EARLY CAMBRIAN TRILOBITE FAUNAS AND CORRELATIONS, LABRADOR GROUP, SOUTHERN LABRADOR—WESTERN NEWFOUNDLAND

Douglas Boyce[1], Ian Knight[1], Christian Skovsted[2] and Uwe Balthasar[3]
1 - GSNL; 2 - Swedish Museum of Natural History; 3 – University of Plymouth, England.

Newfoundland Labrador
Natural Resources

Paleontological, lithological and mapping studies of mixed siliciclastic–carbonate rocks of the Labrador Group have been ongoing, since 1976, by the GSNL. Recent systematic litho- and bio-stratigraphic studies with Drs. Skovsted and Balthasar focus on trilobite and small shelly fossils (SSF), mostly in the Forteau Formation. At least 34 co-eval sections have been measured, and 434 fossiliferous samples have been collected; publication of trilobite and SSF systematics is in preparation.

GLOBAL		LAURENTIA			
Series	Stages	Series	Stages	Previous Trilobite Zones	Current Trilobite Zones
Ser. 3	Stg. 5			*Oryctocephalus indicus*	*Oryctocephalus indicus*
boundary position undecided		Lincolnian	Delamaran	*Amecepahlus arrojosensis*	*Amecepahlus arrojosensis*
				Eokochaspis nodosa	*Eokochaspis nodosa*
Series 2	Stage 4	Waucoban	Dyeran	Bonnia-Olenellus	*Nephrolenellus multinodus* *Bolbolenellus euryparia* *Peachella iddingsi* *Bristolia insolens* *Mesonacis* n. sp. *Bristolia mohavensis* *Arcuolenellus arcuatus* Lower two-thirds of Dyeran currently under study.
	Stage 3		Montezuman	"Nevadella"	*Nevadella eucharis* *Nevadia addyensis* "barren" interval *Avefallotaspis maria* *Grandinasus patulus* *Esmeraldina rowei*
				"Fallotaspis"	*Fallotaspis*
	Stage 2	Begadean	No stages designated	*Fritzaspis*	*Fritzaspis*
Terre-neuvian				Trilobites not present	

Early Cambrian and early Middle Cambrian global and Laurentian series and stages (Hollingsworth, 2011).

Stage	Biozone	Sub-biozone	Hawkes Bay	Port au Port Peninsula	Gros Morne National Park	Canada Bay
Topazan	*Ehmaniella*	*Altiocculus*		*Ehmaniella*	*Ehmaniella*	*Ehmaniella cloudensis*
		Ehmaniella				*Olenoides longispinus*
		Elrathiella				
		Proehmaniella				
Delamaran	*Glossopleura walcotti*	(undivided)		*Polypleuraspis* *Glossopleura walcotti*	*Glossopleura walcotti*	*Polypleuraspis* *Glossopleura walcotti*
	Mexicella mexicana	*Albertella highlandensis*			*Mexicella mexicana*	*Ptarmiganoides*
		unnamed				
		Albertella aspinosa				
	Poliella denticulata	(undivided)				*"Proliostracus"*
	Amecephalus arrojoensis					*Amecephalus*
	Eokochaspis nodosa					
Dyeran (uppermost)	*Nephrolenellus multinodus*	(undivided)	*Mesonacis fremonti*		*Mesonacis fremonti*	*Bonnia-Olenellus* (undivided)
	Bolbolenellus euryparia					
	Peachella iddingsi		*Fritzolenellus lapworthi*	*Bonnia-Olenellus* (subsurface)	*Bonnia-Olenellus* (undivided)	
	Bristolia insolens					
	Bristolia mohavensis					
	Arcuolenellus arcuatus					

FORTEAU FM HAWKE BAY FM MARCH POINT FM

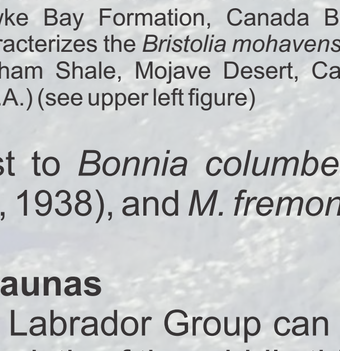
Dyeran to Topazan biostratigraphy, southern Labrador and western Newfoundland.

Distribution of the Trilobite Faunas

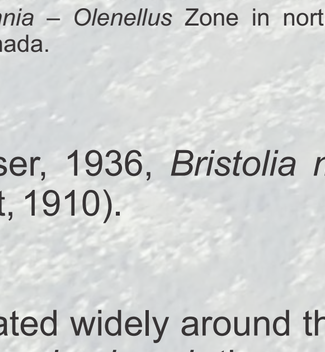
Early Cambrian trilobite faunas occur throughout the Forteau Formation and in the lowest strata of the overlying Hawke Bay Formation. They divide into two broad faunas – Olenelloidea, mostly occur in deep-water shale and mudrocks, and Corynexochida, are hosted in shallow-water limestone, including archeocyathid reefs.

The Devils Cove member, basal Forteau Formation - a regionally widespread pink limestone - hosts *Calodiscus lobatus* (Hall, 1847), *Elliptocephala logani* (Walcott, 1910), and *Labradoria misera* (Billings, 1861a). *Calodiscus lobatus* and *E. logani* range high in the formation regionally, but *L. misera* is restricted to the lower 20 m of the formation in Labrador (includes archeocyathid reefs).

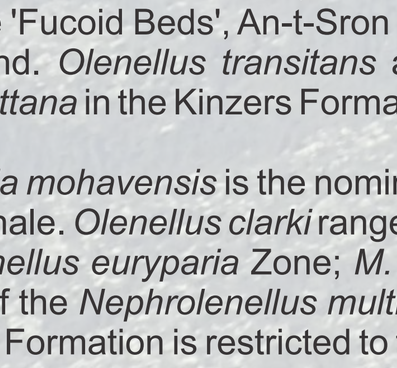
Bonnia parvula (Billings, 1861a), *B. senecta* (Billings, 1861a), *E. logani* and *Olenellus transitans* (Walcott, 1910) are the most common trilobites in the Forteau Formation. The first three generally characterize shallow-water limestone and the last deep-water shale. Other taxa include *Bonnia* sp. nov. Boyce, *Bristolia mohavensis* (Crickmay *in* Hazzard and Crickmay, 1933), *Fritzolenellus lapworthi* (Peach and Horne, 1892), *Olenellus clarki* (Resser, 1928), *Olenellus thompsoni* (Hall, 1859), *Wanneria walcottana* (Wanner, 1901), *Zacanthopsis* sp. A Boyce, and various unidentified ptychopariids. Many occur in GMNP; most are new to Newfoundland.



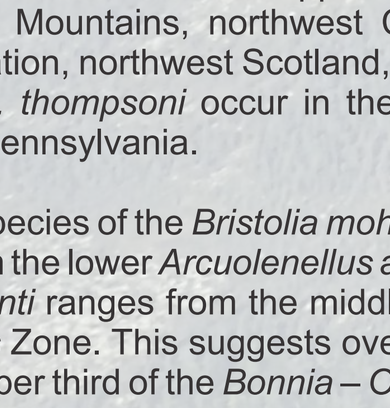
***Zacanthopsis* sp. A Boyce**: latex replica of partial cranidium, Mackenzie Mill member, GMNP.



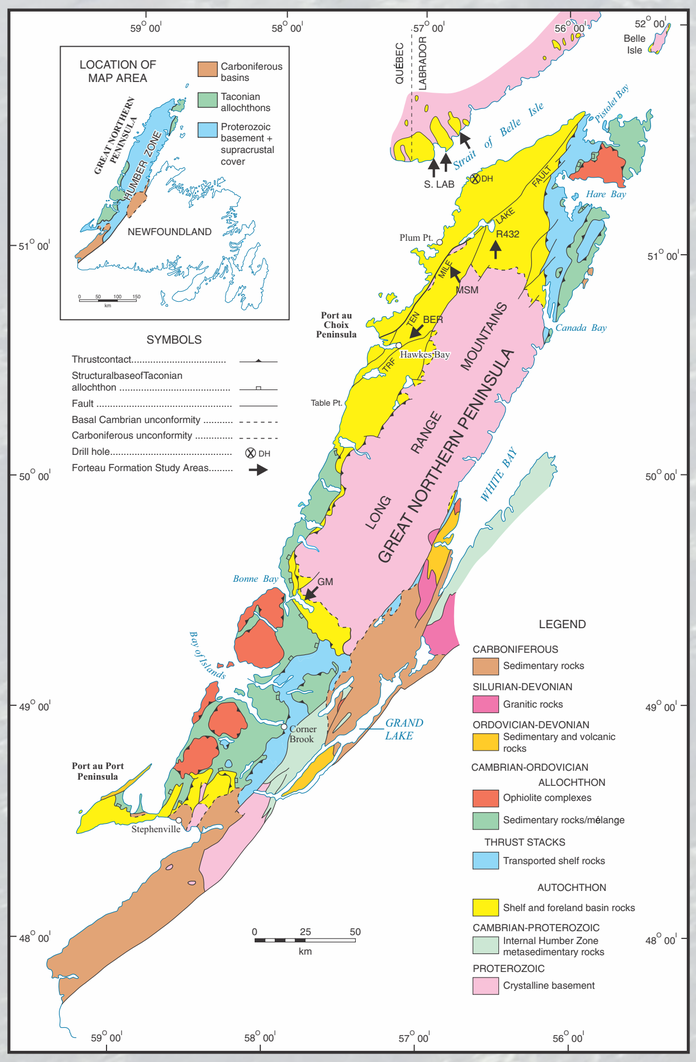
***Bonnia* sp. nov. Boyce**: latex replica of partial, highly ornamented, spinose cranidium, Route 432, Great Northern Peninsula (GNP); it also occurs in the Deer Arm limestone, Mackenzie Mill member, GMNP.



Bristolia mohavensis (Crickmay *in* Hazzard and Crickmay, 1933): incomplete cephalic sclerite, Route 432, GNP; it also occurs in the basal Grosse Pointe member, Hawke Bay Formation, Canada Bay and characterizes the *Bristolia mohavensis* Zone (Latham Shale, Mojave Desert, California, U.S.A.) (see upper left figure)



***Elliptocephala logani* (Walcott, 1910)**: latex replica, incomplete cephalon, Route 432, GNP. This distinctly ornamented trilobite characterizes the middle of the *Bonnia – Olenellus* Zone in northwestern Canada.



Primary geological terranes of western Newfoundland showing the Forteau Formation study areas (arrows). GM - Gros Morne National Park.

The basal Hawke Bay Formation is host to *Bonnia columbensis* Resser, 1936, *Bristolia mohavensis*, *Mesonacis bonnensis* (Resser and Howell, 1938), and *M. fremonti* (Walcott, 1910).

Laurentian Correlation of the Trilobite Faunas

The Dyeran trilobite faunas of the middle Labrador Group can be correlated widely around the margin of Laurentia. *Elliptocephala logani* is characteristic of the middle third, and *B. columbensis* the uppermost part of the *Bonnia – Olenellus* Zone of the Sekwi Formation, Mackenzie Mountains, northwest Canada. *Fritzolenellus lapworthi* is known from the 'Fucoid Beds', An-t-Sron Formation, northwest Scotland, and the Bastion Formation, North-East Greenland. *Olenellus transitans* and *O. thompsoni* occur in the Parker Formation, Vermont, and *Wanneria walcottana* in the Kinzers Formation, Pennsylvania.

In the Great Basin (western USA), *Bristolia mohavensis* is the nominate species of the *Bristolia mohavensis* Zone (see above figures) in the Latham Shale. *Olenellus clarki* ranges from the lower *Arcuolenellus arcuatus* Zone to possibly the lowermost *Bolbolenellus euryparia* Zone; *M. fremonti* ranges from the middle of the *Arcuolenellus arcuatus* Zone to the top of the *Nephrolenellus multinodus* Zone. This suggests overall that the trilobite fauna of the basal Hawke Bay Formation is restricted to the upper third of the *Bonnia – Olenellus* Zone.

Global Correlation of the Trilobite Faunas

Calodiscus lobatus indicates a correlation with the *Serrodiscus bellimarginatus-Triangulaspis annio-Hebediscus attleborensis* assemblage in Avalonia, West Gondwana, Taconic Laurentia, and Siberia, but it also occurs in younger Cambrian strata: *e.g.*, the *Pagetides* assemblage in the Taconic region of New York State, the *Protolenus* Limestone of England, and the *Cephalopyge notabilis* Zone /upper *Hupeolenus* Zone of Morocco.