

## RECENT DEVELOPMENTS IN WESTERN NEWFOUNDLAND CAMBRO-ORDOVICIAN TRILOBITE BIOSTRATIGRAPHY

by W.D. Boyce

### INTRODUCTION

The Cambro-Ordovician carbonate deposits of the Great Northern Peninsula are the object of a continuing regional biostratigraphic study aimed at correlating the western Newfoundland trilobite faunas with the standard Cambrian and Ordovician trilobite zonal schemes of North America (Palmer, 1977; Ross, 1951; Hintze, 1953). This report summarizes previous studies and discusses material collected from the St. Barbe coast and Port au Choix areas in 1976 and 1977. This material is restricted to trilobite faunas and zones in carbonate rocks of Middle Cambrian to Lower Ordovician age.

### CAMBRIAN FAUNAL STUDIES

#### Summary of Previous Work

Middle Cambrian faunal zones have been described extensively in western Newfoundland. Trilobites of the *Bathyriscus-Elrathina* zone are known from the Cloud Rapids Formation of Canada Bay (Howell, 1948) and in limestones named the "Micrite Formation" (Knight, 1977 a&b, and this report) of the St. Barbe coast (Whittington *et al.*, 1966, Boyce, 1977). Recently the zone has been recognized on the Port au Port Peninsula (Boyce *et al.*, 1977). Trilobites include *Ehmania*, *Ehmaniella*, *Glyphaspis*, "*Solenopleura*" and *Kootenia*.

The *Bolaspidella* zone which is the next and youngest Middle Cambrian zone is well known on the Port au Port Peninsula (Lochman, 1938) where it occurs in the March Point Formation. The zone trilobites found were *Marjuria* and *Eldoradia*. Lochman (1938) also reported the overlying *Cedaria* zone in the Petit

Jardin Formation. This zone which is the lowest zone of the Upper Cambrian also appears extensively in western Newfoundland. It has been identified in the St. Barbe coast by Boyce *et al.* (1977) and in the East Arm Formation of Bonne Bay by Troelsen (1947). Typical trilobites include *Arapahoia*, *Kingstonia*, *Terranovella*, *Blountiella*, *Lecanopleura*, *Talbotina* species, *Densonella*, *Coosella*, *Welleraspis*, and *Maryvillia* (Lochman, 1938; Troelsen, 1947)

The above three zones were the only ones known in the post-Lower Cambrian autochthonous carbonates of western Newfoundland until recently. However, Boyce *et al.* (1977) report the trilobites *Dytremacephalus*, *Camaraspis* and *Taenicephalus* which are typical of the later *Aphelaspis-Dunderbergia*, *Elvinia* and *Taenicephalus* zones respectively. These occur on the Port au Port Peninsula. The presence of these trilobite zones shows that Cambrian rocks in western Newfoundland are more thickly developed than most earlier workers indicated. This supports independent lithostratigraphic conclusions for relocating the Cambro-Ordovician boundary much higher in the carbonate sequence of the St. Barbe area as presented by Knight (1977 a & b).

#### Summary of Field Work

The reader is referred to Knight (1977 a, b, and this report) for lithostratigraphical, geological and geographical details. Two formations are presented in the discussions.

##### (1) Micrite formation

Collections were made from the Micrite formation during the past two summers along the St. Barbe Coast between Lonesome Cove and Eddies Cove. The formation includes the two uppermost-Middle Cambrian

trilobite zones, namely, (a) the *Bathyriscus-Elrathina* zone typified by *Ehmania borealis* Howell, *Ehmaniella (Ehmania) cloudensis* (Howell), *Elrathia cf. E. quebecensis* Rasetti, *Glyphaspis* sp. and (b) the *Bolaspidella* zone including the Coreospirid gastropod *Latouchella* sp. and the trilobites *Blainia* sp. and *cf. Asaphiscus laeviceps* (Walcott). This zone was previously not recognised in the formation although it was known from Port au Port (Lochman, 1938).

## (2) Dolomite formation

For the first time, Upper Cambrian rocks have been confirmed north of Bonne Bay. At Bear Cove Point, just north of Deadmans Cove (see also Whittington *et al.*, 1966), the lower Dresbachian trilobites *Arapahoia* sp., *Terranovella cf. T. obscura* Lochman, *Coosella cf. C. helena* Lochman and *Blountia* sp. were collected. These trilobites are indicative of an upper *Cedaria* - lower *Crepicephalus* zone age, that is, lowermost Upper Cambrian (Lochman-Balk and Wilson, 1958; Lochman-Balk, 1970). This data permits preliminary biostratigraphic correlation with the Port au Port Peninsula, 400 km to the south.

Several indeterminate trilobite fragments were also collected from a bed stratigraphically higher than those at Bear Cove Point further south in Winter Cove in St. Barbe Bay. These beds, which also contain the nondiagnostic inarticulate brachiopod *Lingulella* sp., are also most likely Upper Cambrian in age.

## LOWER ORDOVICIAN FAUNAL STUDIES

### Summary of Previous Work

Lower Ordovician rocks of western Newfoundland consist of dolomites and limestones known as the St. George Group (Knight, 1977a,b). There has been a distinct paucity of paleontological and biostratigraphical research into this group in western Newfoundland relative to the Cambrian. The faunas are widely preserved in the limestones. The most complete work on the Lower Ordovician faunas of the group remains that of Billings (1861-65) although Raymond (1913) and Whittington (1953) subsequently revised some of Billings' genera. Most of the fossils described were collected on the Port au Choix Peninsula. Here, Billings (1861-65) described the trilobites *Petigurus nero* (Billings), "*Bathyrurus*" *timon* Billings, "*Bathyrurus*" *caudatus* Billings, *Bathyurellus abruptus* Billings, *Bathyurellus marginatus* Billings, *Bolbocephalus convexus* (Billings), *Benthamaspis gibberulus* (Billings) and "*Amphion*" *insularis* Billings. "*Bathyrurus*" *cordai* Billings was

collected from St. John's Bay. *Isoteloides whitfieldi* Raymond (Schuchert and Dunbar, 1934) and *Carolinites* Whittington and Kindle (1969) are also reported from Port au Choix. Comparable limestones from Cape Norman contain *Carolinites* sp., *Ischyrotoma* sp., *Petigurus nero* (Billings), *Bolbocephalus* sp. and species of *Bathyurellus* (Whittington *et al.*, 1969). Similar, if not the same, trilobites are recorded from the Port au Port Peninsula over 400 km to the south. These Port au Choix faunas have been assigned to zone G of the Ross (1951)-Hintze (1953) Ordovician trilobite zonal scheme by Whittington (1968) and Barnes *et al.* (1976) after comparison with the faunas of the Cow Head breccia (Kindle *et al.*, 1958). These faunas are Upper Canadian in age.

A little known but significant occurrence of the Lower to lower Upper Canadian trilobite genus *Hystriacus* was reported by Betz (1939) from the Chimney Arm Formation of Canada Bay on the eastern side of the Northern Peninsula. Unfortunately, this indication of an Ordovician trilobite fauna older than zone G was either ignored or forgotten until the study of the Cow Head Group by Kindle and Whittington (1958).

### Summary of Field Work

Sampling of limestone sequences near Eddies Cove West and Boat Harbour (figure 1, Knight, this report) was begun this past summer to add to fairly detailed sampling of the sections of Port au Choix and Boat Harbour made in 1976. These limestones have been subdivided into two formations by Knight (this report). These include a lower formation (Unit 6, Knight, this report) which is as yet unnamed and is overlain by rubbly limestones known as the Catoche Formation. The lower unit is exposed along the shorelines near Eddies Cove West and Boat Harbour. The Catoche Formation is the well known limestone sequence between Port au Choix Inlet and Barbace Cove on the Port au Choix Peninsula. Equivalent strata, however, is also found west of Bustard Cove on St. John's Bay and also near Cape Norman in the north of the peninsula.

The collection of trilobite faunas this past summer has shown the presence of two distinct trilobite faunas basically correlating with the two formations of Knight (this report). Most important is the documenting of an older previously little known Lower Ordovician fauna in the lower formation from Eddies Cove West and Boat Harbour.

Detailed bed by bed sampling and sectioning in the Boat Harbour area reveals the presence of the two faunas separated by a faunal and lithological break which coincides with a "pebble bed" (Knight, this report). They are: (1) Below the "pebble" bed, a trilobite fauna

## Lower Ordovician

### Canadian Stage

- J *Pseudocybele* Zone
- I *Presbynileus* Zone
- H *Trigonocerca* Zone
- G2 *Protopliomerella* Zone, St. John Bay, Port au Choix, Boat Harbour
- G1 *Hintzeia* Zone, St. John Bay, Port au Choix, Boat Harbour, Port au Port
- F *Rossaspis* Zone
- E *Tesselacauda* Zone
- D *Leiostegium-Kainella* Zone, Eddies Cove West, Boat Harbour?
- C “*Paraplethopeltis*” Zone, Eddies Cove West, Boat Harbour?
- B *Bellefontia-Xenostegium* Zone, Eddies Cove West, Boat Harbour
- A *Symphysurina Euloma* Zone  
*Mississquoia* Zone

## Upper Cambrian

### Trempealeauian Stage

- Saukia* Zone
  - Corbinia apopsis* Subzone
  - Saukiella serotina* Subzone
  - Saukiella junia* Subzone
  - Rasettia magna* Subzone

### Franconian Stage

- Saratogia* Zone
- Drumaspis* Subzone

- Idahoia lirae* Subzone
- Taenicephalus* Zone, Port au Port
- Parabolinoidea* Subzone
- Elvinia* Zone, Port au Port

### Dresbachian Stage

- Dunderbergia* Zone, Port au Port
- Prehousia* Zone, Port au Port
- Dicanthopyge* Zone, Port au Port
- Aphelaspis* Zone, Port au Port
- Crepicephalus* Zone, Port au Port, Bear Cove Point
- Cedaria* Zone, Port au Port, Bear Cove Point

## Middle Cambrian

### No stages named

- Bolaspidea* Zone, Port au Port, Eddies Cove
- Bathyriscus-Elrathina* Zone, Port au Port?, Eddies Cove, Canada Bay
- Glossopleura* Zone
- Albertella* Zone
- Plagiura-Poliella* Zone

## Lower Cambrian

### No stages named

- Bonnia-Olenellus* Zone, Port au Port, Bonne Bay, Canada Bay, SE Labrador, Hawkes Bay, St. John Highlands
- Nevadella* Zone
- Fallotaspis* Zone

Table 1.

consisting of *Hystricurus* sp. 1, *Hystricurus* sp. 2, *Bellefontia* ? cf., *B.?* *acuminiferentis* Ross (1951), and two as yet undetermined trilobites. This fauna appears to typify an unnamed lithostratigraphic sequence (Unit 6, Knight, this report). (2) Above the pebble bed, a fauna essentially the same as the relatively well known Port au Choix fauna. This fauna includes two undetermined genera as well as *Petigurus nero* (Billings), *Bolbocephalus convexus* (Billings), *Bolbocephalus* sp., "*Bathyurus*" *timon* Billings, "*Bathyurus*" *caudatus* Billings, *Bathyuellus abruptus* Billings, "*Peltabellia*" sp., *Ischyrotoma* sp., *Isoteloides* sp. and *Uromystrum* sp. The fauna occurs in limestone called the Catoche formation (Knight, 1977a, b, and this report).

Reconnaissance sampling in the Eddies Cove West area yielded *Hystricurus* sp. 2, *Hystricurus* (*Paraplethopeltis*?) cf. *H?* (*P.?*) *millardensis* and/or *Hystricurus* (*Paraplethopeltis*?) cf. *H?* (*P?*) *genacurvis* (Hintze, 1953), *Lloydia* sp. and one undetermined trilobite.

### Discussion of Lower Ordovician Faunas

At Boat Harbour, *Bellefontia?* cf. *B.?* *acuminiferentis* Ross mostly occurs below beds containing *Hystricurus* sp. 2 which also occurs at Eddies Cove West. The trilobites *Hystricurus?* (*Paraplethopeltis*?) cf. *H?* (*P?*) *millardensis* and/or *genacurvis* (Hintze, 1953) and *Lloydia* (*Leiostiegium*) sp. occur in a bed only a few metres above beds containing *Hystricurus* sp. 2 at Eddies Cove West. These trilobites indicate a possible zonal range from zone B to D age (Ross, 1951; Hintze, 1953) for the succession below the "pebble bed" at Boat Harbour and below the Catoche Formation at Eddies Cove West. This fauna is found only associated with the lower limestone sequence (Unit 6, Knight, this report) and contrasts with the fauna collected from limestones of the Catoche Formation (Unit 7, Knight, this report) from these two localities and from Port au Choix. This upper fauna is typical of zone G (Ross, 1951; Hintze, 1953). So far, no trilobites suggestive of zones E and F have been collected; however these zones do not have a large diversity of fauna in the type areas of Utah and Nevada where the zones were first established and thus may have been overlooked in the project area. However, the trilobites collected from the Cow Head breccia also indicate the absence of zones E and F (Whittington, 1968). It is therefore possible that the "pebble" bed at Boat Harbour reflects an event which removed or prevented the record of these missing trilobite zones and that a disconformity exists within the Lower Ordovician of Western Newfoundland. Further detailed work is planned to hopefully confirm the presence of the two faunas, the missing fauna, and the possible disconformity.

Table 1 outlines the trilobite zones of the Cambro-Ordovician of North America as compiled from Palmer (1977) and Barnes *et al.*, (1976). The zones so far recognized in Newfoundland are indicated by the localities at which the characteristic faunas have been collected.

**Acknowledgements:** *The author would like to thank Ian Knight for the opportunity to work on the Cambro-Ordovician faunas and for his enthusiastic encouragement and discussions of various problems as well as assistance in fossil collection. The author would also like to thank Judi Edwards and Cathy Patey for their assistance in fossil collection and often lively discussion, and especially Ms. Patey for the donation of a critical specimen.*

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