Current Research (1988) Newfoundland Department of Mines, Mineral Development Division, Report 88-1, pages 189-192

CONODONT AGES FOR THREE CARBONATE SAMPLES FROM MIDDLE ORDOVICIAN CHERTS AND SHALES IN CENTRAL NEWFOUNDLAND

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ABSTRACT

Conodonts have been recovered from three carbonate samples collected in 1981 during a lithogeochemical survey of Middle Ordovician cherts and shales from central Newfoundland. The faunas range in age from Middle Arenig to Middle Llanvirn.

INTRODUCTION

A lithogeochemical-sampling program was carried out in 1981 to assess the potential for sedimentary, clastic-hosted, base-metal sulphide deposits within Middle Ordovician cherts and shales in central Newfoundland (Dean and Meyer, 1982). These strata, which were deposited in a starved marine basin after the cessation of pre-Caradocian oceanic volcanic activity, are a widespread stratigraphic assemblage which can be recognized throughout central Newfoundland. The base of the sequence generally comprises thin- to thick-bedded chert overlying volcanic flows and volcaniclastic rocks. These cherts pass abruptly upward into black graptolitic shales, recording the effects of the Caradocian transgression (Leggett, 1978).

During the course of the sampling program, fossils were collected wherever possible, to help accurately date and correlate the strata. Graptolites were collected from black shales; carbonate beds, lenses and concretions were sampled for conodonts. In this paper we report the results of the conodont sampling.

METHODOLOGY

In the original study, stratigraphic mapping and sampling of the Middle Ordovician cherts and shales were carried out at twenty-four well-exposed coastal, road, and stream sections (Dean and Meyer, 1982). Mapping of the sections included a description of sedimentological and structural features, and mineral occurences. All samples were geochemically analyzed for major and trace elements, the results of which were reported in Dean and Meyer (1983). Thirteen carbonate rock samples from five sections, were collected for conodont analyses and submitted to Memorial University of Newfoundland. The samples were processed with acetic acid, and the insoluble residues separated by heavy liquid and then hand picked. Nine samples proved to be barren and one sample contained unidentifiable conodont fragments. The three productive samples containing identifiable conodont taxa, along with the sections from which they were sampled (Figure 1), are described below.

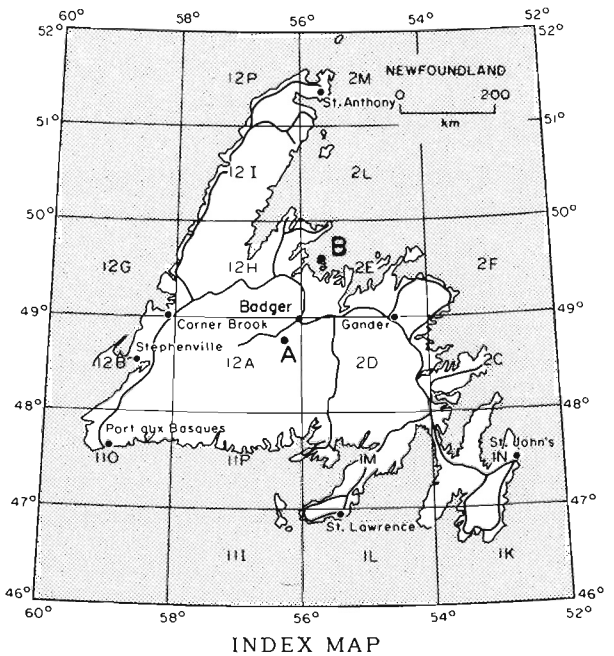

Figure 1. *Location of sections containing conodonts. (A) Little Red Indian Falls. (B) Oil Island and Lushes Bight sections.*

LITTLE RED INDIAN FALLS

A 124-m, steeply dipping, north-facing section of cherts and shales is exposed on the west side of the rapids at Little Red Indian Falls on the Exploits River, 19 km southwest of Badger (Figures 1 and 2). The base of the section is in fault contact with a northeast-striking syncline (within the same unit), and the top of the section is covered by Recent alluvium.

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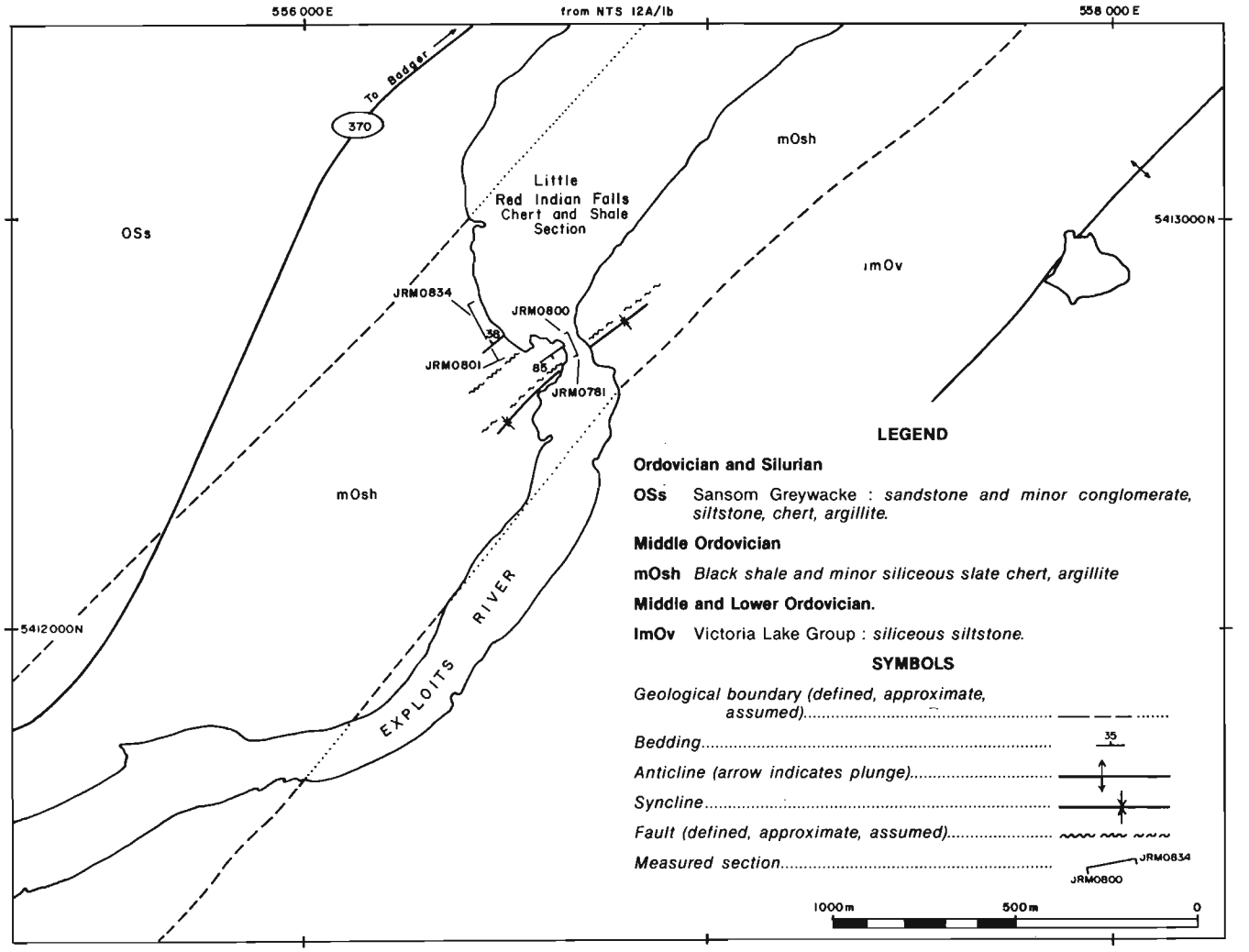

Figure 2. *Location of Little Red Indian Falls section. (Geology after Kean and Jayasinghe, 1982).*

The lower half of the section consists of grey chert and minor shale, which forms a resistant ridge striking perpendicular to the falls (Figure 2; sample numbers JRM 781-800). Recessive black shale in the upper half is exposed below the falls (Figure 2; sample numbers JRM 0801-0834) and is extremely graptolitic, defining three graptolite zones that are approximately equivalent to the British *gracilis, multidens,* and *clingani* zones (Williams, *this volume).*

Carbonate beds and lenses up to 5-cm thick, and concretions up to 50 cm in diameter, are present within both halves of the section, but are much more common in the lower cherty strata. The productive sample (JRM 0786) was collected 18 m above the base of the measured section. The host rocks consist of grey, thin-bedded argillaceous chert containing minor, very thin shale beds. Limestone was collected from a 2- to 8-cm-thick bed, which pinches and swells along strike. The following conodont taxa were identified from this sample:

Belodella sp.
Prioniodus (Baltoniodus) sp.

OIL ISLANDS

On the northeastern corner of the Oil Islands (Figure 3), at the head of Halls Bay, a 38-m section of calcareous shale and clastic limestone of the Parsons Point formation (Dean, 1978) is conformably overlain by felsic volcanics of the Long Tickle formation (Dean, 1978). This shale was correlated with other Carodocian shales around Notre Dame Bay (Dean, 1978). The base of the Oil Island section is not exposed.

The base of the section is on the northeastern edge of a wave-cut bench. Thin-bedded, calcareous shale and minor chert are folded and irregularly interbedded with medium- to coarse-grained clastic limestone and minor limestone conglomerate. Fifteen metres from the base of the section, a 10- to 15-m-thick massive unit of fine- to coarse-grained clastic limestone with an erosional base, contains blocks of shale up to 50 cm in size. The remainder of the section is thinly interbedded to massive, grey calcareous shale and limestone breccia.

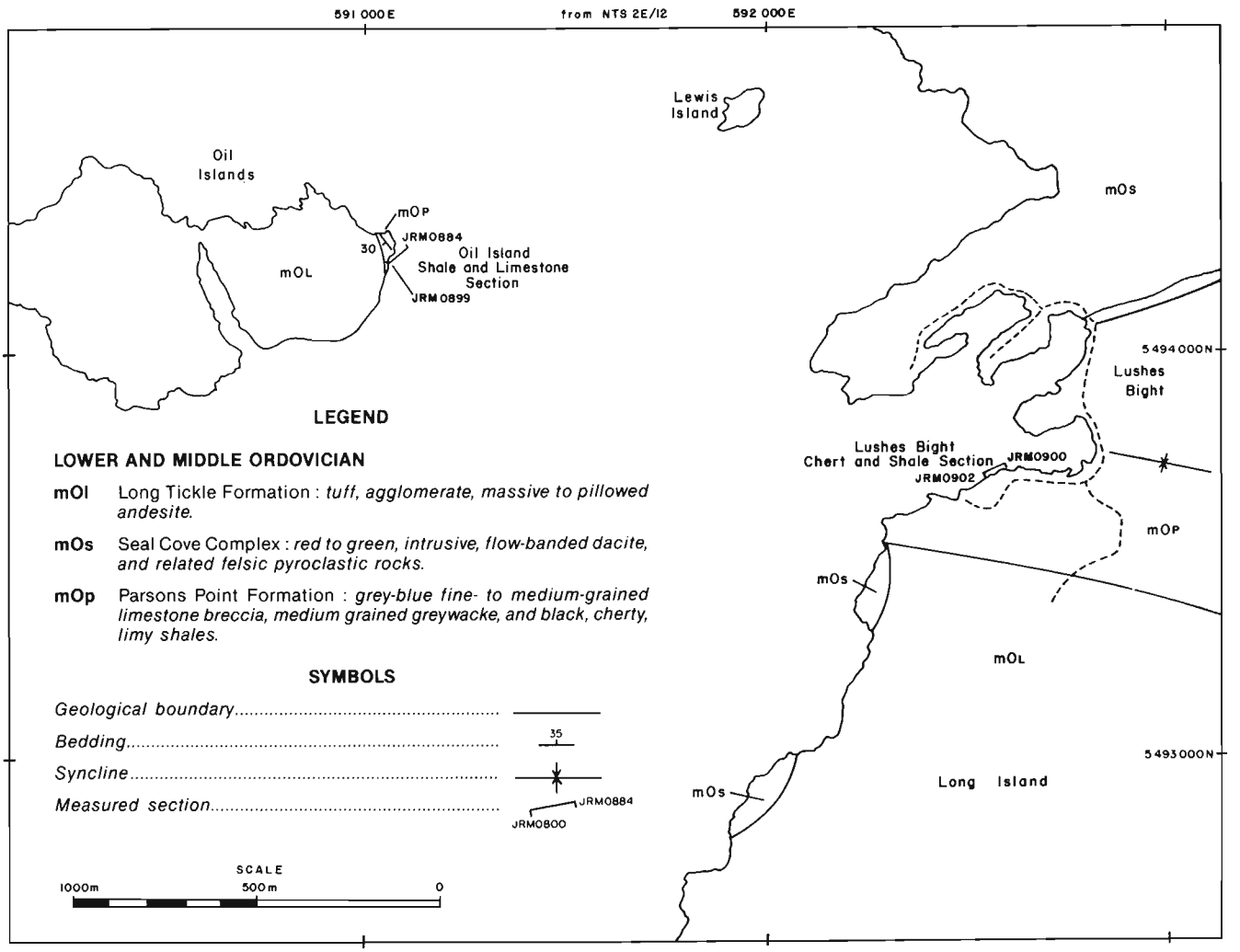

Figure 3. *Location of Oil Island and Lushes Bight sections. (Geology after Dean, 1978).*

Six limestone samples were collected from this section. The one sample that yielded conodonts (JRM 0886) was collected from a 3-m interval, 6 m from the base. The interval consists of thin-bedded, calcareous shale and thin beds and lenses of calcarenite and calcirudite. Importantly, from a biostratigraphic point of view, some of the lenses of calcarenite and calcirudite may have been transported downslope in the basin of deposition by mass flow processes (e.g., sliding). The conodont taxa recovered from this sample are:

Periodon aculeatus Hadding
Protopanderodus robustus (Hadding)
Prioniodus (Baltoniodus) prevariabilis medius Dzik

LUSHES BIGHT

On the western side of Long Island at Lushes Bight (Figure 3), argillaceous chert and shale of the Parsons Point formation are exposed on the south side of the harbour in 6- to 10-m cliffs, and on a wave-cut bench. The base of the 9-m section is not exposed, and the top is capped by a 2-m porphyritic dacite sill.

The section consists of thinly interbedded, argillaceous chert and shale, 1- to 4-cm thick and less than 5-mm thick, respectively. Graptolites have been recovered from this unit, (Dean, 1978), and are discussed by Williams *(this volume)*. Several 1- to 2-cm-thick sandy interbeds and grey calcareous concretions up to 15 cm in diameter are also present. These inconspicuous concretions (JRM 902) contain the most diverse conodont fauna of all three samples:

Belodella jemtlandica Löfgren
Belodella sp.
Cordylodus horridus Barnes and Poplawski
Paracordylodus gracilis Lindström
Periodon aculeatus Hadding
Prioniodus (Baltoniodus) prevariabilis medius Dzik
Protopanderodos rectus Lindström
Protopanderodos sp.

DISCUSSION

The conodont faunas in JRM 0786, JRM 0886, and JRM 0902 are similar, although JRM 0903 contains the most diverse fauna. *Prioniodus (Baltoniodus) prevariabilis medius*

has arange of Lower to Middle Llanvirn in Sweden (Löfgren, 1978). *Belodella jemtlandica* has a similar range; both this species and *Periodon aculeatus* are first known in the latest Arenig. *Paracordylodus gracilis* is more typically found in the Arenig but it is usually a rare element. Current research on the Cow Head Group conodonts in western Newfoundland should firmly establish its range relative to the zonal taxa of conodonts and graptolites. *Cordylodus horridus* of Barnes and Poplawski (1973) is also characteristic of latest Arenig and Llanvirn strata. Löfgren (1978) reported *Protopanderodus rectus* to range into the Early Llanvirn in Sweden.

Based on the above comments, age assignments for these three samples are:

JRM 0786: Middle Arenig–Llanvirn
JRM 0886: Llanvirn, probably Early to Middle Llanvirn
JRM 0902: Llanvirn, probably Early to Middle Llanvirn.

The age given for the sample from Little Red Indian Falls (JRM 0786). based on fragmental and limited conodont data, has a wide range. An upper age limit for this section is provided by graptolites collected from black shales stratigraphically above, and in apparent conformable contact with, the chert unit containing the carbonate bed that yielded the conodonts (Williams, *this volume).* The graptolites collected belong to Williams' Zone 1, the widespread *gracilis* Zone, of Middle Llandeilo to Lower Caradoc age.

COMMENTS

The most abundant and diverse fauna recovered from these samples came from the smallest sample of carbonate; namely, several clay-rich carbonate concretions 15 cm or less in diameter. This is in accord with Blome and Albert (1985), who cite carbonate concretions as being excellent places to preserve fossils, 'largely due to the rapid syngenetic formation at or near the sediment-water interface, which removes the fossil component from corrosive bottom waters relatively early and prevents crushing during compaction of sediments' (Blome and Albert, 1985). Furthermore, they state that large concretions tend to deform more than smaller ones, perhaps damaging brittle microfossils in the outer part, or, cracking and thus allowing penetration by 'destructive pore fluids'. The one sample submitted that contained unidentifiable conodont fragments, was collected from the outer part of a concretion 1 m in diameter, and samples from other, equally large concretions, proved to be barren. Blome and Albert (1985) suggest that the centre of large concretions are more likely to preserve fossils.

There are varying amounts and sizes of carbonate concretions in many of the sections sampled in the original survey (Dean and Meyer, 1982). These concretions, and those in other sections of fine grained sedimentary rocks, would seem to provide excellent sites to sample in an effort to obtain additional paleontological data.

ACKNOWLEDGMENTS

Terry Rees is once again thanked for his help in collecting the original samples in 1981. Conodont processing and initial identification was carried out at Memorial University by F. O'Brien. S. Swinden and D. Boyce critically reviewed and improved the manuscript.

REFERENCES

Barnes, C.R. and Poplawski, M.L.S.
1973: Lower and Middle Ordovician conodonts from the Mystic Formation, Quebec, Canada. Journal of Paleontology, Volume 47, pages 760-790.

Blome, C.D. and Albert, N.R.
1985: Carbonate concretions: an ideal sedimentary host for microfossils. Geology, Volume 13, pages 212-215, March 1985.

Dean, P.L.
1978: The volcanic stratigraphy and metallogeny of Notre Dame Bay, Newfoundland. Memorial University of Newfoundland, Geology Report 7, 205 pages.

Dean, P.L. and Meyer, J.R.
1982: Metallogenic study of Mid-Ordovician cherts and shales of central Newfoundland. *In* Current Research. Newfoundland Department of Mines and Energy, Mineral Development Division, Report 82-1, pages 175-187.

1983: Lithogeochemistry of Mid-Ordovician cherts and shales of central Newfoundland. Newfoundland Department of Mines and Energy, Mineral Development Division, Open File Report (NFLD 1317).

Kean, B.F. and Jayasinghe, N.R.
1982: Geology of the Badger map area (12A/16), Newfoundland. Newfoundland Department of Mines and Energy, Mineral Development Division, Report 81-2, 37 pages.

Leggett, J. K.
1978: Eustacy and pelagic regimes in the Iapetus Ocean during the Ordovician and Silurian. Earth and Planetary Science Letters, 41, pages 163-169.

Löfgren, A.
1978: Arenigian and Llanvirnian conodonts from Jämtland, northern Sweden. Fossils and Strata, no. 13, 129 pages.

Williams, S.H.
This volume: Middle Ordovician graptolites from central Newfoundland.