

## MORE ORDOVICIAN AND SILURIAN GRAPTOLITES FROM THE EXPLOITS SUBZONE

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### ABSTRACT

In the region to the west of Gander Lake and around Lewisporte, biostratigraphically diagnostic graptolite assemblages have been collected from a number of new or previously poorly known localities within the Exploits Subzone. Most of the assemblages are of Middle Ordovician age, and represent outcrops of the Lawrence Harbour Formation and its correlatives.

A number of new Silurian samples are reported from Upper Black Island in the Bay of Exploits, suggesting that, on that island, the contact between the late Ashgill breccia and middle Llandovery sandstones is tectonic.

### GANDER LAKE AREA

**CARELESS BROOK** (NTS 2D/15; northing 5418130, easting 647600)

A number of localities yielding shelly macrofossils of Silurian age were recorded by Blackwood (1982) from his Unit 15 "Botwood Group" along Careless Brook (Figure 1), near the southwest corner of Gander Lake. Blackwood (1982, p. 38) also recorded the presence of an Ordovician trace fossil 'cf. *Protovirgularia* sp.' (identified by R. Pickerill) from graphitic, pyritiferous slate in his underlying Unit 13 of the Davidsville Group. Graptolitic black shale, of Middle Ordovician age, occurs within this unit near the Trans-Canada Highway at Glenwood (Williams, 1972).

The dark, argillaceous material of Unit 13 in Careless Brook, from which the trace fossil was recorded, is highly sheared, and in most places too pale for normal graptolite preservation. One narrow band has, however, yielded a few poorly preserved graptolites; these are generally inadequate for critical identification, but include:

*Dicellograptus* sp. indet.

*Orthograptus* sp. indet.

*Climacograptus bicornis* (Hall)

The presence of *C. bicornis* indicates the *N. gracilis* or *C. bicornis* (i.e., *D. multidentis*) Zone of late Llandeilo or early Caradoc age, and suggests a correlation with the lower part of the Lawrence Harbour Formation of the Exploits Subzone.

**CARELESS BROOK TRIBUTARY**(NTS 2D/15; northing 5420760, easting 648150)

The Careless Brook succession, from Unit 15 to Unit 13, is also seen along a small, unnamed tributary of Careless

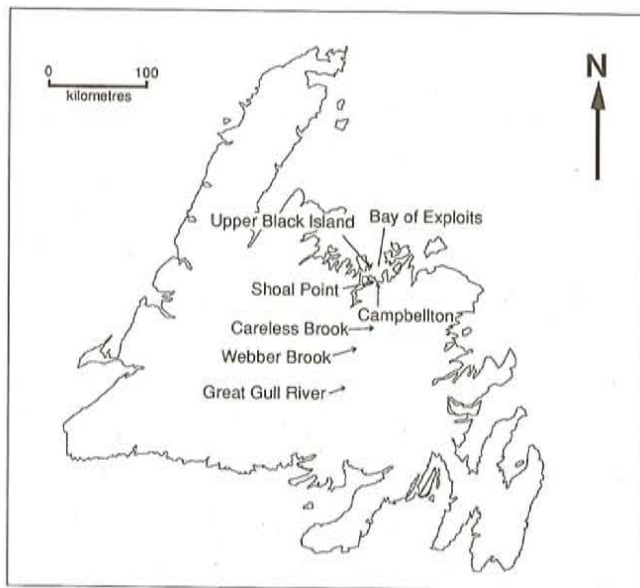


Figure 1. Map of Newfoundland showing position of localities discussed in text.

Brook. Anderson and Williams (1970) and Williams (1972) noted a graptolite locality in this brook, but no fossils were recorded by Blackwood (1982). Just west of the eastern boundary of Blackwood's Unit 15, about 500 m from the logging road, there is a relatively long exposure of black, silty shale, which yields undeformed graptolites beautifully preserved in partial relief. With the exception of the most easterly locality (see below), the assemblages collected from the shale are all similar, and include:

*Dicellograptus morrisi* Hopkinson

*Leptograptus* sp. cf. *L. flaccidus macer* Elles and Wood

*Orthograptus quadrimucronatus* (Hall)

*Orthograptus* ex. gr. *calcaratus* Lapworth (*O. calcaratus basilicus* of Elles and Wood?)

*Ensigraptus tubuliferus* (Lapworth)

*Normalograptus miserabilis* (Elles and Wood)

This association indicates that the shale belongs to the *P. linearis* Zone (late Caradoc—early Ashgill). The rock type, consisting of a rather coarse, non-fissile, siliceous mudstone, is unlike that typical of much of the Lawrence Harbour Formation. It suggests that the shale either represents the top of a black shale unit passing gradationally into sandstone, or is an argillite lens within an otherwise coarser, sandstone sequence, similar to occurrences within the Point Leamington Formation of Notre Dame Bay (Williams 1991; Williams *et al.* 1992).

The most easterly (downstream) locality, some 10 m from those discussed above, yields a subtly different fauna, including:

*Dicellograptus moffatensis* (Carruthers)

*Orthograptus quadrimucronatus* (Hall)

*Orthograptus* ex gr. *amplexicaulis* (Hall) (*O. intermedius* of Elles and Wood?)

*Normalograptus miserabilis* (Elles and Wood)

Although not conclusively different in age, this assemblage may represent a slightly older interval, perhaps the lower *P. linearis* Zone or upper *D. clingani* Zone. Furthermore, the rock is rather finer and more fissile than the locality upstream.

#### GREAT GULL RIVER FOREST ACCESS ROAD (NTS 2D/11; northing 5382600, easting 619100)

Following an initial discovery of graptolites by S.P. Colman-Sadd and W.D. Boyce, additional collections were made from a pit excavated in black shale on the Great Gull River forest access road (Figure 1), 8 km due east of the Bay d'Espoir Highway and just south of the Northwest Gander River. The shale unit is badly deformed, but includes rocks identical to those characteristic of both the upper and lower parts of the Lawrence Harbour Formation in the Badger—Grand Falls—Notre Dame Bay area. The graptolites include:

*Dicellograptus flexuosus* Lapworth

*Leptograptus* sp.

*Climacograptus* sp.

*Normalograptus brevis* (Elles and Wood)

*Orthograptus* cf. *calcaratus* Lapworth

*Corynoides calicularis* Nicholson

*Neurograptus margaritatus* (Lapworth)

*Plegmatograptus nebula* Elles and Wood

This assemblage indicates the presence of the *D. clingani* Zone.

In the part of the pit nearest to the logging road, a single unidentifiable diplograptid specimen was found by S.P. Colman-Sadd. It occurs in a loose fragment of shale, which apparently formed a thin interbed in a sandstone sequence. The sandstone appears to overlie the main shale unit exposed in the rest of the pit, in a relationship that may be analogous to the transition between the Lawrence Harbour and Point Leamington formations in Notre Dame Bay. Unfortunately, no further specimens were found from this level, despite intensive searching.

#### WEBBER BROOK (NTS 2D/11; northing 5392400, easting 627300)

Graptolites were collected from this locality by W.L. Dickson and W.D. Boyce during the summer of 1991. Their collections include:

*Geniculograptus typicalis* (Hall)

*Amplexograptus?* cf. *praetypicalis* Riva

*Normalograptus brevis* (Elles and Wood)

*Orthograptus* cf. *calcaratus* Lapworth

*Geniculograptus typicalis* has apparently never been recorded previously from outside the central and eastern North American mainland. It has not been found in Newfoundland, with the exception of a single record of “*C. cf. typicalis*” by Bergström *et al.* (1974), and was not recorded by Williams (1991) from the Point Leamington Formation of the Exploits Subzone. It is a very distinctive species, due to the strongly geniculated thecal margins; from ranges given by Finney (1986), Riva (1987), Riva and Malo (1988) and Mitchell and Bergstrom (1991), the species appears to be restricted to the equivalents of the *D. clingani* and *P. linearis* zones. It has been recorded from many regions on the North American mainland including Cincinnati, Indiana, Ohio, Oklahoma, New York, St. Lawrence Lowlands, Gaspé Peninsula and Anticosti, and appears to have been restricted in extent to the eastern margin of Laurentia.

#### SHOAL POINT (NTS 2E/3; northing 5455650, easting 642670)

An apparently continuous succession from black shale into sandstone is structurally repeated several times in the wavecut platform at Shoal Point (Figure 1), directly east of the town of Lewisporte. Graptolites are locally abundant both within the main shale unit and in thin black shale interbeds in the lower part of the sandstone unit. The fauna is dominated by *Orthograptus* ex. gr. *calcaratus* Lapworth and *Orthograptus* cf. *pauperatus* Elles and Wood, neither of which is biostratigraphically diagnostic. A few specimens of *Dicellograptus flexuosus* Lapworth, however, also occur, and the assemblage suggests either the late *D. clingani* Zone or *P. linearis* Zone (late Caradoc). The sedimentary transition is thus equivalent to that between the Lawrence Harbour and Point Leamington formations as seen farther to the west.

#### OLD MINE, CAMPBELLTON (NTS 2E/7; northing 5462900, easting 650200)

The black, sulphide-rich argillites of this showing (Figure 1) have not been previously dated. Despite the intense deformation, collections made during the past summer have revealed the presence of abundant, poorly preserved graptolites from one of the darker coloured, more siliceous intervals. Most graptolites are unidentifiable diplograptids, but one specimen represents a definite example of *Climacograptus caudatus* Lapworth; this indicates the *D. clingani* Zone (late Caradoc).

**Table 1.** *Graptolite identifications and biostratigraphic conclusions for samples from the Upper Ordovician and Silurian rocks of Upper Black Island*

Level	Sample	Fossil identifications	Zone	Series
3.4 m	A	diplograptid sp. indet	Indet.	Indet.
4.7 m	B	<i>Rastrites peregrinus</i>	<i>gregarius</i>	Llandovery
5.5 m	C	<i>Climacograptus rectangularis?</i> <i>Rhaphidograptus toernquisti</i> <i>Rastrites sp. indet.</i>	<i>gregarius</i>	Llandovery
15.5 m	D	<i>Coronograptus gregarius?</i> <i>Monograptus austerus sequens?</i> <i>Atavograptus sp.</i> <i>Climacograptus rectangularis?</i> <i>Rhaphidograptus toernquisti?</i> <i>Glyptograptus? sp. indet.</i>	<i>gregarius</i>	Llandovery
16.1 m	E	<i>Coronograptus gregarius?</i> <i>Atavograptus? sp.</i> <i>Rhaphidograptus toernquisti?</i> <i>'Orthograptus' sp.</i> diplograptid sp. indet <i>Dictyonema sp.</i>	<i>gregarius</i>	Llandovery
18.7 m	F	<i>Coronograptus gregarius?</i> <i>Rastrites? sp.</i> diplograptid sp. indet	<i>gregarius</i>	Llandovery
29.5 m	G	<i>Rhaphidograptus toernquisti?</i> <i>Dictyonema sp.</i>	<i>gregarius</i>	Llandovery
34 m	H	<i>Rhaphidograptus toernquisti</i>		
	I	<i>Coronograptus gregarius?</i> <i>Orthograptus insectiformis?</i>	<i>gregarius</i>	Llandovery
41 m	J	<i>Coronograptus gregarius?</i> <i>Rhaphidograptus toernquisti?</i>	<i>gregarius</i>	Llandovery
	A'	<i>'Orthograptus'? sp.</i> diplograptid sp. indet.	Indet.	Indet.
	B'	diplograptid sp. indet.	Indet.	Indet.
	C'	<i>Pseudoclimacograptus? sp.</i>	Indet.	Indet.

#### UPPER BLACK ISLAND (U. ORDOVICIAN– SILURIAN) (NTS 2E/6; northing 5474550, easting 636350)

Subsequent to the report of middle Llandovery graptolites from a dark-grey sandstone sequence on Upper Black Island (Williams and O'Brien, 1991), a number of additional, mostly Llandovery, graptolitic intervals have been sampled from the same section (Table 1). The lowest Horizon (A) lies directly below the breccia unit from which Boyce *et al.* (1991) recovered late Ashgill trilobites. Unfortunately, this horizon has not yielded any identifiable graptolites. Contorted, dark-grey shale, directly overlying the breccia unit, contains middle Llandovery graptolites; the contact between the two units appears to be sharp, and is here considered to be a fault.

Graptolites from the following 40 m of sandstone do not appear to permit any biostratigraphic subdivision; those described by Williams and O'Brien (1991) originated from a level approximately 30 m higher than Horizon J. The remaining samples (from Horizons A' to B') were collected from the uppermost part of the sandstone sequence below the level at which it becomes structurally disrupted; unfortunately, the assemblages from these samples are biostratigraphically inconclusive.

#### MISCELLANEOUS COLLECTIONS, BAY OF EXPLOITS

A number of other graptolite collections have been examined from localities in the Bay of Exploits, including

**Table 2.** *Graptolite identifications and biostratigraphic conclusions for samples from miscellaneous localities in the Bay of Exploits*

Sample	Fossil identifications	Zone	Series	Northing	Easting	NTS
F92-1	diplograptid indet.	Indet.	Indet.	5454400	624300	2E/3
F92-2	no fossils	Indet.	Indet.	5458950	631750	2E/6
F92-3a,b,c	burrows	Indet.	Indet.	5465200	642140	2E/6
F92-4	<i>Dictyonema</i> sp. dendroids indet.	Indet.	Indet.	5474750	635300	2E/6
F92-5	dendroids indet.	Indet.	Indet.	5474750	635300	2E/6
F92-6	dendroids indet.	Indet.	Indet.	5474750	635450	2E/6
F92-7	burrows	Indet.	Indet.	5462900	643450	2E/6
F92-8	no fossils	Indet.	Indet.	5460320	644500	2E/6
F92-11	<i>Dicranograptus ziczac</i> <i>Climacograptus bicornis</i> <i>Orthograptus</i> sp. diplograptid spp. indet. <i>Hallograptus?</i> sp.	<i>gracilis/bicornis</i>	Caradoc	5455800	642800	2E/3
F92-12	<i>Dicellograptus cf. morrisoni</i> <i>Orthograptus quadrimucronatus?</i> <i>Orthograptus calcaratus?</i>	<i>clingani or linearis</i>	Caradoc- Ashgill	5455650	642670	2E/3
F92-13	<i>Dicellograptus cf. morrisoni</i> <i>Dicellograptus flexuosus</i> <i>Climacograptus spiniferus</i> diplograptid spp. indet.	<i>clingani</i>	Caradoc	5455650	642670	2E/3
F92-14	<i>Climacograptus caudatus</i> <i>Climacograptus spiniferus</i> <i>Orthograptus quadrimucronatus</i> <i>Orthograptus ex gr. amplexicaulis</i> diplograptid spp. indet.	<i>clingani</i>	Caradoc	5456250	642750	2E/3
F92-17	graptolites indet.	Indet.	Indet.	5461600	645900	2E/7
F92-18	<i>Dicranograptus</i> sp. indet. diplograptid spp. indet	<i>clingani</i> or older	Caradoc	5460300	651100	2E/7

one other collection from Shoal Point (F92-12, Table 2). Biostratigraphic conclusions and location information are presented in Table 2.

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