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PAPER 67-24

STRATIGRAPHIC SECTIONS OF PALAEOZOIC ROCKS
ON PRINCE OF WALES AND SOMERSET ISLANDS,
DISTRICT OF FRANKLIN, NORTHWEST TERRITORIES

(Report and 7 figures)

R. L. Christie



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Cat. No. M44-67-24

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ROGER DUHAMEL, F.R.S.C.
Queen's Printer and Controller of Stationery
Ottawa, Canada
1967

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ABSTRACT

The results of the measurement of six stratigraphic sections in lower and middle Palaeozoic rocks in the Central Canadian Arctic are presented and a brief discussion of the age and correlation of these strata is given.

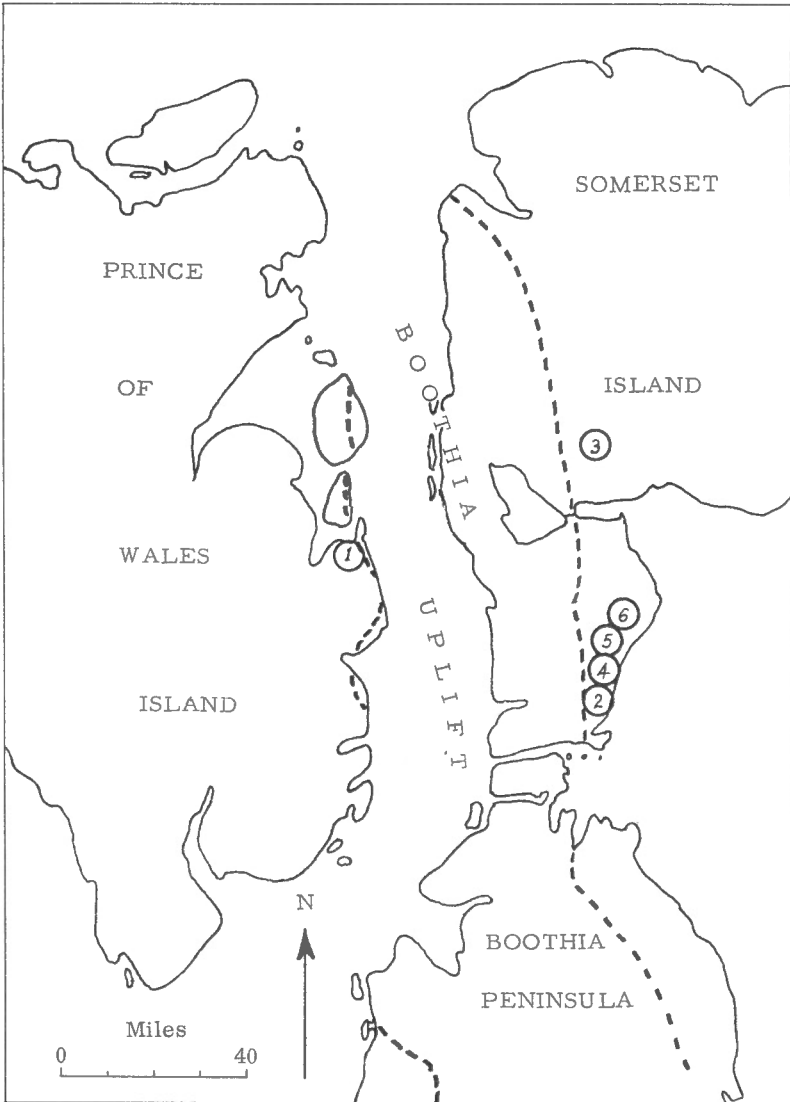


Figure 1. Locations of stratigraphic sections

STRATIGRAPHIC SECTIONS OF PALAEOZOIC ROCKS ON PRINCE OF
WALES AND SOMERSET ISLANDS, DISTRICT OF FRANKLIN,
NORTHWEST TERRITORIES

INTRODUCTION

Several stratigraphic sections in lower and middle Palaeozoic rocks of Prince of Wales and Somerset Islands were measured in 1962 during 'Operation Prince of Wales', an air-supported geological reconnaissance of Boothia Peninsula and adjacent islands. Field work on the Palaeozoic rocks was carried out by R.L. Christie and W.W. Nassichuk.

A recent increase in interest in the sedimentary rocks of Prince of Wales and Somerset Islands has prompted this publication of the tabulated sections. In order to expedite publication the graphic sections have been reproduced directly from sections drawn in the field camps. A full report on the Palaeozoic rocks is in preparation and will be published in the Bulletin series of the Geological Survey.

Fossils in the accompanying stratigraphic sections have been examined by T.E. Bolton and G.W. Sinclair and are identified by initials where appropriate.

The Prince of Wales-Somerset region straddles the northern part of Boothia uplift, a northerly trending, finger-like extension of the Precambrian, crystalline Canadian Shield (see Kerr and Christie, 1965). Sedimentary basins of mainly flat-lying Palaeozoic rocks lie to the east and west of the uplift, and zones of folded rocks flanking the uplift are named the Cornwallis fold belt.

The basinal sedimentary rocks are well exposed in the numerous coastal river valleys. In addition, excellent exposures of steeply upturned beds are available along narrow zones in the Cornwallis fold belt. Vertical Palaeozoic beds lie directly against uplifted crystalline rocks along much of the western margin of the exposed Precambrian basement complex, and it is from this zone that the accompanying 'Young Bay' stratigraphic section is obtained. Strata on the eastern flank are upturned in several parallel bands lying some miles east of the Precambrian area. The stratigraphic sections of the eastern flank were measured, however, across gently tilted beds rather than in the fold zones.

STRATIGRAPHIC SECTIONS

Section 1. Young Bay, Prince of Wales Island

| Unit | Lithology | Thickness (feet) | Height above base (feet) |
|------|--|---------------------|--------------------------------|
| | Overlying: covered; talus from sandstone beds as unit 19. | | |
| | Top? of Read Bay Formation. | | |
| 20 | Limestone; as unit 17. | 40 | 3320 |
| 19 | Sandstone; light grey, thick bedded. | 10 | 3280 |
| 18 | Covered interval | 10 | 3270 |
| 17 | Limestone; greenish grey, fine crystalline, thin bedded, with irregular, distinct bedding planes; slightly silty; bedding planes on weathered debris characterized by a thin veneer of clayey material through which protrude an abundance of <i>Atrypella</i> brachiopods; scolecodonts obtained from specimen digested in acetic acid. | 160 | 3260 |
| 16 | Covered interval | 15 | 3100 |
| 15 | Limestone; green grey to brown grey, microcrystalline, weathering rusty red in lower 110 feet; massive appearing; hand specimen from base of unit yielded upon digestion in acetic acid: triaxial sponge spicules, scolecodonts, and crinoid fragments. 70 feet above the base, small favositid coral mounds are present; brachiopod remains lie scattered thinly throughout the unit. | 155 | 3085 |
| 14 | Limestone; brownish grey, finely crystalline; thin bedded, with argillaceous partings; brachiopods as in unit 12, more abundant; in upper part of unit, elliptical coralline mounds up to 10 inches diameter are present, with numerous other fossils (GSC locality 50762)(T.E.B.): cup corals | | |

| Unit | Lithology | Thickness (feet) | Height above base (feet) |
|------|--|---------------------|--------------------------------|
| | <p><u>Favosites</u> sp. (not <u>Parafavosites</u>) <u>Atrypella scheii</u> (Holtedahl) "Camarotoechia" sp. <u>Howellella</u> sp. <u>Encrinurus</u> (Frammia) <u>arcticus</u> (Haughton)*</p> <p>Some of the uppermost beds are fragmental, with abundant crinoid detritus.</p> | 175 | 2930 |
| 13 | Limestone; brownish grey, micro-crystalline; in part fragmental and only slightly argillaceous. | 45 | 2755 |
| 12 | <p>Limestone; dark grey microcrystalline, with argillaceous appearance; weathers medium green-grey; well bedded and thin bedded, with irregular bedding planes; fossils present but not abundant at base of unit (GSC locality 50765) (T.E.B.):</p> <p><u>Atrypella scheii</u> (Holtedahl) large clam, thick-shelled - <u>Megalomus</u> sp. outline rather than <u>Pycnodesma</u></p> <p>40 feet above the base, solitary and colonial corals appear (GSC locality 50767) (T.E.B.):</p> <p>cup corals <u>Favosites</u> sp. <u>Atrypella scheii</u> (Holtedahl) "Camarotoechia" sp. <u>Hormotoma</u> sp.</p> <p>Parts of the unit, with more argillaceous bedding parting, are quite recessive.</p> | 230 | 2710 |
| | Base? of Read Bay Formation. | | |

* E. (F.) arcticus has been described by Bolton (1965, pp. 4-8) and this locality listed.

| Unit | Lithology | Thickness (feet) | Height above base (feet) |
|------|---|---------------------|--------------------------------|
| 11 | Covered interval | 300 | 2480 |
| 10 | Dolomite; brown to grey, weathering grey to light grey; medium crystalline, with silty appearing beds; thin to medium bedded, with irregular bedding planes. | 600 | 2180 |
| 9 | Dolomite; light grey, weathering light grey; thin bedded, relatively recessive, breaking into platy debris. | 550 | 1580 |
| 8 | Covered interval. | 350 | 1030 |
| 7 | Dolomite; light grey weathering, with stylolitic bedding planes; beds 10 inches to 2 feet thick, competent. | 70 | 680 |
| 6 | Dolomite; dark brown, bituminous; thin to medium bedded, but breaks easily into rubble; the lower 50 feet of the unit contains irregular dark grey siliceous patches up to 6 inches, and colonial corals (GSC locality 50727) (G. W. S.); <u>Eofletcheria</u> cf. <u>compacta</u> (Billings) <u>Catenipora</u> sp. | 80 | 610 |
| 5 | Dolomite; fine grained, grey-brown, bedding 3 to 6 inches; small crinoid stems. | 110 | 530 |
| 4 | Dolomite; nearly massive, medium crystalline, dark brown, with bituminous odour; beds 8 inches to 2 feet thick; scattered siliceous lenses. | 40 | 420 |
| 3 | Dolomite; compact; grey, weathering light grey; variably thin and medium bedded, the lower third medium bedded and similar to unit 1; domal algal forms about 6 inches in diameter observed in float. | 30 | 380 |
| 2 | Dolomite; light grey, weathering yellow-grey; thin bedded. | 50 | 350 |

| Unit | Lithology | Thickness (feet) | Height above base (feet) |
|------|---|---------------------|--------------------------------|
| 1 | Dolomite; medium crystalline, pale brown to grey weathering; medium to thick bedded with stylolitic bedding surfaces; some irregular siliceous forms and nodules; in part bituminous odour on breaking. | 300 | 300 |
| | Base of section not exposed; presumed fault contact with crystalline rocks. | | |

Section 2. Mount Oliver, Somerset Island.

| Unit | Lithology | Thickness (feet) | Height above base (feet) |
|------|--|---------------------|--------------------------------|
| 10 | Overlying: dolomite; fine crystalline, pale yellow-brown weathering light yellow to grey; competent, scarp forming, medium to thick beds. | | |
| 9 | Covered interval. | 120 | 420 |
| 8 | Dolomite; sandy, medium granulose, pale brown, weathering dark grey, with grey-brown rounded and sub-angular fragments up to 10 mm diameter. | 10 | 300 |
| 7 | Covered interval | 80 | 290 |
| 6 | Interbedded dolomite, dolomite intraformational breccia, crumbling, impure carbonate rock, and shale; basal 4 feet is medium crystalline grey dolomite breccia with thin flake fragments and domal algal growth; overlying: banded light grey dolomite with quartz crystalline vugs, gypsum (?) pods, and chert nodules; green-grey and brown incompetent shales, some possibly gypsiferous. | 30 | 210 |

| Unit | Lithology | Thickness (feet) | Height above base (feet) |
|------|--|---------------------|--------------------------------|
| 5 | Interbedded dolomite and shaly, variable carbonate rocks; basal few feet of beds, and some higher beds, are competent, fine grained light grey to brown dolomite and intraformational dolomite breccia; most of the unit is incompetent brown and green-grey shaly carbonate rocks, perhaps in places gypsiferous; pyrite crystals evident on some bedding planes; weathered surface coated with white sulphate salts. | 25 | 180 |
| 4 | Dolomite; medium crystalline; light yellow-brown, weathering orange-brown; medium to thick bedded; some sandy beds. | 50 | 155 |
| 3 | Covered interval | 35 | 105 |
| 2 | Dolomite; medium crystalline, grey, weathering light orange-brown; medium to thick bedded, scarp forming. | 35 | 70 |
| 1 | Covered interval: float is dolomite; fine grained, grey, weathering slightly greenish grey; thin bedded, breaking into platy debris with shaly partings. | 35 | 35 |

Underlying: gneiss

Section 3. West Creswell River, Somerset Island

| Unit | Lithology | Thickness (feet) | Height above base (feet) |
|------|--|---------------------|--------------------------------|
| 3 | Dolomite and limestone; basal 5 feet is pale, purplish brown weathering, mottled, and contains large crinoid stem fragments; overlying, 10 feet of fine crystalline, pale brown, brown weathering cavernous limy dolomite with abundant very | | |

| Unit | Lithology | Thickness (feet) | Height above base (feet) |
|------------------------------|--|---------------------|--------------------------------|
| | conspicuous irregular white chalky lenses and networks; upper beds are medium to coarse crystalline grey fossiliferous limestone, weathering green-grey, and marked by abundant pale yellowish mottling; fauna collected from middle of unit (GSC locality 50721) (G.W.S.): <u>Tollina</u> sp. <u>Receptaculites</u> sp. <u>Rafinesquina</u> cf. <u>lata</u> (Whiteaves) <u>Maclurites</u> sp. <u>Rhynchotrema</u> sp. fauna collected from upper 20 feet of unit (GSC locality 50730) (G.W.S.): <u>Plasmopora</u> sp. <u>Catenipora</u> sp. (not <u>C. rubra</u> Sinclair and Bolton) <u>Charactoceras</u> sp. | 50 | 220 |
| 2 | Shale; grey-green, fine grained; crumbling, massive rock with some carbonate content. | 20 | 170 |
| 1 | Dolomite; very fine crystalline; grey, weathering green-grey; thin bedded, with argillaceous appearance; massive beds producing sharp debris with conchoidal surfaces alternate with incompetent brown shaly beds with shaly partings; finely laminated silty dolomite with graded bedding is a common rock type, and in some beds salt casts observed; medium beds of competent dolomite interbedded in the upper 40 feet of the unit. | 150 | 150 |
| Underlying beds not exposed. | | | |

Section 4. 'Sand River', Somerset Island

| Unit | Lithology | Thickness (feet) | Height above base (feet) |
|------|---|---------------------|--------------------------------|
| | Overlying, at uncertain interval but nearby; beds characteristic of the Read Bay Formation. | | |

| Unit | Lithology | Thickness (feet) | Height above base (feet) |
|------|---|---------------------|--------------------------------|
| 7 | Dolomite; fine to medium crystalline; pale yellow, weathering yellow to very pale yellow; compact; banded algal structures very broad, resulting in knobby domes up to 10 feet across and 3 feet high. | 70 | 383 |
| 6 | Dolomite; medium and thick bedded; variable texture, often vuggy, and with patchy colour variation; thin bedded and laminated algal-rich interbeds are fine grained, and have a petroliferous odour. | 100 | 313 |
| 5 | Dolomite; mostly medium granular, but variable; porous to vuggy; pale brown to brown, often emitting petroliferous odour on breaking; lower part of unit thick bedded, upper medium to thin bedded; favositid corals are present, much altered by carbonate mineralization. | 100 | 213 |
| 4 | Dolomite; medium to fine crystalline; thin to medium bedded; weathering yellow-brown; beds at the middle of the unit contain abundant domical algal growths 2 to 6 inches in diameter; above, the rock is brown, vuggy, and emits a petroliferous odour on breaking; the unit is capped by a 5 foot thick bed of grey, medium grained but porous, competent dolomite. | 55 | 113 |
| 3 | Covered interval; debris from covered beds is mostly orange weathering porous dolomite containing the following fossils (GSC locality 50723) (G. W. S.): <u>Streptelasma</u> sp. <u>Palaeophyllum</u> sp. <u>Catenipora</u> sp. small nuculid pelecypod? | 10 | 58 |
| 2 | Dolomite; medium bedded, light yellow weathering. Uppermost 3 feet is a distinctive fossiliferous | | |

| Unit | Lithology | Thickness (feet) | Height above base (feet) |
|------|---|---------------------|--------------------------------|
| | bed; medium crystalline, vuggy, brown, and weathering light grey but with amoeboid white patches; petroliferous smell on breaking; fossils (GSC locality 50718) include small algal growths and (G.W.S.): | | |
| | <u>Encrinurus</u> sp. | | |
| | <u>Streptelasma</u> sp. | 33 | 48 |
| 1 | Dolomite; brown to grey, weathering yellow to grey-brown; lower bed medium crystalline, thin laminated, silty; upper 10 feet medium to thick bedded cavernous, with dome shaped algal structures; in places coarsely crystalline, with possible solution breccia structures; fossils collected (GSC locality 50725) (G.W.S.): | | |
| | <u>Rhynchotrema</u> sp. | 15 | 15 |
| | Underlying beds: not exposed. | | |

Section 5. Lang River, Somerset Island

| Unit | Lithology | Thickness (feet) | Height above base (feet) |
|------|--|---------------------|--------------------------------|
| | Overlying beds; green-grey, fine grained; thin to medium bedded, with silty or argillaceous, irregular bedding planes; beds characteristic of the Read Bay Formation. | | |
| 2 | Limestone; grey-green; interbedded competent beds up to 2 feet thick and argillaceous thin bedded limestone; shaly partings abundant; basal 5 feet a crumbling shaly limestone; fish remains (GSC locality 50766) occur 10 feet and 50 feet above the base of the unit, and at other horizons; graptolites and fish scales (GSC locality 50754) collected from uppermost beds. | 80 | 100 |

| Unit | Lithology | Thickness (feet) | Height above base (feet) |
|------|---|---------------------|--------------------------------|
| 1 | Dolomite; brown weathering, thin to medium bedded; silty, breaking into platy debris. | 20 | 20 |
| | Underlying beds: dolomite; yellow-brown weathering, thick bedded, with abundant laminated domical algal beds. | | |

Section 6. Somerset Island

| Unit | Lithology | Thickness (feet) | Height above base (feet) |
|------|---|---------------------|--------------------------------|
| | Top of measured part of section. | | |
| 6 | Limestone; dark grey, thin bedded, with very irregular bedding planes; <u>Atrypella</u> fauna present. | 40 | 330 |
| 5 | Limestone; grey to dark grey, weathering mottled buff-grey; fine crystalline, in part fragmental; beds variously thick to thin, with irregular bedding planes; partings silty; <u>Atrypella</u> abundant. | 80 | 290 |
| 4 | Covered interval. | 40 | 210 |
| 3 | Limestone; medium crystalline; yellow-grey, weathering buff; bedding 2 to 6 inches; fragmental and fossiliferous; more competent than lower units. | 10 | 170 |
| 2 | Limestone; light grey, weathering light green-grey; fine crystalline; thin bedded, with distinct, irregular bedding surfaces; relatively resistant unit fossils from talus from units 2 to 5 are reported (T.E.B.) as follows (GSC locality 50753): | | |

| Unit | Lithology | Thickness (feet) | Height above base (feet) |
|------|---|---------------------|--------------------------------|
| | <u>Atrypella</u> sp. cf. <u>A. scheii</u> (Holtedahl) <u>"Camarotoechia"</u> sp. <u>Schuchertella?</u> sp. <u>Gypidula</u> sp. <u>Hormotoma</u> sp. | 80 | 160 |
| 1 | Dolomite and limestone; light grey, weathering light green-grey; fine grained; thin bedded; shaly, with interlayers of mudstone; fine crenulated bedding laminae; the unit is dolomitic at base, becoming limy upward. Brachiopods in uppermost beds. | 80 | 80 |
| | Underlying beds: covered. | | |

AGE AND CORRELATION

The beds described in the accompanying sections may be divided into three formations. The older two are unnamed; the youngest probably nearly coincides with the Read Bay Formation of Cornwallis Island.

The basal beds of Somerset Island (Section 2, units 1 to 9) are included in an unnamed formation that is probably correlatable with basal, Cambrian beds of Boothia Peninsula (see Blackadar and Christie, 1963, p. 9). In both regions similar beds underlie competent, apparently Ordovician dolomites. Fossils have not been found on Somerset Island but a *Glossopleura* and *Elrathia* fauna has been identified by A. W. Norris, Geological Survey of Canada, in collections from Boothia Peninsula. Norris assigned a Middle Cambrian age to the fauna and suggested a rough correlation with the Bear Point Formation of Dundas Harbour, Devon Island (see Kurtz, McNair, and Wales, 1952).

A basal formation with numerous clastic beds on Victoria Island is assigned a possible Upper Cambrian age (see Thorsteinsson and Tozer, 1962, p. 40).

These scattered exposures of basal clastic beds seem roughly correlative, and may represent a basal, Cambrian formation of the Arctic Lowlands.

Overlying the basal clastic group of strata is a considerable thickness of unnamed, relatively competent, generally medium- to thick-bedded dolomite. The few fossil collections from these beds have been examined by G. W. Sinclair, Geological Survey of Canada, and assigned Middle and Upper Ordovician ages. A general correlation with Ordovician and Silurian formations underlying the Read Bay Formation on Cornwallis Island is proposed; these include (see Thorsteinsson, 1958; Thorsteinsson and Kerr, 1965): an unnamed Ordovician formation, Eleanor River, Cornwallis, and Allen Bay Formations. The broad terms of this correlation are due to the rather uniform lithological character of the dolomite beds; mappable or stratigraphic divisions are not easily distinguished and fossils are scarce and poorly preserved.

Ages tentatively assigned to the fossil collections by Sinclair are:

| Section | GSC locality no. | |
|---------|-------------------------|--|
| 1 | 50727 | Middle Ordovician |
| 3 | 50730 50721 | Upper Ordovician Edenian (earliest Upper Ordovician) |
| 4 | 50723 50718 50725 | Middle or Upper Ordovician |

Fauna from presumed equivalent beds south of the area under discussion are considered by Sinclair to represent the 'Red River fauna',

and the beds are thus referable to the upper part of the Cornwallis Formation (with its "Arctic Ordovician fauna"; see Thorsteinsson, 1958, p. 40).

The lack of Lower Ordovician and Silurian fossils probably should not be taken at this time as an indication of missing strata; no evidence of widespread disconformity was discovered, and as noted above fossiliferous horizons are relatively sparse.

The Ordovician (- Silurian ?) dolomite formation is overlain by a distinctive limestone formation recognized as the Read Bay Formation of Cornwallis Island (see Thorsteinsson, 1958, p. 47). On Prince of Wales and Somerset Islands this formation attains a thickness of about 1,000 feet or less (measured as 850 feet at Young Bay), and is characteristically thin-bedded, fine-grained limestone with markedly irregular, silty or silty-argillaceous bedding planes. Fossils are abundant and well-preserved.

Read Bay and the older, Ordovician carbonate rocks may be distinguished at a distance by their differing weathering characteristics; Read Bay terrane weathers to dark grey rubble and typically supports a modest amount of vegetation; the Ordovician dolomites weather to lighter grey, whitish, or buff colours and the vegetation cover is very sparse or virtually absent. Competent beds in the dolomites are also evident in places.

The Read Bay overlies the dolomite formation conformably on Somerset Island, where a transition-zone of silty, thin-bedded dolomite and overlying argillaceous, thin-bedded limestone marks the boundary (Section 5, units 1, 2).

Fish remains and graptolites occur in the transition-zone, and fish remains have been recovered from both basal and higher beds at scattered localities on Boothia Peninsula to the south. The fish remains are presently being studied by R. Thorsteinsson, Geological Survey of Canada. Shelly faunas occur throughout the Read Bay Formation and have been reported on by T.E. Bolton.

Intensive vertebrate and other fossil collecting on Somerset Island was carried out by D.L. Dineley, University of Ottawa, between 1964 and 1966. Dineley (1966) describes the fauna from the Read Bay Formation as consisting of Cyathaspidids, Traquairaspidids, Corraspidids, Cephalaspidids, Acanthodii, and several placoderms, probably Arctolepidae. The fauna is reported to extend upward into the Peel Sound Formation, with little to distinguish the assemblage of remains of one formation from those of the other, and no age has been assigned specifically to the Read Bay beds (Dineley, 1965, 1966).

Bolton considers the shelly fauna collected from the Read Bay Formation on both Somerset and Prince of Wales Islands as representing the Silurian Atrypella scheii fauna, and remarks particularly on the occurrence of the pelecypod Megalomus, a Guelph form (uppermost Niagaran, or late Middle Silurian in southern Ontario). The Atrypella scheii fauna occurs throughout most, if not all of the Read Bay Formation on Cornwallis Island, and this formation is considered, from contained graptolite and fish assemblages, to represent both the Wenlockian and Ludlovian series (Middle and Upper Silurian).

The Read Bay Formation passes upward conformably and gradationally into the Peel Sound Formation. On both Somerset and Prince of Wales Islands, the uppermost 100 feet of Read Bay beds include sandy limestone, sandstone, and conglomeratic (intraformational) rock. The overlying Peel Sound Group, comprising vari-coloured sandstone and conglomerate, is not described in this report.

A fossil collection from Read Bay beds about 100 feet stratigraphically below basal Peel Sound sandstone was obtained at the mouth of a large river, northeast of section 6 of this report and was identified by T.E. Bolton as follows (GSC locality 50732).

Actinodictyon sp.
Clathrodactyon sp.
Favosites sp.
Acervularia sp.
fish remains

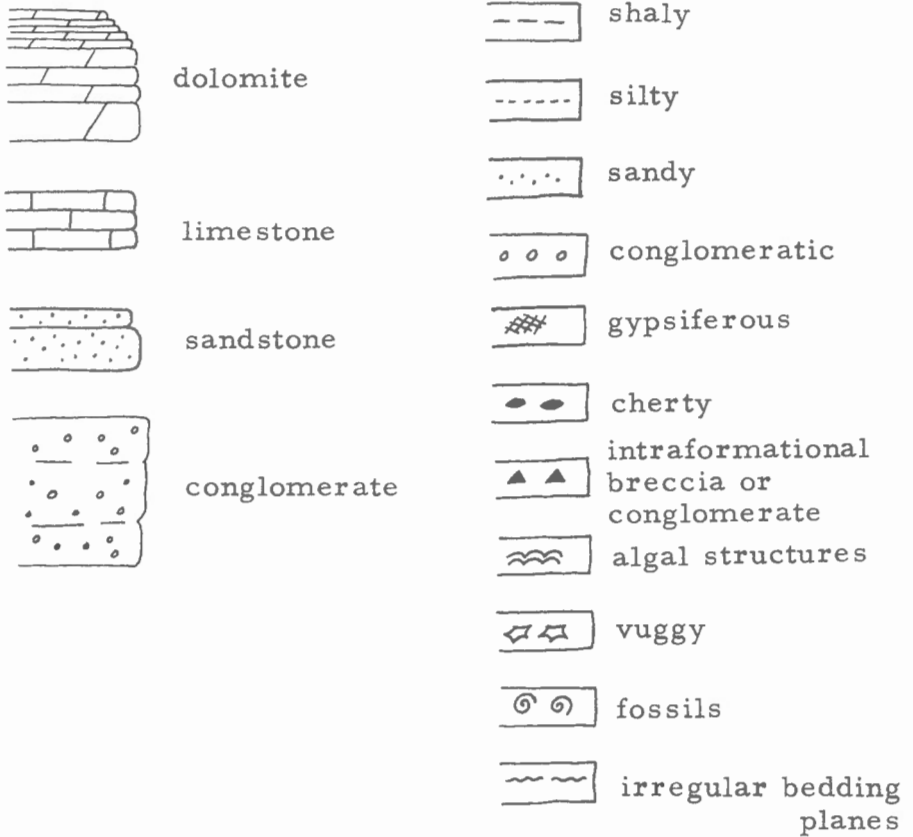
Dineley (1966), on northern Somerset Island, has collected very well preserved cephalaspid remains and associated ostracoderms, eurypterids, ostracods, and plant material at the base of the Peel Sound Formation. He suggested (1965) that the Read Bay - Peel Sound boundary corresponds to a horizon low in the Downtonian stage, and thus approximates to the Siluro-Devonian boundary.

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L E G E N D



(F) fossiliferous horizon

50727 Geological Survey of Canada
locality number

Figure 2A.

SECTION 1

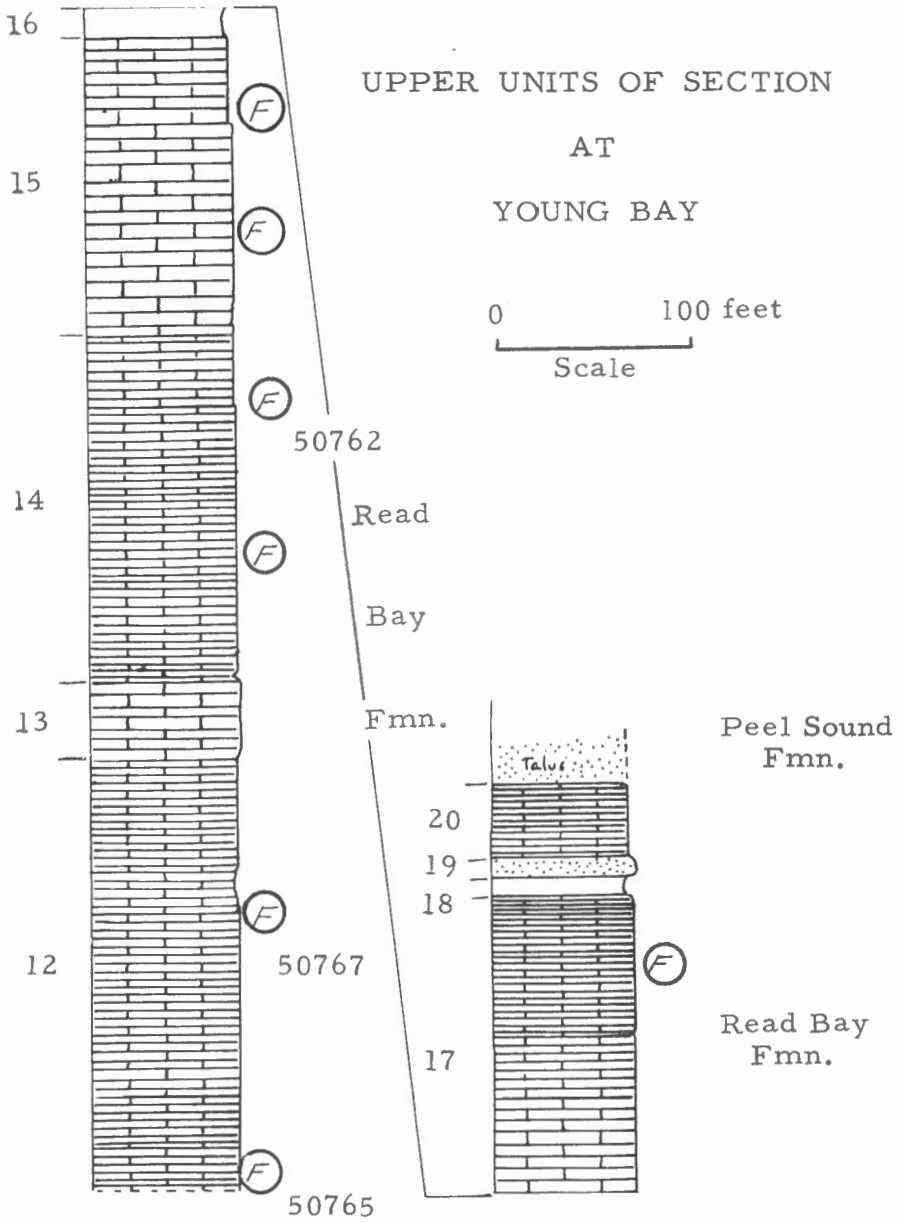
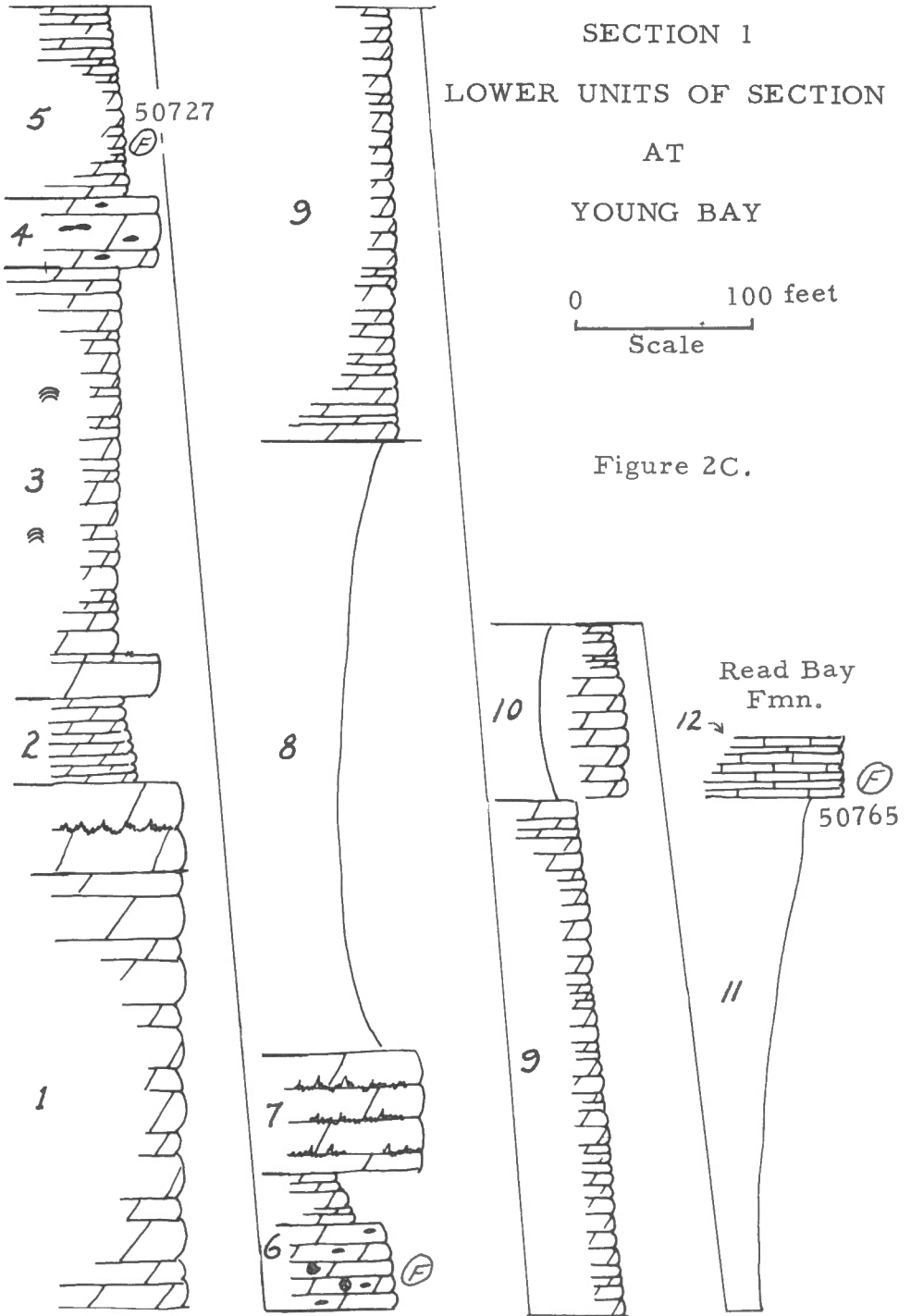


Figure 2B.



SECTION 2
WEST OF
MOUNT OLIVER
SOMERSET ISLAND

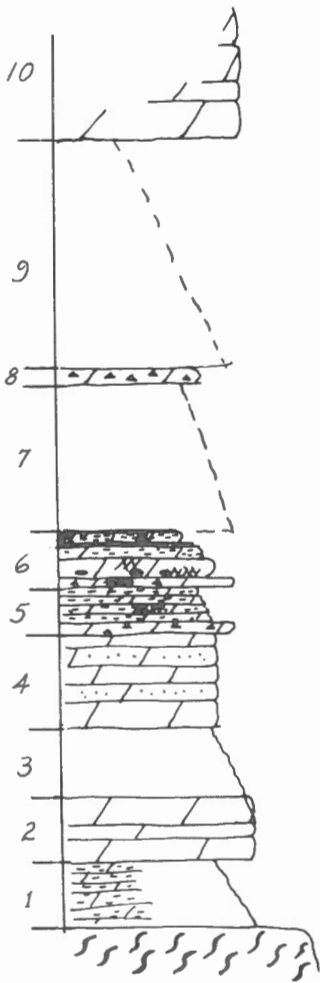
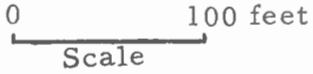


Figure 2D.

SECTION 3
WEST CRESWELL RIVER
SOMERSET I.

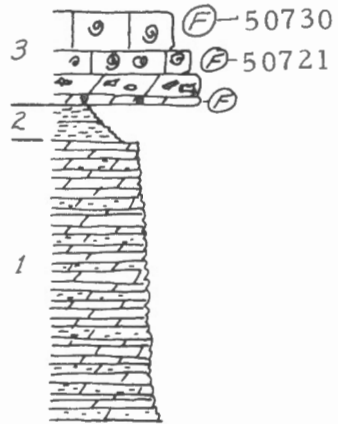
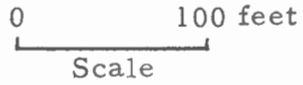
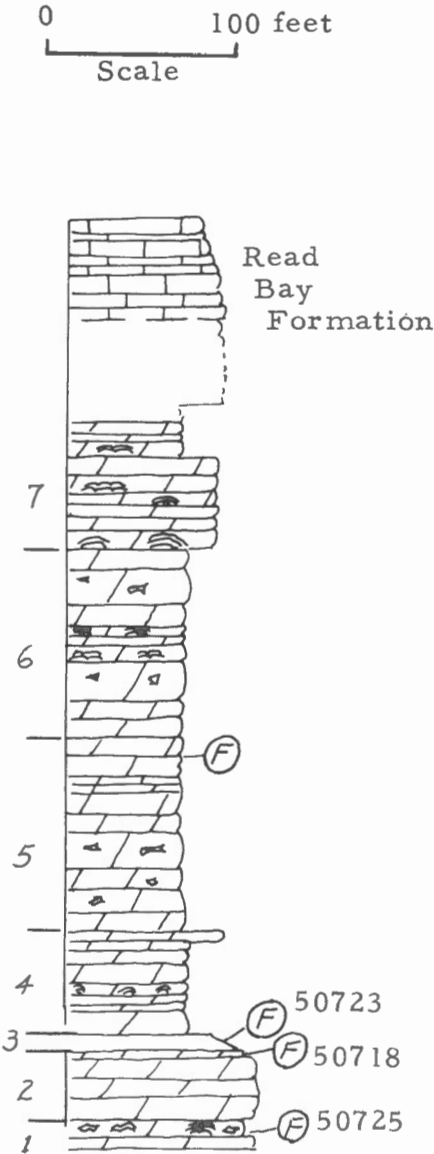


Figure 2E.

SECTION 4
SOMERSET ISLAND



SECTION 5
LANG RIVER
SOMERSET ISLAND

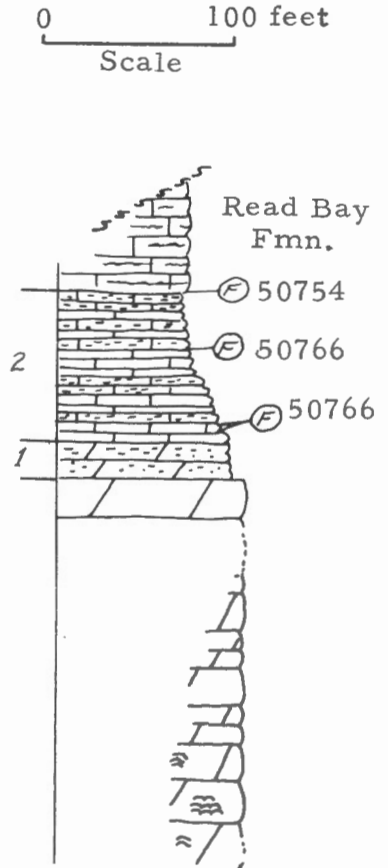


Figure 2F.

SECTION 6
SOMERSET ISLAND

