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New olenelloid trilobites from the Northwest Territories, Canada

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Abstract

The Olenelloidea are a superfamily of early Cambrian trilobites, which have been the subject of several phylogenetic analyses and also used to address macroevolutionary questions regarding the nature and timing of the Cambrian radiation. The Sekwi Formation of the Mackenzie Mountains, Northwest Territories, Canada, has yielded numerous species from this clade, and here we present new information that expands on the diversity known from this biogeographically and biostratigraphically important region. In particular, we describe seven new species, (*Olenellus baileyi*, *Mesonacis wileyi*, *Elliptocephala jaredi*, *Holmiella taurus*, *H. domackae*, *Mummaspis delgadoae*, and *Bristolia colberti*). Also recovered are specimens of *Elliptocephala logani*, specimens that shared affinities with *Olenellus clarki*, *O. getzi*, *O. fowleri*, and *Fritzolenellus hansenii*, and one partial specimen, which appears to be a new species of *Bolbolenellus*.

Key words: Cambrian, Trilobita, Olenelloidea, Northwest Territories

Introduction

The Olenelloidea Walcott, 1890 is a diverse superfamily of early Cambrian trilobites referable to the suborder Olenellina Walcott, 1890 and have been the focus of much attention in the study of evolutionary tempo and mode during the Cambrian radiation (Fortey *et al.* 1996; Lieberman 1999, 2001, 2003). The purpose of this study is to describe new species and additional material of previously described species in order to expand our knowledge of the diversity of the group. The new material comes from the Sekwi Formation, Mackenzie Mountains, Northwest Territories, Canada. This formation has yielded a diverse array of early Cambrian trilobites (Fritz 1972; Abe *et al.* 2010; Gapp *et al.* 2011) as well as a well-preserved chancelloriid fauna (Randell *et al.* 2005). The unit is relatively thick, consisting of 715 to 750 m of interbedded carbonate, shale, and sandstone, comprising mainly weathered limestone and dolostone, deposited during the *Fallotaspis*, *Nevadella*, and *Olenellus* trilobite zones (Fritz 1972, 1973; Randell *et al.* 2005; Dilliard *et al.* 2007, 2010). This genus level zonation scheme has been abandoned such that all are now treated as within the Laurentian Waucoban series, with the first two zones corresponding to the Montezuman stage and the latter equivalent to the Dyeran stage (Webster 2011a, b).

This paper describes seven new species of olenelloid trilobites belonging to six different genera: *Olenellus* Hall, 1862, *Mesonacis* Walcott, 1885, *Elliptocephala* Emmons, 1844, *Holmiella* Fritz, 1972, *Bristolia* Harrington, 1956, and *Mummaspis* Fritz, 1992. Also recovered were specimens of *Elliptocephala logani* Walcott, 1910 and *Holmiella preancora* Fritz, 1972 and some trilobites whose taxonomic identity could not be precisely determined yet seem to have affinities to previously described species of *Olenellus*, *Fritzolenellus*, and *Bolbolenellus*.

The specimens used in this study occur as internal and external moulds with some in relief (see Webster and Hughes 1999 and Paterson *et al.* 2007 for more detailed studies regarding early Cambrian trilobite taphonomy). Some material was collected *in situ* and other material was collected in float. Specimens were prepared manually, by air abrasion, and vibratool. For photographic purposes, specimens were blackened using process black, then coated with ammonium chloride. Casts were made of external moulds using latex for figuring (these are noted in figure descriptions). Sections given for the Sekwi Formation under “occurrences” refer to those used in Dilliard *et al.* (2007), Abe *et al.* (2010), and Gapp *et al.* (2011).

In southwestern Laurentia, species of *Bristolia* typically occur high up in the Dyeran stage (Webster 2011a, 2011b; Webster *et al.* 2011). However, in northwestern Laurentia this genus occurs relatively lower down in the stage, especially relative to the position of other olenelloid genera.

Occurrence. *Olenellus* zone or Waucoban Series, Dyeran stage, *sensu* Webster (2011a, b) and Webster *et al.* (2011), early Cambrian, Sekwi Formation, Mackenzie Mountains, Northwest Territories, Canada, Section 4, 430–435 m above the base of section.

Subfamily Biceratopsinae Pack & Gayle, 1971

Genus *Bolbolenellus* Palmer & Repina, 1993

Type species. *Olenellus euryparia* Palmer in Palmer & Halley, 1979.

Bolbolenellus sp.

Fig. 3.3, 3.4

Material examined. KUMIP 355561.

Discussion. Fritz (1972) suggested his *Olenellus* sp. 4 was similar to *B. altifrontatus* (Fritz, 1972). This specimen was compared with both species and it appears to be more similar to *B. altifrontatus*. It does differ however from *B. altifrontatus* in having somewhat more prominently incised S1-S3, but this might be attributable to the fact that the specimen medially is somewhat weathered. As we only have a single incompletely preserved specimen, we are leaving it in open nomenclature.

Occurrence. *Olenellus* zone or Waucoban Series, Dyeran stage, *sensu* Webster (2011a, b) and Webster *et al.* (2011), early Cambrian, Sekwi Formation, Mackenzie Mountains, Northwest Territories, Canada, Sekwi Formation, Mackenzie Mountains, Northwest Territories, Canada, Section 4, 710–720 m above the base of section.

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