

GEOLOGICAL  
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DEPARTMENT OF ENERGY,  
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PAPER 66-55

ORDOVICIAN STRATIGRAPHIC SECTION  
AT DALY RIVER, NORTHEAST ELLESMERE ISLAND,  
DISTRICT OF FRANKLIN

(Report and 2 figures)

B. S. Norford

MANUSCRIPT AND  
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SECTION



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ROGER DUHAMEL, F.R.S.C.

Queen's Printer and Controller of Stationery

Ottawa, Canada

1966

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#### ABSTRACT

A stratigraphic section is described from northeast Ellesmere Island through rocks equivalent to part of the Cornwallis Formation and possibly also part of the Eleanor River Formation, both of Cornwallis Island. The section is incomplete but very well exposed. Two rock units can be distinguished but are not named. The lower unit contains sedimentary structures indicative of deposition in shallow water. Three faunal assemblages are present. All three are of Caradoc age, the lowest is also dated as probably Wilderness, the second as probably Wilderness to Maysville, and the third as probably Eden or Maysville.

# ORDOVICIAN STRATIGRAPHIC SECTION AT DALY RIVER, NORTHEAST ELLESMERE ISLAND, DISTRICT OF FRANKLIN

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## INTRODUCTION

The section was measured in July 1966 on the northwest side of Daly River, Judge Daly Promontory, Ellesmere Island, at about Lat.  $81^{\circ}08'N$ . Long.  $67^{\circ}25'W$ . A valley glacier flows south from a small ice-cap and almost reaches Daly River. Recent recession of the ice has left a marginal swath of freshly glaciated outcrops that as yet have received very little talus cover from the higher hillsides. Dips are moderate, ranging from 20 to 32 degrees in the northwest limb of a broad anticline. Most of the section was measured with a five-foot staff but a tape and compass method was used for the long covered intervals.

Excellent exposures span parts of two thick map units that together may correspond to the Cornwallis Formation of Cornwallis Island (Thorsteinsson 1959). The lower unit (Formation A) is a well-bedded sequence of limestones and very subordinate dolomites that give varied weathering colours such as yellowish grey, light grey, brownish grey, and grey. Mud-cracks; edgewise, mudflake, and other intraformational conglomerates; and channelled and truncated lamination indicate deposition in shallow water and an intertidal environment. The base of the unit was not seen. The rocks below the section are not well enough exposed for study and the stratigraphic section starts at the top of a thick covered interval. The upper unit (Formation B) is characterized by resistant thickly bedded limestones that weather dark grey. Well-weathered outcrops commonly have a dark yellowish orange surface wash. Only the basal 600 feet of this second unit was studied in the measured section. About 100 feet of similar rocks outcrop above the highest beds of the section but some faulting is present and thus the stratigraphic position of these outcrops is uncertain. A thick sequence of similar rocks, which outcrop on the ridge crest high above the measured section, is thought to be overlain by recessive rocks of the Cape Rawson Group. The total thickness of Formation B is probably two thousand feet or more.

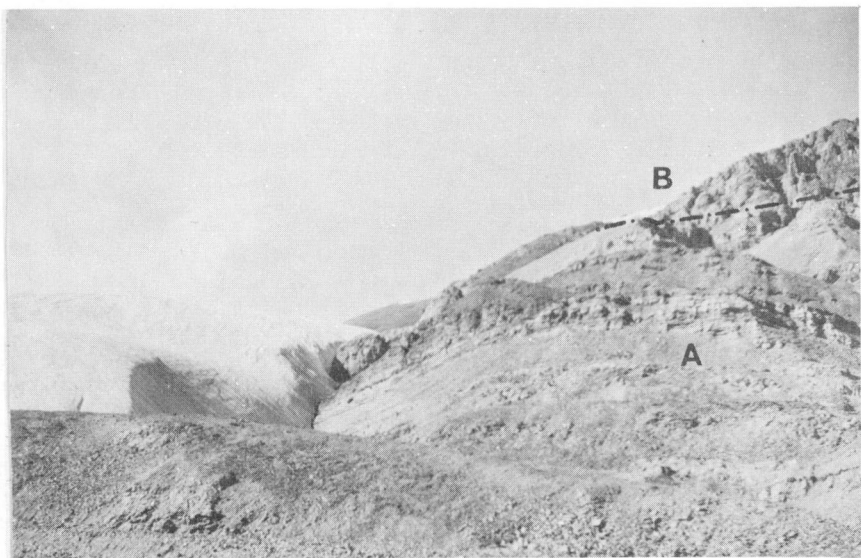


Figure 1. Stratigraphic section viewed from below snout of glacier. Line at top right marks base of Formation B.

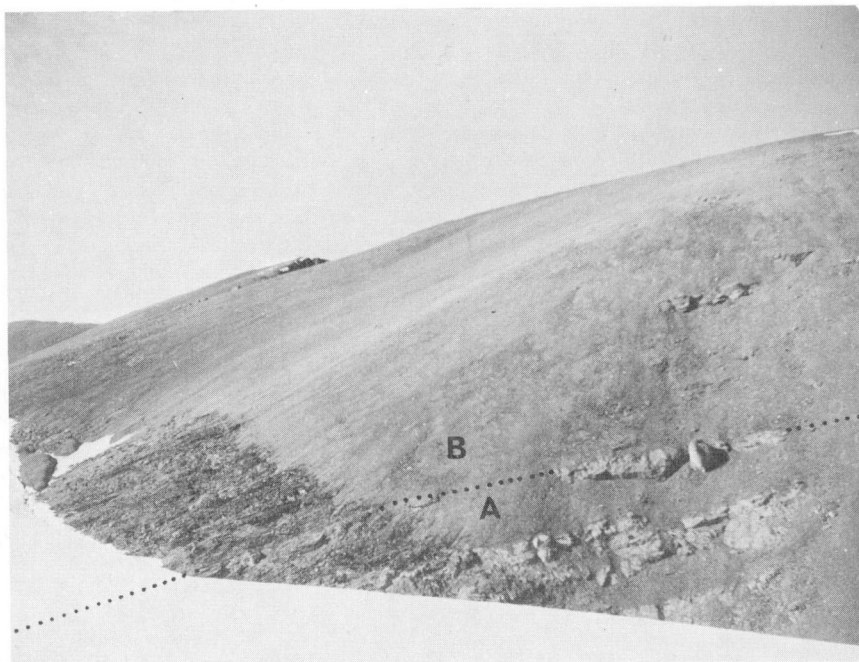


Figure 2. Contact between Formation A and Formation B. Dotted line marks base of Formation B picked at top of highest yellowish grey weathering bed of unit 17. Valley glacier in foreground.

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# STRATIGRAPHIC SECTION

<u>Unit</u>		<u>Thickness (feet)</u>	
		<u>Unit</u>	<u>From base</u>
<u>Formation B (600 feet measured)</u>			
21	Limestones, microcrystalline to aphanitic, some rocks with very minor dolomite crystals; dark grey, weather dull dark grey, yellowish brown, brownish grey, and dark greyish orange, resistant; bedding 6 inches to massive; calcite stringers and veins abundant in many beds; acid residues of sparse brown clay-size material and rarely quartz silt. A few small faults within unit. Covered interval at 3120-3125. Contact with unit 20 concordant but abrupt. Colonial and solitary corals, stromatoporoids, straight cephalopods, <u>Receptaculites</u> , and gastropods (GSC localities 73916 3233-3237, 73915 3166-3171, 73914 3144-3149, 73913 3070-3080, 73912 3063-3066, 73911 2995-3020) .....	313	3270
20	Limestones, microcrystalline to aphanitic, some rocks with wispy layers of brown argillaceous material; dark grey, weather dull grey, recessive; bedding 1 inch to 2 inches; calcite stringers present; acid residues of brown clay-size material and fine quartz silt. Barren.....	4	2957
19	Covered interval, may be largely underlain by rocks similar to unit 20 .....	141	2953
18	Limestones, microcrystalline to aphanitic with biogenic debris; dark grey, weather dull dark grey and grey, somewhat recessive; bedding 2 to 24 inches; some beds weather slightly flaggy; some beds with partings of shaly mudstone; with calcite stringers and vugs; acid residues of brown clay-size material and rarely quartz silt. Limestones, pelletal and aphanitic with sparse biogenic debris, pellets cemented by clear calcite; olive-grey, weather dull olive-grey and light grey; bedding 1 inch to 18 inches, some beds laminated; acid residues of light clay-size material and fine quartz silt. At 2685-2689 and 2676-2677, shaly limy mudstones with thin limestone interbeds. Covered intervals at 2785-2787, 2769-2771, 2761-2764, 2720-2726, 2690-2698. Contact with unit 17 appears to be gradational and is		

<u>Unit</u>	<u>Thickness (feet)</u>	
	<u>Unit</u>	<u>From base</u>
picked at the top of the highest yellowish grey weathering bed. Rare ostracods, small gastropods, trilobites, and tabulate corals (GSC locality 73910 2672-2673) ....	142	2812

Formation A (2670 feet measured)

17	Limestones, microcrystalline to aphanitic, some rocks with abundant fine quartz silt; dark grey, weather yellowish grey, light olive grey, greyish yellow, and light grey; bedding 3 to 18 inches, most beds laminated; some beds with stylolites; some beds with fine calcite vugs and stringers; acid residues of clay-size material and, in some beds, abundant quartz silt. In upper part of unit, interbedded limestones, pelletal with clear calcite cement, some rocks with sparse biogenic debris; dark grey and olive-grey, weather olive-grey, dark grey, and dark brownish grey; in beds 2 inches to 3 feet, some beds laminated, and as layers, lenses, and laminae within the light weathering limestones; rare beds with stylolites; acid residues of sparse clay-size material. Mudcracks at 2671, 2565, 2532. At 2484-2486, thinly bedded dark grey platy limestones with reddish stained bedding planes. Layers of edgewise conglomerate at 2446 and 2410. Barren except for small high-spined gastropods in uppermost beds .....	352	2670
16	Covered interval, a few outcrops of dark grey and yellowish grey weathering carbonates are present higher up on hillside .....	194	2318
15	Dolomites, microcrystalline with common to abundant fine quartz silt, most rocks limy; dark grey, weather yellowish grey and light grey; bedding 2 to 12 inches, some beds laminated; some beds with stylolites; some beds with fine calcite stringers and vugs; acid residues of common light clay-size material and abundant quartz silt. Rare medium to thick beds of very light grey weathering dolomite. Rare medium beds of dark grey weathering dolomite with greyish red stained bedding planes. Mudcracks at 2100 and 2010. Barren .....	121	2124

Unit		Thickness (feet)	
		Unit	From base
14	Limestones, pelletal with clear calcite cement, fine stringers, and pin-point vugs; olive-grey, dark grey, and grey, weather dull olive-grey, dark grey, and light olive-grey, resistant; bedding 1/4 foot to 2 feet; some beds with stylolites; acid residues just a trace of quartz silt. Limestones, microcrystalline, light grey, weather yellowish grey, light grey, and very light grey; in beds 6 to 12 inches thick and as layers, laminae, nodules, and mottles in the dark limestones; some beds with stylolites; acid residues of fine quartz silt and common light clay-size material. Intraformational conglomerate at 1918. Barren .....	97	2003
13	Limestones and limy dolomites, microcrystalline to aphanitic; light grey, dark grey, grey, and light olive-grey, weather light grey, yellowish grey, and grey; bedding 1/4 foot to 2 feet, many beds indistinctly laminated; some beds with stylolites; some beds with calcite stringers and vugs; some beds with pyrite crystals; acid residues of light clay-size material, and, in some beds, fine quartz silt. Minor thick beds of dolomites like those of unit 12, microcrystalline, light grey, weather very light grey; some beds with fine clear calcite vugs. At 1875-1877 1/2 and 1841-1846, limestones, pelletal and aphanitic with scattered rhombs and patches of finely crystalline dolomite; dark grey, weather dull grey, brownish grey, and dark grey; bedding 2 to 18 inches, some beds indistinctly laminated; some bedding planes stained greyish red. Shaly partings at 1837. Erosion surface cut 3 inches deep at 1795. Rare crosslamination at 1738. Barren..	209	1906
12	Dolomites, limy, microcrystalline to very finely crystalline; light grey, pinkish grey, grey, and very light grey, weather yellowish grey, very light grey, light olive-grey, and very pale yellowish brown; bedding 1/4 foot to 2 feet, a few beds indistinctly laminated; many beds with stylolites; many beds with dolomite and calcite vugs, blebs, and stringers; acid residues of sparse light clay-size material. About 2 per cent fine vuggy porosity at 1645-1680. Dark grey weathering beds at 1618-1619 and 1565-1566. Barren .....	157	1697

<u>Unit</u>	<u>Thickness (feet)</u>	
	<u>Unit</u>	<u>From base</u>
11 Dolomites, some limy, many beds with abundant fine quartz silt, microcrystalline to very finely crystalline; dark grey and grey, weather yellowish grey and light olive-grey; bedding 2 to 18 inches, some beds laminated; acid residues of abundant to sparse quartz silt and light clay-size material. Very sparse dolomites, very finely to finely crystalline; dark grey and grey, weather dark grey, grey, and light grey; bedding 2 to 18 inches, many beds laminated; some bedding planes stained greyish red. Dark grey slaty interbeds at 1465, 1451, 1448, 1323. Mudcracks at 1475. Sparse vuggy porosity at 1450. At 1410, chert mass about 1 by 2 feet in cross-section. Conglomeratic bed at 1348. Small gastropods in dark grey dolomites at 1295 . . . . .	275	1540
10 Limestones, pelletal and aphanitic, some beds with rare biogenic debris, some beds with rhombs and patches of finely crystalline dolomite; dark grey, weather dark grey and dull olive-grey; bedding 2 inches to 3 feet; rare beds with stylolites; some beds with calcite stringers; some bedding planes stained greyish red; acid residues of sparse fine quartz silt. Limestones, microcrystalline with coarser clasts of pelletal and aphanitic limestones; grey and dark brownish grey, weather light olive-grey and grey; bedding 3 inches to 2 feet; acid residues of quartz silt and common light clay-size material. Limestones, aphanitic and pelletal, some beds with abundant wispy argillaceous laminae; olive-grey and light brownish grey, weather yellowish grey, light olive-grey, and light brownish grey; bedding 3 inches to 3 feet, some beds laminated; acid residues of common quartz silt, light clay-size material abundant in some beds. Limestones and limy dolomites, microcrystalline to finely crystalline; light brown and olive-grey, weather reddish orange, greyish orange, pale yellowish brown, and light orange-brown; bedding 1 foot to 2 feet; acid residues of light clay-size material and abundant quartz silt. Rare limy siltstones and limestones with abundant quartz silt, microcrystalline; light olive-grey, weather yellowish grey and very light grey; bedding 6 inches to 3 feet, some beds laminated. At 1205, laminated chert bed 6 inches thick, weathers off-white and greyish black. At 1112, 3 inches of platy dolomites, weather brownish grey. Small faults within interval 1075-1100.		

Unit	Thickness (feet)	
	Unit	From base
	Mudcracks at 1025. Small high-spired gastropods in dark grey dolomites at 1220 and 1200 .....	
	282	1265
9	Limestones, aphanitic and pelletal with cement and pin-point vugs of clear calcite, some beds with dolomite rhombs and patches; grey and light brownish grey, weather dark grey, grey, light brownish grey, light olive-grey, and yellowish grey, with dolomitic mottles, resistant; bedding 3 feet to massive; acid residues virtually nil. Mottles, patches, and beds of limy dolomite, finely to coarsely crystalline; very light grey and grey, weather brownish grey, greyish orange, and pale yellowish brown; acid residues with rare light clay-size material. Contact with unit 8 gradational. Significant fault matched across at 983. At 875, fossil debris (including ? <u>Maclurites</u> ) .....	
	126	983
8	Dolomite, limy, arenaceous, finely to medium crystalline; grey, weathers light olive-grey and yellowish grey; a single massive bed with coarse lamination and cross-lamination; with about 5 per cent intergranular porosity; acid residues of sparse light clay-size material and rare fine quartz silt. Barren.....	
	16	857
7	Limestones, dolomitic, finely to medium crystalline dolomite with patches of undolomitized aphanitic limestone with rare biogenic debris; dark grey, weather dark grey, resistant; bedding 2 to 8 feet; calcite stringers present; acid residues with sparse quartz silt. Dolomitic mottling most abundant in upper half of unit. Rare large gastropods (GSC locality 73909 812-815) .....	
	32	841
6	Limestones, many beds with abundant quartz silt, micro-crystalline; dark grey, grey, and pale reddish grey, weather yellowish grey, pale greyish orange, greyish yellow, light olive-grey, and yellow; bedding 2 to 18 inches; many beds with laminae, layers, mottles, and nodules of dark grey limestone. Limestones, aphanitic and pelletal, some rocks with wispy argillaceous layers rich in quartz silt, rare beds with sparse biogenic debris, rare beds stromatolitic, some beds with conglomeratic layers that include mudflake and edgewise conglomerates; dark grey, weather dark grey and dull grey; bedding 3 to 18 inches, some beds laminated;	

Unit	Thickness (feet)	
	Unit	From base
	some beds with calcite stringers and veins; acid residues of light clay-size material and sparse quartz silt. At 715, 6 inches of recessive platy limestones. Sparse chert nodules at 675. At 513, layer of greyish black chert, 2 inches thick. Mudcracks at 600 and 543. Very rare small high-spired gastropods, trilobites, and straight cephalopods (GSC localities 73908 588-591, 73907 543-544) .....	
	309	809
5	Limestones, many beds argillaceous, most beds with abundant quartz silt, microcrystalline to aphanitic; grey, pale yellowish brown, light grey, very pale orange, and dark grey, weather very light grey, greyish orange, yellowish grey, and light olive-grey; bedding 2 to 18 inches, some beds poorly laminated, some with truncated laminae; some beds with stylolites; acid residues of common to abundant light clay-size material and quartz silt. Limestones, aphanitic, stromatolitic, and pelletal, with layers of limestone conglomerates that include mudflake and edgewise conglomerates; light brownish grey and light grey, weather light brownish grey; bedding 2 to 8 inches, some beds laminated, rare beds crosslaminated; rare beds with vuggy porosity; acid residues of light clay-size material, sparse quartz silt, and rare pyrites. Recessive argillaceous limestones at 478-481, 454-459, 402-404. Rare chert nodules at 400-410. Mudcracks at 415. Barren .....	
	117	500
4	Limestones, aphanitic and pelletal, rare stromatolitic horizons, some beds with layers of mudflake and edgewise conglomerates; dark grey, weather dark grey and grey; bedding 6 inches to 3 feet; some beds with mottles and layers of light grey argillaceous limestone; acid residues of quartz silt and sparse light clay-size material. Sparse yellowish grey and pale greyish orange weathering limestones. Mudcracks at 374. At 354, two thin layers of arenaceous limestone. Sparse off-white weathering chert nodules at 354 and 345. Barren .....	
	48	383
3	Limestones, most rocks with abundant quartz silt and very fine sand, microcrystalline; grey and light grey, weather yellowish grey, light olive-grey, light grey, and pale yellowish orange; bedding 2 to 12 inches, a few beds	

<u>Unit</u>	<u>Thickness (feet)</u>	
	<u>Unit</u>	<u>From base</u>
laminated. Very minor limestones, aphanitic to microcrystalline, some rocks pelletal, many beds with layers of mudflake conglomerate; dark grey, weather dark grey and grey; bedding 2 to 24 inches; some beds with stylolites; some beds with calcite stringers and vugs; acid residues of clay-size material and quartz silt and sand. Rare intergranular porosity in grey rocks, rare vuggy porosity in dark grey rocks. Rare layers and nodules of chert. At 175-177 and 179-180, recessive platy argillaceous limestones, weather yellowish orange. Covered interval at 177-179. Barren .....	181	335
2 Covered interval .....	37	154
1 Dolomites, some limy, most rocks with abundant quartz silt to fine sand, a few rocks are dolomitic quartz siltstones; very finely crystalline to microcrystalline; grey with dark grey laminae, weather yellowish grey, grey, olive-grey and light grey; bedding 3 inches to 3 feet, most beds laminated, some laminae cut by channels and burrows; acid residues of abundant quartz silt and sand and, in some rocks, common clay-size material. Limestones and dolomites, aphanitic to microcrystalline; dark grey, weather dark grey; in beds 3 to 12 inches thick and as laminae within yellowish grey dolomites; acid residues of light clay-size material and common quartz silt. Rare mudflake and edgewise conglomerates. Greyish black chert nodules at 110. Mudcracks at 21. At 17-18, recessive dark grey dolomites, bedding 1 to 2 inches. Lower half of unit poorly exposed. Barren.....	117	117

## FAUNAS AND CORRELATION

Fossils are common in parts of Formation B but are extremely rare in Formation A. The collections can be grouped into three assemblages, all are considered to be Caradoc in age.

The lowest assemblage was found in units 6 and 7 of Formation A:

<u>Maclurites</u> sp.	GSC loc. 73909	812-815 feet
small high-spired gastropods	GSC loc. 73908	588-591 feet
straight cephalopod	GSC loc. 73907	543-544 feet
? <u>Bathyrurus</u> sp.	GSC loc. 73908	588-591 feet

The presence of ? Bathyrurus suggests a Wilderness age. Wilderness fossils have also been collected by Christie (1964, pp. 21-22, locality 6) from M'Clintock Inlet on the coast of northern Ellesmere Island.

The second assemblage is represented by a single collection at the base of Formation B, GSC loc. 73910 (2672-2673 feet):

undetermined tabulate coral  
Foerstephyllum sp.  
 undetermined pygidium  
Ceraurus sp.  
 ostracods, probably isochilinids

The ostracods were studied by Dr. M. J. Copeland. The Foerstephyllum has extremely short septa and resembles Lichenaria major Bassler from Appalachian rocks of late Porterfield and Wilderness age but the fauna can only be firmly dated as within the interval Porterfield to Richmond. However its stratigraphic position within the section restricts the age to Wilderness to Maysville.

The third assemblage is represented by several collections from the highest rocks studied in the measured section, collected in sequence from 2995 to 3237 feet within unit 21 of Formation B:

straight cephalopod	GSC locs. 73911 73913
gastropod	GSC loc. 73913
? <u>Maclurites</u> sp.	GSC loc. 73913
echinoderm debris	GSC locs. 73912 73916
sponge (?)	GSC loc. 73913
<u>Receptaculites</u> sp.	GSC locs. 73914 73915
stromatoporoid	GSC loc. 73916
solitary coral	GSC loc. 73916
<u>Grewingkia</u> sp.	GSC loc. 73916
undetermined tabulate coral	GSC locs. 73912 73916
<u>Catenipora</u> sp.	GSC locs. 73915 73916
<u>Calapoecia</u> sp.	GSC locs. 73915 73916



<u>Labyrinthites</u> sp. or spp.	GSC locs. 73912 73915
<u>Paratetradium</u> sp.	GSC loc. 73915
<u>Rhabdotetradium</u> sp. or spp.	GSC locs. 73911 73912 73913 73914 73915 73916

The presence of Grewingkia dates the assemblage as within the interval Eden to Richmond. A Richmond age can be ruled out for there are no representatives of Palaeofavosites, Palaeophyllum, Bighornia, and Lobocorallium that are common in Richmond faunas from the lower beds of the Allen Bay Formation on Devon Island (Glenister and Thorsteinsson 1963, pp. 199-200), from the Stony Mountain Formation of southern Manitoba (Nelson 1959, p. 51), and from the lower part of the Beaverfoot-Brisco Formation of southeast British Columbia (Norford 1962, pp. 449-450). The age is thus Eden or Maysville but the coral faunas of these stages are not well known. The faunas of the Red River, Portage Chute, and Surprise Creek Formations of Manitoba may correlate with the Eden-Maysville interval (Nelson 1959, pp. 51-52; 1963, pp. 9-14; 1964, pp. 8-20). The present assemblage may be the same age or slightly older than the faunas of the Red River and Portage Chute Formations. The assemblage is older than Richmond faunules collected elsewhere in Judge Daly Promontory by Christie (1964, pp. 19-20, localities 1-4). These faunules include Bighornia sp. and Lobocorallium cf. L. trilobatum (Whiteaves) and probably come from higher strata within Formation B. They are younger than any faunas reported from beds of the Cornwallis Formation elsewhere in the Arctic Archipelago.

The succession of faunas within the Cornwallis Formation of the Arctic Islands is not fully understood but three horizons have previously been recognized. Most collections have been made from the abundantly fossiliferous uppermost beds of the formation and show a fauna that includes Probillingsites, Receptaculites, Maclurites, Calapoecia, Catenipora, Palaeophyllum, and Foerstephyllum. These beds directly and conformably underlie the lower Ashgill graptolite zone of Orthograptus n. sp. A. The age of these beds is considered to be within the Eden-Maysville interval (Thorsteinsson 1959, p. 41). A second fauna has been collected from considerably lower in the Cornwallis and includes Bathyurus (Thorsteinsson 1963a, p. 38). This trilobite genus indicates a Wilderness age. A third fauna is characterized by species of Gonioceras and is known from three collections, all from Ellesmere Island. Two were collected from the Cornwallis Formation, at Sydkap Fiord (Glenister 1963, p. 290) and at Copes Bay (Thorsteinsson 1963b, p. 393), and the other is from the Challenger Group at M'Clintock Inlet (Christie 1964, p. 21; Trettin 1966, p. 9). The presence of Gonioceras suggests Wilderness age but all three collections are from float, talus, or conglomeratic rocks and thus the stratigraphic position of the Gonioceras fauna is uncertain.

The lowest assemblage at Daly River probably belongs to the same fauna as the collections with Bathyurus reported by Thorsteinsson. The uppermost assemblage may be the same age as the fauna from the top beds of the Cornwallis Formation but more probably it is somewhat older for it lacks Palaeophyllum and is dominated by Rhabdotetradium, a genus that previously has not been reported from the Canadian Arctic. The Gonioceras fauna has not been found in the same section as the Bathyurus fauna but Thorsteinsson (1963a, p. 39) has suggested that possibly it may be younger. Its stratigraphic position relative to the second assemblage at Daly River is unknown.