb Mountain Formation in the project area. It also is consistent with the interpretation of a post-Bay Fiord unconformity in the western part of Somerset Island as discussed earlier. There is a regional thinning of the Thumb Mountain Formation from Cornwallis Island, which is part of the geosyncline, southward to Somerset Island which is part of the Arctic Platform (Fig. 4). According to Mayr (1978), most of this thinning takes place in the lower part of the Formation, which may be absent in the Garnier O-21 well. The more local thinning on western Somerset Island may be due to the Boothia Uplift (Fig. 2).

Upper Ordovician

Irene Bay Formation

Definition, distribution and thickness

The Irene Bay Formation was defined by Kerr (1967a) as an argillaceous limestone with minor shale beds of Middle to Late Ordovician age. The type section is near Irene Bay in Ellesmere Island, where the formation is 83 m thick. A particularly distinctive characteristic of the Irene Bay Formation is the presence of a suite of large invertebrate fossils known as the Arctic Ordovician Fauna (also found in the upper part of the underlying Thumb Mountain Formation).

The Irene Bay Formation is now known to be widely distributed within the Franklinian Geosyncline (Kerr, 1967a, b; Thorsteinsson and Kerr, 1968; Kerr, 1974). Rocks of similar lithology and age have been described previously from the Arctic Platform but this report is the first time that the name has been applied south of Parry Channel.

The distribution of the Irene Bay Formation in Somerset Island is similar to that of the Thumb Mountain Formation, though less extensive. It is present in most locations immediately north of Creswell Bay, where it varies from 8 to 43 m in thickness. The formation was not included in Section 10 (measured by Dixon, 1973a), possibly because of poor exposure. As noted earlier, the Irene Bay Formation could not be recognized at Lang River; it is probably absent by gradation into the Thumb Mountain Formation. The Irene Bay Formation has not been recognized on northern Boothia Peninsula, at Lost River, or near Aston Bay (Sections 5, 15) where it is presumed to be missing by erosion (*see* later discussion). Farther east on northern Somerset Island rocks of that age are not exposed.

In the Garnier O-21 well there is a dolomitic shale unit 20 m thick in the B Member of the Baillarge Formation, and Mayr (1978) has correlated this with the Irene Bay Formation.

Lithology

The formation consists of interbedded limestone or dolomitic limestone and shale. Carbonate units are argillaceous. The characteristic colour is greenish grey, and the formation is generally recessive (Pl. 6). In the Creswell Bay area there are strong lithologic similarities between the Irene Bay and the Bay Fiord Formations.

Fossils are locally abundant in the Irene Bay Formation and include solitary and compound corals, brachiopods and nautiloids.

Depositional environment

Conditions were probably similar to those prevailing during deposition of the Bay Fiord Formation.

Age and correlation

No macrofossils of any biostratigraphic utility have been collected from outcrops of the Irene Bay Formation of Somerset Island, and no conodonts have been recovered. Regional stratigraphic information (Kerr, 1967b; Barnes et al., 1976) and the age of the enclosing strata in the report area indicate that the formation probably is Ashgillian to Caradocian (late Late Ordovician) in age.

Mayr (1978) recorded late Middle or Late Ordovician conodonts in the Irene Bay Formation in the Garnier O-21 well.

Possible post-Irene Bay unconformity

At several localities the Thumb Mountain Formation, or the Irene Bay Formation, or both, are missing, and the Allen Bay Formation rests directly on the Bay Fiord or Ship Point Formations. This may be due to post-Irene Bay, pre-Allen Bay erosion, or it may reflect lateral facies changes within the Cornwallis Group. Mayr (pers. com., 1978) reports that in some areas thickness variations in the Thumb Mountain and Irene Bay Formations are due to the discontinuous distribution of a shaly Irene Bay facies which laterally replaces the uppermost part of the Thumb Mountain Formation. The evidence is not sufficient to determine which is the correct interpretation in the report area. The following notes describe the localities at which the succession is incomplete.

1. At Lost River (Section 5), the Allen Bay Formation rests directly on the Ship Point Formation and the Cornwallis Group is absent. The Bay Fiord Formation probably is absent as a result of pre-Thumb Mountain erosion, as at Section 6. The Thumb Mountain and Irene Bay Formations may have been removed by pre-Allen Bay erosion, or they may be represented by a facies variant indistinguishable from the Allen Bay Formation. The presence of the Arctic Ordovician Fauna in unit 12 of Section 5 is not conclusive evidence for either interpretation, as this fauna is present in the upper Thumb Mountain Formation, the Irene Bay Formation and the basal Allen Bay Formation on Cornwallis Island.

2. At Lang River (Section 6), the Thumb Mountain and Irene Bay Formations cannot be distinguished, the thickness of the section here suggests that the two units are both present, but are of similar facies.

3. At Creswell Bay (Section 9), the Thumb Mountain Formation is thin and the Irene Bay Formation is absent. This might suggest pre-Allen Bay erosion cutting through the Irene Bay Formation and down into the Thumb Mountain. However the Thumb Mountain Formation is known to be very thin elsewhere, such as at Sections 12 and 13, where the Irene Bay Formation is present, and so the evidence from Section 9 also is ambiguous. The absence of the Irene Bay Formation could be the result of lateral facies change into the Allen Bay or Thumb Mountain, or pre-Allen Bay erosion.

4. At Hunting River (Section 15), the Allen Bay Formation rests on the Thumb Mountain Formation, which here is 78 m thick. Six kilometres to the north the Thumb Mountain Formation pinches out and the Allen Bay Formation rests directly on the Bay Fiord Formation.

The Cornwallis Group and its constituent formations can be traced for hundreds of kilometres through the Franklinian Miogeocline, which contrasts strongly with the complex picture of lateral variability described above. Thorsteinsson (pers. com., 1978) reports similar thickness and facies variations in the Cornwallis Group in Devon Island, also within the Arctic Platform. The miogeocline was characterized by gentle but steady subsidence throughout most of Cambrian to Silurian time, whereas gentle positive movement of the Arctic Platform during or following deposition of the Thumb Mountain and Irene Bay Formations could have caused local facies changes, thickness variations or disconformities, and this would explain all the variations observed in the Cornwallis Group. Accordingly the base of the Allen Bay Formation is drawn as a possible unconformity at Sections 5, 9, and 15 where the Irene Bay Formation is known to be absent. At Section 6 the thickness of the Cornwallis Group suggests that the upper part of the group has not been reduced by erosion and the absence of the Irene Bay Formation is interpreted tentatively as a lateral facies change into the Thumb Mountain Formation.

The post-Irene Bay unconformity possibly is related to movement on Boothia Uplift, and its apparent patchy distribution, as suggested in Figure 2, may reflect only the fact that the line of section does not exactly follow tectonic or depositional strike. A detailed section perpendicular to the uplift (which cannot be provided because of insufficient data) might show progressively deeper erosion levels below the Allen Bay Formation as this contact was followed westward toward the centre of the uplift (Fig. 3). Alternatively there may have been a more widespread uplift in the Arctic Platform, increasing in displacement southward, toward the Shield. Evidence for a widespread disconformity at the Ordovician-Silurian boundary was summarized by Lenz (1976). Our present correlations would place this within the lower Allen Bay Formation. An unconformity at that level has not been documented in the Arctic Islands and it remains an open question whether the data discussed above could be interpreted along these lines.

Lower Ordovician to Middle Silurian

Franklin Strait Formation (abandoned)

Blackadar and Christie (1963) mapped a succession of "light weathering, relatively competent dolomite, dolomitic sandstone, and minor sandstone containing Ordovician and probably Silurian fossils" which they termed map-unit 9. They mapped this succession throughout Somerset and Prince of Wales Islands and Boothia Peninsula. Christie (1973) later

applied the new name Franklin Strait Formation to map-unit 9, using a type section at Pasley Bay on northwestern Boothia Peninsula. He correlated it with the Cornwallis Group and Allen Bay Formation and with map unit 10b on Victoria Island (Thorsteinsson and Tozer, 1962).

Dixon (1973a, b; 1975) studied map-unit 9 on Somerset and Prince of Wales Islands and reassigned the lower part to the Lang River Formation. It is now recognized that this part of the section corresponds to the Cornwallis Group.

Map-unit 9 is unquestionably a distinctive rock stratigraphic unit. Christie (1973, p. 19) quoted a description by Haughton (1860) which indicated that this fact was recognized during the early voyages of exploration into the Arctic over 100 years ago. However, it is now apparent that this unit encompasses two different stratigraphic configurations:

1. Throughout Somerset Island, and over much of northeastern Boothia Peninsula, map-unit 9 is Late Ordovician to Early Silurian in age and has been reassigned to the Cornwallis Group and Allen Bay Formation. A detailed description of the latter is given in the next section.

2. At Lost River (Section 5) and Pasley Bay (Section 3), the Cornwallis Group is absent. However, the Arctic Ordovician Fauna, typical of the upper part of the Cornwallis Group and the lowermost Allen Bay Formation (Thorsteinsson, 1963; Thorsteinsson and Kerr, 1968), is found in both these sections high in map-unit 9. At these localities the base of the unit is clearly much older, although this was not recognized by Christie (1973).

This confusion has arisen because at Lost River the Allen Bay Formation rests directly on the Ship Point Formation. The two formations are lithologically very similar. The contact between them is unconformable, and the distinctive Cornwallis Group is absent, so that there is a continuous section of pale weathering dolostone of Early Ordovician to Silurian age, all of which was assigned to the Franklin Strait Formation by Christie (1973). The position of the unconformity has not been located at Lost River but must be at or near the top of unit 11 (a poorly exposed interval) in Section 5, immediately below the first appearance of the Arctic Ordovician Fauna (the Pasley Bay section has not been studied in detail by the writers but the stratigraphy there probably is similar). Accordingly, the name Franklin Strait Formation is not used in this report for northeastern Boothia Peninsula or Somerset Island.

Upper Ordovician to Middle Silurian

Allen Bay Formation

Definition, distribution and thickness

The Allen Bay Formation was defined on Cornwallis Island by Thorsteinsson and Fortier (1954) and Thorsteinsson (1958) as a dolostone unit 1700 m thick of Ashgillian to Wenlockian age. The formation overlies the Cornwallis Group and underlies the Read Bay Formation. In the Franklinian Miogeocline the upper part of the Allen Bay Formation, as originally defined, has been reassigned to the Cape Storm Formation (Kerr, 1975). In the report area the Cape Storm comprises sediments that were earlier assigned to the Read Bay Formation, as discussed by Miall and Kerr (1977), and the upper contact of the Allen Bay Formation has not been changed. The lithologies and stratigraphic relationships on Somerset Island are closely similar to those of the type area. As noted earlier in this report, the Allen Bay Formation of Somerset Island and northeastern Boothia Peninsula corresponds to part of map-unit 9 of Blackadar and Christie (1963).

The lower contact of the Allen Bay Formation is placed at the base of a massive, pale weathering dolostone that commonly contains the Arctic Ordovician Fauna. The contact may be unconformable at least locally, as discussed earlier. The top of the Allen Bay is less clearly defined, although normally it can be ascertained readily in areas of good outcrop. The thick bedded to massive, buff to yellowish dolomite of the Allen Bay passes up abruptly into thinner bedded, grey to greenish grey dolostone of the Cape Storm Formation.

The Allen Bay Formation is distributed throughout the western part of Somerset Island, and outcrops continuously along the flanks of Boothia Uplift. In eastern Somerset Island rocks of this stratigraphic interval are substantially thicker (Fig. 3). There are facies variations in the upper part of the interval, the main one being the presence of evaporite in the succession, and the rocks are assigned to the Cape Craufort Formation. The facies change occurs in the subsurface, but its exact geographic position has yet to be defined.

Complete sections and accurate thicknesses of the Allen Bay Formation are difficult to obtain because the formation outcrops in the area of structural complication flanking Boothia Uplift. At Lost River (Section 5) the formation is 535 m thick. A complete section 550 m thick was measured by Dixon (1973a, b) at Lang River (Section 6), and an incomplete section 432 m thick was recorded by him in a fault block north of Creswell Bay (Section 10). Short sections were studied by the writers in the Hunting River-Aston Bay area (eg. Section 20) but the complete thickness in this area is not known. Equivalent strata in the Garnier O-21 well (including the Cape Crauford Formation) are 1050 m thick, and a comparable thickness may be present in northwestern Somerset Island. The Allen Bay Formation probably thickens northward along the east flank of Boothia Uplift, due to the northward tilt of the craton toward the Franklinian Geosyncline (Dixon, 1973a).

Lithology

The rock types of the Allen Bay Formation are mainly buff to pale grey, medium bedded to massive weathering dolostone (Pl. 7). A finely crystalline texture is predominant, but some medium to coarsely crystalline beds are present. Vuggy, bioturbated (Pl. 8A) and bioclastic textures are common. Rare, thin shaly partings and sandy units occur throughout. The lithology is similar to that of the Ship Point Formation. Stromatolitic and bioclastic dolostone units are common throughout the Allen Bay Formation, and rare intraclast breccias also are present. The most common stromatolite type is large, laterally-linked, low amplitude domes (Pl. 8B). Fossils present commonly include corals, stromatoporoids and brachiopods, but preservation generally is poor. Rare gastropods and nautiloids have been recorded.

Depositional environment

Rock types in the Allen Bay Formation are similar to those of the Ship Point Formation, the main difference between the two units being the greater abundance and variety of marine macrofauna in the Allen Bay. Conditions probably ranged from intertidal to subtidal, fossiliferous beds indicating a subtidal environment. The upper part of the formation shows an eastward facies change into supratidal evaporite rocks of the Cape Crauford Formation.

Age and correlation

Fossil collections from the Allen Bay Formation of Somerset Island were studied in detail by Dixon (1973a, 1975). Most indicate a Middle Silurian age. The Arctic Ordovician Fauna occurs at the base of the formation at Lost River (Section 5). The formation rests on the Irene Bay Formation which is Middle to Upper Ordovician. It is followed by the Cape Storm Formation, which Reinson et al. (1976) considered to be Early to Late Silurian on the basis of Kerr's (1975) work in the type area of the Cape Storm Formation on Ellesmere Island. However, Jones and Dixon (1977) showed that in Somerset Island the base of the Cape Storm decreased in age from Wenlockian to Ludlovian from west to east across the island. An Ashgillian to Wenlockian age is provisionally assigned to the Allen Bay Formation in western Somerset Island.

Data provided by Trettin (1969) and Mayr (1978) show that the Allen Bay Formation correlates with the Cape Crauford Formation and the upper part of Member B of the Baillarge Formation of Baffin Island (Table 2).

Lower to Upper Silurian

Cape Crauford Formation

Definition, distribution and thickness

The Cape Crauford Formation was defined by Trettin (1969) as comprising all the lower Paleozoic strata of northwestern Baffin Island overlying the Baillarge Formation. It was stated to be the youngest bedrock unit in the area and consists of dolomitic limestone and dolostone with numerous brecciated horizons representing evaporite solution. A type section was established by Trettin (1969) near Cape Crauford, where the formation is 408 m thick.

Beds of similar lithology are exposed in the cliffs along the east side of Somerset Island between Port Leopold and Batty Bay (Pl. 6A). The beds at Port Leopold were assigned to a local "lower unit" of the Read Bay Formation by McMillan (1963, p. 130). The same unit, between Elwin Bay and Port Leopold, was referred to as an "evaporite member" of the Read Bay Formation by Norris (1963, p. 137), and a gypsiferous part of the Read Bay Formation north of Batty Bay was described by Blackadar (1963, p. 141). Jones and Dixon (1975) re-investigated the stratigraphy of the Port Leopold area and referred to the evaporitic lower unit exposed there as the "unnamed carbonates and evaporites". They assigned the overlying rocks in this area to a new unit, the Leopold Formation, which they regarded as a lateral facies variant of the Read Bay Formation of western Somerset Island.

The unnamed carbonates and evaporites of eastern Somerset Island are assigned to the Cape Crauford Formation. The section exposed at Port Leopold represents the upper 50 m of the formation, and a complete section 579 m thick was penetrated in the Garnier O-21 well (Mayr, 1978). A detailed sedimentological study of a coastal section through the formation was given by Reinson (1978). The upper contact of the Cape Crauford Formation is drawn in exposures at the top of the uppermost continuous evaporite bed (Jones and Dixon, 1975, p. 400). The overlying Leopold Formation is now known to be the same rock-stratigraphic unit as the Cape Storm Formation of western Somerset Island, although the formation is diachronous, becoming younger to the east (Miall and Kerr, 1977; Jones and Dixon, 1977).

As noted earlier in this report, the evaporite beds disappear westward and the formation becomes indistinguishable from the Allen Bay Formation. The position of this facies change within the subsurface is unknown at present.

Lithology

In the Garnier O-21 well the Cape Crauford Formation consists predominantly of dolostone and dolomitic limestone, with numerous beds of anhydrite and rare units of dolostone intraformational breccia and stromatolitic dolostone. Along the east coast of Somerset Island exposures of the upper 50 m of the formation show similar rock types (Pl. 9; Section 22, Appendix). Most units are laminated to thin bedded, and there is considerable vertical and lateral variation within the succession. Thin units of alabastrine gypsum, with or without crystalline gypsum, low domal stromatolites, bioturbated, brecciated and ripple laminated dolomite units are interbedded on a decimetre scale within the section. Minor scour surfaces and evaporite-solution vugs are common. One unit of bioclastic dolarenite containing small ovate stromatoporoid colonies was observed. Evaporite beds reach a maximum thickness of approximately 1.5 m. Most are very discontinuous, grading laterally within a few tens of metres into dolostone with thin anhydrite stringers.

The lithostratigraphy and sedimentology of this unit in northeast Somerset Island are considered in greater detail by Reinson (1978). He recognized a cyclic sequence in the formation which he attributed to repeated progradation on a subsiding lagoonal-sabkha shoreline.

Age and correlation

Very few fossils have been collected from the Cape Crauford Formation of eastern Somerset Island and none has provided more than the most generalized age information. Mayr (1978) reported conodonts of Silurian age from the subsurface section in the Garnier O-21 well.

Jones and Dixon (1975) assigned a Pridolian age to the overlying rocks at Port Leopold (which they assigned to the Leopold Formation) on the basis of vertebrates, invertebrate macrofossils, and conodonts. This was later revised to Ludlovian-Pridolian (Jones and Dixon, 1977). Trettin (1969) assigned a Middle Silurian and possibly Late Silurian age range to the Cape Crauford Formation of Baffin Island, and this correlation is accepted herein. The Cape Crauford is largely the lateral facies equivalent of the Allen Bay Formation of western Somerset Island. The Cape Storm and Leopold Formations are interpreted as the same rock-stratigraphic unit, with the upper contact becoming slightly younger eastward across Somerset Island (Miall and Kerr, 1977; Jones and Dixon, 1977). The unit ranges in age from Wenlockian to Pridolian, and will be considered in a separate report.

CONCLUSIONS

The following are the principal results of this investigation:

1. The stratigraphy of Upper Cambrian to Middle Ordovician rocks has been correlated at formation level with that of Baffin Island.

2. The stratigraphy of Middle Ordovician to Upper Silurian rocks has been correlated at formation level with that of the Franklinian Geosyncline, and with that of Baffin Island which is described by a different stratigraphic terminology.

3. The report has cast some light on various breaks in sedimentation that have been postulated at several levels in the stratigraphic column (Trettin, 1969, 1975; Thorsteinsson and Mayr, pers. com., 1978):

   A. No evidence has been found for a disconformity between the Turner Cliffs and Ship Point Formations. The former is of similar thickness everywhere within the report area, suggesting that it was not eroded prior to Ship Point sedimentation.

   B. No evidence has been found for a disconformity between the Ship Point and Bay Fiord Formations, although the sharpness of the contact between the two units might be regarded as evidence of such a disconformity.

   C. Evidence has been accumulated of a disconformity between the Bay Fiord and Thumb Mountain Formations.

   D. There probably is a post-Irene Bay disconformity and local angular unconformity beneath the Allen Bay Formation.

4. It is possible that both the post-Bay Fiord and post-Irene Bay disconformities are widespread in the Arctic Platform. If so, the influence of the Boothia Uplift is unclear. Further work on the Cambrian to Silurian strata of Prince of Wales and Victoria Islands might cast some light on this problem.

5. The Boothia Felix, Netsilik, Franklin Strait and Lang River Formations are recently defined units that have not been adopted in this report, except to facilitate interpretation of their type and reference sections in terms of the preferred stratigraphic terminology. However, all these units were also applied by their authors in areas beyond those covered by this report, in particular, western Boothia Peninsula (Boothia Felix, Netsilik and Franklin Strait Formations) and Prince of Wales Island (Franklin Strait and Lang River Formations). Their continued use or abandonment in those areas must await further study.

6. Late Cambrian to Middle Silurian time was dominated by intertidal to subtidal carbonate sedimentation within a broad, tectonically stable shelf region. Siliciclastic sediments are common only at the base of the succession and represent reworking of a thin veneer of supermature detritus on the initial Precambrian erosion surface.

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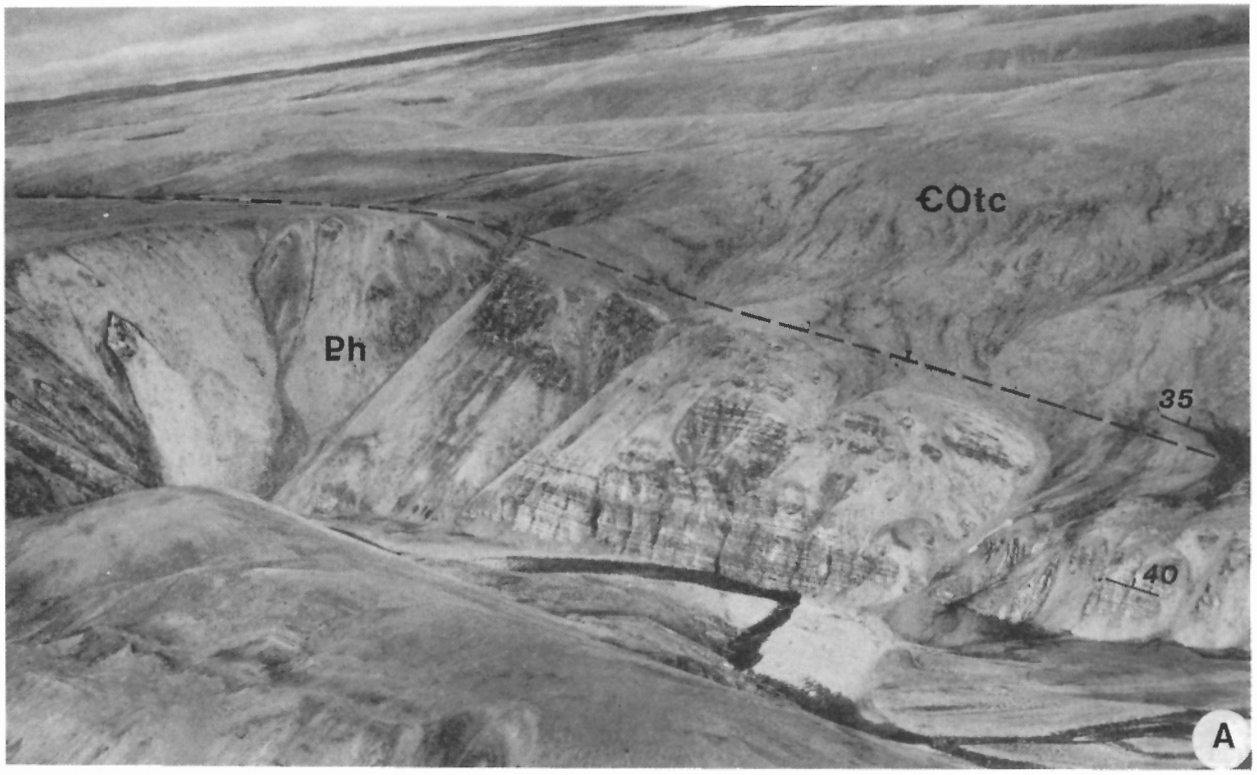


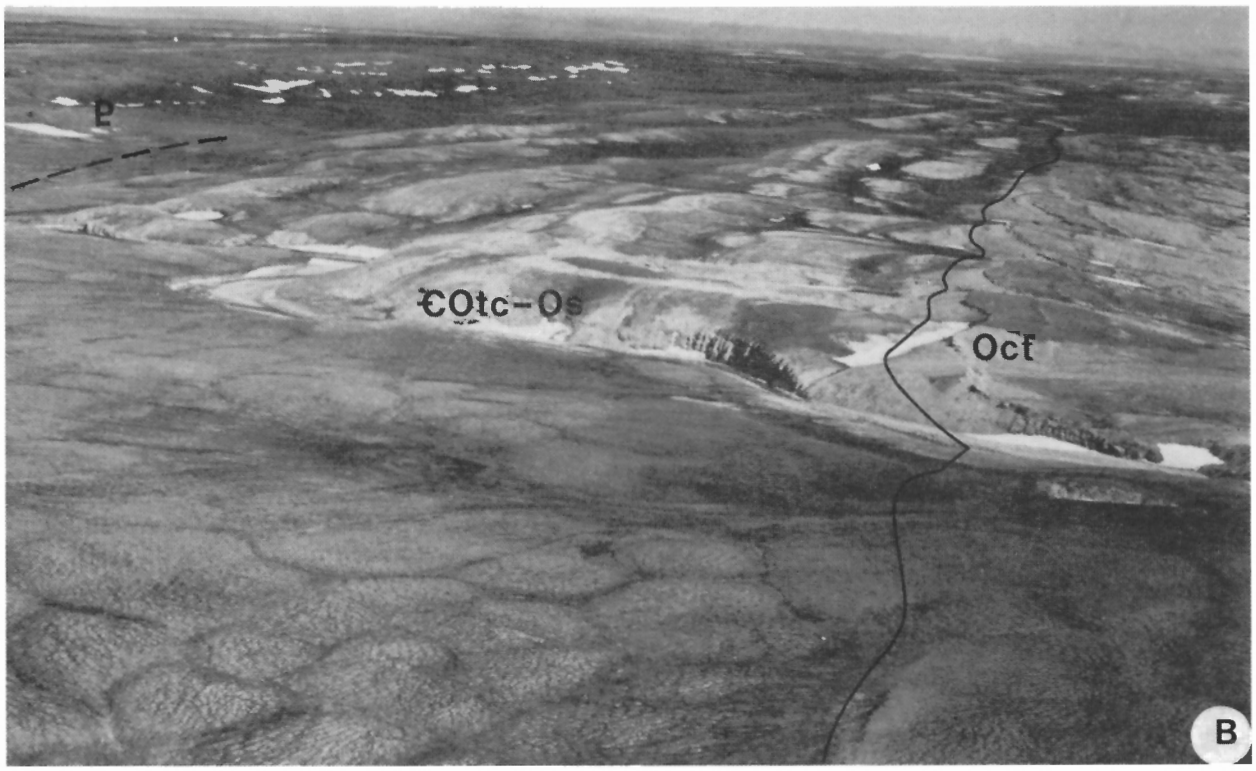


PLATE 1. *Aerial views of the Turner Cliffs and Ship Point Formations. A: View to the northwest of the unconformable basal contact of the Turner Cliffs Formation with the Hunting Formation at Hunting River, 10 km upstream from the mouth of the river. The Turner Cliffs Formation dips to the east at 35°. ISPG 827-46. B: View to the north of the Lang River area (Section 6) showing the unconformable contact separating the Paleozoic rocks from the underlying gneissic rocks of the Precambrian Shield, and the unconformable contact between the Ship Point Formation and the Thumb Mountain Formation. Ꝑ = Precambrian crystalline rocks, Ꝑh = Hunting Formation, €Otc = Turner Cliffs Formation, Os = Ship Point Formation, Oct = Thumb Mountain Formation. ISPG 827-334.*

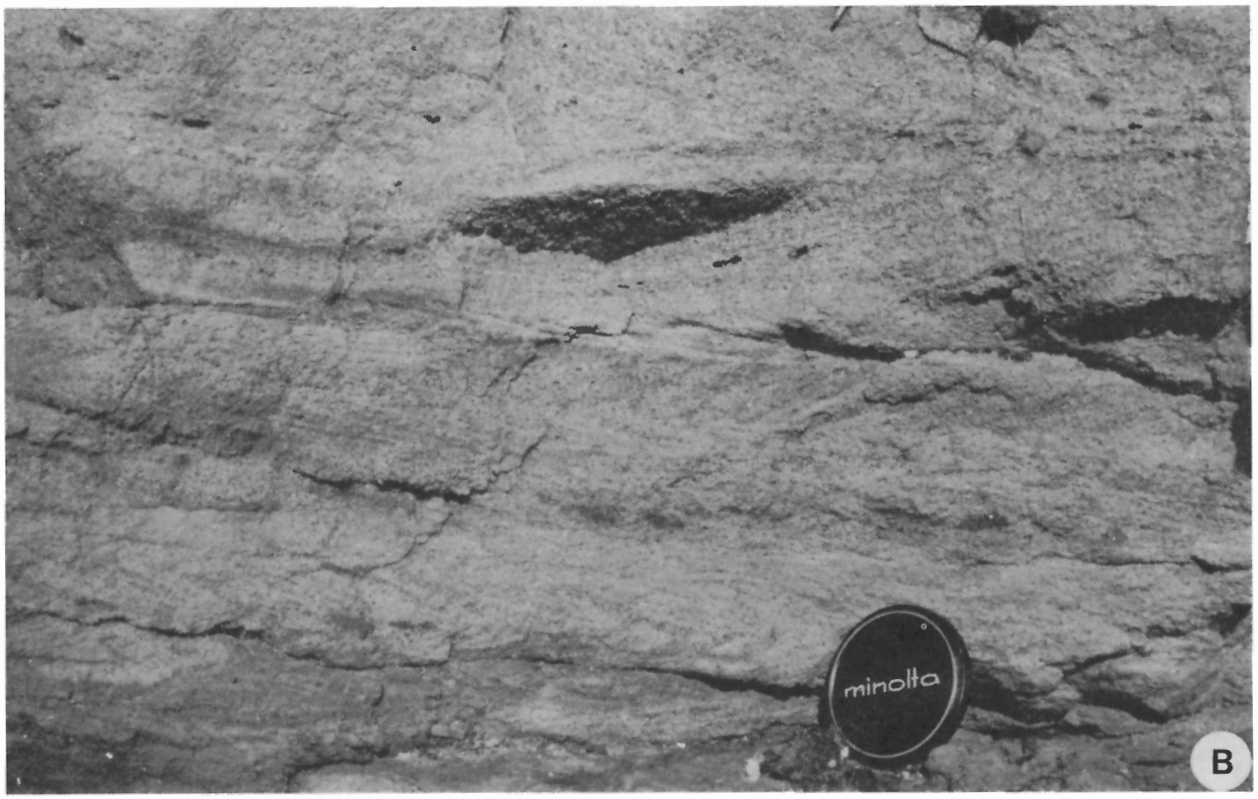
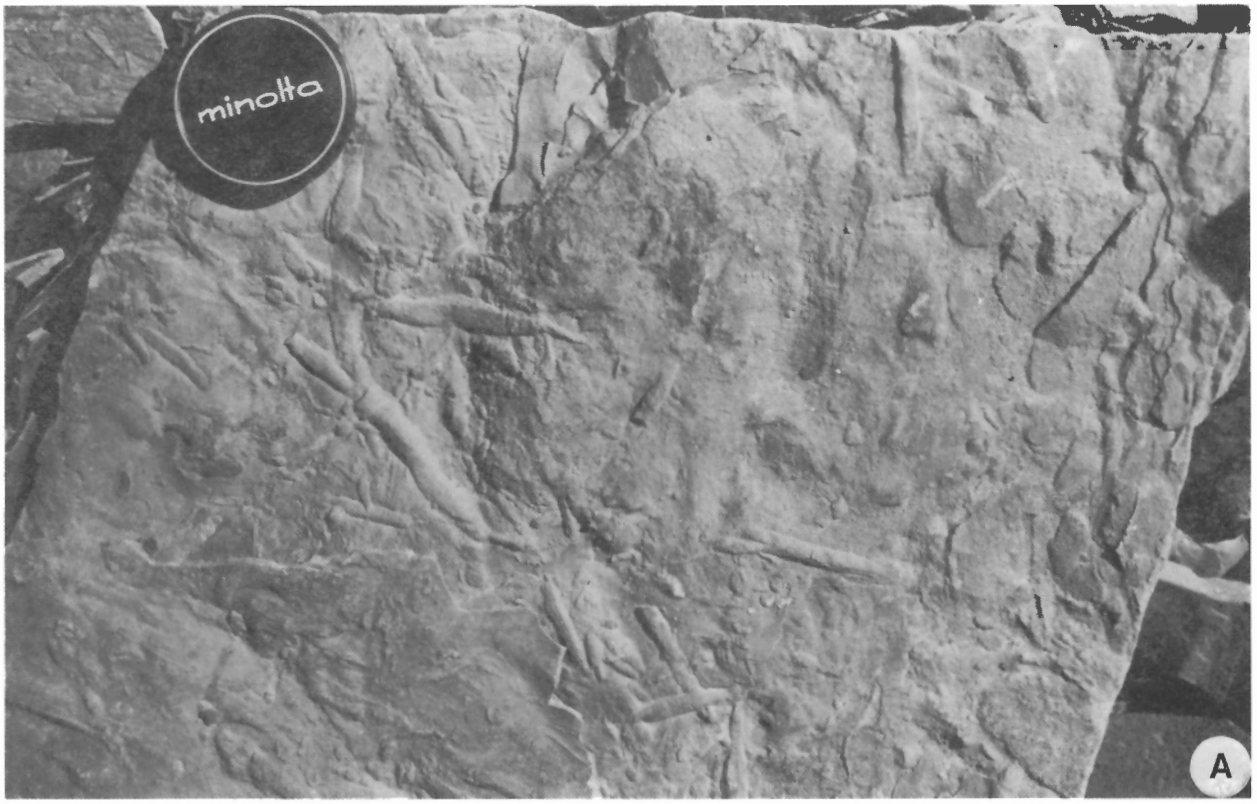


PLATE 2. *Basal Turner Cliffs Formation at Abernethy River (Section 4). A: Basal sandstone section (units 1-10 of section) folded into a plunging anticline. Aphebian metamorphic rocks are exposed on the left side of the river, and the basal Phanerozoic unconformity is concealed beneath the river. ISPG 818-89. B: Basal gritty sandstone with herringbone crossbedding. ISPG 818-86.*



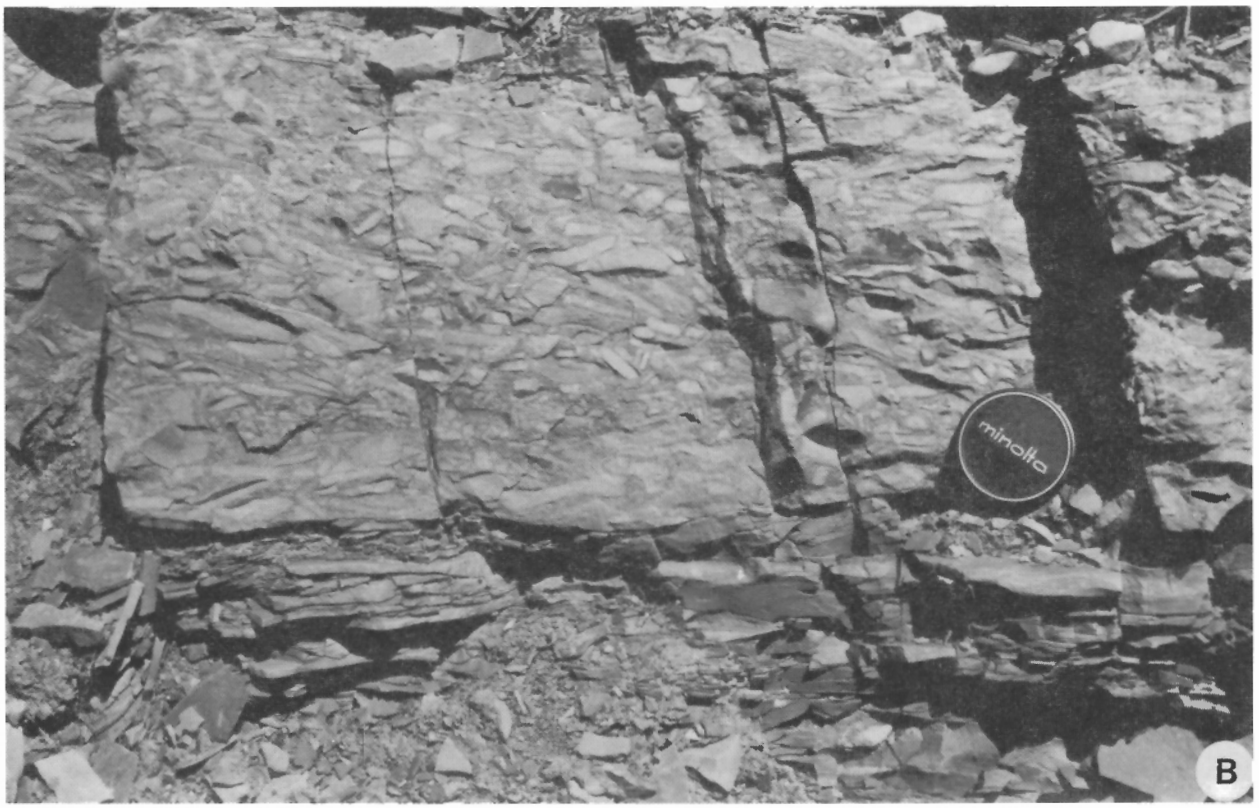


PLATE 3. *Rock types in the Turner Cliffs Formation, Abernethy River (Section 4). A: Trace fossils on bedding plane surface, sandstone bed in unit 4 of section: ISPG 818-88. B: Dolostone intraclast conglomerate with glauconitic sandy matrix, unit 6 of section. ISPG 818-87.*

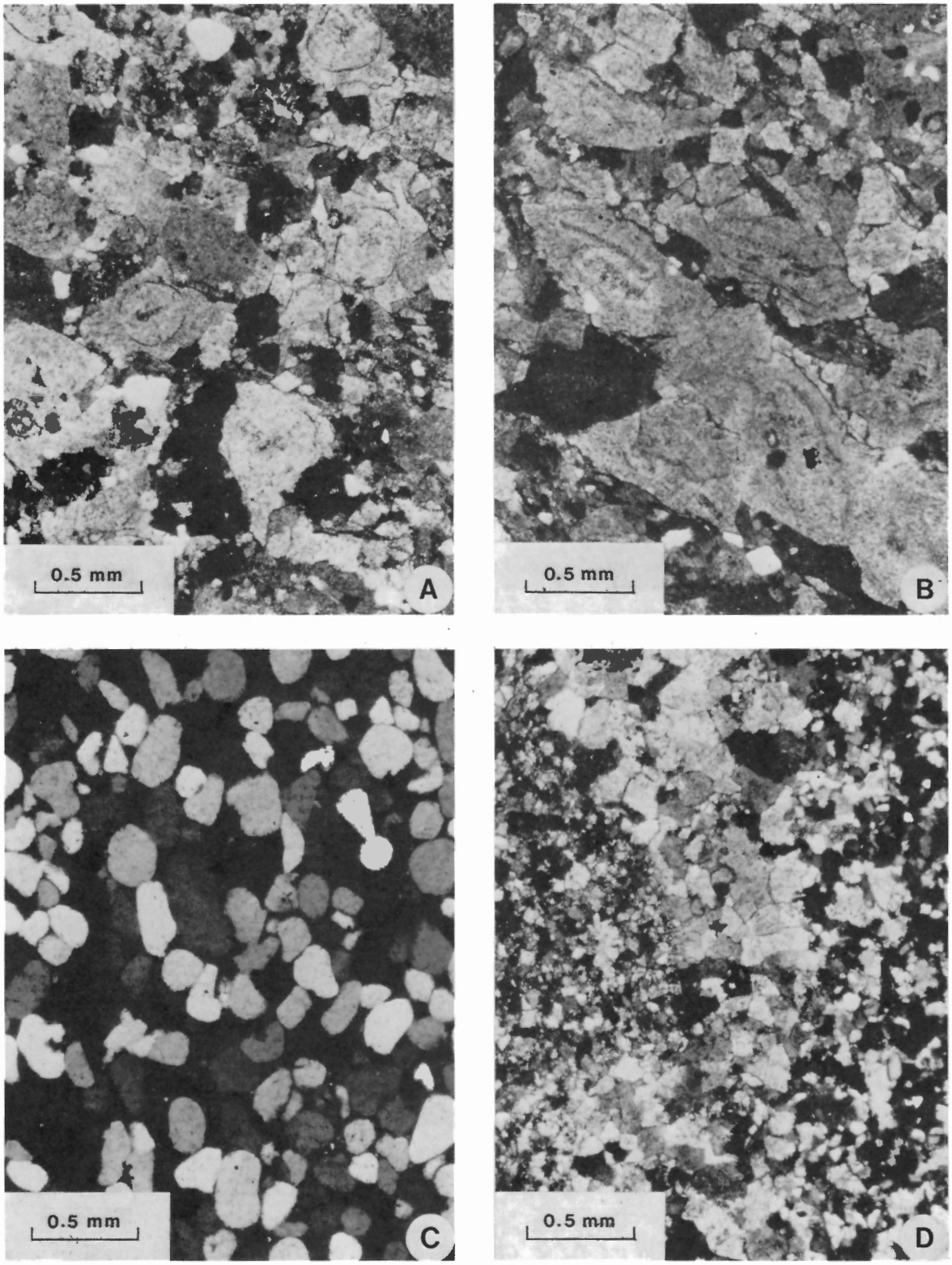


PLATE 4. *Photomicrographs of rock types in the Turner Cliffs Formation. A, B: Sandy calcarenite, showing sparry calcite grains containing nuclei of fossil fragments, (GSC loc. C-60696, Section 1, unit 1). ISPG 988-17. ISPG 988-14. C: Medium- to coarse-grained quartzose sandstone, supermature with good porosity and weak cementation, Abernethy River (GSC loc. C-60706, Section 4, unit 9). ISPG 988-2. D: Sandy dolostone intraclast breccia, clasts of dolosparite set in a matrix of fine grained quartzose sand, Lost River (GSC loc. C-60687, Section 5, unit 2). ISPG 988-8.*

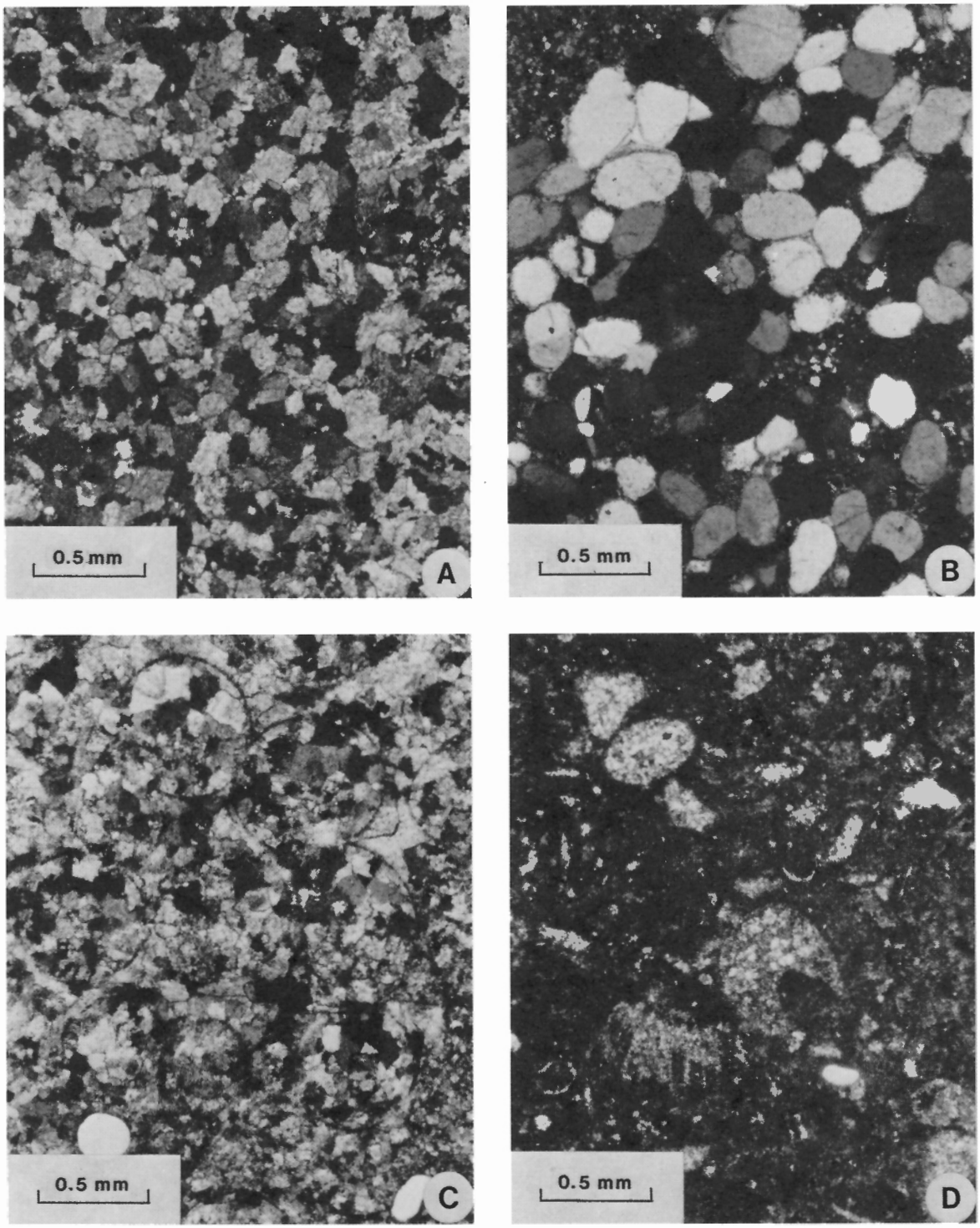
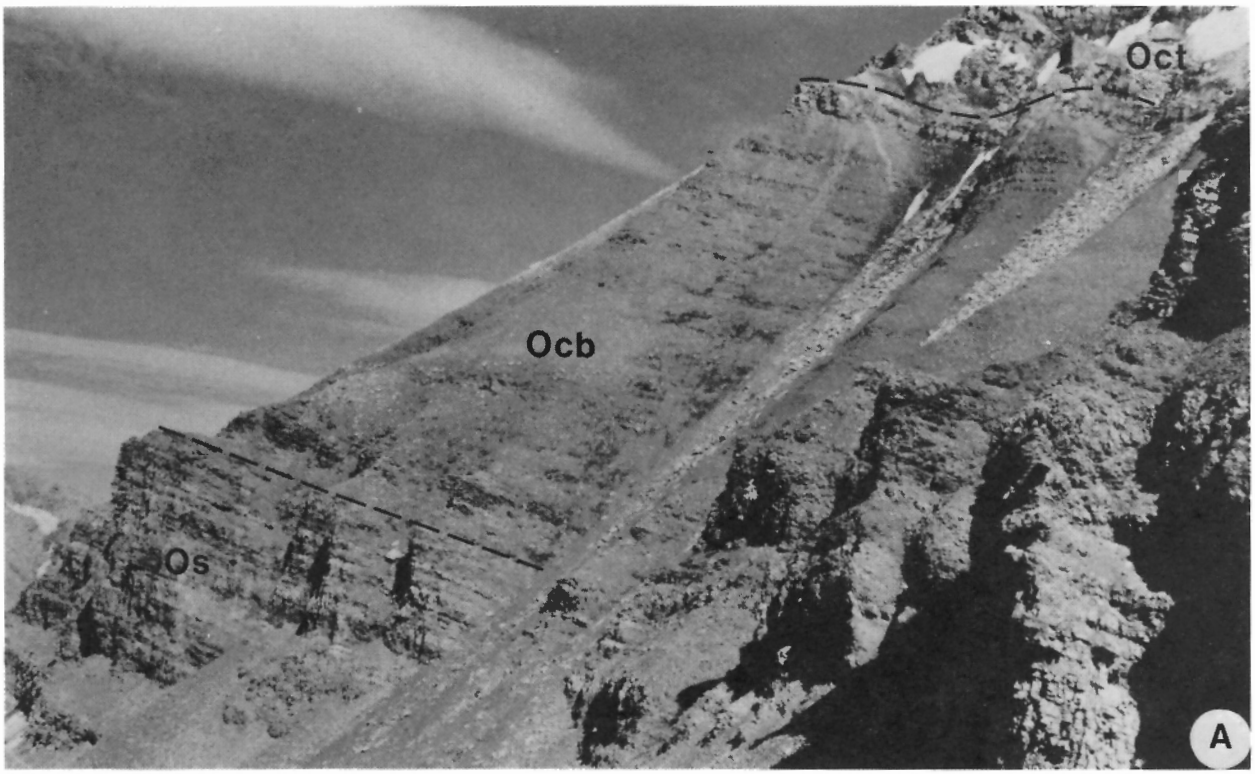


PLATE 5. *Photomicrographs of rock types in the Turner Cliffs, Ship Point and Thumb Mountain Formations. A: Typical dolarenite of the upper member of the Turner Cliffs Formation, Hunting River (GSC loc. C-60640, Section 15, unit 10). ISPG 988-22. B: Medium grained sandstone, consisting of unstrained monomineralic quartz grains with abundant quartz overgrowths and silica cementation and containing scattered clasts of dolosiltite, Turner Cliffs Formation, Aston Bay (GSC loc. C-60559, Section 19, unit 2). ISPG 988-31. C: Dolomitized oolite. Dolosparite has replaced ooliths and rare shell fragments, Ship Point Formation, Aston Bay (GSC loc. C-60568, Section 19, unit 19). ISPG 988-28. D: Lime wackestone, containing fragments of crinoids, bryozoa, gastropods and brachiopods in a micrite matrix, with traces of replacement by dolomite rhombs, Thumb Mountain Formation, Creswell Bay (GSC loc. C-60668, Section 13, unit 13). ISPG 988-11.*



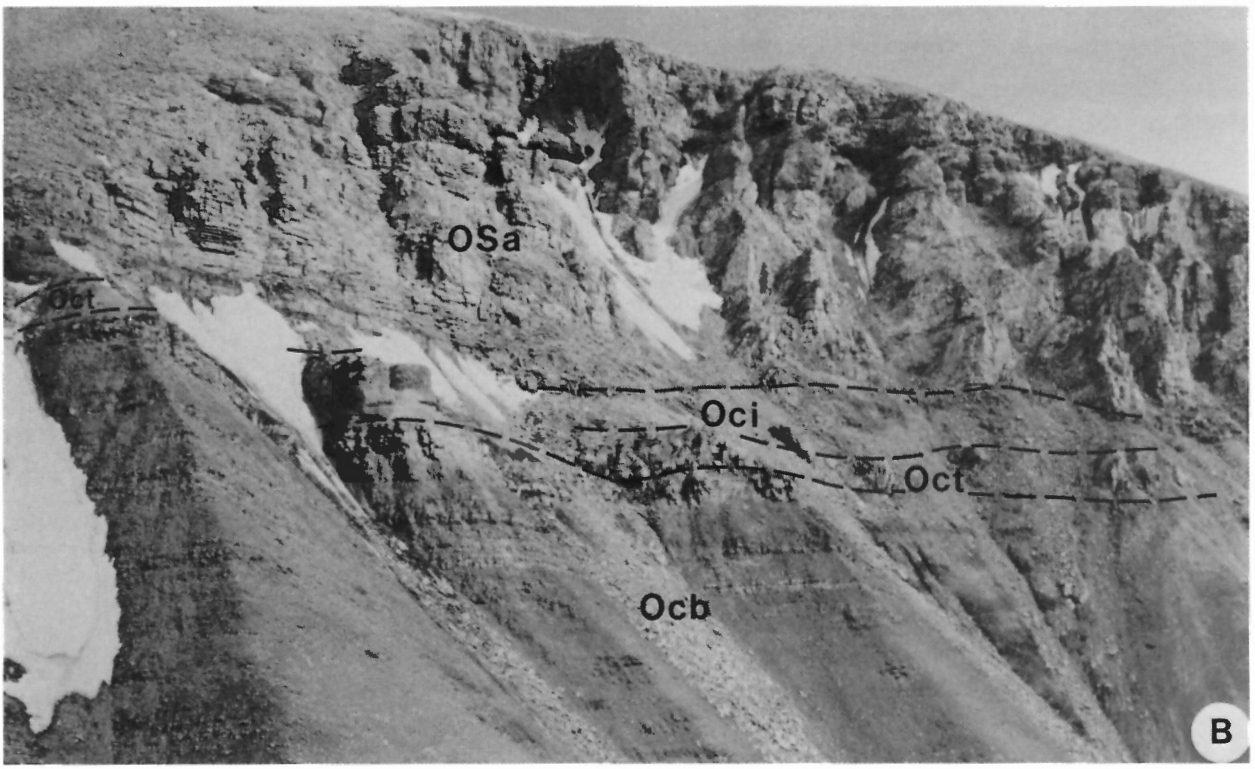


PLATE 6. *Cornwallis Group and Allen Bay Formation near Creswell Bay, at Section 13. A: Dark grey dolostone of the Bay Fiord Formation overlying lighter coloured beds of the Ship Point Formation; ISPG 818-78. B: The upper part of the Cornwallis Group and the basal beds of the Allen Bay Formation. Note the thinness of the Thumb Mountain and Irene Bay Formations. Os = Ship Point Formation, Ocb = Bay Fiord Formation, Oct = Thumb Mountain Formation, Oci = Irene Bay Formation, OSa = Allen Bay Formation. ISPG 818-80.*

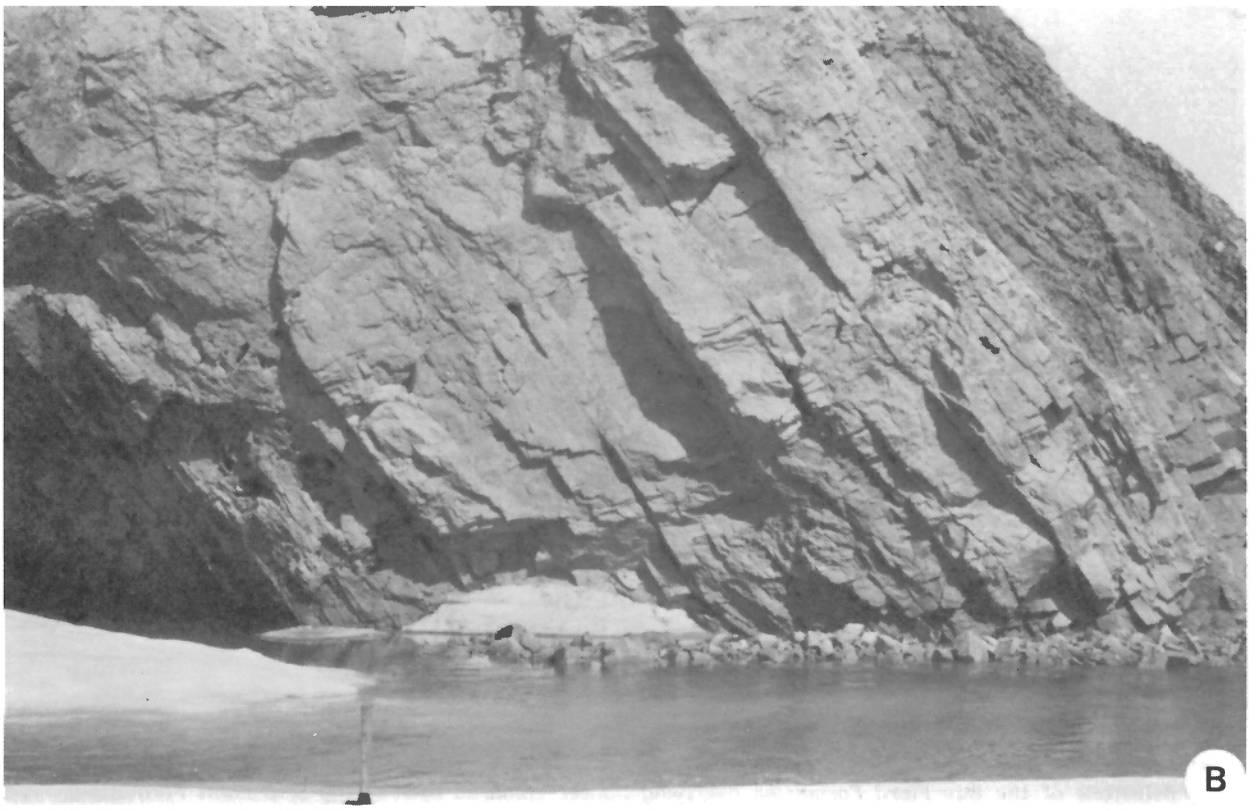


PLATE 7. *Allen Bay Formation. A: Finely crystalline, cream coloured dolostone near the base of the formation, containing large invertebrate fossils of the Arctic Ordovician Fauna, Lost River (Section 5, unit 12). ISPG 818-81. B: Medium bedded, yellowish-weathering dolomite, West Creswell River. ISPG 818-19.*

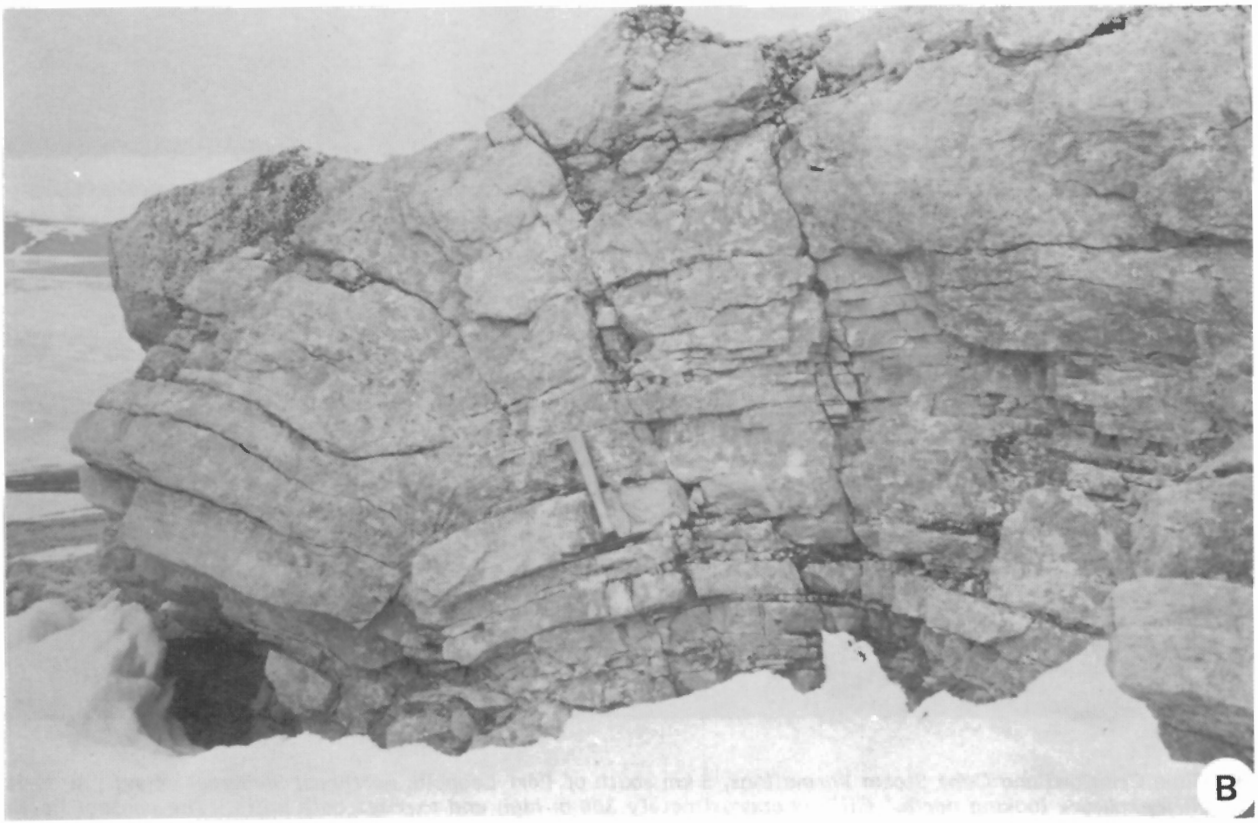


PLATE 8. *Allen Bay Formation. A: Bioturbated dolostone, Lost River (Section 5, unit 12). ISPG 818-82. B: Domal stromatolites, Aston Bay (Section 20, unit 4). ISPG 818-31.*

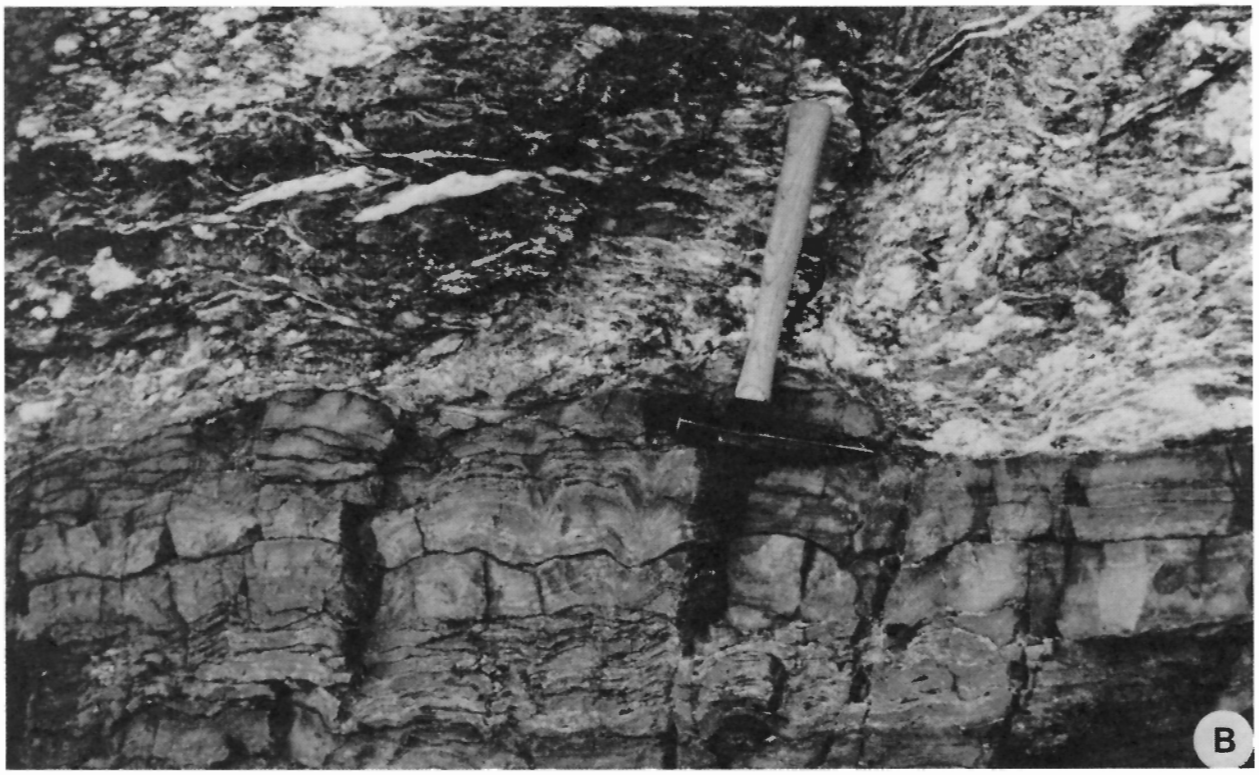


PLATE 9. *Cape Crauford and Cape Storm Formations, 5 km south of Port Leopold, northeast Somerset Island. A: General view of sea cliff exposure looking north. Cliff is approximately 300 m high and exposes both units. The contact between them occurs beneath the talus in the centre of the cliff. ISPG 818-32. B: Cape Crauford Formation showing stromatolitic dolostone overlain by brecciated evaporite, located at sea level near cliff shown in Plate 9A. Scc = Cape Crauford Formation, Scs = Cape Storm Formation. ISPG 818-38.*

APPENDIX

Stratigraphic Sections

Locations of the stratigraphic sections are given in Figures 2 and 3. The following sections are taken from work by other authors and are not repeated here:

Sections 1, 2, 3 – Christie (1973)
Sections 6 (upper part), 8-11, 16, 17 – Dixon (1973a)
Section 21 – Mayr (1978)

The sections described below were measured by A.D. Miall during June and July 1976 using a graduated measuring staff, except for Section 18, which was studied by B. Jones in 1975, and units 13-17 in Section 15, which are reconnaissance measurements by J.Wm. Kerr. All measurements are given in metres.

Section 4. Abernethy River

The section commences at the crest of an anticline at water level and continues up the river cliffs and hillside exposures to the crest of a prominent ridge near the base of the Franklin Strait Formation.

Unit	Lithology	Thickness	Height Above Base
	TURNER CLIFFS FORMATION (incomplete)		
19	Dolostone, structureless, cream, blocky weathering.	13.0	250.0
18	Dolostone, dark grey, brown weathering, platy weathering, felsenmeer only	2.0	237.0
17	Dolostone, finely crystalline, cream, faint lamination, ripple marks, buff weathering, slabby to blocky weathering. Prominent ridge forming unit	4.0	235.0
16	Covered interval, talus of dolostone, sandy, buff to cream weathering, rare lenses of intraclast breccia	93.0	231.0
15	Dolostone, as in unit 16	0.5	138.0
14	Covered interval	29.5	137.5
13	Dolostone, finely crystalline, sandy, cream, yellow to buff weathering, laminated, trace of vuggy porosity, massive weathering, becoming blocky weathering at top	7.5	108.0
12	Dolostone, very finely crystalline, laminated, buff to yellow weathering, platy weathering	3.5	100.5
11	Dolostone, finely crystalline, sandy, cream, yellow to buff weathering, laminated, trace of vuggy porosity	7.0	97.0
10	Sandy, very fine grained, cream, finely laminated, brown weathering, slabby weathering	14.5	90.0
9	Sandstone, fine grained, quartzose, white, bedding faint, abundant trough and planar crossbedding with multidirectional orientation (not measured), massive weathering	11.0	75.5
8	Sandstone, as in unit 4, with a bed of greenish grey, dolostone, silty shale in 55.0-55.4 m interval	21.0	64.5

Unit	Lithology	Thickness	Height Above Base
7	Sandstone, as in unit 5	6.0	43.5
6	Intraclast conglomerate, clasts of dolostone, fine grained, subrounded, in matrix of sandstone, fine grained, glauconitic, "salt and pepper" colouration	0.2	37.5
5	Sandstone, very fine grained, grey, abundant ripple marks, partings of greenish grey, micaceous, argillaceous siltstone, some recessive, laminated intervals near base of unit, with sole markings, greenish grey weathering, platy weathering	10.3	37.3
4	Sandstone, very fine to coarse grained, laminated to medium bedded, lenses containing ripple marks, lenses of dolostone intraclasts, abundant trace fossils, especially on bedding planes; some slabby weathering, laminated beds with groove and load casts and parting lineation, some thin beds of micaceous siltstone. Unit has reddish brown weathering colour	9.3	27.0
3	Covered interval, probably as in unit 2	4.2	17.7
2	Sandstone, mainly fine grained, well sorted, white, bedding faint to absent, blocky to irregular weathering, excellent intergranular porosity, thin beds containing siltstone intraclasts and syneresis concretions, rare lenses of coarse-grained sandstone with multidirectional (including herringbone) crossbedding as in unit 1. Most crossbed sets less than 5 cm in amplitude. Contact with unit 1 is gradational and marked by red stained interval	12.5	13.5
1	Sandstone, very coarse to gritty, abundant small pebbles, loosely cemented, excellent intergranular porosity, abundant straight- and sinuous-crested ripples and dunes with internal foreset stratification, multidirectional (including herringbone) crossbed orientation, abundant trace fossils	1.0	1.0

Base of unit 1 is at water level. Precambrian metamorphic rocks are exposed on other side of river. Base of section is an estimated 2 m above top of Precambrian.

Section 5. Lost River

The section commences at the estimated position of the basal Paleozoic unconformity and follows the river cliffs and adjacent hillside exposures downstream. This section was first described by W.W. Nassichuk in Christie (1973) and includes a reference section of the Franklin Strait Formation.

Overlying beds: greenish grey silty dolostone containing vertebrate remains, assigned to the Cape Storm Formation.

Unit	Lithology	Thickness	Height Above Base
	ALLEN BAY FORMATION		
21	Dolostone, microcrystalline, pale grey, weathering pale grey, slabby or nodular weathering, rare low amplitude domal stromatolites	19.0	739.0
20	Dolostone as in unit 18. Rare brachiopods at 717 m	50.0	720.0
19	Dolostone, as in unit 18 with large, low amplitude domal stromatolite units up to 40 cm thick	1.0	670.0
18	Dolostone, microcrystalline, cream, no bedding visible, buff weathering, slabby to blocky weathering	27.0	669.0
17	Covered and inaccessible interval, probably same as in unit 16	82.0	642.0
16	Dolostone, finely to very finely crystalline, cream, intervals of laminated, very finely crystalline dolostone with intraclast breccia, slabby weathering, and intervals of massive fine-grained, blocky weathering dolostone with patches of good vuggy porosity	58.0	560.0
15	Dolostone, microcrystalline, pale grey, bedding faint to absent, bioturbation, intervals of intraclast breccia, blocky weathering, abundant chert nodules at 500 m	22.0	502.0
14	Dolostone, cream, bioturbation, rare chert nodules, rare entire brachiopods and abundant scattered brachiopod shell debris, Manipora(?) sp.	15.0	480.0
13	Covered and inaccessible interval, probably same as in unit 12	85.0	465.0
12	Dolostone, finely crystalline, cream, white chert nodules, abundant bioturbation, massive, blocky weathering, Maclurites sp. and nautiloid at 375 m. (Arctic Ordovician Fauna?)	22.0	380.0
	TURNER CLIFFS FORMATION		
11	Partially covered intervals, felsenmeer as in unit 9 plus rare faintly laminated dolomite intervals	79.0	358.0
10	Covered interval	72.0	279.0
9	Dolostone, finely crystalline, cream, massive, blocky to irregular weathering	3.0	207.0
8	Covered interval	64.0	204.0
7	Covered interval, felsenmeer of dolostone, very fine grained, argillaceous, grey, laminated, platy weathering, pale grey weathering	59.0	140.0
6	Dolostone, as in unit 4, rare lenses of intraclast conglomerate	15.0	81.0
5	Covered interval	26.0	66.0

Unit	Lithology	Thickness	Height Above Base
4	Dolostone, finely crystalline, medium grey, bedding faint to absent, brown weathering, slabby weathering	1.5	40.0
3	Covered interval	15.5	38.5
2	Dolostone, finely crystalline, grey, abundant lenses of flat intraclasts, rare quartz grains, abundant current ripples, brown weathering, slabby to platy weathering	2.0	23.0
1	Covered interval, felsenmeer of dolostone, fine grained, sandy, with lenses of intraclast breccia	21.0	21.0

Underlying unit: Precambrian metamorphic rocks.

Section 6. Lang River

The complete section was studied by Dixon (1973a). The lower part was re-measured by Miall in 1976 and this description is given below. The section is located along river cliffs and across adjacent hillside outcrops.

Overlying beds: Limestone and dolomite of the Cornwallis group.

SHIP POINT FORMATION

29	Dolostone, laminated to medium bedded, ripple marks, lenses of intraclast breccia	22.0	400.0
28	Dolostone, massive, scattered chert nodules, poor vuggy porosity	12.6	378.0
27	Dolostone, thin bedded, bioturbation, lenses of intraclast breccia with shell fragments, lenses of chert nodules	5.6	365.4

TURNER CLIFFS FORMATION

26	Dolostone, thin bedded to massive, scattered chert nodules, low angle crossbedding in part	67.3	359.8
25	Covered interval	31.5	292.5
24	Dolostone, massive	2.0	261.0
23	Dolostone, domal stromatolites	9.0	259.0
22	Covered, felsenmeer as in unit 21	10.0	250.0
21	Dolomite, buff, buff weathering, platy weathering	10.5	240.0
20	Dolomite as in unit 18	13.5	229.5
19	Shale, dolomitic, dark grey, with beds of finely laminated, yellow weathering dolostone	2.0	216.0
18	Dolomite, medium bedded to laminated, lenses of intraclast conglomerate and breccia	12.0	214.0

Unit	Lithology	Thickness	Height Above Base
17	Shale, dolomitic	1.0	202.0
16	Dolomite, massive	1.0	201.0
15	Covered interval	41.0	200.0
14	Dolomite, as in unit 4	13.0	159.0
13	Covered interval	5.0	146.0
12	Dolomite, as in unit 4	0.8	141.0
11	Intraclast breccia, clasts up to 2 cm in diameter	0.2	140.2
10	Dolomite, massive	2.0	140.0
9	Covered interval	26.5	138.0
8	Dolomite, as in unit 4 with fine grained sandy laminae	3.5	111.5
7	Covered interval	12.0	108.0
6	Dolomite, as in unit 4	9.5	96.0
5	Dolomite, laminated, with broad, low amplitude domal stromatolites	0.5	86.5
4	Dolomite, fine grained, massive, yellow weathering	6.0	86.0
3	Sandstone, dolomitic, very fine grained, planar crossbed sets up to 15 cm thick, abundant current ripples with multidirectional orientations, stromatolitic lamination near base of unit	4.0	80.0
2	Sandstone, very fine grained, quartzose, white, mainly massive weathering, abundant planar crossbedding, minor trough crossbedding, interval of ripple laminated sandstone 1 m thick at base of unit	31.5	76.0
1	Covered interval above basal Phanerozoic unconformity	44.5	44.5

Section 7. Creswell Bay

The section was measured across hillside exposures less than 1 km south of section 8 (note lateral variability). It commences on the banks of a stream which follows the basal Paleozoic unconformity.

TURNER CLIFFS FORMATION
(incomplete)

15	Dolostone, fine grained, cream, massive to blocky weathering, rare chert nodules	10.0	245.0
14	Dolostone, finely crystalline, buff, ripple laminated, platy weathering	10.0	235.0
13	Dolostone, as in unit 11 abundant lenses of intraclast breccia, rare chert replacement, felsenmeer outcrop only	28.0	225.0

Unit	Lithology	Thickness	Height Above Base
12	Sandstone, dolomitic, glauconitic, medium grained, abundant platy dolomite intraclasts and lenses of intraclast breccia	1.0	197.0
11	Dolostone, medium grained, brown, laminated, abundant ripples, grey weathering, blocky weathering, above 170 m abundant laminae and thin beds of fine grained sandstone, grading up into unit 12	43.0	196.0
10	Dolostone, bioturbation, low amplitude domal stromatolites at centre of unit, blocky weathering, felsenmeer only	7.5	153.0
9	Dolostone, bioturbation, blocky weathering, upper part of unit formed by laterally persistent bed of small digitate stromatolites 15 cm thick overlain by a bed of intraclast flat-pebble dolomite breccia 15 cm thick	4.5	145.5
8	Dolostone, as in unit 7, with interbedded units of platy weathering, porcellanous dolomicrite	5.5	141.0
7	Dolostone, cream, bioturbation, beds of brown, low amplitude domal stromatolites and smaller digitate forms, rare intraclast breccia, desiccation cracks, yellowish weathering, blocky to massive weathering	2.5	135.5
6	Dolostone, cream, bioturbation, yellowish weathering, felsenmeer only	28.0	133.0
5	Dolostone, various lithotypes present in felsenmeer: mainly thin to medium bedded, cream, yellowish weathering; rare greenish, argillaceous layers; rare sandy laminae with ripple marks, rare massive, bioturbated beds, rare units of low amplitude, laterally linked domal stromatolites	49.0	105.0
4	Sandstone, fine grained, quartzose, yellowish-cream, bedding faint, rare ripple marks, grey weathering, blocky- to massive-weathering	18.5	56.0
3	Interbedded units of dolostone with bioturbation, massive and dolostone, slightly argillaceous, thin bedded to laminated, ripples, slightly greyish-yellow weathering	7.5	37.5
2	Dolostone, bioturbation, yellow weathering, blocky to massive weathering	1.5	30.0
1	Covered interval with talus of dolostone, sandy, with ripple lamination	28.5	28.5

Underlying unit: Precambrian metamorphic rocks.

Section 12. Creswell Bay

The section traverses hillside exposures through a fold limb in which dips are vertical or overturned. The base of the section is located at a major fault.

ALLEN BAY FORMATION
(incomplete)

11	Dolostone, cream to buff, nautiloids and compound corals, including chain corals, massive, pale cream weathering	52.0	310.0

Unit	Lithology	Thickness	Height Above Base
	CORNWALLIS GROUP		
	IRENE BAY FORMATION		
10	Limestone, medium greenish-grey, laminated, recessive, poorly exposed	43.0	258.0
	THUMB MOUNTAIN FORMATION		
9	Limestone, as in unit 7	6.0	215.0
8	Limestone, greenish grey, brachiopods, crinoid ossicles, Receptaculites sp., trilobites, orthocone nautiloids, solitary corals, Maclurites sp., abundant indeterminate shell debris, slabby to irregular weathering	1.0	209.0
7	Limestone, cream-yellow, bioturbation, trace fossils, abundant macrofossils including crinoid ossicles, Maclurites sp., solitary corals, slabby weathering	5.0	208.0
	BAY FIORD FORMATION		
6	Dolostone, medium greenish-grey, laminated to massive, sub-conchoidal fracture, recessive	45.0	203.0
	SHIP POINT FORMATION		
5	Dolostone, as in unit 3	29.0	158.0
4	Dolostone, cream, finely crystalline, bioturbation, faint lamination, blocky weathering, lenses of intraclast breccia	29.0	129.0
3	Dolostone, very finely crystalline, pale grey, laminated, argillaceous laminae, rare lenses of flat-pebble intraclast breccia, bioturbation, rare dolomite-filled vugs, pale buff-grey weathering, platy weathering	45.0	100.0
	TURNER CLIFFS FORMATION (incomplete)		
2	Dolostone, creamy yellow, fine grained, faint bioturbation, faint lamination, abundant small chert nodules, rare pinpoint vugs, blocky weathering	53.0	55.0
1	Dolostone, fine grained, pale grey, thin bedded, platy weathering	2.0	2.0

Section 13. Creswell Bay

The section follows a gully.

	ALLEN BAY FORMATION (incomplete)		
15	Dolostone, finely crystalline, cream, bioturbation, poor vuggy porosity, blocky weathering, pale cream to grey weathering	131.5	227.0

Unit	Lithology	Thickness	Height Above Base
	CORNWALLIS GROUP		
	IRENE BAY FORMATION		
14	Interbedded dolostone and shale, solitary and compound corals, brachiopods, nautiloids, recessive	7.7	95.5
	THUMB MOUNTAIN FORMATION		
13	Limestone, grey, massive, abundant crinoid debris	3.8	87.8
	BAY FIORD FORMATION		
12	Dolostone, dark grey, finely crystalline, thin bedded, ripples, rare thin dolomite breccia beds, fissile	40.5	84.0
11	Dolostone, coarsely crystalline, medium grey, pisolitic(?), shell fragments, ripple marks at top	0.5	43.5
10	Dolostone, dark grey, very fine grained, weathering medium greenish-grey, papery to irregular weathering	2.5	43.0
	SHIP POINT FORMATION (incomplete)		
9	Dolostone, finely crystalline to microcrystalline, laminated to thick bedded, low amplitude domal stromatolites; thick bedded units are finely crystalline, with shell debris and lenses of intraclast breccia; unit is buff weathering	3.0	40.5
8	Dolostone, finely crystalline, thick bedded, abundant bioturbation, blocky weathering	4.0	37.5
7	Dolostone, finely crystalline, laminated in part, lenses of intraclast breccia, some chertified, low amplitude domal stromatolites and oval concretionary masses, slabby weathering	1.5	33.5
6	Dolostone, finely crystalline, thick bedded, abundant bioturbation, slabby to blocky weathering	2.5	32.0
5	Dolostone, laminated, with abundant partings of green-grey argillaceous dolomite, oscillation ripples, rare desiccation cracks and lenses of intraclast breccia, platy weathering	5.0	29.5
4	Dolostone, laminated, ripple marks, slabby to blocky weathering	4.5	24.5
3	Dolostone, cream, abundant faint bioturbation, scattered chert nodules, poor vuggy porosity, buff-yellow weathering, blocky weathering	8.0	20.0
2	Dolostone, cream, abundant bioturbation, buff-yellow weathering, blocky weathering	10.0	12.0
1	Dolostone, cream, finely crystalline, thin to thick bedded, some thin sand lenses, some massive beds, some bioturbated lenses, buff-yellow weathering	2.0	2.0

Unit	Lithology	Thickness	Height Above Base
	Section 14. Creswell Bay		
	The section commences near the crest of an anticline and follows hillside exposures.		
	CORNWALLIS GROUP		
	THUMB MOUNTAIN FORMATION (incomplete)		
7	Limestone, cream, mottled, with Maclurites sp., Receptaculites sp., and abundant crinoid debris, blocky weathering	10.0	280.0
	BAY FIORD FORMATION		
6	Dolostone, dark grey, thin bedded, greenish grey weathering, felsenmeer only	6.0	270.0
	SHIP POINT FORMATION		
5	Dolostone, as in unit 3	64.0	264.0
	TURNER CLIFFS FORMATION (incomplete)		
4	Dolostone, as in unit 2	17.0	200.0
3	Dolostone, cream, laminated, rare chert nodules, slabby-weathering, felsenmeer only	9.0	183.0
2	Dolostone, cream, finely crystalline, rare chert nodules, thick-bedded to massive, rare vugs lined with dolomite crystals, blocky-weathering, resistant	107.0	174.0
1	Dolostone, thin to medium bedded, some fine sandy beds with ripples, rare greenish grey argillaceous dolomite beds; felsenmeer only	67.0	67.0
	Section 15. Hunting River		
	The section commences at the contact with the Hunting Formation (Proterozoic) and traverses hillside exposures.		
	ALLEN BAY FORMATION (incomplete)		
17	Dolostone, cream, pale weathering, resistant	150.0	865.5
	CORNWALLIS GROUP		
	THUMB MOUNTAIN FORMATION		
16	Limestone, resistant, fossiliferous	78.0	715.5

Unit	Lithology	Thickness	Height Above Base
	BAY FIORD FORMATION		
15	Dolostone, fissile, dark green-grey, recessive	120.0	637.5
	SHIP POINT FORMATION		
14	Dolostone, cream, pale weathering, minor chert, resistant	105.0	517.5
13	Dolostone, thin bedded to fissile	91.0	412.5
12	Sandstone, medium grained, medium bedded, blocky weathering, felsenmeer only	3.0	321.5
11	Dolostone, cream, laminated, with sandy intervals, small ripple marks	11.0	318.5
	TURNER CLIFFS FORMATION		
10	Dolostone, finely crystalline, cream, pale cream weathering, blocky to massive weathering, resistant	90.0	307.5
9	Dolostone, finely crystalline, grey, thin bedded, ripple marks, trace fossils, slightly greenish grey weathering, platy to rubbly weathering, recessive	28.5	217.5
8	Dolostone, as in unit 3	11.5	189.0
7	Sandstone, very fine grained, medium grey, slightly dolomitic, scattered dolostone intraclasts, desiccation cracks, laminated, papery weathering	0.5	177.5
6	Dolostone, as in unit 3, interbedded with two thin beds of grey, argillaceous dolostone, low amplitude oscillation ripples, rare current ripples, resistant	5.5	177.0
5	Dolostone, scattered outcrop and felsenmeer as in unit 3, abundant current ripples in upper part	53.0	171.5
4	Dolostone, cream, massive to laminated, rare thin sandy beds, yellow weathering	23.0	118.5
3	Dolostone, cream, laminated, abundant lenses of intraclast breccia, yellow weathering, slabby to blocky weathering	5.0	95.5
2	Dolostone, as in unit 3, felsenmeer only	53.0	90.5
1	Dolostone, with abundant very coarse grained quartzose sand grains and quartz pebbles up to 5 mm in diameter, yellow weathering, slabby weathering	37.5	37.5

Underlying unit: Hunting Formation.

Unit	Lithology	Thickness	Height Above Base
	Section 18. Aston Bay		
	This section was measured by B. Jones in 1975 on a peninsula projection into the east side of Aston Bay. It commences near sea level.		
	SHIP POINT FORMATION (incomplete)		
62	Covered interval. Basal 4.5 m of scree suggests underlying rock similar to unit 61, 4.5-9.0 m above base of unit probably very thin bedded dolostone. Remainder of interval unknown	42.6	552.9
61	Dolosiltite, light brown, weathering cream-buff, very thin bedded, mostly scree, but numerous small exposures suggests that all this interval is dolosiltite	1.5	510.3
60	Covered interval	21.3	508.8
59	Microcrystalline dolostone, unbedded; light brown, weathers light grey to light brown, vuggy, <5%, basal 4.5 m indicated by scree	18.8	487.5
58	Covered interval. Basal 6 m probably underlain by dolostone that is light brown, weathering buff-brown, planar bedding, very thin bedded; upper part of unit probably underlain by massive dolostone, similar to unit 59, contains chert nodules	10.6	468.7
57	Dolosiltite, dark and light grey, weathering light grey, thin bedded, wavy bedded, beds internally laminated. Semi-recessive unit. Chert nodules with irregular shape, up to 13 cm longest axis, commonly with longest axis parallel to bedding	4.0	458.1
56	Dolosiltite, light brownish grey, weathering buff-brown thin bedded	1.8	454.1
55	Covered interval. Basal 3 m of unit probably underlain by thick bedded dolostone with chert nodules	13.7	452.3
54	Microcrystalline dolostone, light grey, weathering light brown, thin bedded	1.5	438.6
53	Covered interval	6.0	437.1
52	Dolosiltite, medium grey, weathering light grey, slightly mottled in places, thin bedded, rare chert nodules	0.3	431.1
51	Covered interval, basal 3 m probably same as unit 50	17.6	430.8

Unit	Lithology	Thickness	Height Above Base
50	Dolosiltite, light brown, weathering buff-brown, thin bedded, fairly resistent unit	0.9	423.2
49	Covered interval	31.6	422.3
48	Sandstone, coarse grained, light grey to white, weathering medium grey, locally has rusty colour; friable, forms prominent unit	9.1	390.7
47	Covered interval	31.9	381.6
	TURNER CLIFFS FORMATION		
46	Dolosiltite, light brown, weathering buff-brown, thin bedded	1.4	349.7
45	As for unit 46 but thin bedded	1.0	348.3
44	Covered interval, upper 7 m underlain by (?)buff-brown dolostone	24.3	347.3
43	Dolosiltite, brown-tan, weathering light buff-brown, thin bedded, beds internally laminated	1.8	323.0
42	Dolosiltite, light brown weathering buff to light grey, very thin bedded, recessive	1.5	321.2
41	Covered interval	21.3	319.7
40	Dolosiltite, sandy, light grey with brown partings, weathering medium grey, thin bedded, recessive	0.6	298.4
39	Covered interval. Scree suggest same rock as unit 38	1.8	297.8
38	Dolostone, medium crystalline, medium brown, weathering light grey, rare small vugs up to 2.5 cm in diameter; Chondrites-type trace-fossil on bedding planes, unbedded	0.6	296.0
37	Dolosiltite, light grey, weathering white to light cream, laminated, recessive	1.5	295.4
36	Medium crystalline dolostone, as in unit 38	0.6	293.9
35	Dolosiltite, laminated, as for units 37, 33, and 30, chert nodules very common, markedly elongate and flat, aligned with long axes parallel to bedding planes, generally in distinct planes, nodular,, up to 15 cm long and 1.5 cms thick; recessive	2.3	293.3
34	Dolosiltite, unbedded, as for unit 36 and 38 except that chert nodules are present	0.3	291.0
33	Dolosiltite, as for unit 37	0.5	290.7
32	Covered interval	1.6	290.2
31	Dolosiltite, as for units 36 and 38	1.0	288.6
30	Dolosiltite, laminated, as for units 33 and 37 recessive	1.3	287.6

Unit	Lithology	Thickness	Height Above Base
29	Medium crystalline dolostone, light brown, weathering medium to dark brown, chert nodules common	1.5	286.3
28	Covered interval	2.1	284.8
27	Medium crystalline dolostone, very thick bedded, similar to unit 29	3.9	282.7
26	Covered interval, probably underlain by crystalline dolostone, with chert nodules, as for unit 24	33.8	278.8
25	Medium crystalline dolostone, medium brown, weathering light buff, thick bedded, chert nodules common, irregular shapes, but with longest axes parallel to bedding plane and commonly in one plane, resistant	3.9	245.0
24	Covered interval	9.8	241.1
23	Dolosiltite, dark grey, weathering light grey and buff, thin bedded, wavy bedded, beds thicker in basal part of unit	6.6	231.3
22	Covered interval	6.7	224.7
21	Dolosiltite, dark grey, weathering buff-brown, thin bedded, wavy bedded	1.6	218.0
20	Intraformational conglomerate, unbedded, blade-shaped intraclasts up to 7.5 cm long, smaller clasts more circular in shape; some clasts have red outer surface, most clasts are dolostone, light grey, weathering medium grey, resistant	0.3	216.4
19	Dolosiltite, as for unit 21 except planar laminated	1.2	216.1
18	Intraformational conglomerate as for unit 20	0.9	214.9
17	Dolosiltite, as for units 19 and 20	0.9	214.0
16	Covered interval	63.8	213.1
15	Dolarenite, brown to dark grey, thin bedded, moderately calcareous, basal 1 m more recessive, possibly due to thinner bedding, spherical bodies, possibly ooids common, intraclasts, blade shaped, up to 10 cm long, 1.5 cm thick, locally common	2.2	149.3
14	Covered interval	24.3	147.1
13	Dolosiltite, light grey, weathering buff-brown, unbedded, very prominent unit, locally reddish streak running through rock	3.0	122.8
12	Intraformational conglomerate, blade-shaped clasts up to 10 cm long, 1.5 cm thick, some clasts have reddish hue, possibly sandstone and dolostone	0.3	119.8
11	Dolosiltite, light grey, weathering light buff, unbedded, poorly defined internal stratification, semi-crystalline in places	1.9	119.5
10	Covered interval	21.6	117.6

Unit	Lithology	Thickness	Height Above Base
9	Dolosiltite, medium grey, weathering medium brown medium-bedded, resistant	1.5	96.0
8A	Covered interval	23.4	94.5
8	Crystalline dolostone, light brown, weathering buff-brown, vuggy, unbedded	1.5	71.1
7	Covered interval	10.9	69.6
6	Dolosiltite, light grey, weathering buff-brown, unbedded, locally vuggy, resistant	5.5	58.7
5	Dolosiltite, medium grey, sandy, thin bedded, resistant	1.5	53.2
4	Covered interval, scree material suggests that underlying rock type is dolostone	49.6	51.7
3	Dolosiltite, light grey, weathering yellowish-brown, thin bedded, resistant	0.6	2.1
2	Conglomerate, poorly exposed, difficult to determine exact relationship to units 1 and 3, clasts of sandstone, some are reddish, possibly from Aston Formation, well rounded, up to 78 x 15 x 10 cm, smaller pebbles tend to be more angular, matrix contains fine to medium sand-sized quartz, dolomitic	0.3	1.5
1	Dolosiltite, as for unit 3	1.2	1.2

Underlying unit: Hunting Formation.

Section 19. Aston Bay

The section is a composite of measurements across hillside exposures on two adjacent small peninsulas on the east side of Aston Bay. The section commences at sea level.

Overlying beds are not exposed but are presumed to be recessive sediments of the Bay Fiord Formation. They occupy a covered interval an estimated 71 m thick below a major fault (section unit 23).

SHIP POINT FORMATION

22	Dolostone, as in unit 16	5.0	288.0
21	Covered interval	68.0	283.0
20	Dolostone, as in unit 16 with rare laminated layers, trace fossils on bedding planes at 203 m and 215 m, chert nodules above 203 m	22.0	215.0
19	Dolostone, oolitic	0.5	193.0
18	Dolostone, as in unit 16, sandy beds near top	14.2	192.5
17	Sandstone, fine grained, quartzose, laminated	0.3	178.3

Unit	Lithology	Thickness	Height Above Base
16	Dolostone, finely crystalline, medium buff-grey, brachiopods at 172 m, resistant, massive, unit has sharp lower contact	11.5	178.0
15	Sandstone, dolomitic, quartzose, buff, laminated, buff weathering, platy weathering, slightly recessive	0.8	166.5
14	Dolostone, as in unit 12, grades up into unit 15	1.7	165.7
13	Dolostone, silt-size crystals, abundant chert nodules, massive, resistant	0.5	164.0
12	Dolostone, finely crystalline, abundant quartz sand grains and ellipsoidal dolomite intraclasts, massive, creamy buff weathering	0.5	163.5
11	Dolostone, as in unit 1, resistant	4.0	163.0
10	Dolostone, cream, with scattered quartz sand grains and sandy laminae, ripple marks with amplitudes of less than 1 cm, chert nodules, abundant dolostone intraclasts, blocky weathering, buff weathering	4.0	159.0
9	Sandstone, as in unit 8 but with planar crossbed sets up to 15 cm thick	9.0	155.0
8	Sandstone, dolomitic, medium to coarse grained, thin bedded, chert lenses, abundant well rounded dolostone intraclasts up to 5 cm in diameter	14.0	146.0
7	Dolostone, sandy, finely crystalline, laminated, chert lenses	1.0	132.0
6	Sandstone, medium to coarse grained, white, quartzose, laminated, grey weathering	1.0	131.0
	TURNER CLIFFS FORMATION		
5	Dolostone, as in unit 1, poor exposure	67.0	130.0
4	Dolostone, finely crystalline, medium grey, thin bedded, poor exposure	1.0	63.0
3	Dolostone, as in unit 1, felsenmeer only	25.5	62.0
2	Dolostone, as in unit 1, with thin lenses of sandstone consisting of fine grained, well rounded quartz grains, ripple marks, dolostone intraclast breccia	0.5	36.5
1	Dolostone, cream, medium to thick bedded, coarsely crystalline scattered lenses of chert nodules, abundant mottling (bioturbation), desiccation cracks(?), buff weathering, blocky weathering	36.0	36.0

Underlying unit: uppermost Turner Cliffs Formation(?).

Unit	Lithology	Thickness	Height Above Base
	Section 20. Aston Bay		
	The section traverses hillside exposures commencing at sea level. It is not known where this section is located stratigraphically relative to the top or base of the Allen Bay Formation.		
	ALLEN BAY FORMATION (incomplete)		
6	Dolostone, as in unit 1, large, low amplitude domal stromatolites at 285 m, large chert nodules at 287 m	70.0	289.0
5	Covered interval	51.0	219.0
4	Dolostone, as in unit 1 but with little or no porosity, rare chert nodules, rare beds of fine grained, quartzose sandstone, rare laminated intervals, bed of low amplitude domal stromatolites at 156 m, 20 cm thick	30.0	168.0
3	Dolostone, as in unit 1, rare sandy laminae, coral fragment at 132 m, felsenmeer only	42.0	138.0
2	Covered interval	81.5	96.0
1	Dolostone, cream, massive to thick bedded, brachiopods, rare fossil solution cavities, fair vuggy porosity, blocky weathering	14.5	14.5
	Section 22. Port Leopold		
	The section follows cliffs along a stream that enters the southwest corner of Port Leopold.		
	CAPE STORM FORMATION (incomplete)		
16	Dolostone, finely crystalline, thinly laminated	1.4	20.4
15	Covered	2.3	19.0
	CAPE CRAUFORD FORMATION		
14	Gypsum	0.7	16.7
13	Dolostone, finely crystalline, laminated	1.4	16.0
12	Dolarenite, bioclastic, small ovate stromatoporoid colonies not in growth position	0.4	14.6
11	Dolostone, in-place brecciation as in unit 8, rare lenses of sand sized intraclasts,scoured, wavy base	1.9	14.2
10	Dolostone, massive, finely crystalline, rare lenses of bladed vugs, rare small domal stromatolites	1.2	12.1
9	Gypsum, small included blocks of dolostone	0.7	10.9

Unit	Lithology	Thickness	Height Above Base
8	Dolostone, lenses of disrupted but in-place flat clasts (probably represents subaerial weathering)	2.78	10.2
7	Dolostone, intraclast breccia, ripples, scoured base	0.02	7.42
6	Dolostone, thin bedded, with abundant laminae of gypsum	0.3	7.4
5	Dolostone, bioturbated, lenses of dark and light colour, sharply scoured base, fair vuggy porosity, passing up into dolarenite, laminated, becoming massive at top, ripples, scoured laminae, minor stylolites, intraclasts	1.3	7.1
4	Dolostone, as in unit 1, with thin lenses of rippled dolarenite, becoming massive in top 10 cm	1.25	5.8
3	Dolarenite, laminated, small dolostone intraclasts, sharp scoured base, grades up into unit 4	0.05	4.55
2	Dolostone, mottled, bioturbated, rare ripples, blebs and single blades of gypsum, fair vuggy porosity	2.5	4.5
1	Dolostone, medium and dark grey, laminated, with abundant vertical burrows	2.0	2.0