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A new, Middle Cambrian, Burgess Shale-type biota, *Bolaspidella* Zone, Chancellor Basin, southeastern British Columbia

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ABSTRACT

A newly discovered Burgess Shale-type (BST) biota occurs in southeastern British Columbia on Haiduk and Tangle peaks. The fossiliferous rocks of the informally named Vermilion sub-unit and Duchesnay unit occur in the *Bolaspidella* Zone, one trilobite biozone younger than the Burgess Shale Formation. The younger rocks abut the Eldon Escarpment in a stratigraphic and depositional relationship that mirrors that of the Burgess Shale Formation and Cathedral Escarpment.

The biota, concentrated at the Eldon Escarpment, is hosted predominantly in the Duchesnay unit, and includes Burgess Shale genera of sponges, worms, some arthropods and brachiopods. New taxa include an arborescent, benthic graptolite with preserved fuselli. Microbial fossils, including vendotaenid bacteria, are locally abundant and range up to 750 m basinward of the Escarpment in both the Vermilion sub-unit and Duchesnay unit, while concentrations of animal fossils are restricted to within 100 m.

In the Vermilion sub-unit, large autochthonous carbonate mud mounds, previously interpreted as platform-derived olistoliths, originated at the base of the Escarpment, probably over fluid conduits, and then slid downslope, bulldozing and entraining sediments in their paths. Local magnesian- and barian-rich brine pool deposits occur up to 750 m distal of the Escarpment; fractionation of the fluids may explain the differing geochemistries. At least one MgO-rich brine pool deposit on Haiduk Peak is fringed by abundant animal fossils, including concentrations of priapulid worms. This assemblage, together with high-density, low-diversity assemblages on Tangle Peak likely represent "fringing fauna facies" around brine seeps, a model erected for similar fossil concentrations and distributions in the Burgess Shale.

Intrabasinal comparison of the Vermilion sub-unit and Duchesnay unit with the Burgess Shale Formation reveals an identical stratigraphic ordering of carbonates and shales, brine pool deposits, major debris flow deposits, carbonate mud mound growth and fossiliferous deposits. The Eldon and Cathedral platform formations are known to share complimentary brine-derived characteristics as well. The stratigraphic patterns signify that the depositional processes producing the suite of older lithofacies recurred during deposition of the younger units. Interbasinal correlation with the Wheeler and Marjum formations, Utah, identifies the Duchesnay unit deposit as the youngest basinal Burgess Shale-type deposit in North America.

Decreasing abundance of animal fossils away from the Eldon and Cathedral escarpments is generally attributed to increasing development of tectonic fabrics. However, on Haiduk Peak, rocks hundreds of metres basinward of the Escarpment contact are essentially undeformed and contain rare *Planolites*, brachiopods and trilobites as the only macrofauna; locally abundant vendotaenids and *Morania* are evidence that BST preservation occurred at these distances. The concentration of animal fossils at the Escarpment is therefore a primary ecological feature, not due to a preservational or rheological bias. Communities were clustered at the face of the Escarpment where brines were seeping.

1. Introduction

The Middle Cambrian Chancellor Group includes the famous Burgess Shale Formation and younger, less renowned rocks of the informal Vermilion sub-unit and Duchesnay unit. These younger units are exposed in scattered outcrops for 100 km along the southeasterly trending Eldon Escarpment, a nearly vertical Middle Cambrian seafloor feature that marked the outer edge of a carbonate platform. In this way, the Vermilion sub-unit and Duchesnay unit share a depositional geometry with the Burgess Shale Formation, which abuts the older Cathedral Escarpment. Like the Burgess Shale, these mixed

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carbonate and argillaceous basinal strata host fossils including nonbiomineralized taxa (*i.e.*, "BST preservation" *sensu* Butterfield, 2003) in a narrow zone along the Escarpment face.

This study introduces the stratigraphy and biota of the Duchesnay unit and Vermilion sub-unit and outlines similarities with the Burgess Shale in the relative stratigraphic positions of major lithologies and fossil occurrences. Many lithostratigraphic components of the Burgess Shale Formation are mirrored in the Vermilion sub-unit and Duchesnay unit, including the occurrence of MgO-rich brine pool deposits (Powell et al., 2006). Four sites in southeastern British Columbia were examined: (1) the north face of Mt Dennis, across the Kicking Horse River valley from Mt Field and Fossil Ridge; (2 and 3) Haiduk and

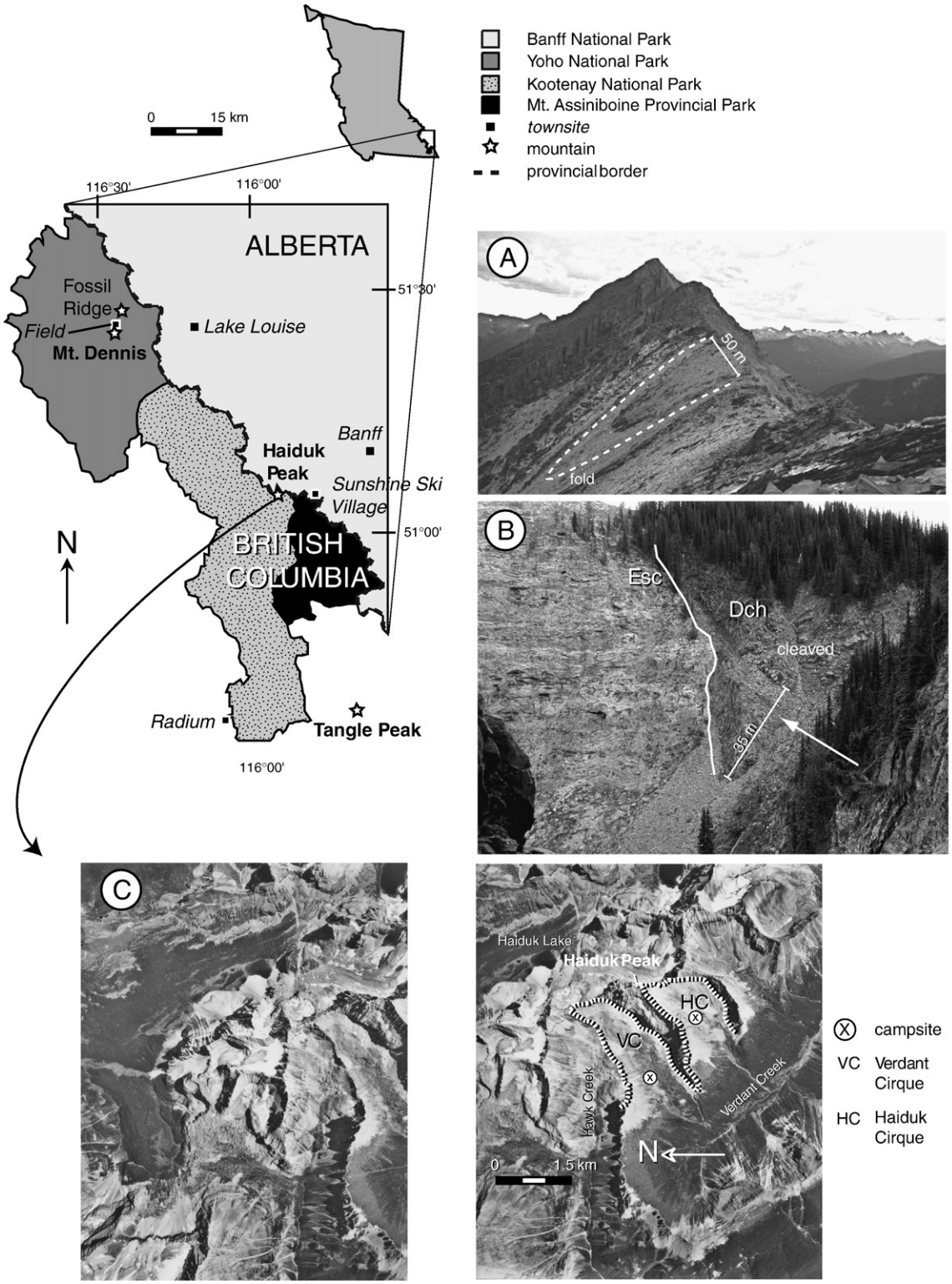

Fig. 1. Map and photographs of study and reference localities. (A) Isoclinal fold in Duchesnay unit on south slope of eastern limb of Mount Dennis, Yoho National Park. (B) Contact of Duchesnay unit (Dch) and Eldon Escarpment (Esc), Tangle Peak near Miller Pass. Bar shows 35 m measured section with cleaved strata above. Arrow shows position of pyrite-rich bed with concentrations of *Hemirhodon amplipyge* Robison and *Byronia annuata* Matthew. (C) Aerial photographs (stereo pair) showing Verdant Cirque (VC) and Haiduk Cirque (HC) on southwestern slope of Haiduk Peak, Kootenay National Park. North to left.