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THE SIGNIFICANCE OF A NEW BIVALVE FAUNA FROM THE GANDER MAP AREA (NTS 2D/15) AND A REVIEW OF SILURIAN BIVALVE-BEARING FAUNAS IN CENTRAL NEWFOUNDLAND

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ABSTRACT

Although bivalves are generally a minor component of Paleozoic marine faunas in central Newfoundland, locally, they are abundant. A previously unknown bivalve fauna from Careless Brook includes Cuneamya arata *(Hall, 1860), a distinctive species that also occurs in the Přídolí to Gedinnian (latest Silurian to earliest Devonian) Stonehouse Formation of Arisaig, Nova Scotia. The implication is that Paleozoic marine sedimentation in central Newfoundland continued much later than was previously suspected. This is consistent with evidence from Sops Arm (White Bay) and the Port au Port Peninsula (western Newfoundland) where marine strata of Přídolí age are recognized.*

INTRODUCTION

During the summer of 1992, twenty-five collections of macrofossils were obtained from sandstone and limestone assigned to the Botwood Group (Blackwood, 1982) and exposed along Careless Brook (Figure 1). Among the taxa recovered were articulate brachiopods, bryozoa, corals, pelmatozoan debris (crinoids), and undetermined trace fossils; most of these had earlier been reported (Anderson and Williams, 1970; Blackwood, 1982). However, four previously unknown bivalve localities were discovered in sandstone beds upstream from the logging-road bridge. The westernmost horizon yielded *Cuneamya arata* (Hall, 1860), *Modiolopsis* sp. and *Orthonota ?simulans* Billings, 1874, as well as one articulate brachiopod, and a possible trilobite (as yet unidentified).

Additional exposures of the Botwood Group along the Careless Brook logging road were unsuccessfully investigated for fossils.

SIGNIFICANCE OF THE CARELESS BROOK BIVALVE FAUNA

Cuneamya arata (Hall, 1860) and *Orthonota simulans* Billings, 1874 both occur in the Stonehouse Formation of Arisaig, Nova Scotia (McLearn, 1924); of the two, *Cuneamya arata* (Hall, 1860) is particularly distinctive (see Plate 1). The Stonehouse Formation is of Přídolí (latest Silurian) to Gedinnian (earliest Devonian) in age (Harper, 1973; Tansathien and Pickerill, 1989). The presence of *Cuneamya arata* (Hall, 1860) in the Careless Brook sandstone beds, therefore, suggests a similar age. The implication is that Paleozoic marine sedimentation in central Newfoundland continued much later than was previously suspected. Previously, the youngest Silurian rocks documented were:

a) Late Wenlock to Ludlow brachiopod-bearing limestone xenoliths from the 'Exploits Group'' on the east side of Upper Black Island (Point Leamington map area—NTS 2E/6) (Boucot and Smith, 1978); and

b) possible Ludlow age graptolite-bearing strata of the Botwood Group on Salmon Pond Brook (just west of Glenwood on the Gander map area—NTS 2D/15) (Berry and Boucot, 1970; Williams, 1972).

CORRELATION WITH OTHER AREAS

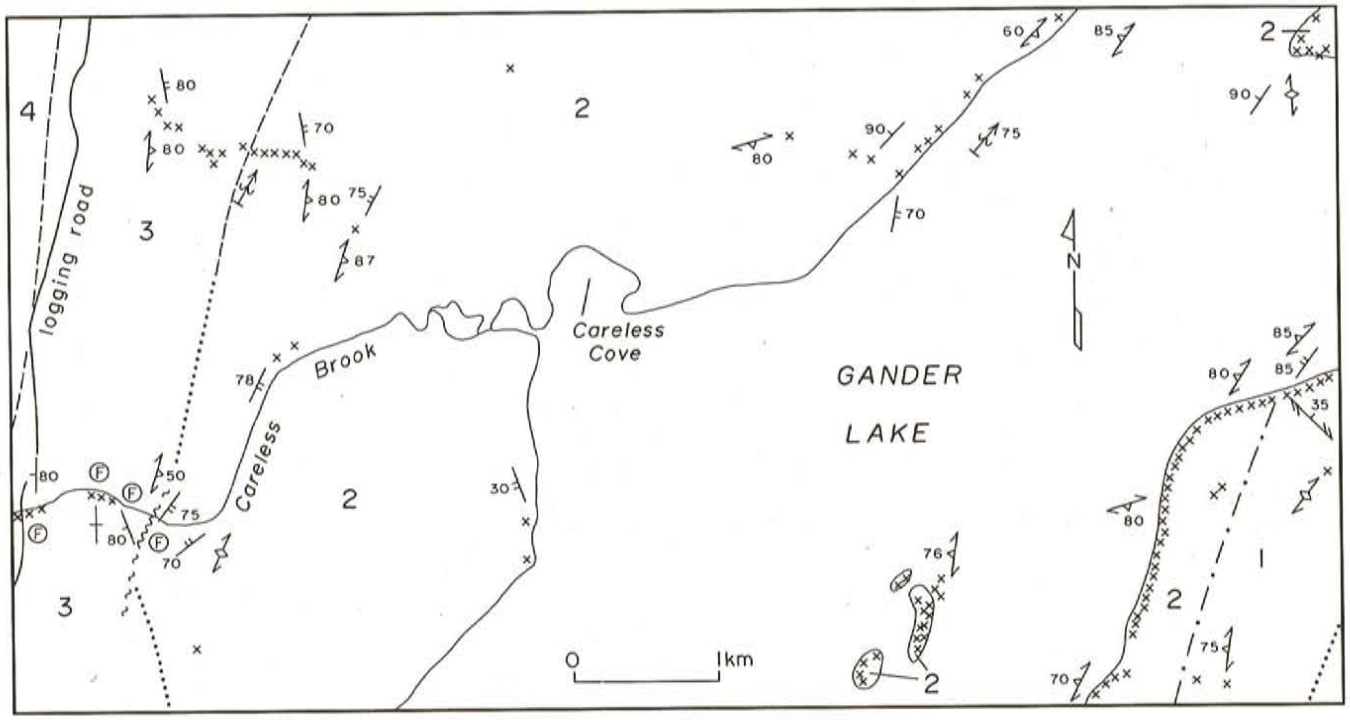
The implication that marine sedimentation in central Newfoundland continued into the Přídolí and/or Gedinnian is supported by biostratigraphic evidence from Long Point, Port au Port Peninsula (western Newfoundland) and Sops Arm, White Bay.

Long Point, Port au Port Peninsula

Schuchert and Dunbar (1934, pages 104-107) reported the following taxa from thin-bedded, rippled, sandy and muddy limestones of the Clam Bank Formation:

Anthozoa-Tabulata
Favosites sp.
Arthropoda-Ostracoda
Leperditia sp.
Brachiopoda-Articulata
Spirifer sp.
Echinodermata
Camarocrinus sp.

Berry and Boucot (1970, page 136) suggest that the presence of *Camarocrinus* sp. indicates a Přídolí age (see Table 1).



LEGEND

DEVONIAN (?)

4 *Fine to medium grained, pink granite*

SILURIAN

BOTWOOD GROUP

3 *Grey and minor red sandstone, locally micaceous; minor fossiliferous calcareous beds*

MIDDLE ORDOVICIAN AND LATER

DAVIDSVILLE GROUP

2 *Fine- to coarse-grained sandstone, locally with shale intraclasts, interbedded with grey to black siltstone and shale*

1 *Grey to black slate and siltstone; minor red slate and minor sandstone*

SYMBOLS

Geological boundaries (approximate, assumed, gradational).....

Fault (assumed).....

Fossil locality..... Ⓕ

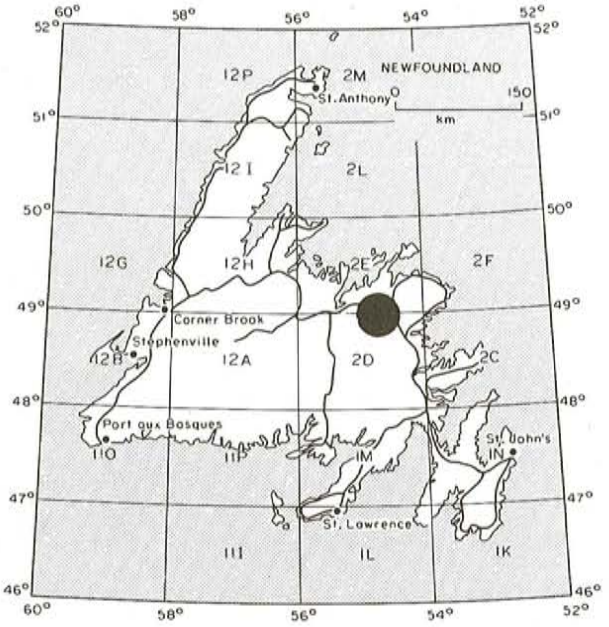


Figure 1. *Location and simplified geology map of the Careless Brook area (after Blackwood, 1982); x = outcrop locations.*

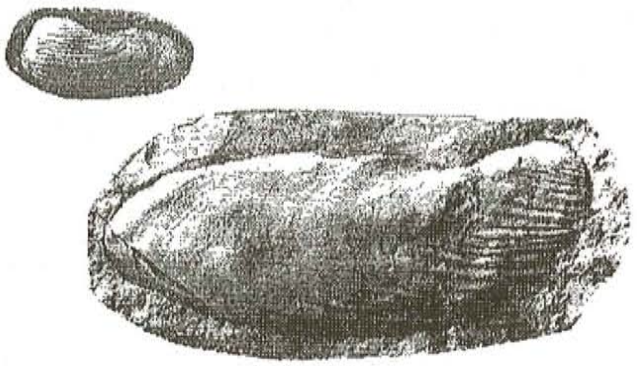


Plate 1. Cuneamya arata *(Hall, 1860), x 1.33, from the Prídolí (latest Silurian) to Gedinnian (earliest Devonian) Stonehouse Formation (Arisaig Group), Arisaig, Nova Scotia; these are computerized images scanned from McLearn (1924; Plate X, figures 13 and 27).*

Sops Arm, White Bay

The Natlins Cove Formation comprises the lower sandstone member, the middle, Sops Arm Volcanic Member, and the upper sandstone member (Heyl, 1936, 1937).

Twenhofel (*in* Heyl, 1937, Table 2, page 1782) and Shrock and Twenhofel (1939, pages 245-246) identified the following taxa from several localities in the lower sandstone member:
Anthozoa-Tabulata
Cladopora newfoundlandensis Shrock and Twenhofel, 1939
Favosites gothlandicus (Fought)
Favosites hisingeri Milne-Edwards and Haime, 1854
Halysites catenularius (Linné, 1767)
Heliolites interstinctus (Linné, 1767)
Brachiopoda-Articulata
Pentamerus? sp.
Small brachiopods?
Cephalopoda
'Orthoceras' sp. indet.
Echinodermata
Crinoid stems
Porifera-Stromatoporoidea
Clathrodictyon vesiculosum Nicholson and Murie, 1892

The tabulate (colonial) corals *Favosites gothlandicus* (Fought), *Favosites hisingeri* Milne-Edwards and Haime, 1854, and *Heliolites interstinctus* (Linné, 1767) are long-ranging species. On the Gaspé Peninsula, they occur in strata of Llandovery C_3 (latest Aeronian) to Ludlow age (Northrop, 1939; Berry and Boucot, 1970). On Anticosti Island, *Favosites gothlandicus* (Fought) occurs in strata of Llandovery A_4 (latest Rhuddanian) to Llandovery C_6 (latest Telychian)/earliest Wenlock (earliest Sheinwoodian) age; *Favosites hisingeri* Milne-Edwards and Haime, 1854 occurs in beds of Llandovery B_1 (earliest Aeronian) to Llandovery C_6 (latest Telychian)/earliest Wenlock (earliest Sheinwoodian) age; and *Heliolites interstinctus* (Linné, 1767) occurs in strata of Llandovery C_5 (medial Telychian) to Llandovery C_6 (latest Telychian)/earliest Wenlock (earliest Sheinwoodian) age (Twenhofel, 1928; Bolton, 1972; Barnes, 1989).

Halysites catenularis (Linné, 1767) is another extremely widespread and long-lived species; it ranges from the Late Ordovician to the Early Devonian and has a wide distribution throughout the Silurian of North America and Europe (Shimer and Shrock, 1944, page 113). On Anticosti Island, the species occurs in beds of latest Ordovician, Richmondian to Llandovery C_6 (latest Telychian)/earliest Wenlock (earliest Sheinwoodian) age (Twenhofel, 1928; Bolton, 1972; Barnes, 1989). On the Gaspé Peninsula, *Halysites catenularis* (Linné, 1767) occurs in strata of Llandovery C_3 (latest Aeronian) to Ludlow age (Northrop, 1939; Berry and Boucot, 1970).

The stromatoporoid *Clathrodictyon vesiculosum* Nicholson and Murie, 1892 also occurs in the Clemville Formation of Llandovery C_3 (latest Aeronian) to Llandovery C_5 (medial Telychian) age on the Gaspé Peninsula (Northrop, 1939; Berry and Boucot, 1970). On Anticosti Island, the species is reported from strata of latest Richmondian to Llandovery C_6 (latest Telychian)/early Wenlock (earliest Sheinwoodian) age (Twenhofel, 1928; Bolton, 1972; Barnes, 1989).

Berry and Boucot (1970, Plate 2) indicated an age of Llandovery C_3 to Llandovery C_6 (latest Aeronian to latest Telychian of present usage) for the lower sandstone member of the Natlins Cove Formation. Pending more detailed biostratigraphic sampling, Berry and Boucot's (*op. cit.*) correlation is followed here (Table 1).

Neale and Nash (1963, page 18) report that L.M. Cumming collected the articulate brachiopod *Dayia* sp. from an unspecified level within the lower sandstone member of the Natlins Cove Formation.

From the upper sandstone member, Twenhofel (*in* Heyl, 1937, Table 2, page 1782) identified the following taxa:
Anthozoa-Tabulata
Favosites gothlandicus (Fought)
Echinodermata
Crinoid stems
Porifera-Stromatoporoidea
Clathrodictyon vesiculosum Nicholson and Murie, 1892

In 1965, W.S. McKerrow obtained cystoids (*?Pseudocrinites*) of probable Prídolí age from the top hundred feet (30 m) of the Natlins Cove Formation (Lock, 1969, pages IX.12-13). He also obtained *Isorthis* sp. cf. *I. arcuaria*, suggestive of a Late Wenlock to Prídolí age (Berry and Boucot, 1970, page 189). In 1966 and 1967, McKerrow and Lock (*in* Berry and Boucot, 1970, page 189) obtained possible *Hyattidina* and *Howellella* (articulate brachiopods), suggesting a Llandovery C_2 to Prídolí age (Berry and Boucot, *op. cit.*).

Berry and Boucot (1970, Plate 2) indicated an age of Ludlow to Prídolí for the upper sandstone member of the

Table 1. *Correlation of faunas discussed in this paper*

STANDARD SUBDIVISIONS OF THE SILURIAN SYSTEM			PORT AU PORT PENINSULA	SOPS ARM, WHITE BAY	BOTWOOD (2E/3)	TWILLINGATE (2E/10) AND GANDER (2D/15)
Přídolí Series	(Stages not defined)		Clam Bank Formation	Natlins Cove Formation (upper sandstone member)		Botwood Group Careless Brook (this report)
Ludlow Series	Ludfordian Stage					Botwood Group Salmon Pond Brook and Glenwood (Williams, 1972)
	Gorstian Stage					
Wenlock Series	Homerian Stage			Natlins Cove Formation (Sops Arm volcanic member)		
	Sheinwoodian Stage					
Llandovery Series	Telychian Stage	C_6		Natlins Cove Formation (lower sandstone member)	Botwood Group Martin Eddy Point	Goldson Formation Burnt Island
		C_5				
		C_4				
	Aeronian Stage	C_{1-3}			Jumpers Brook	
		B_3		Simms Ridge Formation		
		B_2				
		B_1				
	Rhuddarian Stage	A_4				
		A_3				
		A_2				

Natlins Cove Formation, a correlation that is followed here (Table 1).

REVIEW OF SILURIAN BIVALVE-BEARING FAUNAS IN CENTRAL NEWFOUNDLAND

Silurian bivalves are also known from the Botwood (NTS 2E/3) and Twillingate (NTS 2E/10) map areas. In the faunal lists below, the names of the taxa have been updated whenever possible.

BOTWOOD (NTS 2E/3)

In the Botwood map area (NTS 2E/3), bivalves have been collected from two localities:

1) Martin Eddy Point (Twenhofel and Shrock, 1937; Shrock and Twenhofel, 1939; Williams, 1962, 1972)

2) Jumpers Brook (Williams, 1962, 1972)

Martin Eddy Point

At Martin Eddy Point, Twenhofel and Shrock (1937, page 1755) measured a sequence of conglomerate and interbedded limy shale, siltstone and hard greyish-blue argillite. These were assigned to the Botwood Group by Williams (1962, 1972). Twenhofel and Shrock (1937, page 1755) and Shrock and Twenhofel (1939) reported the following fossils from both the boulders and matrix of the conglomerate:

Anthozoa-Rugosa
- *Zaphrentis* sp. cf. *Z. stokesi* Milne-Edwards and Haime, 1851

Anthozoa-Tabulata
- *Favosites gothlandicus* (Fought)
- *Favosites hisingeri* Milne-Edwards and Haime, 1854
- *Favosites* sp. cf. *F. pyriformis*
- *Halysites catenularius* (Linné, 1767)
- *Heliolites interstinctus* (Linné, 1767)

Arthropoda-Ostracoda
- *Leperditia* sp. and some small ostracodes

Arthropoda-Trilobita
- *Dicranopeltis norrisensis* Shrock and Twenhofel, 1939
- *Encrinurus anticostiensis* Twenhofel, 1928
- *Eophacops newfoundlandensis* Shrock and Twenhofel, 1939

Brachiopoda-Articulata
- *Atrypa reticularis* (Linné, 1758)
- *Eocoelia hemisphaerica* (Sowerby, 1839)
- *Chonetes exploitensis* Shrock and Twenhofel, 1939
- *Lissatrypa atheroidea* Twenhofel, 1928
- *Mendacella uberis* (Billings, 1866)
- *Pentamerus oblongus* Sowerby, 1839
- *Resserella elegantula* (Dalman, 1828)
- *Rhyncotreta cuneata americana* Hall, 1879
- *Zygospira? exploitensis* Shrock and Twenhofel, 1939

Bryozoa
- *Hallopora?* sp.

Echinodermata
- Echinoderm columnals, probably crinoidal

Mollusca-Gastropoda
- *Diaphorostoma?* sp.
- *Pleurtomaria* sp.

Porifera-Stromatoporoidea
- *Clathrodictyon vesiculosum* Nicholson and Murie, 1892

Trace Fossils
- Fucoids, probably algal
- Worm? tubes

Cumming (*in* Williams, 1962, page 9) and Boucot (*in* Williams, 1972, page 95) subsequently identified the following from limestone pebbles in conglomerate:

Anthozoa-Rugosa
- *Zaphrentis* sp.

Anthozoa-Tabulata
- *Favosites* sp. cf. *F. gothlandicus* (Fought)

Brachiopoda-Articulata
- *Atrypa reticularis* (Linné, 1758)
- *?Dalmanella* sp.
- *Resserella* sp. cf. *R. elegantula* (Dalman, 1828)

Mollusca-Bivalvia
- *Nuculites* sp.

From grey shale interbedded with the conglomerate, Cumming (*in* Williams, 1962, page 9) also identified the following fossils:

Anthozoa-Rugosa
- *Zaphrentis* sp.

Arthropoda-Trilobita
- *Octobronteus* sp.

Brachiopoda-Articulata
- *Atrypa reticularis* (Linné, 1758)
- *?Idiorthis* sp.

The rugose (solitary) coral *Zaphrentis stokesi* Milne-Edwards and Haime, 1851 occurs in strata of Llandovery C_3 (latest Aeronian) to Wenlock age on the Gaspé Peninsula, Québec (Northrop, 1939; Berry and Boucot, 1970). On Anticosti Island, it occurs in strata of Llandovery C_1 (latest Aeronian) to Llandovery C_6 (latest Telychian)/earliest Wenlock (earliest Sheinwoodian) age (Twenhofel, 1928; Bolton, 1972; Barnes, 1989).

The trilobite *Encrinurus anticostiensis* Twenhofel, 1928 was originally described from strata of Llandovery C_1 to Llandovery C_5 (late Aeronian to medial Telychian) age on Anticosti Island (Twenhofel, 1928; Bolton, 1972; Barnes, 1989).

The articulate brachiopod *Atrypa reticularis* (Linné, 1758) is an extremely widespread and long-ranging species. At Arisaig, Nova Scotia, Hurst and Pickerill (1986) report it from strata of Llandovery C_1 to C_2 (latest Aeronian) age in the middle member of the Ross Brook Formation. It occurs in strata of Llandovery C_3 (latest Aeronian) to Ludlow age on the Gaspé Peninsula, Quebec (Northrop, 1939; Berry and Boucot, 1970). *Atrypa reticularis* (Linné, 1758) also ranges into the upper half of the Ludfordian Stage of the type Ludlow Series (Lawson and White, 1989, page 78, Figure 53; page

83, Figure 57). On Anticosti Island, the species occurs in rocks of Llandovery C_2 (latest Aeronian) to Llandovery C_6 (latest Telychian)/early Wenlock (Sheinwoodian) age (Twenhofel, 1928; Bolton, 1972; Barnes, 1989).

Eocoelia hemisphaerica (Sowerby, 1839) occurs in beds of Llandovery C_1 to C_2 (latest Aeronian) age in the middle member of the Ross Brook Formation of Arisaig, Nova Scotia (Harper, 1973, pages 76, 77); it is also reported from strata of Llandovery C_2 to C_5 (latest Aeronian to medial Telychian) age on the Gaspé Peninsula (Northrop, 1939; Berry and Boucot, 1970). On Anticosti Island, the species occurs in beds of Llandovery B_2 to C_5 (medial Aeronian to medial Telychian) age (Twenhofel, 1928; Bolton, 1972; Barnes, 1989, page 102, Figure 74). Bassett (1989, page 234, Figure 156) indicates a range of Llandovery $?B_2$-C_2 for *Eocoelia hemisphaerica* (Sowerby, 1839).

Lissatrypa atheroidea Twenhofel, 1928 occurs in strata of Llandovery C_1 to C_5 (latest Aeronian to medial Telychian) age on Anticosti Island (Twenhofel, 1928; Bolton, 1972; Barnes, 1989).

Mendacella uberis (Billings, 1866) occurs in beds of Ashgill to Llandovery C_2 (latest Aeronian) age on Anticosti Island (Harper, 1973, page 25); on the Gaspé Peninsula, it occurs in strata of Llandovery C_3 (latest Aeronian) to Wenlock age (Northrop, 1939; Berry and Boucot, 1970).

Trilobate forms of the *Pentamerus oblongus* type, range from about Llandovery C_1 (latest Aeronian) to Llandovery C_5 (medial Telychian)/possibly Llandovery C_6 (latest Telychian)/early Wenlock (Sheinwoodian) (Berry and Boucot, 1970, page 130). Bassett (1989, page 234, Figure 156) indicates a range of Llandovery B_3-C_4 (medial Aeronian to early Telychian) for *Pentamerus oblongus* Sowerby, 1839. On Anticosti Island, it occurs in strata of Llandovery B_2 to C_5 (medial Aeronian to medial Telychian) age (Twenhofel, 1928; Bolton, 1972; Barnes, 1989).

Resserella elegantula (Dalman, 1828) occurs in strata of Llandovery C_3 (latest Aeronian) to Ludlow age on the Gaspé Peninsula, Quebec (Northrop, 1939; Berry and Boucot, 1970).

Rhyncotreta cuneata americana Hall, 1879 occurs in beds of Llandovery C_6 (latest Telychian) to Ludlow age on the Gaspé Peninsula (Northrop, 1939; Berry and Boucot, 1970).

The Martin Eddy Point fauna is probably Llandovery C_3 to C_5 (latest Aeronian to medial Telychian) in age (Table 1). This is slightly older than the late Llandovery to early Wenlock age ascribed to it in Williams (1972, page 95).

Jumpers Brook

According to Williams (1972), brittle, grey to greyish-blue shale beds of the Botwood Group occur southeast of the Exploits River near Jumpers Brook between the (now abandoned) Canadian National Railway line and the Trans-Canada Highway. Cumming (*in* Williams,1962, page 9 and 1972, page 95) identified the following fossils from this locality:

Anthozoa-Rugosa
- *Rhabdocyclus* sp.

Arthropoda-Trilobita
- *Eophacops* sp. cf. *E. marklandensis* (McLearn, 1924)

Mollusca-Bivalvia
- *Goniophora* or *Pterinea* sp.

Brachiopoda-Articulata
- *Leptaena rhomboidalis* (Wahlenberg, 1821)
- *Parmorthis* sp. Schuchert and Cooper, 1931—probably
- *Resserella* sp.
- *Pentamerus oblongus* Sowerby, 1839

Mollusca-Gastropoda
- *Hormotoma* sp.

The trilobite *Eophacops marklandensis* (McLearn, 1924) occurs with the articulate brachiopod *Eocoelia hemisphaerica* (Sowerby, 1839) in Llandovery C_1 to C_2 (latest Aeronian) beds of the Ross Brook Formation at Arisaig, Nova Scotia (McLearn, 1924; Berry and Boucot, 1970; Hurst and Pickerill, 1986; Tansathien and Pickerill, 1989).

The Jumpers Brook fauna is probably Llandovery C_1 to C_2 (latest Aeronian) in age, although it may be as young as Llandovery C_5 (medial Telychian) in age (Table 1).

Twillingate (NTS 2E/10)

The Goldson Formation of the Twillingate map area (NTS 2E/10) comprises red to grey boulder-conglomerate and interbedded grey and black fossiliferous argillite, sandstone, and silty conglomerate (Williams, 1963); it includes strata previously assigned to the Pike Arm Formation (Shrock and Twenhofel, 1939; Williams, 1963). Here, bivalves have been collected from two localities in Notre Dame Bay:

1) Burnt Island, Goshens Arm (Shrock and Twenhofel, 1939)

2) Burnt Arm (Williams, 1972)

Burnt Island, Goshens Arm, Notre Dame Bay

Twenhofel and Shrock (1937, page 1762) and Shrock and Twenhofel (1939) identified the following fauna from black argillite of their Pike Arm Formation along the north side of Burnt Island:

Algae
- *Goldsonia burntensis* Shrock and Twenhofel, 1939

Annelida
- *Cornulites serpularius* Schlotheim, 1820

Anthozoa-Tabulata
- *Coenites labrosus* Milne-Edwards and Haime, 1851
- *Enterolasma caliculum* (Hall)
- *Halysites catenularius* (Linné, 1767)
- *Heliolites interstinctus* (Linné, 1767)

Arthropoda-Ostracoda
- *Leperditia* sp. cf. *L. selwyni* Jones, 1891

Arthropoda-Trilobita
Calymene niagarensis Hall, 1843
Encrinurus anticostiensis Twenhofel, 1928
Eophacops newfoundlandensis Shrock and Twenhofel, 1939
Illaenus or *Bumastus* sp.
Brachiopoda-Articulata
Atrypa reticularis (Linné, 1758)
Eocoelia hemisphaerica (Sowerby, 1839)
Leptaena rhomboidalis (Wahlenberg, 1821)
Resserella elegantula (Dalman, 1828)
Rhyncotreta cuneata americana Hall, 1879
Brachiopoda-Inarticulata
Lingula sp.
Mollusca-Bivalvia
Pterinea emacerata (Conrad, 1842)
Mollusca-Cephalopoda
Amphicyrtoceras? sp. cf. *A? futile*, doubtful
Kionoceras bellatulum (Billings, 1866)
Orthoceras sp., with fine annulate striae
Mollusca-Gastropoda
Bellerophon sp.
Gyronema? sp., high-spired
Gyronema? sp., low-spired
Hormotoma? sp. cf. *H? aculeata*

McKerrow and Cocks (1978, page 1128) subsequently reported the articulate brachiopod *Eocoelia intermedia* (Hall, 1860) from Burnt Island; this was probably misidentified as *Eocoelia hemisphaerica* (Sowerby, 1839) by Shrock and Twenhofel (1939).

The annelid *Cornulites serpularius* Schlotheim, 1820 is an extremely long-ranging species. It occurs in strata of early Llandovery (Rhuddanian) to Gedinnian (earliest Devonian) age at Arisaig, Nova Scotia (McLearn, 1924; Berry and Boucot, 1970; Tansathien and Pickerill, 1989), and in Llandovery C_3 to C_5 (latest Aeronian to medial Telychian) beds on the Gaspé Peninsula, Quebec (Northrop, 1939; Berry and Boucot, 1970). On Anticosti Island, *Cornulites serpularius* Schlotheim, 1820 occurs in strata of Llandovery A_4 to C_5 (latest Rhuddanian to medial Telychian) age (Twenhofel, 1928; Bolton, 1972; Barnes, 1989).

The tabulate (colonial) coral *Coenites labrosus* Milne-Edwards and Haime, 1851 occurs in strata of Llandovery C_5 (medial Telychian) to Llandovery C_6 (latest Telychian)/earliest Wenlock (earliest Sheinwoodian) age on Anticosti Island (Twenhofel, 1928; Bolton, 1972; Barnes, 1989).

The ostracode *Leperditia selwyni* Jones, 1891 occurs in strata of Llandovery A_4 to C_5 (latest Rhuddanian to medial Telychian) age on Anticosti Island (Twenhofel, 1928; Bolton, 1972; Barnes, 1989).

The trilobite *Calymene niagarensis* Hall, 1843 occurs in beds of Llandovery A_3 to C_5 (medial Rhuddanian to medial Telychian) age on Anticosti Island (Twenhofel, 1928; Bolton, 1972; Barnes, 1989).

Bassett (1989, page 234, Figure 156) indicates a range of Llandovery C_2 to C_4 (latest Aeronian to early Telychian) for *Eocoelia intermedia* (Hall, 1860).

Shrock and Twenhofel (1939, page 262) state that the bivalve *Pterinea emacerata* (Conrad, 1842) is widely distributed in the Clinton (Stage) of Canada and the United States. On the Gaspé Peninsula, it occurs in strata of Llandovery C_3 to C_5 (latest Aeronian to medial Telychian) age (Northrop, 1939; Berry and Boucot, 1970). On Anticosti Island, it occurs in strata of Llandovery A_4 to C_5 (latest Rhuddanian to medial Telychian) age (Twenhofel, 1928; Bolton, 1972; Barnes, 1989).

The cephalopod *Kionoceras bellatulum* (Billings, 1866) occurs in strata of Llandovery A_4 to C_4 (latest Rhuddanian to medial Telychian) age on Anticosti Island (Twenhofel, 1928; Bolton, 1972; Barnes, 1989).

The Burnt Island fauna, on balance, appears to be indicative of a Llandovery C_3 to C_4 (latest Aeronian to early Telychian) age (Table 1).

Burnt Arm

Cumming (*in* Williams, 1972, page 84) identified the following taxa from the northwest shore of Burnt Arm, 'half a mile' southwest of Toogood Arm:
Anthozoa-Tabulata
Favosites sp.
Heliolites sp.
Brachiopoda-Articulata
Coelospira sp.
Mollusca-Bivalvia
a large indeterminate pelecypod

This fauna cannot easily be dated as the taxa have not been identified to species level, but it is probably about the same age as the nearby Burnt Island fauna.

In summary, the bivalve-bearing faunas of the Botwood and Twillingate areas are all late Llandovery, i.e., much older than the Careless Brook bivalve fauna of Přídolí (or younger) age. Also, the bivalves in these faunas are very much a minor component. The Careless Brook fauna, on the other hand, is dominated by bivalves. Furthermore, the much lower faunal diversity and higher number of individuals of the Careless Brook fauna suggest a more nearshore setting for it.

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